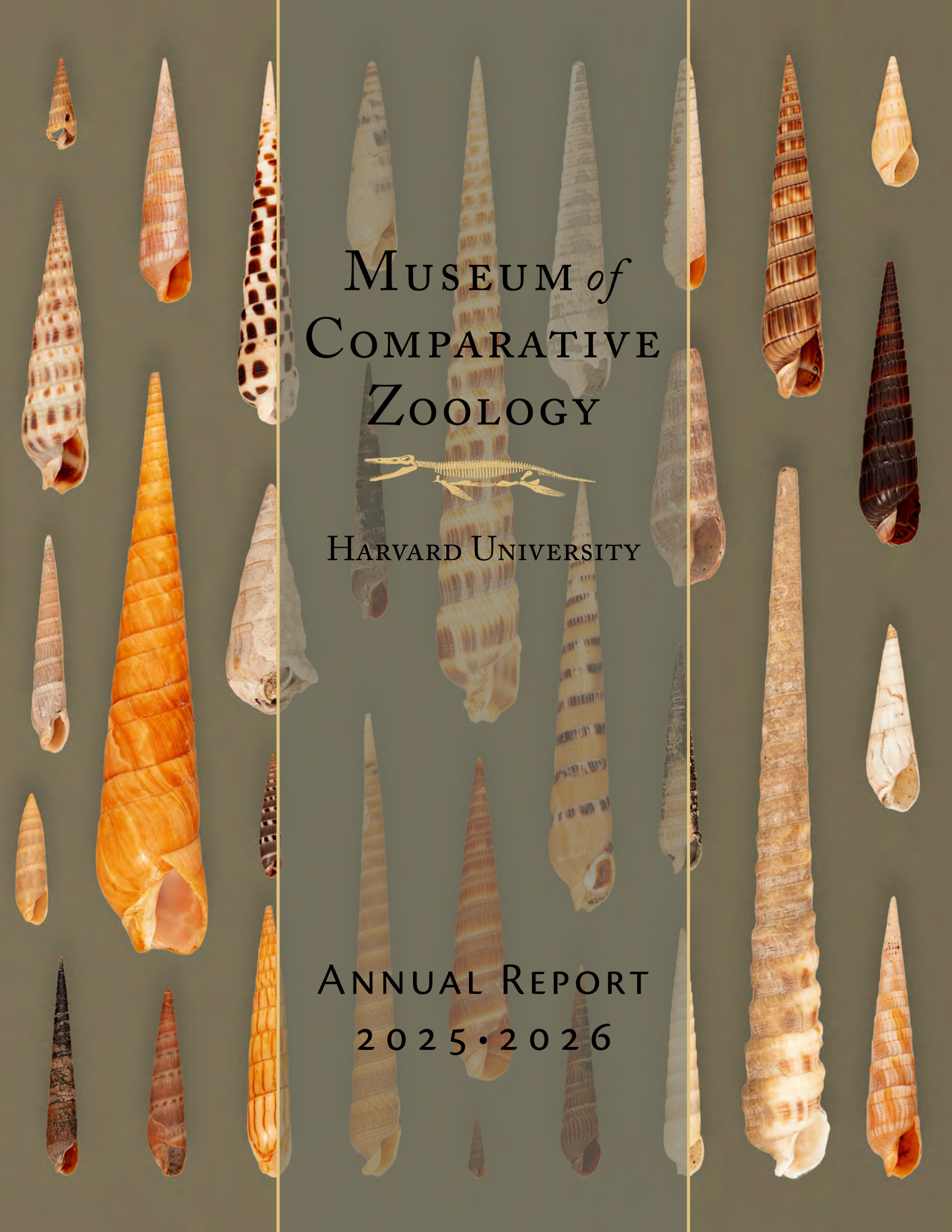

Museum of Comparative Zoology

Harvard University

Annual Report
2025•2026

About the MCZ

The Museum of Comparative Zoology at Harvard University is a global center for research and education focused on the biology and evolution of animal life.

The MCZ collections comprise approximately 21 million extant and fossil invertebrate and vertebrate specimens, which are a focus of research and teaching for the MCZ, Harvard, and students and researchers around the globe.

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Director's Message

As I begin my second term as Director of the MCZ, I would like to thank everyone—our staff, administrators, students, postdoctoral researchers, curators, associates and friends—for making this such an extraordinary institution and for making my work so rewarding.

Coming to work each day and discovering something exciting is a privilege that few people enjoy, and I feel extremely fortunate to have this opportunity.

I meet weekly with the Executive Director of the Department of Organismic and Evolutionary Biology, Rebecca Chetham, and we discuss every aspect of the MCZ, plan for the future, and consider how to make the MCZ an even more special place. She has been a pillar of support throughout my directorship, always advocating for and supporting the MCZ. Rebecca is now leaving us to become the first Managing Director of Department and Center Administration for the Sciences in Harvard's Faculty of Arts and Sciences. I will miss her greatly, but I offer her my warmest congratulations!

This past year has once again been marked by uncertainty, something felt particularly acutely by our staff, as well as by our international students and scholars. We are beginning to see the effects of Faculty of Arts and Sciences Workforce Planning on many of our close colleagues and friends, and above all, we wish them all the best.

Despite the university-wide hiring freeze, we were fortunate to welcome Dr. Carrie Albertin as an Assistant Professor in OEB. Carrie brings her cutting-edge research on the evolution and embryogenesis of cephalopods to the MCZ, and you can learn more about her research in this Annual Report. She also serves as Curator in Malacology. The Malacology Department was likewise able to fill a curatorial staff vacancy.

We have also seen a slowdown in federal funding, but the MCZ continues to support research at Harvard and around the world through its strong endowment. Now, more than ever, it is important to demonstrate resilience in support of biodiversity science. Stewarding and disseminating biodiversity data must remain a priority for natural history museums.

We therefore continue to bring new specimens to campus through our Field Research Grants—including the Putnam, Miyata, Jenkins Jr. and McQuilling-Cabral Grants—as well as through new acquisitions and partnerships. We also continue to invite researchers from around the world to study our world-class collections. In addition, we have resumed our programs for international scholars (Ernst Mayr Grants) and reopened applications for our Biodiversity Postdoctoral Fellowships, hoping to bring to the MCZ the next generation of taxonomists.

My hope is to continue supporting the MCZ as a vital and accessible collection that serves the entire world, not only those with the privilege of working at Harvard. For this reason, we are strengthening our imaging facilities and digitization projects, with the goal that one day all MCZ specimens will be freely accessible online to researchers and members of the public everywhere.

To conclude, I wish everyone a happy and productive year ahead, one filled with new discoveries and surprises, as we continue to explore the depths of our extraordinary collections.



Stephanie Mitchell/Harvard University

Gonzalo Giribet
Director

On the cover: Alex Robson's *Terebrids* brings together approximately 4,000 individual focus-stacked photographs of terebrid shells from the MCZ Malacology collection. Robson, a fine art photographer, visited the MCZ this year to photograph specimens from Ornithology, Invertebrate Zoology and Malacology.

Inside cover: A living terebrid in the Holford Lab. Photo by Pierre Lozouet

Introducing Our Newest Faculty-Curators

The Museum of Comparative Zoology is pleased to welcome its two newest Faculty-Curators, Dr. Mandë Holford and Dr. Carrie Albertin, who will both serve as Curators in Malacology.



Dr. Carrie Albertin &
Dr. Mandë Holford





Shells from the MCZ Malacology collection; photo by Stephanie Mitchell/Harvard Staff Photographer. Living terebrid photo by Pierre Lozouet

Although both scientists work with molluscs, their research focus is strikingly different. "As a malacologist since I was a teenager, I am thrilled to have two new colleagues focusing on molluscs, especially on such hot topics as venoms and development," says Director Gonzalo Giribet. "They are bringing charismatic cephalopods to the center of our malacological research in the MCZ."

Dr. Mandë Holford

Dr. Holford joined the MCZ in July 2025 as a Professor of Organismic and Evolutionary Biology. She studies venoms and venomous animals as agents of molecular change and medicinal innovations.

Many of today's medicines are derived from animal venom, such as Prialt®, a synthetic version of a peptide—ziconotide—from the venom of the cone snail *Conus magus*, used to treat severe, chronic neuropathic pain. "Snail venoms are fast, potent and very specific in targeting certain biological systems—blood, brains and membranes—revealing chemical pathways to manipulate cellular biology."

Holford's research can be described as *molluscs to medicine*—an evolutionarily integrated strategy to discover novel peptides from venomous marine molluscs that could be used to manipulate cellular physiology related to pain and cancer and thus lead to new drug treatments.

Among other molluscs, Holford and her lab study Terebridae, a family of globally distributed predatory marine snails whose more than 400 species use venom to subdue their prey. Her group applies a systems biology approach, venomics, to discover and characterize new bioactive venom peptides. In 2019, her team used venomics to discover the terebrid snail peptide Tv1, and found that, in mice, it could inhibit the proliferation of liver cancer cells. Research into this peptide is ongoing.

To leverage the venomics approach, the Holford lab combines research in taxonomy, phylogeny and systematics of venomous marine snails and cephalopods to do comparative analyses of venom across taxa to find new therapies for pain and cancer by creating high-throughput methods for screening novel venom peptides, optimize venom peptide drug delivery, and study the evolution of new micropeptides that arise as a response to selective "arms race" pressures.

In more recent work, the Holford lab is generating synthetic venom models, organoids, of snail and cephalopod venom glands to develop natural product drug factories and determine how venom genes become weaponized through regulation and expression.

Holford's interest in natural history began early on. When she was a child, her parents frequently took her and her siblings to the American Museum of Natural History in New York City, and she loved it there. Even though she studied chemistry, specifically peptide

chemistry, she found a way to combine those twin passions. In an interview with the *Boston Globe*, she explained, "After I finished my PhD at The Rockefeller University in New York, I was looking for something that would bridge the two worlds, and that led me to venom. Venomous creatures have a lot of chemical compounds in their arsenal, and they were something that you could make a collection out of, particularly snails, because most natural history museums have a snail collection."

Holford is a strong supporter of STEM education. She is a cofounder of Killer Snails, which develops tabletop, digital and XR games about nature as a way to advance scientific learning in K–12 classrooms. She is also the Principal Investigator for *The 2030STEM Champions and Fellows Network*, a project to advance the professional careers of early career, under-resourced STEM researchers and professionals and to spotlight those in senior positions who are championing a new generation of diverse STEM professionals.

Dr. Carrie Albertin

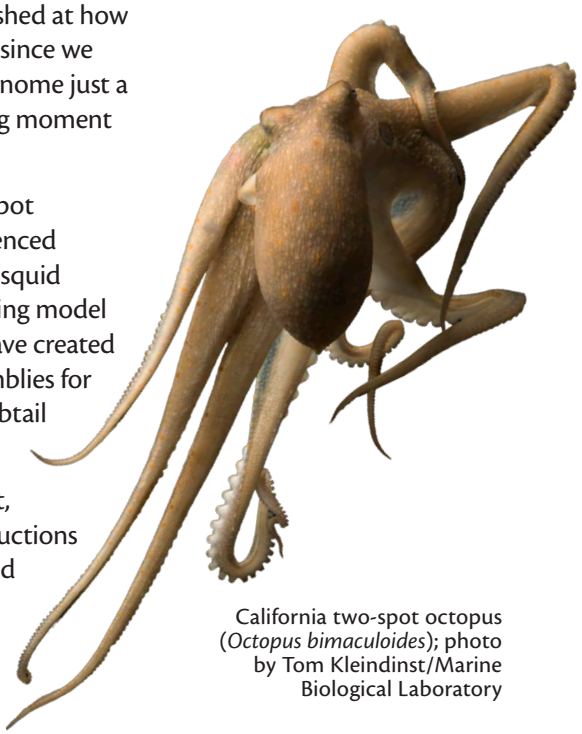
Dr. Albertin joined the MCZ in January 2026 as an Assistant Professor of Organismic and Evolutionary Biology. She was previously at the Marine Biological Laboratory in Woods Hole, which has a long history of cephalopod research. Albertin's research program focuses on cephalopod development and evolution at a molecular and cellular level, with the goal of establishing cephalopods as a compelling model system for comparative evolutionary and developmental research.

Albertin and her lab study how novelty arises over the course of evolution and development using cephalopods—octopuses, squid and cuttlefish—as models. They are exploring the biology of cephalopods, the development of their unique body plans, and the evolution of their large, complex nervous system through diverse approaches, including comparative genomics, gene expression studies and live imaging.

Albertin was a member of a team that sequenced the first cephalopod genome of the California two-spot octopus (*Octopus bimaculoides*), finding it to be nearly as large as the human genome. "I'm astonished at how far and fast the research has come since we sequenced the first cephalopod genome just a decade ago. We're at a very exciting moment in cephalopod research."

In addition to the California two-spot octopus, Albertin's team has sequenced the genome of the longfin inshore squid (*Doryteuthis pealeii*)—a longstanding model organism in neuroscience—and have created chromosomal-scale genome assemblies for these species and the Hawaiian bobtail squid (*Euprymna scolopes*).

"The genome is essentially a toolkit, encoding all the proteins and instructions to build an organism," she says, "and we're using them to understand some of the really unusual body plans and properties we see in these animals."

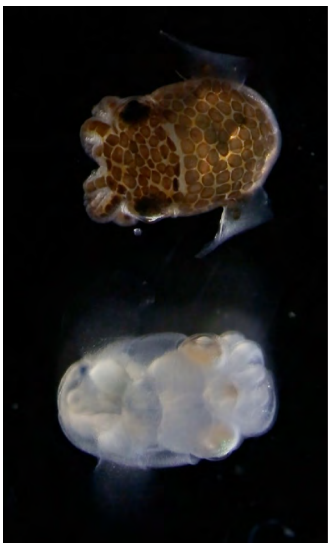


California two-spot octopus (*Octopus bimaculoides*); photo by Tom Kleindinst/Marine Biological Laboratory

A key tool for modern biology is the ability to manipulate DNA, in essence to turn genes on and off or make other adjustments, and accessible genome sequencing and CRISPR-mediated genome editing have recently opened up new model systems, such as cephalopods.

The lab is developing new approaches to test gene function, including the creation of cephalopod knockouts—where a gene is removed or deactivated—making it possible to functionally test diverse aspects of cephalopod biology at a molecular level. For example, the team has used these tools to create a genetically altered albino bobtail squid that is essentially clear—you can see its organs through translucent skin—by knocking out the pigmentation gene. "Because this squid has a large brain, the albino version is of interest to brain researchers. You can use dye to see brain cells glow when they are activated."

Albertin is the Principal Investigator for *A New Animal Model to Elucidate Mechanisms of Gene Regulation and Embryonic Patterning*, an effort to explore *Hox* genes as important regulators of development through her team's work with cephalopods as models; see page 13 for more information on this research grant.



Carrie Albertin

Hummingbird bobtail squid hatchlings (*Euprymna berryi*): wildtype & the genetically altered albino version

Faculty-Curator Profiles



Carrie Albertin

Assistant Professor of Organismic & Evolutionary Biology

Curator in Malacology

Prof. Albertin's research program explores the evolution of animal developmental programs using molluscs as model systems. Her group focuses on cephalopods, including the hummingbird bobtail squid (*Euprymna berryi*), to understand the molecular and cellular changes underlying the development of cephalopod innovations. Current projects in the lab include investigating the molecular mechanisms patterning the body plan, the cell migrations shaping the nervous system, the development of the circulatory system, and the evolutionary origins of cephalopod arms. The lab is also working to develop new tools for the study of cephalopod biology, including generating knockout and transgenic lines.

Scott V. Edwards

Professor of Organismic & Evolutionary Biology

Alexander Agassiz Professor of Zoology

Curator in Ornithology



Kris Snibbe/Harvard University

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 in the Edwards lab use genomics technologies to study the evolution of flightlessness and other traits in birds; phylogeography and speciation in Neotropical and Australasian birds; and the genomics of host–parasite coevolution between House Finches and a recently acquired bacterial pathogen, Mycoplasma.



Brian D. Farrell

Monique & Philip Lehner Professor for the Study of Latin America

Professor of Organismic & Evolutionary Biology

Curator in Entomology

Prof. Farrell's research is broadly concerned with the evolution of ecological interactions between host plants and animals and their parasites, pests and pathogens, such as insects and other tiny consumers. His current projects include applying comparative genomics to the evolution of associated species of beetles and plants, documenting mosquito diversity in the Dominican Republic and Brazil, and repatriating digital information from scientific specimens of insects and fossils in museums to their countries of origin. He is working on a book on the evolution of tiny consumers. For his next book project, he is bringing together ways of measuring biophilia.

Gonzalo Giribet

Professor of Organismic & Evolutionary Biology

Alexander Agassiz Professor of Zoology

Curator in Invertebrate Zoology & Malacology

Director, MCZ



Casey Dunn

Prof. Giribet's primary research focuses on the evolution, systematics and biogeography of invertebrate animals, including biodiversity discovery as well as genomics. Current projects in the Giribet lab include a study to characterize the radiation of velvet worms in the Neotropics and exploring techniques to use degraded DNA from old museum specimens in phylogenomics and population genomics. Ongoing research focuses on evolution of a diversity of terrestrial arthropod lineages, including arachnids and myriapods, as well as evolution of molluscs and several marine invertebrates.



Kris Snibbe/Harvard University

Hopi E. Hoekstra

Edgerley Family Dean of the Faculty of Arts & Sciences

C.Y. Chan Professor of Arts & Sciences

Xiaomeng Tong & Yu Chen Professor of Life Sciences

Curator in Mammalogy (on leave)

Prof. Hoekstra combines field and laboratory work to understand the evolution of mammalian diversity. Her research focuses on the genetic basis of morphological and behavioral variation, primarily in rodents, identifying both the evolutionary processes and the molecular mechanisms responsible for traits that help organisms survive and reproduce in the wild. Research in the Hoekstra lab integrates ecological, behavioral, genetic, developmental and neurobiological approaches. She is currently the Edgerley Family Dean of the Faculty of Arts and Sciences.

Mandë Holford

Professor of Organismic & Evolutionary Biology

Alexander Agassiz Professor of Zoology

Curator in Malacology



Prof. Holford's research demonstrates the scientific path from molluscs to medicine—examining how venoms evolved, developed and function over time, and how we can use this knowledge as a roadmap for discovering and characterizing peptide natural products with therapeutic potential. Her work combines scientific research, education and diplomacy to understand marine biodiversity and transform this knowledge for the benefit of nature and humanity. She is cofounder of Killer Snails and *2030STEM*, two initiatives focused on advancing K–12 STEM education and the professional careers of underrepresented STEM practitioners across sectors.



Melissa Aja

George V. Lauder

Henry Bryant Bigelow Professor of Ichthyology

Curator in Ichthyology

Acting Curator in Herpetology

Prof. Lauder's research focuses on the biomechanics of fishes and the development of robotic models for studying aquatic locomotion. Using mechanical systems to understand vertebrate structure and function allows controlled studies of how changes in structure affect performance and provides inspiration for the design of biomimetic devices. His current studies focus on the structure and function of shark skin and other fish surface structures, shark and ray sensory systems, and research with various robotic fish models. Additional broad interests include biological fluid mechanics and theoretical approaches to the analysis of form and function in organisms.

Javier Ortega-Hernández

Associate Professor of Organismic & Evolutionary Biology

Curator in Invertebrate Paleontology



Prof. Ortega-Hernández's research focuses on the evolution of metazoans that appeared and diversified during the Paleozoic Era. His group specializes in the study of exceptionally preserved Cambrian and Ordovician fossil biotas around the world, with interests in the morphology, ecology, phylogeny and development of invertebrate animals. The lab combines collection and fieldwork-based paleontology with cutting-edge imaging and analytical techniques to obtain new data from key fossil specimens, test macroevolutionary hypotheses through deep time, and better understand the origin of the major animal groups that have shaped the biosphere for more than 500 million years.



Isabella Kirkland

Naomi E. Pierce

Sidney A. & John H. Hessel Professor of Biology

Curator in Lepidoptera

Prof. Pierce's research focuses on behavioral ecology and symbiosis, particularly the coevolution between plants, pathogens and herbivores, and interactions between ants and other organisms. Her laboratory integrates approaches from phylogenetics, ecology, behavior, genomics and comparative methods to investigate reciprocal adaptations and patterns of species diversification. Recent work has explored the phylogeny of Lepidoptera, and the extent to which insects perceive and use signals in the near-infrared, including how the evolution of multimodal sensory systems has influenced diversification of pollination systems as well as symbioses between lycaenid butterflies and ants.

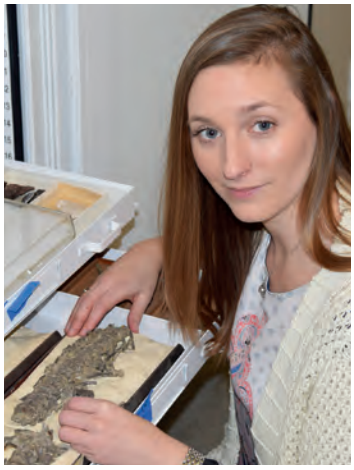
Stephanie E. Pierce

Professor of Organismic & Evolutionary Biology

Alexander Agassiz Professor of Zoology

Curator in Vertebrate Paleontology

Acting Curator in Mammalogy



Paul Whatmough

Prof. Pierce's research is focused on major morphological and ecological transitions in vertebrate evolution through an examination of the fossil record. Her work spans almost all vertebrate groups, from the earliest tetrapods to emerge onto land through to modern-day amphibians, reptiles and mammals.

Studies in the S. Pierce lab tend toward transformation of the musculoskeletal system, including feeding and locomotion, with particular attention on the link between form and function across macroevolutionary timescales.



Melissa Aja

Mansi Srivastava

Professor of Organismic & Evolutionary Biology

Curator in Invertebrate Zoology

Co-Chair, Department of Organismic & Evolutionary Biology

Prof. Srivastava's research focuses on understanding the evolution of animal development and regeneration. Her group utilizes the three-banded panther worm, *Hofstenia miamia*, which she has developed as a new acoel model system. Acoels represent an understudied phylum that is distantly related to other well-studied regenerative species, which allows her group to study genetic mechanisms from a comparative perspective. 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 evolution of centralized nervous systems.



Chun-Yu Su

Emeritus Profiles



Andrew A. Biewener

Charles P. Lyman Research Professor of Biology
Charles P. Lyman Professor of Biology, Emeritus

Prof. Biewener studies the biomechanics and neuromuscular control 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 movement in natural environments, work with engineers to develop bio-inspired robotic designs, and develop improved neuromuscular models for treating human movement disorders. He served as Director of the Concord Field Station from 1998 to 2024 and as Chair of the Department of Organismic and Evolutionary Biology from 2001 to 2010. He is a Fellow of the American Association for the Advancement of Science.

A. W. "Fuzz" Crompton

Fisher Professor of Natural History, Emeritus



Justin Ide

Prof. Crompton 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 Cape Town. 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 for lifetime achievement from the Society of Vertebrate Paleontology.



Catherine Weisel

James Hanken

Research Professor of Biology
Professor of Biology, Emeritus

Prof. Hanken utilizes laboratory-based analyses and field surveys to examine morphological evolution, developmental biology and systematics.

Active areas of research include the developmental basis of morphological novelty and life-history evolution, the systematics and evolution of Neotropical and Southeast Asian frogs and salamanders, and collections-based digital imaging.

Together with students, postdoctoral fellows and other collaborators he has discovered and formally described more than 45 species of living amphibians. He came to the MCZ in 1999 and served as Director from 2002 to 2021. His current work is supported by the U.S. National Science Foundation.

Robert M. Woollacott

Professor of Biology, Emeritus



Robert M. Woollacott is a Professor of Biology, Emeritus. He joined the Harvard faculty in 1972 and retired in 2018. Prof. Woollacott is the founding Chair of the Department of Organismic and Evolutionary Biology.

His focus is human impact on life in the sea.



Courses Led by Faculty-Curators

Academic Year 2025–2026



Robin Pan

OEB 190: Biology & Diversity of Birds



OEB 56: The History & Evolution of Life on Earth. Photo by Javier Ortega-Hernández

Organismic & Evolutionary Biology

OEB 10: Foundations of Biological Diversity

Mansi Srivastava (and Peter Girguis, Elena Kramer, Ognenka Avramovska)

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, including the development, adult anatomy, biology and evolutionary relationships of the main animal phyla including sponges, molluscs, annelids and arthropods among others. The class includes weekly labs and a week-long field trip to the Keys Marine Lab in the Florida Keys.

OEB 56: The History and Evolution of Life on Earth

Javier Ortega-Hernández (and Nadja Drabon)

Explores the ways that planet Earth and living organisms interact in deep time, focusing on the intricate relationship between the physical world, the biogeochemical cycles of major elements, and the evolution of complex life over billions of years. The class includes weekly labs and a week-long field trip to Utah.

OEB 57: Animal Behavior

Naomi E. Pierce (and Bence Olveczky)

A review of the behavior of animals under natural conditions, with emphasis on both mechanistic and evolutionary approaches. Topics include classical ethology; behavioral endocrinology; behavioral genetics; learning and memory; communication; orientation, migration and biological rhythms; optimal foraging; evolutionary stable strategies; sexual selection; parental investment and mating systems; selfishness, altruism, and reciprocity; and sociality in vertebrates and invertebrates.

OEB 130: Biology of Fishes

George V. Lauder

Fishes inhabit diverse aquatic environments including deep seas, intertidal zones, coral reefs, polar waters, the vast Amazonian basin, and great East African lakes. A single fish species may occupy diverse environments through extraordinary long-distance horizontal and vertical migrations. To explore this unparalleled diversity, this course explores the anatomy, physiology, ecology and evolution of fishes.

OEB 141: Biogeography

Gonzalo Giribet

Biogeography aims to explain distributions of organisms through historical and ecological factors. This course focuses on the history of biogeographic research, developments in historical biogeography, and ecological processes that affect distributions of whole clades. Topics include plate tectonics and earth history, vicariance and dispersal, areas of endemism, phylogenetic niche conservatism, latitudinal gradients in species richness, and the theory of island biogeography. Software for biogeographical analysis is discussed and evaluated.

OEB 155R: Biology of Insects

Naomi E. Pierce

An introduction to the major groups of insects. The life history, morphology, physiology and ecology of the main taxa are examined. Topics include the phylogeny of terrestrial arthropods, an analysis of abiotic and biotic factors regulating populations, and the use of insects in biological control.

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, higher-level systematics and field characters of the ~27 orders, speciation processes, nesting and courtship behavior, vocalizations, mating systems and sexual selection, cooperative breeding, demography and conservation. This class includes weekly labs and a week-long field trip to the American Museum of Natural History's Southwestern Research Station in Arizona.

OEB 275R: Comparative Genomics: Phylogenetic Approaches to Linking Genomes and Phenotypes

Scott V. Edwards

Reviews recent literature on so-called "comparative methods" in evolutionary biology—methods examining interspecific patterns of variation in traits, their relationship to rates of speciation and links to variation in the genome, and discusses recent efforts to link genomic and phenotypic variation.

Freshman Seminar

FYSEMR 52L: Life and Death Lessons from the Fossil Record

Javier Ortega-Hernández

Takes a deep dive into the multifaceted world of paleontology and its bearing on human activities. Students learn how cutting-edge scientific research informs our understanding of the main processes that have influenced the evolution of life on Earth, gain insights into the socioeconomic impact of fossils, and explore how technological advances blur the lines between science fiction and reality.



OEB 51: Biology & Evolution of Invertebrate Animals

Life Sciences

LIFESCI 2: Evolutionary Human Physiology and Anatomy

Stephanie E. Pierce (and Joanne Clark Matott, Andrew Yegian, Rachel Carmody)

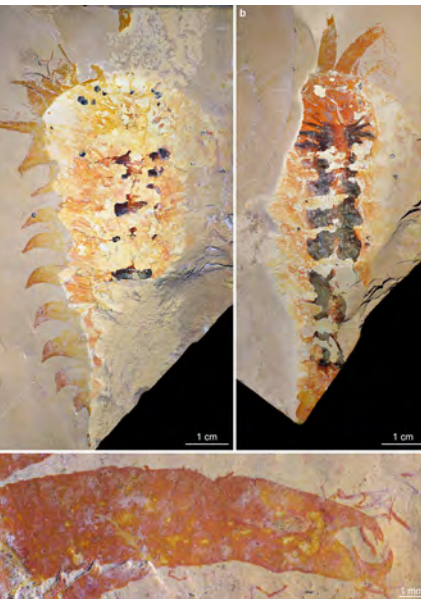
Explores human anatomy and physiology from an integrated framework, combining functional, comparative and evolutionary perspectives on how organisms work.



OEB 130: Biology of Fishes

Research Making Headlines

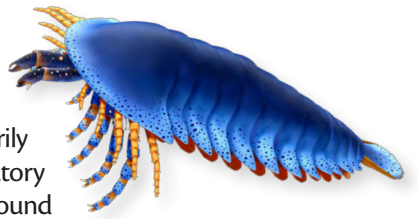
A Pinch in Time



Megachelicerax cousteaui fossil; at right, an artistic reconstruction by Rudy Lerosey-Aubril & Masato Hattori

Chelicerates are a diverse group of ecologically and economically important arthropods that includes spiders, scorpions, mites and horseshoe crabs. Chelicerates have a deep fossil record extending back to the early Ordovician approximately 480 million years ago, with some of the earliest species closely resembling extant horseshoe crabs. Although chelicerates are thought to have originated during the Cambrian radiation of animal life over half a billion years ago, the fossil record has not produced decisive evidence for their presence at the time—until now.

In a study published in *Nature*, research scientist **Rudy Lerosey-Aubril** and **Javier Ortega-Hernández** describe *Megachelicerax cousteaui*, a large soft-bodied arthropod from the middle Cambrian of Utah. Critically, *M. cousteaui* features prominent three-segmented pincer-like appendages, interpreted to be chelicerae, which potentially links the morphology of this Cambrian species with modern chelicerates.



It was primarily a large predatory organism, around 10 cm long, that inhabited the ocean floor. It had a segmented body with a rounded head shield covering six pairs of leg-like appendages—including pincers for feeding—and a trunk with modified gill-bearing limbs that were used for propulsion and breathing. *Megachelicerax cousteaui* demonstrates that large predatory chelicerates had already evolved at least 500 million years ago and likely played an important ecological role, as their modern counterparts do today. Despite having a strikingly advanced morphology, *M. cousteaui* and its close relatives suggest that chelicerates did not become dominant until several million years later when the group emerged from the sea to colonize dry land environments.

Lerosey-Aubril R, Ortega-Hernández J (2026) A Chelicera-Bearing Arthropod Reveals the Cambrian Origin of Chelicerates. *Nature* 652:931–937 **DOI: 10.1038/s41586-026-10284-2**

Discovery in the Deep

The deep ocean supports surprisingly high biodiversity, much of which lives on whale falls or wood falls that create ephemeral ecosystems by providing nutrients for their inhabitants.



Wood fall brought on board E/V *Nautilus*. Photo by Ocean Exploration Trust, Inc. (OET)

During August 2023, Biodiversity Postdoctoral Fellow **Paula Rodríguez-Flores** was aboard the E/V *Nautilus* on an Ocean Exploration Trust expedition to Johnson Atoll, an isolated group of four islands in the Central Pacific Ocean, when it collected a wood fall hosting numerous organisms from a depth of nearly 2,400 meters. Among these specimens, Rodríguez-Flores, **Gonzalo Giribet**, **Jennifer Winifred Trimble** and **Arianna Lord** discovered a new species of limpet, *Pectinodonta nautilus.* All species in the genus *Pectinodonta* live and feed on sunken wood, deriving nutrients via symbiotic bacteria within their intestinal tracts. *Pectinodonta nautilus* is large for its family—up to more than three centimeters long—with sturdy, strongly arched and unusually smooth off-white shells. To visualize its internal anatomy, the team examined one specimen of *P. nautilus* with high-resolution micro-CT scanning and 3D modeling. Among other features they found oversized radular teeth—scraping tools for feeding on decaying wood—that are nearly twice the size of other *Pectinodonta* species, pointing to distinct feeding strategies or evolutionary pressures of this isolated location. The team then generated a complete genome for the species and used its mitochondrial genome to place it within the taxonomic tree of *Pectinodonta*.

Wood falls are unique ecosystems that provide a rare window into the assemblages of organisms in the deep ocean, and this research demonstrates how many new species await discovery in such inaccessible environments.

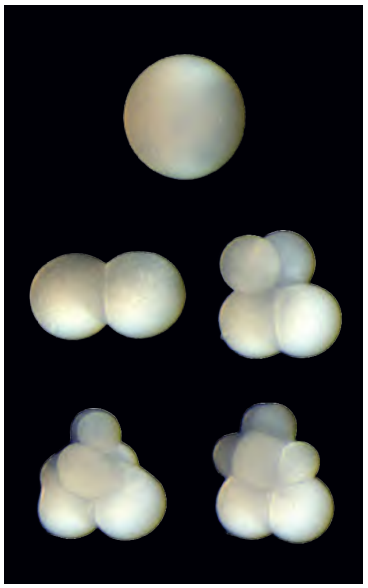
Giribet G, Trimble JW, Rodríguez-Flores P, Lord A (2026) A New Deep-Sea *Pectinodonta* Species (Mollusca, Gastropoda, Patellogastropoda, Pectinodontidae) from a Wood Fall Near Johnston Atoll, Central Pacific. *Molluscan Res* 46:25–41 **DOI: 10.1080/13235818.2025.2578245**

A Change of Fate

The three-banded panther worm, *Hofstenia miamia*, is a model system used to study whole-body regeneration with a well-known embryonic "fate map." In the early stages of development in *H. miamia*, cells undergo a stereotyped choreography of cell divisions, with each embryo producing cells with specific sizes, positions and fates at specific times. This process normally indicates low levels of cellular plasticity, raising the question of how such an embryo results in making highly plastic, regenerative adults. Graduate student **Amber Rock** and **Mansi Srivastava** set out to systematically study the plasticity of embryonic cells in *H. miamia*.

From a single-cell zygote, *H. miamia* divides into smaller micromeres that are fated to create the neurons, pharynx, muscle and epidermis, whereas larger macromeres make the gut and stem cells. At the four-cell stage, Rock removed one of the macromeres and, unexpectedly, found that it developed into an adult animal with all the major cell types, indicating that it is fully totipotent. Using eight-celled embryos, she studied robustness by removing some cells and replacing them with cells from transgenic *H. miamia* that allow researchers to trace the types of tissue each cell creates. Rock placed these glowing cells in different physical locations within the embryo. These altered embryos survived and developed into complete, fully functioning animals, but in a surprising manner. The cells didn't reorganize to their normal positions, as expected, but changed their fates to produce different tissues than their original purpose. These results establish a new system for studying cell plasticity, enabling future research into the underlying molecular mechanisms. Further, the finding of unexpected totipotency highlights the importance of work on understudied animal lineages, reminding us that a fuller exploration of biodiversity will reveal novel insights into biological principles.

Rock A, Srivastava M (2026) Totipotency and High Plasticity in an Embryo with an Invariant, Fate-Specifying Cleavage Program. *Curr Biol* 36:1410–1421.e4
DOI: 10.1016/j.cub.2026.02.014



Amber Rock

Hofstenial miamia embryo cell division time-lapse

Fish Findings

Vertebrates are unique among animals in that they have a neurocranium that encapsulates the brain. In mammals and birds, the brain fits snugly within this space, allowing paleontologists to use a fossil's endocast—a cast of the inside of the cranium—to study ancient brain morphology. However, ray-finned fish are a major group of vertebrates where this relationship has not been documented, limiting research into the evolution of their brains through the fossil record.

Biodiversity Postdoctoral Fellow **Rodrigo Tinoco Figueroa** and **Stephanie E. Pierce** provide the first steps to rectify this data shortage by documenting the relationship of endocast to brain size and composition for 86 extant ray-finned fishes, from a wide variety of taxa, held in museum collections. They used CT scanning to map each endocast with the associated internal structures and were able to categorize each with a Brain Endocast Coefficient (BEC)—a ratio to compare brain volume with intracranial space—and document brain and endocast complexity. They found that most of the specimens had brains that filled 40% to 60% of the intracranial space while others occupied less than 5%. In some species these ratios varied with age, filling the cavity while young but less so when adult. Analyzing the data, they found significant BEC variation among species from different habitats, especially shallow versus deep water environments, but that habitat did not correlate with either endocast or brain complexity. Thus, endocasts cannot be used as a proxy for brain size and morphology for this clade, although fossils from early diverging lineages seem to show a more predictable fit. As the first dataset of its kind, these initial findings provide valuable stepping stones for future research.

Figueroa RT, Pierce SE (2026) The Ray-Finned Fish Blackbox: Unprecedented Morphological Diversity and the Interplay Between Brain and Endocast. *Proc R Soc B* 293:20253277
DOI: 10.1098/rspb.2025.3277

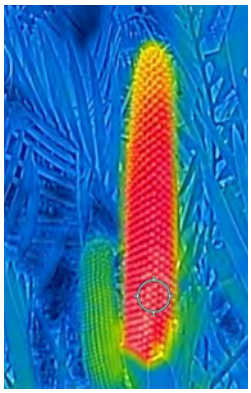


Rodrigo Tinoco Figueroa (all)

Some of the ray-finned fish specimens used in the study. From top: *Acanthurus bahianus*; *Caranx ruber*; *Canthigaster solandri*; *Elops affinis*; *Uranoscopus scaber*; *Lepidorhynchus denticulatus*

Bringing the Heat





Wendy Valencia-Montoya (2)

In plants, color and scent are well-known pollinator cues. Some plants also produce heat, possibly for improving frost tolerance, volatilizing scent and providing warmth for pollinators. Could heat also play a role in signaling pollinators? To investigate this possibility, former graduate student **Wendy Valencia-Montoya**, **Naomi E. Pierce** and colleagues studied the relationship of cycads, the oldest living lineage of seed plants pollinated by animals, and their beetle pollinators.

Cycads have cones rather than flowers, and male and female cones occur on separate plants. In a field experiment with the cycad *Zamia furfuracea*, the researchers determined that the cones generated heat, emitting infrared radiation in a circadian rhythm, with the male cones heating first at dusk, attracting beetles to their pollinating cones, then cooling. About three hours later the female cones heated, drawing the beetles to deposit pollen in the ovulate cones. The researchers hypothesized that beetles must have sensory adaptations for detecting thermal infrared radiation. In two beetle species that are cycad pollinators, *Rhopalotria furfuracea* and *Pharaxonotha floridana*, they found that the tips of the beetles' antennae are thermosensitive and tuned to the specific temperature profiles of their respective host plants, but they have limited color perception, correlating with the less-colorful cycad cones. Tracing the evolution of the cycad–beetle relationship into deep time, they found that it represents one of the most ancient pollination syndromes, emerging around 275 million years ago and predating the emergence of angiosperms (flowering plants). The shift to color-based pollination signaling of angiosperms coincided with the expansion of daytime pollinators with enhanced color perception—bees and butterflies.

Valencia-Montoya WA, Liénard MA, Rosser N, Calonje M, Salzman S, Tsai C-C, Yu N, Carlson JR, Cogni R, Pierce N, Bellono NW (2025) Infrared Radiation Is an Ancient Pollination Signal. *Science* 390:1164–1170 DOI:10.1126/science.adz1728

Sex Education



Marjorie Awai



Ancestors of chambered nautilus dominated our oceans millions of years ago, but today are restricted to a handful of species in the waters of the Southern Indo-Pacific. These charismatic creatures are distant relatives to squids and octopuses, but are easily distinguished by their external, chambered shell. Their striking shell makes them one of few marine invertebrates in need of protection from over-harvesting.

While the sex determination system for chambered nautiluses, or any cephalopod, had not previously been investigated, recent research proposed a ZZ/ZO system for all cephalopods, where males are homozygous (with two identical sex chromosomes) and females are hemizygous (with one sex chromosome). An international team, including **Gonzalo Giribet**, proposed a different system in chambered nautiluses. The research team combined phenotypic sex data with three genomic datasets representing 85 different specimens of the two extant chambered nautilus genera, *Allonautilus* and *Nautilus*. They found chromosome #4 to be the X sex chromosome that is diploid (XX) in females and haploid (XY/XO) in males. They also identified five scaffolds for a putative Y chromosome, pointing to an XX/XY system. These findings suggest that coleoids (octopuses, squids and cuttlefish—the cephalopods without a shell) and nautiloids (chambered nautiluses and their close relatives) may have evolved distinct sex determination systems from genetic material of their most recent common ancestor. The research also provides a genetic method to determine sex in *Nautilus* populations, which is more reliable than phenotypic sexing and can also be used in immature juveniles and in DNA extracted from shells, thus providing a potentially valuable tool for conservation and management efforts.

Torrado H, Leiva C, Riesgo A, Lemer S, Perez A, Lorente-Sorolla JM, Carlson B, Awai M, Giribet G, Combosch DJ (2025) *Nautilus* Sex Determination Is Unique Among Cephalopods. *Curr Biol* 35:4561–4569.e3 DOI: 10.1016/j.cub.2025.07.047

Highlights of Faculty-Curator Grants

Carrie Albertin is the Principal Investigator for *A New Animal Model to Elucidate Mechanisms of Gene Regulation and Embryonic Patterning*, a $769,309 research grant from the U.S. National Institutes of Health/NIGMS. This is the transfer of an award previously made to Albertin at the Marine Biological Laboratories.

This award is to study *Hox* gene function and regulation. *Hox* genes are critical regulators of developmental processes. In animals as distantly related as humans and fruit flies, *Hox* genes are found clustered in the genome and are expressed along the head to tail axis in the same order in which they are found in the cluster. Disruption in *Hox* gene function in embryo development results in regions of the body transforming from one identity to another. While there is extensive data for the role of *Hox* genes in many animals, the spiralians—molluscs, annelids, flatworms and others—are an understudied but crucial group in understanding the evolutionary origins and fundamental character of bilaterian developmental mechanisms, including those driving the regulation and role of the *Hox* genes in body patterning. Albertin's lab has developed resources and tools for studying cephalopod molluscs (squid and octopus), including chromosome-scale genome assemblies, extensive transcriptomics and tools for gene manipulation.

Through this award, they are using these tools to study the role of *Hox* genes in embryonic patterning in cephalopods, which have a highly derived body plan and many evolutionarily novel features. They are studying the genomic arrangement and expression of the *Hox* genes during development and are also testing the role of the *Hox* genes with CRISPR-mediated genome editing to learn how this gene family patterns these extraordinary animals. These experiments are the first functional analysis of *Hox* genes in a spiralian and point to a fundamentally different mode of action than in overtly segmented animals like flies and humans. Work in cephalopods is therefore poised to provide transformational insights into *Hox* biology and the basic principles of how pattern is established during embryonic development.



Carrie Albertin

Late-stage longfin inshore squid embryos (*Doryteuthis pealeii*) in their chorions

MCZ History



Steller makes the first measurement of a sea cow, Bering Island, 1742

The Steller's sea cow (*Hydrodamalis gigas*) is an extinct giant sirenian reaching seven to nine meters in length, a close relative of living dugongs and manatees. The species was first described by Georg Wilhelm Steller in 1741, when members of Vitus Bering's expedition encountered it around Bering Island in the Commander Islands, a remote Russian archipelago in the southwestern Bering Sea. The expedition itself was a tragic one. A ship commanded by Vitus Bering—the famous Danish explorer in the Russian army for whom the Bering Strait and Bering Sea were named—was wrecked on the uninhabited island that now bears his name. Bering and 31 crew members perished. Among the survivors was Steller, who studied the sea cows when not caring for the sick. After the expedition members were able to build a boat to reach the mainland, they brought news of the animal to the outside world. Intensive fur hunting drove it to extinction by approximately 1768, a mere 27 years after its scientific discovery. The MCZ is one of 24 museums with an almost complete, mounted skeleton (MCZ:Mamm:59412), which is on display at the Great Hall of Mammals in the Harvard Museum of Natural History. Like most surviving Steller's sea cow skeletons, it was assembled from bones belonging to more than one individual, supplemented by artificial elements. The Steller's sea cow continues to attract many visitors and is a testament to the fragility of the natural world, especially for highly specialized giant vertebrates.

Illustration by Leonhard Stejneger, from *Bering's Voyages: An Account of the Efforts of the Russians to Determine the Relation of Asia and America*, Vol. 2. New York: American Geographical Society

Highlights from the Collections

Rachel Ruysch: Artist, Naturalist, and Pioneer



Melissa Aja

In an era when few women attained artistic prominence, the masterful technique and dynamic still life compositions of Dutch painter Rachel Ruysch (1664–1750) made her famous across Europe. The Boston Museum of Fine Art exhibition *Rachel Ruysch: Artist, Naturalist, and Pioneer*, which ran from August to December 2025, brought together 35 of her finest floral still life paintings, where small creatures appear among the plants and fruit to add to the enchanting complexity of her paintings. In the exhibition, the creatures she so lovingly and realistically rendered were represented by specimens from the MCZ collections displayed alongside these works.



Glasgow Life Museums

Rachel Ruysch, *An Arrangement of Flowers by a Tree Trunk* (detail), about 1683

Ruysch's father was a scientist, collector, professor of anatomy and botany, and an amateur painter. At a young age, Ruysch practiced her drawing and painting skills using his extensive collection of plants and small creatures. At 16 years old, Ruysch was apprenticed to a well-known painter, who not only influenced her technique but also taught her how to construct less formal still lifes.

In the 17th century, the Dutch Republic was a seafaring nation with colonies worldwide. Ships brought back goods from remote lands, including exotic plants for domestic cultivation, and Ruysch was among the first artists to introduce these new botanical species into lush floral scenes, with beetles, butterflies, lizards and others among the foliage.

"These compositions are beautiful, but wild," says **Stevie Kennedy-Gold**, Curatorial Associate in Herpetology, "because some of these species would not exist together in nature. In one painting there's a cluster of butterflies, and if you look even closer, there's actually a lizard preying on one of those butterflies. We believe the lizard is a bridled skink, native to Africa, and the butterfly to be a North American swallowtail. These lizards will eat butterflies, they just probably wouldn't eat *that* species of butterfly."

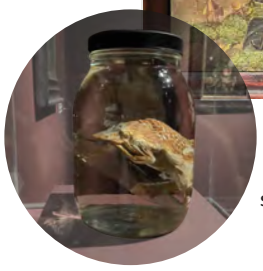


Melissa Aja

"Working on the MFA exhibition was a lot of fun and very different from working with scientists like we normally do," says **Crystal Maier**, Curatorial Associate in Entomology. "We pulled specimens that appear in the paintings with an emphasis on attractiveness, since, after all, it's an art exhibit." MFA made special cases with linen backgrounds to display the entomology specimens, and the herpetology specimens were presented in glass specimen jars. All together, more than 300 specimens from the MCZ Entomology collection and six from the Herpetology collection appeared in the exhibition. Charles Davis, Professor of Organismic and Evolutionary Biology and Curator in Vascular Plants in the Harvard University Herbaria, collaborated with MFA staff on scientific content and the many Herbaria specimens also on display.



Melissa Aja (2)



Rachel Ruysch, *Nature Piece with Surinam Toad*; specimen of *Pipa pipa* (MCZ:Herp:A-1244)

Staff Highlight



Juan Giribet

In her very first class as an undergraduate, Insects and Human Society, **Crystal Maier**, Curatorial Associate in Entomology, realized, "This is it. This is what I want to do." It harkened back to one of her earliest memories, when at about four or five years old she found a wooly bear caterpillar. Proudly showing it to everyone she could find, she brought it to her great-grandmother. A proper Southern lady, she promptly smacked the caterpillar from her hand and declared, "Little girls don't play with bugs." So, of course, that's just what she did.



Crystal Maier

Stegoelmis sp.

Maier has been immersed in entomology collections since she wrangled a job as a "beetle nanny" as an undergraduate at Virginia Tech. "My job was to feed the beetles, and I fell in love with it." Throughout graduate school at Montana State University and during her PhD studies at University of Kansas she worked in their entomology collections, curating specimens, describing new species of water beetles and studying phylogenetics. Her skills led to becoming the Collection Manager at the Field Museum before joining the MCZ.

Maier's favorite part of her job is that every day is different. A researcher may inquire about a specimen mentioned in literature 50 years ago, and the request may entail a search of the collection, the database and the archives to try to find the answer. "I'm always getting unusual requests, so it's like every day is a detective story."

Maier and her team are focused on the ongoing digitization of the Entomology collection, which currently stands at around 600,000 records available to scientists and the public. In years past, it was a laborious process to take high-resolution images of the tiny specimens and transcribe the data from their mini labels. Now, much of Maier's efforts go toward improving this process. "We are working closely with the MCZ team developing 3D-robotic-imaging technology and high-throughput software. By employing these innovations, we can significantly speed the digitization of the remaining eight million entomology specimens in the MCZ collection."

Spiders on the Move



The MCZ's spider collection is currently one of the largest in the world and is particularly rich in type specimens—the specimens used to describe and document new species—many from the works of notable spider researchers such as James H. Emerton, Elizabeth B. Bryant and Herb W. Levi.



While most spider specimens in the MCZ are stored alphabetically by species name, type specimens were stored according to the researchers who described them, often with many type specimens of different species stored in a single jar. This made it difficult and time-consuming to locate a specific specimen, as staff often do for researchers.

To modernize and follow current museum best practices, Curatorial Associate **Adam Baldinger** and Curatorial Assistants **Ligia Benavides**, **Zoe Flores**, **Melissa Merkel**, **Alana Rivera** and **Michelle Tang** spent three months organizing the type specimens. "This was very literally a game of Tetris®—a complex project with many moving parts that required seamless coordination between people," said Rivera.

Each type specimen is now housed in a single jar, with the proper percentage of ethanol and an updated label with complete data from the MCZ collections database, MCZbase. Now type specimens of 4,171 species are shelved alphabetically and according to best-practice standards for long-term collections management. Improved organization was not the only outcome. "There were many welcome surprises throughout, most notably the rediscovery of dozens of type specimens that were either misplaced or thought to be missing," says Flores.

Staff Highlight



Gonzalo Giribet & Murat Recevik

Graphis striata (MCZ:Mala:342696)

Murat Recevik, former Curatorial Assistant in Malacology, has had a lifelong passion for his field. "My fascination with shells began with a simple, personal gesture: making a shell necklace for my mother when I was a boy in Türkiye," he says. His captivation with gathering and handling those shells led his parents to arrange an apprenticeship with a malacology professor at the University of Istanbul when he was just 13 years old. The apprenticeship provided a foundation of knowledge, but much of his early expertise in shell morphology came through intense self-directed study.

After moving to the United States, he worked day jobs while continuing his study of malacology and practicing as an artist at night (he holds a master's in fine arts). Drawn to the extensive library at the MCZ's Malacology Department while in search of a particular research reference, he met Prof. Kenneth Boss, then Curator in Malacology. They connected instantly, and impressed by Recevik's knowledge of morphology and malacology, Boss invited him to join the department, first as a volunteer, then as a staff member. "Murat was one of the first colleagues I met at Harvard," says Director Giribet. "He's a fellow Mediterranean malacologist with whom I shared many experiences (and favorite mollusc species). I have the impression he always felt like a kid in a candy store opening drawers in our extensive collection."

During his nearly 24 years in the department, Recevik identified over 11,000 catalogued items and contributed 491 lots to the collection. His research focuses on Pectinidae (marine bivalves), Pyramidellidae (pyramid shells), Eulimidae (parasitic sea snails), and land snails around the world, working extensively on Cerastidae (air-breathing land snails). Upon his retirement in 2025, he donated his entire collection to the MCZ and to the Naturalis Biodiversity Center in Leiden, The Netherlands. He continues his research in the collection as an MCZ Associate.

Dimetrodon Returns



Melissa Aja

In August 2025, one of the MCZ's *Dimetrodon* specimens returned home after a long absence. Along with an Irish elk skull, *Dimetrodon limbatus* had been on loan to Brigham Young University's Museum of Paleontology for 63 years. *Dimetrodon* was an apex predator that lived about 295 to 272 million years ago. An early ancestor of mammals, *Dimetrodon* walked on four legs, much like a crocodile, and is known for the substantial spiny sail along its back. According to **Christina Byrd**, Curatorial Associate in Vertebrate Paleontology, "This specimen of *Dimetrodon limbatus* is one of the most complete and well preserved. It is also extensively illustrated in Alfred S. Romer's 1940 monograph about early synapsids."

Because of the specimen's large size and weight, it took a few months to determine the best storage location. Once it was decided to put it on display in the lobby of the Northwest Building, the project then pivoted to include a detailed assessment of the specimen and mount, stabilization and repair of damaged areas, cleaning the mount of decades of dust and grime, and refreshing the painted areas. The full mount was also scanned for digital archiving and reference.

Due to limitations in the temporary storage area, a full conservation assessment and treatments occurred after the specimen was installed in its exhibition location. While Byrd and Preparator **Scott Johnston** conducted repairs and treatments, the Northwest Building staff built a new façade to cover the old mount. They also provided electrical support and updated the lights inside the case. During the final stretch of installation at the end of March 2026, the team from the Vertebrate Paleontology collection, consisting of Byrd, Johnston and **Sara Antonuccio**, spent a weekend conducting conservation treatments and painting the mount before proudly unveiling the *Dimetrodon* exhibit.



Christina Byrd

Sara Antonuccio & Scott Johnston conducting conservation treatments on the mount & *Dimetrodon* specimen (MCZ:VP:VPRA:1347)

Projects & Initiatives

The Harvard Museums of Science & Culture is the public face of the Museum of Comparative Zoology and Harvard's five other research museums. Exhibitions at the Harvard Museum of Natural History, developed through the collaborative efforts of the HMSC exhibit staff and the people of the MCZ, showcase MCZ collections and research to visitors of all ages.



Tony Rinaldo (2)

Alligator snapping turtle (*Macrochelys temminckii*; MCZ:Herp:191168), Carolina Parakeet (*Conuropsis carolinensis*; MCZ:Orn:67853) & Crepuscular burnet moth (*Zygaena carniolica*; MCZ:Ent:239875)

Collecting Wonders: Tomorrow's Discoveries





Charles Darwin's fossil sand dollar (*Echinarachnius juliensis*; MCZ:IP:102431)

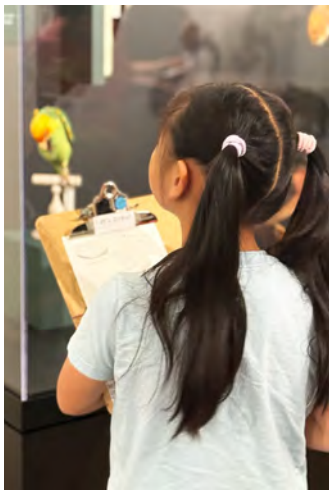
From June 2026 through April 2027, *Collecting Wonders: Tomorrow's Discoveries* at the Harvard Museum of Natural History brings some of Harvard's extraordinary research and teaching specimens into the light, many of which are on public display for the first time. The exhibition is a collaboration between the Harvard Museums of Science & Culture and the University's three natural history research museums, including the MCZ, and was supported by MCZ collections staff. *Collecting Wonders* showcases rare objects from the vaults of all major MCZ collections, from a massive polar bear to tiny jewel-like beetles, so visitors can learn about the biodiversity and beauty of our shared world over billions of years.

A whale vertebra, a Komodo dragon skull that inspired King Kong, and a great white shark's jaws are among the larger items on display. **Andrew Williston**, Curatorial Associate in Ichthyology, says, "There are not a lot of large shark specimens in museums … people come from around the world to see these."



Tony Rinaldo

George Washington's Golden Pheasants (*Chrysolophus pictus*; MCZ:Orn:335908)



To mark America's 250th Anniversary, the exhibition includes specimens that bridge scientific discovery and historical moments. In 1786, the Marquis de Lafayette presented George Washington with a pair of Golden Pheasants, now on view in the gallery. History buffs will be pleased to see a fossil sand dollar collected by Charles Darwin, a banded sunfish caught by Henry David Thoreau, and a woodpecker from the Lewis and Clark Expedition. Biological specimens, like a fully articulated skeleton of a dodo, "provide a snapshot in time about a species and where it occurred," explains **Jeremiah Trimble**, Curatorial Associate in Ornithology. "People can use them to look at how genetics have changed within a species over time."



Polar bear (*Ursus maritimus*; MCZ:Mamm:63650)

Far from simply relics, extinct and extant specimens continue to support science. New species are identified each year using specimens from the MCZ collections. The chemical composition of tissues of historical specimens can help assess environmental conditions, trends and impacts. Genetic information extracted from museum specimens provides insights into genetic history, evolutionary processes and adaptations, and bones can be used to study anatomy and evolution millions of years after a species went extinct.

Velvet Worms: A Fierce Hunter with a Secret Weapon

In October 2025, *Velvet Worms: A Fierce Hunter with a Secret Weapon*, supported by a grant from the National Science Foundation, opened in the Arthropod Gallery at the Harvard Museum of Natural History. Curated by **Gonzalo Giribet**, the exhibition highlights MCZ research on velvet worms, displays specimens from MCZ collections, and features Giribet's dramatic photographs of these charismatic, little-known creatures.



Gonzalo Giribet

Diemenipatus taiti; MCZ:IZ:164524

Velvet worms are not worms at all. Surprisingly, they are most closely related to arthropods, invertebrates with jointed legs like spiders, crabs and insects. Velvet worms have soft skin covered in papillae—tiny bumps lined with bristles sensitive to smell and touch—and like arthropods, the skin has a layer of chitin that molts as they grow.



Tony Rinaldo

Visitors are invited to explore their unique structure and biology through photographs, preserved specimens, and an oversized tactile model of a velvet worm from a new species discovered in Singapore by an MCZ expedition in August 2025. And, true to the exhibition's title, velvet worms are fierce nocturnal predators. The exhibition shows rare footage of the velvet worms' secret weapon—their ability to shoot glue-like slime to capture their next meal.

"Studying and documenting the lives of velvet worms," says Giribet, "is a unique opportunity to work in some of the most remote and beautiful forests on the planet." A video spotlighting MCZ research examines how these organisms colonized diverse environments while changing little over 300 million years. And in current research, Harvard scientists are studying velvet worms in the Caribbean to discover how they dispersed among the islands despite being unable to cross saltwater.

Making the Invisible Visible: Digitizing Invertebrates on Microscope Slides



In the MCZ's collections, there are around 50,000 invertebrate specimens mounted on microscope slides, some of which are more than 150 years old. A selection of these colorful, ornately labeled slides are on display in the exhibition *Making the Invisible Visible: Digitizing Invertebrates on Microscope Slides* at the Harvard Museum of Natural History Arthropods Gallery and elsewhere in the museum, including the lobby photograph gallery.

The MCZ's incredible slide collection spans species and continents, decades and collectors, and it's still growing today. In 2024, a team of MCZ curatorial and collections staff led by **Mansi Srivastava**, Curator in Invertebrate Zoology, embarked on a massive project to locate, restore, rehouse and digitize slides that had been largely overlooked for over a century. "The goal," says Srivastava, "is to make this meaningful data available to anyone, anywhere on the planet."



In the exhibition, visitors can appreciate the beauty and diversity of slide-mounted specimens through a wall of oversized images, discover how digitizing slide-mounted specimens brings information from the collections to the wider world, and explore for themselves at an interactive microscope station. *Making the Invisible Visible* was supported by a grant from the National Science Foundation to Srivastava; **Naomi E. Pierce**, Curator in Lepidoptera; **Adam Baldinger**, Curatorial Associate in Invertebrate Zoology; **Crystal Maier**, Curatorial Associate in Entomology; and **Jennifer Winifred Trimble**, Curatorial Associate in Malacology. High-resolution images were taken by Curatorial Assistants **Amelia Lawson** and **Even Dankowicz**, and intern **Jenni Nelson**.

Ernst Mayr Library

The Ernst Mayr Library (EML) works in close partnership with the MCZ to advance the Museum's research, teaching, collections and broader scientific mission. The library is embarking on an exciting era of modernization and improved technology, expanding access to information and data and creating new ways for biodiversity knowledge to be discovered, used and shared with communities around the world.

Welcome Rebecca Parmer

The library welcomed Rebecca Parmer in 2025, when she was appointed Head of Biodiversity and Natural History Libraries, a dual role as director of the EML and Harvard's Botany Libraries. Rebecca's experience spans leadership, teaching and curatorial roles across the academic and cultural heritage sectors, including positions at the Winterthur Library and the University of Connecticut. She collaborates with scholars, faculty and students to develop partnerships and initiatives that fuel new research and ways of learning, and that bring collections into the heart of teaching, scientific inquiry and creative dialogue.



Digital & Archival Projects in Support of MCZ Collections Operations

EML works closely with MCZ curatorial departments to improve access to collections information. Recent projects include digitizing Philips Academy specimen labels for the Ornithology Department; digitizing and depositing field notebooks from notable zoologists Federico Medem, Ken Miyata and John Cadle into Harvard's digital preservation system for the Herpetology Department; processing Entomology Department records; and working toward the conservation and digitization of more than 200 historical teaching charts in the EML and MCZ collections.



Collaborative & AI-Driven Transcription Experimentation

EML staff are developing tools to unlock biodiversity data held in its special collections, piloting AI models and leveraging a global community of volunteers to transcribe handwritten field notes, correspondence and specimen data into machine-readable text that can be searched, indexed and analyzed.

Mohit Mandal, 2026 Pforzheimer Fellow, spent the summer at EML investigating the use of handwritten text recognition and developing AI models to analyze and extract biodiversity data contained in field notebooks, and sharing these datasets with global projects like the Biodiversity Heritage Library and the Global Biodiversity Information Facility. These approaches significantly expand the scale, accuracy and discoverability of biodiversity information held within the EML special collections.





William Brewster at Lake Umbagog, Maine, September 5, 1898

Celebrating William Brewster

In September 2025, the Nuttall Ornithological Club celebrated the launch of the digital William Brewster photograph collection. A collaborative effort between Mass Audubon and the EML, this collection brings together thousands of images taken by Brewster and his assistant, Robert Gilbert, over two decades in the late 19th and early 20th centuries. These images, now freely available online, provide an important visual record of Brewster's fieldwork, documenting the landscapes and wildlife of a rapidly changing New England, and helping us understand changes in biodiversity over time.

Awards & Recognition



Brian D. Farrell (center) with Jordan Johnson (third from right)

Faculty-Curators

Brian D. Farrell received funding from the Dean's Competitive Fund for Promising Scholarship for the project "Spot the Difference: Genomics and Phylogeny of *Chrysomela* Beetles," supporting the PhD research of Jordan Johnson.

Mansi Srivastava was appointed co-chair of the Department of Organismic and Evolutionary Biology.



Alonso Delgado

Postdoctoral Researchers

Alonso Delgado (Holford Lab) received funding from the Postdoctoral Enrichment Program of the Burroughs Wellcome Fund, supporting his career in biomedical research, and was elected co-chair of the Gordon Research Seminar on Venom Evolution, Function and Biomedical Application.

Bruno Becker Kerber (Ortega-Hernández Lab) was awarded a Marie Curie Postdoctoral Fellowship.

Teresa Pegan (Edwards Lab) received a Kessel Fellowship for Ornithological Research from the American Ornithological Association.

Federica Pizzulli (Holford Lab) was awarded a grant from the Conchologists of America for her project "Neuroanatomical Integration of the Posterior Salivary Glands and the Crop in Octopuses: A Comparative Study Across Cephalopods."

Divya Ramesh (Lauder Lab) received an award from The Ingenuity Project for outstanding mentorship for mentoring high school students from their program during her PhD.



Divya Ramesh

Graduate Students

Max Laubstein (Edwards Lab) was awarded an Alexander Wetmore Memorial Research Grant from the American Ornithological Society for his project "Phylogeographic Implications of Structural Genomic Variation in a Tropical Andean Bird."

Ethan Mooney (S. Pierce Lab) received a postgraduate scholarship from the Natural Sciences and Engineering Research Council of Canada.

Edna Rodríguez Sánchez (Ortega-Hernández Lab) received the President's Prize for her talk "Re-Evaluating the Cambrian Chelicerate Molaria" presented at the 69th Annual Meeting of the Palaeontological Association.

Undergraduate Students

Lauren Bartel (Edwards Lab) was awarded the Bowdoin Prize for Outstanding Undergraduate Essay in the Natural Sciences for "The Mutation Rate of *de novo* Structural Variants in the Florida Scrub-Jay, *Aphelocoma coerulescens*, Estimated Using Long-Read Trio Sequencing."

Ashwin Sivakumar (Edwards Lab) won a Marshall Scholarship, enabling him to continue his studies in the United Kingdom.

Staff

Several staff members celebrated long-term service anniversaries this year.

Twenty years: **Katherine Eldridge**, collection assistant in Ornithology; **Alana Rivera**, collection assistant in Invertebrate Zoology; and **Andrew Williston**, curatorial associate in Ichthyology.

Twenty-five years: **Jessica Cundiff**, curatorial associate in Invertebrate Paleontology; **Tsuyoshi Takahashi**, collection assistant in Herpetology and Collection Operations; **Jeremiah Trimble**, curatorial associate in Ornithology; and **Jon Woodward**, digitization manager.

Thirty years: **Wendy Heywood**, Department of Organismic and Evolutionary Biology communications specialist.



Federica Pizzulli

PhD Theses Defended



Katherine Angier



Arianna Lord



Juli Mayorga



Jared Richards



Amber Rock



Maya Woolfolk

Katherine Angier, advised by Gonzalo Giribet and Andrew Davies: *Termite Communities in the Republic of the Congo: Drivers of Diversity and Ecological Impacts*

Arianna Lord, advised by Gonzalo Giribet: *An Integrative Approach to Velvet Worm Biodiversity and Systematics*

Juli Mayorga, advised by Gonzalo Giribet: *Pseudoscorpion Systematics & Phylogenetics: Exploring the Effects of Accelerated Rates of Evolution on Both Ancient and Recent Diversification*

Jared Richards, advised by Javier Ortega-Hernández: *The Marine Biosphere During the Great Ordovician Biodiversification Event—Quantitative Insights from the Early Ordovician Fezouata Shale Biota of Morocco*

Amber Rock, advised by Mansi Srivastava: *Embryonic Plasticity Through Evolution and Development in the Acoel,* Hofstenia miamia

Maya Woolfolk, advised by Hopi Hoekstra and Cliff Tabin: *The Evolution of Neonatal Vocal Behavior in Deer Mice*



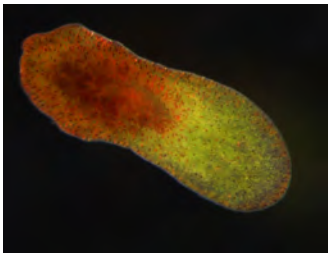
Willians Porto

Grant Recipients

Field Research Grants

Field research by those at the MCZ is sponsored by generous gifts from donors and enables field research and specimen collection that may otherwise not be possible.

A gift from family and friends of Professor Jenkins established the **Farish A. Jenkins Jr. Fund** to support student fieldwork in comparative zoology. Andrew V. McQuilling, AB 1988 and MBA 1994, and Mirtha M. Cabral, MBA 1994, created the **McQuilling-Cabral Fund** to support research by MCZ Faculty-Curators, postdoctoral fellows and graduate students in the Dominican Republic. The **Ken Miyata Fund in Herpetology** and the **Ken Miyata Fund for Field Research** were established by gifts from Barbara Jil Wu, PhD 1981, and Eric Larson, AB 1977, and other close friends of Dr. Miyata to support research by graduate students and others in herpetology. **Putnam Expedition Grants** support MCZ Faculty-Curators, postdoctoral fellows and graduate students collecting specimens and data relating to the study of comparative zoology and are made possible by a gift from Mr. George Putnam Jr., AB 1949 and MBA 1951, and Mrs. Nancy Putnam.



Paul Bump

Australian acoel, species undescribed



Anna Hatzakis

Blue copper butterflies (*Lycaena heteronea*)

Recipient	Grant Source	MCZ Department/ Faculty Sponsor	Project Title	Amount
Brian D. Farrell	Putnam	Entomology	Incipient Speciation in the *Tetraopes-Asclepias* System: A Population Genomic Study of Xeric-Adapted *T. annulatus* and *T. femoratus* in the American Southwest	$11,521
Ella Frigyik	Miyata	Invertebrate Zoology/ Gonzalo Giribet	*Nunciella*: A Candidate Genus for Targeted Forest Conservation in Western Australia	$8,500
Gonzalo Giribet	Putnam	Invertebrate Zoology	Closing an Antillean Circle: Surveying Onychophora Velvet Worm Diversity in Jamaica and the Lesser Antilles	$10,105
Anna Hatzakis	Putnam	Entomology/Naomi Pierce	Nabokov's Rocky Mountain Blues Revisited	$10,300
Jordan Johnson	Jenkins Jr.	Entomology/Brian Farrell	Spot the Difference: Investigating Variable and Fixed Colouration Morphs of a Holarctic Group of Tree-Feeding Beetles	$5,838
Breanna Jordan	Miyata	Invertebrate Zoology/ Gonzalo Giribet	Comparisons of the Microbiome and Predation for Oregon Intertidal Sea Spiders	$4,830



Gonzalo Giribet

Lily Shapiro



Breanna Jordan



Bruno Becker Kerber

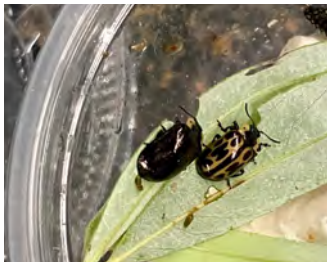


Tamayoa decolorata by Gonzalo Giribet

Recipient	Grant Source	MCZ Department/ Faculty Sponsor	Project Title	Amount
Max Laubstein	Jenkins Jr.	Ornithology/Scott Edwards	Phylogeographic Implications of Structural Genomic Variation in a Tropical Andean Bird	$5,265
Javier Ortega-Hernández & Bruno Becker Kerber	Putnam	Invertebrate Paleontology	Small Carbonaceous Fossils: The Hidden Animal Diversity of the Cambrian Period	$6,400
Javier Ortega-Hernández & Rudy Lerosey-Aubril	Putnam	Invertebrate Paleontology	Dissecting the Most Prolific Cambrian Konservat-Lagerstätte in the United States: Bed-by-Bed Paleoecology of the Gray Marjum Quarry, Utah	$14,400
Naomi E. Pierce	Putnam	Entomology	Lycaenidae (Lepidoptera) from Taiwan and Thailand	$17,760
Willians Porto	Putnam	Invertebrate Zoology/ Gonzalo Giribet	Exploring Understudied Arachnids from South Africa	$12,926
Catalina Romero-Ortiz	Putnam	Invertebrate Zoology/ Gonzalo Giribet	Filling Gaps: Leaf Litter Sampling of the Guadeloupe and Martinique Islands for Target Arachnids	$5,400
Mansi Srivastava & Paul Bump	Putnam	Invertebrate Zoology	Primary Production and Regenerative Strategies: An Abundant Acoel from One Tree Island	$27,041
Galen Tong	Jenkins Jr.	Entomology/Naomi Pierce	Collecting Larvae and Adults of an Obligately Ant-Associated Lycaenid Butterfly Clade	$13,810
Dillon Wheeler	Miyata	Entomology/Naomi Pierce	Myrmecophile Communities Associated with the Swollen-Thorn Acacia *Vachellia collinsii*	$4,550
			Total Awards	**$158,646**



Catalina Romero-Ortiz



Jordan Johnson

Chrysomela confluens



Galen Tong

Jalmenus pseudictinus caterpillars attended by *Froggattella kirbii* ants



Javier Ortega-Hernández

Walker Weyland



Brian D. Farrell

Paulino Siqueira Ribeiro



Matheus Barbosa



Odilon Vieira



Miriam Hueytletl Pérez

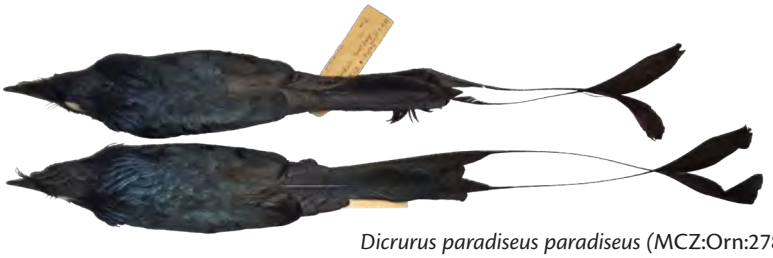


Sergio Matías Delpiani

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
Matheus Barbosa	National Museum of Brazil	Systematics and Evolution of Trachylepis in Africa	$2,150
Pedro H.M. Constancio-Lima	University of São Paulo	Phylogenetic Systematics and Historical Biogeography of New World Corydalinae (Megaloptera: Corydalidae)	$2,350
Breno de Oliveira	Federal University of Rio de Janeiro	Taxonomic Revision of the Genus *Oxyruncus* Teminck, 1820 (Oxyruncidae: Aves)	$2,000
Sergio Matías Delpiani	National University of Tierra del Fuego	Systematic Revision of Zoarcidae from the Southwest Atlantic and Southeast Pacific Based on Museum Collections	$2,492
Elton Galdino	Federal Rural University of Pernambuco	Systematics of Selandriinae (Tenthredinidae: Hymenoptera)	$2,500
Solomon Hendrix	University of Arizona	Evolution and Diversification of Nearctic Oak-Associated Treehoppers	$2,000
Miriam Hueytletl Pérez	Interdisciplinary Center for Marine Sciences	Morphochromatic Variability of the Species Complex *Ophionereis annulata* (Le Conte, 1851) (Echinodermata: Ophiuroidea) in the Eastern Pacific	$2,500
Chukwudi Michael Ikegwu	Howard University	Taxonomic Revision of the *Phrynobatrachus steindachneri* Species Complex (Amphibia: Anura: Phrynobatrachidae) in West-Central Africa	$2,500
Ian Solon Ito	State University of Londrina	Diversity, Evolution and Biogeography of *Hypomasticus* (Anostomidae; Characiformes)	$2,460
János Novák	Clemson University	Taxonomical Investigations on Pseudoscorpion Type Materials at the MCZ	$2,200
Juliana Ehlert Rincaweski	Federal University of Paraná	To Evolution and Beyond: Morphology, Systematics and Biogeography of the Neotropical Emerald Dragonflies of Corduliidae *s.l.* Selys in Selys & Hagen, 1850 (Insecta: Odonata)	$2,500
Jason Robinson	University of Illinois, Urbana-Champaign	Investigating Type Specimens with Localities and Mitochondrial Haplogroups to Further Taxonomic Description	$2,500
Archita Sharma	Indian Institute of Science Education and Research	Re-Assessing the Taxonomy of Peninsular Indian Birds Using Next-Generation Genetic Tools and Museum Specimens	$2,000



Dicrurus paradiseus paradiseus (MCZ:Orn:278292) by Archita Sharma

Recipient	Institutional Affiliation	Project Title	Amount
Odilon Vieira	Federal University of Rio de Janeiro	Taxonomy and Biogeography of Formicariidae (Aves: Passeriformes)	$2,500
Michele Violi	University of Modena and Reggio Emilia	Global Systematics of Neglected and Minute Deep-Soil Leptotyphlinae Rove Beetles (Coleoptera Staphylinidae)	$1,613
		Total Awards	**$34,265**

Grants-in-Aid of Undergraduate Research

GUR grants support research by Harvard College undergraduates under faculty supervision. Priority is given to projects that utilize MCZ research collections, laboratories and facilities. Support for these grants comes from the MCZ's Myvanwy M. and George M. Dick Scholarship for Students.

Recipient	Academic Dept./ Faculty Sponsor	Project Title	Amount
Shahmeer Baqir	OEB/Javier Ortega-Hernández	Using AI and Micro-CT Scanning to Measure Respiration Capacity in Arthropods	$5,498
Connor Coffman	OEB/Gonzalo Giribet	*Pristobunus* Phylogeny and Species Delimitation	$1,200
Mei Fujimura	OEB/Naomi Pierce	Creating CT Scans of Lycaenid Caterpillars to Study Their Ant-Association Mechanism	$1,200
Liam Joy	OEB/Naomi Pierce	Sodium Availability and Ant Behavior in the *Vachellia drepanolobium* Mutualism	$5,000
Lucille Nomaguchi-Long	OEB/Mansi Srivastava	Characterizing Early, Asymmetric Wound-Induced Gene Expression in the Acoel *Hofstenia miamia*	$1,200
Skye Schmiegelow	HEB/Kevin Uno	Geochemical Characterization of the KNM-ER 803 Hominin Locality, East Turkana, Kenya	$3,490
Chun-Yu Su	OEB/Andrew Davies	The Spatial and Temporal Stability of Ecosystem Transitions on the Bateke Plateau, Congo	$1,200
Chun-Yu Su	OEB/Andrew Davies	Biodiversity and Vegetation Structural Complexity Relationships Across Transitioning Ecosystems	$1,200
Chun-Yu Su	OEB/Andrew Davies	Biodiversity–Vegetation Structural Complexity Relationships Across Transitioning Ecosystems	$6,000
		Total Awards	**$25,988**



Chukwudi Michael Ikegwu



Skye Schmiegelow



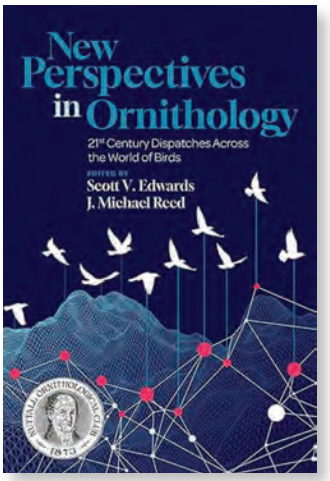
Chun-Yu Su



Mei Fujimura

Publications in 2025





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Financial Data

These charts describe the income and expenses of the Museum of Comparative Zoology in fiscal year 2025.

Endowment income funds much of the Museum's activities, such as acquisition and maintenance of collections, faculty and staff salaries, capital projects, and facilities renovation and maintenance. It includes the annual distribution (payout) and endowed funds decapitalized per donor request.

Gifts are donations received in support of Museum activities that are available for current use; it does not include donations for endowed funds.

Other Income comprises miscellaneous income from publication subscriptions, royalties, sales and fees, and cost recovery from other MCZ-sponsored activities.

Overhead is funds paid from sponsored projects to cover associated facilities and administrative costs. It is shown as both income (**Overhead Earned**) and expenses (**Overhead Charged**).

Accumulation of Restricted Reserves indicates net growth of balances in restricted gifts and endowments from, for example, interest payments and unspent portions of the current year's endowment payouts.

Draw on Unrestricted Reserves indicates unrestricted fund balances utilized to fund operations.

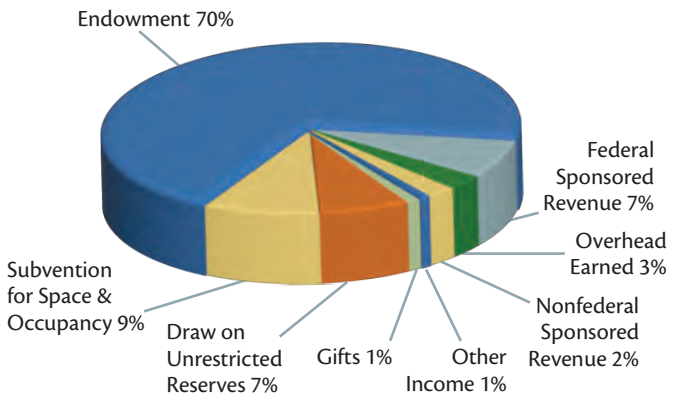
Building expenses such as maintenance, facility improvements and utilities are captured in the **Space & Occupancy** category, and **Subvention for Space & Occupancy** is support provided by the Faculty of Arts and Sciences to offset these costs.

Operating Expenses consist of equipment purchases, supplies, and consultant and conference fees, as well as annual subventions for administrative services and MCZ support for faculty-curator research.

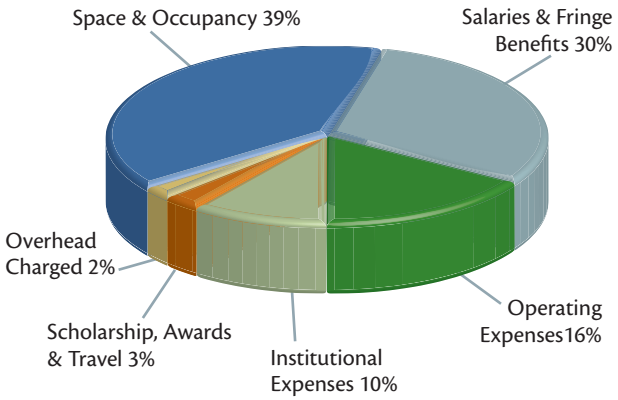
Support for MCZ-affiliated graduate students in OEB is included in **Scholarships, Awards & Travel**.

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



EXPENSES & NON-OPERATING FUNDS



Income

Endowment	$20,840,371
Federal Sponsored Revenue	$2,078,879
Overhead Earned	$778,117
Nonfederal Sponsored Revenue	$485,029
Gifts	$408,373
Other Income	$323,319
Accumulation of Restricted Reserves	($396,354)
Draw on Unrestricted Reserves	$2,130,695
Subvention for Space & Occupancy (from FAS)	$2,834,266
Total	**$29,482,695**

Expenses

Space & Occupancy	$11,443,823
Salaries & Fringe Benefits	$8,840,086
Operating Expenses	$4,637,978
Institutional Expenses	$2,946,613
Scholarships, Awards & Travel	$927,908
Overhead Charged (Sponsored)	$686,287
Total	**$29,482,695**

Personnel

Faculty-Curators

Carrie Albertin
Assistant Professor of Organismic & Evolutionary Biology; Curator in Malacology

Scott V. Edwards
Professor of Organismic & Evolutionary Biology; Alexander Agassiz Professor of Zoology; Curator in Ornithology

Brian D. Farrell
Monique & Philip Lehner Professor for the Study of Latin America; Professor of Organismic & Evolutionary Biology; Curator in Entomology

Gonzalo Giribet
Professor of Organismic & Evolutionary Biology; Alexander Agassiz Professor of Zoology; Curator in Invertebrate Zoology; Curator in Malacology; Director, MCZ

Hopi E. Hoekstra
Edgerley Family Dean of the Faculty of Arts & Sciences; C.Y. Chan Professor of Arts & Sciences; Xiaomeng Tong & Yu Chen Professor of Life Sciences; Curator in Mammalogy (on leave)

Mandë Holford
Professor of Organismic & Evolutionary Biology; Alexander Agassiz Professor of Zoology; Curator in Malacology

George V. Lauder
Henry Bryant Bigelow Professor of Ichthyology; Curator in Ichthyology; Acting Curator in Herpetology

Javier Ortega-Hernández
Associate Professor of Organismic & Evolutionary Biology; Curator in Invertebrate Paleontology

Naomi E. Pierce
Sidney A. & John H. Hessel Professor of Biology; Curator in Lepidoptera

Stephanie E. Pierce
Professor of Organismic & Evolutionary Biology; Alexander Agassiz Professor of Zoology; Curator in Vertebrate Paleontology; Acting Curator in Mammalogy

Mansi Srivastava
Professor of Organismic & Evolutionary Biology; Curator in Invertebrate Zoology; Co-Chair, Department of Organismic & Evolutionary Biology

Emeritus Faculty

Andrew A. Biewener
Charles P. Lyman Research Professor of Biology; Charles P. Lyman Professor of Biology, Emeritus

A.W. (Fuzz) Crompton
Fisher Professor of Natural History, Emeritus

James Hanken
Research Professor of Biology; Professor of Biology, Emeritus

Robert M. Woollacott
Professor of Biology, Emeritus

Postdoctoral Fellows, Research Associates & Visiting Scholars

Aylin Alegre Barroso
Invertebrate Zoology, Giribet Lab

Steven Ascoët
Malacology, Holford Lab

Saurabh Attarde
Malacology, Holford Lab

Hans Niclas Backstrom
Ornithology, Edwards Lab

Peter Bishop
Vertebrate Paleontology, S. Pierce Lab

Valentine Bouju
Entomology, Farrell Lab

Paul Bump
Invertebrate Zoology, Srivastava Lab

Wei-Ping Chan
Invertebrate Zoology, Giribet Lab

Vikram Chandra
Invertebrate Zoology, Srivastava Lab

Júlia Chaumel Cerda
Ichthyology, Lauder Lab

Richard Childers
Entomology, N. Pierce Lab

Alonso Delgado
Malacology, Holford Lab

Ye Duan
Invertebrate Zoology, Srivastava Lab

Omar Entiauspe-Neto
Invertebrate Zoology, Giribet Lab

Lilly Maria Olivia Eriksson
Invertebrate Zoology, Giribet Lab

Leticia Franco
Invertebrate Zoology, Giribet Lab

Claudia Gerecke
Ornithology, Edwards Lab

Colin Goodman
Concord Field Station, Biewener Lab

Yuki Haba
Mammalogy, Hoekstra Lab

Shuonan He
Mammalogy, Hoekstra Lab

Guillem Izquierdo Aranega
Ornithology, Edwards Lab

Nicholas Jourjine
Mammalogy, Hoekstra Lab

Allison Kann
Invertebrate Zoology, Srivastava Lab

Bruno Becker Kerber
Invertebrate Paleontology, Ortega-Hernández Lab

Kim Kirchhoff
Malacology, Holford Lab

Panagiotis Kontos
Invertebrate Zoology, Giribet Lab

Laura Laino da Costa
Invertebrate Zoology, Giribet Lab

Joseph Lancho Silva
Entomology, N. Pierce Lab

Thalles Lavinscky Pereira
Entomology, Farrell Lab

Rudy Lerosey-Aubril
Invertebrate Paleontology, Ortega-Hernández Lab

Sarah Losso
Invertebrate Paleontology, Ortega-Hernández Lab

Talia Lowi-Merri
Ornithology, Edwards Lab

Inbar Maayan
Ornithology, Edwards Lab

Marc Mapalo
Invertebrate Paleontology, Ortega-Hernández Lab

Bianca Mari
Invertebrate Paleontology, Ortega-Hernández Lab

Diana Martinez Baquero
Malacology, Holford Lab

Juli Mayorga
Invertebrate Zoology, Giribet Lab

Jennifer McCarthy-Taylor
Malacology, Albertin Lab

Nelson Novo
Invertebrate Zoology, Giribet Lab

Yu Pan
Ichthyology, Lauder Lab

Teresa Pegan
Ornithology, Edwards Lab

Carlos Perafán Liévano
Invertebrate Zoology, Giribet Lab

Francesc Pérez Peris
Invertebrate Paleontology, Ortega-Hernández Lab

Federica Pizzulli
Malacology, Holford Lab

Willians Porto
Invertebrate Zoology, Giribet Lab

Divya Ramesh
Ichthyology, Lauder Lab

Catalina Romero-Ortiz
Invertebrate Zoology, Giribet Lab

Trey Scott
Entomology, N. Pierce Lab

Paulino Siqueira Ribeiro
Entomology, Farrell Lab

Jessica Stock
Malacology, Albertin Lab

Rodrigo Tinoco Figueroa
Vertebrate Paleontology, S. Pierce Lab

Kelsey Tyssowski
Mammalogy, Hoekstra Lab

Yangfan Zhang
Ichthyology, Lauder Lab

Graduate Students

Katherine Angier
Invertebrate Zoology, Giribet Lab

Gaurav Bhardwaj
Invertebrate Zoology, Srivastava Lab

Catriona Breen
Invertebrate Zoology, Srivastava Lab

Christian Burns
Ornithology, Edwards Lab

Kaylin Chong
Entomology, Farrell Lab

Sarah Dendy
Invertebrate Zoology, Giribet Lab

Ella Frigyik
Invertebrate Zoology, Giribet Lab

Anna Hatzakis
Entomology, N. Pierce Lab

Evan Hoki
Entomology, N. Pierce Lab

Jordan Johnson
Entomology, Farrell Lab

Breanna Jordan
Invertebrate Zoology, Giribet Lab

Akshay Kane
Invertebrate Zoology, Srivastava Lab

Duyi Kuang
Vertebrate Paleontology, S. Pierce Lab

Max Laubstein
Ornithology, Edwards Lab

Kelsie Lopez
Ornithology, Edwards Lab

Arianna Lord
Invertebrate Zoology, Giribet Lab

Juli Mayorga
Invertebrate Zoology, Giribet Lab

Ethan Mooney
Vertebrate Paleontology, S. Pierce Lab

Jared Richards
Invertebrate Paleontology, Ortega-Hernández Lab

Amber Rock
Invertebrate Zoology, Srivastava Lab

Edna Rodriguez Sanchez
Invertebrate Paleontology, Ortega-Hernández Lab

Lily Shapiro
Invertebrate Zoology, Giribet Lab

Belkes Stambouli
Malacology, Holford Lab

Catherine Strong
Vertebrate Paleontology, S. Pierce Lab

Julius Tabin
Mammalogy, Hoekstra Lab

Galen Tiong
Entomology, N. Pierce Lab

Madeleine Waskom
Invertebrate Paleontology, Ortega-Hernández Lab

Walker Weyland
Invertebrate Paleontology, Ortega-Hernández Lab

Dillon Wheeler
Entomology, N. Pierce Lab

Maya Woolfolk
Mammalogy, Hoekstra Lab

Associates

Bruce Archibald
Associate of Entomology
University of British Columbia

Aaron Bauer
Associate of Herpetology
Villanova University

Reinier Beeuwkes III
Associate of the Concord Field Station
Independent Researcher

Sathyabhama Biju
Associate of Herpetology
University of Delhi

James Blake
Associate of Invertebrate Zoology
Independent Researcher

Gustavo Bravo
Associate of Ornithology
Humboldt Institute

Janet Collett
Associate of Entomology
University of Sussex

David Bruce Conn
Associate of Invertebrate Zoology
Berry College

James Costa
Associate of Entomology
Western Carolina University

Stefan Cover
Associate of Entomology
Independent Researcher

Catherine Craig
Associate of Invertebrate Zoology
Independent Researcher

Tauana J. Cunha
Associate of Malacology
Loyola University Chicago

Bruno A.S. de Medeiros
Associate of Entomology
Field Museum of Natural History

Harlan Dean
Associate of Invertebrate Zoology
University of Massachusetts, Boston

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 Invertebrate Zoology
Pacific Biosciences Research Center

Berthold Hölldobler
Associate of Entomology
Arizona State University

Gustavo Hormiga
Associate of Invertebrate Zoology
The George Washington University

Michael Huben
Associate of Entomology
Independent Researcher

Samuel Jaffe
Associate of Entomology
The Caterpillar Lab

Alan Kabat
Associate of Malacology
Independent Researcher

Elizabeth Kane
Associate of Vertebrate Paleontology
Charleston Center for Paleontology

Leslie S. Kaufman
Associate of Ichthyology
Boston University

Anthony E. Kiszewski
Associate of Entomology
Bentley University

Richard J. Knecht
Associate of Entomology
University of Michigan

Nicolai Konow
Associate of the Concord Field Station
University of Massachusetts, Lowell

Katrin Linse
Associate of Malacology
British Antarctic Survey

Cong Liu
Associate of Entomology
University of Massachusetts Boston

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

D. Luke Mahler
Associate of Herpetology
University of Toronto

James Mallet
Associate of Entomology
Harvard University

Axel Meyer
Associate of Ichthyology
University of Konstanz

Shinichi Nakahara
Associate of Entomology
Independent Researcher

Piotr Naskrecki
Associate of Entomology
Gorongosa Restoration Project

Paulo Petry
Associate of Ichthyology
The Nature Conservancy

Christian Rabeling
Associate of Entomology
University of Hohenheim

Michael Reed
Associate of Ornithology
Tufts University

R. Graham Reynolds
Associate of Herpetology
University of North Carolina, Asheville

Neil Rosser
Associate of Entomology
Princeton University

Jessica Rykken
Associate of Entomology
University of Alaska Museum

Carl Schmitt
Associate of Ornithology
Independent Researcher

Donna Schmitt
Associate of Ornithology
Independent Researcher

Andrea Sequeira
Associate of Entomology
Wellesley College

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

Scott R. Shaw
Associate of Entomology
University of Wyoming

James Traniello
Associate of Entomology
Boston University

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

Jacqueline Webb
Associate of Ichthyology
University of Rhode Island

Haven Wiley
Associate of Ornithology
University of North Carolina, Chapel Hill

Judith Winston
Associate of Invertebrate Zoology
Smithsonian Marine Station

Staff

Melissa Aja
Administrative Manager

Adam Baldinger
Curatorial Associate, Invertebrate Zoology

Tracy Barbaro
Faculty Coordinator, Vertebrate Paleontology & Mammalogy

Dan Belich
Cataloger, Harvard Library Information & Technical Services

Ligia Benavides Silva
Curatorial Assistant, Invertebrate Zoology

Eva Biedron
Curatorial Assistant, Vertebrate & Invertebrate Paleontology

Nina Black
Curatorial Assistant, Mammalogy & Ornithology

Emily Blank
Curatorial Assistant, Collections Operations

Diana Bolanos Rodriguez
Researcher, Invertebrate Zoology

Ronnie Broadfoot
Coordinator of Access Services, Ernst Mayr Library

Yvonne Burke
Research Assistant, Ichthyology

Christina Byrd
Curatorial Associate, Vertebrate Paleontology

Christian Carrasco
Laboratory Technician, Malacology

Paul Cervantes
Curatorial Assistant, Collections Operations

Wei-Ping Chan
Research Scientist, Collections Operations

Richard Childers
Research Scientist, Collections Operations

April Collins
Library Assistant, Ernst Mayr Library

Sawyer Cooper
Laboratory Assistant, Ichthyology

Jessica Cundiff
Curatorial Associate, Invertebrate Paleontology

Even Dankowicz
Curatorial Assistant, Entomology

Joseph deVeer
Digital Projects Manager, Ernst Mayr Library

Katherine Eldridge
Curatorial Assistant, Ornithology

Anne Everly
Curatorial Assistant, Ichthyology

Charles Farnum
Curatorial Assistant, Entomology

Ayman Fayad
Greenhouse Coordinator for Plant Sciences

Zoe Flores
Curatorial Assistant, Invertebrate Zoology

Ella Frigyik
Researcher, Invertebrate Zoology

Patricia Fuentes-Cross
Faculty Coordinator, Invertebrate Zoology

Matthew Gage
Curatorial Assistant, Herpetology

Mariam Gelashvili
Laboratory Technician, Holford Lab

Cyrus Green
Technician & Preparator, Invertebrate Paleontology

Cory Hahn
Plant Technologist

Brendan Haley
Senior Database Manager

Andra Hollis
Staff Assistant, Concord Field Station

Samuel Howard
Curatorial Assistant, Entomology

Scott Johnston
Technician & Preparator, Vertebrate Paleontology

Amie Jones
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Michelle Kennedy
Collections Information & Database Specialist

Stevie Kennedy-Gold
Curatorial Associate, Herpetology

Jeremy Kisala
Curatorial Assistant, Collections Operations & Assistant Registrar

Adam Kowalczyk
Curatorial Assistant, Vertebrate Paleontology

Amelia Lawson
Curatorial Assistant, Collections Operations

Lisa Litchfield
Coordinator, Concord Field Station

Julia Lucey
Research Assistant, Malacology

Crystal Maier
Curatorial Associate, Entomology

Shaadi Meher
Informatics Project Lead, Malacology

Melissa Merkel
Curatorial Assistant, Malacology & Invertebrate Zoology

Paul J. Morris
Biodiversity Informatics Manager

Madeleine Mullon
Curatorial Associate, Mammalogy

Catherine Musinsky
Faculty Assistant, Mammalogy

Mark Omura
Curatorial Associate, Mammalogy

Rebecca Parmer
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Melinda Peterson
Research Lab Coordinator, Ornithology

Meri Petollari
Faculty Coordinator, Malacology

Bridget Power
Faculty Coordinator, Herpetology & Invertebrate Zoology

Pedro Ramirez
Research Assistant, Concord Field Station

Jennalee Ramnarine
Curatorial Assistant, Entomology

Mark Renczkowski
Curatorial Assistant, Invertebrate Paleontology

Alana Rivera
Curatorial Assistant, Invertebrate Zoology

Mary Sears
Head of Public Services, Ernst Mayr Library

Isobel Smith
Laboratory Technician, Mammalogy

Meaghan Sorce
Curatorial Assistant, Ichthyology

Margaret Starvish
Faculty Assistant, Entomology & Ichthyology

Tsuyoshi Takahashi
Curatorial Assistant, Collections Operations & Herpetology

Michelle Tang
Curatorial Assistant, Invertebrate Zoology

Jennifer Winifred Trimble
Curatorial Associate, Malacology

Jeremiah Trimble
Curatorial Associate, Ornithology

Diana Turmenne
Curatorial Assistant, Collections Operations

Cynthia Wang-Claypool
Manager of Genetic Resources

Peter Wiggin
Plant Growth Facilities Manager

Kenneth Wilcox
Building Superintendent, Concord Field Station

Andrew Williston
Curatorial Associate, Ichthyology

Jonathan Woodward
Digitization Manager

Robert Young
Special Collections Librarian, Ernst Mayr Library

Breda Zimkus
Director, Collections Operations

Temporary Staff

Sara Antonuccio
Vertebrate Paleontology

Matthew Baldinger
Malacology

Laura Borrelli
Mammalogy

William Brister
Malacology

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Entomology

Rose Courtney
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Eliza Hirsch
Invertebrate Zoology

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Invertebrate Paleontology

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Herpetology

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Concord Field Station

River Pfaff
Herpetology

Gary Taylor
Concord Field Station

Jocelyn Wang
Entomology

Annabelle Zhang
Ornithology

Yangfan Zhang
MCZ Seminars

Zixuan Zhang
Concord Field Station

Administration for the Department of Organismic & Evolutionary Biology

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Events Coordinator

Ognenka Avramovska
Education & Outreach Manager

Janelle Batista
Financial Analyst

Tiara Borneman
HR Coordinator

Lydia Carmosino
Senior Academics Programs Administrator

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Financial Associate

Sarine Der Kaloustian
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Assistant Director, Graduate Program

Diana Gjino
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Christopher Preheim
Senior Academic Appointments Administrator

Emily Reynolds
Research Administration Manager

Margaret (Peg) Richards
Financial Operations Specialist

Liliana Teixeira-Davis
Senior Research Administrator

The MCZ deeply appreciates the additional support and contributions of numerous interns and undergraduate students during the 2025–2026 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.

Dr. Elizabeth Kane

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Dr. Barbara Jil Wu

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Editors

Melissa Aja, Administrative Manager
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HARVARD

MUSEUM OF COMPARATIVE ZOOLOGY

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

mczharvard