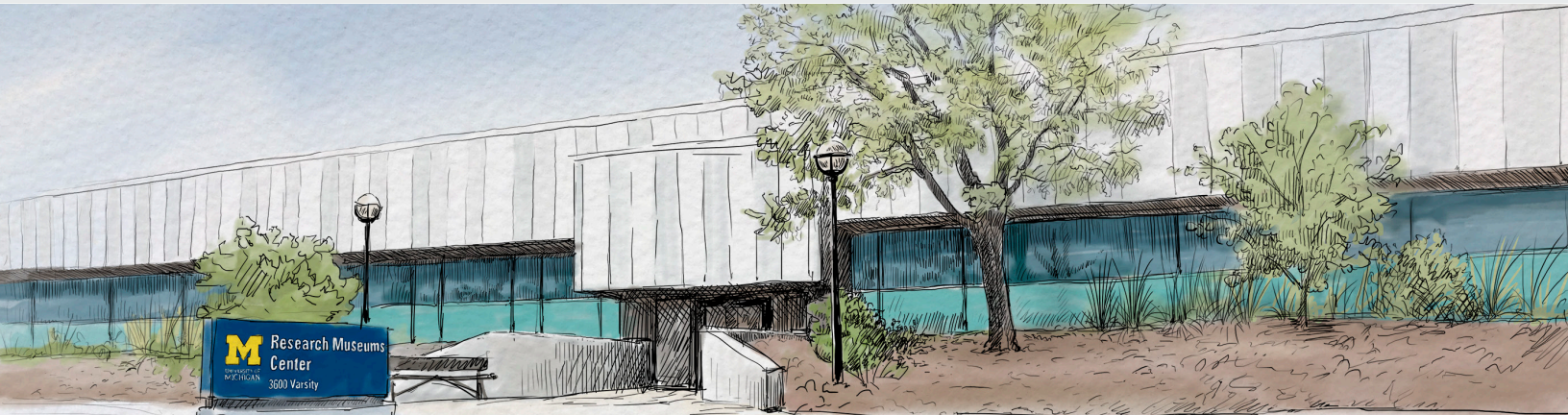




THE UNIVERSITY OF MICHIGAN
DEPARTMENT OF ECOLOGY AND EVOLUTIONARY BIOLOGY
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Research Museums Center

A convergence of minds, collections, resources

To think that the origin of nearly 15 million specimens located at the state-of-the-art Research Museums Center can be traced back to a Cabinet of Natural History stored in a faculty member's home 180 years ago. The first objects brought to campus in the late 1830s included bird skins, pressed plants and pieces of copper from the Upper Peninsula.

The collections were temporarily located in a house being built in 1841 for Douglas Houghton, who had been appointed first professor of chemistry, pharmacy, mineralogy and geology at the University of Michigan. The specimens had been stored in boxes and researchers were clamoring to examine at least a portion of the collections. Later that year, the natural history cabinet was moved to a space in what's now known as Old Mason Hall. Houghton led the first Michigan Geological Survey in 1837,

which continues to be an important scientific endeavor today. On these expeditions, he amassed valuable and impressive natural history collections that were presented to U-M.

The University of Michigan's College of Literature, Science, and the Arts invested more than \$35 million to renovate 97,000 square feet (that's larger than one-and-a-half football fields) at the RMC and move collections that were located at the Ruthven Museums Building from the Museums of Anthropological Archaeology, Paleontology and Zoology to the newly expanded facility on Varsity Drive in Ann Arbor. Situated some five miles south of central campus, the Herbarium has been located at the RMC site since 2001. The migration of zoology specimens will be completed in early 2018 when the mollusks finish their journey.

see RMC, page 9

Carrying it forward: from U-M Frontiers to a Ph.D. and beyond

Senay Yitbarek (Ph.D. EEB 2016) and Theresa Ong (Ph.D. EEB 2017) are the first two University of Michigan EEB Frontiers master's students to graduate with their doctoral degrees from EEB. Both were advised by Professor John Vandermeer.

The goal of the Frontiers Program, which launched in 2008, is to increase participation by underrepresented groups in the graduate study of ecology and evolutionary biology at U-M and beyond. This program has been a major reason behind EEB's success in raising the proportion of minorities of the department's graduate students since 2008.

"The Frontiers program was like a

second family for me at Michigan," said Ong. "Having a group of people who came from a background similar to my own was invaluable to me as I progressed through the master's and doctoral programs. I could always count on members of the Frontiers program to understand the difficulties of being a minority in a majority serving institution, and also for just being resources whether it was data analysis, project planning or funding ideas. Everyone in the Frontiers program looks out for each other and that is probably its most important aspect. We want to see each other succeed because any success is a success for us all."



alumni profile

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Diarmaid Ó Foighil
Chair and Professor of Ecology and
Evolutionary Biology
Curator, Museum of Zoology

Greetings from the Department of Ecology and Evolutionary Biology. This is my fourth *Natural Selections* chair column and I would like to take the opportunity to share with you a snapshot of our department at a major inflexion point in its history. We are a department on the move, both physically and programmatically!

This academic year is significant not just for it being the University of Michigan's Bicentennial. As the University enters its third century, the EEB department is about to relocate from the Kraus Natural Sciences Building, the home of the biology program since 1916, to a spectacular new \$260 million Biological Sciences Building, currently in the final phase of construction just north of the Ruthven Building. We will move in by the summer of 2018 and it will allow us to co-locate our entire faculty for the first time in the department's history. Meantime, our fabled Museum of Zoology collections are completing their migration from the Ruthven building to join the Herbarium, Museum of Paleontology and Museum of Anthropological Archaeology in a renovated Research Museums Center on Varsity Drive – see lead article in this issue.

In addition to massive investment in our infrastructure, we are currently experiencing a major pulse of faculty recruitment. Over the past year, we have hired, or made commitments to hire a total of nine talented new faculty members. It is no exaggeration to say that the EEB department

that makes its home in the new Biological Sciences Building will be a substantially new department. Two of our new hires are featured in this issue. Assistant Professor Jake Allgeier is an ecosystems ecologist whose research program is giving us new insights, both empirical and conceptual, into the role that consumer-derived nutrient cycling, and fish behavior, play in the functioning of coastal marine ecosystems. Assistant Professor and Curator of Birds Ben Winger is an evolutionary ecologist and ornithologist and the major theme of his research is the influence of dispersal and migration on the evolution of biogeographic ranges, speciation and community assembly.

Our department has an outstanding faculty. That's not just my opinion; it's corroborated by the prestigious awards they regularly win, many of them in the face of intense competition with their U-M peers. For instance, just this year, EEB faculty have won (amongst others) a Distinguished University Professorship (Mark Hunter), Collegiate Professorship (Trisha Wittkopp), Thurnau Professorship (Deborah Goldberg), Henry Russel Award (Dan Rabosky), John Dewey Award (Catherine Badgley) and the inaugural President's Award for Public Impact (Meghan Duffy). The Thurnau Professorship recognizes extraordinary contributions to undergraduate teaching and this is the second year in a row that an EEB faculty member has won, bringing our total to three. See profiles of our remarkable Thurnau Professors – Goldberg, Wittkopp and Vandermeer – in this issue.

If you are in need of inspiration or hope for the future, you must read the article profiling two of our recent doctoral graduates, Theresa Ong and Senay Yitbarek. These impressive young scientists joined the department through our NSF-funded Frontiers Master's Program. Its goal is to act as a stepping-stone for students from a non-traditional background interested in obtaining a doctorate in ecology and evolutionary biology. Drs. Ong and Yitbarek were the first Frontiers students to obtain their doctorates through EEB and both have now embarked on exciting postdoctoral studies – read all about it.

There's always something of interest happening in our department. Keep in touch via our webpage and social media and do come and pay us a visit when you are next on campus, either in Kraus and Ruthven (before May 2018) or in the new Biological Sciences Building and Research Museum Center. You are most welcome to drop in!

Best Wishes,

Diarmaid Ó Foighil



ALWAYS INNOVATING. FOREVER VALIANT.

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photo credit: Dale Austin

EEB's three Thurnau Professors demonstrate commitment to undergrad teaching

Arthur F. Thurnau Professorships are the highest honor for undergraduate teaching at the University of Michigan. They recognize a strong commitment to students including excellence and innovations in teaching and learning, working effectively with a diverse student body, a demonstrable impact on students' intellectual or artistic development, and contributions to undergraduate education beyond the classroom or lab. Five faculty receive this distinction each year and hold the title for the remainder of their career. They are named for alumnus Arthur F. Thurnau and supported by the Thurnau Charitable Trust.

The Department of Ecology and Evolutionary Biology is exceptionally proud of its three current Thurnau Professors: Deborah Goldberg (2017), Patricia Wittkopp (2016) and John Vandermeer (1994).

Deborah Goldberg

Goldberg's visionary leadership led to the establishment of two prescient, transformative programs that have had outsized and growing impacts on undergraduate STEM education: M-Sci (formerly M-Bio) and Authentic Research Connection.

Goldberg, also the Elzada U. Clover Collegiate Professor of EEB, served with distinction as chair of EEB from 2003-2013. In 2010, Goldberg started the Michigan Biology Academy Scholars program, M-Bio, a high school-to-college two-year transition program. M-Bio aimed to increase the number of undergraduates with degrees in biology by creating a support system for students with high ability and potential, but who might not otherwise be successful at a large, highly competitive research university. She also obtained a \$600,000 scholarship grant from the National Science Foundation to support M-Bio.

M-Bio launched in 2011 with 20 students, working with a program in the College of Engineering as a model. Early success encouraged Goldberg to expand to all the natural sciences in the College of Literature, Science, and the Arts and a program name change to M-Sci. She worked with the natural science chairs and developed a partnership with engineering in successful efforts to obtain a \$2 million, five-year M-STEM NSF grant.

In 2014, M-Bio officially transformed into M-Sci with Goldberg continuing as LSA's faculty director. To date, 235 undergraduates have participated in M-Bio/M-Sci. The participants comprise a much more diverse community than LSA undergraduates as a whole. However, when compared to undergraduates with similar backgrounds, M-Sci students are more likely to stay in STEM programs. She has been working with the college to see how to extend M-Sci beyond the NSF grant.

"The goal is to build a supportive community of students – one of the most important things for the success of M-STEM."

Deborah Goldberg

"Within the past few years, diversity, equity and inclusion issues have rightly attained first-rank prominence at the University of Michigan," said Diarmaid Ó Foighil, EEB professor and chair. "Deborah not only realized its importance years ago, she acted on it, with truly ground-breaking results that are making a real difference in a substantial number of lives."

Protecting livelihoods and food sources for Caribbean islanders

If you're ever in need of a good story, just ask scientists what sparked interest in their field. Take Jacob Allgeier, ecosystem ecologist, a new assistant professor in the Department of Ecology and Evolutionary Biology. His childhood was spent casting fishing rods into creeks and rivers in Kentucky.

Before he embarked for college, he developed an obsession for the Amazon. "Everything I was doing, getting into college and moving forward, was trying to get there," he recalled. The obsession led Allgeier on a series of paths, including research technician positions in – you guessed it – the Amazon. Nearby, in the Orinoco River basin, he met his closest colleague, a doctoral student at the time, Craig Layman, who was working on rivers in Venezuela. Years later, he somewhat grudgingly (because of his laser focus on the Amazon) joined Layman for a tidal creek restoration project in The Bahamas.

"I camped on a spit of land between a mangrove swamp and the ocean for six months." The intense experience was a turning point for the young scientist who had to hike two miles to get to the mouth of a tidal creek where he camped solo, fished and snorkeled. His first glimpse of the breathtaking underwater vistas blew him away.

"It was insanely alive." Although he had gotten somewhat accustomed to caiman and crocodile neighbors in the Amazon, he said the abundance of sharks in the tropical waters "scared the hell out me."

The underwater visibility in tropical marine systems is in stark contrast to the waters of the Amazon,

where Allgeier said, "you can't even see your hand," which lead to dangers such as pulling caimans in with nets and traps.

Given the combination of opportunities to study relevant conservation issues and the underwater experience, he never looked back. Much of his research takes place in tropical coastal ecosystems (mangroves, seagrass beds, and coral reefs) where he studies gradients created by anthropogenic impacts to test theory directly within the context of environmental change and biodiversity loss. Coral reefs are clearly in decline. "We need to start thinking of alternative ways these systems are functioning."

He said that coastal benthic researchers hadn't previously thought a lot about marine systems from an ecosystem ecology (or whole system) perspective. "Ecosystem ecology is more about nutrient and energy flow," he explained. Ecosystem ecologists are less concerned with the identity of what's doing what and more with what the system is doing.

Allgeier's research combines an ecosystem ecology approach with community and population ecology, which are more traditionally used in the coastal marine setting. His doctoral dissertation generated data that allowed them to start asking bigger questions. Since then, his research has produced first-of-a-kind large data sets for Caribbean (and now Pacific) coastal ecosystems. The data sets have a variety of applications such as understanding the role of biodiversity, community structure and fishing pressure for mediating nutrient dynamics at the ecosystem scale.

see Allgeier, page 7



Winger's research to consider the evolution of avian migration

Imagine you're in a thick and lush cloud forest. With each step, you sink into the deep cushion of decaying leaves and moss. A misty layer of cloud cover is suspended at the canopy diffusing the sparse rays of sunlight permitted entry through the towering trees. The trees are covered in moss and ferns making them difficult to walk between. Almost everything is sopping wet, including your muddy clothes. The air is redolent with the ground cover. Birds are a rare sight through the mist, but you catch a fleeting glimpse of a large, colorful flock of foraging tanagers as they flicker through the trees. It's invigorating to try to see them all before they disappear into the clouds.

You've just gone on a virtual journey to an Andean cloud forest, a study site of (suitably named) Benjamin Winger, one of the newest faculty in the Department of Ecology and Evolutionary Biology and the curator of birds at the University of Michigan Museum of Zoology. Winger has been with the department for two years as a postdoctoral scholar of the Michigan Society of Fellows. On Sept. 1, 2017, he began his new appointment.

While in the Andes, the researchers rely on pack animals and often porters to help them carry their gear through challenging terrain into the field. They have to carry a multitude of supplies for preparing specimens, including a large liquid nitrogen tank, which is always difficult to transport up and down muddy trails. To reach the most remote sites, they have to cut trails with machetes and carry everything in backpacks because mules can't traverse those trails. Some of their toolkit essentials include binoculars, sound recording gear, and mist nets for capturing and studying understory birds.

Winger became interested in birds when he was 12 years old on a family trip to Wyoming, with friends who were casual bird watchers. "I thought it was really neat that you could use the field guide to identify birds," he recalled. Back home in Cleveland, he met some local birders who took him on numerous bird watching expeditions during his middle and high school years. That inspired his future undergraduate studies of avian biology and ecology and evolution at Cornell University, well known for ornithology. He became involved in research projects early on.

"It's a real dream come true to teach Ornithology at a university like Michigan and have the collection available to teach about biodiversity."

He earned his doctorate degree at the University of Chicago, spending most of his time at the Field Museum, where his advisor, Dr. John Bates, worked. Winger trained in museum science and curatorial endeavors at the Field Museum and at Cornell.

When he's in the field, Winger works mainly in the cloud forests of the central Andes, and in the boreal forest of North



photo credit: Dale Austin

America. However, future work will take him and his lab to many different locations.

An early career highlight for Winger was in 2008 when he and his colleagues discovered a new species of barbet in the remote Sira mountains of Peru, which they named the Sira Barbet (*Capito fitzpatricki*). "That was on my first expedition after finishing undergrad, so needless to say that was incredibly exciting," he said. "Few people have been able to access its habitat to see it since then."

Broadly, Winger's research seeks to understand biogeography, why birds are found where they are in time and space as well as the process of speciation. A big question his research asks is why do we see tremendous diversity in color patterns through the avian tree of life? "I'm quite interested in how the processes of geographic isolation leads to different color patterns in closely related bird populations."

In addition, he has a strong interest in all aspects of avian migration. From a research perspective, his particular interests are in evolutionary aspects of migration including why birds migrate to particular locations and not others. He spent much time watching migratory birds and witnessing spectacles of migration in far-flung locales and as near as in the Great Lakes region.

Alumni profile from page 1

Dr. Ong is an NSF postdoctoral biology research fellow in the area of Broadening Participation of Underrepresented Minorities in Science. As such, “I have the luxury of designing my own project and working with three amazing scientists: Simon Levin, Princeton University, Stacy Philpott (U-M EEB Ph.D. 2004), University of California, Santa Cruz, and Brenda Lin, Commonwealth Scientific Industrial Research Organization.”

Ong’s project is an extension of her dissertation work on the complexity of urban agricultural systems. Ong will examine the rate, tempo and patterns of transitions in land-use from vacant lots to urban gardens to urban development projects in California using historical aerial imagery combined with dynamic modeling. She plans to link the transitions to a combination of socioecological drivers including food security, precipitation and income levels.

“Frontiers not only changed the playing field of who gets to do science but has also expanded the types of questions that are being asked.” Senay Yitbarek

In an effort to broaden participation of underrepresented minorities in science, Ong will work with a youth group in the Community Action Network called Growing Justice. This group is composed of children of farmworkers who use urban agriculture to supplement low incomes. Santa Cruz, Calif. is experiencing rapid gentrification, and as a result, many of these families are currently losing their homes and access to urban agriculture. As part of her postdoc, she will share the maps she develops of historical transitions in land-use with Growing Justice, and work with them to better understand what drove land-use transitions in the past in their neighborhoods and how this information may be used in the future to retain land for urban agriculture. She’d ultimately like to have a tenured faculty position and would like her research to improve food and cities by making both more sustainable, ecologically robust systems.

Dr. Yitbarek credits the Frontiers program with exposing him to the rich diversity of research done in ecology and evolution. “My greatest strength, and admittedly weakness, is my interest in a wide range of biological topics and for that reason the Frontiers program within EEB served as a perfect environment.”

Frontiers allowed the young scientist to maintain an open mind while he gained necessary research skills. “This flexible approach eventually led me to find my own path.”

He notes that the Frontiers program signified a major cultural shift within the department. “As part of the first Frontiers cohort, I was fortunate to witness the rapid demographic changes of the graduate student body in the department. Frontiers not only changed the playing field of who gets to do science but has also expanded the types of questions that are being asked.”

“My advisor, John Vandermeer, played a crucial role in my development as a scientist. John’s enthusiasm got me interested in theoretical ecology, particularly in the spatial dynamics of populations, and under his guidance I was able to develop those skills.”

Yitbarek is likewise an NSF Postdoctoral Research Fellow in the area of Broadening Participation of Groups Underrepresented in Biology at UC Berkeley. “This fellowship provides a great degree of intellectual freedom while benefitting from active support by my mentor Mike Boots at UC Berkeley, who is a leading theoretical disease biologist.”

Yitbarek’s current research focuses on the evolution of host-parasite interactions in spatially structured environments. In particular, his research addresses the effects of host and parasite dispersal on the evolution of life-history traits such as transmission or mortality. The evolutionary outcome depends on the interplay between within-host and between-host levels of selection. To address these questions, Yitbarek is utilizing experimental evolution and modeling approaches to understand how dispersal shapes the evolution of host-parasite interactions.

This research expands from his dissertation work which focused on the population level consequences of spatial structure on multi-species coexistence. “I hope that my research contributes to revealing hidden patterns in complex systems.”

Yitbarek will be partnering with the Biology Scholars Program at UC Berkeley to mentor underrepresented students and guide them in developing independent research projects to prepare them for graduate school. “Empirical research is showing that the rate of scientists from underrepresented minority (URM) backgrounds has significantly increased over the last three decades. It’s therefore important that we connect the pool of URM scientists with academic hiring. I hope that my outreach work can aid in that process, because I am the direct result of it.” His career goal is to become a professor at a research institution.

Mark Hunter, the Earl E. Werner Distinguished University Professor of Ecology and Evolutionary Biology, directed Frontiers from the first cohort entering in 2008 through the 2011-2012 academic year. Professor Thomas Duda became director in 2012. The success of the Frontiers program inspired the Rackham Graduate School’s successful proposal to NSF’s bridges to the baccalaureate program to expand the model to several other science, technology, engineering and math (STEM) departments in the College of Literature, Science, and the Arts.

“Some students are attracted to the program to explore research themes and broaden their knowledge base,” said Duda. “Others want to know if graduate studies in biology are the right track for them. The program provides students with opportunities to achieve these goals through its established structure and wealth of supportive personnel in EEB including faculty, students and staff.”

Allgeier from page 4

The overarching goal of Allgeier's work is to estimate the flow of nutrients and energy going into and out of an ecosystem, a coral reef system, for example. In particular, he is interested in the role of animals that hold nutrients in their tissues and excrete nutrients via their urine, which contains nitrogen and phosphorous that helps plants and coral grow. This quantification allows researchers to see how humans, by adding nutrients (like fertilizer runoff or sewage) or removing fish, are changing the model.



photo credit: Richard Appeldo

One application of this research is the use of artificial reefs. Allgeier and his crew dive and laboriously stack hundreds of cinder blocks underwater to build artificial reefs. The blocks create an ideal experimental system with many holes for fish to hide. His approach targets basic conservation questions like how to increase fish in a system for people to eat. They've been working with artificial reefs for over eight years.

Allgeier's research shows that fish urine is one of, if not the, largest sources of nutrients to coral reefs. The impact of fish urine is much larger than was expected and was not considered until recently.

However, a challenge is how to quantify how much fish biomass is being created by the artificial reefs. Their next step will be to dive more deeply into these questions by tagging and monitoring the movement of fish on and off the artificial reefs, for example.

Allgeier and Layman are working in The Bahamas and Haiti, a nice island combination for pairing theory with conservation. Much of The Bahamas' coastal system is generally healthy, while Haiti's is heavily degraded. They can apply what they learn in The Bahamas to Haiti to see if they can increase the numbers of fish.

Their block reefs are a potential tool to help to rebuild fisheries and, possibly, coral reefs. Their pilot studies are designed to see if locals will agree not to fish certain small-scale areas around artificial reefs and whether this will increase fish numbers. In theory, if you don't fish a certain area, fish will

multiply until there's a spillover effect of growing fish populations in neighboring reefs.

While it takes about four years to see a strong effect from the artificial reefs, when they returned this summer, the density of fish on a one-year-old reef was more than most fisherman have seen in a lifetime with seagrass grown high around the reef.

Their research has shown that their artificial reefs enhance primary production that can be described as a cycle: More fish habitat leads to more fish > More fish means more fish urine (or pee) > Fish pee makes sea grass grow bigger > Bigger sea grass provides more food for invertebrates (such as lobsters, crab, shrimp and coral) > More invertebrates means more food for fish and people > And, if we protect the coral reefs, fish can grow bigger and produce more baby fish. And the cycle continues.

"To be able to ask questions in parallel with communities and their livelihood adds a really fulfilling aspect to the research." The researchers have produced educational posters and films on conservation and ecology (in English and Haitian Creole), and talked to hundreds of school kids and community members about their work. He said the positive response they get back is tremendous. They are now extending questions beyond the Caribbean to the Pacific.

Along the way, the research partners have worked with the United Nations and the Nature Conservancy to perform habitat assessments that help identify areas of highest conservation need. As a result of their work, the U.N. designated the first national marine park in Haiti. They continue to collaborate with the U.N. on other projects, including extending their artificial reefs within the park.

This fall, back in Ann Arbor, Allgeier is teaching a course he developed, Coastal Ecology and Sustainability. His professional and personal interests overlap seamlessly. "I'm an avid

"Conservation is not just a lofty ideal of the privileged world, but a concept that is integral to the lives of the poorest of fishermen, the web of life we depend on is still salvageable even in the most damaged of places."

mountain person." He likes to climb, hike, fish and backpack and recently returned from an expedition to the Himalayas. He's traveled extensively with a penchant for "super remote places and learning about people and cultures. I'm always outside. Even at my house, I sit outside all the time."



Watch video [Pipi Pwason myumi.ch/JYj7P](https://www.youtube.com/watch?v=PipiPwasonmyumi.ch/JYj7P)

Thurnau from page 3

In addition, Goldberg is the principal investigator of a successful five-year \$1.5 million Howard Hughes Medical Institute proposal called “Does authentic research in introductory courses increase persistence in STEM?” This innovative program incorporates faculty-led research projects into special sections of the large enrollment introductory lab courses in chemistry and biology.

By winter 2018, six Authentic Research Connection streams will be established across introductory biology, introductory chemistry and organic chemistry. Topics include the human microbiome, evolution in action, solar cell technology, snow chemistry, storm water chemistry (at U-M Biological Station), and cancer medications, with still more research streams in development for fall 2018.

Goldberg’s newest project is to develop non-residential learning communities based on a model from University of California, Riverside, whose program was particularly noted for the success of underrepresented STEM students. Students will enroll in the same sections of science or math courses for the first year, share study groups and take a one-credit faculty seminar.

“The goal is to build a supportive community of students – one of the most important things for the success of M-STEM,” said Goldberg. The community pilot program starts with four learning communities in winter 2018 and will help determine the feasibility of scaling up to include more students.

Goldberg has had many undergrads in her research lab, which works on plant community responses to climate change and invasions and she is a prolific mentor. “I love being around young enthusiastic students. I’m especially concerned about supporting students who are traditionally underrepresented at Michigan and in science more generally: underrepresented minorities, first generation college students and low-income students.”

The programs she’s developed provide social support and guidance in navigating the many valuable resources available to students at U-M. Her best advice to today’s undergrads is to use the resources the university has to offer. “Michigan has tremendous resources, both on campus and in the alumni network – we can reach around the globe to people ready and willing to help you.”

Goldberg recently announced that she will retire in 2019. Following this last year of teaching, she will take a retirement furlough year and then move to Tucson, Ariz. “I need my mountains and desert.”

During her final year, she hopes to get her STEM education programs transitioned. “I’m not going to really retire. I’m going to keep working on research, on programs to broaden participation in science, and on teaching, but at a different pace.” Upon retirement, Goldberg will have been at U-M for 36 years. “I’ve had a fabulous career here. It’s really meaningful to have gotten the Thurnau as I finish.”



Patricia Wittkopp

Wittkopp began a faculty position at U-M in 2005, where she is now the Sally L. Allen Collegiate Professor in the Department of Ecology and Evolutionary Biology, Department of Molecular, Cellular, and Developmental Biology, Center for Computational Medicine and Bioinformatics, and LSA Honors Program.

“Trisha is a world-renowned evolutionary geneticist who has made fundamental contributions to our understanding of the evolution of gene regulation and its role in morphological variations within and between species,” said Ó Foighil. The first course she taught at U-M was BIO 305: Introduction to Genetics. Wittkopp and her coteacher restructured it from a conventional lecture course to one that incorporated evidence-based teaching strategies and introduced a new textbook, leading to improved enrollment and teaching evaluations.

“I first heard of her through her work reforming Bio 305,” said Tim McKay, Arthur F. Thurnau Professor of Physics, Astronomy, and Education, and director of the LSA Honors Program. “This course is both completely central to the education of biologists and extremely difficult. This was a daunting job for anyone to take on – she volunteered to do it as a new assistant professor.”

Wittkopp developed a new LSA Honors Program course while working with EEB Professor Meg Duffy to substantially reform Bio 171: Introduction to Ecology and Evolution. “I don’t think one can ask for more evidence of a strong commitment to teaching and learning,” said McKay.

To date, Wittkopp has trained 31 undergraduates in her lab in addition to graduate students and postdoctoral fellows. She co-advised 19 undergrads. Five undergrads have written honors theses on research in her lab. Her best advice to undergraduates is to “take the time early in your college career to learn about effective (and efficient) study habits.” She recommends strategies that force you to recall the information you are trying to learn.

“She has not only had an impact on my studies while a student at the university, but on the person I am today.”

Xuan Ouyang

Her reach extends outside the university with educational opportunities she’s provided for elementary through graduate students. For example, she developed activities for girls in 3rd - 8th grades for the Females Excelling More in Math, Engineering and Science capstone events. Many of the students she’s reached out to are members of groups currently underrepresented in science.

Wittkopp has also been a central figure in interdepartmental



Alumni from page 6

"My enjoyment in working with students is witnessing their growth and successes. The most fun is attending their thesis defenses and seeing the expertise and accomplishments that they achieved during their time in the program," said Duda.



Best advice for young science students

"Science is fundamentally about confronting one's stupidity. This can make research feel hard at times because it's about finding answers to the unknown. Yet, the more we feel comfortable about our stupidity to the unknown, the better we become at making scientific discoveries. My advice is to embrace stupidity."

~Senay Yitbarek

"Take the classes that interest you because you will never know what you are really passionate about if you don't try a lot of different things. But, don't forget the math classes, they are more important than you think."

~Theresa Ong

RMC from page 1

"The unification of these biodiversity and cultural museums will facilitate cross-disciplinary interactions, with the potential for new academic directions and improved stewardship of our invaluable collections," said Christopher Dick, associate chair for museum collections. "The enlarged facilities will also provide new spaces for specimen-based classroom activities."

A major reason for the move was to rehouse the research collections of the four museums in a single location that is in compliance with modern safety and environmental standards.

The renovated space features:

- Environmentally controlled collection space, with temperature and humidity conditions optimized for each collection
- Preparatory laboratories, research space, museum libraries and offices

"These collections are the result of the work of thousands of scientists for over one hundred years, and the move to the RMC will allow us to preserve that legacy for generations to come."

LSA Dean Andrew Martin

- New archival metal specimen cabinets and compact storage for specimen and paper collections
- A demonstration room for teaching and public programs
- Modern molecular biology laboratory
- Expanded liquid nitrogen facility for curating DNA and tissue samples

"The work in this facility, along with the collections it houses, will have a continuous impact on ongoing research," said LSA Dean Andrew D. Martin, "on everything from climate change to the impact of declining habitat on species."

Advantages abound from the convergence of museum collections. Previously, the Herbarium and UMMZ worked independently whereas now, they will more easily be able to share their wealth of knowledge to operate more efficiently. An example is a recent move from separate databases by unit to a common software system for the collections database. Hand in hand with that initiative is a renewed emphasis on digitizing data to make it available to the world, facilitating further scientific use of the collections. Naturally, as a result of the move, there were efforts to catalog everything, which prompted database initiatives and grant proposals geared toward stewardship of collections. "We have field notebooks, artwork, things that have been out of sight and out of mind," said Dick, which has led to the question, "how will we curate it?"

There will be increased opportunities for discussion among museum directors, curators and staff about program direction, problem solving and how to achieve goals as a more unified natural history and cultural museums center.



see RMC, page 11

Winger from page 5

“More recently, I’ve started thinking about how climate change impacts migratory birds,” he said. “I’ve started working with data from museum specimens on how climate change is affecting morphology – the size and shape of migratory birds – on rather remarkably short time scales.”

Winger said that while there are many predictions about how climate change will impact migratory birds, research varies in terms of the actual impact of climate change on bird populations, and that the answers are often complicated. Researchers have a lot of work to do.

“We can use museum specimens to look back 40 to 60 years and then make predictions about the future,” he said. “We are seeing that beak size is decreasing in many migratory birds and wings are getting longer. We have a great time series available to use through the collections. Using the collections, we can make some exciting, or potentially depressing inferences, about what’s happening.”

Genetic testing allows researchers to identify changes such as population size through time and shifts in migratory patterns. There are some indications that population size and migratory patterns may be changing as a result of climate change.

Part of Winger’s field work involves sampling migratory birds from throughout their breeding ranges and creating corresponding reference maps. For example, researchers only have general ideas of where warblers flying through the United States on their way to Central and South America began their journey. But through genetics, they can pinpoint their origin

and ask whether and how that’s changed through time.

To date, his studies have looked at the migratory behavior of species using geographic data to make inferences rather than studying the behavior of individual birds. However, Winger plans to track individual birds in the future using new miniature tracking technologies, potentially with students. “I hope to start doing some tracking of migration. The technology now is quite extraordinary, we can get transmitters on very small birds.”

The dispersal of birds, including how they find habitat, is difficult to study. “Each year, when baby birds hatch and fly off, we have limited ability to know where they go. Before the young breed for the first time, they fly thousands of miles to their wintering grounds and back again to their first breeding site, and so much can happen during this time.” Researchers can learn a great deal using transmitters and trackers and genetics provides another perspective. “They’re powerful when they’re used together.”

As curator of the bird collections, Winger oversees 200,000 specimens of birds. “We don’t always know how they’ll be useful in the future, which is one of the most important aspects of collections – new uses are always emerging.”

Today’s technology allows researchers to look at things such as the chemical composition of feathers, and the genetics of birds 200 years old. Scanning and electron microscopy provides a look inside specimens in ways that are breaking new ground. “My role as curator is to nurture this record of biodiversity, to protect and grow the collection. We’re always looking for new ways to use the collections to increase the reach of their impact.”

To Winger, the best part of his job is the wide variety. “In any given year, I’ll be in the field, doing analytical work, computer and lab work, teaching, and of course always looking forward to the next field trip and the next expedition.”

Winger estimates he’s seen some 2,000 bird species. “I haven’t yet spent any time in Australia, New Guinea or southeast Asia, so I look forward to visiting those regions to see the many endemic birds.”

Winger taught Ornithology during fall 2016 as a Michigan Fellow and will teach it again in fall 2018. “It’s a real dream come true to teach this class at a university like Michigan and have the collection available to teach about biodiversity,” he said. “Most universities don’t have these collections. At U-M, we have two-thirds of the world’s bird diversity at our disposal.” That, along with the faculty, combines for what he calls a great experience. “I hope to be teaching here for a long time,” he said. “It’s a wonderful and really diverse department.”

He likes living in Ann Arbor, nearby his family in Cleveland. His wife’s family is from Ann Arbor and affiliated with U-M, “so I feel right at home here,” he said.

He loves camping, cooking, trying to stay in shape, mainly by being outdoors and birding (of course).





Thurnau from page 8

efforts to foster STEM education reform. “Trisha has been involved from the start, helping to craft a proposal, which won a \$2 million NSF grant, and serving on the REBUILD faculty committee.” REBUILD stands for Researching Evidence-Based Undergraduate Instructional and Learning Developments.

“I so admire the life she leads – it’s a perfect example for our students,” said McKay. “A first generation college student who came to Michigan without privilege or wealth, she’s made it to the top in one of the most competitive parts of biology. This background makes her an ideal mentor for students of all kinds, but especially those who need it the most.”

In addition to the Thurnau, Wittkopp has been honored with multiple awards that include excellence in teaching as a major criterion. She’s been on the Education Committee for the Genetics Society of America and was the inaugural education officer for the Pan-American Society of Evolutionary Developmental Biology.

Wittkopp was one of undergraduate Jason Dowda’s first science professors for Introduction to Ecology and Evolutionary Biology. The course interested Dowda and he considered becoming a biology major, but his struggles gave him doubts. “She guided me towards efficient and effective methods for studying,” he said. “She saw a potential in me to do well in this course that I did not believe was possible before.” He credits his success in this course and courses to follow on the advice and skills he gained during office hours with Wittkopp.

Xuan Ouyang, a medical student, credits his success on the MCAT exam, in part, to Wittkopp’s instruction in class. “The way she instructed us to analyze literature has stuck with me through the years. She has not only had an impact on my studies while a student at the university, but on the person I am today.”

John Vandermeer

Vandermeer is widely recognized for his outstanding accom-



plishments in teaching, mentoring, research, writing, and diversity outreach. He was awarded the Harold R. Johnson Diversity Service Award from the U-M Office of the Provost in 2013. The research interests in the Vandermeer lab cross many boundaries including forest ecology, tropical agroecology, and theoretical ecology. His most recent project is unraveling the complex interactions associated with the production of coffee in southern Mexico and Puerto Rico. He always has a full contingent of interested students working in his lab. Vandermeer is the author or co-author of 16 books and almost 250 scientific papers.

Accepting a faculty position at the University of Michigan in 1970, he encountered a campus ablaze with political activism ripe for initiating discussions of race. His teaching immediately reflected “the intellectual ferment gripping the campus at that time. Marston Bates had only recently passed, and his very popular course Zoology and Human Affairs seemed like a perfect vehicle for putting together a politically oriented approach to biological subjects. Thus was born Biology 101 – Biology and Human Affairs, a course I have been teaching for some 40 years. Its current title is Food, Energy, and Environmental Justice, reflecting the changed imperatives of the current world.”

Vandermeer has taught courses at universities in Costa Rica, Nicaragua, Mexico, Brazil, Austria, Italy, India and Puerto Rico, where he said he experiences the diverse intellectual stimulus that is the reward of teaching a diversity of students. In addition to BIO 101, Vandermeer has recently taught Field Ecology and the Ecology of Agricultural Ecosystems at U-M and has taught many thousands of students over the last 47 years.

Vandermeer also bears the title of Asa Gray Distinguished University Professor of Ecology and Evolutionary Biology. In addition to EEB, he is formally affiliated with the Center for the Study of Complex Systems, Michigan Center for Theoretical Physics, School for Environment and Sustainability, Latin American and Caribbean Studies, and American Studies.



RMC from page 9



Graduate students will be able to incorporate a multi-disciplinary perspective into plant and animal research. “We want the program to be strong and vital and something students find to be a valuable part of their experience at EEB,” said Dick. “Michigan is uniquely positioned to train students in museum science and collection-based research.”

There is potential to develop field expeditions that traverse labs and units, to engage students across fields. Many UMMZ and Herbarium faculty curators have ongoing research projects worldwide incorporating multiple interests. They’re considering how to engage grads and undergrads with exciting research that helps build the collections. Additionally, more community outreach is being planned through faculty’s memberships with local natural history groups.

“These collections are the result of the work of thousands of scientists for over one hundred years, and the move to the RMC will allow us to preserve that legacy for generations to come,” said Martin.



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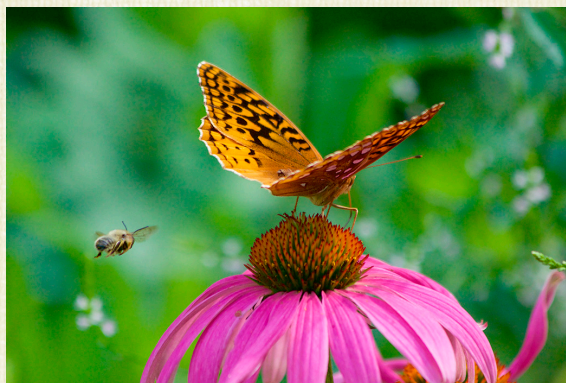


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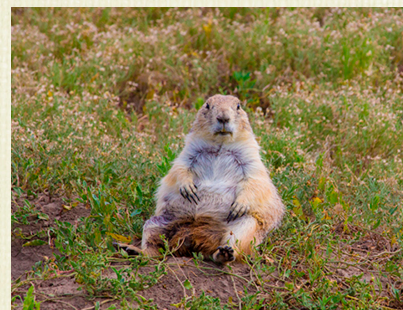
Moments in time captured: EEB Photographer at Large Contest 2016 highlights



Stephen Smith "Out of My Way"



Stephen Smith "Always a Line"



Chuan Li "Prairie Dog's Day of Zen Meditation"

EEB Honorary Photographer at Large Contest 2016

Stephen Smith "Out of My Way," Michigan

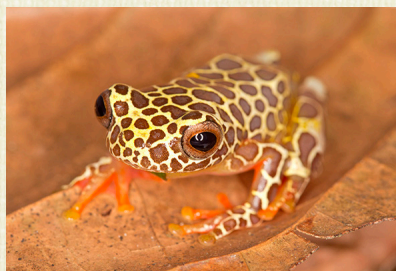
Stephen Smith "Always a Line," Ann Arbor, Mich.

Chuan Li "Prairie Dog's Day of Zen Meditation," South Dakota

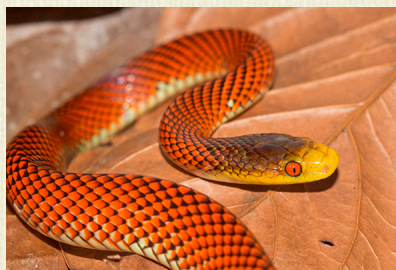
Pascal Title "*Dendropsophus Triangulum*," Peruvian Amazon

Pascal Title "*Oxyrhopus Formosus*," Peruvian Amazon

Talia Moore "Pebble Mimic," Western Australia



Pascal Title "*Dendropsophus Triangulum*"



Pascal Title "*Oxyrhopus Formosus*"



Talia Moore "Pebble Mimic"

The ninth annual photo contest was held in memory of David Bay, "photographer at large" for EEB and its predecessor departments for 34 years. View all of the 2016 photos: myumi.ch/aG20E The 2017 contest is underway.



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