

Department of

GEOSCIENCES



PennState
College of Earth
and Mineral Sciences

From the Department Head



Dear Alumni and friends,

I'm pleased to welcome you to the 2018 Penn State Geosciences Newsletter. As the new department head, I am excited to take on the challenges and opportunities that lie ahead. I take great pride in being a part of our department, the College of Earth and Mineral Sciences, and the broader Penn State community, and look forward to working with our administration, faculty, staff, students, and alumni in the coming years to continue the legacy of Penn State geosciences as a model for interdisciplinary science, diversity and inclusivity, innovative teaching and mentorship, and public engagement.

The Department of Geosciences remains at the forefront of major initiatives on the national and international scenes. Our faculty and students are leading interdisciplinary projects that address fundamental science questions while having great impact on policy, our understanding of natural hazards, and human health. These involve programs focused on climate risk management that include the network for sustainable climate risk management (SCRiM); major

multi-national field campaigns in Antarctica and Greenland to assess the dynamics and drivers of ice movement (p. 18); studies of active volcanoes in Central America (p. 10); and international ocean drilling efforts to study plate boundary deformation and earthquakes (see p. 20). Penn State geosciences faculty are leading a newly funded major NASA Astrobiology Center that will spin up this year. And our department is a key player in a large NSF-funded graduate training program led by colleagues in geography, focused on the food-energy-water nexus. Our students and faculty continue to win accolades at the highest levels in the science community (p. 27).

Our faculty are also innovating in the classroom, for example, through the development of virtual reality field trips—an effort strongly aligned with the University's strategic plan—that will vastly increase the accessibility of field experiences for our students. And the Imperial Barrel Award (IBA) team continues its extraordinary success, having placed third in the AAPG international competition in 2018 after winning the Eastern Section competition for the third year in a row (p. 16).

The past year has also been an exciting time for the department's growth, as we have hired several new colleagues. We are excited to welcome Sarah Ivory, a hydro-ecologist who joined us in August 2018 as an assistant professor. Sarah's work focuses on environmental change linked to fire and aridity, and the reconstruction of ecological and hydrologic dynamics in past environments. We are also eager for several additional new hires to arrive at Penn State in the coming year or so: Miquela Ingalls, a sedimentologist and geochemist who uses the carbonate record to understand modern and ancient environments, will join us in early 2020; and Jesse Reimink, a petrologist whose work focuses on the formation of the Earth's crust and evolution of the early Earth, will arrive in 2019. We are currently initiating a search in the critical area of hydrogeology, with interviews slated for spring of next year.

We also celebrate the careers of two influential leaders and emeritus faculty who passed away this past year: Ben Howell and Shel Alexander. Both left a lasting legacy and had a profound impact on the department, their fields, and through their mentorship of students (p. 12).

Our students are fortunate to continue to have opportunities for extraordinary experiences outside of the classroom, ranging from the field experiences in our undergraduate and graduate curricula to research projects that take them anywhere from our regional Susquehanna Shale Hills Critical Zone Observatory to the far corners of the globe in Japan, New Zealand, and Africa. Your generous support continues to make these opportunities possible, so thank you!

A handwritten signature in black ink, appearing to read "Demian Saffer".

Demian Saffer

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Penn State Geosciences

Bachelor's Degree Student: Madeline Nyblade



I am passionate about helping create a more sustainable, equitable world. My experience studying in Tanzania, Belize, and Bhutan opened my eyes to the challenges facing our planet and people around the world. So, I decided to study geosciences

to develop my knowledge of earth systems and the skills to create the change I wanted to see. As a sophomore, I began working with Dr. Tess Russo on modeling the hydrologic system in Punjab, India, an important agriculture state experiencing the highest rates of groundwater overdraft worldwide.

As I studied this issue, I quickly learned that hydrology was only one aspect of this complex, unsustainable system. In order to develop a sustainable management plan, many forms of expertise are required, especially local knowledge. Unfortunately, I discovered most academic studies and models of Punjab were restricted to academic disciplines, rather than built from collaborations across physical and social sciences and partnerships with local communities. The lack of interdisciplinary, community-based work left important questions unexplored, so I decided to expand my research and my own understanding of water resource use to include human dimensions.

I ended up taking classes in economics, anthropology, geography, landscape ecology, philosophy, community development, international agriculture, and sociology. I expanded my research to include numerical modeling with Dr. Ludmil Zikatanov and economics modeling with Dr. Kate Zipp to develop an integrated numerical model of the hydrologic, agricultural, and economic situation in Punjab, India. Due to time constraints, I was unable to travel to India to include more social science and local knowledge from Punjabi farmers, but these aspects are integral to developing a path towards sustainability. Through this experience, I have explored the nature of hydrologic issues facing humanity today and the rewards and challenges of interdisciplinary research. I plan to continue studying water resource

management through interdisciplinary and community-based research in graduate school.

Outside of academics, I am involved in environmental activism across the community. I was president of Eco Action, Penn State's environmental advocacy club, where I helped organize busses to the Climate and Science Marches, a homecoming float made from single-use plastic water bottles, a public forum on climate justice, and many other events. I have learned a tremendous amount about leadership and community building from this experience. I will carry these skills with me as I help create a more sustainable, equitable future through the co-creation of science between experts and communities.

Master's Degree Student: Gabrielle Ramirez



I vividly remember my first class as an undergraduate student at the University of Texas at Austin. It was 9:00 a.m. and Dr. Jaime Barnes, the professor for my Introduction to Physical Geology class, was bursting

with excitement as she told us about all of the wild earth processes and curiosities that were encompassed in the term geology. I was immediately hooked. I couldn't (and still can't) think of anything better than applying the scientific method to explore our diverse planet. Structural geology and tectonics struck my attention during my time at UT Austin so I decided to pursue this discipline further as a master's degree student with Dr. Donald Fisher at Penn State.

My work at Penn State consists of trying to understand the geochemical processes that influence how earthquakes behave in subduction zones. I study ancient subduction fault rocks that have experienced deformation in the seismogenic zone in the past and are now exposed on the coastlines of Japan. Specifically, I study the scaly fabrics (anastomosing slip surfaces that experience shear and accommodate plate motion) and crack-seal veins. Silica is redistributed through dissolution, diffusion, and precipitation from the scaly fabric to the veins. We observe a wide range of behavior in the

Students in the Spotlight

Gabrielle Ramirez (continued)

seismogenic zone, from slow slip to megathrust, and this geochemical process could change the mechanical strength of the subduction interface and influence earthquake behavior. I mainly use geochemical tools, such as electron microprobe, laser ablation inductively coupled mass spectrometry, X-ray diffraction, and X-ray fluorescence to understand how silica redistribution works. I was also granted a National Science Foundation East Asia and Pacific Summer Institute Fellowship to conduct this research at Kochi University in Japan for three months.

Outside of research, I enjoy running, cooking, and wood whittling. I also thoroughly enjoy being the outreach coordinator for the Association of Women Geoscientists. As the outreach coordinator, I organize educational events so that the community and scientists can interact in an informal and fun environment. Learning how to effectively communicate science with non-scientists can be extremely difficult but it is our responsibility to engage the public on earth-related issues that can affect their lives and environment.

During my time at Penn State, I have learned a great amount of skills and tools but, more importantly, I have learned how to problem solve through the use of the scientific method. After graduation, I fully intend on applying what I have learned to a career in geosciences.

Doctoral Degree Student: Allison Karp



I came to geosciences via the roundabout route of biology. My initial curiosity for natural science was fostered by summer afternoons spent at various Chicago cultural institutions as a kid. These places were favorites of my

family's, and these experiences encouraged me to be a lifelong learner.

I studied ecology and evolution for my bachelor's degree at Washington University in St. Louis. There I participated

in the Pathfinder Program in Environmental Sustainability, which included field experiences in Hawai'i and the Mojave Desert. A theme of this program was to learn about the climactic and geologic past of these areas in order to place current sustainability challenges into a historical context. From this experience, I realized if I wanted to study ecology and climate on timescales greater than the historical past, then my greatest asset was the geologic record. I've always thought that answers to our present problems lie in lessons from the past, so this approach resonated with me. My interest pivoted to geochemistry, which I saw as a toolkit to reveal clues about the mysteries of past environments and ecosystems.

Here at Penn State, I apply and develop said toolkit in my work with Dr. Kate Freeman. My research uses biomarkers preserved in the geologic record to understand terrestrial paleoecology and paleoclimate. I'm specifically working to develop molecular and isotopic tools to study the role of fire in the expansion of grassland ecosystem, an appropriate topic for someone who grew up in the "Prairie State." The first part of this project produced the first terrestrial record tying the Miocene expansion of C4 grasslands directly to increasing fires, and revealed this relationship was more complex than previously thought. Now, I am testing how this system varies in different spatial and continental contexts. To predict how this system may change in the future, it is critical to understand the fundamental relationships between climate, fire, and vegetation in the past.

The Penn State Department of Geosciences has been a wonderful place to grow as a scientist and a person. I've taken advantage of the amazing training opportunities offered by the department. This last year, I've engaged in Penn State's American Academy of Underwater Scientific (AAUS) SCUBA diving certification program. This training will allow me to apply skills from a recreational activity I enjoy to my science. While I don't dive for my dissertation work, I hope that this training will lead to new ideas and collaborations as I continue my career. Since I arrived at Penn State, I've also had the opportunity to participate in international fieldwork and coursework. To me, travel is a way to physically engage with geology, which sometimes gets lost during long hours in the lab. Through these experiences I learned from a wonderful community of international scientists.

As I enter my last couple years at Penn State, I plan to continue to expand my perspectives both as a scientist and as an engaged citizen. My hope is through studying the Earth's past I will help provide better information to make decisions that lead towards a brighter future.

Alumni Spotlight: Arthur “Trem” Smith ’79g, ’83g

by Art Rose, professor emeritus of geosciences



In March 2018, a remarkable alumnus returned to Penn State to explain his oil company and seek interns. Arthur Tremaine (“Trem”) Smith has had a career in the oil business that exceeds the wildest dreams. He has not only mastered the technology of petroleum, but has also excelled in finances, management, and the creation of new entrepreneurial organizations. And several students have reportedly accepted internship offers and will go to work for his company, Berry Petroleum.

Trem graduated magna cum laude with a B.A. degree in geology from Amherst College in 1977. When he entered the Penn State Geology graduate program that year, the search for uranium deposits in the United States was in full swing and Trem joined a research project supported by a U.S. Department of Energy grant supervised by Professor Arthur Rose. Many small uranium occurrences and one mine were known in the Catskill red beds in Pennsylvania and Trem studied about forty of these for his M.S. thesis and then conducted a regional study of the Catskill stratigraphy and sedimentation as related to the uranium occurrences

for his Ph.D. in 1983. Although none of these uranium occurrences have developed into a mine, Trem’s gold finger in oil exploration suggests that the uranium potential shouldn’t be overlooked. Also during his tenure at Penn State, he showed his entrepreneurial bent by joining with fellow student Dave Wesolowski and me in a partnership that sampled stream sediments for uranium in a large area in eastern Pennsylvania and New York.

As thesis completion loomed, he and Dave discussed joint future projects, but a job offer from Chevron attracted Trem and he set off for New Orleans where he developed oil and gas fields in the Gulf of Mexico for about seven years, and learned the business. He then began a series of promotions into different parts of Chevron: first as a manager with a staff of thirty scientists in California dealing with reservoir management technology and then as a manager of strategic planning in San Francisco, and then as a manager of business development in San Ramon, California.

In 1998 a new lifestyle began. He moved to Thailand where he succeeded in greatly increasing Chevron’s production in Thailand, Cambodia, and Bangladesh, and in developing relations with government agencies. Following this foreign experience, he was transferred in 2002 to an even more challenging location—Moscow. He led Chevron into a major gas field partnership with Gazprom and into other projects with various partners in Russia and in the country’s area of Siberia. However, with the changing political and economic scene in Russia, he then recommended a pullback in the company’s activities. While in Moscow, he was elected chair of the American Chamber of Commerce in Russia.

On a family note, Trem’s wife, Julie, is a radio and podcast talk show host along with her four sisters. Their show *Satellite Sisters* celebrated its eighteenth anniversary this year! The show was broadcast throughout the family’s expatriate adventures as well. The Smiths have two sons and five grandchildren.

In 2006, Trem became more entrepreneurial; he left Chevron and started a new company Hillwood International Energy. And it was definitely international: he led the company into deals leading to producing properties in Russia, the Kurdistan Region of Iraq, and the Barnett Shale play in the United States. The field discovered in the Kurdistan Region of Iraq has more than one billion barrels of reserves. More recently he has initiated a consulting company that has evaluated properties and advised bidding for several companies.

Most recently he became chief executive officer of Berry Petroleum, after it was spun off in a bankruptcy, and built its board, staff, and assets to the point that it is producing 30,000 equivalent barrels of petroleum per day. His focus has been on value creation in all the varied aspects of the petroleum business: operations, technology, finance, management, and he has certainly created a lot of value.

As Trem’s one-time adviser, I knew Trem was an excellent student and a great person, but even now I can hardly believe all the challenges and successes he has surmounted and accomplished. The prospective interns are set for some real education!

Alumni Spotlight: Kent Newsham '78

by Liz Hajek, associate professor of geosciences, and Chris Marone, professor of geosciences



Geosciences alum Kent Newsham's enthusiasm and passion for Penn State and the Department of Geosciences are difficult to hide. Newsham, director and chief of petrophysics at Occidental Petroleum Corporation, is a proud supporter of Penn State programs and has established funds that enhance student learning through hands-on opportunities in geosciences and petroleum engineering. Newsham's generosity has helped students participate in the Imperial Barrel Award contest, observe modern sediment transport on Wallops Island, and conduct senior thesis research in paleontology. Additionally, Newsham has worked closely with faculty in the Center for Geomechanics, Geofluids, and Geohazards linked to his broad interests in petrophysics and geomechanics.

Newsham earned a B.S. in Earth science with a geology focus from Penn State, and a minor in marine science. He later obtained masters-level training at the Amoco Petrophysics Center of Excellence. With more than forty years of industry experience, Newsham has developed leading technical expertise in petrophysics and in the characterization of unconventional natural gas and tight oil systems. In addition to holding three patents, Newsham has authored more than thirty technical papers, and has recently been tapped to write a series of tutorials on the petrophysics of unconventional reservoirs for the Society of Well Log Analysts' journal *Petrophysics*. Newsham's geosciences work has led directly to important discoveries, including identifying in 2004 gas fields in the Horn River and Liard Basins, British Columbia, which ranks as one of the largest gas field complexes ever discovered in North America.

Newsham's industry experience spans the full gamut from field operations, to production, to exploration. He generously shares his expertise in many ways, including frequent visits to campus, which benefits students by providing an important industry and business perspective on geosciences and petroleum geology. He is a tireless cheerleader for Penn State's Geosciences and Petroleum and Natural Gas Engineering programs, serving on the Department of Geosciences advisory board and working personally to highlight and amplify accomplishments of students and faculty. His extensive support for the college's programs, including the Kent and Helen Newsham Petroleum GeoSystems Endowment Fund and support for Penn State's Society of Petroleum Engineers PetroBowl team, has significantly enhanced student learning and faculty research. Newsham is a true Penn Stater as demonstrated through his excitement and sharing of technical expertise for the benefit of our undergraduate and graduate programs in Geosciences. We are proud to call him one of ours!

Alumni Passings

Dr. John M. Aaron, III '71

Dr. Arvid M. Johnson '65

Dr. Richard R. Thompson '61

Mr. Richard B. Craft '68

Ms. Karen C. Kraynak '84

Mr. Gary A. Thomson '69

Mr. Richard E. Dovell '71

Miss Mary F. O'Connor '65

Dr. Charles E. Weaver '52

Dr. Robert L. Folk '52

Mr. Joseph Omelchuck, Jr. '52

Mr. Carlyle W. Westlund '76

Dr. John R. Holloway '70

Mr. Jack T. Phillips '17

Mr. Charles T. Illsley, Jr. '55

Mr. James A. Shultz '71

Wallops Island 40th Reunion

by Kent Newsham and Janet Kappmeyer

Introduction

In 1977, fifty-four students from a variety of educational backgrounds attended a ten-week “live-in” field program to study the coastal and marine ecosystems at Wallops Island located on the Eastern Shore of Virginia. Forty years later, twenty-two of those students returned to Wallops Island to reengage with classmates and re-experience some of those incredible moments in learning, friendship, and collaboration.



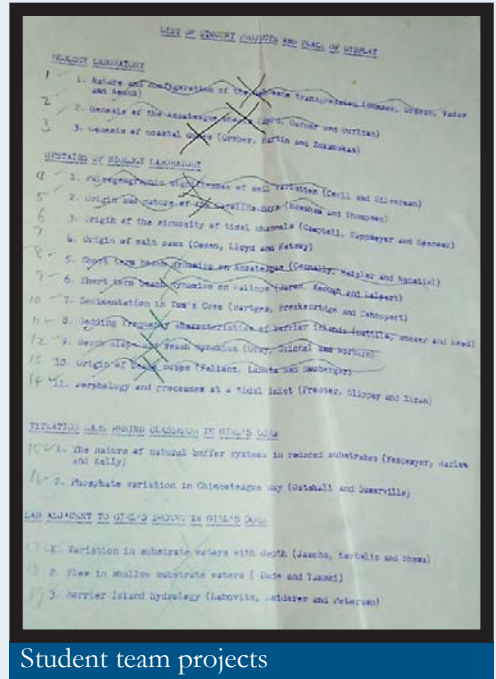
The Marine Science Consortium

The Chincoteague Bay Field Station (CBFS), formerly the Marine Science Consortium, is located on Virginia’s Eastern Shore minutes away from Chincoteague National Wildlife Refuge and adjacent to Wallops Island Flight Facility, operated by NASA’s Goddard Space Flight Center. The mission of the consortium was to provide a living classroom to allow the study of marine and coastal ecosystems along the Mid-Atlantic Region via the bays, marshes, beaches, maritime forests, and offshore

waters surrounding Wallops Island. The campus consists of several dormitories, laboratory buildings, cafeteria, and classroom buildings that were originally part of a U.S. Naval housing complex.

Penn State’s Marine Science Program - 1977

In 1977, Penn State was a consortium member and offered a live-in, full saturation educational experience for ten weeks during the spring quarter. Under the direction of Al Guber, Penn State’s Marine Science program offered a sequential curriculum in marine engineering, coastal geology and coastal biology and ecosystems. Guber conducted interviews during the winter quarter and selected the fifty-four students from a range of discipline backgrounds including biology, geology, geophysics, Earth science, education and business.



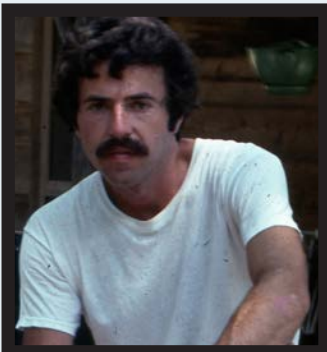
Student team projects



Wallops '77 list of professors, student awards

Students developed a camaraderie with numerous professors including Guber, the program director, Rudy Slingerland, Robert Schmaltz, and Eugene Williams. Every week, numerous visiting Penn State professors participated in the classroom and field activities. The program ran each discipline theme in sequential order starting with a week-long orientation course in marine sampling and equipment operation followed by the three-week topical programs. What made this program unique, were the team-based field and lab project requirements associated with each module.

The first week of each theme involved daily intensive classroom lectures from 8:00 a.m. to 10:00 p.m.. The second week involved project selection and field work, including measurement, project sampling and initial laboratory activity. The third week involved continued data analysis and lab testing with a project summary; posters were peer reviewed by a rotating group of students with professors during the last day of each module with each team member providing an oral defense of the work.



Rudy Slingerland

The Reunion

In 2016, a group of alumni who participated in Wallops Island 1977 proposed a fortieth reunion and requested that the Department of Geosciences aid in locating all 1977 Wallops alumni. Lee Kump, then department head, adopted the initiative and put the department's resources to work. The majority of alumni were contacted and funding was provided by an anonymous donation to the department. Kump was able to engage Rudy Slingerland to participate as a co-host and event organizer. The reunion was held the weekend of November 3-5, 2017 at the CBFS.



(Left to right: Eugene William, Robert Schmaltz, and Albert Guber)



Cruising the tidal channel

The gathering began that Friday with dinner at the CBFS dining hall followed by a raucous campfire engagement. After breakfast on Saturday, the "Walloppers" boarded two flat-bottom tidal boats for a back barrier, tidal channel cruise, and mini-organism talk (after seine casting) led by a CBFS educator. It was a "back to the future" event for all.

That afternoon the group headed to Assateague Island for a review of coastal marine sedimentation processes, spits, dunes, and cross bedding. A few wild ponies were also

observed in transit. Slingerland made a valiant attempt at reminding the group what we learned forty years ago. A highlight was a visit to the Assateague Lighthouse for a reunion photo reshoot. The evening began with a fabulous "dutch" dinner at Etta's Channel Side Restaurant. The Wallopsters returned for an evening of music, reminiscing, and great appreciation for the Wallops experiences. Sunday morning found the Wallopsters boarding a bus for a Wallops Island beach tour where the final group photo was arranged.



Lee Kump and Rudy Slingerland digging in the beach sand



Pulling the nets up to the boat

The influence on all students who attended the Wallops Program was far reaching. It taught a great deal about science and ecosystems, but most important was the enduring friendship and collaboration of a very diverse group of individuals who were united in a common interest. We discovered that we had more in common with each other than we had differences and those bonds have lasted a lifetime.



The class of 1977



The class of 1977 reunited

Wider Coverage of Satellite Data Better Detects Magma Supply to Volcanoes

by David Kubarek

Using satellite imaging, Penn State researchers for the first time identified a major magma supply into a reservoir extending almost two miles from the crater of a volcano in Nicaragua.

This shows that volcanoes can be fed magma through nearby underground channels and could help explain how volcanoes can erupt seemingly without warning because the active center of the volcano exhibits little deformation activity. The findings were published earlier this year in *Geophysical Research Letters*.

A team led by Christelle Wauthier, assistant professor of geosciences and associate with Penn State's Institute for CyberScience, used satellite data to chart movement of the ground surrounding Masaya Volcano, an active volcano and popular tourist destination near millions of residents near Managua.

Using Interferometric Synthetic-Aperture Radar (InSAR), a technique that uses radar satellite remote-sensing images, the team found ground swelling of more than three inches in a large area north of the crater. They used comparative data taken at different points in time to determine increases in magma supply. That work was corroborated by independent gas measurements taken at the crater by another team. Charting ground inflation near volcanoes is one way to determine the likelihood of a future volcanic eruption. InSAR can measure changes of one-third of an inch in the topography of the Earth.

Kirsten Stephens, a doctoral student in geosciences at Penn State, said InSAR data helped the team spot an increase in magma supply whose extent and amplitude can be missed or underestimated by ground-based sensors like GPS.

“When you're using the satellite data you're actually looking at a wide area as opposed to a GPS station, which is one point of measurement on the Earth,” Stephens said. “With satellite data, we're looking at hundreds by hundreds of kilometers of Earth. With this better spatial coverage, we were able to image this inflating ground movement related to this 2015 lava lake appearance, which no one had captured before.”

Wauthier said this research changes how we should monitor volcanoes.

“This shows that you should monitor close to the active vent area but also farther away to get a broader picture of the magma processes,” Wauthier said. “This is clear evidence showing magma can be supplied in large quantities further away from the point of eruption.”

Wauthier suspects the magma pathways are related to a pre-existing caldera structure that was formed during the collapse of the volcano twenty-five hundred years ago. Masaya—like Wyoming's Yellowstone Caldera—is not conical shaped. Past magmatic activity caused the roof of a reservoir to fall out, creating a depression at the point of eruption. Weak zones could have been formed during this event and could currently serve as magma pathways, Wauthier said, but it will take more research to determine that.

“The offset magma supply has a lot of consequences interpreting volcanic unrest, because if you would have been looking at the active event only, you might have missed most of the inflation,” Wauthier said. “You might not have realized that there was a lot of magma accumulating below the ground.”

The last time Masaya had a massive eruption was in 1772, and a lava lake has often been visible at the summit since then. However, the volcano has been showing signs of activity, with its most recent explosive eruption—which lasted for about a week—occurring in 2012. The 1772 eruption spewed ash and molten lava more than thirty miles. Today, about two million people live within twelve miles of the volcano.

“The volcano has the potential to be very explosive and create very big eruptions,” Wauthier said. “That’s why we focused on this area. Because there are so many people living around there, we want to understand what’s going on at that volcano and where the magma reservoirs and pathways are. If magma supply is increasing significantly, it’s a sign the volcano could become more active.”

Stephens said the team is now working on a follow-up study using their massive amounts of remote sensing data provided by seven satellites, together with ground-based measurements acquired by Pete LaFemina, associate professor of geosciences, to model the temporal evolution of the magma supply in more detail.

“Through inversion modeling you can then get an estimate of the change in volume,” Stephens said. “You can get a rough estimate of how much magma was supplied into the system within that time.”

NASA and the National Science Foundation funded this research.



The lava lake in Santiago crater, Masaya volcano, Nicaragua on November 20, 2017.

Image: Peter Lafemina

Department Passings



Professor Shelton Alexander (1934-2018)

by Charles Ammon, professor of geosciences, and Richard Parizek, professor emeritus of geosciences

Professor Shelton Setzer Alexander passed away peacefully on July 4, 2018 surrounded by his family. Shelton was born on September 26, 1934 in Statesville, North Carolina, the son of Edna Setzer Alexander and Arnold Franklin Alexander. He earned his bachelor's degree from the University of North Carolina in 1956 and his doctorate from the California Institute of Technology in 1963. During his studies, Shelton met his future wife, Judith Kubly, in Paris, where both were Fulbright scholars. They married on June 16, 1958 and shared the next sixty years, most of them in State College. Shelton was a devoted family man, fun-loving, kind, and quick witted. In addition to his work, Shelton loved golf, poker, and Penn State football.

Shelton shaped a long and successful career in seismology and geophysics. He completed his Ph.D. dissertation under the guidance of Frank Press, studying fundamental- and higher-mode seismic surface wave propagation in the western United States. He was one of the first to consider the effect of Earth's heterogeneity

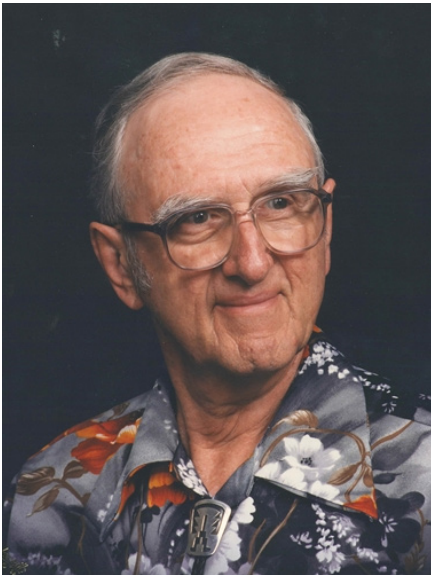
on those signals. After earning his Ph.D., Shelton served as a geophysicist in the Air Force from 1963 to 1966 and retained a lifelong connection with the service. He was part of the first group of modern earthquake seismologists who entered the field, partly in response to the call to help monitor and characterize underground nuclear explosions. While completing his service, he worked with Princeton Professor Robert Phinney on the diffraction of seismic waves along Earth's core-mantle boundary. In 1966, after leaving active duty, Shelton joined the Penn State faculty as a geophysicist specializing in earthquake seismology. He served Penn State until his retirement, including tenures as chair of the Geophysics program and as head of the Department of Geosciences .

In the late 1960s Shelton worked on using cross-correlation approaches to measure relative travel times on refraction data, long before these methods became some of the most important tools in seismological analysis. In the 1980s, together with students, Shelton explored what we now call machine learning. Former students share great affection for Shelton and describe his confident, steady mentoring blended with perspective and a good sense of humor. While attending any professional meeting it's hard not to meet at least one or two former students, postdoctoral researchers, or scientists who did not work or collaborate at some point with Shelton. His contributions to student careers while serving as adviser and a committee member are clearly one of his lasting legacies.

While at Penn State, Shelton's academic interests expanded and he collaborated on research projects with numerous students and faculty within the large geosciences department. A number of colleagues fondly recount stories of Shelton providing professional contacts and introducing countless friends, including an occasional future spouse. All agree that one of his greatest gifts was the ease with which he encouraged, facilitated, and often collaborated on interesting and interdisciplinary research. Much of Shelton's later work involved remote sensing observations and environmental imaging of the shallow subsurface. He worked on geophysical imaging problems in a number of exotic locales that included an interesting interdisciplinary effort in Egypt. Colleagues describe how throughout some unusual data collection trips Shelton was also calm and confident. This venue leaves little room to recount the many entertaining and fascinating anecdotes, but one could certainly say Shelton led his share of adventures. Both Duff Gold and Dick Parizek vividly recall their experiences transporting explosive ordinance for seismic imaging experiments into Egypt with him.

For the professional community, Shelton served on numerous influential committees established by professional organizations, including the Seismological Society of America, the Geological Society of America, the National Academy of Sciences, and the American Geophysical Union. He was vice chair of the inaugural Incorporated Research Institutions for Seismology (IRIS) Executive Committee (now the Board of Directors) and the first chair of the IRIS Data Management System Standing Committee. Throughout his career Shelton provided technical expertise to NASA, NSF, and numerous other government

continued on page 13



Professor Benjamin Howell (1917-2018)

by D.P. Gold, professor emeritus of geosciences, and Roy Greenfield, professor emeritus of geosciences

Professor Benjamin F. Howell passed away on May 12, 2018. He was born on June 12, 1917 in Princeton, New Jersey and was the only son of Claire and Benjamin F. Howell, Sr. Ben joined the Penn State faculty in 1949. He served as the head of the Division of Geophysics and Geochemistry from (1949 to 1954), and head of the Department of Geophysics and Geochemistry from (1954 to 1963). I remember him as a senior faculty member in the Department of Geology and Geophysics and a well-respected elder statesman in the College of Earth and Mineral Sciences. In particular, he was appreciated by junior faculty for his open-mindedness, support, and guiding hand. I valued his encouragement and support in my early work on impact structures.

Ben, the geoscientist, started young; he was the son of a well-known geologist at Princeton University. He graduated from Princeton late University with his bachelor's degree in 1939. He earned both his master's and doctoral degrees from the California Institute of Technology and while there he worked on methods for demagnetizing ships for the US Navy. His academic career bore the influence of his mentor C.F. Richter. His scientific contributions included three text books; *"Earth and Universe"*, a survey text on the Earth's development, *"Introduction to Geophysics"*, and *"An Introduction to Seismological Research: History and Development"*. After retiring from Penn State in 1977 he continued an active interest in seismology and continued publishing on statistical earthquake prediction.

I remember him as an able and pragmatic administrator: to him there were no gray scales—only black and white. He was the historian for the college and his vision was apparent for developing new initiatives such as (isotope geology; organic sediments; Earth resources, and remote sensing,) and in the design and construction of new facilities in the (Deike Building). His fostering of innovative programs is apparent in current curriculum. A notable achievement was removing the gender bias from the University's graduate programs in the University. Through Ben's prodding, air conditioning was incorporated into the plans for mass spectrometer laboratories in the Deike Building, and with a little more nudging, the whole building making it the first on campus to be completely air conditioned.

Although Ben played a pivotal role in developing a the Geophysics program at Penn State, his notable achievements were at a higher level of service—elder statesman in the college, and associate dean of the Graduate School.

Ben enjoyed tennis and played regularly with academic colleagues from across many disciplines and played into his late 80s. He had a dry sense of humor and was a fun partner. He also was an active bridge player year until he was ninety-nine years old.

Alexander (continued)

agencies and private entities. Although not widely appreciated, perhaps Shelton's greatest contribution to the seismological community was his advocacy for the establishment of the IRIS Data Management System. Shelton argued for an open data policy that allows anyone to access the data collected by IRIS. Open data access, in fact, is one of the foundational principles behind the entire IRIS effort. He also pushed for the investments necessary to make the data easily accessible. With his help, the community met his challenge and the result is one of their greatest accomplishments.

Throughout its existence, Shelton served on the Air Force Office of Scientific Research's Seismic Review Panel, which provides advice on seismological monitoring of underground nuclear explosions. When learning of his passing, members of that panel were unanimous in recognition of the loss of an important panel member. Writing clearly was one of Shelton's personal interests, and he was the authority for grammatical disagreements that arose as the review panel drafted reports. During a return trip from one panel meeting, he described his earliest assignment as a graduate student, helping Beno Gutenberg, one of the founders of earthquake seismology, edit his notes. He also described his satisfaction with one of his last formal contributions to the department, editing undergraduate theses.

Most importantly, Shelton was a devoted father and grandfather. He is survived by his wife, Judy; daughters, Cindy Alexander of Seattle, Washington, and Cathy Doppelt (Harvey) of Chappaqua, New York; and grandchildren, Michael Doppelt and Eric Doppelt. Shelton requested that in lieu of flowers for his memorial service, donations may be made to the Seismological Society of America. Many of us will miss Shelton, but few of us will forget him.

Annual Graduate



Among the Prairie Smoke; Virginia Marcon



Dropstone in the Pecor Fm. of the Paleoproterozoic Huronian Supergroup in Ontario, Canada; Gregory Wong



Valle Rojo, Cusco, Peru; Elena Stiles



Clouds over alluvial fans in Saline Valley, California; Julia Carr



Left: Morning light on Great Sand Dunes National Park & Preserve, Colorado; Austin White Gaynor

Colloquium Photo Contest



Early morning views from a hot air balloon of the Sedona, Arizona Red Rocks area; Gregory Wong



Teton Range, Wyoming; Joanmarie DelVecchio



Early morning campsite views as we prepare for a day of field work exploring alluvial fans in Saline Valley, California; Perri Silverhart



Early morning views from a hot air balloon of the Sedona, Arizona Red Rocks area; Gregory Wong



Alaskan outlook; Emily Schwans

Celebrating 50 Years of the Graduate Colloquium

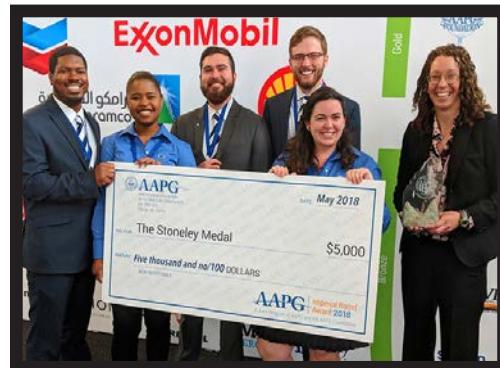
The fiftieth annual Geosciences Graduate Student Colloquium was held on March 22-23. This year's event was a milestone anniversary for the annual colloquium. The Graduate Student Colloquium is a student-organized annual event that celebrates the research accomplishments of our graduate student community. This event is hosted by the Department of Geosciences and is open to all graduate students involved in geosciences-related research. The colloquium format stimulates research discussion, allows students to practice for national meetings, and helps students improve their speaking skills.

In 2018, forty graduate students presented their research in poster or oral formats. Presentations were evaluated and given formal feedback by faculty and postdoc judges, with the best presentations receiving prizes in a variety of categories. The first place award for an oral presentation by a post-comprehensive Ph.D. student is designated the Peter Deines Lectureship for the following academic year. The award is named for the late Peter Deines; it is a tradition which began in 2004 to honor his contributions to graduate education in the department, and to celebrate an outstanding Ph.D. student each year. The 2019 Deines Lecture will be given by Beth Hoagland.

In addition to student presentations, several additional special events were held to celebrate the fiftieth anniversary. A series of preparatory workshops on communicating research in poster and oral form were held, and several distinguished alumni of the geosciences graduate program attended this year's colloquium. These alumni—Gavin Hayes, Byron Parizek, and Christina Lopano—gave talks on their experiences and success in a variety of career fields since graduating. In addition to providing valuable perspective on future pathways for current graduate students, these alumni are a testament to the impact our graduate student community continues to have in a broad variety of geosciences careers.

The Graduate Colloquium Committee wishes to thank the students, postdocs, faculty, and staff of the Department of Geosciences for their participation and assistance with the event. The committee also wishes to thank the People Services Division of Royal Dutch Shell and the Department of Geosciences for their donations of prize money and their generous financial support. They would also like to thank Dave Cannon and his family for their generous donation towards the graduate colloquium awards.

Imperial Barrel Team Places Third



(Left to right) Brandon Clark, Safiya Alpheus, David Soto, Tim Witham, and Haley Ramirez with adviser Professor Liz Hajek

The department's team placed third in the global finals of the American Association of Petroleum Geologists (AAPG) Imperial Barrel Award (IBA) competition. In April, the

was the Eastern Section First Place winner and earned a trip to Salt Lake City, Utah for the final contest and to attend the AAPG Annual Meeting. At the finals they competed against eleven other teams from sections from across the United States and around the world. Teams were assigned a potential "lease block" and provided data they were charged with using to evaluate the potential for oil and gas accumulations within the block. This challenge closely parallels what working exploration geologists do in industry and provides hands-on experience for participating students. The team has to use their understanding of geosciences and Earth history to analyze data such as seismic images of deeply buried sediments and geophysical information from a few wells and identify likely hydrocarbon accumulations—leads or prospects—in the lease block. They then need to estimate the probability of success of each of the possible targets they identify and estimate the total amount of oil or gas buried in each prospect. Perhaps the most challenging part, the team then needs to synthesize their analysis into a twenty-five minute business presentation that conveys key technical results in a clear way and provides "management" with a strong justification for making investment decisions. The contest is judged by industry professionals who rank teams based on their technical evaluation, their professionalism and presentation skills, and their ability to answer questions and work as a team.

Over the course of the contest, the team, M.S. degree students, Brandon Clark, David Soto, Haley Ramirez, and Tim Witham, and undergraduate student, Safiya Alpheus '18, developed a close working relationship and supported each other as they worked under an eight-week time crunch to complete high-level technical analyses and wrestle with difficult decisions about how to manage their time and deal with uncertainty in their results. As third place finishers, the team brought home the Stonely Medal and a \$5000 scholarship for the department. They also gained invaluable first-hand experience that will help jump start their careers in industry and provided them new perspectives on science communication.

Geosciences Field Camp 2018



Group photo of students at an overlook on the Beartooth uplift.

The Penn State Geosciences Field School had another year of high enrollment, with forty-five students who left campus in early June to return six weeks later after a counterclockwise regional tour of the intermontane Western United States. The tour began with two weeks at the Yellowstone-Bighorn Research Association (YBRA) facilities on the Beartooth Front just outside of Red Lodge Montana. During this time, Erin Dimaggio instructed the

students on the basics of ArcGIS, used to produce final maps and cross sections for five of six exercises based on geologic mapping in the field. At YBRA, the students spent two weeks completing a project on the stratigraphy and geology of Elk Basin. During the third week, the caravan moved to the Grand Teton National Park where Roman DiBiase directed a study of the Quaternary glacial geology and the active faulting along the mountain front. Subsequently, the class moved to the Pioneer Mountains in East Central



Roman DiBiase leads the exercise along the front of the Tetons.

Utah for an exercise led by Don Fisher and Maureen Feineman to reconstruct the history and landscape evolution of an area with a complex history of tectonics and volcanism. As in past years, the course finished in Alta, Utah where maps and cross sections were used to estimate fault slip and shortening in the overthrust belt. In the last week, Kevin Furlong and Andrew Smye introduced the geologic history of the Wasatch Range and students constructed maps of metamorphic isograds around the Alta Stock as a constraint on models for the thermal evolution around a cooling, intrusive igneous body. Graduate student

Erica Pitcavage came back for a second year as the coordinator of seven teaching assistants, all of whom were instrumental in managing such a large class: Tim Witham, Troy Ferland, Joan-Marie Del Vecchio, Julia Carr, Gabrielle Ramirez, Marit Wyatt, and Kirsty MacKenzie.



Erin DiMaggio leads a discussion in Elk Basin.



The top of Flagstaff Mountain in Alta, Utah.



Students measure a stratigraphic section in Elk Basin.



Icebergs in the Amundsen Sea
Image: Sridhar Anandakrishnan

Thwaites Glacier Focus of International Program

by Andrea Elyse Messer

The National Science Foundation and the United Kingdom’s National Environmental Research Council are the forces behind eight new initiatives in Antarctica to determine how quickly a massive glacier could collapse. Penn State is part of two of these projects, GHOST and MELT.

GHOST—Geophysical Habitat of Subglacial Thwaites—will look at the sediment and bedrock underlying the Thwaites glacier.

“The future picture of what the glacier will do is dependent on the bed,” said Sridhar Anandakrishnan, professor of geosciences and principal investigator for this five-year, \$4 million grant. “We need to know if it is sediment or hard rock and whether it is rough or smooth. All these details make it easier to understand what the glacier’s response will be over decades and centuries.”

The Thwaites glacier is part of the West Antarctic Ice Sheet and flows into the Amundsen Sea in the southern South Pacific Ocean. It has a relatively small ice shelf, so most of the ice is supported by land, meaning that any ice from the glacier that enters the water will add to



Parizek in the freezer unit, where drilling fluid evaporates off newly cut and labeled core sections prior to relocation into the winter-over storage trench. After being subjected to high in-situ glaciostatic pressures at depth, the initially brittle core needs to be kept cold (to minimize chemical alteration) and allowed to equilibrate to atmospheric pressure (to minimize physical damage) before being transported to the National Ice Core Lab in Denver, Colorado where it is ultimately studied, cataloged, stored, and dispensed to researchers.

sea-level rise. Ice shelves slow the progression of ice flowing into the oceans and protect the edge of the glacier from melting by ocean water.

“Thwaites is a relatively slow-going glacier in the interior,” said Anandakrishnan. “But at the terminus it can move at the rate of two and one-half miles per year.”

Researchers understand, in general, how glaciers move and ice shelves calve off, but they need to know the particulars of exactly what happens in this glacier.

To find out, the researchers will use radar and seismic sensing to study the interface of the glacier and the rock and debris beneath. The Thwaites ice is a half-mile to a mile deep, so remote sensing, and particularly active sensing, are planned. For example, in active seismic sensing, sound is sent through the ice, and seismic sensors on the surface of the ice record the echo that returns. Once field data are collected, Professor Byron Parizek will lead graduate as well as undergraduate researchers from the University Park and DuBois campuses in a data-constrained modeling effort to assess whether Thwaites Glacier is likely to contribute to sea level rise in the near future or whether it will destabilize over longer times.

Anandakrishnan is also a co-principal investigator on the MELT project, which is aimed at investigating the interaction of the ocean on the small Thwaites ice shelf and the grounding zone—the area where the glacier leaves the ground and begins to float on the water. New York University’s David Holland is the principal investigator on this project and researchers from the United Kingdom are also investigators.

Over the next five years both projects will have field seasons to collect data. GHOST will be in the field during the southern hemisphere’s summer in 2019 and 2020.

The eight-project initiative on the Thwaites glacier will cost, over all, about \$25 million, provided by the National Science Foundation and the National Environmental Research Council, UK.



After a good “night’s” rest in his home at Siple Dome, West Antarctica, Parizek emerges into white-out conditions and prepares for another day as head core handler on the processing line for the Siple Dome deep coring project.



Other researchers on the GHOST project include Richard Alley, Evan Pugh University Professor of Geosciences, Penn State; Byron Parizek, professor of mathematics and geosciences, Penn State; Leigh Stearns, associate professor of geology, University of Kansas; Knut Christianson, assistant professor of Earth and space sciences, University of Washington; and Lucas Zoet, assistant professor of glaciology and glacial geomorphology, University of Wisconsin.

Other researchers on the MELT project are Eric Rignot, Donald Bren Professor of Earth System Science, University of California, Irvine; Britney Schmidt, assistant professor of Earth and atmospheric sciences, Georgia Tech; and John Paden, research faculty at the University of Kansas.

From left to right: Rebecca Boon, Knut Christianson, Don Voigt, Leo Peters, Sridhar Anandakrishnan, Luke Zoet

Researchers Embark on First-Ever Slow Earthquake Drilling Mission

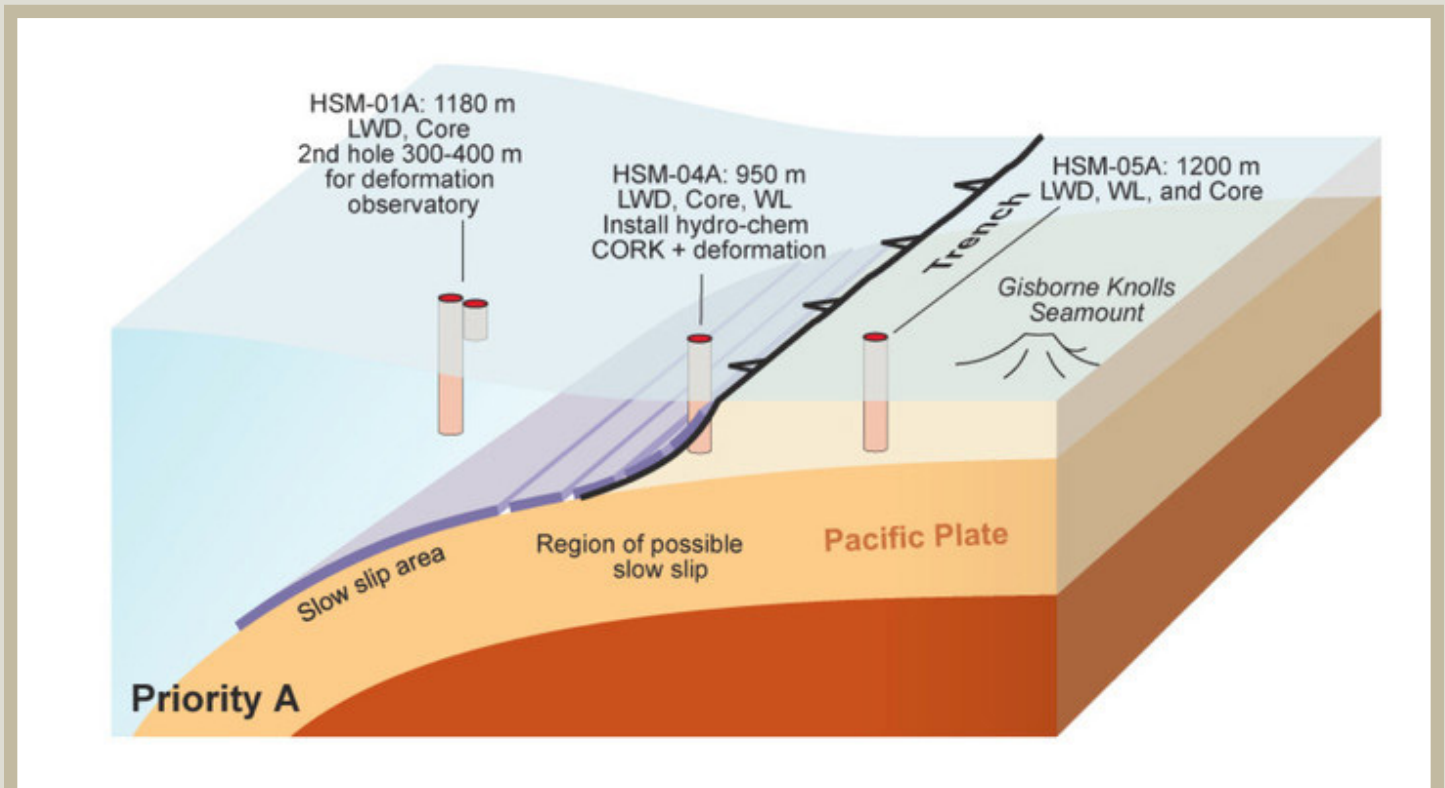


Illustration showing subduction zone, region of slow slip, and drillholes for coring and observatory sensors.

Image: Demian Saffer, Penn State; Laura Wallace, GNS Science

by Liam Jackson

In March and April of this year an international team of researchers installed monitoring equipment inside an active fault zone off the coast of New Zealand, in the Ring of Fire, in the first-ever scientific drilling mission specifically designed to study slow earthquakes.

Led by Demian Saffer, professor of geosciences and now department head, and Laura Wallace, geodetic scientist, GNS Science, the team installed observatories beneath the sea floor on two colliding tectonic plates, with the goal of revealing links between slow earthquakes, large normal earthquakes, and tsunami generation risk. The expedition was funded through the National Science Foundation's International Ocean Discovery Program (IODP).

Slow earthquakes, also known as slow slip events, are not well understood partly because they are difficult to detect. In some cases, they may release roughly the same total energy as magnitude seven or larger earthquakes, except that instead of lasting for seconds or minutes, they last for days or weeks at a time. Because of this, they dissipate energy at a much slower rate, which has allowed them to elude detection by seismographs. Only within the last two decades have researchers begun to focus investigations on slow earthquakes, but a lack of robust data prevents us from knowing how or why they occur, and how they relate to major earthquakes and the risk of tsunamis.

Saffer, Wallace, and their collaborators aim to change this.

In addition to collecting samples of the rock and sediment in the slow slip source area to characterize its properties, they installed two observatories roughly 1,600 feet beneath the sea floor that will allow them to document rock strain and deformation, temperature, and the chemical makeup of the rocks, and to fingerprint any fluids released during tectonic activity.

“These data will tell us about the ‘creaks and groans,’ or strain accumulation of the shallow fault zone, which is important for tsunami genesis, as well as potentially the origins of fluids associated with slow earthquakes,” said Saffer.

The researchers placed their observatories along the Hikurangi continental margin, located off the coast of New Zealand’s North Island. Here, the Pacific tectonic plate is being pushed underneath the Australia tectonic plate, a process known as subduction. One observatory was placed in the Australian plate above the slow slip source fault, and a second was placed directly into the fault zone where the two plates meet and slide past one another.

This area is a hotbed of tectonic activity ranging from slow earthquakes occurring on roughly two-year cycles to major earthquakes, such as the one in 1947 that triggered a large and damaging tsunami.

“This expedition will yield information and samples that are key to understanding why destructive tsunamis happen after shallow earthquakes at plate subduction zones and underwater landslides,” says James Allan, program director in the National Science Foundation’s Division of Ocean Sciences, which funds IODP.

There are multiple theories on whether slow earthquakes increase or decrease the risk of tsunami generation.

“One hypothesis is that slow earthquakes release strain before it can accumulate to be released in a large earthquake, and therefore decrease the risk of tsunamigenic slip; while another is that the slow slip may load up regions of the subduction fault nearby and trigger earthquakes,” Saffer said. “The only way to know what’s happening is to get in there and document the conditions, the stresses and temperatures and pressures associated with slow earthquake activity.”

The team will return in 2020 or 2021 to collect data from the observatories and begin analyzing the data.

The expedition was well represented by Penn Staters—of the thirty-one scientists aboard the ship, six had an affiliation with Penn State, including Srisharan Shreedharan, geosciences doctoral student; Heather Savage, geosciences doctoral alumna now at the Lamont-Doherty Earth Observatory; Matt Ikari, geosciences doctoral alumnus now at MARUM research center; Patrick Fulton, geosciences doctoral alumnus now at Texas A&M University; and Hiroko Kitajima, former Penn State postdoctoral researcher, now at Texas A&M University.

The team left March 11 from New Zealand and completed their mission on May 5. For more information, visit the project website: <http://joidesresolution.org/expedition/375>.



JOIDES Resolution drillship was used to place the equipment to monitor slow earthquakes. Image: IODP

Undergraduate Scholarships & Awards

Thomas F. Bates Undergraduate Research Enhancement Fund: *Anna Ablak*

Joseph Berg Award for Undergraduate Research in Geosciences: *Catherine Hanagan, Cissy Ming*

Barton P. Cahir Award: *Albina Alzhanova*

Frank Dachtel Memorial Award in Geochemistry:
Beth Ann Eberle, Ellen Polites

David M. Demshur Undergraduate Research Endowment: *Matthew Feliciano, Marcus Guarnieri, Pureunsol Oh, Sapol Raadnui, Erin Redwing*

Edwin L. Drake Memorial Scholarship: *Marissa Arrendondo, Chad Cole, Megan Deabreu, Shaun Donmoyer, Beth Ann Eberle, Jiaven He, Johanna Jacobson, Shams Joon, Tori Labirt, Amanda Lay, Louisa Lytle, Christopher Markle, Nik Abdul Wafiy Bin Nik Mohd Shubaimi, Ellen Polites, Michael Pungitore, Nicholas Schuler, John Stewart, Lisa Woodward, Cathleen Baker, Joseph Glowacki, Thomas Margetanski, Aiden Price, Daniel Delgado*

General Scholarship Endowment in Geosciences:
Alonso Alzua, Martina Dundovic, Nicholas Crescenzo

David P. "Duff" Gold Undergraduate Scholarship Fund:
Yaolin Miao, Nancy Weinheimer

John C. and Nancy Griffiths Scholarship: *Cathleen Baker, Kalen Griffiths*

James and Nancy Hedberg Scholarship: *Erifili Drakellis, Fairuz Hidayah Hasnan, Madiba Massey, Paul Pietrinferni, Iman Nasuha binti Rosland, Nicholas Schuler, Christine Tamburri*

Arthur P. Honess Memorial Fund: *Fatin Faribah binti Babarudin, Matthew Leddy, Emma Osenbach, Lisa Woodward, Junyin Xaio*

Benjamin F. Howell, Jr., Award: *Jiaven He, Wen Jou Lin, Sapol Raadnui, Kittichote Veeranuntawet*

Kappmeyer-Isaacs Field Camp Award: *Oluwatoyin Oresanya, Naji Mahmoud Rizig, Brooke Roselle, Adreina Shamsul Anuar*

Ronald A. Landon Endowment in Hydrogeology:
Mike Forgeng, Emily Loucks

Earle S. Lenker Fund for Field Studies in Geology:
Safya Alpheus, Nathaniel Butina, Caroline Gazze, Dylan Nuhn, Oluwatoyin Oresanya

Reif Undergraduate Summer Field Camp Award: *Morgan Frazier, Callan Glover, Oluwatoyin Oresanya, Christine Tamburri, Aaron Williams*

Robert F. Schmalz Award: *Collin Charnoff, Porrakat Dechdacho, Shaun Donmoyer, Thomas Tran*

Dr. David E. Vaughan and Mrs. Julianne Vaughan Field Camp Fund: *Alonso Alzua, Kasey Cannon, Michael Forgeng, Natasha Nagle*

External Scholarships & Awards

Erickson Discovery Grant: *Catherine Hanagan*

Geological Society of America Graduate Student Research Grant: *Claire Cleveland, Gabriella Rossetto, Elena Stiles*

Mid-American Paleontology Society Outstanding Student Research Award: *Elena Stiles*

NASA Earth and Space Science Fellowship:
Gregory Wong

Penn State Graduate Exhibition Awards: *Kalle Jabn, Kirsty McKenzie, Joshua Woda*

Graduate Scholarships & Awards

Alley Family Graduate Scholarship: *Elisabeth Clyne, Allison Karp*

Cannon Family Graduate Symposium Award in Geosciences: *Chas Bolton, Helen Gall, Beth Hoagland, Abby Kenigsberg, Shelby Lyons, Ben Madara, Virginia Marcon, Peter Miller, Erica Pitcavage, Maeva Pourpoint, Gabrielle Ramirez, Haley Ramirez, Kenneth Roop-Eckart, Austin White-Gaynor, Guangchi Xing*

Chevron Scholarship: *Shelby Lyons, Virginia Marcon*

Charles E. Knopf, Sr., Memorial Scholarship: *Troy Ferland, Judit Gonzalez-Santana Gabriella Rossetto, Elena Stiles, Damaris Wyatt*

Krynine Memorial Award: *Chas Bolton, Si Chen, Claire Cleveland, Elisabeth Clyne, Allison Fox, Helen Gall, Judit Gonzalez-Santana, Ben Hayworth, Kalle Jabn, Heather Jones, Peter Miller, Erica Pitcavage, Gabriella Rossetto, Emily Schwans, Judith Sclafani, Srisaran Shreedharan, Perri Silverhart, Kirsten Stephens, Elenasa Stiles, Callum Wayman, Josh Woda, Clay Wood, Damaris Wyatt*

Hiroshi and Koya Ohmoto Graduate Fellowship: *Claire Cleveland, Erica Pitcavage*

Richard R. Parizek Graduate Fellowship: *Joanmarie DelVecchio, Kalle Jabn*

Scholten-Williams-Wright Scholarship in Field Geology: *Julia Carr, Elisabeth Clyne, Alex Neely, Judi Sclafani*

Shell Geoscience Energy Research Facilitation Award: *Chas Bolton, Jared Carte, Claire Cleveland, Abby Kenigsberg, Peter Miller, Haley Ramirez, Adriana Rizzo, Alex Santos, Srisaran Shreedharan, Guangchi Xing*

Richard Standish Good Graduate Scholarship: *Allison Fox, Kirsten Stephens*

Donald B. and Mary E. Tait Scholarship in Microbial Biogeochemistry: *Beth Hoagland, Adriana Rizzo, Chloe Stanton*

Teaching Assistant Award: *Erica Pitcavage*

Barry Voight Endowment: *Judit Gonzalez-Santana*

2018 Graduate Colloquium Awards

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

First: Beth Hoagland (Deines Lecturer)
Second: Austin White-Gaynor
Third: Erica Pitcavage

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

First: Abby Kenigsberg
Second: Guangchi Xing
Third: Shelby Lyons

Oral Presentation by an M.S. Student

First: Haley Ramirez
Second: Kenneth Roop-Eckert
Third: Gabby Ramirez

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

First: Maeva Pourpoint
Second: Chas Bolton
Third: Helen Gall

Energy Related (M.S./Ph.D.)

First: Virginia Marcon
Second: Peter Miller
Third: Ben Madera

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.

2018 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

Cannon Family Graduate Symposium Award in Geosciences

Charles E. Knopf, Sr. Memorial 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

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 C. and Nancy Griffiths Scholarship in Geosciences

Joseph Berg Award for Undergraduate Research in Geosciences

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

Michael G. Loudin Trustee Scholarship in the College of Earth and Mineral Sciences

Open Flow Gas Supply Corporation Endowed Program Fund in Geosciences

Petroleum Geosystems Enrichment Fund

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

R.J. Cuffey Fund for Paleontology

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 Bruce Miller Scholarship in the College of Earth and Mineral Sciences

The Paul D. Krynine Memorial Fund

Thomas F. Bates Undergraduate Research Enrichment Fund

Thomas Kenneth (T.K.) Reeves, Jr. Family Scholarship

Timothy B. and Cindy Lynch Mullen Scholarship in Geosciences

Timothy D. Watson Fund in Geosciences

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Mr. and Mrs. Joseph W. Berg
Mr. and Mrs. Steven M. Bertenthal
Mr. and Mrs. Jeffrey L. Bologna
Mr. and Mrs. Claude E. Bolze
Mr. and Mrs. William A. Bragonier
Dr. Timothy Bralower
Dr. and Mrs. Robert P. Breckenridge
Dr. Gregory P. Byrd
Ms. Karen Rasmussen Campbell
Mr. and Mrs. David L. Cannon
Mr. Robert M. Cohen
Mr. and Mrs. Richard H. Craft
Dr. Ellen D. Currano
Mr. and Mrs. Randall T. Cygan
Mr. and Mrs. Timothy M. Demko
Mr. and Mrs. John N. Dougherty
Mr. James A. Doutt
Dr. John E. Ehleiter
Dr. and Mrs. Richard Engelder
Dr. and Mrs. J. Terry Engelder
Dr. James A. Ewart Jr.
Dr. Martin B. Farley
Dr. Robert L. Folk
Dr. Kevin P. Furlong
Dr. Lawrence Garmezy
Ms. Judith Gray
Mr. Lloyd S. Grearson, Jr.
Mr. and Mrs. Charles H. Grenot Jr.
Dr. Albert L. Guber
Ms. Amy K. Leon Guerrero
Dr. John and Mrs. Susan Guswa
Dr. and Mrs. John W. Hess
Dr. Christopher H. House
Dr. and Mrs. David W. Houseknecht
Mr. and Mrs. Stephen S. Howe
Dr. Benjamin F. Howell Jr.
Mr. and Mrs. Solomon Jarmell
Dr. and Mrs. John J. Kelley
Mr. and Mrs. Bruce J. Kobelski
Mr. Lawrence G. Kodosky
Dr. Leonard F. Konikow
Ms. Lisa A. Korner
Mr. Andrew B. Kovalcik
Mr. and Mrs. Garry M. Kramchak
Dr. and Mrs. Lee R. Kump
Mr. Ronald A. and Joyce S. Landon
Dr. and Mrs. Laurence H. Lattman
Dr. and Mrs. Peter M. Lavin
Dr. Robert H. Leeper, Jr.
Dr. Earle S. Lenker
Mr. and Mrs. Jon J. Major
Dr. Chris Marone
Dr. Roger K. McLimans
Mr. James L. McNett
Mr. and Mrs. Timothy B. Mullen
Mr. Kent E. Newsham
Ms. Nancy L. Niemann
Mr. Tye J. Numelin
Dr. and Mrs. Hiroshi Ohmoto
COL and Mrs. Fred S. Peter, Jr., Ret.
Dr. Lawrence D. Ramspott
Mr. and Mrs. Thomas K. Reeves, Jr.
Dr. Anthony L. Riccardi
Dr. John H. Rowland
Dr. Robert and Mrs. Marlene Ryder
Dr. Stephen L. Salyards
Mr. and Mrs. Martin A. Schoonen
Dr. and Mrs. Stephen O. Sears
Ms. Alice H. Sengstack
Mr. and Mrs. Irvin C. Shambaugh, Jr.
Dr. and Mrs. Barry S. Siegal
Dr. and Mrs. Allen R. Spelman
Dr. and Mrs. Daniel B. Stephens
Mr. and Ms. Keith R. Sweitzer
Mr. and Mrs. Carl H. Taylor
Ms. Regina C. Thompson
Mr. and Mrs. Kenneth H. Turner
Mr. Stephen J. Urbanik
Dr. and Mrs. John W. Washington
Mr. Barry L. Weinman
Mrs. Sue E. Werley
Dr. Matthew L. Werner, III
Mr. William E. Wertz
Dr. Timothy S. White

Alumni News

Rick Abegg '83

Rick is the recipient of the 2018 GEMS Alumni Achievement Award. This award is given by the EMS Alumni Society to recognize outstanding achievement by EMS alumni.

John Ackerman '75

John will be installed for his fifth term (1991-92; 2010-11; 2016-19) as chair of the Penn-Anthracite Society of Mining Engineering (SME) Section at their 144th Annual Meeting in June. In 2017, Mr. Ackerman oversaw the expansion of the section to cover all of eastern Pennsylvania and western and southern New Jersey with the merger of the former Lehigh Valley and Philadelphia SME Sections into the Penn-Anthracite Section.

Greg Baker '01

Greg just celebrated his thirteenth year with his own drilling company and just bought a new drilling rig that has increased their capabilities substantially.

Maryjo Brounce '09

After graduating from Penn State, Maryjo went on to receive a Ph.D. in Oceanography from the University of Rhode Island's Graduate School of Oceanography in 2014 and was the sole recipient of the Excellence in Doctoral Research Award at URI that year. She was a postdoctoral scholar at the California Institute of Technology for two years before joining the faculty at the University of California Riverside in October of 2016.

Theresa Damiani '03

Theresa was recently promoted to chief of the National Geodetic Survey's (NGS) Spatial Reference System Division. The Division helps to define the United State's National Spatial Reference System, manages NGS' national Global Navigation Satellite System (GNSS) network, houses an International GNSS Service analysis center for GPS satellite orbit products, and maintains the Online Positioning User Service suite of tools for precise GNSS positioning. Theresa and her husband welcomed their first child in September 2017.

Theodore Donovan '08

Following graduation, Ted's work has included volcano deformation modeling and the development of a 100 kg volcanic rover that was deployed in Hawaii in 2015 to collect temperature cross section near a fissure. Currently, Ted is developing robotic arm motion algorithms, sensor fusion algorithms, and computer vision algorithms as he seeks a permanent position in robotics/computer vision.

Jody Gibson '99

Jody was awarded Houston Geological Society's 2017-18 Teacher of the Year.

Joe Head '70

During Joe's time at Penn State, he had the opportunity to participate in the 1968 Olympic Marathon Trials in Alamosa, Colorado. Joe and his wife recently traveled to Alamosa to celebrate the fifty-year reunion with the seventeen Olympic athletes from the 1968 trials.

Jacqueline Huntoon '90

Jacqueline, provost and senior vice president for academic affairs at Michigan Technological University, has been named an inaugural member of the STEM Education Advisory Panel, overseen by the National Science Foundation, the U.S. Department of Education, the National Aeronautics and Space Administration, and the National Oceanic and Atmospheric Administration.

Janet Kappmeyer '79

Janet was appointed to the California State Mining and Geology Board by Governor Jerry Brown in November 2017 and confirmed by the California State Senate in May 2018. She will serve a four-year term.

Mike Loudin '79

Mike was elected chair of the Society of Exploration Geophysicists Foundation on January 1, 2018.

Joseph McNally '84

Joe was recently appointed by Governor Tom Wolf to a six-year term on the Pennsylvania State Registration Board for Professional Engineers, Land Surveyors, and Geologists. He is currently vice president and principal hydrogeologist with GeoServices, Ltd. in Camp Hill, Pennsylvania.

Emily Constantine Mercurio '96

Emily recently left her job as a geologist in the Pennsylvania shale gas industry to work full time as chief executive officer of her company, CivicMapper. Visit the link to listen to the podcast for more details on her company (<https://www.goingdeepwithaaron.com/podcast/emily-mercurio>).

John Miller '73

John, scientist emeritus at the U.S. Geological Survey, received (along with coauthors) the 2017 Best Presentation Award by the Rocky Mountain Association of Geologists, Denver, Colorado for the presentation "From Mantle To Mountain Top – A Restorable East-West Transect Across Colorado Following Interstate 70." Authors included: Edward J. (Ned) Sterne, Stephen P. Cumella, Robert G. Reynolds, John J. Miller, and James W. Granath.

Shuhei Ono '01

Shuhei was one of the co-chairs for the Goldschmidt Conference in Boston, Massachusetts this year.

Frederic Pirkle '77

In October 2017, Fred Pirkle, Ph.D., P.G. was awarded the Florida Association of Professional Geologists (FAPG) 2017 Hero of the Industry Award. Each year, FAPG bestows this honor upon individuals that have made significant contribution to Florida's mining industry. For the past forty years, Fred has been recognized as a leader in the mining industry, and as a dedicated mentor and educator.

Sameer Safaya '04

Sameer is busy in the Netherlands working as a sustainability consultant, lecturer, and entrepreneur. He created an initiative called OnePlanet Kitchen, sustainable pop-up food events that have been running for seven years as a social venture. Checkout oneplanetkitchen.org for more details as they are looking to expand the community and have ambassadors help run chapters globally.

Cameron O. Smith '75

Cameron is still living in Sharon, Connecticut. He is on a couple of exploration and production boards in Calgary, Canada and Tulsa, Oklahoma and consults a couple days a week in New York. He just won the Sharon Country Club Men's Golf Championship for the eighteenth time.

Dan Stephens '71

Dan has been selected as the recipient of the 2017 Groundwater Resources Association (GRA) of California's Lifetime Achievement Award. This award is presented to individuals for their exemplary contributions to the groundwater industry, contributions that have been in the spirit of GRA's mission and organization objectives.

Anthony Zvirblis '71

Anthony has donated his personal Pennsylvanian Period fossil plant collection to Cornell University's School of Integrative Plant Science, Plant Biology Section. The collection consisted of approximately 1,200 specimens. Professor William Crepet accepted the collection which was delivered on May 22, 2018.

Faculty Awards



Richard Alley

- Honorary Member of the American Meteorological Society
- Distinguished Explorer of the Roy Chapman Andrews Society for 2018



Michael Arthur

- V. M. Goldschmidt Award from the Geochemical Society
- Fellow of the Geochemical Society



James Kasting

- Elected member of the National Academy of Sciences



Peter LaFemina

- Hanse-Wissenschaftskolleg Institute for Advanced Study Fellowship



Michael Mann

- Elected Fellow of the Geological Society of America
- Public Engagement with Science Award, American Association for the Advancement of Science
- Stephen H. Schneider Award for Outstanding Climate Science Communication, Climate One & The Commonwealth Club
- James H. Shea Award of the National Association of Geoscience Teachers



Andy Nyblade

- Wilson Award for Outstanding Service in the College of Earth and Mineral Sciences.



Arthur Rose

- Hitchon Award, International Association of Geochemistry



Tieyuan Zhu

- Wilson Research Initiation Award in the College of Earth and Mineral Sciences
- J. Clarence Karcher Award, Society of Exploration Geophysicists

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