News from

EMPOWER

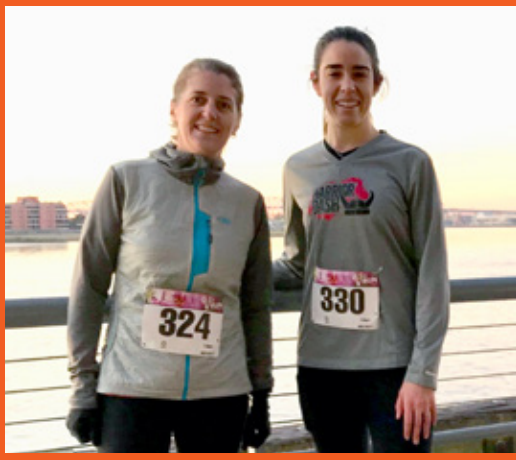
WINTER 2018

EMPOWER:

Transformative Experiences in the Classroom and the Field

From the Director

This September, I headed to the annual meeting of the National Science Foundation Research Traineeship (NRT) program in Washington, DC, to share progress on EMPOWER with NSF program managers from across the agency, as well as other NRT programs across the country. Back in 2015, EMPOWER was one of the first 8 NRT programs to be funded by NSF. Today, there are more than 50 such programs across the country, aimed at preparing STEM graduate students for careers within and beyond academia. The annual meeting included over 200 faculty, NRT trainees, program managers, and evaluators sharing best practices.



EMPOWER Director Laura Lautz and trainee Amanda Campbell.

At the meeting, I shared an overview of EMPOWER, as well as evidence of the program's effectiveness for career preparation across multiple sectors, including industry, consulting, and government. Joining me at the meeting were Chris Scholz, EMPOWER Co-PI, Amanda Campbell, EMPOWER trainee and PhD student in Earth Sciences, as well as Annie Pennella, EMPOWER program manager. Chris Scholz gave a lightening talk on the inaugural offering of our international field course in Rwanda, which you can read about elsewhere in the newsletter. Amanda Campbell gave a lightening talk on using multimedia storytelling to communicate science to broad audiences - a skill taught in a Newhouse science communication course designed for EMPOWER trainees and taught by New York Times science writer, Erica Goode. Amanda also presented a poster on methane in domestic water wells in the Marcellus Shale region of New York, an example of ongoing research at the nexus of water and energy. At the same poster session, Annie Pennella presented a poster on our program design, highlighting some of our recent graduates as program success stories.

During the annual meeting, it was apparent that our program is leading the way in developing a model of best practices in STEM graduate education. Our success is built on the dedication of our faculty, who are committed to outstanding educational experiences such as the Rwanda field class; the enthusiasm of our staff, who make sure we offer outstanding professional development experiences; and most importantly - the strength of our student cohorts, who have taken advantage of every opportunity and shown us how a program like EMPOWER can best support their career aspirations. As we approach the final year of our NRT award, we are considering how to institutionalize the lessons we have learned - stay tuned!

—LAURA LAUTZ, *Director, EMPOWER*

ON THE COVER: Syracuse University EMPOWER team with Rwandan colleagues stop to pose for a picture while on the road to Lake Kivu.

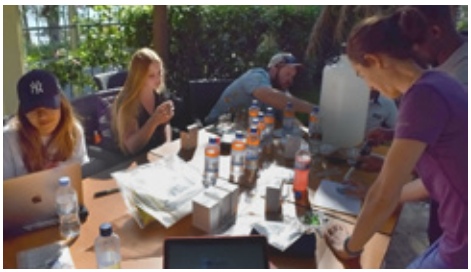
EMPOWER Trainees Travel to Rwanda for Water-Energy Research

From June 1-16, eleven students and four faculty from the EMPOWER program joined 12 students from the University of Rwanda for a field course at Lake Kivu in Rwanda.

Lake Kivu is one of the African Great Lakes, along the western border of Rwanda near the Democratic Republic of the Congo. It is one of the deepest lakes in the world, and strongly influenced by volcanic activity.

The EMPOWER team stopped first in the city of Kigali, then Kibuye and Gisenyi on Lake Kivu. Students learned a variety of field methods to study lakes, their sediments, the water column and surrounding geology. Small groups of SU and Rwandan students designed their own field -based projects to research the lake and its environment. The class culminated in student presentations of research results.

The EMPOWER and Rwandan students also visited the Kivuwatt energy platform; received a lecture on the impacts of the energy generating facility on local culture and the economy by Kristin Doughty, a professor at the University of Rochester; visited the markets in Kigali, Kibuye and Gisenyi; hiked to the top of a 12,000-foot-elevation volcano at Volcano National Park; and visited the Rwandan Genocide museum.



Exploring Scientific Career Paths in the Not-for-Profit Sector

Career paths for STEM graduate degree holders are increasingly diverse. One career option is working as a scientist at a non-governmental, or not-for-profit, organization (NGO). EMPOWER students have interned with NGOs doing research at the water-energy nexus, including national organizations, such as The Nature Conservancy, and local organizations, such as the Upstate Freshwater Institute. To learn more about career paths at NGOs, EMPOWER students and faculty visited Cornell University to attend the first in a series of workshops held at The Atkinson Center for a Sustainable Future this fall. "Science at an NGO" was presented in collaboration with the Center's long-standing partner,

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Faculty Spotlight

CHRIS SCHOLZ

Professor of Earth Sciences, College of Arts and Sciences & EMPOWER Leadership Faculty member

The world's large rift valley lakes are outstanding laboratories for understanding the interaction of tectonic, climatic, and depositional processes, and are particularly useful for developing models for hydrocarbon exploration in ancient rift systems. EMPOWER co-Investigator Chris Scholz studies the evolution of sedimentary basins, and especially lake basins that form in continental rift basins. Some of the classic examples of these tectonically-controlled lake basins are located in the East African Rift, a zone of continental extension. Ongoing research in this area has led Scholz's research group to other lines of scientific inquiry, including:

- recovering records of climate variability within Africa over geological time frames;
- studying processes of continental rifting;
- studying the impacts of tropical climate variability on early human ancestors.

Professor Scholz routinely collaborates with industry partners which closely fits EMPOWER's mission of preparing student trainees for work beyond academia. Scholz notes, "Most of the world's geologists are employed by companies or organizations involved in the extraction industries. Think about it—everything in our society that is manufactured, that was not grown, came out of the ground and was initially located by a geologist. Academic-Industry partnerships provide our students with exposure to professional practices outside of the world of academic research."

Chris Scholz is a Professor in the Department of Earth Sciences and was a Distinguished Lecturer for the American Association of Petroleum Geologists in 2018. Last year, he received the Chancellor's Citation for Faculty Excellence and Distinction and he currently serves as Principal Investigator for two active research awards from the National Science Foundation.

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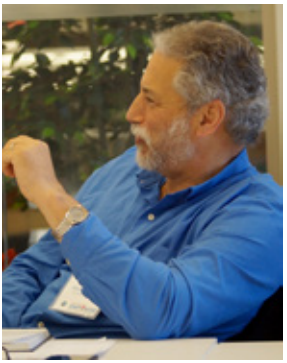
the Environmental Defense Fund (EDF). EDF is a science advocacy organization known for its work on global climate change, ecosystem restoration, and human health. The distinguished panel featured EDF Chief Scientist and EMPOWER External Advisor Steve Hamburg, along with Jennifer McPartland, Ritesh Gautam and Doria Gordon. SU Professor and EMPOWER faculty member Charles Driscoll introduced Dr. Hamburg. Each panelist discussed their career trajectories, what they are currently working on at EDF and the real-world impact of their research. The event was part of a series of career panels held by EMPOWER, including a prior career panel on the environmental consulting industry.

Q&A

Q&A with External Advisor Dr. Steve Hamburg



Steven Hamburg engages with students during the external advisors meeting.

EMPOWER is supported by an External Advisory Committee (EAC), which is comprised of professionals in non-academic careers, including energy, advocacy, government, research, environmental consulting and STEM education. The EAC provides guidance for programming to ensure high-level performance of EMPOWER graduates in the workplace.

Steven Hamburg is the Chief Scientist for the Environmental Protection Fund. He plays a leading role in EDF's research efforts, including work on quantifying methane emissions from the natural gas supply chain and the use of emerging sensor technologies to improve our understanding of air pollution and related impacts on human health. Prior to joining EDF he spent 25 years on the faculties of Brown University (Director of the Global Environment Program of the Watson Institute) and the University of Kansas (Environmental Ombudsman - Sustainability officer: Director Environmental Studies Program).

Q: Why did you decided to take a position with an NGO vs. another sector or remain in academia?

A: I had taught environmental science for over 20 years and wanted to put into practice what I had taught. I thought it was important to practice what I preach. I had a great opportunity to put my science to direct use solving real world problems from within an organization that values the importance of advocating for science-based policies.

Q: What might readers not know about your background? Anything unexpected?

A: Throughout my life I have tried to have a positive impact on the environment - my shift from academia to NGO meant my avocation became my vocation. I have been building an off-grid house in New Hampshire forest for 30+ years. I know, I am slow.

Q: What appealed to you about participating as an advisor for an NRT program like EMPOWER?

A: Helping the next generation see the opportunities offered by bringing strong science to non-academic jobs. We need more good scientists serving as advocates for science across civil society if we have any hope of effectively addressing the environmental and social problems we face.

Q: What do you hope to see as outcomes for the EMPOWER program?

A: That students will see the opportunities for careers that have positive impacts on society.

Q: As a PhD scientist yourself, what advice would you give our EMPOWER trainees?

A: Be willing to risk criticism for thinking outside of the box. Society needs innovative science based solutions and doing things the same old way will not get us to a future we want our grandchildren to live in.

Q: What do you do for fun?

A: Work on my house in the woods and observe the changing forest around it.

Student Spotlight

RILEY SESSANNA

M.S. Student, Earth Sciences

EMPOWER has provided me the opportunity to learn about Unoccupied Aerial Vehicles (UAVs), more commonly referred to as drones. My interest in drones first arose while working with Dr. Christa Kelleher, who pitched me the idea of using drones to study algae on a local creek in Syracuse, NY. Drones provide a new mechanism for obtaining data at a higher spatial and temporal resolution than previously available via planes or satellites. My research in the Earth Sciences Department has allowed me to be at the forefront of this revolutionary technology, and to develop knowledge and connections in the UAV world.

Before I began collecting drone imagery at my research site, I studied the rules and regulations associated with flying drones for the non-hobbyist. I was awarded an EMPOWER Seed Grant, which allowed me to enroll in a two-week, hands-on training course offered by SkyOp, LLC which taught me the do's and dont's of flying, and gave me the initial experience I needed to get behind the controls of a large research drone. With this knowledge, I was able to pass my FAA Part 107 Certification, which means that I am legally able to fly drones for my research and other commercial endeavors.

With my new pilot's license in hand, I became proficient at executing drone missions from the beginning stages of creating a flight plan, through flying the drone and collecting imagery, to post processing imagery to extract data. Through EMPOWER, I was also encouraged to build connections with local organizations, such as the Skaneateles Lake Association (SLA). I am currently completing my EMPOWER Career Pathways Experience through an internship with SLA. I am helping this non-profit community organization use aerial imagery for watershed remediation projects, as well as ongoing projects to control unwanted aquatic vegetation.

In addition to my growth as a researcher and the ability to pursue my interests, EMPOWER has built the foundation for professional and personal relationships which have helped me in graduate school and will undoubtedly accompany me into my future career.

Student Spotlight

CAITLIN EGER

Ph.D. Student, Civil and Environmental Engineering

One of the benefits of the EMPOWER program is learning alongside members of our EMPOWER community. This year, I've focused on several research collaborations with EMPOWER trainees, faculty and staff. Connor Olson and I started a pop-science bookclub this fall. Our first book was Judea Pearl's "The Book of Why: The New Science of Cause and Effect" (2018), which is about causal modelling. Causal modelling is used by economists, public health specialists and social scientists to ask counterfactual questions about observational data, and monitor the outcomes of intervention on unobserved variables. This summer, Connor and I began to read, discuss and try to apply the methods we learned. I've supplemented our activities by reading parts of Pearl's textbook "Causality" and by doing online coding tutorials. Fellow trainee Mandy Klaben has joined with us to work on applying these methods to a harmful algal bloom dataset.

Another recent collaboration is with trainee Laura Markley. We just submitted a "big idea" to the NSF 2026 IDEA MACHINE in which we suggest directing funding toward the problem of reducing plastic waste. STEM fields advance society, but also generate tremendous amounts of waste, especially single-use plastics from medicine, electronic waste, chemical byproducts, and even space trash! Changing our "throw away" culture and cleaning up our littered environment are challenges worthy of NSF attention.

Finally, trainee Lucie Worthen and I outlined a paper about a new method to use soil moisture to predict evapotranspiration from the OnCenter green roof in downtown Syracuse. The method was originally inspired by a paper written by EMPOWER PI, Laura Lautz! If our method works, we will use it on some other Syracuse green infrastructure sites. Supported by an EMPOWER Seed Grant, I plan to attend the American Geophysical Union conference in Washington, DC in December 2018. There, I will present a poster about tools I've developed for green infrastructure performance monitoring.

The contacts and opportunities for collaboration with other trainees and faculty within EMPOWER have enhanced my graduate experience and better prepared me for working in interdisciplinary teams.

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Donald Siegel, Hydrogeology

Civil and Environmental Engineering
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Chris Johnson, Environmental Chemistry
Teng Zeng, Environmental Engineering

Chemistry
Tara Kahan, Environmental & Atmospheric Chemistry

Maxwell School of Citizenship and Public Affairs
Peter Wilcoxen, Energy Economics

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Visit ***empower.syr.edu*** for our calendar of events, full news stories, and the latest program information.

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