

MUSEUM *of*
COMPARATIVE
ZOOLOGY



HARVARD UNIVERSITY

ANNUAL REPORT

2016 • 2017



DIRECTOR'S MESSAGE

As I write this message during the fall of 2017, I confess to being more conflicted than in past years regarding the future of the natural world and the ability and inclination of human society to take steps needed to preserve and sustain it.

In the last 12 months, the United States has formally declared its intention to withdraw from the United Nations Paris Agreement on climate change; threats to nationally protected lands are being raised from within the federal government; and the ability of the U.S. Environmental Protection Agency to both monitor and protect the air we breathe and the water we drink is being severely curtailed, if not eliminated.

As an organization that is committed to exploring and understanding Earth's biological diversity and sharing what we learn with professional colleagues, students and laypeople, these developments are of great concern.

It will be incumbent on future leaders to chart a different course and one that respects the natural environment, both to preserve the legacy of millions of years of biological evolution and to sustain a planet that is habitable for humans and other species.

Despite the worrisome picture painted above, the MCZ has extended its string of successful years in terms of outstanding scholarship, effective teaching and engaging public programs.

The most newsworthy development, and perhaps the one with the greatest long-term impact, follows a generous gift from Edward O. Wilson, MCZ faculty-curator emeritus, which will enable us to establish an endowed postdoctoral fellowship program.

The Wilson Biodiversity Fellows will be expected to focus their research on the

discovery and formal description of animal species. This support will allow us to attract talented young researchers in an essential field and further their career development at a critical stage. The new program may be launched as early as next academic year, and it is expected to expand in subsequent years as the endowment grows.

Nobody loves parties more than we do, and we demonstrated this to great effect last spring with a ceremony to celebrate the 16 staff members who have achieved a long-term employment milestone: more than 25 years of service at Harvard University, with most of those years spent at the MCZ.

The museum is tremendously grateful for the ongoing contributions of its dedicated curatorial, research and administrative staff, who sustain the infrastructure that allows us to do great work.

Finally, as one of six Harvard museums associated with the public-facing [Harvard Museums of Science & Culture](#), we were able to help HMSC, as well as the [Harvard Art Museums](#), to further their missions to increase the utilization of museum collections across campus.

By reaching more educators, students and visitors, we are able to demonstrate the tremendous depth and breadth of Harvard's museum resources.

I hope you enjoy reading the following pages and learning more about what we accomplished this year.



Melissa Aja

James Hanken
Director



About the Cover:

The Santa Rosa beach mouse forages in the primary dunes of Florida's Gulf Coast. Photo by Nicole Bedford.

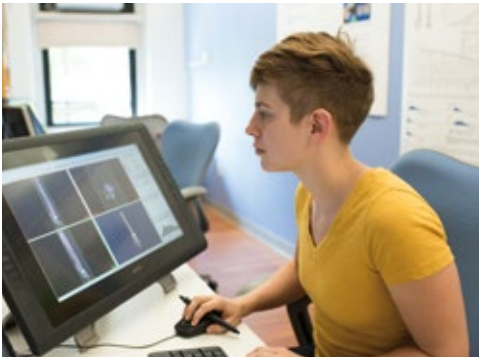
Opposite page: A tetrapod humerus surrounded by fish bones collected from Blue Beach, Nova Scotia, by the Stephanie Pierce lab. Photo by Melissa Aja.



GRADUATE TRAINING

The MCZ has a robust doctoral program, which averages 42 students per year.

Under the umbrella of the Department of Organismic and Evolutionary Biology (OEB), approximately 40% of OEB graduate students are advised by one or more of MCZ's 13 faculty-curators. MCZ students are also associated with other departments at Harvard, such as Molecular and Cellular Biology, as well as with the Howard Hughes Medical Institute. Funding sources include Harvard programs outside of OEB, the U.S. National Science Foundation and numerous research foundations worldwide. Graduates have gone on to assume prestigious postdoctoral fellowships and faculty positions, while others have become consultants and specialists in the private sector.



Brianna McHorse

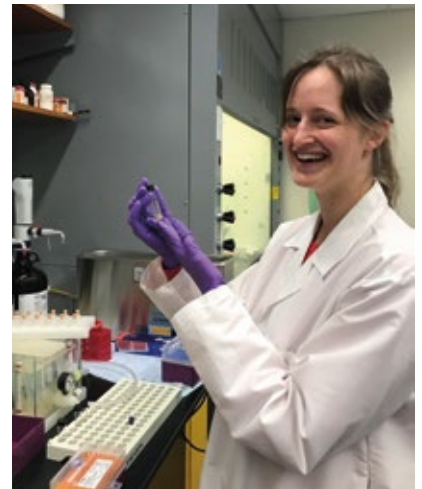
"Turns out it's surprisingly hard to find a place where you can combine biomechanics and paleontology for your PhD," says **Brianna McHorse**. "This is a perfect place to do ambitious, interdisciplinary research."

Brianna's dissertation aims to answer how and why horses evolved from small, forest-dwelling creatures with three toes to the large, grazing, single-toed animals we know today. "I am planning to pursue a career in data science, which makes use of the problem solving, experimental design, statistics, coding and data analysis skills I've built up over the course of my dissertation," says McHorse.

Mara Laslo

"I chose Harvard because the OEB department allows a lot of intellectual freedom," says graduate student **Mara Laslo**. "I like the idea of being able to work out a question that was interesting to me and being able to pursue that question in a direction that I find most interesting."

Laslo is interested in the evolution of life cycles and development. Direct-developing frogs bypass the tadpole stage completely and hatch as miniature adults. "I want to understand the role that thyroid hormones, which have diverse and long-lasting effects in all vertebrate taxa, potentially have in the repeated evolution of direct development in frogs."



Bruno A. S. de Medeiros

Bruno A. S. de Medeiros received an undergraduate degree in biology and a master's in zoology at the University of São Paulo, Brazil. At Harvard, he has focused on understanding the role of interactions between a group of weevils and their host plants—palm trees—on weevil diversification.

"I chose Harvard for many reasons," says de Medeiros, "but OEB and MCZ are great places for anyone interested in studying biodiversity. Here I can interact with great people sharing similar interests and have plenty of resources for all steps in my research, from fieldwork to specimen imaging, molecular biology and bioinformatics."



MCZ FACULTY-CURATORS



Andrew A. Biewener

*Charles P. Lyman Professor of Biology
Director, Concord Field Station*

Prof. Biewener's research focuses on understanding the biomechanics, neuromuscular control and energetics of animal movement on land and in the air.

His goal is to understand general principles that govern the biomechanical and physiological design of vertebrate animals related to their movement in natural environments.



Scott V. Edwards

*Professor of Biology
Alexander Agassiz Professor of Zoology
Curator of Ornithology*

Prof. Edwards' research focuses on the evolutionary biology of birds and related species, combining field, museum and genomics approaches to understand the basis of avian diversity, evolution and behavior. Current projects utilize genomics technologies to study comparative genomics and the evolution of flightlessness in birds; phylogeography and speciation of Australian and North American birds; and the genomics of host-parasite coevolution between house finches and a recently acquired bacterial pathogen, *Mycoplasma*.

Tony Rinaldo



Brian D. Farrell

*Professor of Biology
Curator of Entomology
Director, David Rockefeller Center for Latin American Studies*

Prof. Farrell's research is broadly concerned with the evolution of ecological interactions between host plants and animals and their parasites, such as insects and other tiny consumers. His current

projects include applying next-generation sequencing to speciation and phylogenetic studies of associated species, documenting biodiversity in the Dominican Republic, and repatriating digital information from scientific specimens of insects and fossils in museums to their countries of origin.

Stephanie Mitchell

Gonzalo Giribet

*Alexander Agassiz Professor of Zoology
Professor of Organismic & Evolutionary Biology
Curator of Invertebrates
Harvard College Professor*

Prof. Giribet's primary research focuses on the evolution, systematics and biogeography of invertebrate animals, including the use of morphology and next-generation sequencing techniques. Current projects in the Giribet lab include the evolution of orb-weaving spiders and other arachnids, and systematics and biogeography of arthropods, mollusks and onychophorans, among other groups. He is also interested in philosophical aspects of molecular data analysis, emphasizing homology-related issues and the use of genomic-level data for inferring phylogenies.



© Casey Dunn



FACULTY-CURATORS



Catherine Weisel

James Hanken

*Professor of Biology
Alexander Agassiz
Professor of Zoology
Curator of Herpetology
MCZ Director*

Prof. Hanken utilizes laboratory-based analyses and field surveys to examine morphological evolution, developmental biology and systematics. Current areas of research include the evolution

of craniofacial patterning; the developmental basis of morphological novelty and life-history evolution; biodiversity informatics; and systematics and evolution of neotropical salamanders.



Stephanie Mitchell

George V. Lauder

*Professor of Biology
Henry Bryant Bigelow Professor of Ichthyology
Curator of Ichthyology*

Prof. Lauder's research focuses on the biomechanics of fishes and the development of robotic models for studying aquatic locomotion.

His current studies focus on the function of shark skin and other surface structures, the role of flexibility in improving the efficiency of aquatic propulsion, and how fishes control body and fin position as they maneuver through obstacles. Additional broad interests include biological fluid mechanics and theoretical approaches to the analysis of form and function in organisms.



Kris Sribbe

Hopi E. Hoekstra

*Professor of Organismic & Evolutionary Biology
Professor of Molecular & Cellular Biology
Alexander Agassiz Professor of Zoology
Curator of Mammalogy
Howard Hughes Medical Institute Investigator
Harvard College Professor*

Prof. Hoekstra combines field and laboratory work to understand the evolution of mammalian diversity from morphology to behavior. Her research focuses on the genetic basis of adaptive variation—identifying both the ultimate causes and the proximate mechanisms responsible for traits that help organisms survive and reproduce in the wild. Research in the Hoekstra lab integrates ecological, behavioral, genetic and molecular approaches.



Rose Lincoln

Jonathan B. Losos

*Monique & Philip Lehner
Professor for the Study of
Latin America
Professor of Organismic &
Evolutionary Biology
Curator of Herpetology*

Prof. Losos' research focuses on the behavioral and evolutionary ecology of lizards, specifically how lizards interact with their environment and how lizard clades have diversified evolutionarily.

His laboratory integrates approaches from systematics, ecology, behavior, genetics and functional morphology, taking both observational and experimental approaches in the field and in the laboratory.



Jon Chase



James J. McCarthy.

*Professor of Biological Oceanography
Alexander Agassiz Professor of Biological Oceanography
Acting Curator of Malacology*

Prof. McCarthy's research focuses on factors that regulate the processes of primary production and nutrient supply in the ocean. Using field studies and modeling, Prof. McCarthy and his group examine the effects of

seasonal or interannual climate change on marine life from plankton to whales.

Kris Sribbe



Naomi E. Pierce.

*Sidney A. & John Hessel Professor of Biology
Curator of Lepidoptera*

Prof. Pierce's research focuses on the behavioral ecology of species interactions, particularly insect/plant associations, and symbioses between ants and other organisms, including bacteria, fungi, plants and caterpillars of butterflies in the family Lycaenidae. Prof. Pierce is

interested in how parasitic and mutualistic life histories can influence the evolutionary trajectories of each partner.

Paul Whatmough



Stephanie E. Pierce.

*Assistant Professor of Organismic & Evolutionary Biology
Curator of Vertebrate Paleontology*

Prof. Pierce's research is focused on major morphological and ecological transitions in vertebrate evolution through an examination of the fossil record.

Her work tends toward 3-D modeling and experimentation of the musculoskeletal system, with particular attention to the link between form and function. Current projects include the fin-to-limb transition, the evolution of the mammalian backbone, and the origin of the avian neck.

Robert M. Woollacott

*Professor of Biology
Curator of Marine Invertebrates*

Prof. Woollacott's research focuses on aspects of marine invertebrate life history, such as synchronization of reproductive events and ecology and physiology of larvae.

Topics of particular interest include larval dispersal and population connectivity, as well as human impacts on life in the sea.



Isaac Orderberg



Mansi Srivastava

*Assistant Professor of Organismic & Evolutionary Biology
Curator of Invertebrate Zoology*

Dr. Srivastava's research focuses on understanding the evolution of animal development and regeneration. Her group utilizes the three-banded panther worm, *Hofstenia miamia*, which Dr. Srivastava has developed as a new acoel model system. Acoels represent the sister-group to all animals with bilateral symmetry, which allows the study of genetic mechanisms that span 550 million years of animal evolution. Current projects in the lab range from identifying gene regulatory networks for regeneration to determining the embryonic origins of pluripotent stem cells to understanding the origins of bilateral nervous systems.



MCZ EMERITI



Justin Ide

A. W. "Fuzz" Crompton

Faculty-Curator, Emeritus

Fisher Professor of Natural History, Emeritus

Prof. Crompton, former Curator of Mammalogy, was the Director of the MCZ from 1970 to 1982, having served as Director of both the Peabody Museum of Natural History at Yale University and the South African Museum in Capetown. His primary research interests include the origin and evolution of mammals, functional anatomy, and neural control and evolution of feeding in recent and fossil vertebrates. Prof. Crompton received two Guggenheim fellowships for his research on vertebrate paleontology and functional morphology, and in 2011 received the Romer-Simpson Medal from the Society of Vertebrate Paleontology.



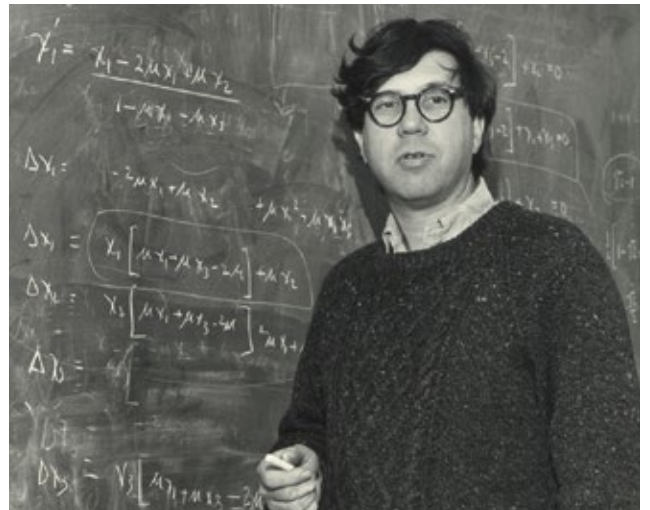
Richard C. Lewontin

Professor of Biology, Emeritus

Alexander Agassiz Professor of Zoology, Emeritus

An evolutionary geneticist, Prof. Lewontin pioneered the field of molecular population genetics by merging molecular biology and evolutionary theory, as well as the philosophical and social implications of genetics and evolutionary theory.

Among his many books are *The Genetic Basis of Evolutionary Change*; *Biology as Ideology: the Doctrine of DNA*; *Human Diversity*; and *The Triple Helix: Gene Organism and Environment*.



Beth Maynor Young

Edward O. Wilson

Honorary Curator in Entomology

Pellegrino University Professor, Emeritus

Prof. Wilson is considered the founder of sociobiology and evolutionary psychology and has developed the basis of modern biodiversity conservation. He has received many of the world's leading prizes in recognition of his research, creative literature and environmental activism.

Among those in literature, he was awarded two Pulitzer Prizes for his books *The Ants* (1990, with Bert Hölldobler) and *On Human Nature* (1978). Prof. Wilson received the TED Prize in 2007, where he articulated the concept of the Encyclopedia of Life, and the Hubbard Medal in 2013, the rarely given highest award of the National Geographic Society.



COURSES IN 2016–2017 LED BY MCZ FACULTY-CURATORS



Gonzalo Giribet

Organismic and Evolutionary Biology

OEB 10: Foundations of Biological Diversity

Brian D. Farrell (and Andrew Richardson and Elena Kramer)

An integrated approach to the diversity of life, emphasizing how chemical, physical, genetic, ecological and geologic processes contribute to the origin and maintenance of biological diversity.

OEB 51: Biology and Evolution of Invertebrate Animals

Gonzalo Giribet (and Cassandra Extavour)

Introduction to invertebrate diversity, covering the development, adult anatomy, biology and evolutionary relationships of the main animal phyla, including sponges, mollusks, annelids and arthropods, among others.

OEB 57: Animal Behavior

Naomi E. Pierce (and Bence P. Olveczky)

A review of the behavior of animals under natural conditions, with emphasis on both mechanistic and evolutionary approaches.

OEB 115: The Developmental Basis for Evolutionary Change

Mansi Srivastava (and Matthew Harris and Clifford Tabin)

Introduction to evolutionary developmental biology, focusing on the molecular and cellular bases of how embryos generate adult body plans in order to understand how form, physiology and life history strategies are modulated over the course of evolution.

OEB 51: Biology and Evolution of Invertebrate Animals

FRSEMR 50E: The Science of Cats



Jonathan Losos





James Hanken

OEB 300: Museum Collections Management and Curation

OEB 125: Molecular Ecology and Evolution

Scott V. Edwards

A survey of theory and applications of DNA technologies to the study of evolutionary, ecological and behavioral processes in natural populations.

through historical and ecological factors, focusing on the history of biogeographic research, developments in the area of historical biogeography and ecological processes that affect distributions of whole clades.

OEB 126: Vertebrate Evolution

OEB 126: Vertebrate Evolution

Stephanie Pierce

A comprehensive survey of the origin and evolution of vertebrates through an examination of the fossil record, focusing on major events in Earth's evolutionary history, with an emphasis on anatomical and physiological transformations in fish, amphibians, reptiles, birds and mammals.

OEB 155r: Biology of Insects

Naomi E. Pierce (and Michael R. Canfield)

Introduction to the major groups of insects—life history, morphology, physiology and ecology—through a combination of lecture, lab and field exercises.

OEB 190: Biology and Diversity of Birds

Scott V. Edwards

An introduction to the biology of birds. Covers the fossil record and theories for avian origins, physiology and anatomy, systematics, speciation processes, behavior, vocalizations, demography and conservation.

OEB 200: The Evolution of Stem Cells and Regeneration

Mansi Srivastava

An exploration of stem cell biology and the cellular, molecular and genetic principles of regeneration. Covers the main concepts and methods concerning the study of stem cells and familiarity with comparative approaches as applied to stem cell biology and regeneration.

OEB 141: Biogeography

Gonzalo Giribet

Aims to explain distributions of organisms



Stephanie Pierce



OEB 258: Contingency Versus Determinism: Is Evolution Predictable?

Jonathan Losos

Discussion of Stephen Jay Gould's ideas presented in his 1989 book *Wonderful Life*, how they have been developed and transformed over the last quarter century, and what the data say after 25 years of molecular phylogenetics and experimental field studies of evolution.

General Education

Science of Living Systems 22: Human Influence on Life in the Sea

Robert M. Woollacott and James J. McCarthy

Over-harvested fish stocks, pollution and anthropogenic climate change affect the stability and productivity of marine ecosystems. This course asks what we need to know about the causes and effects of anthropogenic change to best protect marine ecosystems and ensure sustainable harvests from the sea.

Graduate Courses Reading and Research

OEB 300: Museum Collections Management and Curation

James Hanken

OEB 310: Metazoan Systematics

Gonzalo Giribet

OEB 320: Biomechanics and Evolution of Vertebrates

George V. Lauder

OEB 321: Evolution of Regeneration and Development

Mansi Srivastava

OEB 323: Advanced Vertebrate Anatomy

Stephanie Pierce

OEB 325: Marine Biology

Robert M. Woollacott

OEB 334: Behavioral Ecology

Naomi E. Pierce

OEB 335/E-PSCI 337: Biological Oceanography

James J. McCarthy

OEB 341: Coevolution

Brian D. Farrell



Jonathan Losos

FRSEMR 50E: The Science of Cats

OEB 355: Evolutionary Developmental Biology

James Hanken

OEB 362: Research in Molecular Evolution

Scott V. Edwards

OEB 367: Evolutionary and Ecological Diversity

Jonathan Losos

OEB 370: Mammalian Evolutionary Genetics

Hopi Hoekstra

OEB 51: Biology and Evolution of Invertebrate Animals



Gonzalo Giribet



Freshman Seminar

FRSEMR 22T: Why We Animals Sing

Brian D. Farrell

Investigates the sounds and structures of different kinds of acoustic animals—including birds, mammals, frogs and insects—and the different kinds of habitats in which they produce their songs and calls.

FRSEMR 50E: The Science of Cats

Jonathan Losos

Focuses on how scientists are using state-of-the-art methods from the fields of evolutionary biology, ecology, behavior and molecular biology to understand *Felis catus*, the house cat.

FRSEMR 50H: The Biology of Movement

Andrew A. Biewener

Explores why and how organisms move, providing an overview of the biological motors animals and microbes use to power movement, and mechanisms plants use for growth and geo-/photo-taxis.

Life Sciences

LIFESCI 1B: An Integrated Introduction to the Life Sciences: Genetics, Genomics and Evolution

Hopi Hoekstra (and Kevin Eggan and Pardis Sabeti)

An integrated approach showing how genetics and evolution are intimately related, together explaining the patterns of genetic variation we see in nature, and how genomics can be used to analyze variation.

LIFESCI 2: Evolutionary Human Physiology and Anatomy

Andrew Biewener and George V. Lauder (and Daniel E. Lieberman)

Explores human anatomy and physiology from an integrated framework, combining functional, comparative and evolutionary perspectives on how organisms work.



MCZ History

Since its founding, the Museum of Comparative Zoology has been overseen by a governing board, the MCZ Faculty. Among the original four members was Dr. Oliver Wendell Holmes Sr.

A physician, poet and prolific author, Holmes served at the Harvard Medical School for 36 years, including seven as dean. Holmes saved countless lives by championing the theory that puerperal fever, a disease that particularly afflicts mothers after childbirth, could be transmitted during delivery via unclean surgical instruments, bedclothes and linens.

He also penned “Old Ironsides,” an iconic ode to the naval frigate U.S.S. *Constitution*, and was arguably the most popular author in the English language for much of the 19th century.

Holmes Sr.’s fame and accomplishments are largely overlooked today, but the same can’t be said for his son. Following the Civil War, when he suffered a nearly fatal wound in the Battle of Antietam, Oliver Wendell Holmes Jr. was ultimately appointed by President Theodore Roosevelt a justice of the U.S. Supreme Court, where he issued groundbreaking opinions that still resonate today.

The Autocrat of the Breakfast Table, lithograph of Dr. Oliver Wendell Holmes from *Vanity Fair*, 1886, by English caricaturist Leslie Ward (1851–1922).



MCZ RESEARCH MAKING HEADLINES

A Robot with Heart

Made of heart cells from a rat, applied to an elastic silicone body encasing a tiny gold skeleton, this minute biohybrid robot is part machine, part living tissue. Patterned on a stingray, the nickel-sized swimming raybot is propelled and guided by light. Researchers at Harvard's Department of Bioengineering and Applied Sciences, **George Lauder** and others created the hybrid ray, described in a cover story in *Science*.

Bio-inspired design in robotics aims to apply the naturally occurring qualities of biological organisms in order to improve the performance of robots. In this case, learning to structure and control heart cells could lead to artificial hearts that function more like natural hearts, propelling blood more effectively through the body, as well as to small autonomous biorobots.

The ray was selected as a model because of the stability of its round, flat body and agile maneuvering in water. Heart cells are printed on a layer of silicone in a radial pattern and bioengineered to contract when exposed to light, making downward motion possible.

Tiny, Threatened *Thorius*

At less than two inches long, minute salamanders from the genus *Thorius* are the smallest four-legged tailed organisms on the planet. They have short legs and long bodies and tails, often have a red stripe on their back and are extremely difficult to find in the wild.

With animals this tiny, and external appearances so similar, species are hard to tell apart. Despite the challenges, **James Hanken** and an international team of researchers have identified three new species of *Thorius* from the remote, high-altitude mountain forests of Oaxaca, Mexico. The team used molecular techniques, including DNA sequencing; digital imaging, such as X-ray computed tomography; and anatomical analyses to differentiate the three new species.

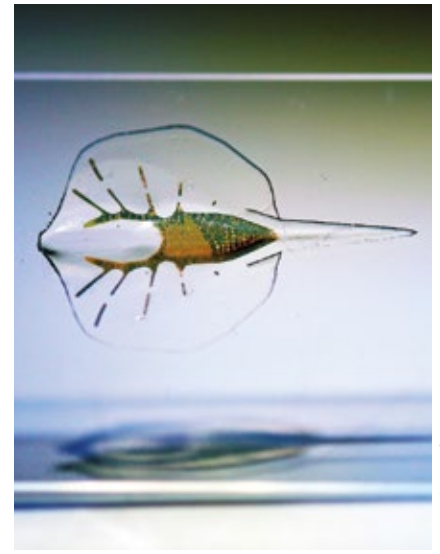
Described in *PeerJ*, *Thorius pinicola* is named for its pine forest home, *T. longicaudus* for its long

tail and *T. tlaxiatus* for a nearby city. Like other minute salamanders, they have well-articulated bodies despite their small size, breed on land, and their young hatch from eggs as diminutive adults, with no tadpole stage.

Once plentiful in southern Mexico, *Thorius* populations have declined precipitously in the last few decades due to habitat destruction, disease and other environmental factors. They may be the most endangered genus of amphibians in the world and could be extinct before the end of the century. The newly described species are already considered critically endangered, and they highlight the quest to discover and describe species before they disappear entirely.

[Park S-J, Gazzola M, Park K S, Park S, Di Santo V, Blevins EL, Lind JU, Campbell PH, Dauth S, Capulli AK, Pasqualini FS, Ahn S, Cho A, Yuan H, Maoz BM, Vijaykumar R, Choi J-W, Deisseroth K, Lauder GV, Mahadevan L, Parker KK \(2016\). Phototactic guidance of a tissue-engineered soft-robotic ray. *Science* 353:158-162](#)

[Parra-Olea G, Rovito SM, Garcia-París M, Maisano JA, Wake DB, Hanken J \(2016\) Biology of tiny animals: three new species of minute salamanders \(Plethodontidae: *Thorius*\) from Oaxaca, Mexico. *PeerJ* 4: e2694](#)



Sung-jin Park



Mario Garcia París



James Hanken



Making Sense of Social Scents

With insects, as with humans, communication is key to successfully living in a group. For social insects, this communication typically occurs via chemical signals, including pheromones, and is perceived through hair-like sensilla in antennae and legs.

Highly advanced social insects like bees, ants and wasps have complex social systems, and thus have the most elaborate chemical communication systems. They use these signals to allocate tasks, care for offspring, provide reproductive status, defend the nest and acquire food.

Surprisingly little is known about how chemical communication systems differ between solitary species and their highly social relatives. For example, social behavior in ants, all of which are social, evolved long ago in the Cretaceous, making comparisons between modern-day social ants and their solitary ancestors difficult. To investigate this relationship, **Naomi E. Pierce**, **Li E. K. Murphy**, **Sarah D. Kocher** and others studied “sweat bees” in the family Halictidae.



Sarah Kocher

The Halictidae comprises species that exhibit the full range of social behaviors, from solitary to highly advanced societies. Halictid bees evolved sociality relatively recently and on several occasions reverted to a solitary lifestyle. Thus a comparison of the physiological investment in chemical communication systems can be made more easily in this group between social and closely related non-social or “solitary” species.

Their research, published in *PNAS*, confirmed that as sociality is gained and lost, evolutionary changes occur in the sensory systems and chemical signals of both solitary and social halictid bees. As social species increasingly rely on chemical signals, rapid adaptations occur in their glands to produce more complex odor profiles and in their antennae to produce more sensilla. However, when social behavior is lost, sensilla density decreases since less complex chemical signals need to be received.

[Wittwer B, Hefetz A, Simon T, Murphy LEK, Elgar MA, Pierce NE, Kocher SD \(2017\) Solitary bees reduce investment in communication compared with their social relatives. *Proc Natl Acad Sci USA* 114:6569-6574](#)

A New Light on Stripes

A wide range of creatures have evolved striped coats, from zebras to tigers to chipmunks, and this patterning is thought to provide camouflage that assists in survival in the wild. However, little is known about how stripes

evolved. To investigate the genetic mechanisms that develop this pigmentation pattern, **Hopi E. Hoekstra** and postdoctoral researcher **Ricardo Mallarino** chose the African striped mouse (*Rhabdomys pumilio*). This mouse, found throughout southwest Africa, is active during the day and sports two dark-light-dark stripes along its back very similar to those of the chipmunk.

Mammals rely on skin cells called melanocytes, which migrate around the embryo as it develops, to produce pigment. The white bib on a cat or the blaze on the nose of a horse occur because melanocytes didn't reach those areas,



Elaine Krueger

leaving the hair without color. However, the researchers discovered the African striped mouse has melanocytes in the skin under its white stripes, but something stopped these cells from maturing. They found that a gene called *ALX3*, linked to craniofacial development but not known to affect patterning, was highly expressed in the skin underneath the white stripes.

Mallarino and Hoekstra then turned to the eastern chipmunk (*Tamias striatus*) and found that the same genetic mechanism caused its light stripes. The *ALX3* gene is also responsible for the white bellies of many rodents, and the researchers think this gene was co-opted and reused during evolution to make white stripes in both species. But because their last common ancestor was about 70 million years ago, it is likely they evolved their stripes independently.

[Mallarino R, Henegar C, Mirasierra M, Manceau MC, Shradin C, Vallejo M, Beronja S, Barsh GS, Hoekstra HE \(2016\) Developmental mechanisms of stripe patterns in rodents. *Nature* 539:518-523](#)



Decoding the Genetic Basis of Parental Care

The oldfield mouse is an exception among mammals—it is monogamous, and both parents are solicitous in the care of their pups. However, closely related deer mice are promiscuous and less attentive parents. To investigate these differences, **Hopi E. Hoekstra**, lead author **Andres Bendesky** and other Harvard colleagues designed an elegant study to trace the genetic basis of these behaviors, and for the first time have linked DNA to variation in parenting habits among mammals.

First, they documented parental behaviors of both species in the lab—including nest building, licking, huddling for warmth and retrieving pups removed from the nest—in both sexes. Oldfield mice (*Peromyscus polionotus*) build elaborate nests and fathers are generally as active as mothers in caring for their young, while deer mice (*Peromyscus maniculatus*) create more basic nests, if any at all, and fathers are much less involved in parenting. They then ruled out parenting as a learned behavior, pointing to a genetic source of parenting behaviors.

To identify the molecular mechanisms, the researchers crossbred oldfield and deer mice to create 769 second-generation hybrids and then measured their parental behavior with their own pups. The results ran the gamut, allowing genetic analysis to isolate 12 stretches of DNA, called loci, associated with parenting. They found some loci affect very specific behaviors, like nest building, while others affect parenting more broadly. In addition, many of the loci were influential in only one sex, suggesting that parental care can evolve independently in males and females. Finally, they homed in on one locus associated with a difference in nest-building behavior. Further investigation into the 498 genes in this locus identified the gene that controlled production of the hormone vasopressin in the brain, and revealed that increased levels of vasopressin decreased nest building.

[Bendesky A, Kwon Y-M, Lassance J-M, Lewarch CL, Yao S, Peterson BK, He MX, Dulac C, Hoekstra HE \(2017\) The genetic basis of parental care evolution in monogamous mice. *Nature* 544:434-439](#)



Hopi Hoekstra

Along Romer's Route

In the 1950s, Harvard paleontologist and former MCZ Director **Alfred S. Romer** explored Nova Scotia, collecting fossils from the Carboniferous period. He was the first to recognize that this period holds the key to the evolution of fish to early four-legged animals—tetrapods—between 360 million and 345 million years ago. This gap in the fossil record is known as “Romer’s gap,” a period from which relatively few fossils have been discovered.

In the summer of 2017, **Stephanie Pierce**, a native of Alberta, set out to follow her predecessor on a prospecting trip to Nova Scotia—one of the only places in the world to find fossils from this important period in animal evolution—hoping to fill some of that gap. Guided by Romer’s detailed field notes, Pierce, **Katrina Jones**, **Blake Dickson** and **Chris Capobianco** replicated the route of Romer’s 1956 expedition, hunting fossils in Parrsboro, Blue Beach and Sydney.

As with any expedition, the search was both exhilarating and frustrating. When they located fossils, the tide drove them to work speedily, unearthing large rocks containing their finds and lugging them across rocky beaches. Their treasure is a large tetrapod’s jaw, and Pierce feels they have found something new in tetrapod evolution from Nova Scotia’s Carboniferous period.



Stephanie Pierce



HIGHLIGHTS FROM THE COLLECTIONS

During the past year, MCZ personnel assisted in the installation of exhibitions and other displays around the university, providing expertise and specimens for public education and enjoyment.



Melissa Aja

All the World Is Here

The Peabody Museum of Archaeology & Ethnology celebrated its 150th anniversary by opening *All the World Is Here: Harvard's Peabody Museum and the Invention of American Anthropology* on April 22, 2017. The exhibition features an astonishing array of over 600 objects from Asia, Oceania and the Americas, many on display for the first time, woven into a narrative tracing the early history of the museum's collections and the birth of American anthropology.

Visitors enter the world of a late 19th-century museum and are transported into the midst of the 1893 World's Columbian Exposition, where the museum's second director, Frederic W. Putnam, and the Peabody presented their anthropological vision and collections to a wider world. *All the World Is Here* displays remarkable and historically significant items, including exotic materials traded and collected by 18th-century Boston ship captains.



Melissa Aja

"The exhibition's curators were interested in something that would exemplify the practice of collecting natural history specimens as part of otherwise unscientific commerce," says Curatorial Assistant **Jonathan Woodward**. "They wanted a model of an animal that could have been found along a Pacific Ocean trade route." The Blaschka glass animal in *All the World Is Here* depicts a Pacific Ocean sea cucumber. "In the time period covered by the exhibition, preservation methods weren't sufficient to preserve a sea cucumber for scientific study. That's why the glass models were so useful."

The Malacology specimen in this exhibit is the black-lip pearl oyster (*Pinctada margaritifera*). "The curators wanted a 'mother-of-pearl' oyster from somewhere in the Indo Pacific," says Curatorial Associate **Adam Baldinger**. He selected specimens that matched the requirements in terms of species, locality, preservation type, size and condition, and from these options the exhibit developers made their selection. "The inner layers of the shell are composed of nacre, often referred to as 'mother-of-pearl,' which can give rise to very beautiful pearls," says Baldinger. The exhibition will remain on view through at least 2022.



Scale: A Matter of Perspective

At the Collection of Historical Scientific Instruments, *Scale: A Matter of Perspective* examines the concept of scale and its power to transform perceptions of the world and our place in it. It explores the concept of scale from multiple perspectives, including models that scale things up—such as glass flowers and embryological models—and those that scale things down, like ethnographic dioramas of village life.



Melissa Aja

To demonstrate the power of scaling things down, a miniature diorama of a desert field site features Harvard paleontologist and former MCZ Director **Alfred S. Romer** unearthing a fossil specimen. Interestingly, the decades-old diorama was found in 2013 by HMNH exhibit staff while they were cleaning out a storage area. It was then accessioned by the Vertebrate Paleontology department, but recalled during planning for the exhibition.

According to Curatorial Associate **Jessica Cundiff**, the exhibition team wanted a skull of the giant 300-million-year-old amphibian, *Eryops megacephalus*, like the one Romer was placing in a plaster jacket in the diorama. “We looked through Romer’s *Eryops* material,” says Cundiff, “and found a skull that was still partially in a plaster jacket. It matched well with the miniature plaster jacket and gave a good sense of the difference in scale.” Cundiff and Curatorial Assistant **Victoria Wilke** assisted with the diorama and specimen.

To show how specimens were once scaled up to make features or activities more plainly understood, Curatorial Assistant **Jonathan Woodward** provided Reiber Glacite models—enlarged 3D depictions of microscopic organisms. Working at the Rochester Museum in the first half of the 20th century, Edwin H. Reiber developed an early translucent plastic that he called “glacite,” and he created and sold these models to educators.

MCZ Special Collections has nine of these historical glacite models made from this unique proto-plastic material. “If they had been produced earlier, glass or even wood would likely have been the medium, whereas now they would likely be 3D printed,” says Woodward. “So they function as a snapshot in time of three-dimensional illustrative enlargement practices.”

“This collection of glacite models of protists is fascinating,” says **Linda S. Ford**, Director of Collections Operations. “We are pleased to see that these objects are becoming recognized for their historical uniqueness.” *Scale: A Matter of Perspective* is on view from March 10 to December 9, 2017.



Melissa Aja



The Philosophy Chamber

Between 1766 and 1820, Harvard College assembled an extraordinary collection of paintings, portraits and prints; mineral, plant and animal specimens; scientific instruments; Native American artifacts and relics from the ancient world. These objects were displayed in three rooms in Harvard Hall adjacent to the college library.

The largest of these spaces, the Philosophy Chamber, was an ornately decorated room named for the discipline of natural philosophy, a cornerstone of the Enlightenment-era curriculum that wove together astronomy, mathematics, physics and other sciences.

After nearly 200 years, *The Philosophy Chamber: Art and Science in Harvard's Teaching Cabinet, 1766–1820*, reunites many of these original objects at the Harvard Art Museums. It features more than 100 works and specimens, including a loose reconstruction of the Philosophy Chamber itself. To represent the original biological natural history exhibits, MCZ contributed specimens from Ornithology, Ichthyology, Herpetology and Vertebrate Paleontology collections. These include a long-eared owl (*Asio otus*) prepared by Charles Willson Peale (1786–1827), a dried skin of an eastern diamondback rattlesnake, fish from New England collected in the late 18th century, and fossil fish that were in the collection during the time of the Philosophy Chamber.

The fish specimens were collected by William Dandridge Peck, Harvard's first Massachusetts Professor of Natural History, in the late 1790s. According to **Karsten Hartel**, Curatorial Associate in Ichthyology, "Peck split the fish in half, removed the soft tissue and then stitched them to paper to dry. This was consistent with the preservation methods of the day." Hartel, who co-wrote *Inland Fishes of Massachusetts* some 200 years after Peck explored the area, provided specimen information for the exhibition.

"Exhibition curators originally requested fossil specimens that were displayed and/or used for teaching at Harvard College between 1766 and 1820," says Curatorial Associate **Jessica Cundiff**, "including a fossil fish." A database search for specimens in the collection during that time period produced a list that indeed included a fossil fish, so that specimen was selected as the focus of the fossil material in the exhibition.

The Philosophy Chamber runs from May 19 to December 31, 2017, and then travels to The Hunterian at the University of Glasgow.



Jeremiah Trimble



Andrew Williston



Next of Kin

An experiential art exhibition, *Next of Kin: Seeing Extinction through the Artist's Lens*, was on display at the Harvard Museum of Natural History from December 17, 2016, to June 4, 2017, supported by a generous gift from 1968 Harvard Business School graduate Clark Bernard and Susana Bernard. This exhibition presented a provocative and powerful new perspective on the biodiversity extinction crisis by encouraging the viewer to make an emotional connection with animals long gone, and those that may soon be lost.

Next of Kin showcased two sets of mirrored portraits of endangered species by visual artist Christina Seely, accompanied by sculptural installations of extinct and threatened animals made in collaboration with Susannah Sayler and Edward Morris of The Canary Project, which produces art and media on ecological issues. Specimens of extinct, endangered and threatened animals from the MCZ collections helped contribute to the immersive experience and evoke a profound sense of empathy with our “next of kin.”

The Ornithology department contributed boxes of bones of the great auk, extinct since 1844, demonstrating the bird's onetime abundance across the North Atlantic. There are skeletons, feathers and eggs of several other extinct birds, notably the flightless moa from New Zealand. Curatorial Associate **Jeremiah Trimble** assisted with the selection of these specimens. Nine specimens of extinct, endangered or threatened animals were provided by the Mammalogy department, including the California grizzly bear, white-tailed deer, blesbok, black-faced impala, giant sable antelope, and two whales, a narwhal and sei whale. Curatorial Assistant **Mark Omura** helped with these specimens.



Kris Sribbe © 2015 President & Fellows of Harvard College

The Cabinet of Curiosity

“The cabinets have been in that hallway for as long as I can remember,” says **Adam Baldinger**, referring to the first-floor entrance to the Invertebrate Zoology department. “They once contained MCZ’s Vertebrate Paleontology specimens, but were emptied around the time that the department moved to the Northwest Building.”



Jennifer Lenihan

Faculty-curator **Gonzalo Giribet** came up with the idea to use the cabinets to display specimens from Invertebrate Zoology and Malacology collections. Once the request was approved, the cabinets were refurbished and exhibit-quality lights added under the direction of **Jay McNeil**, and curatorial staff in both departments selected specimens for display. “Our goal was to highlight the diversity of the phyla represented in the Invertebrate Zoology and Malacology departments, in many ways uniting them,” says Baldinger. The Cabinet of Curiosity debuted in April 2017.

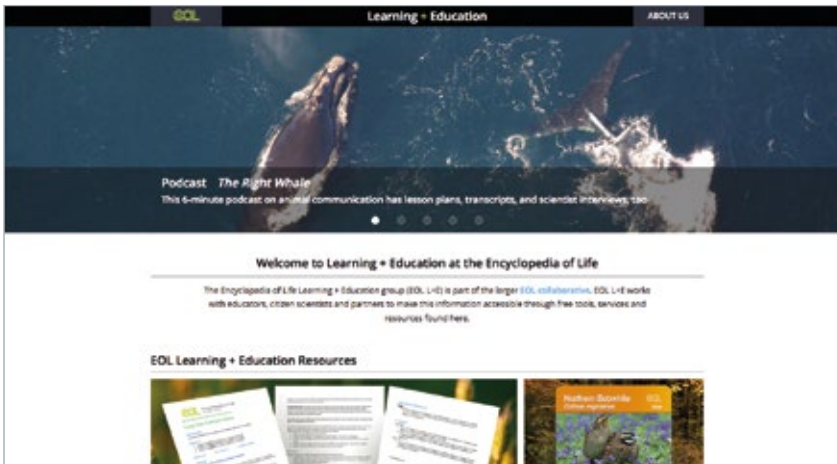
Additional Invertebrate Zoology and Malacology faculty-curators and staff who worked on the project include **Mansi Srivastava, Penny Benson, Laura Leibensperger, Jennifer Lenihan, Murat Recevik, Alana Rivera, Jennifer Goldstein, Ally Jarvis, Kate Sheridan** and **Sarah Kariko**.



PROJECTS & INITIATIVES

Encyclopedia of Life Learning + Education Group

The Encyclopedia of Life (eol.org) is a global effort to bring together species information in a free, trusted online resource. Content on EOL is provided by hundreds of partners, including the MCZ. EOL's Learning + Education Group, which is based at the MCZ, encourages the development of innovative and effective uses of EOL content, data and tools in educational settings.

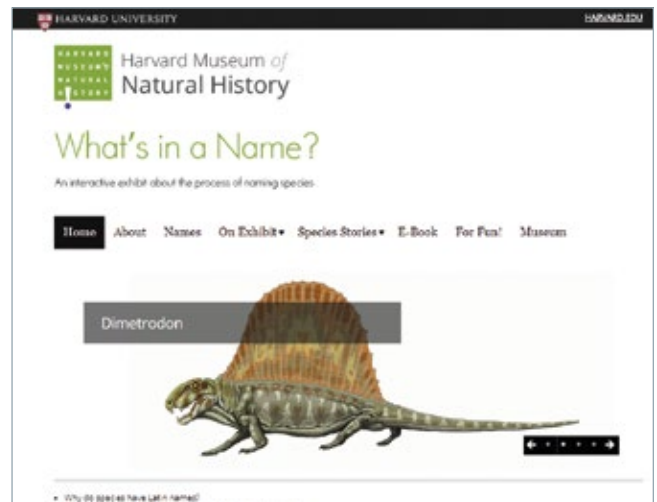


New Website

L+E has a new website, education.eol.org. The goal is to help make the wealth of biodiversity information on EOL accessible through free tools, resources and activities for students, educators, citizen scientists and nature enthusiasts. The site contains lesson plans (education.eol.org/lesson-plans), species cards (education.eol.org/species-cards) and podcasts (eol.org/info/podcasts) that can be used in the classrooms or in the field. All EOL lesson plans are aligned to Next Generation Science Standards and are designed for students 7 to 18 years old.

Collaboration on What's in a Name?

What's in a Name? incorporates four interactive kiosks into existing exhibits at the Harvard Museum of Natural History. The project explores the world of species identification and naming through interactive exhibits and online resources. The project is a partnership among the Harvard Museums of Science & Culture, EOL and the Biodiversity Heritage Library, as represented by the MCZ's Ernst Mayr Library, and was made possible through support from the Institute of Museum and Library Services. The EOL Learning + Education Group created and manages the website for the interactive exhibition, whatsinaname.hmn.harvard.edu.



City Nature Challenge

EOL provided educational resources for the 2017 City Nature Challenge (CNC), a friendly competition among urban areas to determine which location can log the highest number of nature sightings over a four- or five-day period in April. L+E and several partners helped organize the Boston CNC (inaturalist.org/projects/city-nature-challenge-2017-boston-area). In addition, all research-grade images from the CNC flow to EOL from the iNaturalist biodiversity observation platform (inaturalist.org) another open science project. The next CNC will be an international event that takes place from April 27 to 30, 2018.



New MCZ Fund Will Support Postdoctoral Research

A generous gift from Edward O. Wilson, MCZ Faculty-Curator Emeritus, University Research Professor Emeritus, has established the E. O. Wilson Postdoctoral Support Fund. Income from this fund will be awarded to support MCZ postdoctoral researchers in the discovery and formal taxonomic descriptions of the Earth's animal species.

In addition to a career filled with national and international accolades, Prof. Wilson is uniquely beloved at Harvard. He is known for the humor and charm he infuses into his work, and for his memorable ability to weave stories out of his life and research. His accomplishments are the perfect embodiment of the MCZ's research and educational mission; he not only understands and contributes himself to the rigorous study of comparative and evolutionary biology, but he translates these facts into illuminating stories that captivate listeners. The MCZ is deeply grateful for Prof. Wilson's support.



Jim Harrison

Edward O. Wilson

Ernst Mayr Library / Biodiversity Heritage Library

William Brewster's Field Notes

For several years, the Ernst Mayr Library has been digitizing William Brewster's journals, diaries, correspondence and photographs thanks to an Institute of Museum and Library Services (IMLS) grant and one from the Council for Library and Information Resources led by the Smithsonian Institution. Brewster was curator of mammals and birds at MCZ from 1885 until his death in 1919. So far 21,179 of 33,824 pages have been digitized and deposited in Harvard's Digital Repository Service and the Biodiversity Heritage Library (BHL). Approximately 5,000 pages have been transcribed.

Biodiversity Heritage Library

The Ernst Mayr Library has contributed 9,715 volumes (3,247,544 pages), containing 12,280,228 species-name instances, to the Biodiversity Heritage Library. Since 2008, items from our library have been downloaded 8,675,343 times. The most-used title, *Memoires couronnees et memoires des savants etrangers, publies par l'Academie royale des sciences, des lettres et des beaux-arts, t.29 (1856-1858)*, has been downloaded 11,869 times!



Mary Sears

Laura Bush 21st Century Librarian Award

The grant-funded project *Foundations to Actions: Extending Innovations in Digital Libraries in Partnership with National Digital Stewardship Learners* is 50% complete. Image searching and identification tools are being reviewed, collections and gap identification are in process, and better connections with the Global Biodiversity Information Facility and the Encyclopedia of Life (EOL) are being sought.

Expanding Access to Biodiversity Literature (EABL)

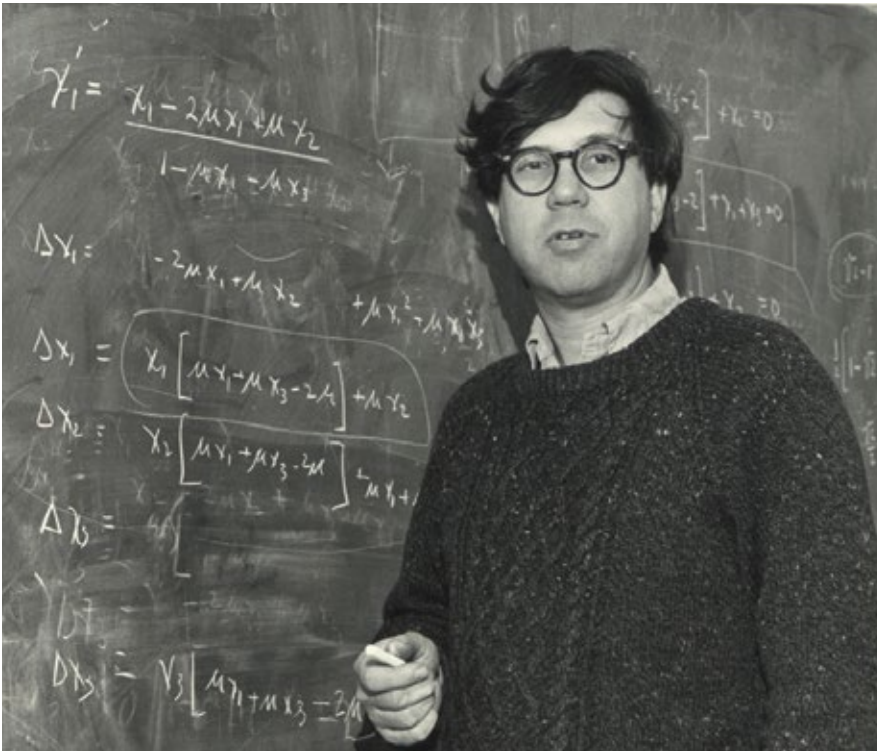
Awarded in 2015 to the New York Botanical Garden with partners Ernst Mayr Library and Missouri Botanical Garden, this grant aims to increase the availability of biodiversity literature by seeking out content providers who may need assistance in digitization and negotiating with copyright holders for more recent publications. Among other accomplishments, permissions to add 187 in-copyright titles have been successfully negotiated. The EABL Collection in BHL currently holds 6,013 volumes from 725 titles and contains 656,309 pages.

Research

Mary Sears, Head of Public Services, co-authored *The Blagg Collection of California Bryozoa at the Museum of Comparative Zoology, Harvard University*, which was published in the journal *Breviora*. Sears and Museum Librarian Connie Rinaldo collaborated with staff from the Harvard Museums of Science & Culture, MCZ and EOL on the IMLS grant, *What's in a Name*. library.mcz.harvard.edu/node/964921



AWARDS & RECOGNITION



Richard Lewontin

Emeritus

Richard Lewontin was awarded the Thomas Hunt Morgan Medal by the Genetics Society of America for lifetime achievement in the field of genetics.

Edward O. Wilson received the 2016 Humane Society of New York's Humane Medal. He also won the 2017 Reed Environmental Writing Award for his book, *Half-Earth: Our Planet's Fight for Life*.



Jonathan Woodward

Faculty

Gonzalo Giribet was awarded a five-year Harvard College Professorship, which recognizes exceptional undergraduate teaching.

Hopi Hoekstra was elected a Fellow of the American Academy of Arts and Sciences, President of the Society for the Study of Evolution, and a member of the Board of Directors of the Genetics Society of America.

Naomi Pierce was one of five recipients of the Verrill Medal from the Yale Peabody Museum of Natural History.

Mansi Srivastava was awarded the Smith Family Award for Excellence in Biomedical Research and a U.S. National Science Foundation CAREER award.

Staff

Sixteen MCZ staff members met long-term service milestones as Harvard employees:

- 25+ years: **Ronnie Broadfoot, Judy Chupasko, Andra Hollis, Catherine Musinsky, Kenneth Wilcox and Robert Young**
- 30+ years: **Stefan Cover, Dana Fisher, Laura Leibensperger, Pedro Ramirez and Mary Sears**
- 40+ years: **Paul Dwyer, Karsten Hartel, John Nevins and José Rosado**
- 51 years: **Kathleen Horton**

OEB staff members also celebrated service milestones: **Wendy Heywood**, 20 years; **Megan McHugh**, 10 years; and **Kristin Pennarun**, 5 years.

Wendy Heywood, OEB Communication and Events Coordinator, and **Jonathan Woodward**, Curatorial Assistant, received a Dean's Distinction award from the Harvard Faculty of Arts and Sciences.

Damari Rosado, OEB Associate Director of Administration, received a Harvard Heroes award.



Postdoctoral Researchers

Katrina Jones received an American Association of Anatomists postdoctoral fellowship.

Mary C. Stoddard won the 2016 Theodosius Dobzhansky Award from the Society for the Study of Evolution.



Zachary Morris

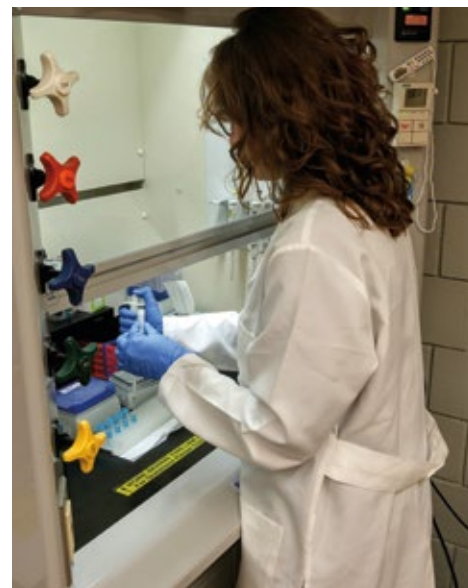
Dylan Wainwright each received a Derek Bok Certificate of Distinction in Teaching.

Tauana Cunha, Phil Lai, Mara Laslo, Caitlin Lewarch, Brianna McHorse and Zachary Morris each received a Doctoral Dissertation Improvement Grant from the U.S. National Science Foundation.

Emily Hager received an American Society of Mammalogists Grant-in-Aid of Research.

Sang Il Kim was awarded a Graduate Student Research Award from the Society of Systematic Biologists.

Mara Laslo received one of two Best Student Oral Presentation Awards at the International Conference on Comparative Endocrinology.



Tauana Cunha

Graduate Students

Felix Baier was selected as a three-year Howard Hughes Medical Institute International Research Fellow.

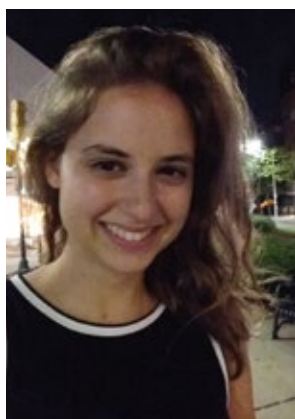
Nicole Bedford was awarded a Young Investigator Travel Award from the Society of Molecular Biology and Evolution.

John Boyle, Glenna Clifton, Tauana Cunha, Philip Grayson, Ambika Kamath, Kelsey Lucas, Brianna McHorse, Zachary Morris, Pavitra Muralidhar, Allison Shultz, Kira Treibergs and

Undergraduates

Emmanuel D'Agostino was awarded a Beacon Travel Award to attend and present his research at the annual meeting of the Society for the Study of Evolution.

Rebecca Greenberg and Annika Gompers were awarded Harvard Herchel Smith Undergraduate Fellowships.



Rebecca Greenberg



Mara Laslo



Felix Baier



MCZ GRANT RECIPIENTS ACADEMIC YEAR 2016–2017

Grants in Aid of Undergraduate Research (GUR)

These grants support research by Harvard College undergraduates under faculty supervision. Priority is given to projects that utilize MCZ, Harvard University Herbaria (HUH) and Arnold Arboretum (AA) research collections, laboratories and facilities. Support for these grants comes from the MCZ's Myvanwy M. and George M. Dick Scholarship for Students, HUH and AA.

Recipient	Faculty Sponsor/ Academic Dept.	Project Title	Amount
Julie A. Baldassano	Hopi Hoekstra/ Organismic and Evolutionary Biology	Expression patterns of nesting-related candidate genes in <i>Peromyscus</i> brains	\$2,500
Lorena M. Benitez	Stephanie Pierce/ Organismic and Evolutionary Biology	Vertebral anatomy and locomotor evolution in mammals: A geometric morphometrics approach	\$500
Adrienne M. Bielawski	Hopi Hoekstra/ Organismic and Evolutionary Biology	Structure versus function: Relating nest score to insulation index in <i>Peromyscus polionotus</i> mice	\$452
Julius G. Bright Ross	Paul Moorcroft/ Organismic and Evolutionary Biology	Hunting feeding station impact on roe deer habitat selection	\$500
Eamon C. Corbett	Scott Edwards/ Organismic and Evolutionary Biology	Phylogeography of a widespread South American dry forest furnariid, the rufous-fronted thornbird	\$2,500
Katherine A. Culbertson	Jonathan Losos/ Organismic and Evolutionary Biology	An investigation of inter-specific interactions of <i>Anolis carolinensis</i> and <i>A. sagrei</i>	\$2,500
Emmanuel R. D'Agostino	Hopi Hoekstra/ Organismic and Evolutionary Biology	Developing Amazon Mechanical Turk as a method for specimen analysis using <i>Peromyscus</i>	\$650
Emmanuel R. D'Agostino	Hopi Hoekstra/ Organismic and Evolutionary Biology	Analyzing and furthering Amazon Mechanical Turk-based specimen analysis	\$2,500
Sarah E. Gonzalez	Stephanie Pierce/ Organismic and Evolutionary Biology	Regional variation in the mechanical properties of the vertebral column in <i>Felis catus</i>	\$2,500
Cara R. Jacobson	Richard Wrangham/ Human Evolutionary Biology	Senior thesis on the effects of male dominance on consortship costs in Kibale olive baboons	\$950



Nicole Bedford



Nina L. Morales



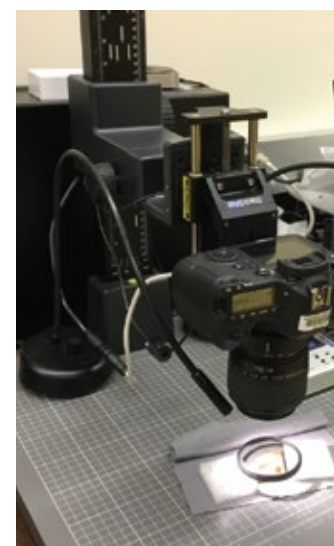
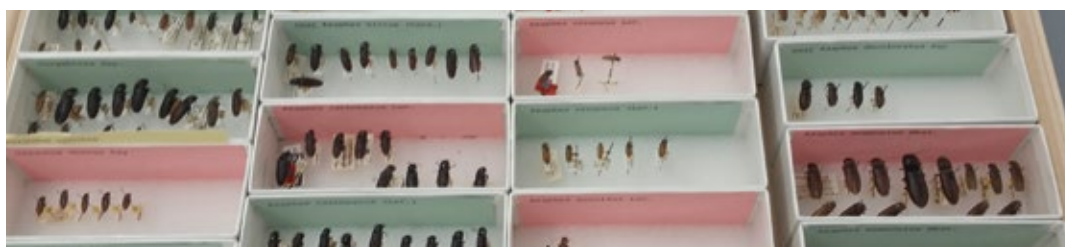
Gonzalo Ciribet



Nina L. Morales



Frank E. Etzler



Gwen S. Antell

Recipient	Faculty Sponsor/ Academic Dept.	Project Title	Amount
Juliet Kim	Mansi Srivastava/ Organismic and Evolutionary Biology	Characterization of the neoblast niche in the regenerating acoel <i>Hofstenia miamia</i>	\$2,500
Nina L. Morales	Jonathan Losos/ Organismic and Evolutionary Biology	Do behavioral changes of <i>Anolis sagrei</i> in the presence of <i>Leiocephalus carinatus</i> impact <i>A. sagrei</i> diet and greater trophic cascades?	\$2,275
Christian Perez	Brian Farrell/ Organismic and Evolutionary Biology	International workshop on Neotropical praying mantises	\$500
Elianna M. Shwayder	Richard Wrangham/ Human Evolutionary Biology	Senior thesis on the motivations for male-female friendships among olive baboons	\$2,500
Shunn Theingi	Hopi Hoekstra/ Organismic and Evolutionary Biology	Pigmentation variation in <i>Peromyscus maniculatus</i> across an environmental gradient	\$2,500
		Total Awards	\$23,327



Gonzalo Giribet

Julia Cosgrove and
Ligia Benavides Silva

Robert G. Goelet Research Awards

Goelet Awards support MCZ graduate student research projects. These grants are made possible through a gift from Mr. Robert G. Goelet.

Recipient	MCZ Department	Project Title	Amount
Mara Laslo	Herpetology	An unbiased view of thyroid hormone regulated development in a direct-developing frog	\$600
Mara Laslo	Herpetology	Evaluating the role of thyroid hormone in limb development in a direct-developing frog, <i>Eleutherodactylus coqui</i>	\$2,456
		Total Awards	\$3,056



Nicole Bedford

Nina L. Morales



Ernst Mayr Travel Grants in Animal Systematics

Ernst Mayr Grants support travel for research in animal systematics and are open to the scientific community worldwide. The principal objective of these grants is to stimulate taxonomic work on neglected taxa and/or poorly described species. Ernst Mayr Grants typically facilitate visits to institutional collections, with preference given to research that uses MCZ's collections. These grants are made possible by a gift from Professor and former MCZ Director Ernst Mayr.

Recipient	Institutional Affiliation	Project Title	Amount
Gwen S. Antell	Florissant Fossil Beds National Monument	Revision of orthopteroid insects from Florissant fossil beds	\$1,150
Doug B. Booher	University of California, Los Angeles	Species-group revision of the Australasian ants of the genus <i>Strumigenys</i>	\$1,500
Brendon E. Boudinot	University of California, Davis	The male ants of the New World: Keys to and diagnoses of the subfamilies and genera	\$1,500
Aldo Caccavo de Araujo	Federal University of Rio de Janeiro	Taxonomic revision of the genus <i>Neacomys</i> Thomas, 1900 (Rodentia: Cricetidae: Sigmodontinae)	\$1,500
Gabriela Procópio Camacho	Smithsonian Institution	Taxonomy and systematics of <i>Gnamptogenys</i> Roger (Hymenoptera, Formicidae, Ectatomminae) in the world	\$830
Anthony I. Cognato	Michigan State University	Scolytine type imaging	\$1,500
Paulo Vilela Cruz	Universidade Federal de Rondônia, Brazil	Delimitation of the mayfly genera <i>Paracloeodes</i> Day, Rivudiva Lugo-Ortiz & McCafferty, and <i>Varipes</i> Lugo-Ortiz & McCafferty (Ephemeroptera: Baetidae): Analysis of the type specimens	\$1,500
Jesús Alberto Cruz-López	National Autonomous University of Mexico	Taxonomy and phylogeny of the <i>Metopilio</i> -group (Opiliones: Eupnoi: Phalangioidea)	\$1,500
Frank E. Etzler	Montana State University	Revision of the <i>Hemicrepidius</i> (Coleoptera: Elateridae) of the New World	\$1,000
Aaron B. Evans	Auckland University of Technology	Systematics of the squid family Cranchiidae in the Pacific Ocean	\$1,500
Andrey Frolov	Russian Academy of Sciences	<i>Anochetus</i> Mayr, 1861 (Hymenoptera: Formicidae: Ponerinae) of the MCZ	\$1,500
Gerardo L. Gutiérrez de la Cruz	National University of San Marcos	An integrative taxonomic revision of genus <i>Dicrodon</i>	\$1,000
Manuel Ituriaga Monsisbay	Institute of Ecology and Systematics, Cuba	Taxonomic review of the blindsnakes of species group <i>Typhlops lumbricalis</i> (Scolophoridae, Typhlopidae) in Cuba	\$1,500
Oliver Keller	University of Florida	Systematic revision of the firefly genus <i>Robopus</i> Motschulsky 1853 (Coleoptera: Lampyridae)	\$1,500
Claire Lewis	University of Hawai'i at Manoa	Investigating historical collections to understand corals of the future	\$1,407



Carolina Yamaguchi

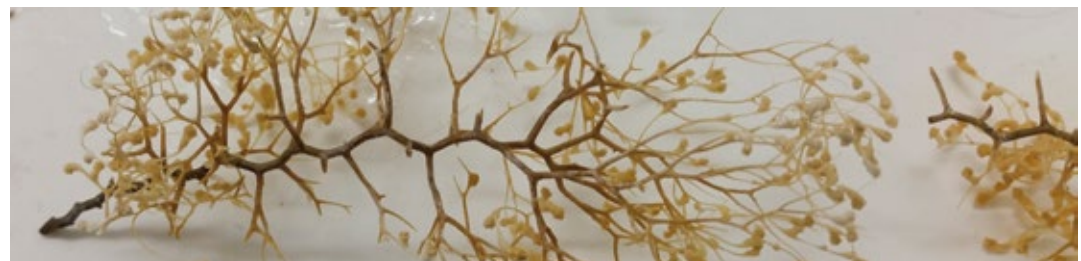


Robert Keller

Doug B. Booher



Alejandro Mendoza



Candice Bobby Untiedt



Gonzalo Giribet



Gwen S. Antell



Carolina Yamaguchi

Recipient	Institutional Affiliation	Project Title	Amount
Ivan L. Fiorini Magalhaes	Museo Argentino de Ciencias Naturales	Systematics and taxonomy of the Nearctic <i>Kukulcania</i> spiders (Araneae: Filistatidae)	\$1,460
Steven J. Messer	Arizona State University	The evolution and taxonomy of inquiline social parasites and their hosts in the crazy ant genus <i>Nylanderia</i>	\$1,500
Ana Paula Motta Vieira	São Paulo State University	Taxonomic review of the Neotropical genus <i>Phrynopus</i> Peters, 1873 (Anura: Craugastoridae)	\$1,500
Sameer Mukund Padhye	Abasaheb Garware College	An in depth taxonomical re-assessment of the "large branchiopods" (Crustacea: Branchiopoda: Anostraca, Notostraca, Laevicaudata, Spinicaudata) collection from the Yale North India expedition deposited in the Yale Peabody Museum of Natural History	\$1,500
Manju Siliwal	Wildlife Information Liaison Development Society, Coimbatore, India	Taxonomic studies on mygalomorph spiders from the Old World	\$1,500
Scott L. Travers	University of Kansas	Evolutionary community assembly of Melanesian Island frogs: Phylogeny, species boundaries, and taxonomic revision of the genus <i>Cornufer</i> (Anura: Ceratobatrachidae)	\$1,000
Candice Bobby Untiedt	University of Tasmania	Revision of <i>Chrysogorgia</i> (Coelenterata: Octocorallia: Alcyonacea: Chrysogorgiidae): Morphological and molecular diversity	\$1,440
Matthew Van Dam	California Academy of Sciences	Revision of the genus <i>Trigonoscuta</i> Motschulsky 1853 (Coleoptera: Curculionidae)	\$1,000
Diego F. B. Vaz	Virginia Institute of Marine Science, College of William & Mary	Taxonomy and systematics of the genus <i>Porichthys</i> Girard, 1854 (Batrachoididae: Batrachoidiformes)	\$1,500
Carolina Yamaguchi	University of São Paulo	Cladistic analysis of Phthiriinae Becker, 1913 (Diptera, Bombyliidae)	\$1,500
Total Awards			\$34,287



Sameer Mukund Padhye

Christian Perez



Manju Siliwal





Gonzalo Giribet

Ligia Benavides Silva

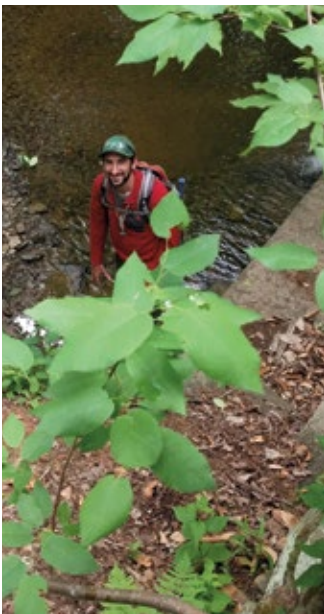
Putnam Expedition Grants

Putnam Expedition Grants are intended to support MCZ faculty-curators, postdoctoral fellows and graduate students in collecting specimens and data relating to the study of comparative zoology. Priority is given to projects that collect living specimens in regions where habitats are threatened or fossil specimens in regions most likely to hold important clues for unraveling evolutionary strategies. These grants are made possible by a gift from Mr. George Putnam, Jr., AB 1949 and MBA 1951, and Mrs. Nancy Putnam.

Recipient	MCZ Department	Project Title	Amount
Nicole Bedford	Mammalogy	Understanding the social and ecological contexts of burrowing behavior in wild beach mice	\$9,280
Claire Marie-Soleil Dufour	Herpetology	Coexistence mechanisms between the native species <i>Anolis oculatus</i> and a new intruder <i>Anolis cristatellus</i> in Dominica: The second step	\$4,735
Gonzalo Giribet	Invertebrate Zoology	Collecting in the open backyard of the forbidden land: An arachnological trip to Trinidad and Tobago	\$9,305
Katrina E. Jones	Vertebrate Paleontology	Hunting for evidence of the earliest synapsids in Nova Scotia	\$2,450
Melissa E. Kemp	Herpetology	Using fossils to predict how global change will impact future lizard communities	\$9,810
Vanessa L. Knutson	Invertebrate Zoology	The evolution of shell loss in heterobranch gastropods	\$5,285
Vanessa L. Knutson	Invertebrate Zoology	Characterization of taxonomy and shell variability in <i>Phyllaplysia taylori</i> , a potential model for heterobranch shell loss.	\$4,872
Oriol Lapiedra	Herpetology	Evolution of animal personalities under new selective regimes: A field experiment in <i>Anolis</i> lizards	\$3,925
Melissa R. Whitaker	Entomology	Cycad moths of southern Africa	\$2,420
		Total Awards	\$40,832



Frank E. Etzler



Katrina E. Jones

Chris Capobianco



Nicole Bedford

Caroline Hu and Jacob Gable

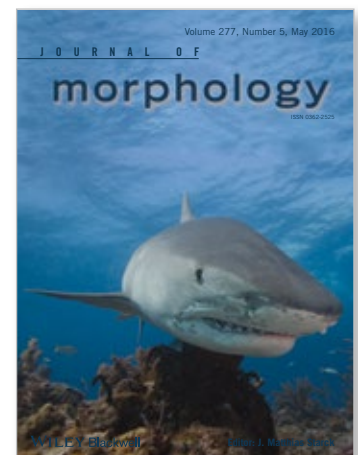


MCZ PUBLICATIONS IN CALENDAR YEAR 2016

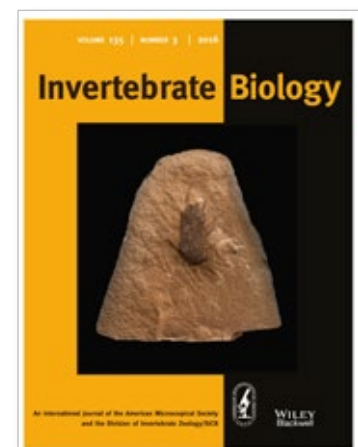
- Akanyeti O, **Thornycraft PJM**, **Lauder GV**, Yanagitsuru Y, Peterson AN, Liao JC (2016) Fish optimize sensing and respiration during undulatory swimming. *Nat Commun* 7:11044
- **Baker CCM**, **Bittleston LS**, **Sanders JG**, **Pierce NE** (2016) Dissecting host associated communities with DNA barcodes. *Phil Trans R Soc B* 371:20150328
- Bear DM, **Lassance JM**, **Hoekstra HE**, Datta SR (2016) The evolving neural and genetic architecture of vertebrate olfaction. *Curr Biol* 26:R1039-R1049
- **Biewener AA** (2016) Locomotion as an emergent property of muscle contractile dynamics. *J Exp Biol* 219:285-294.
- **Bittleston LS**, **Pierce NE**, Ellison AM, Pringle A (2016) Convergence in multispecies interactions. *Trends Ecol Evol* 31:269-280
- Bottom RG, Borazjani I, Blevins E L, **Lauder GV** (2016) Hydrodynamics of swimming in stingrays: Numerical simulations and the role of the leading edge vortex. *J Fluid Mech* 788:407-443
- Campbell-Staton SC, **Edwards SV**, **Losos JB** (2016) Climate-mediated adaptation after mainland colonization of an ancestrally subtropical island lizard, *Anolis carolinensis*. *J Evol Biol* 29:2168-2180
- Carbayo F, Francoy TM, **Giribet G** (2016) Non-destructive imaging to describe a new species of *Obama* land planarian (Platyhelminthes, Tricladida). *Zool Scr* 45:566-578
- Clouse RM, Sharma PP, Stuart JC, Davis LR, **Giribet G**, Boyer SL, Wheeler WC (2016) Phylogeography of the harvestman genus *Metasiro* (Arthropoda, Arachnida, Opiliones) reveals a potential solution to the Pangean paradox. *Org Divers Evol* 16:167-184
- **Combosch DJ**, **Giribet G** (2016) Clarifying phylogenetic relationships and the evolutionary history of the bivalve order Arcida (Mollusca: Bivalvia: Pteriomorpha). *Mol Phylogenet Evol* 94:298-312
- Copes LE, Lucas LM, Thostenson JO, **Hoekstra HE**, Boyer DM (2016) A collection of non-human primate computed tomography scans housed in MorphoSource, a repository for 3D data. *Sci Data* 3:160001
- Costa CS, **Giribet G** (2016) Taxonomic notes on *Mesoperipatus tholloni* (Onychophora: Peripatidae), an elusive velvet worm from Gabon. *Breviora* 552:1-10
- **Couto DR**, Bouchet P, Kantor YI, Simone LRL, **Giribet G** (2016) A multilocus molecular phylogeny of Fasciolariidae (Neogastropoda: Buccinoidea). *Mol Phylogenet Evol* 99:309-322
- Cuff AR, Sparkes EL, Randau M, **Pierce SE**, Kitchener AC, Goswami A, Hutchinson JR (2016) The scaling of postcranial muscles in cats (Felidae) I: Forelimb, cervical, and thoracic muscles. *J Anat* 229:128-141
- Cuff AR, Sparkes EL, Randau M, **Pierce SE**, Kitchener AC, Goswami A, Hutchinson JR (2016) The scaling of postcranial muscles in cats (Felidae) II: Hindlimb and lumbosacral muscles. *J Anat* 229:142-152
- Dunlop JA, Selden PA, **Giribet G** (2016) Penis morphology in a Burmese amber harvestman. *Sci Nat* 103:11
- Dupont ST, Zemeitat DS, Lohman DS, **Pierce NE** (2016) The setae of parasitic *Liphya brassolis* butterfly larvae form a flexible armour for resisting attack by their ant hosts (Lycaenidae: Lepidoptera). *Biol J Linn Soc* 117:607-619
- **Edwards SV** (2016) Inferring species trees. In *Encyclopedia of Evolutionary Biology* (Kliman R, ed) Vol 4. Elsevier Inc: New York
- **Edwards SV** (2016) Phylogenomic subsampling: A brief review. *Zool Scri* 45:63-74
- **Edwards SV**, Potter S, **Schmitt CJ**, Bragg JG, Moritz C (2016) Reticulation, divergence, and the phylogeography-phylogenetics continuum. *Proc Natl Acad Sci USA* 113:8025-8032
- **Edwards SV**, Xi Z, Janke A, Faircloth BC, McCormack JE, Glenn TC, Zhong B, Wu S, Lemmon EM, Lemmon AR (2016) Implementing and testing the multispecies coalescent model: A valuable paradigm for phylogenomics. *Mol Phylogenet Evol* 94:447-462
- Elgar MA, Nash DR, **Pierce NE** (2016) Eavesdropping on cooperative communication within an ant-butterfly mutualism. *Sci Nat* 103:84
- **Feilich KL** (2016) Correlated evolution of body and fin morphology in the cichlid fishes. *Evolution* 70:2247-2267
- **Fernández R**, Edgecombe GD, **Giribet G** (2016) Exploring phylogenetic relationships within Myriapoda and the effects of matrix composition and occupancy on phylogenomic reconstruction. *Syst Biol* 65:871-889
- **Fisher HS**, **Jacobs-Palmer E**, **Lassance JM**, **Hoekstra HE** (2016) The genetic basis and fitness consequences of sperm midpiece size in deer mice. *Nat Commun* 7:13652
- **Flammang BE**, **Lauder GV** (2016) Functional morphology and hydrodynamics of backwards swimming in bluegill sunfish, *Lepomis macrochirus*. *Zoology* 119:414-420
- Fu AL, Hammerschlag N, **Lauder GV**, Wilga CD, Kuo CY, Irschick DJ (2016) Ontogeny of head and caudal fin shape of an apex marine predator: The tiger shark (*Galeocerdo cuvier*). *J Morphol* 277:556-564
- Garwood RJ, Edgecombe GD, Charbonnier S, Chabard D, Sotty D, **Giribet G** (2016) Carboniferous Onychophora from Montceau-les-Mines, France, and onychophoran terrestrialization. *Invertebr Biol* 135:179-190



“Correlated evolution of body and fin morphology in the cichlid fishes” by K.L. Feilich was featured on the cover of *Evolution*.



For the cover story, **George Lauder** and colleagues contributed research on tiger shark morphology.



“Carboniferous Onychophora from Montceau-les-Mines, France, and onychophoran terrestrialization” by **Gonzalo Giribet** and co-authors was the cover story.



- **Gehrke AR, Srivastava M** (2016) Neoblasts and the evolution of whole-body regeneration. *Curr Opin Genet Dev* 40:131-37
- **Giribet G** (2016) Vicariance biogeography. In *The Encyclopedia of Evolutionary Biology* (Kliman RM ed) Academic Press: Oxford
- **Giribet G** (2016) New animal phylogeny: Future challenges for animal phylogeny in the age of phylogenomics. *Org Divers Evol* 16:419-426
- **Giribet G** (2016) Genomics and the Animal Tree of Life: Conflicts and future prospects. *Zool Scr* 45:14-21
- **Giribet G** (2016) Zoology: Invertebrates that parasitize invertebrates. *Curr Biol* 26:R537-R539
- **Giribet G** (2016) Zoology: At last an exit for ctenophores. *Curr Biol* 26:R918-920
- **Giribet G, Boyer SL, Baker C, Fernández R, Sharma PP, de Bivort BL, Daniels SR, Harvey MS, Griswold CE** (2016) A molecular phylogeny of the temperate Gondwanan family Pettalidae (Arachnida, Opiliones, Cyphophthalmi) with biogeographic and taxonomic implications. *Zool J Linnean Soc* 178:523-545
- **Giribet G, Hormiga G, Edgecombe GD** (2016) The meaning of categorical ranks in evolutionary biology. *Org Divers Evol* 16:427-430
- **Giribet G, Kawauchi GY** (2016) How many species of *Siphonaria pectinata* (Gastropoda: Heterobranchia) are there? *J Mollus Stud* 82:137-143
- Greer PL, Bear DM, **Lassance JM**, Bloom ML, Tsukahara T, Masada FK, Nolan AC, **Hoekstra HE**, Datta SR (2016) A family of non-GPCR chemosensors defines an alternative logic for mammalian olfaction. *Cell* 165:1734-1748
- **Groen SC, Humphrey PT, Chevasco D, Ausubel FM, Pierce NE, Whiteman NK** (2016) *Pseudomonas syringae* enhances herbivory by suppressing the reactive oxygen burst in *Arabidopsis*. *J Insect Physiol* 84:90-102
- Harvey MS, Huey JA, Hillyer MJ, **McIntyre E, Giribet G** (2016) The first troglobitic species of Gymnobisiidae (Pseudoscorpiones: Neobisioidea), from Table Mountain (Western Cape Province, South Africa) and its phylogenetic position. *Invertebr Syst* 30:75-85
- Helmus MR, Behm JE, Jesse WAM, Kolbe JJ, Ellers J, **Losos JB** (2016) A comparison of the ecology and evolution of exotic and native anole lizards. In *Invasion genetics: The Baker and Stebbins legacy* (Barrett SCH, Colautti RI, Dlugosch KM, Rieseberg LH, eds) John Wiley and Sons, Ltd
- Higham TE, Rogers SM, Langerhans RB, Janniczky HA, **Lauder GV**, Stewart WJ, Martin CH, Reznick DN (2016) Speciation through the lens of biomechanics: Locomotion, prey capture, and reproductive isolation. *Proc R Soc B* 283:20161294
- **Ingram T, Harrison A, Mahler DL, Castañeda MdR, Glor RE, Herrel A, Stuart YE, Losos JB** (2016) Comparative tests of the role of dewlap size in *Anolis* lizard speciation. *Proc R Soc B* 283:20162199
- Jaffe AL, **Campbell-Staton SC, Losos JB** (2016) Geographical variation in morphology and its environmental correlates in a widespread North American lizard, *Anolis carolinensis* (Squamata: Dactyloidae). *Biol J Linnean Soc* 117:760-774
- **Janda M, Matos-Maravi P, Borovanska M, Zima J, Youngerman E, Pierce NE** (2016) Phylogeny and population genetic structure of the ant genus *Acropyga* (Hymenoptera: Formicidae) in Papua New Guinea. *Invertebr Syst* 30:28-40
- **Jones KE** (2016) New insights on equid locomotor evolution from the lumbar region of fossil horses. *Proc R Soc B* 283:1829
- **Jones KE, Holbrook L** (2016) The evolution of lateral accessory articulations in the lumbar region of perissodactyls. *J Vert Paleontol* 36:6, e1224892
- **Jones KE, Pierce SE** (2016) Axial allometry in a neutrally buoyant environment: Effects of the terrestrial aquatic transition on vertebral scaling. *J Evol Biol* 29:594-601
- Kalfatovic M, **Rinaldo C** (2016) Enabling progress in global biodiversity research: The Biodiversity Heritage Library. In *Libraries: Enabling Progress, The Proceedings of the Eighth Shanghai International Library Forum*. Shanghai Scientific and Technological Literature Press: Shanghai
- **Kamath A** (2016) Ornament morphology varies with display behaviour and sexual size dimorphism, but not habitat, in the fan-throated lizard (*Sitana*, Agamidae). *J Herpetol* 50:394-403
- **Kamath A, Sreekar R** (2016) Morphology, ecology, and behaviour of *Hylarana intermedia*, a Western Ghats frog. *Acta Herpetol* 11:15-20
- **Kenaley CP, Lauder GV** (2016) A biorobotic model of the suction feeding system in teleost fishes: The roles of motor program speed and hyoid kinematics. *J Exp Biol* 219:2048-2059
- Kolbe JJ, **VanMiddlesworth P, Battles AC, Stroud JT, Buffum B, Forman RTT, Losos JB** (2016) Determinants of spread in an urban landscape by an introduced lizard. *Landscape Ecol* 31:1795-1813
- Kvist S, Ocegüera-Figueroa A, Tessler M, Jiménez-Armenta J, Freeman RM, **Giribet G, Siddall ME** (2016) When predator becomes prey: Investigating the salivary transcriptome of the shark-feeding leech *Pontobdella macrothela* (Hirudinea: Piscicolidae). *Zool J Linnean Soc*
- **Lauder GV, Wainwright DK, Domel AG, Weaver J, Wen L, Bertoldi K** (2016) Structure, biomimetics, and fluid dynamics of fish skin surfaces. *Phys Rev Fluids* 1:060502
- **Lemer S, Combosch DJ, Dumale D, Sotto F, Soliman V, Giribet G** (2016) The family Pinnidae (Bivalvia) in the Philippine archipelago: Observations on its distribution and phylogeography. *Nautilus* 130:137-145
- **Lemer S, González VL, Bieler R, Giribet G** (2016) Cementing mussels to oysters in the pteriomorphian tree: A phylogenomic approach. *Proc R Soc B* 283:20160857
- **Lim JL, Lauder GV** (2016) Mechanisms of anguilliform locomotion in fishes studied using simple three-dimensional physical models. *Bioinspir Biomim* 11:046006
- **Losos JB, Lenski RE**, eds (2016) *How evolution shapes our lives: Essays on biology and society*. Princeton University Press: Princeton, NJ
- Lozano-Fernandez J, Carton R, Tanner AR, Puttick MN, Blaxter M, Vinther J, Olesen J, **Giribet G, Edgecombe GD, Pisani D** (2016) A molecular palaeobiological exploration of arthropod terrestrialisation. *Phil Trans R Soc B* 371:20150133
- **Maddin H, Piekarski N, Sefton EM, Hanken J** (2016) Homology of the cranial vault in birds: New insights based on embryonic fate-mapping and character analysis. *R Soc Open Sci* 3:160356
- Mahler DL, Lambert SM, **Geneva AJ, Ng J, Hedges SB, Losos JB, Glor RE** (2016) Discovery of a giant chameleon-like lizard (*Anolis*) on Hispaniola and its significance to understanding replicated adaptive radiations. *Am Nat* 188:357-364
- **Mallarino R, Hoekstra HE, Manceau M** (2016) Developmental genetics in emerging rodent models: Case studies and perspectives. *Curr Opin Genet Dev* 39:182-186
- **Mallarino R, Henegar C, Mirasierra M, Manceau MC, Shradin C, Vallejo M, Beronja S, Barsh GS, Hoekstra HE** (2016) Developmental mechanisms of stripe patterns in rodents. *Nature* 539:518-523
- Mallet J, **Hoekstra HE** (2016) Ecological genetics: A key gene for mimicry and melanism. *Curr Biol* 26:R802-804
- **McHorse BK, Davis EB, Scott E, Jenkins DL** (2016) What species of horse was coeval with North America's earliest humans in the Paisley Caves? *J Vert Paleontol* 36:6, e1214595



- Medina I, **Losos JB**, Mahler DL (2016) Evolution of dorsal pattern variation in Greater Antillean *Anolis* lizards. *Biol J Linn Soc* DOI:10.1111/bij.12881
- **Oliver JD**, **Jones KE**, Hautier L, Loughry WJ, **Pierce SE** (2016) Vertebral bending mechanics and xenarthrous morphology in the nine-banded armadillo (*Dasyus novemcinctus*). *J Exp Biol* 219:2991-3002
- Park SJ, Gazzola M, Park KS, Park S, **Di Santo V**, **Blevins EL**, Lind JU, Campbell PH, Dauth S, Capulli AK, Pasqualini FS, Seungkuk A, Cho A, Yuan H, Maoz BM, Vijaykumar R, Choi JW, Deisseroth K, **Lauder GV**, Mahadevan L, Parker KK (2016) Phototactic guidance of a tissue-engineered soft-robotic ray. *Science* 353:158-162
- Parra-Olea G, Rovito SM, García-París M, Maisano JA, Wake DB, **Hanken J** (2016) Biology of tiny animals: Three new species of minute salamanders (Plethodontidae: *Thorius*) from Oaxaca, Mexico. *PeerJ* 4:e2694
- **Pérez-de la Fuente R**, Delclòs X, Peñalver E, Engel MS (2016) A defensive behavior and plant-insect interaction in Early Cretaceous amber—The case of the immature lacewing *Hallucinochrysa diogenesi*. *Arthropod Struct Dev* 45:133-139
- **Pohl S**, **Frederickson ME**, Elgar MA, **Pierce NE** (2016) Colony diet influences ant worker foraging and attendance of myrmecophilous lycaenid caterpillars. *Front Ecol Evol* 4:114
- Polly PD, Stayton CT, Dumont ER, **Pierce SE**, Rayfield EJ, Angielczyk KD (2016) Combining geometric morphometrics and finite element analysis with evolutionary modeling: Towards a synthesis. *J Vert Paleontol* 36:e1111225
- Randau M, Cuff AR, Hutchinson JR, **Pierce SE**, Goswami A (2016) Regional differentiation of felid vertebral column evolution: A study of 3D shape trajectories. *Org Divers Evol* 17:305
- Randau M, Goswami A, Hutchinson JR, Cuff AR, **Pierce SE** (2016) Cryptic complexity in felid vertebral evolution: Shape differentiation and allometry of the axial skeleton. *Zool J Linn Soc* 178:183-202
- Roman J, **Nejvins JL**, Altabet MA, Koopman H, **McCarthy JJ** (2016) Endangered right whales enhance nutrient availability for primary productivity in a tidally mixed basin. *PLoS ONE* 11:e0156553
- **Ros IG**, **Biewener AA** (2016) Optic flow stabilizes flight in ruby-throated hummingbirds. *J Exp Biol* 219:2443-2448
- **Sefton EM**, **Bhullar B-A S**, **Mohaddes Z**, **Hanken J** (2016) Evolution of the head-trunk interface in tetrapod vertebrates. *eLife* 5:e09972
- Selden PA, Dunlop JA, **Giribet G**, Zhang W, Ren D (2016) The oldest armoured harvestman (Arachnida: Opiliones: Laniatores), from Upper Cretaceous Myanmar amber. *Cretaceous Res* 65:206-212
- Senevirathne G, Thomas A, Kerney R, **Hanken J**, Biju SD, Meegaskumbura M (2016) From clinging to digging: The postembryonic skeletal ontogeny of the Indian purple frog, *Nasikabatrachus sahyadrensis* (Anura: Nasikabatrachidae). *PLoS ONE* 11:e0151114
- **Shukla S**, **Sanders JG**, Byrne M, **Pierce NE** (2016) Gut microbiota of dung beetles correspond to dietary specializations of adults and larvae. *Mol Ecol* 25:6092-6106
- **Shultz AJ**, Baker, AJ, Hill GE, Nolan PM, **Edwards SV** (2016) SNPs across time and space: Population genomic signatures of founder events and epizootics in the House Finch (*Haemorhous mexicanus*). *Ecol Evol* 6:7475–7489
- Stroud JT, **Losos JB** (2016) Ecological opportunity and adaptive radiation. *Annu Rev Ecol Evol Syst* 47:507-532
- Sundberg P, Andrade SCS, Bartolomaeus T, Beckers P, Von Döhren J, Gibson R, **Giribet G**, Herrera-Bachiller A, Junoy J, Kajihara H, Kvist S, Kanneby T, Sun S-C, Thiel M, Turbeville JM, Strand M (2016) The future of nemertean taxonomy (phylum Nemertea)—a proposal. *Zool Scr* 46:579-582
- **Wainwright DK**, **Lauder GV** (2016) Three-dimensional analysis of scale morphology in bluegill sunfish, *Lepomis macrochirus*. *Zoology* 119:182-195
- Warrick DR, Hedrick TL, **Biewener AA**, Crandell KE, Tobalske BW (2016) Foraging at the edge of the world: Low-altitude, high-speed maneuvering in barn swallows. *Phil Trans Soc B* 371:20150391
- Wheeler WC, **Giribet G** (2016) Molecular data in systematics: A promise fulfilled, a future beckoning. In *The Future of Phylogenetic Systematics: The Legacy of Willi Hennig* (Williams D, Schmitt M, Wheeler Q eds) Cambridge University Press & The Systematics Association: Cambridge, UK
- **Whitaker MRL**, **Salzman S**, **Sanders JG**, **Kaltenpoth M**, **Pierce NE** (2016) Microbial communities of lycaenid butterflies do not correlate with larval diet. *Front Microbiol* 7:1920
- Wiedenbrug S, **Laurindo da Silva F** (2016) *Diplosmittia caribensis*, a new Orthoclaadiinae (Diptera: Chironomidae) from the Dominican Republic. *Zootaxa* 4103:71-74
- **Wilson EO** (2016) *Half-Earth: Our planet's fight for life*. Liveright: New York
- Winchell KM, Reynolds RG, **Prado-Irwin SR**, Puente-Rolón AR, Revell LJ (2016) Phenotypic shifts in urban areas in the tropical lizard *Anolis cristatellus*. *Evolution* 70:1009-1022
- Wittorski A, **Losos JB**, Herrel A (2016) Proximate determinants of bite force in *Anolis* lizards. *J Anat* 228: 85-95

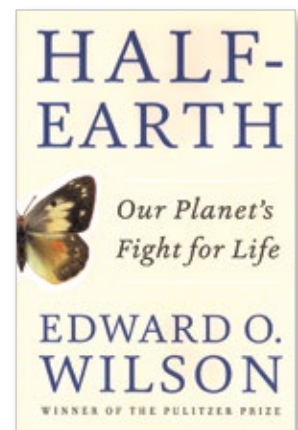
Invertebrate Systematics



Gonzalo Giribet, E. McIntyre and colleagues published their research as the cover story in *Invertebrate Systematics*.



"Phototactic guidance of a tissue-engineered soft-robotic ray" by **George Lauder, V. DiSanto** and **E.L. Blevins** was featured on the cover of *Science*.



Half-Earth by **Edward O. Wilson** proposes an achievable plan to save our imperiled biosphere: devote half the surface of the Earth to nature.



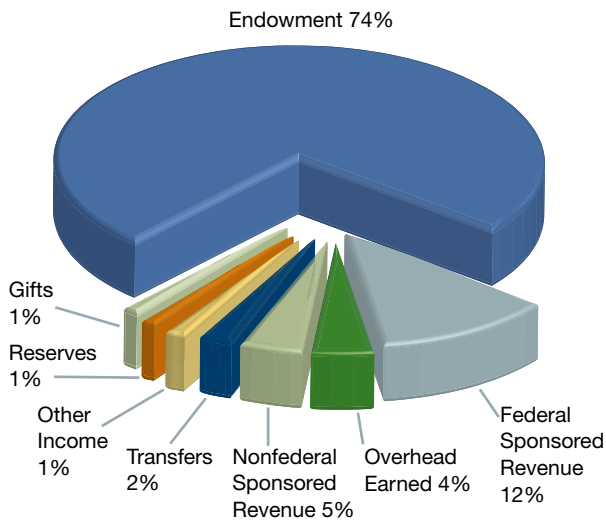
FINANCIAL DATA

These charts describe the income and expenses of the Museum of Comparative Zoology in fiscal year 2017.

Endowment income funds much of the Museum’s activities, including acquisition and maintenance of collections, faculty and staff salaries, capital projects, facilities renovation and maintenance. Included in **Endowment Income** is the annual distribution (payout) and endowed funds decapitalized per donor request. **Transfers** include financial support for the Ernst Mayr Library and other Harvard-funded projects. **Other Income** comprises miscellaneous income from publication subscriptions, royalties, sales and fees, and cost recovery from other MCZ-sponsored activities. **Overhead** is funding paid from MCZ-based sponsored projects to cover facilities and administrative costs for those projects. It is shown as both income (**Overhead Earned**) and expenses (**Overhead Charged**). **Reserves** indicates balances utilized to fund operations.

Capital Projects includes deployment of collections to the newly constructed space in the Northwest Building and renovation of the MCZ’s ground floor prep lab. Building expenses such as maintenance, facility improvements and utilities are captured in the **Space & Occupancy** category. **Operating Expenses** consist of equipment purchases, supplies, and consultant and conference fees, as well as annual subventions to the Department of Organismic and Evolutionary Biology (OEB) for administrative services and MCZ support for faculty-curator research. Support for MCZ-affiliated graduate students in OEB is included in **Scholarships, Awards & Travel**. **Institutional Expenses** are support for other University activities outside the MCZ, including FAS and University initiatives and general operating support to the Harvard Museums of Science and Culture.

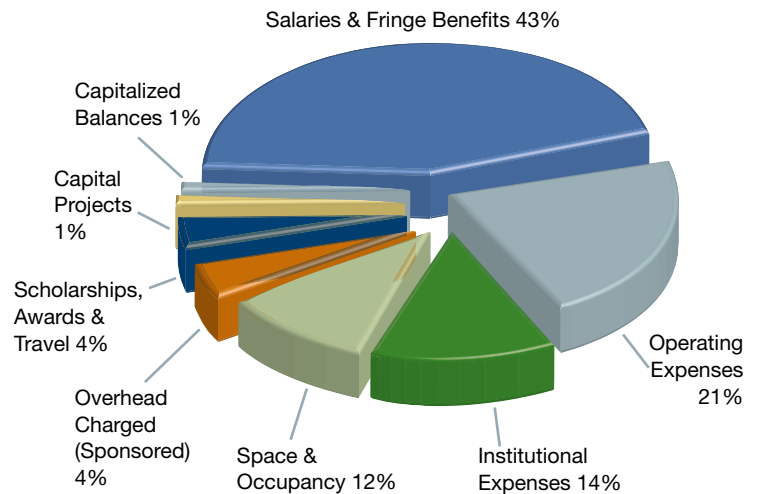
Income



Income

Endowment	\$16,193,671
Federal Sponsored Revenue	\$2,719,004
Nonfederal Sponsored Revenue	\$1,146,409
Overhead Earned	\$879,637
Transfers	\$433,484
Gifts	\$177,168
Other Income	\$129,250
Reserves	\$123,715
Total	\$21,802,337

Expenses & Non-Operating Funds



Expenses

Salaries & Fringe Benefits	\$9,410,863
Operating Expenses*	\$4,460,819
Institutional Expenses*	\$3,117,162
Space & Occupancy	\$2,586,929
Scholarships, Awards & Travel	\$951,217
Overhead Charged (Sponsored)	\$879,637
Capitalized Balances	\$262,910
Capital Projects	\$132,800
Total	\$21,802,337

* These two expense categories were calculated differently in prior years.



Faculty-Curators

Andrew A. Biewener

*Charles P. Lyman Professor of Biology;
Director, Concord Field Station*

Scott V. Edwards

*Professor of Organismic & Evolutionary
Biology; Alexander Agassiz Professor of
Zoology; Curator of Ornithology*

Brian D. Farrell

*Professor of Biology; Curator of
Entomology; Director, David Rockefeller
Center for Latin American Studies*

Gonzalo Giribet

*Professor of Organismic & Evolutionary
Biology; Alexander Agassiz Professor of
Zoology; Curator of Invertebrate Zoology*

James Hanken

*Professor of Biology; Alexander Agassiz
Professor of Zoology; Curator of
Herpetology; Director, MCZ*

Hopi E. Hoekstra

*Professor of Organismic & Evolutionary
Biology; Professor of Molecular &
Cellular Biology; Alexander Agassiz
Professor of Zoology; Curator of
Mammalogy; Howard Hughes Medical
Institute Investigator; Harvard College
Professor*

George V. Lauder

*Professor of Biology; Henry Bryant
Bigelow Professor of Ichthyology; Curator
of Ichthyology*

Jonathan B. Losos

*Professor of Organismic & Evolutionary
Biology; Monique & Philip Lehner
Professor for the Study of Latin America;
Curator of Herpetology*

James J. McCarthy

*Professor of Biological Oceanography;
Alexander Agassiz Professor of Biological
Oceanography; Acting Curator of
Malacology*

Naomi E. Pierce

*Sidney A. & John H. Hessel Professor of
Biology; Curator of Lepidoptera*

Stephanie E. Pierce

*Assistant Professor of Organismic
& Evolutionary Biology; Curator of
Vertebrate Paleontology*

Mansi Srivastava

*Assistant Professor of Organismic
& Evolutionary Biology; Curator of
Invertebrate Zoology*

Robert M. Woollacott

*Professor of Biology; Curator of Marine
Invertebrates*

Emeritus Faculty

A.W. "Fuzz" Crompton

*Faculty-Curator, Emeritus; Fisher
Professor of Natural History, Emeritus*

Richard C. Lewontin

*Professor of Biology, Emeritus; Alexander
Agassiz Professor of Zoology, Emeritus*

Edward O. Wilson

*Honorary Curator in Entomology;
University Research Professor, Emeritus*

**Postdoctoral Fellows, Research
Associates & Visiting Scholars**

Miguel Arnedo

Invertebrate Zoology, Giribet Lab

Leandro Becker

Ornithology, Edwards Lab

Ligia Benavides Silva

Invertebrate Zoology, Giribet Lab

Partha Bhagavatula

Concord Field Station, Biewener Lab

Michael Braby

Entomology, N. Pierce Lab

Gustavo Bravo

Ornithology, Edwards Lab

Mariya Chepishcheva

Entomology, N. Pierce Lab

Jesus Alberto Cruz Lopez

Invertebrate Zoology, Giribet Lab

Valentina Di Santo

Ichthyology, Lauder Lab

Colin Donihue

Herpetology, Losos Lab

Claire Dufour

Herpetology, Losos Lab

Andrew Gehrke

Invertebrate Zoology, Srivastava Lab

Lorna Gibson

Concord Field Station, Biewener Lab

Elsa Goerig

Ichthyology, Lauder Lab

Ariane Gouvea

Ornithology, Edwards Lab

Caroline Hu

Mammalogy, Hoekstra Lab

Charlotte Jandér

Entomology, N. Pierce Lab

Katrina Jones

Vertebrate Paleontology, S. Pierce Lab

Betul Kacar

Ornithology, Edwards Lab

Robert Kambic

Vertebrate Paleontology, S. Pierce Lab

Albert Kao

Entomology, N. Pierce Lab

Barbara Koenig

Mammalogy, Hoekstra Lab

Nicolai Konow

Concord Field Station, Biewener Lab

Sangeet Lamichhaney

Ornithology, Edwards Lab

Jean-Marc Lassance

Mammalogy, Hoekstra Lab

Brian Latorre Reyes

Ornithology, Edwards Lab

Xuan Liu

Herpetology, Losos Lab

Michael Logan

Herpetology, Losos Lab

David Lubertazzi

Global Ant Project, Wilson Lab

Pierre-Jean Male

Entomology, N. Pierce Lab

Fabricio Marcondes Machado

Invertebrate Zoology, Giribet Lab

Katherine Mika

Ernst Mayr Library

Renata Moretti

Herpetology, Losos Lab

Kathrin Naepflin

Ornithology, Edwards Lab

Ricardo Pérez de la Fuente

Entomology, Farrell Lab

Dennis Persson

Invertebrate Zoology, Giribet Lab

Sebastian Pohl

Entomology, N. Pierce Lab

Katia Reinhard

Mammalogy, Hoekstra Lab

Lorenzo Ricci

Invertebrate Zoology, Srivastava Lab

Seyed Mohammad Saadat

Ichthyology, Lauder Lab

Martin Schwentner

Invertebrate Zoology, Giribet Lab

Yung Wa (Simon) Sin

Ornithology, Edwards Lab

Devraj Singh

Ornithology, Edwards Lab

Katherine Stryjewski

Ornithology, Edwards Lab

Chris Tijs

Concord Field Station, Biewener Lab

Cynthia Ursino

Ornithology, Edwards Lab

Roger Vila Ujaldon

Entomology, N. Pierce Lab

Pengcheng Wang

Ornithology, Edwards Lab

Graduate Students

Jennifer Austiff

Herpetology, Hanken Lab

Caitlin Baker

Invertebrate Zoology, Giribet Lab

Nicole Bedford

Mammalogy, Hoekstra Lab

Leonora Bittleston

Entomology, N. Pierce Lab

John Boyle

Entomology, N. Pierce Lab

Rebecca Buckman

Invertebrate Zoology, Giribet Lab

Jasmin Camacho

Mammalogy, Hoekstra Lab

Richard Childers

Entomology, N. Pierce Lab

Glenna Clifton

Concord Field Station, Biewener Lab

Julia Cosgrove

Invertebrate Zoology, Giribet Lab

James Crall

Entomology, N. Pierce Lab

Tauana Cunha

Invertebrate Zoology, Giribet Lab

Blake Dickson

Vertebrate Paleontology, S. Pierce Lab

Amanda Evans

Entomology, Farrell Lab

Kara Feilich

Ichthyology, Lauder Lab

Jacob Gable

Mammalogy, Hoekstra Lab

Kadeem Gilbert

Entomology, N. Pierce Lab

Patrick Gorring

Entomology, Farrell Lab

Philip Grayson

Ornithology, Edwards Lab

Michael Brent Hawkins

Herpetology, Hanken Lab

Ambika Kamath

Herpetology, Losos Lab

Sang Il Kim

Entomology, Farrell Lab

Vanessa Knutson

Invertebrate Zoology, Giribet Lab

Mara Laslo

Herpetology, Hanken Lab

Kelsey Lucas

Ichthyology, Lauder Lab

Inbar Maayan

Herpetology, Losos Lab

Brianna McHorse

Concord Field Station, Biewener Lab

Bruno Souza de Medeiros

Entomology, Farrell Lab

Pavitra Muralidhar

Herpetology, Losos Lab

Sofia Prado-Irwin

Herpetology, Losos Lab

Mary Salcedo

Concord Field Station, Biewener Lab

Shayla Salzman

Entomology, N. Pierce Lab

Jonathan Schmitt

Ornithology, Edwards Lab

Allison Shultz

Ornithology, Edwards Lab

Kari Taylor-Burt

Concord Field Station, Biewener Lab

Kira Treibergs

Marine Invertebrates, Woollacott Lab

Dylan Wainwright

Ichthyology, Lauder Lab

Zhengyang Wang

Entomology, N. Pierce Lab

Rebecca Wolf

Ichthyology, Lauder Lab

Tyler Wooldridge

Mammalogy, Hoekstra Lab



Associates

Gary Alpert
*Associate of Entomology
Harvard University*

Brian S. Arbogast
*Associate of Mammalogy
University of North Carolina,
Wilmington*

Bruce Archibald
*Associate of Entomology
Simon Fraser University*

Ruth Hortencia Bastardo Landrau
*Associate of Entomology
Universidad Autónoma de Santo
Domingo*

Aaron Bauer
*Associate of Herpetology
Villanova University*

Reinier Beeuwkes, III
*Associate of the Concord Field Station
Ischemix, LLC (MA)*

Andrew Berry
*Associate of Population Genetics
Harvard University*

Elizabeth Brainerd
*Associate of Ichthyology
Brown University*

Jae Choe
*Associate of Entomology
Ewha Womans University*

Janet Collett
*Associate of Population Genetics
University of Sussex*

Bruce Collette
*Associate of Ichthyology
National Marine Fisheries Service*

David Bruce Conn
*Associate of Invertebrate Zoology
Berry College*

James Costa
*Associate of Entomology
Western Carolina University*

Catherine Craig
*Associate of Invertebrate Zoology
Conservation Through Poverty
Alleviation, International*

Harlan Dean
*Associate of Invertebrate Zoology
Harvard University*

Lloyd Demetrius
*Associate of Population Genetics
Harvard University*

Philip DeVries
*Associate of Entomology
University of New Orleans*

Gregory D. Edgecombe
*Associate of Invertebrate Zoology
Natural History Museum, London*

Ben Evans
*Associate of Herpetology
McMaster University*

Brooke E. Flammang
*Associate of Ichthyology
New Jersey Institute of Technology*

Michael Hadfield
*Associate of Marine Biology
University of Hawaii*

Berthold Hölldobler
*Associate of Entomology
Arizona State University*

Gustavo Hormiga
*Associate of Invertebrate Zoology
The George Washington University*

Helen F. James
*Associate of Ornithology
Smithsonian National Museum of
Natural History*

Alan Kabat
*Associate of Malacology
Attorney, Bernabei & Wachtel*

Leslie S. Kaufman
*Associate of Ichthyology
Boston University*

Gisele Y. Kawauchi
*Associate of Invertebrate Zoology
University of São Paulo*

Anthony E. Kiszewski
*Associate of Entomology
Bentley University*

Timothy Laman
*Associate of Ornithology
National Geographic Society*

Phillip Lobel
*Associate of Ichthyology
Boston University*

David Lohman
*Associate of Entomology
The City College of New York*

Vladimir A. Lukhtanov
*Associate of Entomology
Russian Academy of Sciences*

James Mallet
*Associate of Population Genetics
Harvard University*

Duane D. McKenna
*Associate of Entomology
University of Memphis*

Russell Mittermeier
*Associate of Herpetology
Conservation International*

Piotr Naskrecki
*Associate of Entomology
Conservation International*

Diane B. Paul
*Associate of Population Genetics
Harvard University*

David L. Pawson
*Associate of Marine Biology
Smithsonian National Museum of
Natural History*

Stewart Peck
*Associate of Entomology
Carleton University*

Paulo Petry
*Associate of Ichthyology
The Nature Conservancy*

Steve Poe
*Associate of Herpetology
University of New Mexico*

Michael Rex
*Associate of Malacology
University of Massachusetts, Boston*

Jessica Rykken
*Associate of Entomology
Harvard University*

Çağan H. Şekercioğlu
*Associate of Ornithology
University of Utah*

Andrea Sequeira
*Associate of Entomology
Wellesley College*

Steven O. Shattuck
*Associate of Entomology
Commonwealth Scientific and Industrial
Research Organization (CSIRO)*

Scott R. Shaw
*Associate of Entomology
University of Wyoming*

Stephen Tilley
*Associate of Herpetology
Smith College*

James Traniello
*Associate of Entomology
Boston University*

David Wagner
*Associate of Entomology
University of Connecticut*

David Wake
*Associate of Herpetology
University of California, Berkeley*

Marvalee Wake
*Associate of Herpetology
University of California, Berkeley*

Philip S. Ward
*Associate of Entomology
University of California, Davis*

Jacqueline Webb
*Associate of Ichthyology
University of Rhode Island*

R. Haven Wiley
*Associate of Ornithology
University of North Carolina*

Cheryl Wilga
*Associate of Ichthyology
University of Rhode Island*

Judith Winston
*Associate of Marine Biology
Virginia Museum of Natural History*

Staff

Melissa Aja
Museum Projects Coordinator

Adam Baldinger
*Curatorial Associate, Invertebrate
Zoology & Malacology*

Dorothy Barr
*Public Services/MCB Liaison Librarian,
Ernst Mayr Library*

Penny Benson
Curatorial Assistant, Malacology

Emily Blank
Curatorial Assistant, Entomology

Ronnie Broadfoot
*Coordinator of Access Services, Ernst
Mayr Library*

Christopher Capobianco
*Technician & Preparator, Vertebrate
Paleontology*

Judith Chupasko
Curatorial Associate, Mammalogy

April Collins
*Acquisitions and Technology Specialist,
Ernst Mayr Library*

Stefan Cover
Curatorial Assistant, Entomology

Jessica Cundiff
*Curatorial Associate, Invertebrate &
Vertebrate Paleontology*

Tatiana De Souza Varges
*Curatorial Assistant, Collections
Operations*

Joseph DeVeer
*Head of Technical Services, Ernst Mayr
Library*

Katherine Eldridge
Curatorial Assistant, Ornithology

Charles Farnum
Curatorial Assistant, Entomology

Helene Ferranti
*Faculty/Collection Assistant, Biological
Oceanography & Marine Biology*

Dana Fisher
*Assistant to the Librarian/Special
Collections, Ernst Mayr Library*

Linda S. Ford
Director, Collections Operations

Matthew Gage
Lab Manager, Hanken Lab

Emily Graham
*Curatorial Assistant, Collections
Operations*

Brendan Haley
Senior Database Manager

Karsten Hartel
Curatorial Associate, Ichthyology

Rachel Hawkins
Curatorial Assistant, Entomology

Evan Hoki
Curatorial Assistant, Entomology

Andra Hollis
Staff Assistant, Concord Field Station

Kathleen Horton
*Assistant with Professor Wilson,
Entomology*

Nikki Hughes
*Faculty Assistant, Mammalogy &
Ornithology*

Amie Jones
Faculty/Collection Assistant, Entomology

Marcia Kazmierczak
Staff Assistant, Collections Operations

Michelle Kennedy
*Collections Information & Database
Specialist*

Laura Leibensperger
*Curatorial Assistant, Invertebrate
Zoology*

Jennifer Lenihan
*Curatorial Assistant, Invertebrate
Zoology*

Lisa Litchfield
Administrator, Concord Field Station



David Lowery
Project Programmer, Biodiversity Informatics

Joseph Martinez
Curatorial Assistant, Herpetology

Patrick McCormack
Curatorial Assistant, Entomology

John Mewherter
Curatorial Assistant, Collections Operations

Elizabeth Meyer
Project Assistant, Ernst Mayr Library

Paul J. Morris
Biodiversity Informatics Manager

Catherine Musinsky
Faculty/Collection Assistant, Mammalogy

Mark Omura
Curatorial Assistant, Mammalogy

Philip Perkins
Curatorial Associate, Entomology

Pedro Ramirez
Research Assistant, Concord Field Station

Jignasha Rana
Curatorial Assistant, Collections Operations

Patrick Randall
Community Manager, Ernst Mayr Library

Murat Recevik
Curatorial Assistant, Malacology

Mark Renczkowski
Curatorial Assistant, Invertebrate Paleontology

Constance Rinaldo
Librarian, Ernst Mayr Library

Alana Rivera
Curatorial Assistant, Malacology

José Rosado
Curatorial Associate, Herpetology

Mary Sears
Head of Public Services, Ernst Mayr Library

Meaghan Sorce
Curatorial Assistant, Collections Operations

Margaret Starvish
Faculty/Collection Assistant, Ichthyology & Entomology

Taylor Tai
Curatorial Associate, Entomology

Tsuyoshi Takahashi
Curatorial Assistant, Herpetology & Collections Operations

Jennifer Thomson
Faculty/Collection Assistant, Populations Genetics

Jeremiah Trimble
Curatorial Associate, Ornithology

Diana Turmenne
Curatorial Assistant, Collections Operations

Kenneth Wilcox
Building Services Coordinator

Victoria Wilke
Curatorial Assistant, Collections Operations

Andrew Williston
Curatorial Assistant, Ichthyology

Jonathan Woodward
Curatorial Assistant, Collections Operations

Robert Young
Special Collections Librarian, Ernst Mayr Library

Breda Zimkus
Cryogenics Collections Manager for Genetic Resources

Temporary Staff

Adham Bedir
Ernst Mayr Library

Kimberly Carlin
Mammalogy

Anne Everly
Ichthyology

Cleo Falvey
Herpetology

Jennifer Goldstein
Invertebrate Zoology

Joseph Greenberg
Ernst Mayr Library

Jane Harrison
Ornithology

Jyhjong Hwang
Collections Operations

Kalvin Janik
Ernst Mayr Library

Allyson Jarvis
Malacology

Adam Kowalczyk
Collections Operations

Linnaea Meyer
Collections Operations

Robert Morris
Biodiversity Informatics

John Nevins
Biological Oceanography

Erin Polka
Malacology

Lauren Shear
Collections Operations

Kaitlin Sheridan
Invertebrate Zoology

Emily Smith
Ernst Mayr Library

Catherine Weisel
Interim Managing Editor

Haolong Zhu
Ernst Mayr Library

Encyclopedia of Life, Learning + Education Group

Tracy Barbaro
Project Coordinator

Gerriana Cohen
Intern

Zoe Foster
Intern

Jeffrey T. Holmes
Digital Learning Editor

Amy Lorenz
Project Coordinator

Carly Sanker
Designer

Marie M. Studer
Learning + Education Director

Michael Vitale
Developer

Administration for the Department of Organismic & Evolutionary Biology

Krista Carmichael
Senior Research Administrator

Lydia Carosino
Senior Academics Programs Administrator

Rebecca Chetham
Executive Director

Irv Dumay
Manager of Museum Facilities

Paul Dwyer
Mailroom Staff Assistant

Christian Flynn
Administrative Coordinator

Donna Gadbois
Financial Associate

Jason Green
Financial Associate

Wendy Heywood
Communications and Events Coordinator

Megan McHugh
Human Resources Coordinator

Jay McNeil
Building Manager

Jeremiah O'Connor
Financial Analyst

Kristin Pennarun
Manager of OEB Research Administration Services

Christopher Preheim
Senior Academic Administrator

Keleigh Quinn
Senior Research Administrator

Peg Richards
Financial Assistant

Damari Rosado
Associate Director of Administration

Deborah Smiley
Managing Editor

Anna Salvato
Manager of Financial Operations

The MCZ deeply appreciates the additional support and contributions of numerous interns and undergraduate students during the 2016–2017 academic year.

MCZ Faculty

The MCZ's charter, signed in 1859, mandates that the Museum's activities will be overseen by a governing board, the Faculty of the Museum of Comparative Zoology.

Mr. Robert G. Goelet

Mr. George Putnam, Jr.

Mr. George Putnam III

Dr. Barbara Jil Wu

Mr. Paul J. Zofnass

President Drew Gilpin Faust

Acknowledgements

This annual report was produced by the Office of the Director of the Museum of Comparative Zoology.

Editors

James Hanken, Director
Melissa Aja, Museum Projects Coordinator

Copy, Design & Production

Cyndi Wood
Creative Project Management, Inc.
creativeprojectmgmt.com





HARVARD
MUSEUM OF COMPARATIVE ZOOLOGY



26 Oxford Street
Cambridge, MA 02138
617.495.2460
mcz.harvard.edu