A Note From the Department Head

Greetings. As I think back on the rich history of the department over the past 50 years, I am constantly reminded of the department’s tradition of excellence, a tradition that continues to this day. Our faculty are deeply committed to providing world class education to our students, while broadening our fundamental knowledge in the fields of Earth, atmospheric, and planetary sciences. Following graduation, our alumni are providing crucial leadership in government, industry, and academia. At every level, our faculty and alumni are boldly defining the measures of our success.

In this edition of Inside EAPS, you will find these stories, and others, of the accomplishments of our students, faculty, and alumni. For example, the department has appointed its first Endowed Chair, made possible by a generous gift from Stephen and Karen Brand. One of our graduate students has been inducted into the Purdue University Teaching Academy. Many more achievements are recognized in this edition, demonstrating the high-caliber department you have and continue to contribute to. I look forward to the opportunity to thank you for all of your contributions to that tradition in-person at the department’s 50th anniversary celebration, The Black and Golden Jubilee, on September 21-23, 2017. A number of alumni and Purdue leaders, including President Mitch Daniels, Interim Provost Jay Akridge, and the College of Science Dean Patrick Wolfe have confirmed to attend this celebration.

I hope that you will be able to join us to celebrate this important milestone for the department. I look forward to hearing from you and welcoming you back to the campus during our Black and Golden Jubilee Celebration.

Hail Purdue,
Indrajeeet Chaubey
Professor and Head
Alumni Highlight: Mark Longacre

Mark Longacre graduated from EAPS with a Master of Science in Geophysics in 1981. Since then, he has enjoyed a successful and dynamic career that ultimately resulted in the founding of his own gravity and magnetics consulting company, MBL, Inc., in 1991. But prior to his coming to college, he never thought he would end up in the field of geology.

“I was born and raised in Manitowoc, Wisconsin and through those first 18 years, geology, much less geophysics, never crossed my mind,” Longacre said. “That all changed over spring break my freshman year at the University of Wisconsin – Milwaukee. On a whim, I went on a marine biology field trip to the Baja Peninsula of Mexico where the oceanography professor, Dr. R. Gordon Pirie, suggested I take Geology 101. The next semester I did and have never looked back!”

Longacre studied Geology at the University of Wisconsin, and after one geophysics course, decided he wanted to become a geophysicist. When he visited Purdue for graduate school, he only met one professor – Dr. William Hinze.

“It was his wisdom and guidance that drew me in;” Longacre said. “Most importantly, it was his passion that ignited my passion that made me say yes to Purdue / EAPS, yes to working under him, and yes to an unknown future in an unknown study of applied gravity and magnetics.”

After graduation, Longacre started his career in San Francisco with Sohio Petroleum as a gravity and magnetics geophysicist. He spent four years with Sohio, then joined Aqua Terra International, a small gravity and magnetics consulting company in Denver. After starting his own company in 1991, Longacre opened an office in London in 1999, and the company has continued to grow since.

Graduate Student Highlight: Jordyn Miller

Where do you come from originally?
I was born and raised in Lehighton, PA. It’s a small town tucked away in the Appalachians.

Can you briefly explain your research?
My research is centered around two disciplines: hydrogeology and temperate alpine glaciology. Specifically I’m working to quantify what impact glacial meltwater may have on deep groundwater recharge from a local to regional scale. Nearly all alpine glaciers worldwide are in retreat, and it’s important to know from a sustainability standpoint how mountain groundwater systems will behave when these massive frozen reservoirs have completely melted away.

What are some examples of field research you’ve had the opportunity to participate in?
Before coming to graduate school, the farthest west I ever traveled was moving here to Purdue. I feel fortunate to say that within the past two years I’ve had the opportunity to be a field assistant in Death Valley, CA, as well as help colleagues with a variety of high-alpine, glacial sampling all over the Pacific Northwest. This summer I will be conducting my own field research in alpine environments on Mt. Hood, Oregon and in Glacier National Park, Montana.

What is it about Purdue EAPS that was attractive or stood out to you?
After attending a tiny liberal arts university for undergrad (Wilkes University), I was a little nervous to come to a huge R1 university. I was pleasantly surprised to find that the Purdue EAPS department maintains a small, close-knit feel on the larger Purdue campus.

What made you want to work with Dr. Frisbee?
Dr. Marty Frisbee is an enthusiastic researcher and is open to exploring new and exciting ideas with his students. He holds a BS in Electrical Engineering and transitioned to Hydrogeology for graduate school - a path that requires a rather steep learning curve. I also am transitioning to Hydrogeology from a Mechanical Engineering career, so I really look up to him in that respect. Overall he’s a great and supportive advisor, and I think the work he does is both novel and fun.

What’s your favorite thing about EAPS?
My favorite thing about EAPS is the wide variety of research that takes place here. For example, it’s pretty awesome that my field-sites are also used by the planetary department for Mars analog studies.
A technology developed by Purdue researchers could provide an “instantly rechargeable” method that is safe, affordable and environmentally friendly for recharging electric and hybrid vehicle batteries through a quick and easy process similar to refueling a car at a gas station.

The innovation could expedite the adoption of electric and hybrid vehicles by eliminating the time needed to stop and re-charge a conventional electric car’s battery and dramatically reducing the need for new infrastructure to support re-charging stations.

John Cushman, Purdue University distinguished professor of earth, atmospheric and planetary science and a professor of mathematics, presented the research findings “Redox reactions in immiscible-fluids in porous media – membraneless battery applications” at the recent International Society for Porous Media 9th International Conference in Rotterdam, Netherlands.

Cushman co-founded Ifbattery LLC (IF-battery) to further develop and commercialize the technology.

“Electric and hybrid vehicle sales are growing worldwide and the popularity of companies like Tesla is incredible, but there continues to be strong challenges for industry and consumers of electric or hybrid cars,” said Cushman, who led the research team that developed the technology. “The biggest challenge for industry is to extend the life of a battery’s charge and the infrastructure needed to actually charge the vehicle. The greatest hurdle for drivers is the time commitment to keeping their cars fully charged.”

Current electric cars need convenient locations built for charging ports.

“Designing and building enough of these recharging stations requires massive infrastructure development, which means the energy distribution and storage system is being rebuilt at tremendous cost to accommodate the need for continual local battery recharge,” said Eric Nauman, co-founder of Ifbattery and a Purdue professor of mechanical engineering, basic medical sciences and biomedical engineering. “Ifbattery is developing an energy storage system that would enable drivers to fill up their electric or hybrid vehicles with fluid electrolytes to re-energize spent battery fluids much like refueling their gas tanks.”

The spent battery fluids or electrolyte could be collected and taken to a solar farm, wind turbine installation or hydroelectric plant for re-charging.

Ifbattery licensed part of the technology through the Purdue Research Foundation Office of Technology Commercialization and has developed patents of its own. The company is a member of the Purdue Startup Class of 2017.
EAPS Researchers Studying Antarctica with Seven-Nation Team

A long-term project in Antarctica is searching for answers on the quest to learn Earth’s history. At the forefront of this search, in little-studied areas of the frozen continent, is a collaboration of seven countries; and with them, Dr. Nat Lifton and graduate student Jenny Newall of EAPS.

The research was and continues to be exciting for the team, but the conditions are often difficult. Travel to and from the team’s base, Wasa, was often challenging.

“We encountered a snowstorm on the way back to Wasa and drove for about four hours in whiteout conditions,” Dr. Lifton wrote in a dispatch from February. “The snow wasn’t so bad, but we often couldn’t see any distinction between the sky and the ground.”

But these types of conditions aren’t unexpected for the research team. In fact, the team met similar troubles on their very first outing.

“There was commonly an icy layer near the surface that was underlain by bone-dry, sugary snow that had no cohesion, kind of like a sand dune,” Dr. Lifton said. “We used heavily modified Toyota pickup trucks, known as Arctic Trucks, to travel most places, and they did great overall, but it turned out that they couldn’t handle the ice-over-sugary snow conditions very well.”

The researchers are eager despite these challenges. Dubbed MAGIC-DML (Mapping, Measuring and Modeling Antarctic Geomorphology and Ice Change, in Dronning Maud Land), this research partnership has representatives from Sweden, the United States, Norway, the United Kingdom, and Germany. The focus on the project – the reason researchers would drive for four hours in whiteout conditions – is to reconstruct the glacial history of a sector of the East Antarctic ice sheet. Newall says this will result in better preparations for future changes in climate.

“To begin to answer current questions about climate, we need to look back to previous times of global warming in Earth’s history,” she said. “By reconstructing past changes in the extent of ice sheets, and combining the empirical data we get from the field work together with numerical modelling, in the way this project does, we can begin to understand the way in which ice sheets respond to changes in climate.”

This empirical data in the field that Newall refers to the study of past thickness variations of the East Antarctic Ice Sheet (EAIS) using in situ cosmogenic nuclides. These nuclides are very rare, typically produced in minerals by cosmic rays that bombard a rock surface. By measuring multiple nuclides in a single sample, researchers can deduce whether the surface has been covered and re-exposed in the past, allowing them to construct a model of how the ice sheet thickness has changed over time.

“It is important to understand how the EAIS has responded to past climatic changes in order to better predict how it may respond to ongoing climate change,” Dr. Lifton said. “EAIS holds the majority of ice in Antarctica, yet is less-well-characterized.
Dr. Doug Schmitt will be joining the EAPS department in spring 2018 as the Stephen and Karen Brand Endowed Chair of Unconventional Energy, which was made possible by a generous gift from Stephen R. Brand, an EAPS alumnus, and his wife, Karen.

“From an energy perspective, exploration of unconventional resources in oil and gas is where the future is headed,” Stephen Brand said in a 2013 news release. “We hope this chair will help Purdue capitalize on its strengths in geology and engineering to build and expand knowledge in this emerging area to help solve the energy problem and offer students the opportunity to learn in-demand skills that will set them apart from other graduates.”

Currently Professor of Geophysics and Physics at the University of Alberta, and Canada Research Chair in Rock Physics, Dr. Schmitt is a leading researcher in energy resources. Dr. Ken Ridgway, Professor of EAPS and Search Committee Chair, said the wide scope of Dr. Schmitt’s experience was key to him being a good fit for the professorship.

“Dr. Schmitt has been at the forefront of research on exploration of the oil sands in Canada,” said Dr. Ridgway. “He is involved not only with the rock physics aspects but the environmental responsibility issues as well. Energy in the one of the centerpieces of many of the economic and environmental issues that the world is facing. Dr. Schmitt will be our leader in that area from the nanometer to sedimentary-basin scale.”

Dr. Schmitt’s research includes more than 27 years of experience in rock physics, and he has served as Director for the Institute for Geophysical Research at the University of Alberta. He has also been involved in deep drilling projects on every continent except South America, advised more than 50 graduate students, and published more than 100 scholarly journal articles. EAPS Professor and Head Dr. Indrajeet Chaubey said these credentials show why Dr. Schmitt is a perfect choice.

“EAPS is very excited to have attracted a world-class researcher of Dr. Schmitt’s caliber. His expertise in energy exploration will help propel the department to a new level of innovation in the field of unconventional energy,” said Dr. Chaubey.
Research is important in higher education. But for EAPS M.S. student Noah Stewart-Maddox, outreach is where the rubber meets the road.

“Outreach is an important and often overlooked part of scientific work,” said Stewart-Maddox. “Scientific publications are typically written at a technical level, and only read by other scientists interested in the research. Outreach presents an opportunity to share your findings at the public level.”

This isn’t only a theoretical musing on the part of Stewart-Maddox. Public outreach has been a core part of his primary research project, studying the hydrology of mountainous watersheds. In 2016, Stewart-Maddox received the EAPS “Hydrologists Helping Others” student research grant in order to conduct research in rural communities in northern New Mexico, and conduct public outreach to share the results with these communities. He studied perennial streams in the Tusas Mountains of New Mexico: Canjilon Creek, El Rito Creek, and Vallecitos Creek. In July 2017, he presented these results to one of the three communities studied - El Rito, New Mexico.

“The disconnect between scientific research and the community was self-evident in El Rito,” Stewart-Maddox said. “The majority of El Rito has a high school education with no college experience. Outreach events can provide an excellent way to educate groups on specific scientific issues relevant to their community.”

The event included four presenters: Stewart-Maddox, Dr. Marty Frisbee of EAPS, graduate student Lani Tsinnajinnie of New Mexico Tech, and Dr. John Wilson of New Mexico Tech. The event kicked off with a 1-hour poster session given by Noah and Lani, followed by five talks from the presenters, and a public question and answer session at the end.

“The El Rito community gets most of their water for irrigation from acequias, which are traditional irrigation ditches,” Stewart-Maddox said. “During the dry summer months, the acequias in El Rito are supported by perennial flow from the El Rito Creek. El Rito Creek is fed by a network of springs in the headwaters, which appear to be sourcing their water from the adjacent Canjilon watershed. This has large implications on the sustainability of El Rito Creek in the upcoming decades. Changes in the Canjilon watershed can impact the way El Rito Creek functions.”

Dr. Frisbee, who is also Stewart-Maddox’s advisor, is committed to outreach. As he explains, growing up in a rural community in North Carolina, he knows that scientific data rarely reaches rural communities. Therefore, public outreach is often the only way some communities have of reaping the benefits of scientific research.

“Outreach events such as this are critical to getting scientific information to rural communities,” Dr. Frisbee said. “They
provide vital information to better manage water resources in water-stressed areas, or areas with poor or deteriorating water infrastructure.

While some members of the science community have been skeptical towards the effectiveness of public outreach, many are now seeing the benefits of it. These events engage not only adults, but also members of the younger generations that could become scientists in the future. They can also help remedy the gap of knowledge between the science community and the general public, bringing the value of science into everyday life.

“Too often taxpayer funded scientific studies are completed without the public’s awareness,” said Stewart-Maddox. “These findings may be disseminated through various governmental agencies and create new policies without the public understanding the linkage. This disconnect between public policy and the science behind it can result in animosity between the public and scientific groups. I believe the best way to garner public support for scientific work, is through local level outreach events. By sharing our findings, we create a more scientifically engaged citizen, who can in turn support further scientific inquiry.’

Stewart-Maddox will graduate at the end of the summer, but outreach efforts like this will continue at EAPS. Carolyn Box, an EAPS graduate student who is also advised by Dr. Marty Frisbee, hopes to show the results of her research in Death Valley in a similar event. This and other possibilities speak to an exciting future of public outreach at EAPS.

Dr. Filley Appointed Interim Director of Center for the Environment

Effective July 1, Timothy Filley, professor of geochemistry and soil science in the Department of Earth, Atmospheric, and Planetary Sciences and the Department of Agronomy, will serve as the interim director of Discovery Park’s Center for the Environment (C4E). Filley is one of the founding members of the Purdue Climate Change Research Center and serves on the executive committee for C4E.

“The Discovery Park Center for the Environment brings together a remarkably talented community of faculty, students, and staff to address the world’s most pressing environmental challenges,” Filley says. “I am honored to serve as the center’s interim director and look forward to supporting and expanding efforts to find solutions that secure a healthy, sustainable and prosperous future.”

Filley also served as the director for the U.S.-China EcoPartnership for Environmental Sustainability from 2012 to 2016, a Discovery Park project associated with the PCCRC and C4E.

September 21-23, 2017

To register, go to http://giving.purdue.edu/eaps50. The registration deadline is August 21, 2017, but please register sooner rather than later to guarantee a spot in the activities you are interested in.

Sept 21
3:00 P.M. – 4:30 P.M. Seminar (Ed Harvey)
6:00 P.M. – 8:00 P.M. Reception at Lafayette Brewing Company

Sept 22
8:00 A.M. – 1:00 P.M. Golf Scramble
9:00 A.M. – 11:30 A.M. Campus Geocache Hunt
1:00 P.M. – 3:30 P.M. Open House
1:00 P.M. – 3:30 P.M. Memory Walk
5:30 P.M. – 8:30 P.M. Anniversary Gala-Dinner and Reception

Sept 23
Two (2) hours before Homecoming Game: Breakfast/Lunch/Tailgate
Football game – Purdue vs. Michigan

September 21-23, 2017
Acquiring an advanced degree takes years of hard work and research. For PhD Candidate Logan Dawson, that hard work starts long before graduate school. Looking back on the steps that ultimately led to graduation, Dawson said his interest in atmospheric science began at a very early age.

“I was in second grade when I decided I wanted to be a meteorologist,” Dawson said. “I was always afraid of thunderstorms and tornadoes when I was a kid, but I was really interested in weather at the same time. As I got older, I read more about different types of weather, that fear went away as I learned more, and the interest just stuck with me.”

Dawson’s interest in the weather continued up through high school, at which point he only looked at universities with meteorology programs. After attaining a Bachelor’s degree in Meteorology from North Carolina State University, he turned his attention to graduate school. His priority in this search was something that ultimately led him to EAPS – a student-focused education.

“I definitely think the flexibility with the academic program and curriculum was really great for me,” Dawson said. “That was one of the biggest draws for me when I was applying and considering my grad school options. I liked that there wasn’t a set curriculum and students could get a well-rounded graduate education while taking classes that would be helpful towards our individual research interests.”

That flexibility included an extensive field research project early on in Dawson’s graduate school career. Dr. Mike Baldwin and Dr. Jeff Trapp, who were Dawson’s advisors, were principal investigators on the Mesoscale Predictability Experiment. This month-long field campaign in 2013 included forecasting activities at the National Center for Atmospheric Research in Boulder, Col. and field data collection in the vicinity of thunderstorms in the Great Plains. Dawson spent the first half forecasting from the safety of the research center, then spent the second half in the field doing hands-on data collection.

“That was my first time doing really extensive fieldwork and somewhat chase storms a little bit, get chased by storms a little bit,” Dawson said. “I enjoyed it because that was an opportunity to really see what storms are doing to the atmosphere; you can see so much in the Great Plains where it’s flat and there are no trees. Seeing thunderstorms in action in person was really cool.” Dawson also said that he learned things don’t always go smoothly on these field projects.

“You have a plan where you expect everything to go just so as you want it to be, but there are things that don’t cooperate, like power lines that get in your way or running out of helium to fill the balloons while you have a thunderstorm bearing down on you.”

Mesoscale predictability continued to be an interest of Dawson’s, ultimately becoming the subject of his dissertation, which he successfully defended in July. Following commencement, he will join IM Systems Group Incorporated as a Support Scientist, contracted to the National Oceanic and Atmospheric Administration’s Environmental Modeling Center in College Park, Maryland.

“We’ll be tasked with doing daily evaluations of the National Weather Service forecast models to determine how well they are performing and to identify errors that be addressed to improve future forecasts,” Dawson said. “I’m very excited to be working on the modeling side of operations for the National Weather Service.”
Christopher Roemmele Inducted into Purdue Teaching Academy

An EAPS graduate student is being recognized for his commitment to high-quality teaching.

Christopher Roemmele, a PhD student studying Geoscience Education, has been selected to become a new Associate of the Purdue University Teaching Academy. The Teaching Academy inducts faculty members and graduate teaching assistants who have shown an outstanding commitment to high-quality teaching and/or engagement programs.

Roemmele's commitment to teaching started before he came to EAPS. He spent 15 years as a science teacher in New Jersey schools, an experience that still influences his current work. His decision to pursue a PhD was born out of a passion to continue contributing to high-quality education.

“I often say I am a teacher,” he said. “First, last, always.”

Associate members of the Teaching Academy are nominated based upon evidence of excellence in teaching. That excellence has been evidenced in multiple areas of Roemmele's study and involvement. In addition to his work as a graduate student, he is heavily involved in EAPS outreach programs, and is Program Coordinator for GK-12 – an outreach program at Purdue that grew out of an initiative originally funded by the National Science Foundation.

Roemmele's induction will be formally recognized at a ceremony in September.

Marie McBride Awarded Multiple Fellowships

Marie McBride, an EAPS PhD student studying planetary science, has received the National Science Foundation (NSF) Graduate Research Fellowship and the Amelia Earhart Fellowship.

The highly competitive NSF Graduate Research Fellowship Program recognizes and supports outstanding graduate students. The Amelia Earhart Fellowship, granted by Zonta International, is given to assist the future of women in aerospace and aerospace-related sciences. Both fellowships provide funding for supplies, and the NSF fellowship also provides a stipend.

“Winning both of these awards is a huge achievement, and secures my funding for the next three years,” she said.

McBride, who is advised by Dr. Briony Horgan, studies explosive volcanic deposits on the Moon using orbital spectroscopic detections of glass. The lunar pyroclastic deposits McBride studies are high priority targets for future missions to the Moon. To complement her lunar research, she travels to study volcanic deposits on the surface of the Earth. She has completed NASA’s Planetary volcanology workshop in Hawaii, a volcanology field camp in Ecuador and the Galapagos Islands, and will be participating in a volcanology field school in Kamchatka, Russia in August.

Currently, McBride is heavily involved with educational outreach in K-12 classrooms, and plans to start a science education non-profit organization, just one of her ambitious career goals.

“My ideal life scenario is that with my lunar science research, I would be chosen as the first woman to walk on the Moon,” she said. “I would embrace the opportunity to be this role model and to inspire others to realize that hard work can make dreams come true. While walking on the Moon would be an amazing feat, realistically, I know many factors may make my dream impossible. If I cannot visit another planetary body myself, I hope to continue to be a part of or lead teams to send cameras or other instruments on NASA planetary or human exploration missions.”
Upcoming Events - Mark Your Calendars!

EAPS Black and Golden Jubilee 50th Anniversary
West Lafayette, Indiana
September 21-23, 2017

SEG 2017: Houston, TX
September 24-27, 2017

GSA 2017: Seattle, WA
October 22-25, 2017

AGU 2017: New Orleans, LA
December 11-15, 2017

AMS 2018: Austin, TX
January 7-11, 2018

EAPS will hold a reception at some of the meetings listed above. The time and location is TBD. Please check for updates at www.eaps.purdue.edu/alumni.

Connect with EAPS
Facebook: www.facebook.com/EAPSPurdue
Twitter: www.twitter.com/PurdueEAPS
YouTube: http://goo.gl/Mb9Yyl