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PROFESSOR NATE SANDERS,
CHAIR OF ECOLOGY AND EVOLUTIONARY BIOLOGY

LETTER FROM THE CHAIR

Dear EEB Community,

The world has changed quite a bit since I wrote the Chair's Letter for last year's fall newsletter. The research, teaching, mentorship, and outreach that folks in EEB are doing matter now as much as they ever did, if not more.

The science featured in these pages highlights what has long been a prominent area of research in EEB - the ecology and evolution of infectious disease. Whether it's theoretical explorations of disease dynamics by Aaron King, or lab and field work in Meg Duffy's or Tim James's groups, or work in Luis Zaman's lab that blends theory, lab experiments and computer simulations to understand how microbes evolve (or even how evolvability evolves), folks in EEB are doing science that matters - as we always have and will continue to do.

This academic year, we'll continue teaching courses that introduce students to how science is done and why that science matters; the piece on how Tom Schmidt blends teaching and research exemplifies this, but I see it every day in our lecture halls, labs, in the field, and even in the hallways of our building. EEB has always done this, even before we were an EEB department (some 25 years ago… see the back page for our anniversary plans).

The interview with our alumni, Trevor Price (PhD '84) and Dolph Schluter (PhD '83), does a good job of characterizing how conversations among fellow students, faculty mentors, postdocs, and others can elevate everyone's work. In their case, they weren't discussing (arguing about?) the ecology and evolution of infectious disease, but rather how natural selection operates in nature, perhaps the most fundamental topic in all of ecology and evolution, if not biology (I'm biased, though, as a Chair of a Department of Ecology and Evolutionary Biology).

One final example of how what we're doing here matters: we launched the "abe Scholars" program this past year, which supports undergrads doing research for the entire summer. In September, they presented their research to the department. It was truly one of the highlights of my time as Chair. One of the students (mentored by new Associate Professor Liliana Cortés Ortiz) ended their presentation by saying, "I want to thank EEB for this opportunity to do research. I didn't really know it was really a thing, but now I'm hooked." Even typing that a couple of weeks after the students' presentations makes me smile. We're doing work that matters in EEB. And thanks to you all for contributing to and supporting so much of that work.

As always, Go Blue! Nathan Sanders

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Cover Image: Whooper Swan by John David Curlis (PhD '24)

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WELCOMING DR. LILIANA CORTÉS ORTIZ

A PASSION FOR BIODIVERSITY:

EEB ASSOCIATE PROFESSOR AND PRESIDENT OF THE INTERNATIONAL PRIMATOLOGICAL SOCIETY, LILIANA CORTÉS-ORTIZ TALKS ABOUT HER JOURNEY IN EVOLUTIONARY BIOLOGY

After more than two decades in the University of Michigan's Department of Ecology and Evolutionary Biology (EEB), Dr. Liliana Cortés-Ortiz has moved into a stable and exciting phase of her career. Although she is a familiar face in the department, her recent promotion to Associate Professor offers fresh opportunities to advance her research on biodiversity—work that combines field-based determination, molecular genetics, and an abiding commitment to student mentorship.

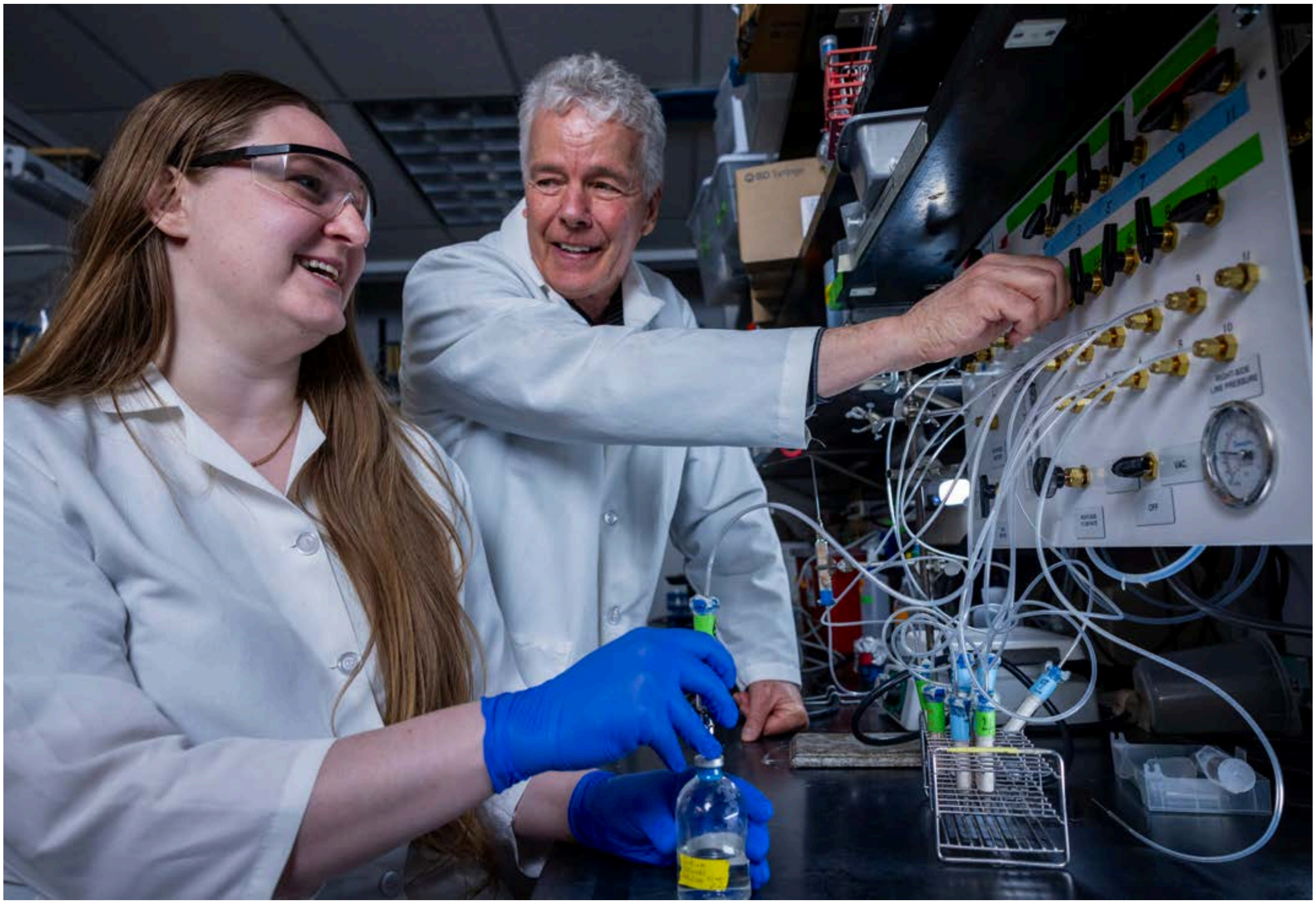
Dr. Cortés-Ortiz's research centers on understanding the processes that generate and maintain biodiversity, with a particular emphasis on the evolutionary history and hybridization of primates of the Americas. "We want to know," she explains, "what processes drive both the increase of diversity and the maintenance of that diversity when it exists." Her lab investigates how physical barriers, such as mountains or rivers, can split populations, leading to genetic differentiation and, sometimes, the emergence of new species.

What excites Dr. Cortés-Ortiz most is her ongoing work on hybridization, particularly in primates. In a region of southern Mexico, she studies two distinct monkey species that, after diverging for three million years, have come back into contact and are interbreeding. These hybrid zones offer a unique window into how genetic diversity is exchanged and maintained, and why some hybrids may be less fit or infertile. "Understanding what's happening at both the ecological and genetic levels is really interesting to me," she says. This research can inform not only fundamental questions in evolutionary biology but also help guide conservation efforts.

For the first time, Dr. Cortés-Ortiz will be able to welcome a postdoctoral fellow to her lab—a development she anticipates will significantly propel her research program forward, given the unique skills and collaboration postdocs bring. Her lab has recently welcomed new graduate students as well, making this year a time of renewal and new beginnings.

Dr. Cortés-Ortiz's own path into evolutionary biology was shaped by curiosity and unexpected opportunities rather than a defined plan—a journey she shares transparently with her students and mentees. Lacking early-career mentors, she followed her interests from behavioral studies in Mexico to genetic research in England, building expertise and pioneering work in primate hybridization along the way. This nonlinear path has made her a dedicated and empathetic mentor herself: "Preparing the people that come after us is one of the most important jobs we have in academia," she reflects.

In the coming year, Dr. Cortés-Ortiz looks forward to new collaborations, wrapping up multi-authored research papers, and, permits allowing, another field expedition to Mexico. Amidst the logistics of international fieldwork, grant writing, and teaching, she offers courses in molecular anthropology and biology of mammals—Dr. Cortés-Ortiz remains grounded in both scientific rigor and a deep enthusiasm for discovery. Her story is a testament to the creativity, resilience, and mentorship at the heart of evolutionary science.



ENGINEERING THE MICROBIAL GARDEN:

DR. THOMAS SCHMIDT ON GUT MICROBIOME RESEARCH AND TRANSFORMATIVE TEACHING

A *Field in Flux: The Microbiome Revolution*

Dr. Schmidt's research is centered on the human gut microbiome—the teeming community of trillions of microbes that inhabit our digestive tract from birth onwards. Long overlooked, these microbes and their metabolites have lately emerged as influential players in human health, impacting everything from digestion and mood to immunity and disease susceptibility.

"What's exciting right now," Dr. Schmidt explains, "is figuring out which of the many associations between the gut microbiome and different health conditions actually reflect cause and effect."

Beyond the media's enthusiasm for "gut health," Schmidt and his colleagues are engaged in the painstaking scientific process of distinguishing true, consequential relationships from mere correlations—identifying when gut microbes actively influence conditions such as diabetes or neurodegenerative diseases, and when they are just along for the ride.

From Classroom to Clinic: A Transformative Discovery

One of Dr. Schmidt's most remarkable breakthroughs grew directly from his teaching. Seeking to bring authentic research to undergraduates, he developed a laboratory section of Biology 173, Intro to Biology Lab, focused on the gut microbiome.

Students –most with little background in microbiology– analyzed their own gut microbiomes and tested the impact of various dietary fiber supplements, under the oversight of the university's Institutional Review Board. The approach was both novel and deeply engaging for the students, who recognized they were part of unscripted, meaningful research.

The results were striking: resistant potato starch, a readily available fiber supplement, had the most profound effect on students' microbial fermentation products in the colon. This finding was not only scientifically intriguing, but also actionable. Dr. Schmidt's team used these classroom insights to launch a clinical trial with bone marrow transplant patients at Michigan Medicine. In this vulnerable population, the risk of graft-versus-host disease (GVHD)—a frequently fatal complication—is significant. Remarkably, among forty patients given the resistant starch developed in the undergraduate class, the incidence of GVHD plummeted from the expected 17–18 cases to just three.

"For me, this epitomized the value of basic research and collaborative teaching: the ability to leverage classroom curiosity into real-world, life-saving trials," Schmidt reflects. "We were able to intentionally 'engineer' the gut microbiome and observe measurable, beneficial outcomes."

Impact on Students—and On Himself

Dr. Schmidt's immersive teaching has left some students reconsidering their diets, their career paths, and even their intended majors. Many became more mindful of gut health, shifted toward scientific research, or declared majors in biology. The hands-on nature of the research—complete with the necessary "ick factor" of collecting fecal samples—underscored the real-world messiness and significance of the work. "Students were delighted to be part of genuine discovery," Schmidt says.

His own habits shifted, too; for nearly a decade, he's added resistant potato starch to his morning smoothies, tending to what he calls his "microbial garden."

The Bacterial Perspective: Ecology and Evolution at Work

Dr. Schmidt is jointly appointed in EEB and the Medical School, and his research reflects this dual focus. While much gut microbiome research considers how microbes affect the human host, Schmidt is equally driven by understanding the bacteria themselves: How do microbial communities evolve, interact, and adapt in the harsh, confined gut environment? Why have bacteria evolved special proteins, like the newly named "TipRS," to latch onto resistant starch granules vastly larger than themselves?

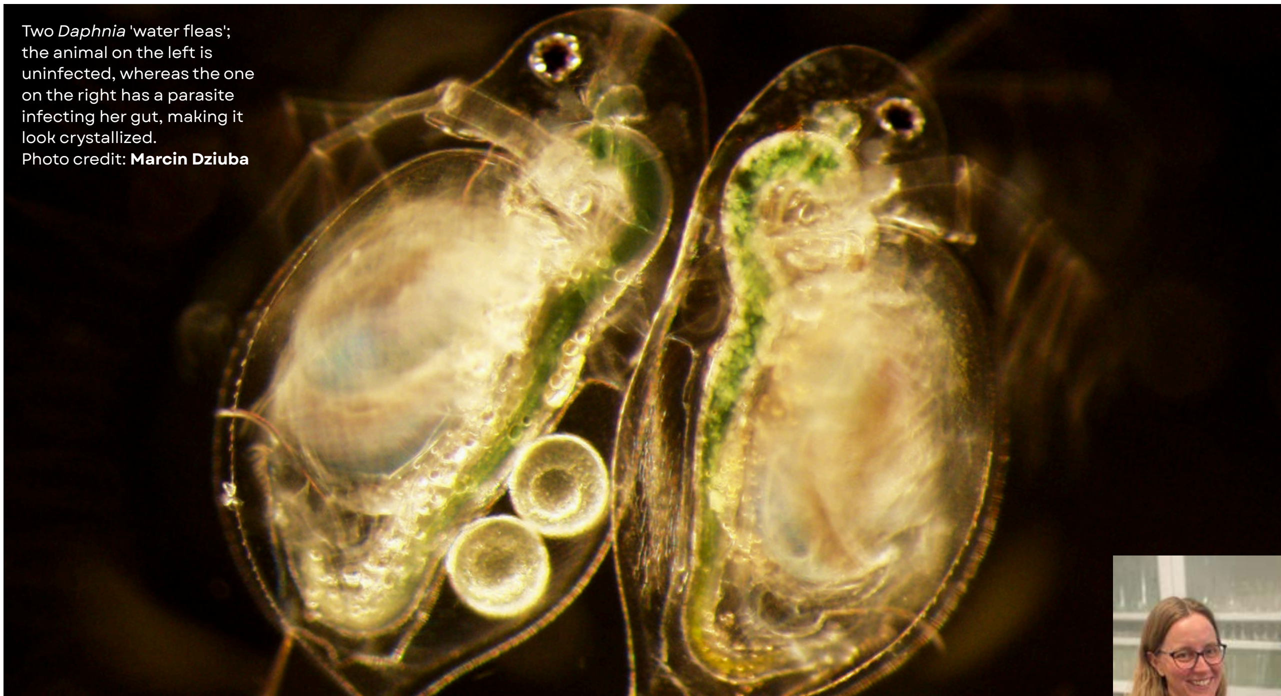
These questions bridge medical research and ecological principles, exemplifying the collaborative, interdisciplinary spirit at U-M. "This is a complex ecosystem—hundreds of interacting species, shaped by evolution and constantly responding to their environment," notes Schmidt.

Looking Ahead: Research and Teaching, Evolving Together

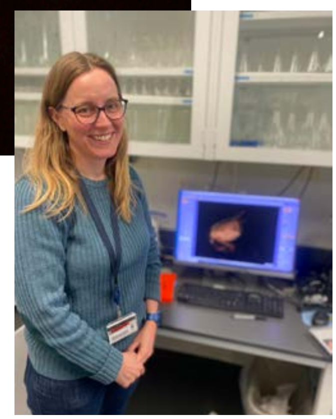
While funding constraints have paused the ambitious lab-based class, Dr. Schmidt now offers a two-credit lecture course on the gut microbiome, open to students of all backgrounds. His lab continues to investigate the ecological tricks bacteria use to outcompete one another and impact their hosts, and new publications exploring the interplay of prebiotics and probiotics are underway.

Ultimately, Dr. Schmidt's career in EEB is an exemplar of research informing teaching—and teaching, in turn, fuelling scientific breakthroughs. His work captures the dynamism, curiosity, and public impact of modern microbiology, with ripples extending from the lab bench, through the classroom, and into the clinic. For Schmidt, the microbial garden is more than a metaphor: it's a call to nurture not just our own health, but the flourishing of science and education.

DISEASE ECOLOGY



Two *Daphnia* 'water fleas'; the animal on the left is uninfected, whereas the one on the right has a parasite infecting her gut, making it look crystallized.
Photo credit: **Marcin Dziuba**



Diving into Disease Ecology: How Dr. Meghan Duffy's Lab Illuminates the Ripple Effects of Parasites in Michigan Lakes

The research led by the Susan S. Kilham Collegiate Professor of Ecology and Evolutionary Biology and Associate Chair for Undergraduate Studies, Meghan Duffy, brings new clarity to the intricate web of life within our lakes—revealing how disease outbreaks among small, often overlooked creatures can have profound implications across entire ecosystems.

Dr. Duffy's lab focuses on disease ecology, specifically aiming to understand why disease outbreaks occur when and where they do, and to unravel the broader consequences of these outbreaks on host populations, communities, and even whole ecosystems. Their chosen study organism is *Daphnia*, a genus of tiny freshwater crustaceans affectionately known as "water fleas." Despite their size, *Daphnia* play a pivotal role in lake food webs, consuming algae and, in turn, providing food for fish. Their ecological importance, combined with their adaptability for laboratory studies, makes them an ideal model for exploring complex questions in disease ecology.

A central theme in Dr. Duffy's research is the causes and consequences of disease outbreaks. As she explains, "The umbrella of what we do is trying to understand why disease outbreaks happen, when and where they do. And then, what their effects are on host populations, communities, all the way up to ecosystems."

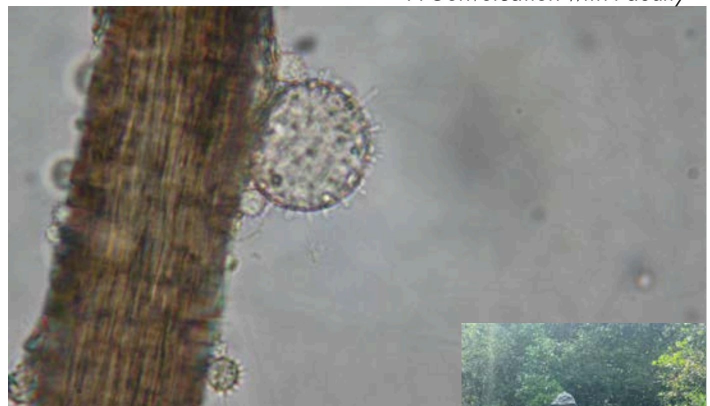
Her team is especially interested in the impact of multiple parasites sharing the same environment and how their interactions play out within individual hosts and at the population level.

Another critical area of research examines parasites' ability to "jump" between host species—a phenomenon that, in *Daphnia*, can mean crossing deep evolutionary divides. Understanding these leaps can inform scientists about the risks of emerging diseases more broadly.

Most recently, Dr. Duffy's lab has been delving into the ecosystem-level effects of parasite outbreaks by intensively sampling six Michigan lakes throughout the summer. The work seeks to reveal, as Dr. Duffy describes, how "these parasite outbreaks… might then end up influencing algae populations, nutrient cycling, all sorts of things."

Dr. Duffy's team is also driven by discovery and the unexpected. As she reflects on their findings about the hidden effects of parasites: "We often find unexpected things, which is how science works, and it's fun." Through a combination of fieldwork and innovative experimentation, Dr. Duffy and her lab team are illuminating the lesser-known ways that disease shapes the natural world—and reminding us of the critical importance of ecological research.

Unraveling the Web of Wildlife Disease: Dr. Timothy James and the Ecology of Fungal Pathogens



EEB Professor, Curator of Fungi, and Lewis E. Wehmeyer and Elaine Prince Wehmeyer Professor in the Taxonomy of Fungi, Dr. Timothy James's research sits at the intersection of disease ecology and conservation, targeting some of the most pressing mysteries around wildlife diseases. Over the past 25 years, Dr. James has focused especially on the alarming decline of amphibian populations, linking these losses to a skin-infecting fungus, *Batrachochytrium dendrobatidis (*Bd). This pathogen, discovered during a global wave of amphibian extinctions, infects keratin-rich skin and has driven several species to local or total extinction.

Central to Dr. James's work is the concept of virulence–how much a pathogen harms its host. Bd is highly dangerous because it is a generalist, infecting many different amphibian species, allowing it to survive even as it decimates the most vulnerable. Dr. James's curiosity, however, extends beyond the fungus to the viruses (*mycoviruses*) living inside these fungi.

In a surprising twist, his lab discovered giant viruses, dubbed *megagenomoviruses*, in aquatic fungi by baiting soil samples with hair–a nod to the keratin connection, which is also the target in amphibian skin. These massive viruses, some with genomes as large as bacteria, challenge assumptions about what viruses are and how they affect their hosts. Are they harmful freeloaders, or do they sometimes actually help their fungal hosts thrive?

One particularly notable case is the discovery of *Batrachochytrium dendrobatidis DNA virus 1* (BdDV-1), a tiny virus that infects the amphibian pathogen itself. Contrary to the initial hope that it could suppress the fungus and help save frogs, Dr. James's tests revealed that BdDv-1 makes Bd even deadlier, increasing its harm to frogs instead of reducing it.

Dr. James also collaborates with researchers in the College of Pharmacy to screen thousands of known drugs, seeking more effective antifungal treatments for wildlife diseases. His lab's interests extend to the study of analogous fungal diseases in bats, which also harbor viruses that can alter a pathogen's virulence.

Reflecting on his work, Dr. James notes: "Viruses generally make you sick, that's true for humans, but what evolution favors is not sickness per se, but spreading." By disentangling the complex ecological relationships between fungi, viruses, and wildlife, Dr. James's research offers critical insights into threats facing global biodiversity–and the hidden worlds within.

Decoding Disease: Dr. Aaron King's Innovative Approach to Disease Ecology

Dr. Aaron King, Nelson G. Hairston Collegiate Professor of Ecology and Evolutionary Biology, is redefining how scientists understand the ecology of disease. Uniquely trained as an applied mathematician, Dr. King's research stands at the intersection of rigorous quantitative thinking and complex biological realities.

At the heart of Dr. King's work lies the challenge of bringing mathematical models–essentially precise hypotheses about biological systems–into meaningful contact with real-world data. Biological systems like host-parasite interactions are immensely complex, with countless variables constantly changing and interacting over time. Measuring everything is impossible, but Dr. King's specialty is developing methodologies and computational tools that extract vital insights from the available, often incomplete, data.

Much of Dr. King's research has focused on infectious diseases–classic host-parasite systems that, while intricate, are more accessible to modeling than broader ecological communities. "From the perspective of a virus," King explains, "the host is almost its entire environment." This tight ecological relationship makes diseases like measles, pertussis, cholera, influenza, and polio fruitful subjects for studying how pathogens evolve and spread.

King's group has delved into historical and contemporary data, from cholera mortality records in colonial India to recent genomic sequences of viruses sampled from patients. The latter marks a profound shift: With advancements in genome sequencing, epidemiologists can now track the evolutionary paths of viruses almost in real time. Dr. King's recent research in "phylodynamics" leverages these genetic data–constructing family trees of viruses to map transmission and evolutionary dynamics as outbreaks unfold.

A key breakthrough from Dr. King's lab is a new mathematical framework that enables researchers to connect complex models of disease dynamics directly to genomic data. This advance opens up new possibilities for understanding the spread of pathogens like avian influenza, a current application area for his group, and could transform public health strategies by providing more accurate, real-time pictures of outbreaks and informing vaccine deployment.

Despite challenges such as constrained funding, Dr. King remains motivated by the impact his methodological advances can have, both for basic science and practical public health. By harnessing mathematics and computation, his work is shining a clarifying light into the complexity of disease–helping scientists and decision-makers better anticipate, understand, and combat infectious threats.

Back row from left: Ariana Di Landro, Lanjun Liu, Drew Tucker, Ronan Montgomery-Taylor, Casey Nichols, Riley Stanton, Ruoxi Wang
Middle row from left: Yeishmary Soto Muñiz, Larissa Lotti, Léo Laborieux, Lydia Fuller-Hall, Cam Durant, Rachel Gutner, Giovanna Munoz-Gonzalez, Seokin Yang
Front row from left: Rosie Zhong, Aadia Moseley-McCloud, Denise Meier, Liana Feller, Renee Rosenkilde, Grace Luo

Meet the 2025 cohort

EEB WELCOMES OUR NEW GRADUATE STUDENTS

PhD Students

Zeer Cen
Research Interests: Microbial ecology, microbial interactions, phage
Advisor: Luis Zaman

Ariana Di Landro
Research Interests: Ecosystem and community ecology, biogeochemistry
Advisor: Aimée Classen

Cam Durant
Research Interests: Evolution, ecology, genomics, trade-offs
Advisor: Regina Baucom

Liana Feller
Research Interests: Social insects, behavior, anthropogenic change
Advisor: Elizabeth Tibbetts

Rachel Gutner
Research Interests: Macroevolution, computational genomics, ecology
Advisor: Gideon Bradburd

Léo Laborieux
Research Interests: Macroevolution, palaeoecology, evolutionary biology
Advisor: Anshuman Swain

"EEB is really well aligned with my research interests and the kind of scientist I want to become–actionable, public-oriented, and well-rounded. This department is full of great people and resources!"
Aadia Moseley-McCloud

Lanjun Liu
Research Interests: Evolutionary genomics and genetics
Advisor: George Zhang

Denise Meier
Research Interests: Evolution, genomics, mammals
Advisor: Liliana Cortés Ortiz

Ronan Montgomery-Taylor
Research Interests: Global change, mycorrhizal/microbial ecology
Advisor: Aimée Classen

Aadia Moseley-McCloud
Research Interests: Ecosystem ecology, plant-fungal interactions, soil
Advisor: Aimée Classen

Larissa Lotti
Research Interests: Tropical and functional ecology, climate change
Advisor: María Natalia Umaña

"EEB's emphasis on hands-on research and collaboration makes it an ideal place for me to study animal responses to environmental and human-driven changes using genetics."
Yeishmary Soto Muñiz

Riley Stanton
Research Interests: Trait evolution, macroevolution, squamates
Advisors: Alison Davis Rabosky & Dan Rabosky

Ruoxi Wang
Research Interests: Evolutionary genomics and computational biology
Advisor: George Zhang

Seokin Yang
Research Interests: Insect behavior, physiology, and evolution
Advisor: Elizabeth Tibbetts

Rosie Zhong
Research Interests: Evolutionary genomics, bioinformatics, phylogenetics
Advisor: L. Lacey Knowles

"EEB aligns with my interest hugely due to its strong faculty and departmental expertise in almost every aspect of EEB. Most importantly, my PI, Lacey Knowles, works on speciation, and is well-established in the field."
Rosie Zhong

Frontiers Master's Students

Giovanna Munoz-Gonzalez
Research Interests: Ecology & evolution of plant-microbe interactions
Advisor: Aimée Classen

Casey Nichols
Research Interests: Fungal biology, ecology, evolution, plant-microbe interactions
Advisor: Timothy James

Renee Rosenkilde
Research Interests: Neotropical biodiversity, biogeography, and climate change
Advisor: Christopher Dick

Yeishmary Soto Muñiz
Research Interests: Wildlife ecology, population dynamics,conservation
Advisor: Liliana Cortés Ortiz

"My research interests have to do with speciation and hybridization, as well as genomics. These are topics that I'm just beginning to scratch the surface of, but I know there are so many resources and knowledgeable faculty members within EEB that would be happy to help."
Denise Meier

EEB Master's Students

Lydia Fuller-Hall
Research Interests: Interactions of microbiota, plants, herbivores
Advisor: Mia Howard

Grace Luo
Research Interests: Plant-microbe-soil interactions, ecosystem management
Advisor: SEAS dual-degree student

Drew Tucker
Research Interests: Climate, animal behavior, genetics, conservation
Advisor: André Green

Support our students:

EEB PhD student, Mars Woodward, in Orange Walk District, Belize.

ENGINEERING EVOLUTION

How EEB graduate students are pushing the frontiers of microbial research

If you walk into the EEB labs at the University of Michigan, you'll encounter a vibrant community of graduate students whose work stretches from lush Brazilian jungles to the high-tech, glass-walled spaces of Ann Arbor's Biological Sciences Building. These researchers are united by a passion for understanding– and, in some cases, even engineering– the dynamics of evolution and disease. Their research builds on classic questions in biology: How do hosts and parasites coevolve? How do environments shape evolutionary processes? And how can this knowledge be harnessed to address global challenges, from emerging diseases to antibiotic resistance?

We sat down with **Emma Carlson**, **Bhaskar Kumawat**, **Manasven Raina**, and **Mars Woodward**, each at a distinct stage in their journey, to unravel the diversity and excitement of their work in the Zaman Lab.

From left: Bhaskar Kumawat, Emma Carlson, Sabina Haque, Manasven Raina (in the back), Matthew Moreno, and Mars Woodward.

From Bats in Brazil to Lab-Based Ecological Justice

Mars Woodward, a graduate student in their second year, bridges the worlds of fieldwork and the classroom. Their focus is the intricate interplay between habitat fragmentation and wildlife disease dynamics, with a special emphasis on host-parasite coevolution. For Mars, research isn't confined to microscopy or lab benches; their passion takes them into the forests of Brazil, where they catch and sample bats to understand how environmental changes affect disease spread.

"My research is deeply interdisciplinary," Mars explains. "Taking a Portuguese course has been essential since part of my work is in Brazil, but I'm also studying feminist environmental justice because the questions we ask—about disease, ecology, and conservation—are inseparable from social context." For Mars, the year ahead involves more time in Brazil, deepening collaborative ties, conducting preliminary dissertation research, and, of course, prepping for their graduate prelims.

Microbial Battles: Modeling and Manipulating Pathogen Competition

While some researchers wade through streams and jungles, Manasven Raina, another second-year graduate student, delves into the unseen worlds within a single droplet of fluid. His research centers on how multiple pathogens interact and evolve within a host. "I'm fascinated by pathogen virulence," he says. "How do they cause damage, and what happens when several pathogens co-infect the same host? Do they compete? Stabilize each other? Evolve new traits?"

Manasven's approach blends classic microbiology, experimental evolution, and mathematical modeling. This year, he's launching new experiments: "My goal is to see how pathogens of different lifestyles interact when infecting together—and how their virulence evolves." It's a question with significant implications for both ecology and public health, especially when considering diseases involving co-infections and the rising threat of drug-resistant microbes.

The Art of Microbial Engineering —and Salad Dressing Science

Emma Carlson, now in her fourth year, approaches evolution from an engineer's perspective—using creative lab systems to recreate and manipulate evolutionary scenarios. "I use an emulsion system that's kind of like really expensive bacteria salad dressing," Emma laughs. "We mix engineered oil and growth media to create thousands of tiny droplets, each a miniature evolutionary experiment."

This approach allows Emma and colleagues to rapidly test how spatial structure and nutrient availability drive evolutionary change—both for solitary bacteria and in the high-stakes wars between bacteria and their viral parasites, the bacteriophages. The next steps? Tackling evolution within naturally forming biofilms and adding viruses back into the mix to study coevolution in realistic, structured environments.

Apart from hands-on experiments, Emma cherishes department camaraderie and the joys of coffee culture. "Sometimes when you spend nine hours straight in the lab, you find yourself naming the cell counter your 'wife'—and everyone just goes with it," she jokes.

Computation, Theory, and the Evolution of Evolvability

Bhaskar Kumawat, a fifth-year student, brings a theoretical and computational lens to the lab's work. "I started out working mostly at the computer, creating models to answer 'meta' questions in evolution—like, can populations become better at evolving themselves?" Bhaskar's recent work, now published and gaining citations, investigates not just evolutionary change, but the evolution of evolvability—how bacteria or viruses may be primed to adapt quickly in the future.

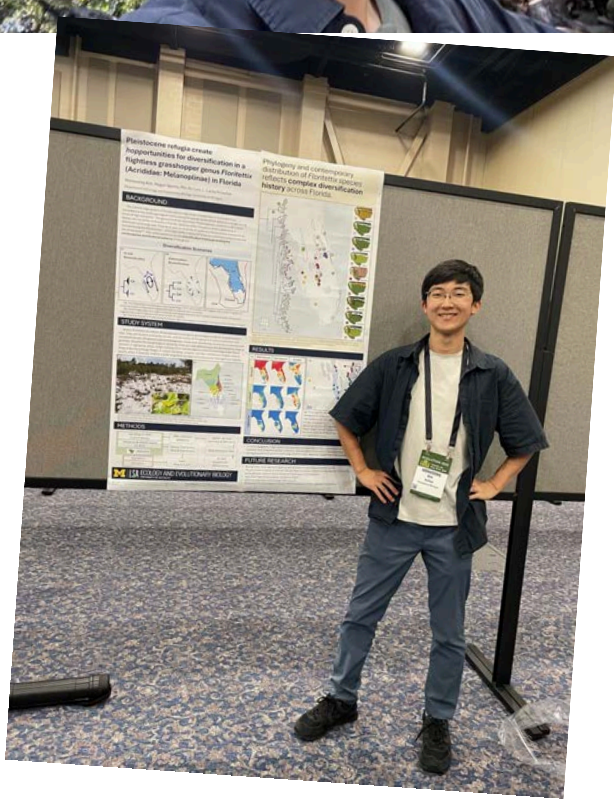
Transitioning from theory to practice, Bhaskar is now testing whether bacteriophages (viruses that infect bacteria) can be evolved in the lab to expand their host range. "This has real-world potential—if we can engineer phages that are highly evolvable, they could potentially target antibiotic-resistant bacteria," he explains.

Bhaskar also mentors younger students and leads a complex systems class, reflecting the lab culture's ethos of collaboration, teaching, and "engineering evolution" on multiple fronts.

abe Scholars

Five undergraduate students share their summer research experiences

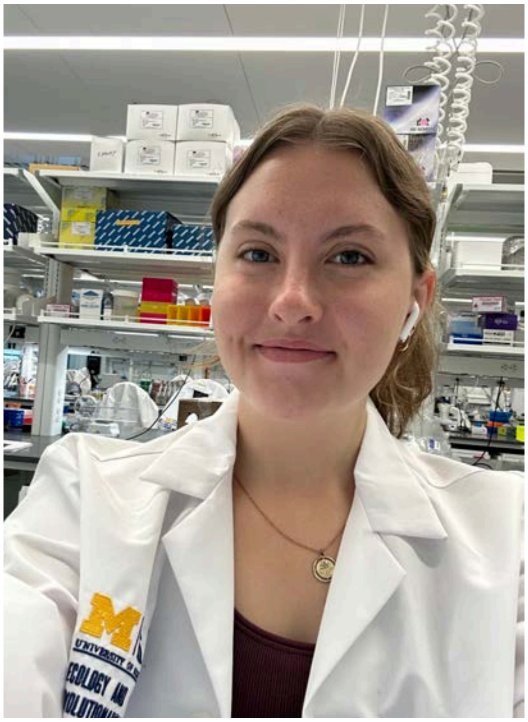
The "abe Scholars" is a 10-week summer program where EEB undergraduate students have the life-changing opportunity to pursue independent or directed research, under the guidance of an EEB mentor. They also participate in professional development and attend social programming and networking events throughout the program.



"The genus *Floritettix Otte*, 2014 (Acrididae: Melanoplinae) is a wingless grasshopper comprising 14 species distributed in Southeastern US. Within the genus, there are three distinct distributional patterns: widespread, coastal, and narrow-range endemics in highlands of central Florida. In order to understand the diversification scenarios, we created phylogeny of 224 specimens in nine species, using ddRADseq protocols followed by *de novo* assembly and SNP calling. All morphologically defined species were clustered together, and significant intraspecific population structure was observed. Ecological Niche Modelling of 875 specimens and literature records in three different timescales (Mid-Holocene, Late-Holocene, Present) showed species experienced differential distributional shifts.

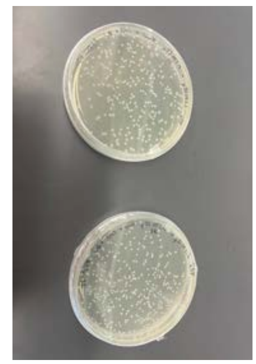
The Summer Fellowship opportunities ("abe Scholars") provided by the EEB department allowed and encouraged me to immerse myself more deeply in this system. Fieldwork in Northeastern coastal areas to collect species missing from the dataset resulted in 434 specimens from 17 localities, including *Floritettix saturiba* (Hebard, 1936) and *F. holatamico Otte*, 2014. Additional molecular work was also conducted and is in the process of being incorporated into the existing dataset. I was able to devote myself to this research thanks to the financial and educational support of the fellowship, for which I am grateful. Finally, I would like to thank the Knowles lab for continuous support and academic encouragement."

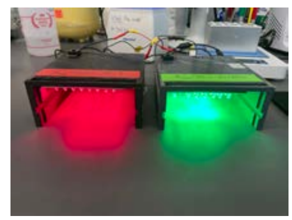
Wonwoong Kim



"This summer, I worked in Dr. Duda's lab studying cone snails in the *Conus sponsalis* species complex. *Conus* is a hyperdiverse genus, and the sponsalis complex has the potential to hold unrecorded cryptic species. My project involved generating more genetic data from snails in the UM Mollusk collection in order to build a bigger phylogenetic tree of the complex. Over the course of the summer, I extracted DNA from 187 specimens, ran PCRs on each gDNA sample, and used the sequences to build a new tree using my data, data from Diana Vergara (PhD student)'s previous work, and some sequences from Genebank. I used 16S mitochondrial DNA for the tree, which recovered two potentially distinct new clades. If these are corroborated with nuclear DNA and more samples in the future, it could mean the sponsalis complex houses even more diversity than initially thought.

Mallory Armstrong





"I worked with the Cortés-Ortiz lab during the summer to learn more about the genetic diversity of mantled howler monkeys. This was my first experience working in a lab, so I learned a lot from my mentor and other students in the lab, like how to do PCR! PCR and gel electrophoresis are a very large component of what I did to collect data over the summer. I was very nervous in the beginning since I've never done work needing a lot of precision. My hands shook a lot during the first two weeks, and especially when I helped to send our first plate off for analysis! It was a very fun and fulfilling experience to have, and helped me to realize I want to go to graduate school and do research."

Kayla Jackson

"This summer, I worked on a project studying *Microcystis*, the dominant cyanobacterium responsible for harmful algal blooms in Lake Erie. While phosphorus was once thought to be the key limiting nutrient for these blooms, nitrogen is now recognized as playing an increasingly important role. Previous work has focused largely on nitrate, but we investigated how *Microcystis* grows under urea as an alternative nitrogen source. We found that different strains of *Microcystis* vary in how they utilize nitrogen forms, showing that even though nitrate and urea are both nitrogen, strain-level differences in growth create niche diversity."

Maria Lopez-Linares

"This summer, I used optogenetics to create a system in which specific bacteriophages would only infect a cell in response to a certain light signal. This project involved three main components: genetically engineering the optogenetic plasmids, transforming them into competent cells, and creating the light box to house the cell plates that we spotted bacteriophage dilutions onto. I found that protein receptors produced by plasmid genes are sufficient for bacteriophage susceptibility, and light can potentially be used to allow for production of those proteins."

Jenny Sun

Support our students:


'ONLY AN ARC LOOKING BACKWARD'

Trevor Price & Dolph Schluter reflect on formative years at Michigan

Drs. **Trevor Price (PhD '84)** and **Dolph Schluter (PhD '83)** met as graduate students in Biological Sciences at the University of Michigan in the fall of 1977, when they arrived as new students of renowned evolutionary biologist Peter Grant. They conducted pioneering work on adaptive landscapes and rapid evolution in Darwin's finches as PhD students, and have remained friends ever since.

Price is now a Professor of Ecology and Evolutionary Biology at the University of Chicago, and Schluter is the University Killam Professor of Zoology at the University of British Columbia. Each has made important and enduring contributions to work on speciation, biogeography, the role of ecology in driving evolution, adaptive radiation, and quantitative genetics, among other topics. Their friendship, they agree, has been characterized by the kind of rigorous academic debate that makes each participant a better scholar, because it requires both to form an argument that is worthy of a friend's scrutiny.

In the following interview—conducted by EEB PhD students Matt Hack and Max Witynski and EEB Associate Professor and Museum of Zoology Curator of Birds, Ben Winger—the two reflect on their formative experiences at Michigan, how their PhD work influenced their later careers, and the ways in which the field has changed since their time in Ann Arbor in the late 1970s and early 1980s.

Note: This interview has been edited and condensed for brevity. Read the FULL interview here:

What brought you to Michigan?

Trevor: I was taking two years off, and before a year working in India, I saw an ad for a position with Peter Grant—who was at McGill University at the time—to work in the Galápagos Islands. It sounded like a good gig to spend the summer in Montreal, and the winter in the Galápagos! I was interested in population genetics and was blown away by the work Peter Grant and his graduate student Peter Boag had already started: color-banding individuals, measuring trait differences between them, following them, and ultimately measuring heritability in the field for the first time. So, I was excited to be involved in that work from the beginning.

Dolph: I didn't have much of a background in evolution, more in ecology. I was interested in competitive exclusion and the structure and assembly of communities. I wasn't even planning to go to graduate school, until Bob Montgomerie, one of Peter Grant's students (and now Emeritus Professor of Biology at Queen's University), came to my university and gave a talk on territorial behavior in hummingbirds. The talk blew me away, with its implications that you could study evolution in the field, so I applied! But Peter wrote to us that summer and told us he was moving, and that we had the option of joining the cohort at Michigan instead of McGill. My undergrad advisor told me it was a good school, so I went! I was working at Algonquin Park as a field assistant that summer, and I remember leafing through issues of *Ecology*. I pulled one out and read this paper by a grad student at the University of Michigan named David Tilman (BS '71, PhD '76, now Regents Professor of Ecology, Evolution, and Behavior at the University of Minnesota). The paper was well written, conceptually interesting, and a neat experiment—just so good! It intimidated me, but it made me prepare for what was coming. I had never been farther south than Boston, and suddenly I was headed to the Galápagos!

What was it like working with Peter and Rosemary Grant?

Trevor: They're English and I'm English, so we could talk about cricket, etc. We also liked to argue about topics in ecology and evolutionary biology: I remember arguing with Peter in the field about things like whether owls reduced the finch population below carrying capacity, allowing more species to coexist.

Dolph: Peter was good at listening to us even when we disagreed with him and with each other. He was a good advisor that way; he was upbeat, and he listened. I remember learning to capture and measure birds from Peter. But I also remember that we had to think on the fly about how to get our projects started, and they were eager to help. I collected tin can lids and painted them, and the Grants helped me set them out every kilometer along an altitudinal transect to designate our first study sites. Even though I hardly knew what I was doing during those first weeks, they were energetic. As soon as we finished one thing, they'd ask, "What's next?"

Are there any differences between the popular understanding of Darwin's finches—the story about adaptation during drought years—and your more comprehensive experience of that work?
Trevor: Some technical details about beak evolution may have been lost—for example, how selection on width differs from depth—but I think the most exciting developments that have been overlooked have been recent ones in the last decade that have linked the selection events that we observed in the past to actual underlying loci.
Dolph: I think the adaptive landscape aspect of the finch work was written up well by Jonathan Weiner in The Beak of the Finch, and I'm glad that the rapid evolution aspect of it has captured the public's interest. But I think the enduring value for evolutionary biologists is that it changed the way we think about evolution and how we conduct science in important ways.

What was it like being a student in this department during your PhDs?
Dolph: I remember Friday afternoon happy hour discussion groups. The topics that were discussed there were often completely unknown to us or over our heads, but they were really influential for me. Just to hear the senior graduate students argue some of these questions and raise topics was amazing. I think it's a key thing early on and a necessary part of grad school.
Trevor: Michigan was and remains just an incredible collection of people. The two offices opposite me were occupied by Marlene Zuk (PhD '86, now Regents Professor of Ecology, Evolution, and Behavior at the University of Minnesota) and David Queller (PhD '82, now Spencer T. Olin Professor of Biology at Washington University in St. Louis), and I shared offices with Dolph, and all three of those friends of mine are now in the National Academy of Sciences.
Dolph: Not only was it an amazing group of brilliant people, but it was very interactive. Everybody worked really hard, but everybody also played really hard. There was a lot of energy in all directions. It was such a fun time to be there, and truly, I remember my first year of graduate school as one of the bestyears of my life. It was hard, but it was amazing.

Tell us more about how you influenced each other, and brought that collaboration forward.
Trevor: In addition to sharing an office, we were also roommates.
Dolph: Our musical tastes did not align!
Trevor: But more seriously—we experienced a lot of personal development together, too. We were competitive, and we argued—
Dolph: But I think it wasn't really about besting each other. It was about getting things right so that when I argued with Trevor, I would really know what I was talking about!
Trevor: Afterwards, I always had the ambition of having a lab where friends could argue in that way. I don't know if I've really succeeded. It wasn't competitive in that sense, you're right. It was more like trying to keep up with the other person. You know, since then, we've converged in some ways. Dolph started off with species' distributions and went into genetics. I started off in genetics and then went into distributions in a big way. Because we were so close, there were things we could discuss about our respective papers that it would have taken other people ages to catch up on. If I had a project that I couldn't do on my own, I'd recruit Dolph to help me.
Dolph: My adaptive radiation book would have gotten nowhere if I hadn't been able to rely on Trevor's input. Now that I'm working on sticklebacks, there's a lot of evolutionary genetics in there. When I was a student, I tried to read a paper a day. Trevor introduced me to Lande (1979), which was a paper that I read over and over for several days, until I really understood it and realized just how profound it was, even beyond its utility for measuring selection on correlated characters, but for modeling the evolutionary process and its macroevolutionary significance as well.

What about the trajectory of your careers would surprise your graduate school selves?
Trevor: I still can't believe that I'm being paid to do this. My ambition has been to study *Phylloscopus* warblers since I was about 10 years old. The surprising thing, to me, is really that the dream has been fulfilled, in many ways.
Dolph: I told you already that I ended up at Michigan almost by accident. It took me a few years to realize that I loved this. I felt like at Michigan—maybe for the first time in my life—that I was among my own people. I can remember during my time in the Galápagos and at Michigan, I felt that intellectually and physically it was the most demanding period of my life, but I enjoyed it all. So, I just thought, well, I'll figure out a way to keep doing this. And so, there's only an arc looking backward, in retrospect, and never forward.




All photos courtesy of Trevor Price and Dolph Schluter.

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