

GEO GRAPH

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*The New
Geographers*



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ON THE COVER

Pictured at the Lion Shrine, left to right, the new geography faculty members: Luke Trusel, Trevor Birkenholtz, Emily Rosenman, Helen Greatrex, Manzhu Yu, and Panagiotis Giannakis.

This publication is available in alternative media on request.

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From the Head of the Department

Geographers Lead and Connect

Geographers make outstanding leaders because they understand and value varied academic cultures. The scholarly approaches in our department range from qualitative humanities to social science inquiries to physical science fieldwork to technological innovation—a mini university on two floors of Walker Building.

As a result, geography faculty are often sought to run key programs at the University. Most recently, Erica Smithwick was appointed as associate director of Penn State's Institutes of Energy and the Environment (IEE). In addition, Guido Cervone serves as associate director of the Institute for CyberScience (ICS), and Alex Klippel is founding director of the university's Center for Immersive Experiences.

We successfully propose new hires for institute programs in response to national initiatives, such as "Innovations at the Nexus of Food, Energy and Water Systems" at

the National Science Foundation (NSF). Jenn Baka and Smithwick are co-hires with IEE; Josh Inwood is a co-hire with the Rock Ethics Institute; and Cervone, Klippel, and Helen Greatrex are co-hires with ICS. We won most of these appointments by competing with other University programs. That's part of how we build a strong department—winning the funding to make great hires. We also have 13 tenure-line positions that are fully funded as geography appointments in the College of Earth and Mineral Sciences (EMS).

We excel in joint hires with other departments and colleges. Greatrex and Sarah Chamberlain are joint with the Eberly College of Science; Bronwen Powell and Melissa Wright are joint with the College of the Liberal Arts. Wright also heads the Department of Women's, Gender, and Sexuality Studies—which geographer Lorraine Dowler headed in the past. Our faculty are also co-hires within EMS: Alan Taylor, Baka, Cervone, and Smithwick are associates in the Earth and Environmental

Systems Institute.

Geographers have led important areas of the University. Denice Wardrop was founding director of the Sustainability Institute. Brent Yarnal and Greg Knight served as chairs of Faculty Senate. Knight was a vice provost. Rod Erickson was provost and then president of the University, among his many leadership positions. Rob Crane served as associate dean and interim dean of EMS, and is currently interim vice provost for Global Programs. Bill Easterling was director of IEE, then dean of EMS, and he now leads the NSF Directorate for Geosciences.

In this newsletter, we highlight a remarkable year with new hires. We have 24 tenure-line professors and 14 full-time teaching or research professors appointed in geography. We note co-hire, joint, associate, courtesy, and other affiliations in geography's directory for our faculty, showing the many connections geographers have throughout Penn State: www.geog.psu.edu/about/who-we-are/directory

Community Updates

Department departures and arrivals

Trevor Birkenholtz joined the department in summer 2019 as an associate professor of geography.

Jack Chang joined the department in spring 2019 as a postdoctoral researcher affiliated with the ChoroPhronesis lab.

Karen Cox accepted a position with Penn State Milton S. Hershey Medical Center (Children's Miracle Network) within the Office of University Development and Alumni Relations because she and her husband relocated to the Lancaster area.

Cindy Etchison joined the department in spring 2019 as the new National Research Traineeship program coordinator for Landscape U.

James Gaboardi joined the department in fall 2019 as a postdoctoral researcher with Christopher Fowler.

Panagiotis Giannakis joined the department in summer 2019 as an assistant teaching professor with the John A. Dutton e-Education Institute.

Helen Greatrex joined the department in summer 2019 as an assistant professor of geography and statistics.

Lucas Harris completed his Ph.D. and is now a postdoctoral

researcher with the Vegetation Dynamics lab.

Carolynne Hultquist completed her Ph.D. and is now a postdoctoral researcher with the Geoinformatics and Earth Observation (GEO) lab.

Ndivhuho Nemapate joined the department in fall 2019 as a visiting scholar.

Andrea Rishworth joined the department in fall 2019 as a postdoctoral researcher with the HELIX lab.

Emily Rosenman joined the department in summer 2019 as an assistant professor of geography.

Pejman Sajjadi joined the department in spring 2019 as a postdoctoral researcher affiliated with the ChoroPhronesis lab.

Mamma Sawaneh was a visiting scholar from The Gambia in spring 2019 working with Erica Smithwick.

Luke Trusel joined the department in summer 2019 as an assistant professor.

Manzhu Yu joined the department in summer 2019 as an assistant professor of geography.

Xi Zhu joined the department in spring 2019 as a postdoctoral researcher affiliated with the GeoVISTA Center.

Alumni

John Frederick '78 published a new book, *Winding Roads: A Bicyclist's Journey through Life and America*.

Lori Cohn Safer '79 is the 2019 president of the Seattle Chapter of the Appraisal Institute, and a content reviewer for the Appraisal Institute's recently published book, *Real Property Valuation in Condemnation*.

Wayne Brew '81 published two articles in the 2018 issue of the journal *Pioneer America Society Transactions (PAST)*, a publication of the International Society for Landscape, Place & Material Culture, from his sabbatical road trip from Montgomery County Community College in Pennsylvania last year.

See UPDATES on p. 20

The Pennsylvania State University



This certifies that

Samantha Mathewz

has successfully completed the requirements for the undergraduate certificate in

Justice, Ethics, Diversity in Space

Awarded December 2018

(Signature)

Geography certificates offer students customized degrees

Students who want to customize their bachelor's degree in geography, add a specific topic in geography to their major, or enhance their career as a non-degree student can now complete undergraduate certificates in geography. Visit the website: www.geog.psu.edu/degree-programs/undergraduate-minors-and-certificates/undergraduate-certificates.

"Certificates are credentials that recognize mastery of a specific area in the discipline," said Jodi Vender, undergraduate adviser in the Department of Geography. "Ours are 12 credits—fewer credits than a minor—so they fit more easily into a degree program. They can be used as milestones for accomplishment in a specific domain or can stand alone."

The department is offering eight certificates:

- Landscapes: Societies, Cultures, and Political Economies
- Justice, Ethics, Diversity in Space
- Environment and Society Geography

- Landscape Ecology
- Global Environmental Systems
- Climate and Environmental Change
- Geographic Information Science
- Geospatial Big Data Analytics

Vender said the department created the certificates to recognize student accomplishments in more specific domains, offer greater flexibility, offer more customized degrees, and provide a way for students in other majors to add a specialization in geography.

"Certificates can attract undergraduate students to a discipline," she said. "Offering certificates is a way of being responsive to students' needs among both degree-seeking and nondegree-seeking at the undergraduate level. That is something we have been offering online at the post-baccalaureate and graduate level for years now through our online geospatial programs."

See *CERTIFICATES* on p. 9

A muddy boots approach to resolving water dilemmas

Trevor Birkenholtz joined the Department of Geography in summer 2019 as an associate professor of geography. He is a political ecologist and development geographer with regional interests in South Asia and the United States, empirical interests in water development, and methodological expertise in mixed methods field research.

Birkenholtz's interests in water and human rights and his engaged scholarship approach formed during his early work experiences.

Birkenholtz began his career as a machinist in central Iowa after earning an associate degree in machine technology. But the low pay and working conditions there "sparked my curiosity in labor rights, health, and the environment," he said. So, he decided to go back to college to study geography at the University of Iowa.

"Geography was the place to be for students who were interested in environmental issues. I took two courses in geography my first semester. In one of them, the United States Geological Survey (USGS) was advertising for a hydrologist trainee. I applied immediately and I was hired, given my previous training and experience as a machinist, which requires precision work," Birkenholtz said.

At the USGS, Birkenholtz learned surface and groundwater modeling, field data collection and GIS.

"I might have stayed with the USGS after graduation, but in the late 1990s the federal government was under a hiring freeze, so I was out the door," he said.

However, that work experience led to his interests in the politics of water and science.

"Now, I ask questions about apparently unintended outcomes in environmental policymaking or technological solutions to environmental problems," Birkenholtz said. "I try to understand why they lead to certain outcomes, and then, how academics, policymakers, engineers, and the public might work together to craft better solutions."

One example is his research on drip irrigation, a water conservation technology that ironically doesn't always lead to water savings and often exacerbates social disparities.

Birkenholtz wondered why that was happening and is now investigating the conservation properties and labor dynamics of drip irrigation in Rajasthan and Karnataka, India, using funding from a Fulbright-Nehru Academic and Professional Excellence award.

"Thus far, I am finding that the drip irrigation dilemma has to do with how the new technology mixes with preexisting water-use rules as well as ongoing processes of social differentiation," Birkenholtz said.

He first visited India in 2001 as a graduate student with his mentor Paul Robbins, formerly at the Ohio State University.

"I am fascinated by the complexity of the place and the innovativeness of the people there. It is a place of makers, where my experiences as a machinist and with farming continue to inform my work on agrarian technology and innovation," Birkenholtz said.

Another one of his research projects looks at the "seemingly contradictory problem of water scarcity that many Great Lakes near-coastal communities are facing," said

Birkenholtz. He is working with groundwater hydrogeologists and modelers to develop future water supply scenarios by creating interactive groundwater models that engage community stakeholders.

From his fieldwork and engagement with local stakeholders in a variety of contexts, Birkenholtz has come to perceive that the biggest threat to a safe and sufficient water supply for all is not scarcity, but our current political economic system, as well as the global underfunding and rollback of environmental institutions and regulations.

“Most people in most places are in favor of tighter rules around water protection and management,”

Birkenholtz said. “Yet we don’t get them very often or without protest, given the influence of big capital on environmental politics. Fortunately, there are many committed people around the world who are working to reverse this trend.”

Birkenholtz said he’s excited to begin teaching at Penn State.

“I’m looking forward to working with students who share my interests in examining the politics of the environment, but who also challenge me to go in new directions,” Birkenholtz said. “Overall, our research collective believes in empirically-grounded and theoretically-informed muddy boots fieldwork.”

Birkenholtz visits a water diversion pipeline in Rajasthan, India, in January 2018, after interviewing farmers about how water diversion practices affect their irrigated agriculture. Photo by Jaywant Mehta.

Thinking geographically to track equity and diversity in networks

Panagiotis Giannakis joined the Department of Geography and the John A. Dutton e-Education Institute in summer 2019 as an assistant teaching professor. His research focuses on the relationship between organizational and physical and/or social network space.

“In my research, I am trying to combine the findings and insights derived from social networks analysis and geography to identify how the two planes—network and physical—can affect social networks,” Giannakis said.

Giannakis said he has always been interested in issues of equity and justice. Over the past decade, he’s noticed significant changes in workplace attitudes and policies toward LGBTQ concerns.

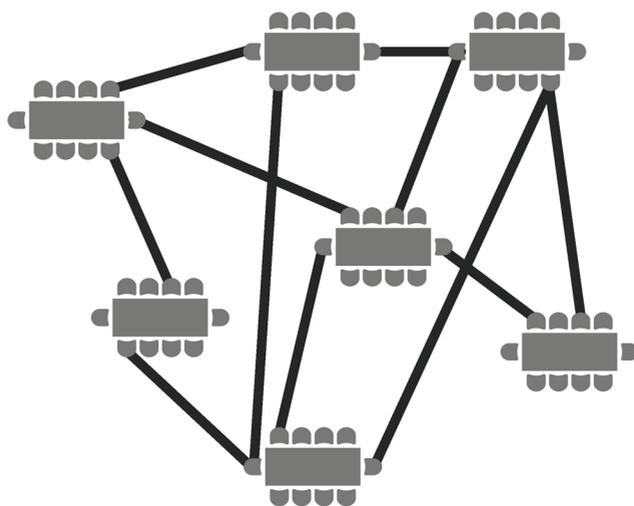
“Companies such as Walmart and General Electric have become more vocal in their efforts to support LGBTQ-friendly causes,” he said.

“Initiatives that come from organizations of that caliber create a ripple effect by providing examples for others. Observing this phenomenon, I wanted to explore the mechanisms through which organizational LGBTQ-friendly practices diffuse over time and physical space.”

The mechanisms Giannakis found to influence the likelihood of adoption of such practices include localized LGBTQ-friendliness, a density measure of geographically close LGBTQ-friendly organizations; and the network of board of director interlocks, members who serve on multiple boards and act as information conduits.

Because nodes do not have the same role and impact across the network space, Giannakis decided to focus on the diffusion of LGBTQ-friendly practices via boards of directors’ interlock networks.

“A board of directors network presents a multitude of interesting characteristics,” he said. “The nodes are the organizations, and the ties are the board members who facilitate the connection between the two boards, thus creating a network consisting of



This diagram shows a simplified board interlock network. Chairs connected by black lines represent a single person. Image: Angela Rogers.

two different entities with possibly diverging interests and agendas.”

“When the connecting tie is a human, using their values, personal interests, and other personal capital to act as a filter or gatekeeper, this can challenge the validity of a common assumption in social network theory—that the connecting tie between two network entities is always open and working at full capacity,” Giannakis said. “So, the values of those human ties between organizations are critical and can be used as a proxy for efficiency as organizational connectors, particularly when the information they are passing along is counter-

normative, not aligned with their values, and concerns socially sensitive matters and policies.”

This year, Giannakis is teaching several courses for the online geospatial program (GEOG 484: GIS Database Development, GEOG 485: GIS Programming and Software Development, and GEOG 585: Open Web Mapping). He also will be advising students in the Master of Geographic Information Systems (MGIS) and Master of Professional Studies (iMPS) in Homeland Security, geointelligence option, in completing their capstone projects.

CERTIFICATES from p. 5

Another benefit to students is that certificates are awarded at the end of the semester in which they are completed.

A student can complete a certificate without being in the major, so certificates are more accessible to undergraduates in other majors and colleges as well as returning adult students.

Nicole Rivera and Samantha Mathews graduated in May 2019 with bachelor’s degrees in geography. They are among the first class of students who earned certificates. Rivera graduated with certificates in Environment and Society Geography and Human Geography (recently renamed Landscapes:

Societies, Cultures, and Political Economies).

“These certificates allow employers and graduate schools to see my focus within my major without necessarily needing to add a lot more credits,” Rivera said.

Mathews completed the Justice, Ethics, Diversity in Space certificate.

“My biggest take-away is that geography is really broad, but having some issues or topics to focus on can make you more appealing to future employers, as well as giving you a specialization that you can use in the future,” she said.

Certificates do not replace the department’s existing minors.

“They are different

animals,” Vender said.

“In geography, we have discontinued the options within the majors, allowing more flexibility for the students. For example, students can more easily combine a human geography emphasis with Geographic Information Science. And minors are still available. A student can complete a minor that has a certificate within it.”

So far, Vender said, the student response has been overwhelmingly positive.

“Students like the idea of being able to customize their degree, and they also like that the certificates are awarded when earned,” she said.



Villagers meet to design custom rainfall insurance within the World Food Programme's R4 Rural Resilience Initiative. Kouthiakoto Ndene village, Senegal 2013. Photo by Helen Greatrex.

Drought or deluge: Reducing the risks of rainfall

Helen Greatrex joined the Department of Geography in summer 2019 as an assistant professor of geography and statistics. Greatrex studies how rainfall is measured and used for decision-making—linking research on rainfall hazards, exposure and vulnerability, and impact. She focuses on supporting the design of index-based weather insurance for farmers.

There are billions of small, rain-fed family farms around the world, which together produce over half of the global food supply. For many farmers, the threat and impact of severe weather can mean that it's hard to invest.

"Imagine you want to take out a loan to purchase high-quality seeds or fertilizer," Greatrex said.

"In a normal year, this could drastically increase your yields and profits. But if a severe drought strikes, you will likely lose your harvest and be unable to repay the loan. It's often really difficult to take that risk. Furthermore, banks can see rain-fed farms as a risky prospect, and so they can be reluctant to give out the loan in the first place."

While agricultural insurance is designed to reduce this risk, premiums are expensive and may be out of reach for many farmers.

"This is where index insurance comes in," Greatrex said. "If drought is the problem, then rather than directly insure farm damages, why not insure the drought instead? Index insurance works by allowing the customer



to purchase coverage based on an index that's closely linked to damages, in this case, low rainfall during a certain window of time.”

Index insurance now covers millions of farmers around the world, especially across Africa, the United States, India, and China, but it is still complicated to find appropriate indices that link weather and farm damages. Much of Greatrex's recent work has focused on this challenge, answering questions such as: Is drought the number of dry days in June? The total regional rainfall in July? Can a satellite rainfall product be used in places where there are few rain gauges? Does there need to be a single cut off or a sliding scale?

Greatrex works with insurance programs around the world to answer those types of questions, looking at the spatial statistics of rainfall information and linking them to actual damage or human impact.

“This might include core rainfall research on the best weather statistics to use, or social research on how insurance programs affect farming communities,” she said. “My research spans working directly with farmers across Africa on custom product design; with national meteorological agencies on satellite rainfall uncertainty; and with business leaders on how to model uncertainty.”

Another focus of Greatrex's research is index insurance programs' potential to exacerbate or alleviate social inequity.

“We often assume that because index insurance is portrayed as a tool to help the poorest farmers, then it must be automatically helpful for everyone in that community,” she said. “There are many insurance programs that have led to poverty reduction, but it's not always the case. For example, in several countries, women are less likely to buy

insurance products, not because they are more risk averse, but because they have less access, or the insurance doesn't cover relevant crops.”

Greatrex and colleagues are addressing those concerns by developing social equity frameworks for insurance companies and by conducting sociological research with women across Africa about the role of insurance in their farming practices.

Greatrex has found the most successful insurance programs are those that consider insurance within a larger context.

“For example, if a farmer needs insurance because she can't access seed, then programs bundling drought insurance with seed and credit work very well,” Greatrex said. “Other programs work well because they consider the needs of their customers. For example, the World Food Programme's R4 Rural Resilience Initiative has been able to scale by linking insurance within a holistic package of loans, credit, and savings, where the products are often tailored to the needs of the poorest farmers.”

Moving beyond index insurance, Greatrex's research focuses on the broader application of geographical, social, and statistical questions surrounding weather risk management.

For example, she is currently working with the humanitarian sector to understand how weather information can be used to more efficiently allocate disaster funding; and with the Red Cross on flash flood response protocols. She is also linking with other Penn State scientists, modelling how severe weather affects bees and pollinators; plus assessing how satellite rainfall can be used in the fight against infant hydrocephalus.



illuminating injustices that markets often hide

Emily Rosenman joined the Department of Geography in summer 2019 as an assistant professor of geography. She is an urban and economic geographer who explores the connections between finance, urbanization, and inequality.

“I am motivated to understand the relationships that produce both wealth and impoverishment, with particular attention to the uneven geographies of financial investments and racialization that characterize contemporary urban life,” she said.

Rosenman became interested in these subjects while working as a federal disaster management contractor, where she learned about the recovery process of New Orleans post-

Hurricane Katrina.

“I became interested in why the storm’s damage—and the city’s recovery—was so uneven,” she said.

Rosenman pursued that question at the University of British Columbia, studying with Penn State alumni Elvin Wylly ’88 and David Ley ’72g.

“At the University of British Columbia, I learned about the racialized injustices present in city and regional planning and also in the American mortgage and rental housing markets,” Rosenman said. “That led me to projects analyzing predatory mortgage lending in majority-Black American neighborhoods in cities hard hit by the financial crisis, like Detroit and Cleveland.” In all of those situations, I learned that the presence of inequality

and poverty in cities was something that must be constantly legitimated as a normal process of the market, whether by government officials, mortgage bankers, or nonprofit workers trying to address socioeconomic problems.

“Poverty is often framed as normal in a market-based society,” she said “While I agree that the presence of poverty is inevitable under capitalism, it is produced by market processes which also benefit from it.”

For this reason, Rosenman prefers the term “impoverishment,” because, she said, “it directs our attention to the social relationships of power and privilege that are actively producing and reproducing geographies of poverty.”

As a critical geographer, Rosenman

believes her role is to question inherited assumptions about how the economy works.

“As a political economist, I am centrally concerned with relationships of power and questions about who benefits— and who does not,” she said. “Those questions are also deeply geographical, as historical spatialities of investment and disinvestment produce urban space as desirable or not desirable for potential investors.”

The idea of what makes an investment desirable to investors has led Rosenman to her current research interest, social finance, a financial product that attempts to make profits for investors while also producing benefits for society.

“The development of this market is also an ideological claim about the role of finance in a just society,” she said. “The idea that there is no need to rid society of the economic processes that produce poverty—and that the wealthy can instead use investments to ‘fix’ social problems while continuing to profit—is very appealing to powerful actors in society.”

However, Rosenman said, it requires a huge industry of financial and policy

intermediaries to contain the contradictions inherent in making poverty profitable for investors and legitimizing for-profit interventions as a solution to impoverishment.

“In my research I have found that solving social problems with for-profit investments works for some things and not for others,” Rosenman said. “A lot of social problems are not readily profitable, so as governments, philanthropies, and the nonprofit sector move toward this idea that solving social problems requires a return on investment, many places and people can be left out. For example, in looking at what makes a social finance investment in affordable housing ‘successful,’ I found that tenant selection is very tied to normative ideas about who is deserving of a subsidized apartment versus who is not.”

But despite those kinds of problems, Rosenman does see a potential upside. “I think social finance marks a shift in how investors think about their connection to how they make money,” she said. “The idea that profits come from somewhere—and often from processes that damage people or nature—is an important step

in illuminating the injustices that financial processes often obscure.”

Coming up on Rosenman’s research agenda are the rise of green finance, which claims to preserve the environment by making investments in things like ecosystem services; and racial justice investing, in which investors try to solve the racial wealth gap in America by investing, for example, in Black entrepreneurship. The latter is often put forth as a market-based alternative to reparations.

“I am interested in what kinds of possibilities these movements hold for the demands of oppressed groups, and also in what kinds of possibilities they foreclose,” Rosenman said.

Rosenman is also following the aftermath of the 2008 mortgage crisis in the racialized geographies of housing sales and foreclosures in Cleveland among other financialization phenomena.

For all her projects she is seeking graduate students who are motivated by the social justice implications of research and also motivated “to help me deal with a massive and messy dataset of Cleveland housing data!”

Whither ice sheets in a warmer world?

Luke Trusel joined the Department of Geography in summer 2019 as an assistant professor. He is an Earth system geographer whose research focuses on understanding the impacts of climate variability and change on the Antarctic and Greenland ice sheets.

Trusel's interests in ice and climate galvanized when, as undergraduate student, he went on a research expedition to the Arctic archipelago of Svalbard to study glacial change and ice-ocean interactions. "It was a transformative experience for me," he said.

In the most basic sense, ice sheets melt when the atmosphere and oceans warm. Trusel said, however, many important questions remain about the relationship between ice and climate.

"The big uncertainty is how much ice melts and how quickly," Trusel said. "These are central motivating questions to my research and those of the cryospheric community. Earth's cryosphere involves a complex system of interactions and feedbacks among the ice, oceans, atmosphere, and people. By better understanding the processes surrounding ice melt and how the ice has already begun to respond, we can better prepare for a warmer world with less ice and higher seas."

What is happening in the polar regions has global implications, he said.

"Many perceive the poles as being remote, and indeed they are, but what happens there matters here, for us in Pennsylvania and for others across the globe," Trusel said. "From sea level rise, to amplifying climate change through feedbacks, to changing the atmospheric circulation that impacts our weather and climate, the polar regions and ice sheets matter to us and everyone else on this planet."

A common misconception is that ice sheet change is slow, occurring only over geologic time scales, Trusel said.

"But we know now that ice sheets have the ability to change on time scales that are relevant to us," he said. "These changes are underway, and they can be abrupt, in part due to nonlinear responses to climate change. And when ice sheets change, they don't do so in isolation, but rather with cascading consequences and the potential to disrupt global climate."

Trusel is investigating questions related to how quickly the ice sheets will respond to climate change over the coming decades.

"Because melting will accelerate in a warming climate, there are many areas of science working to address this big question," he said. "The one I work most closely with



A fractured edge of sea ice overlays Disko Bay, west Greenland, a region of rapid warming and ice loss. May, 2015. Photo by Luke Trusel.

is assessing changes to ice sheet surface mass balance, which is the balance between snow accumulation and ice melt. There are fundamental—and surprisingly simple—questions we still have, such as how much melt water is being produced on the ice sheets? Where is the water going? How does water impact ice dynamics and stability?”

Trusel is taking a holistic approach to answering those questions by combining different approaches for collecting data; satellite observations, ice cores, and climate models. By combining methods, he can harness the inherent strengths of each while overcoming their limitations.

“Satellite data provide an incredible means to observe and quantify ice sheet change today, but offer a limited temporal perspective as they provide at most around forty years of observations,” he said. “Ice cores, on the other hand, represent our best means to understand ice sheet change over long time periods, but cores provide a limited spatial perspective as they’re point observations on the ground. By combining these methods to better understand how the ice sheets have changed over recent centuries and how they are changing today, we can evaluate and build better models of how the ice sheets will respond to future climate.”

Trusel is currently involved in two projects, funded by the National Science Foundation and NASA, that use satellite remote

sensing to quantify current ice sheet melt in Antarctica.

“Harnessing these observations, as well as climate model sensitivity experiments, colleagues at the University of Colorado and the University of Maryland and I are working to better quantify linkages between ice sheet surface mass change, atmospheric circulation, and ocean surface change in Antarctica,” Trusel said.

Trusel said he is hoping in the next few years to collect additional ice cores from coastal West Antarctica to generate longer-term records of ice melt and the response of the cryosphere to climate variability. He’s looking for students “with innate curiosity, motivation, and interest in applying themselves to solve big-picture problems related to ice and climate.”

“Scientifically, and as a citizen of this planet, I am most concerned about the potential for tipping points and abrupt change to the ice sheets and climate system,” Trusel said. “We know that the ice sheets are dynamic and have the ability to change rapidly. And in recent decades, we’ve observed rapid change including ice shelf collapse, glacier acceleration, thinning, and retreat, and accelerating ice mass loss in Antarctica in Greenland. These places more sensitive to warming today than fifty years ago, and they will be more sensitive fifty years from now than they are today.”

Manzhu Yu joined the Department of Geography in summer 2019 as an assistant professor of geography. Her research focuses on spatiotemporal theories and applications, atmospheric modeling, environmental analytics, and big data and cloud computing to solve pressing issues in natural hazards and sustainability.

Yu's interest in natural hazards came from growing up in Northeast China.

"We experienced dust storms that turned the sky orange and dropped visibility drastically," Yu said. "I've always been curious about why these dust storms happen, how they transport in the atmosphere, and where they deposit to the Earth surface."

Yu said her curiosity about dust storms later expanded into a broader interest in

Leveraging spatiotemporal data to manage natural hazards

all kinds of extreme weather events and natural hazards, and how to use big data to understand them.

"The emergence of big data started to influence my generation of scholars around 2010," she said. "Big data technologies pose great opportunities to enhance the analysis and prediction of natural hazards, especially in the efficiency and timeliness aspects."

Yu started to integrate big data technologies into her research to address computational and data handling challenges during natural disaster management.

"For the computational challenge, I used high-performance computing to conduct large-scale simulations of environmental hazards for improved compu-

tational efficiency,"

Yu said. "For the data handling challenge, I adopted a deep learning model that classified different Twitter topics that emerged during hurricanes Sandy, Harvey, and Irma."

By analyzing these topics, Yu is developing a model to identify especially vulnerable populations requiring relief.

The core methodology of Yu's research is spatiotemporal data mining, modeling, analysis, and visualization.

"Extreme weather events are intrinsically spatiotemporal and highly dynamic, so to better understand the complex patterns of these events, spatiotemporal methodologies are essential," Yu said.

Yu said she is most interested in working



otemporal big data atural hazards

with data sources like in situ observations, meteorological observations, numerical simulations, volunteered geographic information, social media data and especially the Internet of Things (IoT).

“IoT sensors can monitor environmental status, such as temperature, humidity, and wind speed, to predict the occurrence of a disaster and the potential impacted areas,” she said. “However, the IoT data is usually incomplete and unstable, so one of my research activities in the near future will be addressing those issues to leverage the capabilities of IoT data to enhance disaster relief efforts.”

Other challenges

Yu sees are intelligent processing and knowledge integration of massive datasets acquired from greater observation capabilities. She asks, “How can one extract the most valuable and related information, i.e. intelligent processing. And how can one integrate the extracted information and translate to knowledge from multiple sources covering different spatial and temporal durations, i.e. knowledge integration?”

Yu is seeking graduate students who share her curiosity about extreme weather events, their spatiotemporal patterns and contributing physical and social factors; and their associated mitigation,

response, and early warning activities.

“Due to climate change, we are experiencing more frequent natural hazards with higher intensity,” Yu said. “Patterns demonstrate that the characteristics of natural hazards are changing. For example, hurricanes are moving more slowly after landfall, dumping more rain on the affected areas and creating more severe floods. Dust events are transporting in abnormal pathways, affecting areas that have never experienced dust storms. Extreme weather events are breaking records at a faster pace, making it harder to use historical statistics to explain and predict future events. Therefore, mitigating the negative impacts of these natural hazards is becoming more challenging.”

A powerful dust storm, known as a haboob, blankets a farm near Ritzville, WA. Image: USDA photo courtesy of Susan DeWald. Used with permission.



Past, present, future for online geospatial education

By Adrienne Goldsberry

Here is something to think about: some of Penn State's current Department of Geography students weren't even born when Online Geospatial Education at Penn State offered its first class. While online classes are now considered normal, for the educators who launched these distance education courses in the late 1990s, it was a novel and risky venture.

If you follow the Online Geospatial Education at Penn State on one of its various social media platforms, you may have noticed that it is recognizing 20 years of offering outstanding online classes in geographic information sciences (GIS), remote sensing and geospatial intelligence. In the next few months, it will be highlighting this legacy, but more importantly, focusing on what it is doing to evolve with the ever-changing field of geospatial science and technology.

"In recent years we've seen a dramatic shift as desktop GIS moved to the web, as new forms of remote sensing and image analysis became common and as the software development world has collided with the mapping industry," said Anthony Robinson, director of Online Geospatial Education programs. "We're talking more today about spatial data science, rather than GIS per se. We're mapping more with open data using open source tools, and professionals are expected to be comfortable with a very wide range of data types and spatial analysis methods."

The idea for an online course in GIS came from Department of Geography faculty members Roger

Downs and David DiBiase who recognized that GIS practitioners could benefit from an online program through the then newly formed Penn State World Campus.

Roger Downs recalled when the Alfred P. Sloan Foundation was providing funding for universities to experiment with online courses.

"As the head of the department, I decided to take a loan to build the program. We were taking a huge risk and I was prepared for it not to work, but it did," he said.

Downs said he focused on the administrative and funding side of the program while DiBiase handled the curriculum.

"DiBiase's position as director of the Deasy GeoGraphics Laboratory, predecessor to the Peter R. Gould Center, gave him the expertise to develop GIS courses," Downs said, "And he insisted that the courses be instructor-led with a real person available. That was a key to our success."

DiBiase became the founding director of the John A. Dutton e-Education Institute in the College of Earth and Mineral Sciences. In 2011, he took a position at Esri but he still teaches online courses with the program and serves on the advisory board.

Penn State Online Geospatial Education offered its first class, Geography 482 (at the time called The Nature of Geographic Information), in January 1999. Fifty-one students enrolled in what became the first in a four-course certificate program in GIS.

Since that beginning, the program has evolved to comprise five certificates, a master's degree in GIS (MGIS), and a Geospatial Intelligence Analytics option



Online geospatial education program students and faculty gather for a reception prior to summer 2019 commencement.

within the Master of Professional Studies in Homeland Security. More than 4,000 students have completed a certificate or degree from the Online Geospatial Education program. The program has also earned Esri's Special Achievement in GIS Award (2004) and the Sloan-C (now Online Learning) Consortium's award for Most Outstanding Online Program (2009).

Recent developments include:

- Two new graduate certificates were added: Remote Sensing and Earth Observation in 2017, and Geospatial Programming and Web Map Development in 2018, which respond to student demand for education in these increasingly important sectors of the geospatial industry.
- Students enrolled in the MGIS program and most certificate programs are now eligible to receive federal financial aid.
- Accelerated admissions into the MGIS program: students who have performed well in their first three classes of a certificate program can apply directly to the MGIS program on a rolling basis.

• Offering more than 30 classes, spanning a wide range of spatial data science topics and serving both aspiring geospatial professionals as well as those who are well established and looking to gain new skills.

"The professional landscape has changed a great deal since our programs began 20 years ago, and we've never stopped working to anticipate that change by offering new courses, launching new credentials, and continually improving the instructional design of our classes," Robinson said. "In addition, we have a strong focus on providing a robust student-centered experience. Every person coming to us has a different story, different experiences, and different needs. Our team works very hard to treat every student accordingly and to make sure that their online experience translates into something very personal. In other words, we try to take the 'distance' out of distance learning in every way you might imagine."

To learn more, please visit www.pennstategis.com.

UPDATES from p. 4

Phil Dennison '97 was appointed chair of the Department of Geography at the University of Utah.

Kirk Goldsberry '99 published a new book, *SprawlBall: A Visual Tour of the New Era of the NBA*, about the evolution of basketball and the analytics driving it.

Stephanie Campbell-Flohr '02 accepted a new position as research project manager with the Center for Health Care and Policy Research at Penn State.

Corene Matyas '05g was named Undergraduate Teacher of the Year for the College of Liberal Arts and Sciences at the University of Florida.

Trieste Lockwood '08 was profiled in *Style Weekly*, an alternative weekly newspaper published in Richmond, Virginia.

Katherine Meckler '14, a captain in the United States Air Force, received the 2019 Lt. Michael P. Murphy Award in Geospatial Intelligence.

Chelsea (Gilliam) Nestel '13 was interviewed for a CNN feature article, "The future of maps: Cartography in the 21st century."

Siddharth Pandey '14, CSMC-CEP, was promoted to associate at Dewberry. Pandey had been an assistant production manager in the company's geospatial group. He is currently pursuing a master's degree in professional studies in geographic information systems at the University of Maryland, College Park.

Rachel Passmore '14 graduated from Columbia University with a master of public health (MPH) degree. She is the project director at the Albert Einstein College of Medicine on a two-year National Institutes of Health-funded study on developmental disabilities in the Bronx.

Jase Bernhardt '16g was awarded the 2018 American Association of State Climatologists' Dissertation Medal in Applied Climatology, for his article "A comparison of daily temperature-averaging methods: Spatial variability and recent change for the CONUS," which was published in February 2018 issue of the *Journal of Climate*.

Whitney Broussard '17g MGIS had his capstone project highlighted in the article, "Marshland survey uses aerial imagery and mapping technology," which was published in the September 2018 issue of the *Point of Beginnings* magazine.

Students

Megan Baumann was awarded a DDRI Award, titled "Doctoral Dissertation Research: Social-Environmental Feedbacks Between the Use and Governance of Water and Soil in Dryland Irrigation Megaprojects" from the National Science Foundation's Geography and Spatial Sciences Program.

Kelsey Brain, Eden Kinkaid, and Nari Senanayake had the article "The podcast-as-method?: Critical reflections on using podcasts to produce geographic knowledge" published in the April 2019 *Geographical Review Special Issue: Fieldwork in Geography*.

Sara Cavallo won the 2019 Supporting Women in Geography Nancy Brown Geography Community Service Award.

Emily Domanico won an American Association of Geographers Cartography Specialty Group Master's Thesis Research Grant for her proposal "Characterizing Map Use in Public Transit Control Centers: a qualitative study of dynamic map interfaces."

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Zachary Goldberg reviewed the book, *The One-Straw Revolution: An Introduction to Natural Farming*, in the *Graduate Journal of Food Studies*.

Joseph Grosso received Earth and Mineral Sciences Academy for Global Experience (EMSAGE) Laureate status.

The new Supporting Women in Geography (SWIG) officers elected for 2019–20 are: **Bradley Hinger**, **Elise Quinn**, **Izzy Taylor**, and **Jacklyn Weier**.

Weiming Hu's entry was chosen as the third-place winner of the Physical Sciences & Mathematics category in the 34th annual Penn State Graduate Exhibition.

Courtney Jackson was selected as an Alfred P. Sloan Foundation Sloan Minority Ph.D. Program scholar.

Curran McBride was selected one of the 2019 Esri Development Center Students of the Year.

Andrew Patterson received the College of Earth and Mineral Sciences' Ellen Steidle Achievement Award.

Jamie Peeler received a National Geographic Support for Women and Dependent Care award to attend the 2019 International Association for Landscape Ecology World Congress in Milan, Italy.

Hannah Perrelli co-authored the poster "Biomimetic Materials for Regenerative Bone Tissue Engineering," which won the Outstanding Research Potential Award in the 2018 EMS Undergraduate Poster Exhibition.

Michelle Ritchie received the George H. K. Schenck Teaching Assistant Award.

Michelle Ritchie was awarded a Global Safety Office's Wilderness

First Aid Training Grant for her travel to Iceland.

Marie Louise Ryan was awarded a Society of Woman Geographers Evelyn L. Pruitt National Fellowship for Dissertation Research.

Saumya Vaishnava received an American Association of Geographers (AAG) Energy and Environment Specialty Group (EESG) Dissertation Data & Field Work Award.

Faculty and Staff

Faculty in the Department of Geography received three post-doctoral positions from the Dean's Fund for Postdoc-Facilitated Innovation:

- **Jenn Baka** with Zhen Lei and Sekhar Bhattacharyya: "Understanding the Opioid Epidemic in the Appalachian Coal Region"
- **Alan Taylor** with Susan Brantley: "Data-Driven Models to Assess Spatio-temporal Variability of Surface Water Quality in Coupled Human and Natural Systems at the Continental Scale"
- **Denice Wardrop** with Raymond Najjar and Michael Hickner: "Fate and Transport of Microplastics in Chesapeake Bay to Inform a Standard of Degradability"

The **Department of Geography Green Team** has been certified by the Sustainability Institute as a "Level Three Certified Green Paws Office." Melissa Weaver is the team leader.

The **Department of Geography** has been recognized for meeting the Integrated Safety Plan Phase

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UPDATES from p. 21

I requirements by Penn State's Department of Environmental Health and Safety.

Qassim Abdullah received the American Society for Photogrammetry and Remote Sensing Lifetime Achievement Award.

Andrew Carleton was elected to serve on the University Graduate Council for a two-year term.

Andrew Carleton was appointed as a science team member of the National Geographic's Perpetual Planet Extreme Expedition: Everest 2019 project.

Guido Cervone was promoted to professor.

Guido Cervone received the 2019 University Consortium for Geographic Information Science Carolyn Merry Mentoring Award.

Sarah Chamberlain was promoted to associate research professor.

Karen Cox was the April Rock in Role Award winner, selected by the College of Earth and Mineral Sciences' Staff Advisory Committee (SAC).

James Detwiler was promoted to associate teaching professor.

Lorraine Dowler was promoted to professor.

Lorraine Dowler was awarded the John T. Ryan Jr. Faculty Fellowship from the College of Earth and Mineral Sciences.

Lorraine Dowler was awarded the 2019 Susan Hardwick Excellence in Mentoring Award from the American Association of Geographers.

Chris Fowler's fall 2018 GEOG 421: Population Geography class took first place in the Higher Ed division in the "Draw the Lines PA" contest statewide finals.

Joshua Inwood was interviewed on *The Debate* program on the

France 24 English news channel about white supremacy in the wake of the attack in Christchurch, New Zealand.

Fritz Kessler and Sarah Battersby published a new book, *Working with Map Projections: A Guide to their Selection*, (CRC Press).

Fritz Kessler served as president of The North American Cartographic Information Society (NACIS) 2018–19.

Brian King was promoted to professor.

Brian King was elected to serve as the Chair of the College of EMS Faculty Advisory Committee for a three-year term.

Alexander Klippel received the 2019 E. Willard and Ruby S. Miller Faculty Fellowship from the College of Earth and Mineral Sciences.

Alexander Klippel, Jiayan Zhao, Danielle Oprean, and Jack Chang were awarded best paper at the 2019 IEEE VR Fourth Workshop on K-12+ Embodied Learning through Virtual & Augmented Reality (KELVAR).

Alan MacEachren was named a 2019 recipient of the Penn State Graduate Faculty Teaching Award.

Anthony Robinson was promoted to associate professor.

Karen Schuckman was promoted to associate teaching professor.

Erica Smithwick received the College of Earth and Mineral Sciences' Wilson Award for Excellence in Research.

Erica Smithwick received a National Science Foundation Research Traineeship award for her project, "Landscape-U, Impactful Partnerships among Graduate Students and Managers for Regenerative Landscape Design" to support preparation of future leaders in the STEM workforce.



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