



# DEPARTMENT OF Zoology

THE INTEGRATIVE STUDY OF ANIMAL BIOLOGY

MSU College of Natural Science | Newsletter for Alumni and Friends

## From the Department Chair...

Last fall, I introduced myself, shared some thoughts about stability and change and asked for your support as we pursue our research and educational missions. Now I want to highlight some of the progress we've made and let you know about important changes we are making to help keep our department at the forefront of our field.

As we look to the future, we need to recognize and honor the people whose accomplishments laid the foundations we are building on. In this issue of the newsletter, we commemorate the life of one of our most distinguished faculty members—Jack King (see page 4).

***“... on July 1, 2015,  
the Department  
of Zoology will  
become the  
Department  
of Integrative  
Biology.”***

The future of the department is already being shaped in the labs of our energetic, new assistant professors. This newsletter features stories about four of them—Sarah Evans, Jason Gallant, Ashlee Rowe and Elise Zipkin (see pages 8–11).

We are actively engaged in several searches and hiring initiatives and we are optimistic that we will be introducing more new faculty members in next year's newsletter.

Another important staff addition to our department is our communications manager,

Katie Licht (see page 5). Katie is an alumna who has returned to help us with advising and with getting our stories out. Please visit our website regularly and read the many exciting stories Katie is posting. I also encourage you to contact Katie at lichtkat@cns.msu.edu to share your stories.

Perhaps the most exciting news I have to share with you is that, on July 1, 2015, the Department of Zoology will become the Department of Integrative Biology.

The Department of Zoology at MSU has grown and evolved quite a bit since 1861, when Manley Miles was appointed the first professor in the Department of Zoology and Animal Physiology at the Agricultural College of the State of Michigan. Over the years, the department has been repeatedly reorganized to better serve the students and faculty at MSU, the people of Michigan, the United States and the world. We have changed from the Department of Zoology and Animal Physiology to the Department of Zoology and Entomology, and then to the Department of Zoology and Geology before becoming the Department of Zoology in 1928.

The change to the Department of Integrative Biology supports MSU President Simon's call for us to be “Bolder by Design.”

Why integrative biology? To borrow a definition from University of California, Davis, Professor M. H. Wake, “Integrative biology—integrative science—bridges disciplines, and it works within and across levels of biological organization and across diverse taxa over time, short (ecological or physiological) and long (evolutionary).” Addressing the big biological challenges of the 21st-century, including sustaining biodiversity, ecological services and human health and well-being, will require an integrative approach that transcends traditional taxonomic boundaries.

If you look at our faculty and graduate student profiles or follow the news stories on our website, you will see that we've already become a department of integrative biology—working across subdisciplines and taxonomic groups to address 21st-century challenges. We can better serve our many constituencies if everyone understands who we are and what we do.

As we move forward, we are building on solid foundations and proud traditions in zoology. We want to continue to honor our alumni and our history. We will continue to offer a B.S. and B.A. in zoology and a B.S. in environmental biology/zoology. In addition, we will create a new B.S. in integrative biology.

We have a lot of work to do as we move forward. We will do our best to keep you informed and answer your questions. Please follow our progress on our website and send us your thoughts and suggestions. We will need your support to realize our full potential in the coming decades. The MSU Capital Campaign is underway, and it provides a great mechanism for you to support your vision for our future.

But first, please turn the page and enjoy the rest of this newsletter. You will see some of the people, honors, awards and initiatives that we are proud of across our whole community—from undergraduates to alumni. ♡



Thomas Getty, Ph.D.  
Chair  
Department of Zoology



**James Potchen**, M.D., zoology, '54, received the Michigan Radiology Society Gold Medal—the highest honor the society bestows.

**George Best**, zoology, '57, just celebrated 50 years working as an anesthesiologist. Best, who is now half-retired, ran track at MSU (pole vault) and still maintains contact with several of his former teammates.

**James Trosko**, Masters, zoology, '62; Ph.D., zoology, '63, recently retired as a “pointy-headed” professor in the MSU College of Human Medicine after 48 years.

**Darrell Campbell**, zoology, '68, is professor of surgery (transplantation) and chief medical officer at the University of Michigan Hospitals and Health Centers in Ann Arbor. He is the 2014 recipient of the U-M Institute for Policy and Innovation's Impact Accelerator Award.

**Edward Christoffers**, fisheries and wildlife, '69; Ph.D., zoology, '86, retired from the U.S. Fish and Wildlife Service (USFWS) in 2007 after 37 years in government service with both the Department of Commerce (NOAA/NMFS) and the Department of the Interior (FWS).

**George Divoky**, zoology, '69; M.A.T., zoology, '72, discovered a seabird colony in northern Alaska in 1973 that he has studied annually since 1975. This study of Black Guillemots on Cooper Island, Alaska, is one of the longest longitudinal bird studies in the Arctic and provides some of the best examples of the biological consequences of climate change vis-

à-vis studies of the recent snow and sea ice reductions there.

**Max Terman**, M.A.T., zoology, '69; Ph.D., zoology, '73, published the Civil War novel *Hiram's Hope: the Return of Isaiah*, in Aug. 2014. It is the sequel to his first Civil War novel, *Hiram's Honor: Reliving Private Terman's Civil War*.

**Diane Newman**, zoology, '70; M.S., parks and recreation resources, '75, is an adjunct professor in the MSU Residential College in the Arts and Humanities. She founded the premiere professional dance company of Lansing—Happendance—in 1976, and continues as director of the Happendance School. Her work in curriculum development in dance composition for private studio settings was featured in the Nov. 2014 issue of *Dance Teacher* magazine.

**Christina Kobland**, zoology, '71, is president of Native Return®, LLC and was recently awarded a U.S. patent on her invention, FlightTurf® – an ultra-low-maintenance grass designed for airfields that virtually eliminates mowing and deters wildlife from grazing on airfield turf space.

**N. Kevin Krane**, M.D., zoology, '72, is vice dean for academic affairs and professor of medicine at Tulane University in New Orleans, La. He recently received the Merrill Flair Award in Medical Education from the American Association of Medical College's Group on Educational Affairs.

**Clint Kilts**, zoology, '73; Ph.D., pharmacology, '79, is a professor and associate director for research at the Psychiatric Research Institute

and director of the Brain Imaging Research Center at the University of Arkansas for Medical Sciences in Little Rock. He became the Wilbur Mills Chair in Addiction Science on Dec. 3.

**Ajit Sodhi**, Ph.D., zoology, '73, retired three years ago as a professor of technology and dean of faculty of science in the School of Biotechnology at Banaras Hindu University in Varanasi, India.

**Archie Vomachka**, Ph.D., zoology, '76, retired from Arcadia University on Sept. 30 after 26 years. He was a professor of biology and served as chair of the biology department for 13 years. In 2011, he was appointed founding dean of the College of Health Sciences.

**Stuart Meyers**, D.V.M., zoology, '77; D.V.M., '86, is a professor in the Department of Anatomy, Physiology and Cell Biology in the School of Veterinary Medicine at the University of California, Davis.

**Doreen (Santioni) Odziana**, zoology, '79; medical technology, '80, has been teaching chemistry and physics at Paw Paw High School since 1994. She published a book titled *A Collection of Chemistry and Physics Labs* in 2008.

**Kimberly Rizzo Brock**, zoology and fisheries and wildlife, '80, opened her own consulting business, Brock Consulting Services, LLC, in 2012. She provides physician office safety and laboratory compliance assistance in the West Michigan area and also consults in Mohs surgery histotechnology.

**Cindy (Smith) Krol**, zoology, '83, recently received an award from the Women's Dermatological Society in recognition of her outstanding outreach activities for sun safety and skin cancer awareness and education. This past August, she coordinated the nation's largest one-day free skin cancer screening event at Chicago's North Avenue Beach.

**Jeffrey Larkin**, M.D., zoology, '88, is chairman of the Department of Pathology and chief laboratory medical director of the Naples Community Healthcare System (a Mayo Clinic Network member) in Naples, Fla., where he has practiced anatomic and clinical pathology for the past 13 years.

**Vernadette Simon**, zoology, '93, has worked at the Mayo Clinic in Rochester, Minn., for 10 years. She works in the Medical Genome Facility, which is a part of the Mayo Clinic's Center for Individualized Medicine (CIM).

**Susan (Philp) Goetz**, zoology, '96, owns and operates All Under 1 Woof!, a dog daycare and in-home training facility in Rochester, Mich.

**Chris Carmichael**, M.S., zoology, '97; Ph.D., zoology, '84, has worked as associate director of collections and horticulture at the University of California Botanical Garden at Berkeley for the past 14 years. In June, he received the American Public Gardens Association's Professional Citation for service to the field of public horticulture.

**Donna (Molnar) Malaski**, zoology and microbiology, '98; M.A., student affairs administration, '00, recently received her Ph.D. in education (with a higher education administration cognate) from Oakland University in Rochester, Mich.

**Sarah Navarro**, zoology, '99; M.S., zoology, '01, was selected as a 2014 Grosvenor Teacher Fellow. This fellowship, focused on geographic-literacy education, is offered through a

partnership with National Geographic and Lindblad Expeditions. In September, she traveled aboard the *National Geographic Explorer* vessel as it circumnavigated Newfoundland.

**Merritt Gilliland III**, zoology '99; M.S., zoology '02; Ph.D., zoology and ecology, evolutionary biology and behavior, '06, was recently appointed to a faculty position in the Division of Gastroenterology at the University of Michigan Medical School in Ann Arbor.

**Shannon (Shaw) Cervený**, zoology, '02, is the associate veterinarian at the San Antonio Zoo in Texas. She recently became board certified in zoological medicine.

**Amy M. Nicols**, D.V.M., zoology, '05, graduated from the Ross University School of Veterinary Medicine in St. Kitts in the Caribbean in May 2013.

**Ryan Alderson**, zoology, '06; M.B.A., integrative management, '14, is a product/market manager for the Anatomic Pathology Marketplace at Cardinal Health in Dublin, Ohio. In 2012, he received his M.S. degree in biological sciences from Western Michigan University in Kalamazoo, Mich.

**Gabriel Yedid**, Ph.D., zoology and ecology, evolutionary biology and behavior, '07, is an associate professor at Nanjing Agricultural University in Nanjing, China. He just received a grant from the National Natural Science Foundation of China to use digital evolution to examine the emergence of stable ecosystems.

**Sasha Fawaz**, zoology and psychology, '08, is the K-12 director of college readiness in the Chicago Public Schools. Fawaz also has a zoology club with more than 360 students signed up to participate.

**Michelle (Wcisel) Jewell**, zoology, '08, worked in South Africa studying great white shark and Cape fur seal behavior, earning her M.Sc. from the University of Cape Town in 2013.

She has been featured on *Scientific American's* list of best shark biologists and conservationists to follow during Discovery Channel's Shark Week.

**Situnyiwe Chirunga**, zoology, '10, is a second-year veterinary student at MSU's College of Veterinary Medicine and plans to work in a small-animal practice in the state following graduation in 2017.

**Meagan Gilbert**, zoology, '12, was accepted to veterinary school at Ross University School of Veterinary Medicine in St. Kitts in the Caribbean. She started in May 2014.

**Karen Beatty**, zoology, '13, started a new job in August with the Natural Resource Group, LLC, in Charlotte, N.C., as an associate natural resource consultant.

**Beth Pynnonen**, zoology, '13, is a wildlife care manager at a wildlife hospital in Tucson, Ariz.

**Sarah Scott**, zoology, '14, and Kirk Mason, another recent graduate, will be moving to Kibale, Uganda, to assist with the construction of two classrooms at Bigodi Secondary School, teach English and help with other projects at the school. (See story on page 12.)

## Contact Us

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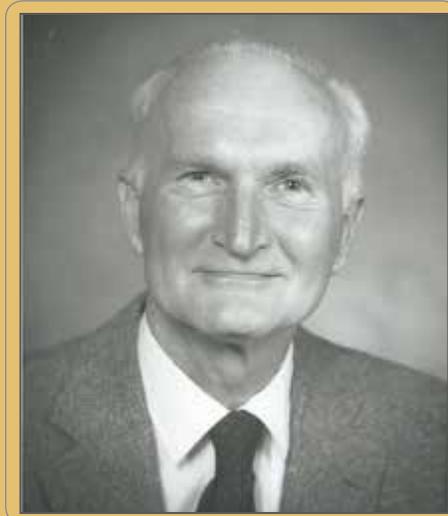
## In Memoriam

**J**ohn (Jack) Arthur King, emeritus professor of zoology, died Sept. 22, 2014, at his home in Rapid River, Mich. He was 93 years old.

During his tenure at MSU (1961 to 1986), King taught and did research on animal behavior, especially the effects of the interaction between hereditary and environmental factors. His work centered on the way in which the behavior of animals is affected by the experiences that they have early in life. He was the editor of *Biology of Peromyscus*, published in 1968, which became the bible for people working with *Peromyscus*, or white-footed mice, also called deer mice.

King was a member of numerous professional societies and was a founding member and president of the Animal Behavior Society, a nonprofit scientific society dedicated to the study of animal behavior.

Professor Richard Hill was a colleague of King's for more than 20 years.



King

"Jack was the 'go to' guy on animal behavior at the time, and he was very committed to the zoology department," said Hill, who contributed a chapter on physiology to King's book. "For many years, Jack and his wife, Joan, would have the entire department—more than 100 people—to

their home near Williamston for a picnic. He wanted to invigorate all the people who worked in the department."

King graduated with a B.S. degree from the University of Michigan in 1943 and then served in the U. S. Army Air Corps as a pilot of a B-17 bomber during WWII. Following his discharge, he returned to the University of Michigan in Ann Arbor and received his Ph.D. in zoology in 1952.

King was a staff scientist at the Jackson Laboratory in Bar Harbor, Maine, from 1951 to 1960. In 1960-1961 he was a senior fellow at the University of Edinburgh in Scotland and the University of Münster in Germany. King was the associate editor of *Ecology* from 1959-1962.

In retirement, King enjoyed writing stories based on his experiences as a young man with a passion for the natural environment. He had enduring friendships with his many graduate students and their families. King is survived by his wife of 65 years, Joan (McGinty) King, a daughter and son, and two grandchildren.

## Faculty Honors

Professor **Stephen Hamilton**, associate director of the W.K. Kellogg Biological Station, was honored by the Michigan Environmental Council (MEC) with the 2014 Petoskey Prize for Environmental Leadership. Hamilton also received an MSU Curricular Service-Learning and Civic Engagement Award for his work with the Kalamazoo Watershed Council (an organization that he founded) and with the Kalamazoo River Oil Spill in 2010.

**Stephen Thomas**, zoology assistant professor, and **Louise Mead**, a zoology adjunct faculty member and education director for BEACON, took top honors at the 2014 Michigan State University AT&T Faculty-Staff Instructional



Hamilton



Thomas



Mead



Cognato

Technology Awards, which recognize the university's best efforts at incorporating technology into enhancing teaching and learning. Thomas and his collaborators received the award for best online course, Integrative Studies 202: Applications of Environmental Organismal Biology. Zoology 890-601: Evolutionary Biology for Non-Life Scientists, taught by

Mead, received the award for the best technology-enhanced course.

**April Cognato** was the recipient of the 2014-15 James D. Hoeschele Endowed Teaching Award. The award, given by MSU's Center for Integrative Studies in General Science awards committee, recognizes faculty excellence in teaching science to non-science majors.

## New Faculty & Staff



Evans

Sarah Evans joined the zoology department as an assistant professor in August 2014. She works at the W.K. Kellogg Biological Station and has a joint appointment in the Department of Microbiology and Molecular Genetics. Her research focuses on how microbial communities respond to environmental variability.

Prior to coming to MSU, Evans had a National Science Foundation postdoctoral fellowship at the University of California, Irvine, where her research focused on using theoretical modeling as a tool to study microbial communities. She also participated in a fellowship program for young scientists in Vienna, Austria, at the International Institute of Applied Systems Analysis during the summer of 2012. Evans received her Ph.D. in ecology from Colorado State University in 2012.

In April 2013, the MSU Department of Zoology welcomed back 2009 alumna, Katie Licht. Licht is a native Michigander who has been a diehard Spartan fan since elementary school. Prior to her East Lansing return, Katie earned her M.S. in behavior analysis and therapy at Southern Illinois University, became a board certified behavior analyst and worked in several laboratories at the U.S. Army Medical Research Institute of Chemical Defense.

Although initially hired as a full-time academic advisor, Katie now juggles her undergraduate advising responsibilities



Licht

with her role as zoology's communications manager. Her communications goals are to make department news more accessible, expand the department's photography archives, design and update zoology's campus displays, and help the department reconnect with alumni. Want to share your story? Send captioned photos and narratives to [lichtkat@msu.edu](mailto:lichtkat@msu.edu).

## Key Grants

Heather Eisthen, associate professor of zoology, and Barry Williams, assistant professor of zoology, received a \$510,000 grant from the National Science Foundation to investigate the evolution of pheromonal communication in amphibians (salamanders and frogs). As part of their research, Eisthen and Williams will trace the evolutionary link between antimicrobial compounds that amphibians produce in their skin and the potential cooption of these compounds for use as pheromones. This research is important because it will provide biologists with a tractable case for studying the molecular mechanism involved in animal communication systems. In connection with the work, the researchers will give talks at the Fenner Nature Center in Lansing, Mich., on chemical defenses used by animals.

Thomas Getty, professor and Department of Zoology chairperson, is part of a multi-disciplinary research team that has been awarded a five-year, \$6.9 million grant from a National Science Foundation (NSF) program related to STEM. The project aims to discover the best ways to build effective and sustainable teacher professional development and support networks that facilitate teaching a key topic in the sciences—the role of carbon in the flow of materials and energy through living systems, human-engineered systems and earth systems in multiple scales. The project is led by MSU teacher education professor Andy Anderson and includes collaborations with organizations and institutions across the country.

Louise Mead, zoology adjunct professor and education director at the BEACON Center for the Study of Evolution in Action, and Jim Smith, associate professor of zoology with joint appointments in entomology and Lyman Briggs College, are part of a research and education team that was awarded \$2.3 million from an NSF program called "Improving Undergraduate Education in STEM for Active LENS: Learning about the Nature of Science using Evolution in Action." The project will address challenges in evolution education through ongoing development and testing of Avida-ED, an educational software tool derived from an experimental digital tool used by scientists to study bio/computational evolution.

## Student view: Marquita Tillotson

I came to Michigan State University in fall 2011 with the goal to work hard in my classes and make myself marketable to employers. The following summer, I traveled overseas to participate in the zoology department's Behavioral Ecology of African Mammals study abroad program.

Knowing that one zoology-related experience would not be enough to make me a competitive candidate for jobs after graduation, I enrolled the following summer in field courses at MSU's W.K. Kellogg Biological Station (KBS).

While at KBS, I was asked to stay an extra five weeks to assist with research projects in Associate Professor Jennifer Lau's lab. This would be my first research experience, but I could not afford housing because the position was unpaid. With the help of KBS, I was awarded a Noall Scholarship in Biological and Environmental Science to cover my housing expenses.

Not only did my research experience in the Lau lab teach me the importance of troubleshooting and collaboration in science, but it also opened my eyes to field research as a career and, more importantly, that science is exciting!

With the assistance of my academic advisor, I had the chance to complete a semester-long internship with the Toledo Zoo's Education Animal Center in the fall of 2013. From that experience,



*Marquita Tillotson is a senior at MSU who plans to graduate in December 2014 with a B.S. in zoology.*

I aspired to work in an AZA [Association of Zoos and Aquariums]-accredited zoo, particularly the Toledo Zoo. To do so, I would need to continue building my resume so that I would have more to offer employers—especially experience with non-mammals.

Through hard work and initiative, I was able to secure research positions working with zebra finches in Professor Juli Wade's lab and three-spined sticklebacks [fish] in Associate Professor Janette Boughman's

lab upon returning to campus. However, only the Wade lab offered a paid position. Once again, I had to seek funding to keep both positions and afford my living expenses. I heard about the College of Natural Science Undergraduate Research Support Program through the Boughman lab. In the application, I described my research project and emphasized that, without the scholarship, I would be unable to continue working in the Boughman lab, despite its valuable contribution to my career trajectory. One month later, I was awarded the funding for my research. The scholarship also provided me with the opportunity to present my research project at MSU's annual Undergraduate Research and Arts Forum in spring 2014.

I remain active in both labs and occasionally volunteer at the Toledo Zoo. After graduation, I may have to complete another unpaid internship at the Toledo Zoo to be eligible for an employment opportunity there. This will be difficult because student loans kick in six months after graduation. I may decide to pursue a paid Aviculture & Environmental Education Internship at the Livingston Ripley Waterfowl Conservancy in Litchfield, Conn., to gain additional experience and refine my communication skills. Obtaining and financing these opportunities has been a challenge, but these experiences are critical to my career success in today's job market. 🍀

## Zoology internship program

The job market for college graduates has changed in the past 25 years. Entry-level positions require applicants to have career-relevant experience. The MSU Department of Zoology has a successful internship program, but it needs your help to expand the program by developing new internship sites for students and securing financial contributions to establish a permanent scholarship program. For more information, contact **Dr. Richard Snider** at **517-355-4640** or [snider@msu.edu](mailto:snider@msu.edu).

# Sisbro Studios: A blend of science, comedy and storytelling

What do a basking shark, a riddle in a bottle and a stranger in the woods have in common?

They are all part of award-winning assemblies and presentations created by MSU zoology alumni Laura and Robert Sams, a sister-brother creative team who own Sisbro Studios, LLC, in Portland, Ore. They produce science-based films, books, music, educational media and live programs that help people discover the natural world (and laugh along the way). They set out to create stories so clever, funny, beautiful and catchy that people can't help but share them again and again.

"My zoology degree gave me the foundation to truly appreciate the intricacies of the natural world, and it opened the doors to meeting incredible scientists and researchers who help us find creatures and stories to film," Laura said.

"Robert and I have been running Sisbro Studios for 13 years," she continued. "When I graduated with my B.S. in zoology, we had the chance to turn the children's book *Stranger in the Woods* into a half-hour children's movie. Rob and I wrote music, performed animal voices and learned how to film animals in winter, and we were able to make a movie that was a finalist for Best Children's Program at the biggest wildlife film festival in the world. We

realized there was a niche for high-quality children's programming. We also started visiting elementary schools to share the writing process and we had to form a business to get paid by the schools. We've been growing ever since."

Despite its success, Sisbro Studios has certainly encountered adversity along the way.

"My greatest challenge for Sisbro has

performed live author/filmmaker visits in venues from the Smithsonian Museum of Natural History in D.C., to the Monterey Bay Aquarium to international schools in Dubai, UAE.

"In early November, we were at the BLUE Ocean Film Festival, where several of our films were shown to a crowd of 700 elementary school kids, and we also performed for them after the movies,"

Robert said. "When the students were walking back to the buses, we heard one boy say to his friend, 'I'm going to remember that for the rest of my life.' I don't think we could accomplish anything better than that."

So what's next for Sisbro Studios?

"We're about to make a music video for the State of Alabama

that will be distributed to every single elementary school, to encourage inclusion of children with disabilities," Laura said. "We're going to use our underwater footage of awesome animals and an original song to share how we are all unique, and we all have special adaptations."

To learn more about Sisbro Studios, visit [www.sisbro.com](http://www.sisbro.com).

Laura Sams received her B.S. in zoology in 2000 and her M.S. in agricultural and Extension education in 2003; Robert Sams received his B.S. in zoology in 2003. 🐠



Laura and Robert Sams visited Anchorage, Alaska, earlier this year to perform their Shark Riddle Program at schools and libraries there.

been to convince broadcasters that wildlife programming for children is financially viable," Laura said. "We have such support from parents, teachers and children, but it is hard to get broadcasters to support non-animated shows."

Sisbro Studio's work has been honored with more than 50 international awards, including a Wildscreen Panda Award (which is often called the "Green Oscars"), a KIDS FIRST! Best of the Year Award, a National Parenting Publications Gold Award and a Parents' Choice GOLD award. The brother-sister team has also

## Teaming up to study vermin and venom

Scorpions and mice may not be typical topics of conversation for most couples. But it's the norm for Ashlee and Matt Rowe.

This wife-and-husband team at Michigan State University have complementary and overlapping research interests, but both

integrative background, with training in animal behavior, molecular biology and neurophysiology.

"Together, we are exploring the arms race between grasshopper mice and bark scorpions," Matt said.

funds permit Matt and Ashlee to take several undergraduate students to the Sonoran and Chihuahuan deserts for about three weeks each summer to assist with collecting scorpions and grasshopper mice.

"This field experience typically inspires an undergrad's curiosity, and many then go on to complete a more formal project during the academic year in one of our labs back at MSU," Matt noted.

Public outreach is another important aspect of their work. They present their research, showing their animals to the public, at venues close to their study sites in New Mexico and Arizona. They have also given talks to the AP biology classes at a local high school, and participated in several on-campus events including Alumni Reunion Days, Classes Without Quizzes and the MSU Science Festival.

"We value these opportunities to share our research with the general public," Matt said. "It's our way of 'giving back' to the community. Most people haven't had the opportunities we've had—collecting scorpions on mountain tops at night in the desert, with the Milky Way so bright it feels like you could reach out and touch the stars, or listening to the dawn laughter of a family of coyotes. Most important, we hope to share our love of science, of solving mysteries, of answering questions. It's hard work, but intensely rewarding."

"If we want the public to support science, it is critically important that they understand science, that they value the process and its results," Ashlee said. "One of our discoveries is a novel mechanism used by the grasshopper mice that reduces the pain they feel when stung by a scorpion. While still a long way off, this discovery could lead to a new class of analgesics with fewer side effects than those currently on the market. Imagine the benefits for people who suffer from chronic pain.

"Many folks aren't fond of either mice or scorpions," Ashlee continued, "but when they hear about our results, they begin to understand the importance of pure research and the value of biodiversity." 🐞



Shown here is one of the scorpions being studied in the Rowe labs—*Centruroides vittatus* from the Organ Mountains in New Mexico. This female is carrying her babies on her back.

bring different strengths to the system they are studying—the interactions between a carnivorous desert mouse (the grasshopper mouse) and the biochemically protected prey they consume, including the deadly bark scorpion.

She is an assistant professor of neuroscience and of zoology; he is a professor of zoology.

Matt was trained as a behavioral ecologist at the University of California, Davis. Ashlee received her Ph.D. from North Carolina State University and has an

"While we focus primarily on the neurophysiological mechanisms that provide the mice with resistance to the potentially lethal and extremely painful toxins in a bark scorpion's sting, we are also investigating how the venom of the scorpions may be evolving in response to the mouse's resistance," Ashlee said.

Their research is supported by a National Science Foundation grant, which includes funding for a summer Research Experience for Undergraduates. The supplemental

## Math + ecology = a variable research career

Elise Zipkin, assistant professor of zoology, has combined her love of math and statistics with her passion for ecology to create a successful and highly rewarding career.

While working on her B.S. degree in mathematics at the University of Michigan, Zipkin—who developed an interest in conservation issues along the way—decided to pursue a second degree in ecology. She developed an undergraduate thesis modeling sea lamprey populations in the Great Lakes.

“That’s when I realized there is this whole field that marries math and statistics with ecology,” Zipkin said.

Research in Zipkin’s Quantitative Ecology Lab at MSU aims to identify climate and habitat factors responsible for variations in species distributions and abundances. The subject matter includes a wide range of taxa—amphibians, birds, fish, insects and mammals. But the common link is quantitative modeling.

“We’re really pushing the envelope in advancing these techniques,” she said. “I work on methods development, using statistical and mathematical models to address complex ecological problems. I’m especially interested in integrated population models, combining different types of data sources to answer large-scale questions.”

Zipkin’s newest method for analyzing count-based data is being used to understand the viability of populations.

“Traditionally, estimating recruitment and survival rates in populations requires intensive fieldwork where individuals must be captured and recaptured many times,” she said. “This new approach allows us to get the same detailed information with much less intensive collection methods. This saves time and money.”

This methodological advance and the model is already being used to

of competing issues.”

Zipkin is developing new models for another project she’s been involved with for several years: wind energy development in the nearshore Atlantic.

“We are synthesizing available data to learn about the optimal placement of wind farms and the effects that will have on marine seabirds,” she said.

Zipkin has also collaborated on a project modeling monarch populations across North America. Through the North American Butterfly Association, citizen scientists across the country have been collecting data as part of the annual “July 4” counts, while other groups have been tracking monarchs more intensely at particular locations for many years. Combined, these



*Elise Zipkin discusses a project with Alli Sussman, an M.S. student working on predictive models to assess potential changes in seabird distributions as a result of wind energy development.*

study populations of northern dusky salamanders, black-throated blue warblers, brook trout, freshwater mussels and Adélie penguins.

One of Zipkin’s current projects is funded by the U.S. National Park Service.

“Our research shows that 8 out of 12 wetland-breeding amphibian species are declining in one particular wetland in the National Capital Region of the U.S. parks system,” she explained. “Given that all parks have slightly different conservation needs, we want to devise a strategy that meets those individual park goals, but also successfully protects species at the regional level. So we develop hierarchical community models to address these types

data enable researchers to learn much more about this iconic butterfly.

“We’ve seen declines in monarch populations, particularly over the past two years,” Zipkin said. “Some of our previous work suggests that spring weather conditions—as the monarchs come up from Mexico—could be having a major effect on their populations.

“I get to work with so many different taxa on all different kinds of questions,” she added. “I love the math and the statistics; it’s so interesting to think about innovative ways to bring quantitative methods into addressing important conservation and ecological issues.”

# Shocking secrets: Electric eels provide clues for practical applications

Assistant professor Jason Gallant and a team of researchers are charging ahead with their research. They are working to identify the regulatory molecules involved in the genetic and developmental pathways that electric fish use to convert a simple muscle into an organ capable of generating a jolt of electricity several times more powerful than standard household voltage. That work may help to power medical implants.



*For the first time, the genome of the electric eel has been sequenced. This discovery has revealed the secret of how fishes with electric organs have evolved six times in the history of life to produce electricity outside of their bodies.*

“The surprising result of our study is that electric fish seem to use the same ‘genetic toolbox’ to build an electric organ even though it evolved independently in six groups of fish,” said Gallant, co-lead author of a research paper that appeared in the journal *Science* this summer. “Using genomics, biologists are starting to learn that evolution makes similar structures from the same starting materials, even if the organisms aren’t that closely related.”

The new work provides the world’s first electric fish genome sequence assembly. It also identifies the genetic factors and developmental pathways the animals use to grow an electric organ. Other electric fishes use electricity for defense, predation, navigation and communication.

All muscle and nerve cells have electrical potential. Simple contraction of a muscle will release a small amount of voltage. But between 100 and 200 million years ago, some fish began to amplify that potential by evolving electrocytes (larger cells) from muscle cells, organized in sequence and capable of generating much higher voltages than those used to make muscles work.

“Six times, evolution has tinkered with the same starting point—skeletal muscles—to make the electrical ‘batteries’ that generate the electric fields,” Gallant said.

The in-series alignment of these cellular batteries, called electrocytes, have unique polarization of each cell, which allows for the summation of voltages across cells, much like batteries stacked in series in a flashlight. The high voltages produced by the electric eel are the result of many thousands of such “batteries” working together and firing their electrical discharge simultaneously.

Future MSU research will focus on testing the role of these genes in the development of electric organs, using state-of-the-art transgenic techniques in Gallant’s newly constructed laboratory.

One dream is to use this new information to create an electric organ for humans that could power medical implants, such as pacemakers, and could eliminate the need for invasive procedures to replace batteries.

“I was recently contacted by a woman who suffers from incontinence, which she is able to control by using an artificial pacemaker,” Gallant said. “She was upset to learn, after the procedure, that the battery for the device has to be replaced every six years. She wanted to know when she could get her electric organ!”

Gallant explained that research accomplishments like theirs provide the “parts list” for such a device, but the know-how to put it all together is lacking.

“It’s an area of intense interest for us, and over the next 10 years, it is entirely possible that we might have a working prototype of such a device,” Gallant said. “However, we would have to collaborate heavily with biomedical engineers to make that possible.”

In addition to MSU scientists, the research involved scientists at the University of Wisconsin-Madison, the University of Texas at Austin and Systemix Institute, and was funded by the National Science Foundation, the W.M. Keck Foundation and the National Institutes of Health. 

# Problem solvers: Earth's tiniest creatures may hold answers to complex problems

Sarah Evans studies organisms so tiny that millions can fit into the eye of a needle. But from this tiny view, she is looking for the big picture on how to preserve ecosystem services and biodiversity. These tiny organisms are microbes, the oldest form of life on earth.

"I am interested in how microbial communities respond to environmental change," said Evans, an MSU assistant professor of zoology who works at the W. K. Kellogg Biological Station (KBS). "Models predict there will be new climate patterns in the future, but despite the vital role of microbes in ecosystem processes and their immense biodiversity, we lack an understanding of how microbial communities will respond to—and alter—shifts in climate."

Scientists also lack much of the fundamental community theory for microbes that is well-established for other organisms.

Evans' work recently took her to Namibia, Africa, to investigate decomposition in the Namib Desert, which, according to Evans, provides an interesting system in which to study decomposition because it is so dry. It is often referred to as the world's oldest desert and has been in existence for some 43 million years, remaining unchanged in its present form for the last 2 million years.

"The microbes that carry out decomposition in this desert have unique adaptations to deal with the harsh conditions, such as little to no rainfall and high temperatures and radiation," Evans explained. "Many processes in this

desert use fog as a source of water, and we were curious as to whether microbes that decompose plants use it too."

Her work in Namibia was done at the Gobabeb Training and Research Centre, an internationally recognized center for dry land training and research. Evans

"We are interested in whether, as guppies genetically evolve, their gut microbiomes evolve with them," Evans said. "It's unclear whether an organism's microbiome changes as its host's genetics change, or if other factors control a microbiome, like certain phenotypic traits, or an organism's diet."



*Sarah Evans' work recently took her to Namibia, Africa, to investigate decomposition in the 43-million-year-old Namib Desert.*

had worked as coordinator of training programs at Gobabeb for a year after receiving her undergraduate degree at Grinnell College in Iowa.

"It was great to go back after eight years, this time as a researcher," she said.

Evans is also working on a research project investigating rapid evolution in nature with guppies, which the team catches in streams in Trinidad. She is collaborating with Sarah Fitzpatrick, a Ph.D. student at Colorado State University, building off of a long-term evolution experiment in Trinidad set up by David Reznick, a biology professor at the University of California, Riverside.

Although her work has taken her to faraway places, Evans is enthusiastic about working at KBS and is particularly interested in taking advantage of the many KBS field sites and the Long-Term Ecological Research (LTER) program to address basic and applied questions.

"In ecological research, especially studies related to climate change, long-term experiments are very important to detect significant trends," Evans said. "We are just beginning to understand the significance of microbes for land management and ecosystem services. I am excited to build off current agro-ecological work at KBS to better understand the role of soil microbes in agricultural practices." 🌱

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## A classroom for Benson

The zoology-related study abroad course in Uganda (Evolution of Uganda's Forest Biodiversity: Apes to Aves) has made a lasting impact on recent zoology alumna, Sarah Scott.

Former Apes to Aves study abroad students were recently notified by course instructors Jeanette McGuire and David Orban that Ugandan Benson Bamatura, who has helped with the course since 2012, died unexpectedly.

Benson is survived by his wife, two children and three foster children. With his passing, the educational future of his children remains uncertain. Learning this, Scott immediately started getting other MSU students and alumni interested and involved, including recent MSU graduate Kirk Mason.

Per the recommendation of Kemigisha Harriet, a birding guide who has worked with the study abroad course since 2008, there were two options to support the



*Ugandan Benson Bamatura (pictured above) on a hike with the study abroad group in Bwindi.*

education of Benson's children—pay the children's school fees or help Benson's children and the other children in the village by building a classroom in honor of him. Upon hearing the options, Scott and Mason pledged to dedicate their time and money to ensuring the success of the classroom.

"It is very important to work with a community to find out how best to help," Mason said. "Education is indescribably important, and knowing that Benson's family and community will have greater access to a good education is what makes this project worthwhile to me."

Scott agreed.

"Education is one of the most valuable pursuits in life," Scott said. "It provides opportunities to succeed that would otherwise not be possible. I've been fortunate enough to receive an education and want to help in giving others the opportunity as well."

Scott and Mason have not only spearheaded fundraising efforts and rallied former course participants to become involved—they plan to travel to Uganda to help with the construction of the classroom.

Visit <http://bit.ly/IHPBUxT> to learn more about the project and to support fundraising efforts. 📍