MICHIGAN STATE UNIVERSITY

Department of Zoology

THE INTEGRATIVE STUDY OF ANIMAL BIOLOGY

NEWSLETTER FOR ALUMNI AND FRIENDS **SUMMER 2013**

From the Department Chair...

In my first message as department chair, I want to acknowledge the efforts and successes of outgoing chairperson Fred Dyer, introduce myself, say a few words about the importance of stability and change, and touch briefly on how critical the support of alumni, donors and friends is to the MSU Department of Zoology.

First, thank you to Fred. Ten years ago, he agreed to take on the responsibilities of department chair despite commitments to his lab group and his leadership of a large National Science Foundation (NSF)–funded graduate training project. Fred worked hard, he worked smart and he helped revitalize the department at a time of shrinking budgets. I've learned a great deal from Fred and I will continue his efforts to revitalize the department.

Second, who am I? Many of you know me already. I have been an MSU faculty member in the Department of Zoology and at the Kellogg Biological Station for 27 years. My research focus is behavioral ecology and my best known work uses mathematical models to address fundamental questions about social interactions. I teach MSU's honors course in introductory organismal biology and a graduate professional development course. My graduate training and K-12 outreach efforts are organized around our NSF GK-12 graduate training project, BEACON education programs and my own lab group.

Third, some thoughts on stability and change. Every healthy organization has to balance what sociologist Thomas Kuhn called "the essential tension" between stability and change." Evolutionary biologists see this as the challenge of "evolvability:" systems have to be able to change and adapt to thrive, but not be so jumpy that they squander their strengths by chasing every opportunity. We have to anticipate and adapt to the changing needs, opportunities and constraints that we will encounter over the next decades, but we need to do it wisely. Over the past decade, zoology faculty members have taken leading roles in key cross-disciplinary initiatives including the MSU Global Water Initiative; the NSF Long-Term Ecological Research Project; the BEACON Center for the Study of Evolution in Action; the Ecology, Evolutionary Biology and Behavior Program; the Great Lakes Bioenergy Research Center; and the Neuroscience Program. Our work has grown to encompass the whole tree of life. It reaches across all levels of biology and across spatial and temporal scales from molecular to global and from milliseconds to eons. We have many proud traditions, including a tradition of innovation.

Fourth, why do we need your support? *Rising above the Gathering Storm: Revisited*, a recent report from the National Academies, sounded an alarm and gave a call to action. The well-being of the citizens of the United States depends on the extent to which we can recruit, develop and retain talented people in science, technology, engineering and math, collectively known as STEM. A major impediment is the cost of providing inspirational research experiences to undergraduates who are ready to catch fire with the right spark. Even modest endowment support and internship opportunities can have a huge impact. Our success depends upon our ability to develop additional support similar to that provided by the Jeffrey Boettcher Fund, the Dr. Marvin Hensley Endowed Scholarship Fund and the Karl A. Stiles and James W. Butcher Award.

Our graduate training programs are among the best in the world. We've built these programs with highly competitive federal, state and MSU funds. As funding from these sources tightens, endowment support will become increasingly critical. The George H. Lauff Scholarship, the T. Wayne and Kathryn Porter Graduate Fellowship, and the George J. Wallace and Martha C. Wallace Endowed Scholarship Award have had a tremendous impact on our ability to sustain a world-renowned graduate training program, and we will need more such support in the future.

A few inspirational faculty leaders can raise the level of performance of everyone, including our students. It is becoming increasingly difficult to recruit, set up and retain exceptional faculty members. The addition of a single endowed faculty chair would make a significant difference to the future of MSU Zoology.

I encourage you to contact me with questions, comments and suggestions. I am looking forward to working with you to sustain and grow our proud traditions of excellence and innovation.

Thomas Getty, Ph.D.
Chair
Department of Zoology

ALUMNI CLASS NOTES

Ken Howland, zoology, '61, a retired high school history teacher, is writing his autobiography and is promoting foreign policy awareness in the Finger Lakes region of upstate New York and in Fort Lauderdale, Fla.

Robert Husband, Ph.D., zoology, '66, retired from Adrian College 16 years ago, but continues to do research. He published two papers in March on a new mite from Japan and a second new species from the United States.

J. Whitfield Gibbons, Ph.D., zoology, '67, heads the Environmental Outreach and Education Program at the Savannah River Ecology Laboratory near Aiken, S.C.

Stanley Kantor, zoology, '68, was reappointed to the clinical faculty as clinical assistant professor of family medicine at the University of Washington School of Medicine, Seattle, Wash., in June.

Barry Stringfield, zoology, '69; M.S., anatomy, '73; M.D., '75, is working as a hospitalist in internal medicine in Greensboro, N.C.

Max Terman, M.A.T, zoology, '69; Ph.D., zoology, '73, is involved in the study of golf courses as wildlife habitat and has also written novels about the Civil War.

Christy (Wuerfel) Ziegler, zoology, '70, retired from Northwest Airlines in 2009 after a 34-year career as an airline pilot. She is remarried and is enjoying life with her husband in Arizona.

Richard Hoover, Ph.D., zoology, '72, is a professor in the pathology, microbiology and immunology department, and associate dean in the graduate school at Vanderbilt University, Nashville, Tenn.

Ajit Sodhi, Ph.D., zoology, '73, retired from Banaras Hindu University, Varanasi, India, in Sept. 2011, as a professor of biotechnology and dean, faculty of science, after a 38-year career there.

Donald Straney, zoology, '73; M.A.T., zoology, '73, is the chancellor at the University of Hawaii at Hilo.

Bruce A. Fenderson, zoology, '74, is a professor of pathology, anatomy and cell biology at Thomas Jefferson University, Philadelphia, Penn.

Mary Manner, zoology, '78; M.S., zoology, '87, promotes early childhood advocacy and does strategic planning in Traverse City, Mich.

Steven Loring, M.S., zoology, '79; Ph.D., zoology, '83, is interim head, Department of Fish, Wildlife and Conservation Ecology at New Mexico State University, Las Cruces, N.M.

Kurt Titze, zoology, '82, was appointed Doctor of Chiropractic to the State of Michigan Worker's Compensation Advisory Board by Gov. Rick Snyder in January.

Paul Bologna, zoology, '88, is the director of aquatic and coastal sciences at Montclair State University, Montclair, N.J.

Jennifer (Huskins) Mertz, zoology, '92; M.S., zoology, '96, is a zoology and mammalian physiology lab coordinator at Central Michigan University, Mt. Pleasant, Mich.

Pegine Walrad, zoology, '93, accepted a Research Lectureship position in the Department of Biology/Centre for Immunology and Infection at the University of York, U.K., at the beginning of 2012.

Kenneth Filchak, zoology, '94, was promoted to director of undergraduate studies for environmental science at the University of Notre Dame in Indiana.

Andria Molina, zoology, '98, published a book, *A Guide to Tarot and Relationships*, earlier this year.

Merritt Gillilland, zoology, '99; M.S., zoology, '02; Ph.D., zoology, '06, is a research fellow in the Division of Gastroenterology at the University of Michigan Medical School, Ann Arbor, Mich.

Dale Telgenhoff, Ph.D., zoology, '02, is an associate professor of medical laboratory science at Tarleton State University, Fort Worth, Tex.

Erin Burkett, zoology, '07, completed her master's degree in natural resources and the environment at the University of Michigan, Ann Arbor, Mich.

Brad Krzyzanowski, zoology, '07, was recently promoted to assistant lead keeper of the Small Mammal-Reptile House at Lincoln Park Zoo, Chicago, Ill.

Michael Driscoll, zoology, '08, is studying holistic health with a goal of treating a variety of conditions and concerns including PTSD, musculoskeletal pain, post injury recovery and addiction recovery.

Carrie Jacobs, zoology, '08; D.V.M., '12, completed an internship at the University of Pennsylvania, New Bolton Center, and was offered a residency in large animal surgery.

Melissa Jaroneski, zoology, '08, is a veterinary technician at the Theater of the Sea, Islamorada, Fla.

Situnyiwe Chirunga, zoology, '10, is a microbiologist in the quality control department at Emergent BioSolutions in Lansing, Mich., and has been accepted into MSU's College of Veterinary Medicine class of 2017.

Natalie Knorp, environmental biology/zoology, '11, completed her master's degree in environmental sciences at Florida Atlantic University and is starting her Ph.D. at Tennessee Tech University.

Katie Leatherman, zoology, '11, was hired as an animal husbandry technician at the Orlando Science Center in Florida.

Emily Nickols, zoology, '11, is pursuing her master's degree in environmental science at Florida Gulf Coast University, Ft. Myers, Fla.

Shayne Ballou, zoology, '12, is working on his DVM and an MBA at St. Matthews University School of Veterinary Medicine, George Town, Grand Cayman, West Indies.

Lindsay Lipe, zoology, '12, was accepted to Long Island University's genetic counseling program (at the C.W. Post Campus) beginning this fall.

Rachel Posavetz, zoology, '12, was hired in May by the Michigan Natural Features Inventory as a seasonal contractor for Michigan Tech Research Institute's project funded by the EPA to help map the Great Lakes coastal wetlands.

Sarah LoPresto, zoology, '13, will enter the veterinary technology program at MSU this fall.

In Memoriam

Martin Balaban, MSU professor emeritus, died October 14, 2012. Balaban joined the faculty in 1964 and retired in 1999. His research focus was behavior. Balaban was a founder and the first head of the Neuroscience Program at MSU. He received his Ph.D. from the University of Chicago in 1959.

Neal R. Band, MSU professor emeritus, died October 12, 2012. Band was a faculty member in zoology from 1963 until his retirement in 2005. His research focus was behavior and cell biology. Band received his Ph.D. from the University of California, Berkeley, in 1958.

Thomas Burton, MSU professor emeritus, died June 1, 2013. Burton was a faculty member with the department for more than 32 years. He served as chairperson of the department and director of the Biological Science Program from 1996 to 2000. Burton's research focused on wetland ecology and restoration, and he was a pioneer in the bioassessment of the Great Lakes wetlands. He received his Ph.D. in aquatic ecology from Cornell University in 1973.

William Cooper, professor emeritus, died November 7, 2011. Cooper was a faculty member in the department for more than 30 years, and served as its chairperson from 1981 to 1987. His research spanned four continents and included the first use of submarines on the Great Lakes and Lakes Tanganyika and Malawi in Africa. Cooper received his Ph.D. in ecology from the University of Michigan in 1964.

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Alumni Profile

Sasha Fawaz: Dedicated to Student Success

Sasha Fawaz received the 2013 College of Natural Science Alumni Association's Recent Alumni Award in April from Fred Dyer (left), former zoology department chairperson, and R. James Kirkpatrick, CNS dean.

Sasha Fawaz (B.S., zoology, '08) has dedicated her life to science education and making sure every child has the opportunity to be successful in whatever they choose to do.

Fawaz, who taught science for Detroit and Chicago Public Schools for four years, was recognized by MSU this spring for her accomplishments. She received the 2013 Recent Alumni Award during the College of Natural Science Alumni Association annual awards ceremony held at the MSU Union on April 12.

Currently a manager of teacher leadership development with Teach for America, she oversees 17 high schools, working with science teachers to design curriculum, expand opportunities for students to attend college and attain scholarships, and expose students to STEM careers.

Last year, Fawaz designed curriculum for English, reading, math, and science, and ran an ACT club six days of the week. Last June, her school's science ACT growth was 12th in the city out of 122 high schools and was the highest in the charter network's history.

Fawaz has not taken a summer off since she began teaching. Last summer she worked with 80 new teachers from five major cities to prepare them for careers as urban educators.

She pays out of her own pocket to take her students to the zoo, the Field Museum and the Museum of Science and Industry to share her knowledge gained while studying zoology at MSU.

She has also taken her students to visit four Big Ten universities, including MSU. Her room is full of Michigan State posters, facts, and admissions information, encouragement for her students to strive to be admitted to MSU one day. In fact, two of her former students did attend MSU and served as captains of MSU's basketball team.

Fawaz completed her master's degree in secondary education from National Louis University in Chicago, and plans to earn her doctorate in educational leadership from Harvard's Graduate School of Education.

"I truly love this work because I love people; I don't just teach students for 45 minutes every day, I work to become a part of their families," said Fawaz. "Once you're in the place where you know the work is truly about the good people you're working with and for, you'll never be able to turn away. This fight chose me because I was a part of it and can envision the faces around me on Ward St. in West Detroit who didn't have the same outcome I did."

Evolving computer programs shed light on how animals compete for mates

Mate choice and sexual displays are widespread in nature; but examining how and why sexual displays evolve is challenging in natural systems. So MSU researchers have created "promiscuous" computer programs in a virtual world called Avida to model how real-world biological mate attraction plays out.

Using a novel software environment, researchers in MSU's BEACON Center for the Study of Evolution in Action are able to program digital organisms known as "Avidians" to compete and reproduce.

When Avidians copy themselves, mutations occur. These digital organisms evolve, just like living things, explained Charles Ofria, associate professor of computer science and engineering and creator of Avida.

"Avida lets us see what happens over thousands of generations of evolution in just a matter of hours, and we can evolve dozens of populations all at the same time," Ofria said.

When the researchers programmed the Avidians with the ability to grow sexual displays and to choose mates randomly, they usually went for the showiest mates, just as the researchers predicted. But why?

"One school of thought argues that the main benefit of choosing an attractive partner is that your offspring also will be sexy," said Ian Dworkin, associate professor of zoology, who co-authored the study—along with Ofria and MSU postdoctoral researcher Chris Chandler. "In the other camp are those who argue that these sexual ornaments are a sign of good health, and so choosing a showy mate ensures that you'll get good genes to pass on to your offspring."

Charles Ofria (left) and Ian Dworkin discuss the results of a recent experiment using Avida, an artificial software platform created by Ofria to study the evolutionary biology of digital organisms.

These two different hypotheses are actually more connected than previously thought. Even when the ornaments first evolve because of sexy sons, they rapidly evolve to become indicators of quality.

Traditionally, biologists thought that ornamental displays clue in potential mates about an individual's virility because the structures are costly, biologically speaking; only an animal in really good health could bear the burden they impose. So the researchers altered Avidians' genetic code to allow them to grow exaggerated displays practically for free.

They expected this change to diminish the evolutionary benefits of preferring showy mates, since even the wimpiest of Avidians could now grow enormous digital tail feathers.

"I was surprised when we didn't find that at all," said Chandler, who is now assistant professor of biological sciences at SUNY Oswego. "Even when we eliminated the costs of these displays, they still evolved to be an indicator of a male's genetic quality."

Dworkin, Chandler and Ofria plan to continue using these Avidians to explore the mysteries surrounding mate choice and its evolutionary consequences.

"Avida is a useful tool because it allows us to ask questions that would otherwise be very difficult to answer," Dworkin said. "Studying nature is important, but sometimes you need a model system that's easy to manipulate, and that's exactly what Avida provides."

Faculty Honors

Kay Holecamp, professor of zoology, was named a 2013 AAAS Fellow by the American Association for the Advancement of Science. Holekamp was honored for her distinguished contributions to animal behavior, particularly behavioral endocrinology and the evolution of sexual dimorphism, with a focus on spotted hyenas in the wild.

Alexander Shingleton, associate professor of zoology, received a 2013 MSU Teacher-Scholar Award in recognition of his enthusiasm for teaching and for establishing a highly successful research program in integrative developmental biology. He was also the recipient of a 2012-13 CNS Teacher-Scholar Award, which recognizes faculty members who, early in their careers, have earned the respect of students and colleagues for their devotion to and skill in teaching.

Stephen Thomas, assistant professor of zoology, received a 2012-13 CNS Undergraduate Teaching Excellence Award. This award recognizes instructors who take pride in and are committed to quality undergraduate teaching, and who demonstrate substantial continuing involvement in undergraduate education.

Seabird bones may reveal human impact on oceanic food webs

A research team led by MSU and Smithsonian Institution scientists has discovered that changes in open-ocean food webs may be due to human influence.

By analyzing the bones of Hawaiian petrels—birds that spend the majority of their lives foraging the open waters of the Pacific—they found that the substantial change in petrels' eating habits coincides with the growth of industrialized fishing.

The birds' dramatic shift in diet leaves scientists pondering the fate of petrels as well as wondering how many other species face similar challenges.

"Our bone record is alarming; it suggests that open-ocean food webs are changing on a large scale due to human influence," said Peggy Ostrom, study co-author and MSU zoologist. "Our study is among the first to address one of the great mysteries of biological oceanography—whether fishing has gone beyond an influence on targeted species to affect nontarget species and, potentially, entire food webs in the open ocean."

Excavated bones of Hawaiian petrels—birds that spend the majority of their lives foraging the Pacific—show substantial change in the birds' eating habits.

Much research has focused on the impact of fishing near the coasts. In contrast, the open ocean covers nearly half of the Earth's surface. But due to a lack of historical records, fishing's impact on most open-ocean animal populations is completely unknown, according to lead author Anne Wiley, formerly an MSU doctoral student and now a Smithsonian postdoctoral researcher.

"Hawaiian petrels spend the majority of their lives foraging over vast expanses of open ocean," Wiley said. "For thousands of years, they've captured a variety of fish, squid and crustaceans from a large portion of the North Pacific Ocean, and a record of their diet is preserved in their bones."

By studying the bones' ratio of nitrogen-15 and nitrogen-14 isotopes, researchers can tell at what level in the food chain the birds are feasting.

Developing the isotope timeline for the Hawaiian petrel took considerable effort from many people—ranging from conservation managers in the Hawaiian Islands to radiocarbon specialists—to find and analyze the large number of modern and ancient bird samples necessary for the work.

Between 4,000 and 100 years ago, petrels had high isotope ratios, indicating they ate prey from higher in the food chain. After the onset of industrial fishing, which began extending past the continental shelves around 1950, the isotope ratios declined, indicating a species-wide shift to a diet of smaller fish and other prey significantly lower in the food chain.

Addressing fishery impact through a chronology of bones is remarkable. Most marine animals die at sea, where their bones are buried on the ocean bottom. But after three decades of fossil collection in the Hawaiian Islands—the breeding grounds of the Hawaiian petrel—co-author Helen James of the Smithsonian Institution and her colleagues have amassed a collection of more than 17,000 ancient Hawaiian petrel bones.

"The petrels breed in burrows and caves where, if they die, their bones are likely to be preserved for a long time," James said. "It's fortuitous to find such a rich bone record for a rare oceanic predator."

Wiley said her research work ranged from searching for fossil bird remains in Hawaiian caves, to visiting cloud forests and volcanic mountain tops where the endangered Hawaiian petrel breeds, to digging through museum collections, to working with colleagues in the lab developing stringent protocols for protein isolation.

"I was able to follow the birds from the Hawaiian Islands to the lab—from bird to bone to protein to isotopes," she said.

Wiley hopes that this research will help make a difference in people's perception of the open ocean.

"In many environments, including marine ecosystems, we have to deal with shifting baseline syndrome—the tendency of each generation to accept lower and lower environmental health standards," she explained. "Most people don't experience the open ocean directly, so for them, there's no 'baseline' to shift, even though humans may impact the open ocean through what they decide to put on their dinner plates, as well as other choices.

"Our study is a small step toward learning the history of large, open ocean ecosystems, and identifying and solving the major problems caused by human influence," Wiley said.

Identifying ways for undergrads to experience forensic research

It's unusual for undergraduates to have an opportunity to conduct research in MSU's Forensic Biology Laboratory. But Drew Fischer and Matt Stoloff got the chance after completing a rigorous interview process with lab director David Foran, professor of zoology and of criminal justice.

Foran's lab is often presented with biological specimens of unknown origin from law enforcement agencies, medical examiners and sometimes the public.

"Our job is to examine and perfect techniques to determine, beyond a reasonable doubt—or actually, with complete scientific certainty—what it is," Foran said. "Forensic science is all about identification.

"If the sequence from an unknown hair comes back as *Odocoileus virginianus*, it is clearly from a white-tailed deer. If the sequence from a bloodstain comes back as *Homo sapiens*—expect a visit from the police!" Foran said.

By fall 2011, Fischer and Stoloff found themselves collecting known tissues from a wide variety of animals, such as fruit flies, axolotls, hyenas , sturgeon, and even pets and roadkill. With Foran's help, they collected about 60 species overall, including all classes of vertebrates, as well as insects, annelids, arthropods and crustaceans. DNA isolation was initiated, and amplification and sequencing followed.

David Foran (center), professor and director of MSU's Forensic Biology Laboratory, with Drew Fischer (left) and Matt Stoloff, selecting specimens for DNA analysis.

"As I became more experienced it became second nature," noted Fischer after hundreds of DNA sequencing reactions. "I looked forward to working in the lab every day because I knew I was fulfilling my passion and that what I was learning to do would make a difference."

One instance early on where Fischer's and Stoloff's research became critical involved a small, degraded rib fragment uncovered at the site where a Michigan woman stated her deceased husband claimed to have murdered and then deposited a young girl 10 years earlier. The species identification methods the two students developed were used, and the fragment was determined to be from a pig, not a human.

"Research experience is incredibly valuable," said Foran, who is also director of the graduate Forensic Science Program at MSU. "The labs that are part of courses are pretty superficial—you do a procedure once and then are done. There is almost nothing in life that you can become competent at by doing once. Working in a research lab, you get good at things. You also get a chance to live the laboratory life, and work closely with other people. It's not for everyone; it's good to learn that as well."

Since their work in Foran's lab, Fischer has graduated (genomics and molecular genetics, '13) and Stoloff is now a genomics and molecular genetics senior.

Fischer, Stoloff and Foran presented their research at the American Academy of Forensic Sciences annual meeting in Washington, D.C., in February 2013. It has also been submitted to the *Journal of Forensic Sciences* for publication.

New Faculty

Jason Gallant joined the department as an assistant professor in August. Gallant's research focuses on the genomic basis of novel phenotypic and behavioral traits as they relate to adaptation and speciation. He is currently working to publish the genome of the electric eel (*Electrophorus electricus*). Gallant received his Ph.D. in 2011 from Cornell University.

Matthew and **Ashlee Rowe** also joined the department in August.

Ashlee is a zoology assistant professor with a joint appointment in the MSU Neuroscience Program. Her research interests include sensory neurobiology and its role in the evolution of adaptive behavior. She received her Ph.D. in zoology with an interdisciplinary minor in genetics and statistics from North Carolina State University.

Matthew is a professor in the department. His research interests include conservation biology of at-risk birds, reptiles and amphibians, and the behavioral ecology of predator-prey interactions. He received his Ph.D. in ecology from the University of California, Davis, and has held positions at both Appalachian State University in North Carolina and Sam Houston State University in Texas.

Elise Zipkin will join the zoology department as an assistant professor in January 2014. She is currently a research ecologist with the U.S. Geological Survey (USGS) Patuxent Wildlife Research Center in Laurel, Md. Her research interests are in mathematical and statistical ecology, especially as it relates to population and community dynamics. Zipkin received her Ph.D. in biology from the University of Maryland in 2012.

World's warmer climate impacts phytoplankton communities

Warmer ocean temperatures could cause phytoplankton populations, such as the diatoms pictured in the inset above, to thrive near the poles and shrink in equatorial waters. These tiny marine organisms could have a major impact on climate change.

Warmer oceans and lakes could significantly alter populations of phytoplankton—which could have a major impact on climate change.

Research done by Elena Litchman, associate professor of zoology, and collaborators shows that by the end of the 21st century, warmer oceans may cause populations of phytoplankton to thrive near the poles and shrink in equatorial waters. Since these microscopic plants—which inhabit the upper sunlit layer of oceans and lakes—are at the base of aquatic food webs and play a major role in regulating carbon dioxide levels in the atmosphere, a drastic drop in populations could have measurable consequences.

"In the tropical oceans, we are predicting a 40 percent drop in potential diversity," said Mridul Thomas, a Ph.D. student in zoology who was one of the co-authors of the research. "If oceans continue to warm as predicted, there will be a sharp decline in the diversity of phytoplankton in tropical waters and a shift toward the poles in the thermal niches of species, if they don't adapt to climate change."

Along with Litchman and Thomas, plant biology doctoral student Colin Kremer, and plant biology associate professor Christopher Klausmeier, worked on the study.

Litchman, who works at the W. K. Kellogg Biological Station (KBS) in Hickory Corners, Mich., an MSU field research center, has been monitoring phytoplankton in Gull Lake and other lakes around KBS for eight years. However, her research is not totally centered in Michigan. She leads a five-university research team that is exploring planktonic food web structure at Lake Baikal in Siberia—the oldest and deepest lake in the world—and she recently worked with graduate students to investigate the effect of warmer oceans on phytoplankton.

More specifically, Litchman is studying Lake Baikal's biodiversity, which is fueled by a unique planktonic food web endemic to this water body, with organisms that are highly sensitive to rising temperatures and other human-induced stress.

"These organisms fuel the lake's incredibly diverse communities," Litchman said. "Human-induced global change is altering most ecosystems on Earth, and highly diverse ecosystems may be better buffered against change, maintaining key functions even as the environment changes."

The research team, which includes scientists from the University of California-Santa Barbara, Wellesley College, East Tennessee State University and the University of Texas, is focusing on key organisms found only in Lake Baikal. These organisms form the backbone of this ecosystem. The researchers want to map their genetic makeup and identify how they interact with the lake's other inhabitants. Based on the data gathered, the researchers will then create mathematical models to predict how phytoplankton and zooplankton will react and reorganize in the future.

"The main question is whether there is enough genetic and functional diversity in the endemic species to help them adapt and persist in the changing climate, or whether the lake's distinctive food web will collapse and be replaced by species found in other regions around the world," Klausmeier said.

Lake Baikal is a treasure trove of biodiversity and a unique natural laboratory in which to study evolution, according to Litchman.

"Our goal is to develop a model to predict how the ecosystem will respond to climate change," she said. "We hope this prototype can then help us forecast what will happen in similar ecosystems undergoing rapid warming."

Litchman recently earned a prestigious national award for her work on phytoplankton and global change. She was among 94 researchers honored by President Barack Obama as recipients of the Presidential Early Career Awards for Scientists and Engineers, the highest honor bestowed by the U.S. government on science and engineering professionals in the early stages of their research careers.

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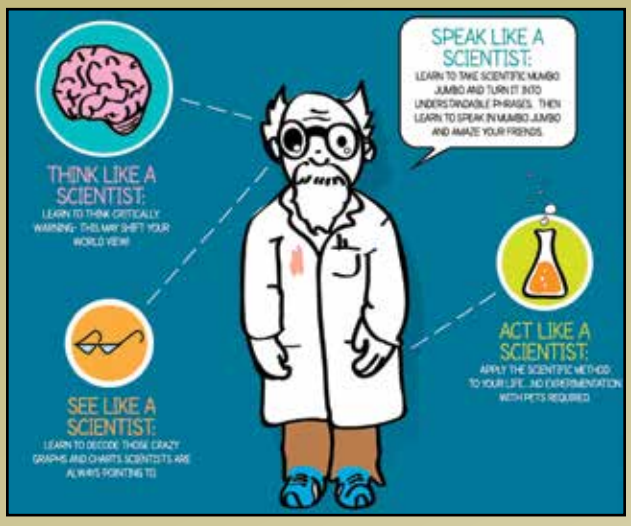
Foundations of Science MOOC attracts participants from around the world

How scientists communicate scientific information to non-scientists inspired Stephen Thomas and collaborators to create MSU's first, free Massive Open Online Course (MOOC). The course, which drew 1,100 participants from 37 countries around the world, focused on improving critical thinking skills and empowering people to make intelligent decisions.

"This MOOC was designed to help people become better evaluators of scientific claims," explained Thomas, assistant professor of zoology and one of the course creators. "The better we can prepare people to evaluate scientific findings, the less likely that pseudo-scientific concepts will be used as the foundation of policy or part of the general public dialogue."

Preliminary results from this seven-week offering, which ran from May 13 to June 28, show that 57 percent of the participants took the course for fun; 63 percent wanted to improve their understanding of science; 61 percent wanted to be better at critical thinking; and 38 percent wanted to learn about MOOCs.



MSU's first, free Massive Open Online Course was designed to help people become better evaluators of scientific claims.

"We saw a 10 percent increase in participants' critical thinking skills as a result of the course," Thomas said.

The course also served as a training experience for 23 graduate students who helped in the creation of curricular materials. Faculty and staff members with the College of Arts and Letters and LearnDAT created two new technologies for use in the MOOC that can now be used for face-to-face interactions, blended courses or online classes. In addition, librarians at MSU prepared materials to help with literacy skills.

"The goal is to continue to offer this course and to build upon what has been learned, but there are technological and procedural barriers that have to be addressed first," Thomas said. "We're looking forward to the next iteration."

Thomas' collaborators are Julie Libarkin, associate professor of geological sciences, and Matt Rowe, professor of zoology.