Notes from the Field

The biannual newsletter of the Intercollege Degree Program in Ecology

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Letter From the Editor

Spring symbolizes new beginnings. We are steeped in signs of renewal as the eastern redbuds burst above our heads and wild ginger unfurls flowers at our feet. The wood frog thaws, the red-winged blackbird returns. Ecologists, too, emerge to examine these phenological phenomena—to capture the timings of when sleep ends and growth begins. Those whose studies are not tied to the seasons still find delight in the stirrings of spring, from the first hike warm enough to shed winter coats, to the first strawberries at the farmer's market.

Alongside these ecological changes arose cultural practices to explain or celebrate them. Ancient rituals entwined the resurrection of land and spirit, with hope for fertile fields interwoven with hope for peace and prosperity. Some rituals remain, with vibrant festivals like Holi welcoming new life in a bath of colors. A common thread tethers these practices: Spring's abundance is an invitation to *all*. Folks across ages and faiths embrace the Hindu festival of colors. Hellenic spring festivals inverted social structures to allow the entire household, even marginalized members, to join. For millennia, cultures worldwide have welcomed the bounty of spring as a sign to sing, to show gratitude, and—critically—to share nature's wealth.

Yet in the Spring of 2025, we struggle to find joy in the changes around us. Slashes at the National Institutes of Health challenge disease ecology and One Health initiatives. Massive overhauls of federal climate mitigation and adaptation measures undo policies that our research helped to inform. Cuts to the U.S. Forest Service and National Parks Service threaten our colleagues, our alumni, our field sites, and our mission to make ecosystems resilient and accessible. Roll backs of diversity, equity, and inclusion programs compound existing barriers that confront us not only as scientists, but more fundamentally, as a community of diverse people. We are left with questions about the future of federally funded research, policy, and career paths that we struggle to answer.

In times of uncertainty, we must turn to what is certain —that our core values cannot and will not be compromised. As an interdisciplinary program, the Ecology IDGP is poised to foster a diverse and inclusive environment for all of its members and collaborators. In 2021, we came together to state that we value and respect the diverse identities, experiences and life challenges of all community members and support the expression of these diverse perspectives; value the rights of every person to dignity, kindness and mutual respect; and value self-reflection by individuals and as a community to regularly reassess our community culture and pursue positive change.

This newsletter is a reminder of those values through a theme celebrating ecology across borders. We welcome the new faculty who are growing our community; share work from students who enrich our program with global experiences; and highlight reflections on international collaborations that make us and our science better.

Spring symbolizes new beginnings, and in 2025 we might ask, the beginning of *what*? Though we have no clear reply, we begin by using this inflection point as an opportunity to reconnect to our values and support systems, to relinquish the structures which are not serving us, and to reinvent new ones together. And when the work overwhelms us, we can honor the long and living traditions of spring, to seek solace in the flower buds and frogs, to share the first fruits with new folks and old friends.

Marissa Kopp | Spring 2025 Editor

Meet Our New Faculty

The Ecology Program is growing! Join us in welcoming five faculty to our community

LYNNE BEATY

Biology Department (Behrend/Erie)

I'm a behavioral ecologist especially interested in the effects of stressors (natural and anthropogenic) on freshwater organisms and herpetofauna. I also do some quantitative work at the population level that focuses on invasive species. Outside of work, I enjoy traditional outdoorsy things (hiking, kayaking, etc.), hanging with my dog, and fishing.

What interested you in joining the program?

I am the primary ecologist on my campus, which can sometimes get lonely. So, I joined the Ecology Faculty at UP to be a part of a larger, ecology-focused community and be involved in graduate mentoring. Behrend also has an 800+ acre campus with a bunch of natural areas that I would love to see used more for research, so I was hoping that people from Ecology may want to come to Erie sometime.

Learn more about Lynne's work at her Penn State profile or Research Gate profile.

MOLLY BLETZ

Ecosystem Science & Management

Dr. Molly Bletz is a disease ecologist and conservation biologist whose research lies at the intersection of disease ecology, microbial ecology and amphibian conservation. Her work has taken her across the globe—from the forests in Panama and Madagascar to the ponds and wetlands in the US and Germany—investigating how host-associated microbiomes influence disease susceptibility and resilience, and how we can harness beneficial microbes to protect wildlife. Molly's research is driven by a passion for the conservation of herpetofauna (amphibians and reptiles) and understanding the intricacies of the microbial world around us. Molly joined Penn State in 2024 and her lab is growing rapidly with five graduate students and five undergraduates. Together, they are exploring mechanisms of microbiome mediated immunity, temperature sensitive disease dynamics and more.

What interested you in joining the program?

Ecology fascinates me and is central to the research we do. I see the Ecology program as an opportunity to connect, learn, grow and share knowledge for both me and my research team.

Learn more about Molly's work in The Bletz Lab.

SUZANNE FLEISHMAN
Plant Science

In January 2024 Suzanne joined the Penn State Plant Science department as an Assistant Professor of Root Biology. The “Root Agroecology Lab” integrates ecology, plant physiology, and omics to clarify the role of roots in perennial agroecosystems. Suzanne studied environmental science at UNC and worked as a program coordinator at a non-profit in North Carolina prior to attending Penn State for a MS Horticulture (2018) and PhD Ecology (2022). In 2023 she was a postdoc with the USDA Genomics and Bioinformatics Unit. When she’s not hanging out with plants, she’s trail running, baking, or crocheting.

What interested you in joining the program?

As a graduate of the Penn State Ecology program, I had no question that I would join! Completing my PhD here was an incredibly fulfilling experience that deeply influenced my research trajectory. The program's interdisciplinary approach and support for student training is a great fit for my lab group. I'm excited to contribute to the same program that shaped my academic and professional journey.

Learn more about Suzanne’s work in the Root Agroecology Lab.

ISABELLE HOLLAND-LULEWICZ
Anthropology

Dr. Holland-Lulewicz is the director for the Socio-ecological Histories of Estuarine Landscapes (SHEL) Lab. Her primary research program focuses on human-environment dynamics and paleoenvironmental conditions in the Southeastern US and eastern Mongolia by way of zooarchaeological analyses of vertebrate and invertebrates, stable isotopes analyses of marine shell, chronological modelling of anthropogenic exploitations of estuarine and riverine environments, and investigations into anthropogenic modifications of landscapes. Current projects include investigating (1) Indigenous North American complex socio-ecological systems, (2) Mongolian Xiongnu complex socio-ecological systems, (3) the manifestation of global cooling and warming events on local landscapes, (4) resource management practices of fisheries, (5) and anthropogenic landscape modification as related to sedentism and urbanization and the associated impacts on ecological systems. This work includes both field and laboratory project across eastern North America, primarily in Georgia and Florida, and eastern Mongolia.

What interested you in joining the program?

Dr. Holland-Lulewicz is committed to the interdisciplinary investigation of the long-term trajectories of human-environment interactions and the use of such data to help inform modern conservation efforts effectively, serving as her primary interest for joining the Program.

DEAH LIEURANCE
Ecosystem Science & Management

My research and extension activities focus on enhancing invasive species prevention and management through horizon scanning, risk assessment, and pathway analysis. I am developing a research program to investigate how rising temperatures and elevated CO_2 levels influence the ecophysiology and chemical ecology of invasive plants—and how these changes may shape plant-herbivore interactions in forest ecosystems. Additionally, I am establishing the **Penn State University Invasive Species Risk Analysis Program (PISRAP)**—a cooperative extension program dedicated to categorizing non-native species in support of the Pennsylvania Governor's Invasive Species Council (PISC).

What interested you in joining the program?

I was interested in joining because of the interdisciplinary nature of the program, collaborative research opportunities, and the opportunity to mentor and work alongside motivated graduate students and postdocs and while advancing my research in invasion ecology.

Learn more about Deah's work in The Lieurance Invasion Ecology Lab.

Faculty Achievements

Join us in congratulating Ecology faculty for their outstanding accomplishments

CHRISTINA GROZINGER
Entomology

Dr. Christina Grozinger, Publius Vergilius Maro Professor of Entomology and director of the Center for Pollinator Research, **became the new director of the Huck Institutes of Life Sciences** at Penn State. In this role, she plans to forward Huck's mission to foster and promote collaborative research.

MARGARITA LÓPEZ-URIBE
Entomology

Dr. Margarita López-Uribe, Lorenzo L. Langstroth Early Career Professor and associate professor of entomology, **won a Presidential Early Career Award for Scientists and Engineers** (PECASE) for her extensive research and outreach conserving and restoring bee populations. The PECASE award is the highest honor the United States government bestows on early-career scientists and engineers.

MEGAN SCHALL
Biology (Hazleton)

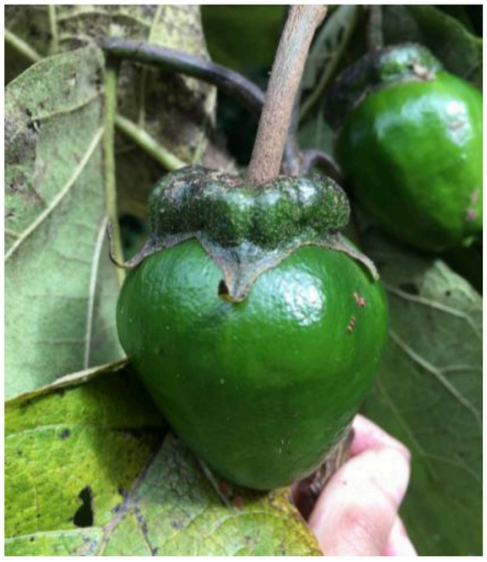
Dr. Megan Schall, associate professor of biology, received a **2025 George W. Atherton Award for Excellence in Teaching.** Schall was recognized for her undergraduate teaching leadership, where she creates learning opportunities for students to apply biology to solve real-world scientific problems.

KARL ZIMMERER
Geography

Dr. Karl Zimmerer was **named Distinguished Professors in 2025**. This academic title is bestowed upon a limited number of professors to recognize their contributions to the University. For Zimmerer, this includes leadership in fields spanning socio-environmental systems and agrobiodiversity.

Where in the world are our ecologists?

Ecology graduate students are creating research and outreach impacts across the globe



Brazil & Peru

JOÃO MESSEDER

In the photos, you can see me climbing a tree to sample a species in Peru, pressing specimens in the field, the flower and the large fruit of *Solanum sycophanta* (7 cm in diameter), and me on my last day of fieldwork in Brazil depositing the three presses of collected specimens at the herbarium.

One of my PhD objectives is to assess how shared evolutionary history influences the diversity of fleshy fruit traits that mediate interactions with frugivores. I focus on the genus *Solanum* (Solanaceae)–relatives of tomatoes, potatoes, and eggplants –because of its remarkable variation in fruit traits. This research has taken me across Brazil, Peru, and Puerto Rico, where I collected Solanum species to extract RNA, perform phylogenomic analyses, and assess evolutionary patterns in fruit color and size. In 2022, I conducted fieldwork in Brazil, driving over 4,000 km to sample species in the Atlantic Forest and Cerrado biomes across seven protected areas in São Paulo, Rio de Janeiro, and Minas Gerais. Shortly after, I traveled to Peru, collecting species from the upper montane tropical forests near Oxapampa at 2,800 m elevation. Together, these

expeditions yielded 140 specimens, which I supplemented by sampling in Puerto Rico and botanical gardens in the U.S. This work, published in New Phytologist and highlighted by Penn State News, clarified the evolutionary timeline and indicated that fruit color and size are phylogenetically conserved and evolutionarily correlated. These field experiences not only enhanced my skills as a researcher but also allowed me to build new international collaborations and learn from diverse cultures. Collaborating with institutions like Universidade Federal de Minas Gerais (UFMG), Universidade Estadual Paulista (UNESP Rio Claro), and Universidad Nacional Mayor de San Marcos (UNMSM) was essential in facilitating access to local expertise, field sites, and herbarium resources. International collaborations like these enrich ecological research and the formation of the new generation of ecologists. This work was only possible with the support received through the Hill Memorial Fund of the Penn State Biology Department, the Association for Tropical Biology and Conservation Seed Research Grant, American Philosophical Society Lewis & Clark Exploration Grant, Fulbright Brazil, and the National Science Foundation (NSF).

Atlantic Forest

JACK BOYETTE

The two frog photos are from Brazil's Atlantic Forest in 2023. One features a clay robber frog (*Haddadus binotatus*) under a mushroom and the other features a Guinle treefrog (*Aplastodiscus leucopygius*) near a waterfall. The picture of me happily holding an unhappy toad (*Rhinella icterica*) was taken in the Atlantic Forest in 2021, while our lab was radio tracking frogs to learn more about microbial recruitment and disease transmission during the breeding season. I haven't visited Brazil since 2023, so these days, my "field" excursions mostly involve excursions to the Smithsonian's National Museum of Natural History and National Zoological Park where I am sampling museum-preserved frog specimens from the museum's herpetology collection and extracting historical DNA at the zoo's ancient DNA lab. By sampling museum specimens collected before and after known population declines, I hope to infer the history of disease introduction and population resilience at my field site in the Atlantic Forest. This involves sampling many jars of museum-preserved frogs and dressing up like a surgeon for historical DNA extraction.

For my master's I worked in an experiment in Brazil. We discovered one of the strongest pieces of evidence to date of the protective role of the amphibian skin microbiome against chytridiomycosis. Collaborating with Dr. Luis Felipe Toledo's lab team in Brazil was essentially important due to their familiarity with the native species of frogs and experience in experimental work with chytrid that enriched our research. We cultivated a strong friendship, and I had the opportunity to contribute to their projects as well.

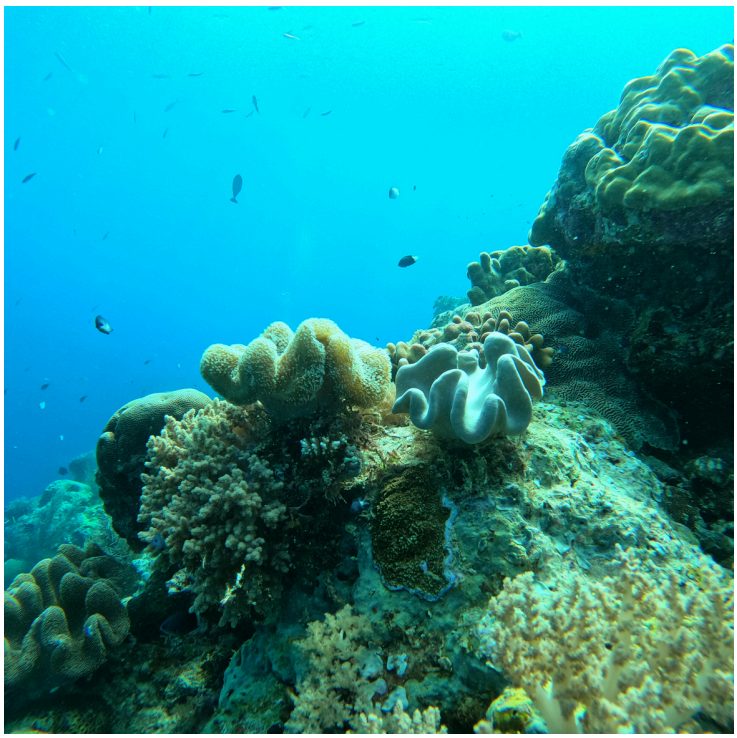
Also, I have a long-term collaboration with a lab in southern Brazil. The top photos are from the southern extreme of the Brazilian Atlantic Forest and associated coast (Rio Grande do Sul state, Brazil). This long-term collaboration began during my undergraduate years when I first started exploring questions about frog ecology with Dr. Alexandro Marques Tozetti. It has continued ever since—just this semester, we published a paper together, with many more on the way!

Brazil

LAURA KAUER SCHUCK

Photos shown are courtesy of Laura Kauer Schuck, Carolina Caberlon and Francisco Zanella

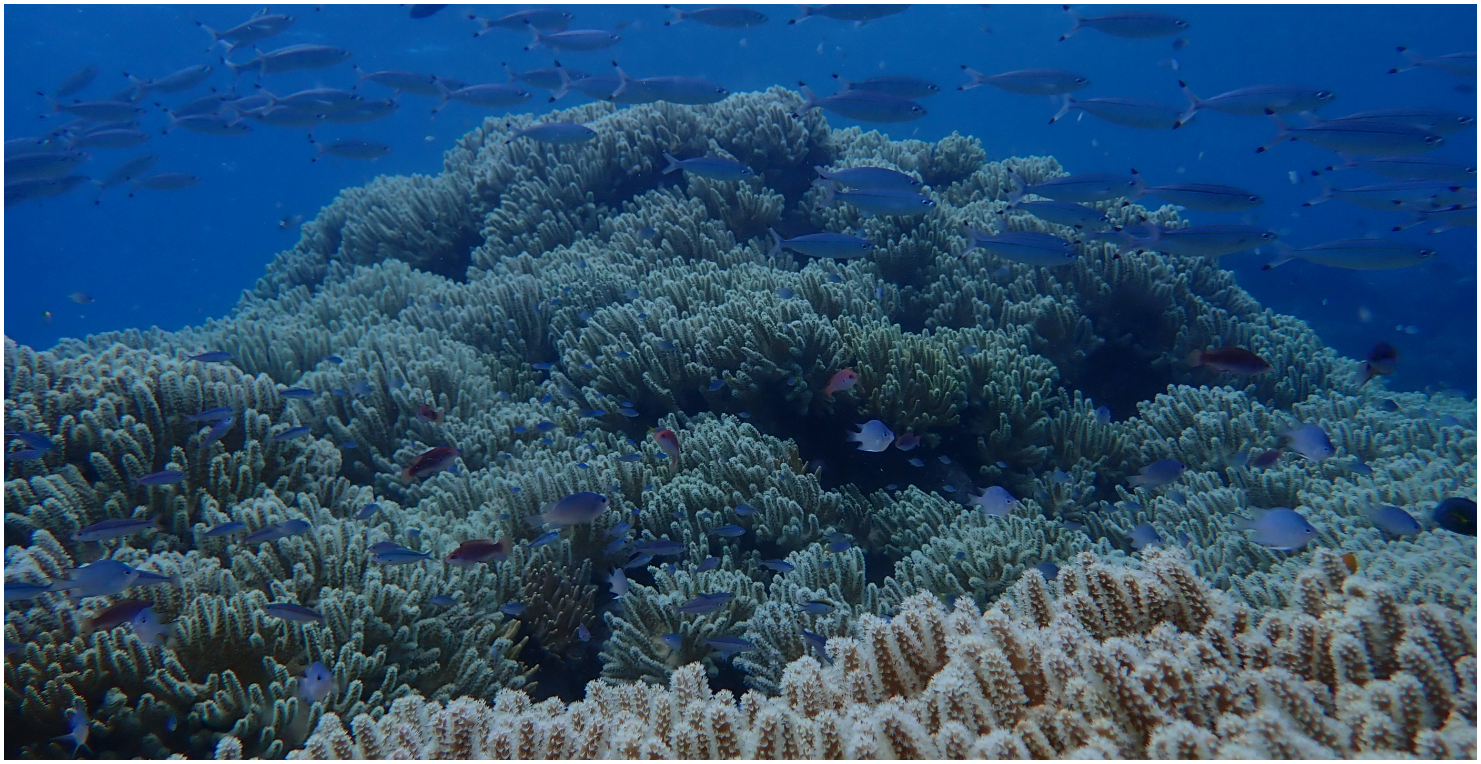
The combination of strong friendships, shared curiosity, and dedicated hard work makes this international collaboration especially meaningful to me.



Palau & Australia

CALEB BUTLER

The top image is from our 2022 trip to Palau, where Dr. Todd LaJeunesse and I began sampling soft corals (octocorals) and their algal symbionts for my second chapter. Pictured in the center are two different colonies of a cryptic genus-level complex of soft corals in the family Sarcophytidae. Working in Palau signaled my start in working in octocoral symbionts which has defined the latter half of my PhD. There, we collaborated with the local Coral Reef Research Foundation on multiple projects including this one, and another where we are working on describing the symbiont species found in Palau's iconic Jellyfish Lake in *Mastigias papua*.



The bottom image of the Great Barrier Reef was taken by a collaborator (Dr. Katharina E. Fabricius) at the Australia Institute of Marine Sciences. My second chapter identified several groups of host-specific symbionts, and we followed this up in a separate study with a more extensive sampling of octocorals from the Great Barrier Reef. In this image, you can see one massive colony of the octocoral *Lobophytum* sp., which hosts an algal symbiont that I have identified from the Great Barrier Reef to the reefs of Palau, Taiwan, Thailand, and as far east as the reefs of Zanzibar, representing one of the most widespread and abundant species of the symbiont genus *Cladocopium*. Surveys spanning decades have documented a growing abundance and coverage of these octocorals and by working alongside the Australia Institute of Marine Sciences, we are beginning to also document the identities and potentially the expansion, of these algal symbionts that coral reefs are dependent on.

Puerto Rico

RACHEL CRUZ-PEREZ

Top photo shows part of the TRACE team, including TRACE's lead PIs (Tana Wood, Sasha Reed, and Molly Cavaleri) posing in front of the Saban Field Research Station sign during the TRACE Annual Meeting 2023. Photo credits: TRACE.

When I started my PhD in 2022, I had many uncertainties. Although I had moved overseas, and left my home island behind, one thing remained clear: I wanted to conduct impactful research that would give back to my community in Puerto Rico (PR) by understanding the impacts of climate change on tropical forests. With this goal in mind, I established a collaboration with the Tropical Responses to Altered Climate Experiment (TRACE), the first *in-situ* warming experiment established in a tropical forest.

Located in the Luquillo Experimental Forest (LEF) in eastern PR—a site with a long history of ecological research—TRACE provided an ideal setting to develop my research on soil carbon (C) cycling processes. This collaboration has allowed me to return to the forests of my home island each summer, conducting research that bridges my scientific pursuits with my personal connection to the land.

At TRACE, my research integrates both field and laboratory experiments to examine how soil depth and warming affect the production and release of CO_2, a potent greenhouse gas, from soils to the atmosphere. My work aims to contribute to the long-standing challenge in biogeochemical research of partitioning the sources of soil respiration into root (autotrophic) and microbial (heterotrophic) contributions. By investigating how the contributions from these sources shift under warming conditions and across different soil depths, I hope to advance our mechanistic understanding of soil C cycling in the tropics.

Left photo shows me setting up soil incubation jars in the lab to measure and collect CO_2 respired by microbes.

Beyond the science, this collaboration holds deep personal significance. It enables me to contribute to ecological research in PR while working alongside an inspiring and diverse network of scientists, including undergraduates, graduate students, research technicians, and principal investigators from around the world. Each summer in the field is not only an opportunity to advance my research but also a chance to engage in scientific exchange, strengthening connections within the broader research community.

In addition to my research, I have had the privilege of engaging with the local community through the Luquillo Long-Term Ecological Research (LUQ-LTER) Schoolyard Data Jam Program. As a scientific mentor in this program, I have worked with middle and high school teachers to introduce students to real ecological data collected from their local ecosystems. This outreach has been particularly rewarding, as it fosters early exposure to ecological research and inspires the next generation of scientists on the island.

Ultimately, my work in PR is more than just a research opportunity—it is a way to give back, to build connections, and to support scientific literacy in the communities I care about. The knowledge we uncover is not just for scientific advancement—it is for the forests, for the communities that depend on them, and for the generations that will walk beneath their canopies long after us. I am grateful for the chance to conduct research that aligns with my values, and I look forward to continuing this work in the years to come.

Top Left: Closed survey chamber connected to a drierite tap and metal canister for surface soil gas sample collection in the field.

Top Center: Soil sample collected from 100-cm depth at the field site. The reddish color is characteristic of Fe-rich soils.

Top Right: Closed-loop system set-up comprised of an air pump and a soda lime trap used to scrub atmospheric CO_2 from incubation jars.

Bottom: Collecting soil gas samples from gas wells at different depths using a syringe. Photo credits: Laura Rubio (TRACE technician).

Being an International Scholar is my superpower in science—it could be yours too.

A personal reflection by Ecology alumna, **Dr. Margarita Fernández**

«Como sapo de otro pozo» (like a frog from another pond) is a very common expression in Latin America. People use it to describe the feeling of being an alien, of not belonging to a place or feeling out of place. It's a sentiment many of us experience when we embark on a journey, start a new project, move to a new place, or enter previously unexplored social circles. Brazilians might call it *saudade*, an emotional state of melancholy or deep nostalgia for a loved one who is absent or something you lost. In many cases, it's about missing oneself or the person you thought you were before emigrating. For those of us who have emigrated, feeling like *un "sapo de otro pozo"* is very common: we miss the food, our loved ones, the warmth of the culture we left behind, the music, the dancing, and the sense of community.

Moving past being *un "sapo de otro pozo"* means taking risks, stepping up, and trying to rebuild an identity by blending past and present experiences. And by taking the leap to cross the pond, you conquer fear, lay all your cards on the table, and gain a deeper appreciation for your experiences. You gain new perspectives and stories that enrich your life. You put who you are and who you were on the line. In the end, being *un "sapo de otro pozo"* becomes a superpower: one that was going to be key for my success in my PhD studies.

I've always had a deep love for travel and new experiences, though I can't quite pinpoint why. There's something about immersing myself in new places and stories that has helped me grow into a better version

of myself. Five years ago, I moved from Argentina to the United States on a Fulbright scholarship to begin my graduate studies in Ecology at Penn State. The Fulbright program, which promotes international academic exchange, gave me the incredible opportunity to bring my experiences and scientific knowledge across borders. It felt like a privilege to be part of such a competitive and globally connected program.

Before coming to the U.S., I was already deeply involved in forestry research in Bariloche, a stunning city in Patagonia. At first, Patagonia itself was a foreign place to me. I'm originally from Misiones, a subtropical region in northeastern Argentina, so adjusting to Patagonia's harsh winters, unique ecosystem, and fieldwork challenges was no small feat. But once I settled in, I found my community and discovered a passion for the mountains. Bariloche changed my life and became my forever home, a place that shaped me in ways I never could have imagined if I'd stayed in Misiones. It was like a new version of myself emerged after crossing that pond.

During my time in Bariloche, I worked in a lab led by a well-known ecologist: Dr. Lucas Garibaldi. The lab was a melting pot of graduate students, postdocs, and researchers from around the world—Argentina, France, Sweden, Spain, Brazil, and more. Those three years were transformative. I grew not only as a researcher but also as a person, learning from my international colleagues every day and making lifelong friendships. They introduced me to new ideas, cultures, foods, and scientific approaches. It was during this time that I realized how valuable international experience is, and I decided to pursue more of it in my career.

I had already spent a short academic stay in Austin, Texas, in 2015 through another Fulbright scholarship, so I knew American academia was an option. Moving to the U.S. for my PhD felt like the right next step, and it unlocked a world of potential for me. But it wasn't without its challenges. As a foreign national, I had to

confront my own prejudices and overcome language barriers to succeed. My first semester was a reality check—the U.S. was nothing like I had imagined. I had to start over in almost every way: language, friendships, work schedules, social dynamics, food, and even my research projects. Taxes and immigration paperwork were true headaches, things that me, and most international students, still struggle with and make me feel a bit alone. The cultural shock hit hard, and I felt like an outsider again. But I knew that pushing through this discomfort would lead to growth. And it did. I rediscovered myself and became more resilient.

I'll always be grateful for the support I found at Penn State—the ESM community, the Ecology Program, and especially my advisors, Margot Kaye and David Eissenstat. Their mentorship was exactly what I needed in my early PhD years. Unlike narrowly focused programs, the Ecology Program's interdisciplinary approach exposed me to new fields and fundamentally reshaped how I think about community ecology. Through participating in local fieldwork and observing the creative dynamics of both labs, I gained firsthand insight into how science operates in international settings. The program's professors were not just brilliant but deeply understanding; Dr. Carlo Joglar, for instance, once let

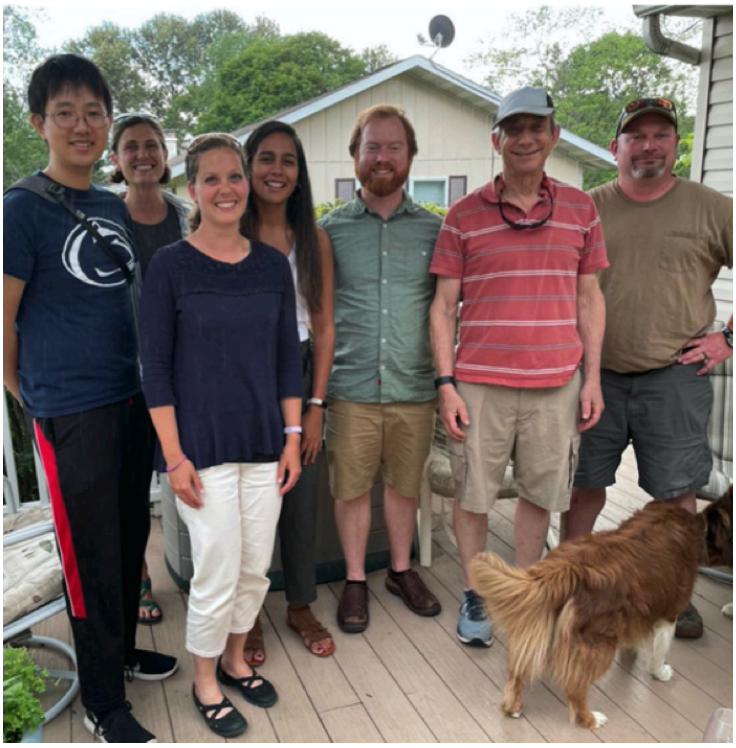
me explain myself in Spanish during a Classical Ecology discussion when my spanglish failed me. That moment crystallized the importance of diversity, equity, and inclusion (DEI) initiatives in academia. Beyond the lab, I found belonging in LAGRASA, Penn State's Latinx community. There, I met friends who made me feel seen and supported. Though some have since moved on, they've left me with a global network—and a lasting reminder that science thrives when people do, too.

Over time, things got easier, and new opportunities emerged. English no longer felt like a barrier—I wrote papers, presented at conferences, and even taught a full course myself: FOR 308. Standing in front of that classroom as a Latinx scientist filled me with pride; my students saw someone like me in a leadership role, and that mattered. Then, in February 2023, I successfully defended my Ph.D. thesis, becoming the first in my family to earn a doctorate. Being bilingual has been crucial to my academic success, but also is allowing me to connect with communities in ways others cannot. Now, as a postdoc and Co-PI of a carbon ecology research project in Pennsylvania, I'm also bringing my expertise back home working alongside Dr. Kreye and Dr. Scott. These days I'm leveraging this skill in an international research project, bridging high-integrity carbon offset initiatives across Pennsylvania, Colombia, Brazil, and Argentina.

Most importantly, my time in the U.S. helped me rediscover the strength and beauty of being Latinx in Ecology. In Latin America, we face so many challenges —political instability, economic hardships—yet we continue to produce impactful science with limited resources. This has made us incredibly resilient and adaptable. I now see Argentina and South America in a new light. Our countries are unique, rich in culture, and full of untapped potential. There's so much research to be done, and we don't need to travel far to make a difference.

Looking back, being a *"sapo de otro pozo"* was my curse and my blessing. My journey has been about more than just academic growth. It's been about embracing my identity, building bridges between cultures, and realizing the power of international collaboration. I've learned that science is not just about data and discoveries—it's about people, stories, and the connections we make along the way.

Dr. Margarita Fernández is a Postdoctoral Scientist in Climate-Smart Forestry Assessment and Policy at Penn State, where she studies carbon sequestration and co-benefits of climate-smart forestry in Pennsylvania's private forestlands. Her work with the Goddard Chair of Forestry & Environ. Conservation aims to create solid cooperative research and extension deliverables (both in Spanish and English). She actively collaborates with Penn State Extension and NIACS. She also provided the cover photo for this edition of *Notes from the Field*.



Interview with an INTAD Grad

Sarah Richards is a Ph.D. Candidate in the Ecology program and one of the first Ecology students to pursue an **International Agriculture and Development (INTAD)** dual title. She shares her insights here to help others learn if the INTAD program is a good fit for them.

What is the INTAD Program at Penn State?

The International Agriculture and Development (INTAD) is one of several dual-title degree program offered to graduate students here at Penn State. These programs are quite unique—to my knowledge there is no exact equivalent at other universities. It entails taking some extra classes in addition to your main degree requirements, and a portion of your thesis research must be conducted with an international focus, though what that means is different for every student, and is flexible by design.

What makes INTAD stand out to me is its interdisciplinary approach. The courses push you to think beyond the apparent confines of your study system, even if your research is more fundamental in nature. It also brings together students from diverse backgrounds who are all working toward becoming global leaders in sustainable agriculture and rural development.

How did you become interested in approaching agriculture from an international perspective?

Prior to grad school I worked for four years as a research associate at Indigo Agriculture (an agricultural start up technology company commercializing plant-beneficial microbial products). There I had joined as an early employee and watched the company grow from 40 to over 1,100 people. That rapid expansion brought constant change—new projects, collaborations, and a growing global presence in several continents. As we scaled up, I started asking bigger questions: Where were our microbial products originally from, and what does it mean to ship them all over the world? On one hand, this could maximize positive impacts of the products—mainly reducing the need for chemical inputs and increasing profits and tools available to farmers around the world. On the other hand, how do these products interact with local microbiomes? Could global application of a few “superstar” strains unintentionally shape local biodiversity in a big way? What determines whether a technology like this is accessible across different regions? And what happens to the inoculants after crop harvest—surely that must look different across global climates? At the time, I didn’t have the expertise to answer these questions, but they stuck with me.

When I came across Penn State’s INTAD program, I saw an opportunity to structure my PhD in a way that allowed me to explore these questions across different global agricultural contexts. I didn’t yet know what form that research would take, but I knew it was the right platform to build from!

How does INTAD support your goals?

Coming into my graduate program back in 2020, I had a very team-oriented mindset, due in part to the role I was in before grad school, where collaboration across large teams and different parts of the organization was the norm. In this sense, it was a bit of a culture shock in the first year of my PhD, realizing in full that our work is predominantly self-driven (this was also exacerbated by the height of the pandemic). While being able to work independently is important, I wanted to find a way to build meaningful collaborations in my program (self-driven doesn't have to mean isolated!). I've seen firsthand that groups can accomplish more than the sum of their individual parts, and I wanted to bring that mindset into my approach to research. INTAD seemed like the perfect way to ensure that would happen. It made it more than just an aspiration, but an actual requirement during my degree.

What are some of your highlights of the program?

Penn State community — The INTAD community has been a second cohort for me. It has brought such a sense of camaraderie to my State College life, especially because there were so many classes that we took together. I remember initially feeling out of place often being the only person studying soil microbiomes in the room! But I soon realized that is the beauty in the program. You learn from each other just as much as (maybe even more than) the courses.

Uncommon opportunities — Being in the INTAD program can create significant and non-traditional opportunities for students to enrich their degree experiences. For an example, I completed an independent study (to satisfy one of my INTAD course requirements), which unexpectedly evolved into an invitation to participate in a two week "Collaborative Learning School" (CLS) in Uganda led by Sustain Foods. During this program, I worked alongside local farmers, policy makers, and other graduate students from around the world to explore challenges and amplify community-driven solutions for sustainable food production in our host region. The idea was that problem solving is iterative and collaborative, and that voices should be heard from every stakeholder level. It was incredible to witness the transformation in our CLS participants (myself included) over those two weeks, from our initial, somewhat hesitant interactions as we struggled to understand each other through a language barrier, to the final days, where we were laughing, hugging and sharing meals together. Engaging in this experience made me more confident working in unfamiliar landscapes and deepened my understanding of what

makes collaborations equitable and successful, which is something I was strove to carry over to my INTAD thesis work in Costa Rica.

Meaningful collaborations — Finally, there will always be a special place in my heart for my Costa Rica family. I have developed relationships with students and faculty at the University of Costa Rica that have grown into lasting friendships. The students were eager to learn and work with me, and to take my hand and show me the way of life, *"pura vida"* style. The faculty were generous hosts and deeply engaged in the project. My main collaborator Dr. Robin Gomez especially had my back when it came to receiving shipments & working around all the legal documents ahead of time, language translational support, safety precautions during residency, experimental needs, field preparations, and so much more. While I don't believe professional collaborations always need to evolve into such personal connections, having this kind of support and engagement was a huge part of what made the project so successful.

What are some lessons that you've learned?

I cant pick just one! Here are the top few:

- You *do* have the power and right to make positive change.
- Question your morals and belief system. Regularly. (For instance, what is positive change?)
- Successful collaborations are built on trust, and the effort and interests need to go both ways.

How has INTAD changed your experience in the Ecology program?

Ok, so I'm not gonna lie, INTAD added a *lot* of course requirements (nearly doubled what was required for my main degree) and is something for students to consider very seriously when entering the program. In my first year I had a discussion with my advisor, who was supportive, and we acknowledged that it could add about 6 months to my degree. Knowing that up front made it ok for us, but either of us might have felt differently if we had been blindsided. For students entering, especially master's students, consider the time it may add and have a discussion with your advisor early on. And know that every INTAD experience is different—maybe it wouldn't add any time at all! Or maybe you can petition for some of your main degree requirements to also satisfy INTAD credits. I was the first ecology student to pursue INTAD, which meant I had to petition a few courses already—hopefully that will help break the barrier for future students interested in INTAD!

Also, the real world can be volatile. I personally know INTAD students who have heartbreaking stories about doing all the work to set up an international experience, only to have had it canceled due to the pandemic. Our current political climate should also be something to consider for students entering or in the program. No one has a crystal ball, but there is always a very real possibility to deal with a wrench in your plans at some point. When planning out your program, I'd advise to have a contingency! The INTAD program faculty are great at working with students to make things work. The logistics of needing to pivot your plans aren't really what I'd worry about the most—the program is flexible to meet individual students' needs by design. I'd worry about managing the let-down on a personal level when things don't work out the way you planned. Talking to your peers and seeking advice from the INTAD community are great sources of experience.

The INTAD program can open up significant funding opportunities; it has specific grants and other small pots of money to support its students' needs. In addition to funding a portion of my sequencing and other experimental costs for my project in Costa Rica, it has also funded professional development opportunities like language learning, mentorship for undergraduates in CR, and working & living abroad.

My last thought here, is because of my involvement in INTAD, I've built strong relationships with faculty members who will likely remain important connections throughout my career, not just as "someone I worked with that one time."

What advice would you give to others interested in starting international collaborations?

For students just entering the program, I'd say to start by brainstorming big ideas. The INTAD program has a lot of funding opportunities if you seek them out, so don't limit yourself early on. Dream big! But then, ironically, do the exact opposite. Your life will be so much easier if you focus on what's practical and accessible to you. But do your research to know what's within the realm of possibilities before you shut down any ideas. You might just surprise yourself to learn of a collaborator who is already in your network!

When I first joined INTAD, my advisor at the time didn't have existing international collaborations to build on. So, I reached out to 5 or 6 potential collaborators across Africa, India, and Nepal, and was straining to reach out to people who weren't even in my network. Ultimately, it was an existing connection (someone I met through a committee member) who not only made the most logistical sense but also showed the most enthusiasm for working together. After our first Zoom call, I could tell they were genuinely engaged, which has made all the difference. This project has been an incredibly rewarding experience, whereas a different choice might have still worked—but with more roadblocks and less engagement.

At the end of the day, a collaboration needs to serve all parties involved. Make sure everyone is aligned on project goals, expected outcomes, publications & authorship expectations, and the level of involvement required. Being upfront from the start is key to building a sustainable, long-term partnership.

How do you think your experiences in INTAD will support your next career steps?

Going through this program has made me a stronger project manager, communicator, and leader. There were so many moments where plans completely fell apart, forcing me to adapt, communicate a new plan, only to have that one unravel too. If I could go back, I could have avoided some painfully simple mistakes, like maybe bringing two pairs of jeans instead of one, in case they RIP right down the middle... (thanks Paul Esker for the subsequent shopping spree at Old Navy). And spending months trying to ship something internationally, only to find out a single missing form at the host university was the holdup. (That's where having an awesome collaborator can save the day!)

Then there were the bigger challenges like dealing with health issues—I developed an esophageal ulcer and was hardly able to eat or drink for a week while trying to set up a field experiment that required hard manual labor on a tight schedule. Or getting our field vehicle stuck in the mud when we had to finish by dark. In those moments, you learn quickly that the only way forward is one step at a time. (And safety first. Always. Especially in the field!) Working through these logistical hurdles, making the calls, and communicating through the chaos was empowering. If I can handle the worst of this, I can handle anything!

Graduate Student Publications

Biancari, L., et al. [90+ other co-authors, including **Vitor S. Messeder, J.**] (2024). Drivers of woody dominance across global drylands. *Science Advances, 10*(41), eadn6007. https://doi.org/10.1126/sciadv.adn6007

Carlo, T.A., **Vitor S. Messeder, J.**, Allbee, S.A., Cruz-Mendoza, A.C., Velázquez, S.G., Andrzejewski, C.M., Jenkins, T.J., & Cordeiro, N.J. (2025). Revisiting ecological specialization: the case of plant–frugivore interactions. *Oikos, 3*, e10948. https://doi.org/10.1111/oik.10948

Denis, H., Selmoni, O., Gossuin, H., Jauffrais, T., **Butler, C. C.,** Lecellier, G., & Berteaux-Lecellier, V. (2024). Climate adaptive loci revealed by seascape genomics correlate with phenotypic variation in heat tolerance of the coral Acropora millepora. *Scientific reports, 14*(1), 22179. https://doi.org/10.1038/s41598-024-67971-1

Hentges, C. R., **Schuck, L. K.,** De Abreu Caberlon, C., Tozetti, A. M., & Oliveira, G. (2025). Impact of environmentally relevant concentrations of glyphosate on Boana faber tadpoles exposed in the laboratory: Morphological and functional markers. Environmental *Toxicology and Pharmacology, 114,* 104643. https://doi.org/10.1016/j.etap.2025.104643

Marshall, V., Neely, W., Siomko, S., **Buttimer, S., Boyette, J., Becker, C.**, & Earley, R. (2024). Iron contamination mediates chytrid infection in Eastern newts: evidence from a field mesocosm study. In *Integrative and Comparative Biology, 64*, S328–S329.

McLaughlin, C.M., Hinshaw, C., Sandoval-Arango, S., **Zavala-Paez, M.,** & **Hamilton, J.A.** (2025). Redlisting genetics: towards inclusion of genetic data in IUCN Red List assessments. *Conservation Genetics* https://doi.org/10.1007/s10592-024-01671-1

Naylor, R. S., **Kopp, M. W., Irizarry, J. I.,** Foust, W. E., Goldberg, Z. A., Jones, M. E., Spencer, O., Banuna, L. D., & Sharma, S. (2025). Graduate student perspectives on opportunities and approaches for supporting transdisciplinary research and education. *Sustainability Science.* https://doi.org/10.1007/s11625-025-01650-6

Bold denotes current Ecology graduate students and faculty. Publication dates range from the Fall 2024 edition of *Notes from the Field* to March 2025.

Call for Alumni Career Panel

Dear Ecology Program Alumni: Graduate students want to connect with you!

Ecologists face a tough job market in 2025, and our students want to learn from alumni who have found success in new roles. Students are particularly keen to talk to alumni who work in the following roles:

- At PUIs & community colleges
- In industry & consulting
- In nonprofits, advocacy, & outreach
- In policy & state governments
- In academia outside of the U.S.

If this sounds like you, then please reach out to Marissa Kopp at mkopp1398@gmail.com for opportunities to join an alumni career panel and to connect with graduate students.