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DEPARTMENT OF ECOLOGY AND EVOLUTIONARY BIOLOGY
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PIVOT! PIVOT!

Unexpected challenges, lessons learned and where we (think we) are now

For those familiar with the iconic 1990s television program *Friends*, the frequently shifting circumstances of the past year-and-a-half may conjure a reminder of Ross' shouts as they tried to carry his couch up a narrow L-shaped staircase: "PIVOT! PIVOT! PIVAAAAAT!"

EEB faculty, postdoctoral researchers and students shared how their research, teaching and lives were upended – but underlying all these stories is the prevailing theme of flexibility, resilience and a can-do spirit. And best of all, some of the adaptations have made us stronger as we move forward.

Professor Alison Davis Rabosky was tasked with teaching herpetology, a traditionally hands-on and tactile course, remotely. "There is no one right way to teach herpetology," Davis Rabosky stated emphatically. As an experimenter who is motivated by a challenge, she emphasized, "flexibility is key."

Teaching herpetology during a Michigan winter into spring (January – April) poses its own unique challenges. So, very intentionally, she asked herself, what does this geographic location and institution do well? What are the strengths? Using the philosophy of "bloom where you're planted,"



Natasha Stepanova, U-M EEB graduate student, herpetology helper.
Image credit: Hayley Crowell



The Batrachian Barf Bowl, an active learning project that shows the "beauty" of the unchewed stomach contents of amphibians.

Illustration credit: Natalie Claunch, Univ of Florida

Davis Rabosky, along with her teaching assistant, Hayley Crowell (current Ph.D. student), came up with a plan.

Davis Rabosky redesigned her entire class (EEB 450: Biology of Amphibians and Reptiles). Having a child trying to do remote schooling, she realized, "you can't just take what you did before the pandemic, shove it online and call it good. I changed everything. It just took a lot of time, creativity and redesign."

"I felt a really deep sense of responsibility to give them the highest quality educational experience I could even if it was online." She spun her thinking to take advantage of opportunities, "what can we do online that is not something we can do in person or not something that I've ever done in person?"

The hardest part of teaching remotely was being limited to "this box" (as she outlined the Zoom screen during the interview), "but I did what I could." Consider the Batrachian Barf Bowl, an active learning project that shows the "beauty" of the stomach contents of amphibians, unchewed. Students lost the ability to line up 20 salamanders and see diversity in a tangible hands-on way or go into the field. "It was isolating and hard to translate," but as a result of her hard work and dedication in revamping the course, Davis Rabosky won the 2021 National Meritorious

see PIVOT, page 7



Image credit: Luna Archey

Patricia Wittkopp
Professor and Chair of Ecology
and Evolutionary Biology

Dear Friends,

As I write this letter, the University of Michigan campus in Ann Arbor (aka Tree Town) is ablaze in autumn hues and buzzing with life again, in stark contrast to the COVID-19 induced quiet campus of last fall. While we certainly haven't put the pandemic fully behind us, it's heartening to see the progress we've made so far. This fall, we were delighted to welcome our newest cohort of six master's students and 13 doctoral students into our EEB community; they are an inspiring group!

We're also happy to return to a print edition of *Natural Selections* this fall. Our COVID cover story features some of the myriad ways we've pivoted in our roles in order to support each other, especially our students. While admittedly a difficult time, we've found some silver linings among the storm clouds. Our students, faculty, postdocs and staff have proven resilient and creative in how they've carried on with their teaching, learning, research and administrative activities. We've been incorporating many positive things we've learned as we move forward.

In this issue, we are delighted to feature two of our newest faculty who we welcomed in 2020: Drs. Aimée Classen and Nathan Sanders. Professor Classen's research tackles an essential aspect of climate change, how plants and soils, and the microorganisms that live in them, regulate the global carbon cycle. She also directs the U-M Biological Station. Professor Sanders, who directs the Edwin S. George Reserve, reveals how, for him, all signs pointed toward studying ants. You will learn more about how his research program explores the mysteries of biodiversity. We are also honored to take part in the Michigan Society of Fellows Program and to have Roberto Márquez as our newest assistant professor and Michigan Fellow. Dr. Márquez's research integrates a variety of approaches to understand the evolution of warning coloration, toxicity and associated traits in poison dart frogs.

Another article highlights our world class EEB Museums – the Herbarium and the Museum of Zoology – and their tireless efforts to digitize their collections. As the article states, these ongoing efforts transport crucial information onto the internet via databases accessible to researchers across the globe, making museum collections more usable and relevant than ever before. I encourage you to use the links at the end of the article to check out some of these digital specimens online.

One of our Museum of Zoology Curators, Associate Professor Dan Rabosky, won the new Biosciences Initiative award that recognizes mid-career excellence. The award is funded by U-M President Mark Schlissel's Biosciences Initiative. Dr. Rabosky studies snakes and lizards in some of the world's most biodiverse regions, including South American rainforests and Australian deserts. EEB faculty have also received prestigious awards for the exceptional teaching and education they performed during the pandemic. Dr. Luis Zaman won the Education and Outreach Award from the International Society for Artificial Life for a tool he designed to help people navigate decision-making during the pandemic. His award-winning website describes why he created simulation models for disease transmission and how they work. Dr. Alison Davis Rabosky, who you'll read more about in this issue, won the Meritorious Teaching Award in Herpetology, presented by the Herpetology Education Committee from the U.S. herpetological soci-

eties. Dr. Melissa Duhaime won the 2020 Best Paper Award from The ISME Journal for her paper on how viruses reprogram cells into different virocells. Our outstanding faculty receive many honors throughout the year, these are a few of the highlights. As always, our graduate students received a multitude of awards summarized on our website in grad student news.

Our popular annual photo contest results from 2020 are once again featured on the back cover and our 2021 contest is underway. The photos, taken through the lens of science, are always stunning and sometimes surprising. The creative and artistic side of science never fails to impress and inspire.

On a solemn note, we were saddened to learn of the passing of Professor and Curator Emeritus Jack Burch, who had an extraordinary, long-lived, and highly influential career in science serving as professor and curator of mollusks at the University of Michigan since 1962 (Emeritus since 2001). And more recently, the passing of Margaret (Peggy) Burch, his partner of 69 years. Peggy worked at the U-M Biological Station officially for 10 years and unofficially for more than 50 in the summer office and the dining hall. Those who knew them best express what a joy it was to know them, in so many ways.

We held our first fully virtual Early Career Scientists Symposium in March of 2021, which had the theme "Natural History Collections: Drivers of Innovation". This virtual event drew an audience five times larger than prior in-person events, with 570 registrants and over 700 attendees. Our JEDI (Justice, Equity, Diversity and Inclusion) Committee is in the planning stages for our 2022 symposium themed Racial Justice in EEB Research.

Finally, it was with sadness for us and happiness for her that we celebrated the retirement of Nancy Smith, EEB's long-time Chief Administrator, this summer. Nancy served in this critical role for 20 years and helped the department grow from a new academic unit into the vigorous department we have today. In the last year, I greatly benefited from her deep knowledge of UM and LSA policies and practices, EEB history, and problem-solving skills nearly every day. Recently, we've welcomed our new Chief Administrator Jennifer Wolff to the department, who joins us from the LSA Business Office. We look forward to what the future holds!

If you're in Ann Arbor, please stop in to say hello. My warmest wishes for a happy, peaceful and healthy holiday season,

Patricia Wittkopp

Writers, editors: Patricia Wittkopp,
Gail Kuhnlein
Editor: Jennifer Wolff
Design & Illustration: John Megahan

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Sanders seeks to unravel causes and consequences of biodiversity



Nate Sanders gets up close with an ant. Image credit: Ben Blonder

Nate Sanders entered college to become a physical therapist. So, what made him turn the corner into the wonderful world of biological sciences? Being in the PT program, he said, “meant that (a) I didn’t have to take Biology for Majors (which I wouldn’t have done well in) and (b) I got to take General Zoology. That class in particular, taught by David Dussourd, changed me forever. One of the labs was something called a taxonomic treasure hunt, and we got one point for every animal we could correctly identify in a forest near campus. Well, not to brag, but I was pretty good at this. About halfway through the lab, I identified some termites in a piece of rotting wood, and Dr. Dussourd said, ‘Physical therapists aren’t supposed to know this kind of stuff. You know you can get paid for running around in the woods identifying things.’ I changed my major from physical therapy to biology the next day, and I’ve been getting paid to run around in the woods identifying things ever since. And I still haven’t taken Biology for Majors.”

“Why ants? I’ve always been fascinated by them, but most people are. The first lab I worked in as an undergrad kept caterpillars of various species, and one of the things we had to do was make sure ants didn’t invade the lab because they’d eat the caterpillars. And my undergraduate advisor, Deane Bowers at the University of Colorado, was interested in how caterpillars defended themselves against predators. Turns out that the ants were common predators. At about the same time, I was taking Insect Biology with

Deane, and we had to go to the library to find a scientific paper to read and summarize. The very first scientific paper I ever read was about two species that compete in the desert. One ant would start its day a little earlier than the other and would plug the nest entrance of the other. I thought it was the coolest thing I’d ever read (maybe it still is), and maybe still do.

“Finally, the very first experiment I did as an undergrad was on what caused caterpillar mortality in the field. Turns out it was ... wait for it ... wait for it ... ants, and especially when the caterpillars were on plants with aphids, because the ants were engaged in a mutualism with aphids. So, all signs pointed toward ants for me.”

Sanders became a professor in the Department of Ecology and Evolutionary Biology at the University of Michigan in July 2020. He appreciates “the opportunity to be at a university that values, supports and facilitates world-class research and innovative teaching.”

“... all signs pointed toward ants for me.”

He is also the director of the Edwin S. George Reserve. “What a place! I’ve spent the fall and spring exploring it and working with Alex Wenner, who knows the place better than anyone and is the perfect person for his job.” The ESGR is a 1400-acre U-M nature reserve and biological research station, 25 miles northwest of Ann Arbor.

Today, the overarching questions the Sanders Lab seeks to understand relate to the causes and consequences of variation in biodiversity. His research ponderings range from very specific to broad scale. “Why are there more ant species in Costa Rica than in Michigan? What happens if montane meadows

see Biodiversity, page 6

Novomessor cockerelli (Sander’s favorite ant) and *Pogonomyrmex barbatus*, in the desert in Arizona. Courtesy: Nate Sanders





Aimée Classen on the Flux tower at UMBS. Image credit: Chris Vogel

Classen Lab focuses on climate and global change

Aimée Classen, one of the newest faculty to join the Department of Ecology and Evolutionary Biology at the University of Michigan, is a perfect example of how teachers' influences early on can have life-changing and career-inspiring effects.

"I wasn't particularly interested in school, but I had to take science my junior year of high school," Classen said. "I signed up, grudgingly, for mammalogy and just loved it — I had an excellent teacher, Brent Gift, who opened my eyes to the wonder of the natural world. I had no idea that science could be so interesting."

Fast forward to today, Classen joined the department in July 2020 as a professor and the director of the U-M Biological Station. She is a terrestrial ecosystem and global change ecologist, "which means our lab group works on anything on land — but we have a fondness for plants, soils and herbivores."

Her team focuses on climate change with an emphasis on how plants and soils, and the microorganisms that live in them, regulate the global carbon cycle. They work across scales from the tiny (soil bacteria) to the large (regional carbon fluxes) as well as across ecosystems such as forests, meadows and bogs. Researchers working and collaborating in the Classen lab use a combination of observations, experiments and models to answer ecological questions and aim to make their work relevant to both the scientific community and society.

Their overall focus is on climate change. "We try to understand how much carbon will be stored in terrestrial ecosystems or fluxed back to the atmosphere from terrestrial systems and how interactions among organisms and their environments shape carbon uptake and release. Understanding these interactions is important because the amount of carbon in the atmosphere influences how much warming will occur in the future."

"I love seeing the light come on for students when they start to make complex connections and really become scientists."

Classen is excited to be the director of UMBS and a member of the faculty in EEB. "Leading a field station like UMBS is a dream job. We are facing the greatest applied problem in human history, climate change, at the same time we are in the midst of a pandemic. Science is more important now than it ever has been and science is the lifeblood of biological field research stations.

"In collaboration with the UMBS staff, faculty and researchers, I am excited to continue to make UMBS a research, educational and community engagement hub that leads science education, discovery and environmental problem solving. Over the next four years, we seek to increase the amount of

science created, the ability of people to use that science, and the ability for natural scientists, social scientists and modelers to work together and connect the science. We aim to continue to develop best practices to transform and diversify educational programming at UMBS and increase the number of students who take part in our immersive programs. We strive to make our campus and programming more inclusive. We are looking forward to welcoming new University of Michigan faculty and students to UMBS and are looking to have UMBS “camp” full next spring and summer session.

“In addition to my work at UMBS, I’m looking forward to teaching as part of the EEB capstone course. This year, I taught a section of the Frontiers Master’s Program focused on ecosystem ecology and I am thinking about teaching ecosystem ecology or field ecology at UMBS one summer.”

“We are facing the greatest applied problem in human history, climate change, at the same time we are in the midst of a pandemic. Science is more important now than it ever has been and science is the lifeblood of biological field research stations.”

Classen has a passion for solving problems and figuring out how things work, especially as part of a team. “I love seeing the light come on for students when they start to make complex connections and really become scientists. I love collaborating with people who have different ideas about how the world works. I love directing a world class research station to facilitate research and give students hands-on experiences in doing research. All in all, I’m pretty darn lucky. This is an incredible job.”

She started her career as a staff scientist at Oak Ridge National Lab in Tennessee, then became a professor at the University of Tennessee. After 10 years in Tennessee, she moved to the

Natural History Museum at the University of Copenhagen for a few years and then to the Rubenstein School for the Environment at the University of Vermont before joining U-M.

“I learned a lot at each of these institutions and I think the experience in research, teaching and leadership at each of these places has given me a lot to draw on in my new director role at UMBS. For example, I’m an ecosystem ecologist but my experience at the museum showed me what powerful places they are for documenting and conducting science. I can see all kinds of synergies between our University of Michigan museums, our botanical gardens and UMBS, which I don’t think I would have seen had I not had a diversity of experiences. I’m excited to work on biodiversity and global change projects that bridge these outstanding U Michigan institutions.”

Married to another ecologist (Nate Sanders, featured in this issue of *Natural Selections*), they have two sons who keep them on their toes. “They are at the ages where they want to challenge and understand the why and how of everything, which is fun for two academics. As a family, we really love to travel, hike, cook and watch movies together. We are excited to be in Ann Arbor because we can easily bike to work and downtown.”

EEB and UMBS are the “pretty darn lucky” ones and are looking forward to more of what Classen’s unique experiences will bring (and already have brought) to the university. 🍁

Aimée Classen conducting a plant removal experiment in Colorado.
Image credit: Nate Sanders



Biodiversity from page 3



The WaRM Team, Vermont 2018. Courtesy: Nate Sanders

lose dominant plant species? How will a suite of ecosystem functions change in an ever-changing world? Are there cascading ecosystem-level consequences of changes in population-level genetic diversity? What happens when an invasive species shows up?

“We see biodiversity in our everyday lives and rely on it for countless services. But why is the biodiversity you see in your backyard or nearby park or on your farm or in your favorite forest that biodiversity – that collection of species? And what is it doing? How do all of those species interact with one another and what are the consequences of those interactions? How does global change alter those interactions and that biodiversity?

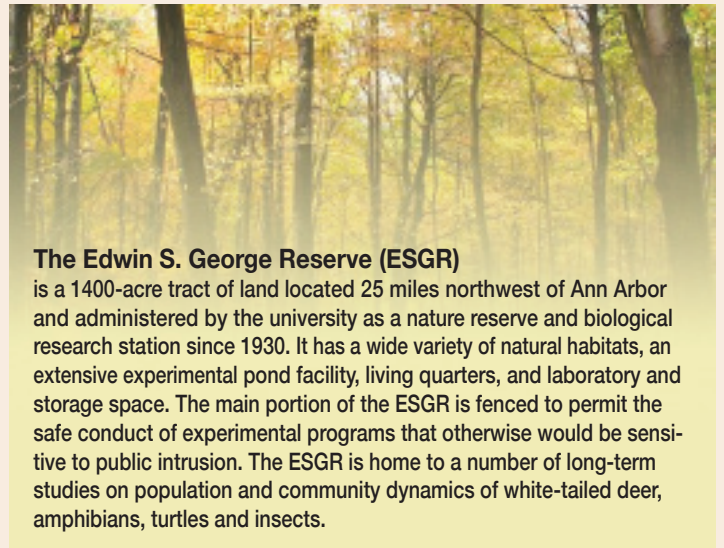
“Right now, we’re working on a series of papers on how increased temperatures and the loss of dominant plant species affect ecosystem function in mountains around the world that we’re pretty excited about. And of course, I’m also excited about any ant paper that we’re about to submit. The most recent ones are on long-term coexistence between native ants (especially *Prenolepis imparis*) and the invasive Argentine ant. As a grad student, I followed up on work by others on the distribution of native ants in a reserve (not unlike the E.S. George Reserve) in California. Twenty-five years later, folks are still following that invasion, and we continue to learn more about how the invasive Argentine ant affects some ants but not others.

“Finally, truly as we speak, I’m working on a paper led by an undergrad that focuses on how sodium in nectar might attract sodium-limited pollinating insects. Just think – some plants might spike their nectar with sodium just to attract more, and more diverse, pollinators. How cool is that? And this was work done by an undergrad in the lab and in collaboration with some dear friends.”

Sanders will teach General Ecology every winter, and hopes to teach it some summers at UMBS. This fall he’s teaching Population and Community Ecology. He hopes to revive the Field Ecology course that Professors John Vandermeer and Stephen Hubbell began in 1972 and Vandermeer continued teaching nearly every year for 44 years.

Professionally, his favorite activities are writing papers with undergrads – he has 23 papers with an undergraduate coauthor – and collecting data, entering those data, and generating the first analyses and figures. “That, for me, is the magic of science, when you go from observing something in the natural world and getting a step closer to understanding it.”

Sanders is married to Aimée Classen, an EEB professor and the director of U-M Biological Station, who is also profiled in this newsletter. They have two teenage boys, Harry and Finn, and a yellow labrador named Rosalind, named after one of their heroes, Rosalind Franklin.



The Edwin S. George Reserve (ESGR)

is a 1400-acre tract of land located 25 miles northwest of Ann Arbor and administered by the university as a nature reserve and biological research station since 1930. It has a wide variety of natural habitats, an extensive experimental pond facility, living quarters, and laboratory and storage space. The main portion of the ESGR is fenced to permit the safe conduct of experimental programs that otherwise would be sensitive to public intrusion. The ESGR is home to a number of long-term studies on population and community dynamics of white-tailed deer, amphibians, turtles and insects.

PIVOT from page 1

Teaching Award in Herpetology, presented by the Herpetology Education Committee from the U.S. herpetological societies. And in what she called “a crowning achievement to pull off in terms of technology,” they gave a completely remote, but synchronous, tour of the herpetology collection at the Research Museums Center.

Also during COVID, “research changed a ton,” Davis Rabosky said. “I advise students to always have backup projects because you just never know. We just didn't think that everybody's planned work was going to not work out at the same time.” Not being able to go into the field and restricted lab access to work on planned genetic analyses meant having to pivot to different data types and different questions. “We worked really hard to make it at least tangentially related to what their big goals were.”

Amid the turmoil, something positive from the COVID days that's continued to some extent, “We started doing remote meetings with people in other countries. We did a lot of networking in Australia. We got to talk to people that I never thought I would get to invite to one of our lab events and that made me happy.”

While there were some solutions to the challenges the pandemic presented, “all of them took three times as long to do to get half of the output” – whether teaching, childcare or research.

Davis Rabosky's survival mechanism to balance her life had always been to have a physical barrier between work and home

life, which for her meant having access to an office. Then suddenly, that was gone. Everything was happening at the same place. When the pandemic hit, her children were barely 3 and 6 years old. She wasn't able to fix that balance until she was able to work in her office part-time in the fall.

Pre-pandemic, her lab relied on frequent face-to-face interaction. Mentoring and playing supportive or collaborative roles on lab projects is much harder when people only interact for weekly hour-long lab meetings on Zoom. Now, they write about everything on Slack where it's visible to everybody, providing an even more transparent record of interaction than before.

Her advice for transitioning back to being in person is to be flexible about what people need. She tries to be preemptively aware of different comfort levels so she doesn't put people in an uncomfortable position where they feel pressured into doing things they don't want to do.



Professor Tim James taught mycology in a hybrid form with recorded lectures and in-person labs. Based on input received from students over summer 2020 who overwhelmingly wanted the course to be in person, “We emphasized and tried to convert labs to outdoor labs, so we went to the (Nichols) Arboretum as much as we could,” James said. “To learn about organisms that most people have little knowledge of, it is critical to be able to interact with them directly. The sensory aspect of mushrooms and lichens is critical to knowing them. Watching them grow in the laboratory is also fundamental.

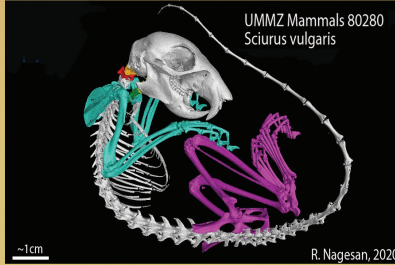
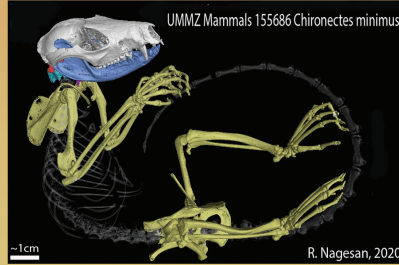
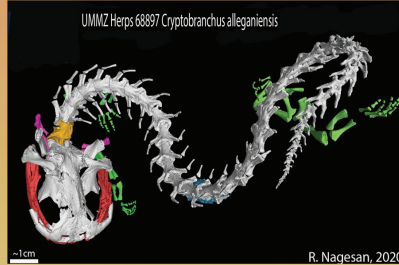
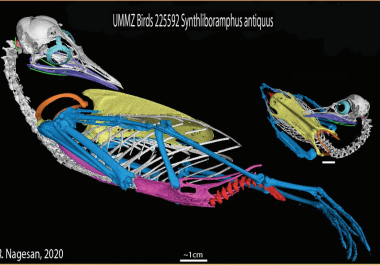
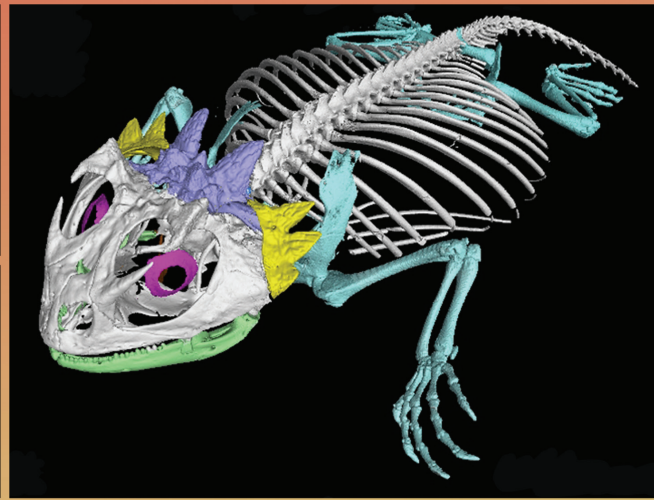
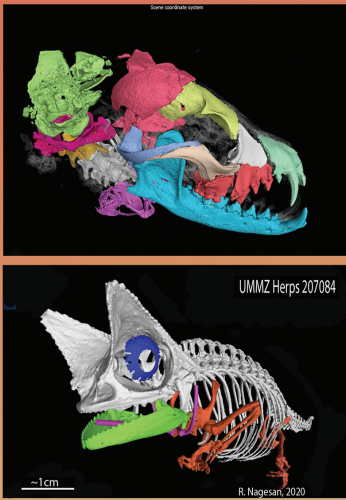
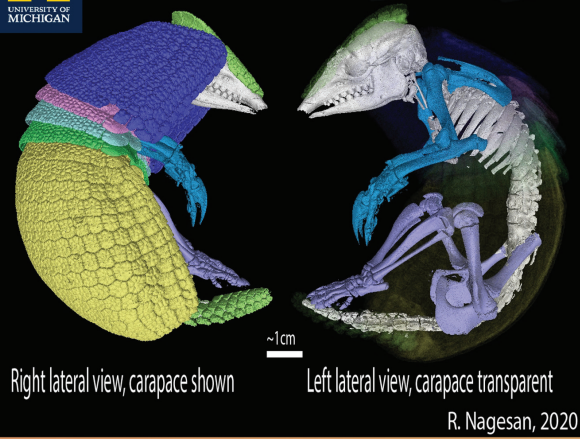
see PIVOT page 10

Biology of Fungi students examine powdery mildew – itself a fungus – on peonies in the Nichols Arboretum peony garden. Image credit: Katie Stannard, Matthaei Botanical Gardens and Nichols Arboretum





UMMZ Mammals 125621 *Tolypeutes matacus*



Images: Ramon Nagesan

Millions of U-M Museum specimens digitized for worldwide online access

As Taylor West enters the silent, cavernous room, shelves that appear to go on forever loom overhead. “It becomes immediately clear that I am surrounded by countless specimens, all of which hold important scientific information that is just waiting to be discovered,” West said about entering the wet collections at the University of Michigan Museum of Zoology (UMMZ).

West, an ecology and evolutionary biology graduate student, researches snake specimens from the UMMZ Division of Reptiles and Amphibians at the Research Museums Center.

“There are specimens in jars everywhere you look, and just a glance at the jar label will tell you important information such as which species is inside, the year it was collected, and from where it was collected. Reading the label for a rock rattlesnake (*Crotalus lepidus*) specimen transports me to the Sky Islands, a mountain range in southwest USA where this species lives. Almost instantly, I can see the rocks where this snake tucks itself away at night and feel the sun that it basks in while thermoregulating.”

She carries the jar to the CT (micro-computed tomography) scanning room and with gloved hands, carefully opens it and reaches into cold ethanol. As she frees the coiled snake specimen, her mind ponders its history. “Who preserved it? How long has it been since another researcher pulled it from this very jar to collect data from it? How long will it be before someone examines it after I do?”

“Ramon Nagesan, our excellent CT lab technician, helps me prepare the specimen for scanning. Then, we open the heavy, sliding door of the CT machine and place the specimen on

the small platform within, which will rotate to capture all angles of the specimen and render them into a 3D image that I can use to answer important questions about snake anatomy and morphology.”

West uses CT scans to look at the sensory organs within a snake’s skull. She primarily looks for the structures of the eyes and ears, along with associated nerves and brain regions. “I am examining these structures in snakes from different habitats to see if their lifestyles affect the shape and function of their sensory systems.”

See online portals to UMMZ and Herbarium digitized data at these links:

Herbarium: lsa.umich.edu/herbarium/databases

Museum of Zoology: lsa.umich.edu/ummz/collections

Her research will result in the production of CT scans for some 1,000 species of snakes that will be available online allowing others to use them for different questions.

Digitization of museum specimens and records provides renewed layers of information involving anatomy, conservation, impacts of climate change, infectious diseases, invasive species and beyond. These ongoing efforts transport crucial information onto the internet via databases accessible to researchers across the globe, making museum collections more usable and relevant than ever before. Only time will tell of the myriad possible future insights museum collections will uncover.

“The coolest thing about specimen digitization is that we now have the ability to peer inside of our specimens without ever

cutting them open,” said Ramon Nagesan, research laboratory specialist. “This has allowed us to interact with our specimens in a whole new way and learn things about their anatomy that would have previously been impossible when reliant on dissection alone.

“Some of the more interesting things we’ve found include gut contents (seeing what a specimen ate before it died), reproductive structures (in some cases we see fully developed embryos), and pathologies (broken and healed bones, scars, and possibly even tumors),” Nagesan said.

“Only time will tell of the myriad possible future insights museum collections will uncover.”

Cody Thompson, collection manager of mammals, UMMZ, explained, “Digitization has several levels. The most basic form of collection digitization is transcribing paper catalog records into electronic databases. And the more advanced form of digitization is imaging specimens in some fashion,” from capturing 2D or 3D images to CT scanning.

EEB graduate student Ben Nicholas is working with Neotropical cichlid fishes and is planning to scan roughly 150 of the 650 species currently described. “I am hoping to study the diversity of Neotropical Cichlid feeding morphology, looking at macroevolutionary patterns of shape change across clades and feeding ecologies.” Without this scanning technology, he wouldn’t be able to analyze the heads of cichlids in 3D. He’s also able to 3D print relevant morphological structures for the Biology of Fishes lab he’s teaching.

The Fish Division has about 240K database lots (a lot is the name given to all the individual fishes of one species collected at one site at the same time) containing over three million specimens – the vast majority of the collection is digitized, according to Randy Singer, collection manager of fishes. The Fish Division is also part of an interdisciplinary effort to digitize environmental data about Michigan fishes spanning the last 100 years, and essential to understand the impact of environmental change on Michigan fishes.

Primary specimen data has been digitized for 99 percent of the nearly 215,000 specimens held in the Bird Division collections, according to Brett Benz, collection manager of birds. These data are available on all the major aggregators such as the Global Biodiversity Inventory (GBIF), iDigBio and Vertnet, all of which are global databases that integrate information from collections across the planet and make fundamental biological information accessible to scientists across the world.

“Digitizing of a collection is never completed as there are always new aspects of digitization that can be captured,” said Tim James, EEB professor and curator of fungi, U-M Herbarium. However, they have fully barcoded and roughly digitized all of their 280K fungal specimens.

EEB graduate student Alden Dirks is using the collections to assay for the fungal toxin gyromitrin produced by false morels. It turns out you can detect this compound in specimens over 100 years old!

The Herbarium, which recently celebrated digitizing its one millionth specimen, has National Science Foundation funding to digitize their extensive collections of ferns, mosses and lichens. “Our current digitization activities focus on non-flowering, non-seed producing plants, both vascular and non-vascular,” said Garth Holman, research lab technician. “There’s been enormous energy over the past decade at the Herbarium to digitize the flora of Michigan and the current NSF grant efforts emphasize specimens that have not been covered in the past.

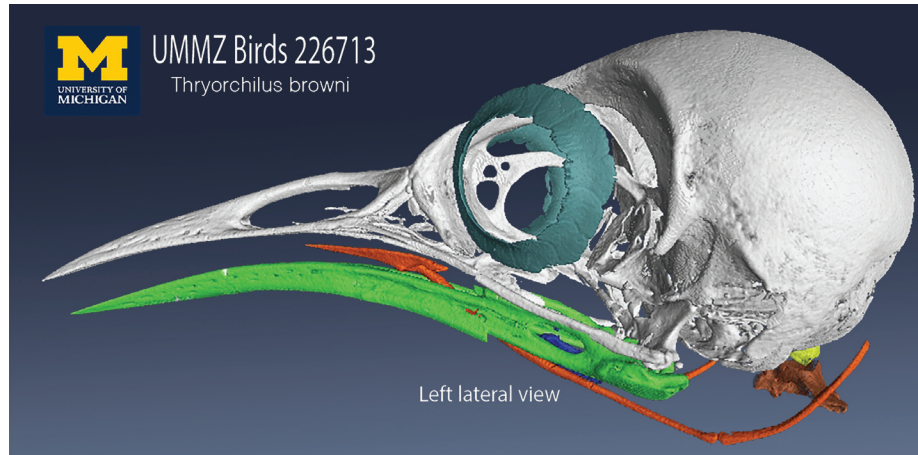


Image: Ramon Nagesan

“Our herbarium collections are largely the result of U-M faculty and student research,” continued Holman. “The physical specimens housed at the herbarium represent many lifetimes worth of work, collected all over the world. Many of the specimens in the Herbarium are well over a century old – some go back to the 1840s.”

“As someone whose first exposure to science came from museum visits, being a part of something that creates material available to anyone interested is quite meaningful,” added West. “I hope researchers around the world can benefit from our open-access CT data and hope the next generation of scientists will stumble upon it and begin to discover their own questions about the natural world and how it works.”



PIVOT from page 7

“The students were extremely flexible, patient and grateful for the opportunity to learn. I was very impressed by the students’ dedication as well as that of the graduate student instructor, Alden Dirks. Some things that worked well that we will carry forward were a more open format, visually diverse form of testing. Moving labs outdoors is something I’ll also likely retain. Lastly, the discussions were almost better on Zoom. Students were engaged and in some ways it was easier to manage the conversation. There are a lot of lessons from the semester. I hope to grow from them but never repeat the scenario.”



Alison Davis Rabosky teaching remotely. Image: Hayley Crowell



Laura Eidietis is one of the lecturers who teaches some 600 students in Introductory Biology each semester, in turn with Professor Meghan Duffy and Cindee Giffen.

Duffy and Giffen converted all of the lectures to recordings – a massive undertaking. “We worked all summer last year making that happen,” said Eidietis.

Remote classes were designed for students to watch lectures ahead of time followed by live interactive Zoom sessions, with support from graduate student instructors, where students answer iClicker questions and participate in Q and A.

“We’re maintaining that system as we move into the fall this year,” said Eidietis. When they asked students about going back to the previous course set up, they said, “absolutely no, this is so much better.” Students found that when they were actively involved in the course activities, they did pretty well in the course.

They made some substantial differences to grading. “I would say the biggest difference is we learned to be flexible and the world did not end,” said Eidietis. “Despite our fears, everything did not all fall apart.” For instance, they more readily excused exams when people were sick. “It seems to improve positivity in the class.” They’d like to keep as much of the flexibility as possible because it helps students’ wellness.

This semester, rather than 600 students gathering in an auditorium for the intro bio active learning sessions, half the class will be invited to attend a session in person if they wish and the other half will be online. They may organize it differently in the future, but this arrangement has benefits. “Think about a student who has autism, ADHD or PTSD. What do they get out of being in a classroom with 300 people? What they get is distracted and nervous. Having a live online option makes a lot of sense for certain groups.” To their surprise, student engagement has been higher on Zoom than it was in person before COVID. Their hypothesis is that it’s easier for students to ask questions via Zoom chat. “If you think about it, it takes a pretty brave student to raise their hand in a lecture hall with hundreds of students. It’s much easier to type a question in Zoom. I’d guess we get at least 10 times as many questions per class session as we did before COVID,” Duffy said.

Some students are more likely to be negatively impacted by online classes. Responding to this, Giffen, who teaches the Comprehensive Studies Program section of intro bio is planning as much in-person instruction as possible. Her smaller group (60 students) makes in-person easier than online. “One thing that is really different in person compared to online is being able to look over the shoulder of a student as they are working and give immediate feedback,” Giffen said. “I also really like the more natural peer learning that happens in person.”

Eidietis has been thinking more about inequity and racism within the institution and what’s really important. “I think part of the COVID experience made me feel more free to challenge some of the norms.” Things she thought could never change had to change. For instance, faculty in the College of Literature, Science, and the Arts voted to move the date when students can choose to take the class pass-fail to the last day of classes. Previously it was the third week of classes.

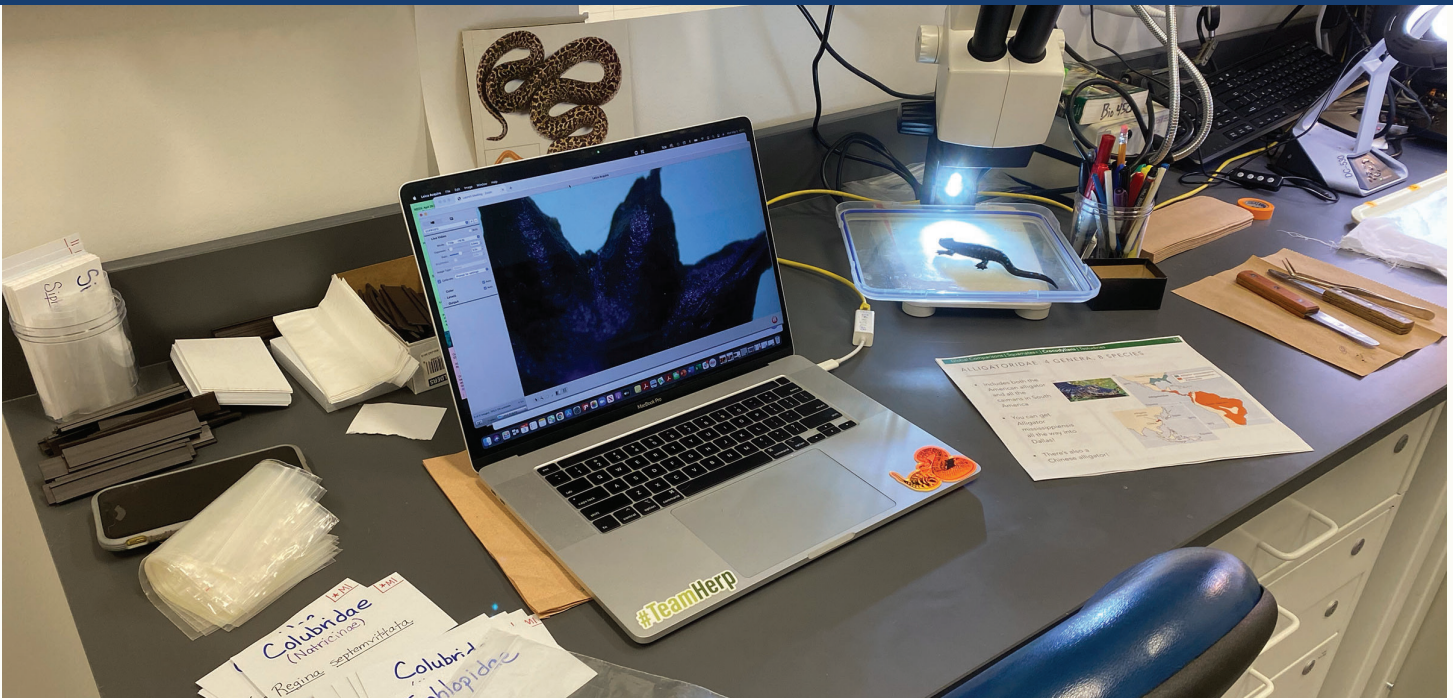
“I think that the extreme structure of the grading system, especially in the first two years at the university, tends to disproportionately hurt students from underrepresented groups. And so, allowing a little bit more flexibility with additional counseling, I think is more inclusive.” It allows students that don’t feel like they belong to take a chance on a course they’re not sure about.



“As with most other faculty last year, I was completely at a loss of how to take my Ecology Lab (normally in-person) class to online” said Lynn Carpenter, lecturer.

During a regular term, we go to the botanical gardens for our labs and the students love it. They get a chance to walk through nature, to appreciate wildlife and to see things in person. Now I had to find a way to design a bunch of labs online that students can do at home. I also had to do this very much ahead of time so I could send them kits with the non-toxic supplies they would need.

“We started to get very creative very fast. We designed an urban bird lab, a population growth lab involving a sourdough starter, a tree identification lab, and every other lab we could



Remote teaching behind the scenes for Biology of Amphibians and Reptiles. Image credit: Hayley Crowell

think of that would involve NON-toxic chemicals yet that would be scientifically, and somewhat ecologically valid. I was even able to get a famous speaker to Zoom a lecture (Lois Gibbs) to my class on the environmental movement and Super Funds. And, Carpenter learned that recording lectures can make class more accessible to students who don't always have a safe way to get to class.



Until the last minute, it was unclear if EEB graduate student Eric Gulson-Castillo would be able to hire anybody for the spring 2021 to help with his fieldwork on bird magnetic reception.

Planning for his project, which involved overnight stays, had to begin before many people were vaccinated so there was much uncertainty. They initially proposed staying in separate buildings but after people got vaccinated, “things changed really quickly,” he said. He and his collaborator stayed in the same building but in different rooms and the larger team only met outdoors, for example, where it's relatively safe.

However, indoor lab work brought different complications. Because of travel restrictions, Gulson couldn't visit scholars at other institutions to learn transferable skills. He found someone at U-M with similar skills working on a different system, which worked, but was less than ideal. Gaining access to buildings and other restrictions put in place due to the pandemic presented additional hoops to jump through, “so it's been an adventure.”

Throughout the time, he appreciated “an attitude of – we will make this work out,” particularly with management at the E.S. George Reserve and PIs from other labs they collaborated with.

Mo Siddiq, a postdoctoral research fellow in the lab of Professor Patricia Wittkopp, said, “the pandemic changed the way I work in a few different ways. First, it has changed the focal projects of my postdoc. In 2020, our building (the Biological Sciences Building) was physically

closed for several months, and I did not have reliable access to other laboratories and core facilities housed in medical and hospital-associated buildings (understandably) until spring 2021. Even within our lab, supply chain shortages in things that I rely on using every day, like PCR tubes, pipette tips, kits, etc. fundamentally changed what I could work on and how I work. Some of these shortages still persist – a critical piece of equipment I needed for my fall experiments has had shipping delayed from Sept 1 and still has not arrived (as of this writing).

“The pandemic forced everyone to slow down,” Siddiq continued. “In doing so, I think it allowed some of us to take the time necessary to appreciate many things that previously went ignored or put down the priority list for things ‘we have to do.’ Rediscovering the joys hiding in plain sight, whether that is from relationships or hobbies, has been nice. Professionally, I've always valued the little moments that happen in lab between the ‘work’ and I cherish those moments and the people I share them with even more now.”

Like many people, my knee jerk reaction to most problems has been to try to do something to fix it and recapture a sense of control. This was absolutely impossible in COVID era – I could not even volunteer my molecular skillset in any meaningful way to run qPCR tests when they were in short supply. This loss of agency felt particularly damning because of my personal life – my wife is a critical care/pulmonary medicine doctor at U-M and the ICUs were (are) completely overwhelmed by the pandemic. Sure, I could spray a trail of Lysol behind her when she'd come home exhausted after having her hands in COVID lungs and listen as she debriefed the traumas of her day, but there really was no ‘fixing’ anything ... just existing with uncomfortable truths. And I think that was a really valuable lesson in humility and, quite frankly, reality for me.”



The University of Michigan
Department of Ecology and Evolutionary Biology
2220 Biological Sciences Building
1105 North University Ave
Ann Arbor, MI 48109-1085
USA



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Stormy yet beautiful photo captures win for a rough 2020



Teresa Pegan



William Weaver



Rumaan Malhotra

1st place: Teresa Pegan

"Waves from an Alberta clipper at sunset" St. Joseph, Mich. Teresa Pegan

2nd place: William Weaver

"Cliff-hanger: A honey bee barely holding onto a sunflower petal" near Dexter, Mich.

3rd place: Rumaan Malhotra

"Alpenglow on Volcan Osorno, as the moon rises" southern Chile

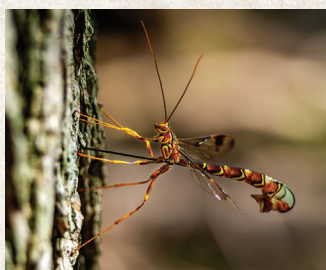
Honorable mentions

William Weaver "A female giant ichneumon wasp (*Megarhyssa macrurus*) drilling into a tree preparing to lay eggs" Detroit

John David Curlis "Fer-de-lance" Panama

John Den Uyl "Summer solstice, UMBS" Michigan

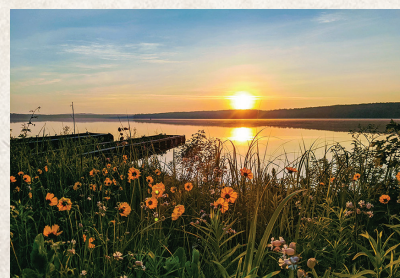
The 13th annual photo contest was held in memory of David Bay, "photographer at large" for EEB and its predecessor departments for 34 years. The 2021 contest is underway. View all photos in a Google photo album at myumi.ch/XeZVB



William Weaver



John David Curlis



John Den Uyl