

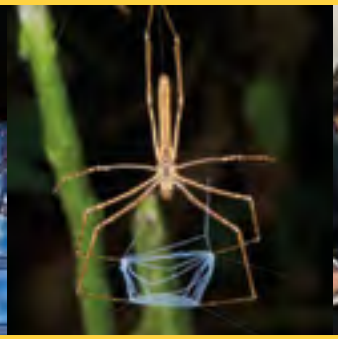
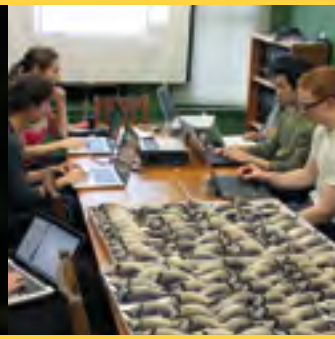


Museum of Comparative ZOOLOGY

Annual Report

Harvard University



2012–2013

Director's Message

Determination, persistence, stamina, confidence, inquisitiveness and patience are among the cornerstones of a successful career in science.

Catherine Weisel

Humor, wit, stubbornness and charm don't hurt either. These characteristics and more made Farish A. Jenkins Jr. an esteemed mentor, teacher, colleague and friend to many—in fact, to just about everyone. On November 11, 2012, we said goodbye to this beloved member of the MCZ. Farish touched us deeply, and he is remembered fondly by all who knew him. He really was one of a kind.

In anticipation of Farish's retirement, which had been scheduled for this past summer, last year we launched a formal search to hire his successor as MCZ's Curator of Vertebrate Paleontology and faculty member in Organismic and Evolutionary Biology. This search concluded successfully, and I am extremely pleased to introduce Dr. Stephanie Pierce, BSc, MSc, PhD, and welcome her to the MCZ. Stephanie will join us beginning in fall 2014 after she completes a very successful lectureship appointment at the Royal Veterinary College and the University of Cambridge, UK. More of Stephanie's professional background and research accomplishments are described elsewhere in this report.

Detailed plans, developed over many years, to insure the long-term care and utilization of many of our specimen collections are finally being realized. The mammalogy collection has already moved into MCZ's new state-of-the-art research and teaching facility in the Northwest Building, essentially ending Phase I of the project. As I write this, the ornithology collection is making a similar migration as the centerpiece of Phase II. Additional collections are preparing for their move beginning this coming year, which will complete Phase III.

Many of the projects and collaborations that help sustain our reputation as a global center for research and education in comparative biology are highlighted in this report. By participating in national initiatives such as *Advancing Integration of Museums into Undergraduate Programs*, *Network Integrated Biocollections Alliance* and *Advancing Digitization of Biological Collections*, we are developing and implementing new tools that foster access to and utilization of museum collections. And the Encyclopedia of Life Learning + Education Group, based here, continues to develop innovative ways to promote bioliteracy worldwide.

Beginning two years ago, the Faculty of Arts and Sciences initiated a major effort to strengthen, support and highlight the public activities of its six research and teaching museums, including the MCZ. The most tangible results are the launch, earlier this year, of the Harvard Museums of Science & Culture and the hiring of its executive director, Ms. Jane Pickering. Under Jane's leadership, the HMSC will manage exhibits, outreach events and other public programs while also encouraging more extensive integration of its component museums, and especially their world-class collections, within the academic life of the university. The MCZ stands to benefit greatly from this affiliation, and I look forward to sharing new developments and accomplishments in future reports.

I close by thanking and applauding the faculty-curators, staff, postdoctoral fellows and students for their role in making 2012–2013 a successful and productive year at the MCZ.

James Hanken
Director

Cover photo credits:
Top, left to right: Naomi Pierce; Christopher Kenaley; JumpStart Youth Connection; Jonathan Losos; Catherine Weisel

Bottom, left to right: Andrew Williston; Marianne Espeland; Shane Campbell-Staton; Gonzalo Giribet; Jeremiah Trimble

Opposite page: Tiktaalik roseae *by Stephanie Mitchell, Harvard University News Office*

Introducing the MCZ's Newest Faculty-Curator

The MCZ welcomes Dr. Stephanie Pierce as the new Curator of Vertebrate Paleontology and a faculty member in Organismic and Evolutionary Biology.

Dr. Stephanie Pierce

3-D reconstruction of Ichthyostega

Dr. Pierce being filmed for a documentary

All photos courtesy of Stephanie Pierce

She will be joining the MCZ in fall 2014 after completing her lectureship appointment at the Royal Veterinary College, UK. "Both MCZ and OEB are delighted that Stephanie has agreed to join us," says MCZ Director James Hanken. "She will bring unique talents and expertise that nicely complement those of faculty across campus, and I anticipate many fruitful collaborations in both research and teaching. We're also very much looking forward to having Stephanie oversee the MCZ's vertebrate paleontology collections and associated laboratories in their new home in the Northwest Building."

A fascination with vertebrate evolution led Dr. Pierce to study the interaction of muscles and bones during feeding and movement. Most recently, she has been examining the locomotion of the earliest limbed vertebrates to decipher how their muscular and skeletal systems evolved as they made the transition from water to land.

In an innovative project, Dr. Pierce led a team that created a 3-D computer model of the skeleton of *Ichthyostega*, one of the first four-legged creatures to transition from water to land during the Devonian period around 400 million years ago.

"Reconstructing the anatomy and biology of the earliest tetrapods is paramount to unraveling the evolution of terrestrialization and how that ultimately set up biodiversity for the rest of Earth's history," says Dr. Pierce. The team used an X-ray micro-CT scanner to build a complete skeleton from 12 different fossil specimens.

Using the 3-D model, Dr. Pierce assessed the range of motion of *Ichthyostega's* shoulder, elbow, hip and knee joints and compared it to modern animals that live both on land and in water.

The results were surprising. "Ever since its first discovery almost a century ago, *Ichthyostega* was presumed to walk around on land on four sturdy limbs—much like a salamander does today. Now the evidence suggests that this pivotal early tetrapod was moving more like a mudskipper than a modern tetrapod."

Mudskippers are fish that travel on land by using their front fins like "crutches" to pull the rest of their body along, and *Ichthyostega's* front limbs operated in much the same way. *Ichthyostega's* hind limbs would have barely touched the ground, making them more useful in the water than on land. This research, and subsequent findings, were published in *Nature*.

Next, Dr. Pierce intends to use dynamic 3-D modeling techniques, such as X-ray Reconstruction of Moving Morphology (XROMM), to reconstruct the evolutionary sequence of locomotor behaviors across the water–land transition. This study will incorporate important fossil material housed in the MCZ's vertebrate paleontology collections.

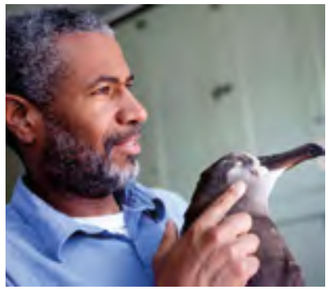
"I am incredibly excited to join the MCZ team and integrate their world class vertebrate paleontology collections into my research and teaching," says Dr. Pierce. "The unprecedented combination of specimen access, technology and know-how will no doubt lead to new insights into the water–land transition and beyond."

In addition to her work on early tetrapods, Dr. Pierce is also interested in the functional morphology of modern animals and other extinct vertebrate groups, such as marine reptiles and ancient crocodiles.

MCZ Faculty-Curators

Andrew A. Biewener
Charles P. Lyman Professor of Biology
Director, Concord Field Station

Prof. Biewener's research focuses on understanding the biomechanics, neuromuscular control and energetics of animal movement on land and in the air. His goal is to understand general principles that govern the biomechanical and physiological design of vertebrate animals related to their movement in natural environments.



Rose Lincoln

Scott V. Edwards
Professor of Biology
Alexander Agassiz Professor of Zoology
Curator of Ornithology

Prof. Edwards' research focuses on the evolutionary biology of birds and relatives, combining field, museum and genomics approaches to understand the basis of avian diversity, evolution and behavior. Current projects utilize technologies to examine genome evolution across the reptile–bird transition; phylogeography and speciation of Australian and North American birds; and the genomics of host–parasite co-evolution between house finches and a recently acquired bacterial pathogen, *Mycoplasma*.

Brian D. Farrell
Professor of Biology
Curator of Entomology

Prof. Farrell's work focuses on whether the diversity of species on Earth is a cause or a consequence of the diversity of roles that species play in ecosystems.

Stu Rosner

To understand the interplay of adaptation, speciation and evolution over geological time, the Farrell lab focuses on the relationships between insects and plants. Beetles are of particular interest because of their unparalleled species diversity and their ecological impact as herbivores, predators, fungal feeders, decomposers, parasites and pollinators. The lab has just completed the NSF-supported Beetle Tree of Life project, a collaborative and comprehensive evolutionary study aimed at understanding these insects' many shifts among trophic levels. A new, complementary NSF-supported initiative to document the MCZ insect fossils has just begun.

Because direct experience serves education, Farrell also leads long-term initiatives that provide educational and research opportunities and materials for undergraduates by documenting species diversity in the Boston Harbor Islands and in the Dominican Republic. In July 2012, Farrell completed a yearlong Fulbright Scholarship to the Universidad Autónoma de Santo Domingo in the Dominican Republic, where he and his Dominican colleagues established a U.S.-style museum specimen study laboratory with undergraduate researchers.

In Memoriam

It was with profound sadness that MCZ bid farewell to longtime colleague and friend Farish A. Jenkins Jr., Professor of Biology, Alexander Agassiz Professor of Zoology and Curator of Vertebrate Paleontology, who passed away on November 11, 2012.

One of the world's leading biologists, Jenkins considered himself a "hybrid" of anatomist, zoologist and vertebrate paleontologist. Combining a polymath's curiosity with a scientist's tenacity, he worked both in the lab with live animals and out in the field with fossils, trekking across the globe from East Africa to Greenland, the American West to the Arctic tundra.

His quest to solve one of the great mysteries of evolutionary biology—how swimming and crawling creatures eventually evolved to walk, run, jump and fly—was his lifelong passion. In 2004, Jenkins was part of a team that traveled to Ellesmere Island in Nunavut Territory, Canada, where they made the groundbreaking discovery of *Tiktaalik roseae,* the 375-million-year-old fossil that represents a critical transitional stage between fish and four-legged animals.

© Jared Leeds

Prof. Jenkins was one of Harvard's most beloved professors, a man of rigorously high standards who took the time to know every student by name and craft lectures that were part science, part art, part adventure and completely unforgettable. A stylish dresser in his pressed white shirts, dapper suits and polished shoes, Jenkins was nonetheless not above donning a body stocking painted with a human skeleton for an anatomy lecture or putting on a peg leg to act out sections of *Moby Dick* to demonstrate theories of human gait. His intricate anatomical illustrations, made on the blackboard with pieces of chalk whose ends he honed to sharp tips, revealed yet another talent: world-class artist.

"Farish A. Jenkins was the epitome of a Harvard professor. He was a true gentleman with impeccable manners and he had a deep love of learned institutions. He cared deeply for his students, and he was for many of them the best teacher they would ever know. He was a superb scientist and model university citizen. Every pursuit received 100% of his effort, and he expected the same of his students and his faculty colleagues," recalls Professor James McCarthy.

Among his many accolades, Jenkins served as president of the Society of Vertebrate Paleontology in 1981–1982, was the recipient of its Romer-Simpson Medal for lifetime achievement in 2009, received a Harvard College Professorship in 2011 and was honored with a June 2012 MCZ symposium celebrating his decades-long career. He will long be remembered for his profound impact on countless students, colleagues and collaborators worldwide.

A memorial fund has been established at the MCZ to support student fieldwork in evolutionary biology. Contributions may be made to: Farish A. Jenkins Jr. Fund, c/o The Museum of Comparative Zoology, 26 Oxford Street, Harvard University, Cambridge, MA 02138.

Gonzalo Giribet

Professor of Biology
Alexander Agassiz Professor of Zoology
Curator of Invertebrate Zoology

© Casey Dunn

Prof. Giribet's primary research focuses on the evolution, systematics and biogeography of invertebrate animals. Current projects in the Giribet lab include multidisciplinary studies for Assembling the Bivalve Tree of Life, the diversity of Neotropical arachnids, and systematics and biogeography of arthropods, mollusks, sponges, sipunculans, platyhelminthes and onychophorans. He is also interested in philosophical aspects of DNA sequence data analysis, emphasizing homology-related issues.

James Hanken

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

Catherine Weisel

Prof. Hanken combines laboratory-based analyses with fieldwork to examine morphological evolution, developmental biology and systematics. Current areas of research include the evolution of cranial patterning, the developmental basis of morphological novelty, biodiversity informatics, and the taxonomy and systematics of neotropical salamanders. Prof. Hanken serves on the Executive Committee of the Encyclopedia of Life (**eol.org**) and on several other boards.

Gretchen Evitt

Hopi E. Hoekstra

Professor of Organismic and Evolutionary Biology
Professor of Molecular and Cellular Biology
Alexander Agassiz Professor of Zoology
Curator of Mammalogy

Prof. Hoekstra combines field and laboratory work to understand the evolution of mammalian diversity from morphology to behavior.

Her research focuses on the genetic basis of adaptive variation—identifying both the ultimate causes and the proximate mechanisms responsible for traits that help organisms survive and reproduce in the wild. Research in the Hoekstra lab integrates ecological, behavioral, genetic and molecular approaches.

Stephanie Mitchell

George V. Lauder

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

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

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

Rose Lincoln

Jonathan B. Losos
Monique and Philip Lehner Professor for the Study of Latin America
Curator of Herpetology

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

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

Jon Chase

James J. McCarthy
Professor of Biological Oceanography
Alexander Agassiz Professor of Biological Oceanography
Acting Curator of Malacology

Prof. McCarthy's research focuses on factors that regulate the processes of primary production and nutrient supply in the ocean. Through controlled laboratory studies and field investigations, Prof. McCarthy and his group examine the effects of strong seasonal or interannual climate change on marine life and biogeochemical systems.

Naomi E. Pierce
Sidney A. and John Hessel Professor of Biology
Curator of Entomology

Kris Snibbe

Prof. Pierce's primary research focuses on the behavioral ecology of species interactions, particularly cooperative interactions between plants and their pollinators, and symbioses between ants and many different organisms including bacteria, fungi, plants and caterpillars of butterflies in the family Lycaenidae. Prof. Pierce is interested in how species associations such as parasitism and mutualism influence the evolutionary trajectories of each partner.

Some of this research is functional, searching for genes and/or pathways involved in the evolution of insect herbivory on the one hand, or plant resistance to pathogen/insect attack on the other. Other projects are comparative, seeking to understand the adaptive advantages of traits such as specialized diets in the Lepidoptera. Current grant-funded research is also investigating environmental and genetic influences in the evolution of social behavior in stingless bees.

Prof. Pierce has also been engaged in reconstructing the evolutionary Tree of Life for ants, bees and butterflies, using the resulting molecular phylogenies to analyze life history evolution, geographic distributions and rates of diversification. In the MCZ entomology collections, Prof. Pierce has been involved in a project to digitize and photograph the butterflies. Recent grants have supported collection of ants of the Navajo Nation, as well as the development of a database of locality records and identification tools for ants from the American Southwest.

Jean-François Bertrand

Robert M. Woollacott
Professor of Biology
Curator of Marine Invertebrates

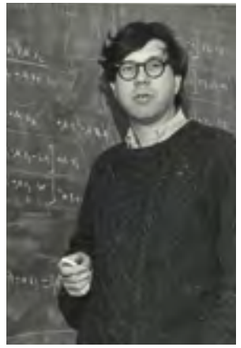
Prof. Woollacott's research focuses on aspects of marine invertebrate life history, such as synchronization of reproductive events and ecology and physiology of larvae. Topics of particular interest include larval dispersal and population connectivity, as well as human impacts on the distribution of marine organisms.

MCZ Emeriti

Kenneth J. Boss
Faculty-Curator, Emeritus
Professor of Biology, Emeritus

Prof. Boss, former Curator of Malacology, has been with Harvard for 40 years. His research focus is the classification, systematics and evolution of mollusks, using data from shell morphology, anatomy and zoogeography to analyze the phylogenetic relationships within various groups of gastropods and bivalves. He has also published on the history of malacology. Prof. Boss has contributed extensively to the *Occasional Papers on Mollusks* and formerly served as editor for *Breviora* and the *Bulletin of the Museum of Comparative Zoology*.

Richard C. Lewontin
Professor of Biology, Emeritus
Alexander Agassiz Professor of Zoology, Emeritus



An evolutionary geneticist, Prof. Lewontin pioneered the field of molecular population genetics by merging molecular biology and evolutionary theory, as well as the philosophical and social implications of genetics and evolutionary theory. Prof. Lewontin's current research involves computer simulation and evaluation of statistical tests for selection. Among his many books are *The Genetic Basis of Evolutionary Change*, *Biology as Ideology: The Doctrine of DNA*; *Human Diversity*; and *The Triple Helix: Gene Organism and Environment*. He served as President of the Society for the Study of Evolution, the American Society of Naturalists and the Society for Molecular Biology and Evolution.

Jim Harrison

Edward O. Wilson
Honorary Curator in Entomology
Pellegrino University Professor, Emeritus

Prof. Wilson is considered the founder of sociobiology and evolutionary psychology and has developed the basis of modern biodiversity conservation. He has received many of the world's leading prizes in recognition of his research and environmental activism. He was awarded two Pulitzer Prizes for his books *The Ants* (1990, with Bert Hölldobler) and *On Human Nature* (1978). In 2007, Prof. Wilson received the Technology, Entertainment, Design (TED) Prize, where he articulated the concept of the Encyclopedia of Life—a contemporary, dynamic Web page for every named species.

A. W. "Fuzz" Crompton
Faculty-Curator, Emeritus
Fisher Professor of Natural History, Emeritus

Justin Ide

Prof. Crompton, former Curator of Mammalogy, was the Director of the MCZ from 1970 to 1982 and the former Director of the Peabody Museum of Natural History, Yale University, and the South African Museum, Capetown. His primary research interests are the origin and evolution of mammals, functional anatomy, neural control and evolution of feeding in recent and fossil vertebrates. Prof. Crompton is a fellow of the American Academy of Arts and Sciences and the American Association for the Advancement of Science. He received two Guggenheim fellowships for his research on vertebrate paleontology and functional morphology and in 2011 received the Romer-Simpson Medal from the Society of Vertebrate Paleontology.

Herbert W. Levi
Faculty-Curator, Emeritus
Alexander Agassiz Professor of Zoology, Emeritus

Courtesy of the Ernst Mayr Library

A former Curator of Arachnology, Prof. Levi's research focuses on the taxonomy of New World orb weaving araneid spider genera. The author of *Spiders and Their Kin*, as well as numerous articles on various spider genera, his research has made possible identification of 1,500 species in 66 genera in the Americas. Prof. Levi served as president of the International Society of Arachnology and, in 2007, won the ISA's Eugene Simon Award for lifetime achievement for his immense influence on spider research.

Naomi Pierce

OEB 155r: Biology of Insects (offered fall 2013)

Courses in 2012–2013 Led by MCZ Faculty-Curators

Organismic and Evolutionary Biology

OEB 10: Foundations of Biological Diversity (undergraduate)
Brian D. Farrell (and N. Michele Holbrook)
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 (undergraduate)
Gonzalo Giribet
Introduction to invertebrate diversity, with special emphasis on the broad diversity of animal forms, their adaptations to different ecosystems and how these phenomena shape animal evolution.

OEB 57: Animal Behavior (undergraduate)
Naomi E. Pierce (and Bence P. Olveczky)
A review of the behavior of animals under natural conditions, with emphasis on both mechanistic and evolutionary approaches.

OEB 130: Biology of Fishes

Catherine Weisel

OEB 121a: Research in Comparative Biomechanics Seminar (undergraduate and graduate)
Andrew A. Biewener, George V. Lauder (and Stacey A. Combes, Anna G. Warrener)
Introduction to experimental techniques used to investigate the structure and physiology of vertebrates, where each instructor offers research projects that are undertaken in their laboratory.

OEB 130: Biology of Fishes (undergraduate and graduate)
George V. Lauder
Explores the unparalleled diversity of fish across different aquatic environments including deep seas, intertidal zones, coral reefs, polar waters, the vast Amazonian basin and great East African lakes.

OEB 234: Topics in Marine Biology (graduate)
Robert M. Woollacott
Examines human impacts on marine life and ecosystems of the sea.

OEB 255: Nature and Regulation of Marine Ecosystems (graduate)
James J. McCarthy
A presentation of topics that are of current interest in marine ecosystems, emphasizing identification and quantification of biological and environmental factors important in the regulation of community structure.

OEB 275r: Phylogenomics, Comparative Genomics and Adaptation (graduate)
Scott V. Edwards
Explores the ways in which comparative genomics can inform phylogeny and genomic adaptation, surveying recent methods for harnessing thousands of loci for phylogenetic reconstruction.

OEB 275br: Evolutionary Genomics and the Museum: Enhancing Insight into Evolutionary Processes Using Museum Collections (graduate)
Scott V. Edwards, James Hanken
Explores the diverse ways to enhance evolutionary studies via online databases for genomics and museum collection through discussions, presentations and video conferencing across multiple institutions.

Graduate Courses of Reading and Research

OEB 307: Biomechanics, Physiology and Musculoskeletal Biology
Andrew A. Biewener

OEB 310: Metazoan Systematics
Gonzalo Giribet

OEB 320: Biomechanics and Evolution of Vertebrates
George V. Lauder

OEB 325: Marine Biology
Robert M. Woollacott

OEB 334: Behavioral Ecology
Naomi E. Pierce

OEB 341: Coevolution
Brian D. Farrell

OEB 345/E-PSCI 337: Biological Oceanography
James J. McCarthy

OEB 355: Evolutionary Developmental Biology
James Hanken

OEB 362: Research in Molecular Evolution
Scott V. Edwards

OEB 367: Evolutionary and Ecological Diversity
Jonathan B. Losos

OEB 370: Mammalian Evolutionary Genetics
Hopi E. Hoekstra

Jonathan Losos

Andrew Williston

OEB 130: Biology of Fishes

Freshman Seminars

FRSEMR 21k: Monsters and Movers in the Deep
Robert M. Woollacott
Explores fantastic beasts of the sea, both imaginary and real, using historical dimensions but emphasizing contemporary sciences.

FRSEMR 22t: Why We Animals Sing (The Ways We Do)
Brian D. Farrell
Investigates the sounds and structures of different kinds of acoustic animals—including birds, mammals, frogs and insects—and the different kinds of habitats in which they produce their songs and calls.

FRSEMR 25j: Evolutionary Biology: The Lizard Perspective
Jonathan B. Losos
Examines the workings of evolution and adaptation through one of the most diverse types of vertebrate animals.

FRSEMR 41u: Museums
James Hanken
Traces the history of museums from their beginnings to the modern institutions of today, considering issues in conservation, finances, exhibit design, legal and ethical issues, and their role in contemporary society.

Freshman Seminar 25j: Evolutionary Biology: The Lizard Perspective

Jeremiah Trimble

OEB 275br: Evolutionary Genomics and the Museum: Enhancing Insight into Evolutionary Processes Using Museum Collections

Life Sciences

LIFESCI 1b: An Integrated Introduction to the Life Sciences: Genetics, Genomics and Evolution (undergraduate)
Hopi E. Hoekstra (and Maryellen Ruvolo, Kevin C. Eggan, Pardis Sabeti)
This course uses an integrated approach to show how genetics and evolution are intimately related, together explaining the patterns of genetic variation we see in nature and how genomics can be used to analyze variation.

OEB 51: Biology and Evolution of Invertebrate Animals

Gonzalo Giribet

LIFESCI 2: Evolutionary Human Physiology and Anatomy (undergraduate)
Andrew A. Biewener, George V. Lauder (and Katherine J. Hinde)
Explores human anatomy and physiology from an integrated framework, combining functional, comparative and evolutionary perspectives on how organisms work.

General Education

Science of Living Systems 22: Human Influence on Life in the Sea (undergraduate)
Robert M. Woollacott, James J. McCarthy
Over-harvested fish stocks, pollution and anthropogenic climate change affect the stability and productivity of marine ecosystems. This course asks what we need to know about the causes and effects of anthropogenic change to best protect marine ecosystems and ensure sustainable harvests from the sea.

Harvard Extension School and Harvard Summer School

BIOS E-225: Human Impacts on Marine Organisms and Ecosystems
Robert M. Woollacott
Examines how anthropogenic-driven events are impacting the structure and function of marine communities.

BIOS S-74: Marine Life and Ecosystems of the Sea
Robert M. Woollacott
A review of the life history and adaptations of marine life and the ecosystems of the sea, with emphasis on understanding the fragility and resilience of marine systems in the face of anthropogenically driven perturbations.

BIOS S-158: Study Abroad: Biodiversity of the Dominican Republic
Brian D. Farrell
Explores the interplay of ecological niches and evolutionary diversification in the organisms and habitats of a tropical island as a microcosm of the evolution of biodiversity on Earth.

Freshman Seminar 25j: Evolutionary Biology. The Lizard Perspective

Jonathan Losos

MCZ History

Two of the foremost evolutionary biologists of the 20th century were successive directors of the MCZ. Alfred Sherwood Romer (1946–1961) assumed his post at the close of World War II. He inherited an institution in "desperate" financial straits due to limited income and rampant (wartime) inflation. Most salaries, he decried, "were desperately small." Yet, thanks to his skillful management and the generosity of key supporters, especially George and Mabel Agassiz, by the end of Romer's tenure "the wolf is, for the moment at least, no longer scratching at the door."

The improved situation enabled Ernst Mayr (1961–1970) to prevail over—indeed, to promote—an important expansion of MCZ, both physically and programmatically. He initiated construction of a new wing, the MCZ Laboratories, equipped for studies of behavior, environmental physiology, population biology and biochemical evolution, which would "enrich the intellectual atmosphere of the Museum." He also helped establish the Concord Field Station and secure the Estabrook Woods for field studies.

The changing of the guard between these two champions of natural history museums in contemporary biology is captured in a photograph from that year's annual report.

Professor Romer (left) welcoming Professor Mayr to his new office as Director of the Museum

Highlights from the Collections

Nadia Rosendal Nielsen

GeoCenter Møns Klint

Mark Renczkowski

Mark Renczkowski

Specimens Relocate to Denmark

During six weeks in fall 2012, fossil specimens of Greenland's ancient fish, amphibians, reptiles and mammals were carefully swaddled in foam and toilet paper for a 20-day sea voyage to Denmark.

The specimens were collected in expeditions led by **Farish A. Jenkins Jr.** during seven field seasons from 1988 to 2001. These expeditions to the Triassic Fleming Fjord Formation yielded significant finds, notably a nearly complete *Plateosaurus* dinosaur and its footprints that contributed to Prof. Jenkins' research on the dinosaur and its gait. The researchers also discovered a small mammal, *Haramiyavia clemmenseni*, whose specialized teeth suggest that mammals may have diversified earlier than was previously thought, possibly in the Middle Triassic.

Prof. Jenkins was joined on the expeditions by colleagues from Denmark and the United States. Under the collecting agreement with the Kingdom of Denmark, the specimens would be housed in the MCZ collections for research during Prof. Jenkins' tenure. Over the years the specimens have been used for research projects—both by Jenkins and his students—and for teaching purposes.

In anticipation of Prof. Jenkins' retirement, arrangements were made to return the specimens to Denmark. **Jessica Cundiff**, Acting Curatorial Associate and Collections Manager for Vertebrate Paleontology; **Mark Renczkowski**; **Bridget Power**; **Richard Knecht**; **Tsuyoshi Takahashi**; and **Victoria Wilke** painstakingly prepared and packed 90 specimens ranging in size from tiny mammal teeth that fit in a small box to the *Plateosaurus* dinosaur, which required five crates.

Sixteen heat-treated wooden crates were specifically constructed to safeguard the fossils during their long sea voyage. Small fragile specimens were placed in plastic boxes with foam sheets cut around their form. Larger specimens, such as the *Plateosaurus*, were sunk into beds of two-inch-thick foam blocks for added protection. Other less fragile specimens were wrapped in toilet paper and layered in the crates.

Prof. Jenkins felt that toilet paper was one of the best materials for wrapping fossils in the field as well as for cushioning them during shipment. "In a memorable moment during the packing process, Farish proclaimed how important it is to have toilet paper in the field—not only for its intended use, but also for wrapping fossils," says Cundiff. "He proceeded to show us his fossil-wrapping technique, and then critiqued our skills and the aesthetics of our toilet paper bundles."

The specimens arrived in December 2012 at the **GeoCenter Møns Klint**, a geological museum on the island of Møn in southeastern Denmark. Curators at the GeoCenter were particularly excited to receive the *Plateosaurus*, which was mounted and is currently featured in *The First Dinosaur*. The exhibition is based on the findings of the 2012 Danish expedition to Jameson Land in Greenland and the seven Harvard expeditions led by Farish Jenkins. Once the exhibition closes, the specimens will reside in the collections of the Natural History Museum of Denmark.

The Ant Room, Transformed

The MCZ's ant collection is the largest and most important in the world, so sprucing up the Ant Room was no small undertaking. In order to make the approximately one million specimens more searchable and accessible for research, the entire collection was reorganized alphabetically by taxonomic group.

Stefan Cover and **Jignasha Rana**, Curatorial Assistants in the ant collection, were joined in the massive undertaking by various users of the collection. Dr. Steve Shattuck and Robyn Meier of the Australian National Insect Collection provided valuable assistance during the process.

The specimen reorganization will facilitate collection initiatives such as cataloging and databasing ant specimens in the collection, and organizing and transferring specimen material to the MCZ cryogenic facility. According to Rana, "The specimens in this new arrangement are certainly more accessible, which increases their scientific utility and value."

The Ant Room underwent physical renovations, as well. With the help of Collections Operations staff, the Ant Room received specialized, lab-quality benches,

Catherine Weisel

From left: Stefan Cover, Jignasha Rana and Steve Shattuck

updated light fixtures and new equipment for curatorial staff. **Edward O. Wilson**, Honorary Curator, provided the funding for work chairs that completed the room's physical transformation, and also for a high-resolution imaging system to enable advanced specimen digitization. The new equipment and renovated workspace now provide welcoming open areas and increased capability for curatorial and research purposes.

The most critical components of the project have been accomplished. However, curating a world-class ant collection will always be a work in progress as new species are discovered and accessioned into the collection.

A New, Powerful Three-Dimensional Research Tool

Over the past few decades, micro-CT scanners have become increasingly valuable for gathering detailed specimen data in a non-invasive manner. By combining this data with 3-D modeling techniques, researchers are able to visualize the skeletal structure and understand the functioning of creatures both modern and ancient.

In September 2012, the MCZ's new micro-CT scanner was installed in the Digital Imaging Facility in the MCZ Labs Building. Micro-CT is the standard technology for imaging and characterizing internal structures in three dimensions, giving researchers a powerful tool for answering a wide variety of questions in ways they might not have imagined previously.

The micro-CT scanner produces a large number of X-ray images as the sample rotates 180°. These images are processed by proprietary software to create a digital 3-D reconstruction of the sample, which can then be analyzed and characterized in a variety of useful ways.

Researchers will be able to analyze and characterize skeletal and other aspects of internal morphology easily, consistently and non-destructively. For MCZ specimens, the data can be represented in MCZbase, the Museum-wide database, so that users can view and manipulate it in their Web browsers. The full data sets will also be available to share with outside researchers and collaborators.

Emma Sherratt

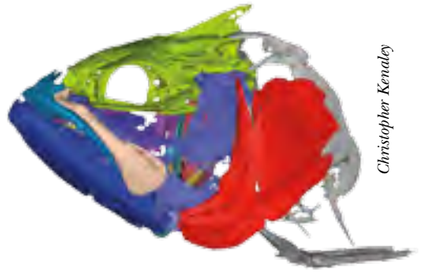
A mummified bird scanned by Emma Sherratt, postdoctoral fellow in the Losos lab, and Adam Aja, Assistant Curator of Collections at the Semitic Museum

Christopher Kenaley, postdoctoral fellow in the Lauder lab, explains the use of the technology in his research.

"I've been working on both biorobotics and biomechanics projects that use data from the micro-CT," says Kenaley. "The biorobotics work uses 3-D models of real fish to construct robotic fish heads that represent the complexity of the skeletal structure.

"The biomechanics work employs 3-D models to establish how feeding and fin morphology vary between species and how this variation has affected diversification."

Bass fish have been scanned for the robotics work, dragonfishes for the feeding work and remoras for the fin work. Most of the scanned specimens are from the MCZ ichthyology collection.

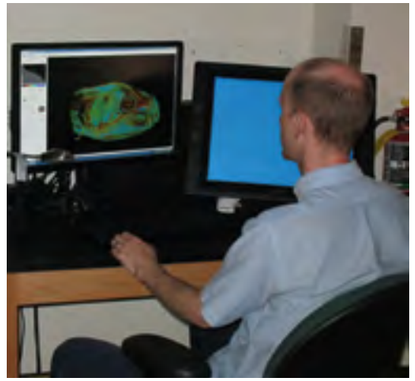


Christopher Kenaley

3-D model of a bass fish

The micro-CT scanner permits researchers to look at a whole animal in three dimensions. "The most important difference for me is that, with a single scan, we can measure any part of the anatomy in any plane, something that can't be done with X-ray data," says Kenaley.

He and **George V. Lauder** will be using 3-D models and a 3-D printer to replicate anatomical parts that can be included in robotic systems to assess how those parts perform in real fishes.



Catherine Weisel

The technology can also be used to produce complex mathematical models of how skeletal properties affect the way bones perform.

MCZ Research Making Headlines

Unearthing the Genetic Homes of Burrowing Behavior

Relative to physical traits, very little is known about how genetics influence development of complex behaviors in nature. When animals build structures, whether beehives, birds nests or burrows, they seem to be guided by behaviors that are more innate than learned.

A team of researchers led by **Hopi E. Hoekstra** studied two species of mice and identified four regions in their genome that appear to influence the style of burrows they build. Their findings were published in *Nature*.

The subjects of the study were oldfield mice (*Peromyscus polionotus*) and the closely related deer mice (*Peromyscus maniculatus*). Each species creates their homes in a distinctive style: oldfield mice burrows are complex, with a long entrance tunnel leading to the nest and a separate escape tunnel that ends slightly below the surface; deer mice burrows are smaller, with simple, single-tunnel structures. Both species will consistently dig shelters of the same design and tunnel length, regardless of soil composition, whether in the wild or in the lab.

When the species were crossbred, the next generation opted for the more elaborate burrow of the oldfield mice. But when these hybrid offspring were bred with deer mice, the subsequent generation's burrows were a combination of the two styles. By matching genetic variations among the mice with their tunnel styles, the researchers found three regions of the genome that determine tunnel length and one that is related to the inclusion of an escape tunnel. The next steps will be to identify the specific genes involved and how changes in those genes affect burrowing behavior.

The paper, featured in *The New York Times*, was authored by Prof. Hoekstra; **Jesse Weber**, former graduate student in the Hoekstra lab; and **Brant Peterson**, postdoctoral fellow in the Hoekstra lab.

Weber JN, Peterson BK, Hoekstra HE (2013) Discrete genetic modules are responsible for complex burrow evolution in *Peromyscus* mice. *Nature* 493:402-406.

Liz Pennisi

Measuring burrows

JB Miller

Looking for Lizards in Colombia

After focusing on the anole species of the Caribbean islands for most of his career, **Jonathan B. Losos** is on a quest to study the mainland anoles of Central and South America.

There are more anole species on the mainland (250 species) than in the islands (150 species), but less is known about them. As part of an effort to rectify this imbalance, the field team—Prof. Losos; **Rosario Castañeda**, a postdoctoral fellow in the Losos lab; and Anthony Herrel, an MCZ Associate based at the Muséum National d'Histoire Naturelle Paris—spent three weeks in Colombia and Venezuela in the spring of 2013. Biology students from the Universidad de Los Andes and elsewhere joined the team to assist in data collection and receive training in field methods.

The expedition is part of ongoing research that so far has compiled behavioral, ecological and morphological data on anole species in Costa Rica, Ecuador, Honduras, Mexico and Panama. In three very different locations and climates, the team used field observations, videotaping and lab work to document the lizards' habitat, diet, behavior, locomotion and biomechanical capabilities such as speed and bite strength.

The researchers are investigating whether the mainland anoles have, in fact, followed the same developmental path as the island anoles, or whether they have evolved in a different manner, and if so, why.

An MCZ Putnam Expedition Grant supported the fieldwork, and Prof. Losos blogged about their experiences and findings for *The New York Times* **Scientist at Work series**.

Jonathan Losos

Jonathan B. Losos

Jonathan Losos

Vegetarian Flies Fond of Mustards

Andrew Berry

Fred Ausubel and Naomi Pierce

Noah Whiteman

Half of the world's insect species feed on plants. Considering their agricultural importance, we still know relatively little about the genetic mechanisms underlying plant–insect interactions.

In a long-term collaboration, **Naomi Pierce** and Frederick Ausubel (Department of Genetics, Harvard Medical School) have used experimental infections of the plant genetic model *Arabidopsis thaliana* with the genetically characterized pathogen *Pseudomonas syringae* to dissect defense-signaling pathways and virulence factors involved in plant–pathogen interactions. By adding to this system a generalist herbivore, the cabbage looper *Trichoplusia ni*, they discovered complex three-way interactions involving pathogen virulence, host resistance and susceptibility to attack by pathogens and herbivores.

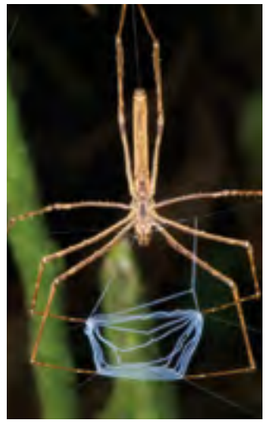
In their most recent paper, published as a cover story in *Genome Biology Evolution* with postdoctoral fellow Noah Whiteman (now at the University of Arizona) as first author, they extend this research by genetically characterizing *Scaptomyza flava*, a drosophilid fly whose leaf-mining larvae specialize on plants in the Brassicaceae—the mustard family—which includes vegetables such as broccoli, cabbage and cauliflower, as well as *Arabidopsis*. They show that this genetically tractable system can be used to investigate pathways underlying plant–insect interactions.

When fed upon, *Arabidopsis* generates increased amounts of defense compounds called glucosinolates. However, these toxins do not deter *S. flava*. Although the glucosinolates of *Arabidopsis* still adversely affect larval development—indicating that the flies are not entirely immune to the plants' defenses—these specialists are able to detoxify them and thrive on the plants. The expression of a number of stress-related genes in the flies suggest that these genes may play a role in the detoxification process.

Insects cause major damage to crop plants around the world, and in addition to learning about the evolution of herbivory, a better understanding of mechanisms underlying plant–insect interactions will facilitate development of novel insecticides and plant breeding strategies.

Whiteman NK, Gloss AD, Sackton T, Groen S, Humphrey PT, Lapoint R, Sønderby I, Halkier BA, Kocks C, Ausubel FM, Pierce NE (2012) Genes involved in the evolution of herbivory by a leaf-mining drosophilid fly. *Genome Biol Evol* 4:788-804.

What a Complex Web They Weave



Gonzalo Giribet

When visualizing a spider web, it is most likely the wheel-like shape of the orb weavers. With more than 12,000 known species, orb weavers make up about 30% of spider diversity.

Understanding the timing and mode of orb web evolution has been hampered by the relatively small size of the samples in previous genetic studies. To address this significant research hurdle, **Gonzalo Giribet** and colleagues compiled a massive dataset that surpasses the size of all prior molecular studies of spider phylogeny.

The resulting research genetically confirmed the hypothesis that orb weavers descended from a single ancestor, but found that ancestor emerged around 207 to 231 million years ago, earlier than suggested by the fossil record.

The results also showed that the history of web diversification is probably much more complex than previously thought. Rather than the web architecture evolving in response to the diversification of prey, the researchers propose that variety in web design was most likely a response to abundant prey and increasingly complex habitat, allowing the spiders to build webs in different types of spaces and therefore decrease competition among spider species. The findings were published in *Proceedings of the Royal Society B.*

Gonzalo Giribet

Dimitrov D, Lopardo L, Giribet G, Arnedo MA, Álvarez-Padilla F & Hormiga G (2012) Tangled in a sparse spider web: single origin of orb weavers and their spinning work unravelled by denser taxonomic sampling. *P Roy Soc B* 279:1341-1350.

Projects & Initiatives

Encyclopedia of Life Learning + Education Group

The Encyclopedia of Life is a global effort to bring together species information in a free, trusted online resource available at **eol.org**. Content on EOL is provided by hundreds of partners, including MCZbase.

The **EOL Learning + Education Group** encourages the development of innovative and effective uses of EOL content in educational settings. One way of achieving this goal is to partner with model projects that inform and inspire, thereby providing concrete examples that can be modified to suit various educational needs.

Contributing to Lifelong Learning

EOL is used in formal and informal education settings, both as a trusted resource and for its tools to organize information around particular areas of interest and allow for directed and open-ended learning activities.

- EOL has developed resources like the *One Species at a Time* podcast series, *Biodiversity on the Move* Google Earth Tours and an EOL page on **iTunesU**. The *One Species at a Time* podcasts at **education.eol.org/podcast** are organized by scientific topic and skill.
- The Center for Essential Science at the University of Michigan and others are testing the *Changethinking* curriculum about the impact of climate change on North American species. The EOL **Ecosystem Explorer Tool**, which provides an easy way to create engaging graphs of species interactions within an ecosystem, is integrated into this study.
- EOL Learning + Education Group, in conjunction with the Professor Garfield Foundation and New York State Teacher Centers, invites students from grades 6 to 8 to participate in a science-based comic contest about invasive species through investigation of **eol.org**.
- *Families by the Seaside: Building Community-Based Outdoor Ocean Science Learning Experiences* uses EOL field guides, observation capabilities and games to improve ocean literacy. The program, run by five New England marine science centers on a NOAA grant, engages underserved families in marine exploration and learning through hands-on and technology-assisted activities.

In Support of Citizen Science

One of EOL's goals is to transform how people participate in biodiversity science, increasing public involvement, maximizing effectiveness and accelerating innovation. In June 2012, EOL and **iNaturalist** debuted an app for Android and iOS operating systems that enables EOL community members to more easily contribute to the growing record of life around us. Citizen scientists can now key their observations directly into their phones, and those observations are then displayed on a map within EOL Collections.

JumpStart Youth Connection

Serving America's National Parks

EOL has partnered with the U.S. National Park Service in 24-hour species inventories called BioBlitzes, conducted to learn more about the biodiversity, distribution and abundance of species in a specific area. Participating in a BioBlitz lets anyone get involved with nature, increasing awareness and understanding of the environment. People can even conduct their own BioBlitz using the tools and tips on the EOL Learning + Education website, **eol.org/discover**.

Encyclopedia of Life

New Alliance Promotes Digitization of Nation's Biocollections

Adam Baldinger

Some of the most valuable resources available to science are contained within our nation's 1,600-plus biological collections. Representing an estimated one billion specimens, these collections are vitally important to the various research, educational and technological pursuits of biologists and non-biologists alike.

As species discovery, documentation and analysis continues to grow, it has become increasingly imperative to improve access to both existing and future collections while also reducing their risk of loss. At a February 2010 workshop held at the National Evolutionary Synthesis Center in Durham, North Carolina, various members of the biocollections community created a strategic plan to do just that. They established the *Network Integrated Biocollections Alliance*, a coordinated, large-scale, sustained effort to digitize the biocollections held within our nation's natural history museums, university science departments and other repositories, and integrate them into an online database. In September 2012, the American Institute of Biological Sciences, with support from the National Science Foundation, held a workshop to put this strategy into action.

The resulting plan of implementation, authored in part by MCZ Director **James Hanken** and Director of Collections Operations **Linda S. Ford**, outlines the key steps, milestones and stakeholders required to build NIBA over the next ten years. Once it is operational, NIBA's biocollections database will be extremely helpful in coping with consequences of climate change, invasive species, pollution and other major environmental problems.

Once its organizational and governance structure has been achieved, NIBA will provide national leadership to implement a digitized biocollections network and sustainable knowledge database. In addition, the alliance will identify key stakeholders as potential members, lead efforts to train existing and future collections staff, and encourage specimen-based learning and exploration in both formal and informal education.

MCZ Opens Collections to Undergraduates in AIM-UP! Initiative

Jeremiah Trimble

Universities throughout the country hold a wealth of information about life on Earth in their natural history museums. For the most part, these collections have only been made available to practicing researchers. Now, a five-year initiative (May 2010 to April 2015) funded by the National Science Foundation called *Advancing Integration of Museums into Undergraduate Programs (AIM-UP!)* is incorporating the collections housed at Harvard and other participating universities into undergraduate instruction.

Each year under the initiative, a different institution takes the lead in presenting a class that highlights the importance of their museum's collection and its potential in undergraduate classes. Classes feature guest lecturers and are made available via videoconferencing to students at each participating university. For the spring 2013 semester, **Scott V. Edwards** led a class that explored the ways in which museum collections and online museum databases can enhance modern studies of genomic and geographic variation.

Additionally, MCZ hosted AIM-UP!'s annual workshop in April 2013, with more than a dozen representatives of the participating institutions in attendance.

While AIM-UP! began as a collaboration among the University of Alaska, Harvard University, the University of California at Berkeley and the University of New Mexico as a way to integrate expertise and data across these institutions, it is expanding to other universities, federal agencies and educators in other countries such as Canada and Uruguay.

In addition to training undergraduates in museum-based field and laboratory research, AIM-UP! also seeks to develop instructional tools for museum databases, increase digitization of collections for easier access, integrate specimen-based questions and lessons into the classroom, conduct outreach to underrepresented students, and include more minority and female scientists, agency biologists, academics, international participants and museums with large public audiences.

Ernst Mayr Library Collaborates on *Bioluminescence* Exhibition

From glowworms that emit sticky threads of light to fireflies that bob through the air on summer evenings, a variety of species have evolved the ability to generate light. But why? From February to June 2013, a unique exhibition in the MCZ's Northwest Building lobby provided illuminating answers to that question and more.

Bioluminescence was part of a successful proposal to integrate Library information and faculty research. The project was steered by **Dorothy Barr** of the Ernst Mayr Library and funded by the Harvard Library Lab, which offers infrastructure and financial support to librarians, faculty and students promoting library-related projects. *Bioluminescence* was a collaborative effort of the Ernst Mayr Library, MCZ staff, and faculty in the departments of Organismic and Evolutionary Biology and Molecular & Cellular Biology. The exhibit highlighted the mechanisms, functions and purposes behind dozens of species' ability to emit light. The book that inspired the exhibition—*Bioluminescence: Living Lights, Lights for Living*—was written by J. Woodland "Woody" Hastings, faculty member in MCB, and Therese Wilson, an MCB Senior Research Associate Emerita.

Christopher Kenaley

Work by **Chris Kenaley** of the Lauder lab and a variety of specimens from the MCZ's vast collection were on display, including fireflies, which use their abilities in part to attract mates, deep-sea fishes that use glowing lures to capture prey, and jellyfish, from which green fluorescent protein (GFP)—widely used in molecular and cellular biology—was first isolated.

The MCZ members who contributed to the exhibit included **Karsten Hartel**, Chris Kenaley and **Andrew Williston** of Ichthyology; **Adam Baldinger** and **Gonzalo Giribet** of Invertebrate Zoology; **Murat Recevik** of Malacology; **Phil Perkins** and **Rachel Hawkins** of Entomology; and **Victoria Wilke** of Collections Operations. Dorothy Barr developed the exhibition's companion webguide.

Ernst Mayr Library Helps Launch BHL-Africa

Two years ago during a Biodiversity Heritage Library Conference in Chicago, Illinois, the idea to create **BHL-Africa** was born. On April 15, 2013, BHL-Africa was officially launched as a part of the library's global family. **The Ernst Mayr Library contributed content from the South African National Biodiversity Institute to kick off BHL-Africa.**

The South African National Biodiversity Institute (SANBI)in Pretoria, South Africa, hosted the launch and three-day workshop, which included presentations by six colleagues from BHL-US/UK programs. **Connie Rinaldo**, the Librarian of the MCZ's Ernst Mayr Library, is Vice Chair of the Executive Steering Committee for the Biodiversity Heritage Library, of which the Ernst Mayr Library is a founding member. She contributed a presentation on copyright, defining public domain, open access and the Creative Commons licenses employed by BHL-US/UK.

A consortium of major natural history museum libraries, botanical libraries and research institutions around the world, the Biodiversity Heritage Library is an online resource featuring more than 42 million pages of biodiversity literature collected to support the work of scientists, researchers and students in their home institutions and throughout the world. Working with the international taxonomic community, rights holders and other interested parties, BHL ensures that this biodiversity heritage is made available to a global audience through open access principles.

The BHL-Africa group at the Pretoria National Botanical Garden

The Africa consortium is now hard at work identifying content for scanning both within and outside of Africa, digitizing that content and building an audience by promoting the project throughout the continent. It is also identifying potential contributors and encouraging them to sign a memorandum of understanding as part of their commitment to provide open access to the biodiversity literature found within African libraries and institutions.

The New Public Face of Harvard's Museums

When many hundreds of people gathered together for the Harvard Museums of Science & Culture's summer solstice celebration, it was more than just a party. It was a celebration of the success of the year-old consortium's first major public outreach initiative.

Rose Lincoln

Jane Pickering

The Harvard Museums of Science & Culture is a partnership created to strengthen, support and promote the six world-class museums that exist within the Faculty of Arts and Sciences. The HMSC officially debuted in July 2012, drawing upon the very successful model of the Harvard Museum of Natural History, the umbrella institution for the public initiatives of the Museum of Comparative Zoology, the Mineralogical and Geological Museum and the Harvard University Herbaria.

The faculty executive board that directed the creation of HMSC was made up of the faculty directors of each participating museum, including MCZ Director **James Hanken**. Professor **James McCarthy**, former Director of the MCZ, served as the board's initial chair.

Participating museums include the MCZ, the Mineralogical and Geological Museum, the Harvard University Herbaria, the Collection of Historical Scientific Instruments, the Harvard Semitic Museum and the Peabody Museum of Archaeology & Ethnology. The Harvard Museum of Natural History is also a member of the partnership. Together, these diverse organizations will collaborate on public outreach initiatives designed to promote greater understanding through a multidisciplinary approach, while retaining strong connections to their respective academic departments, research, collections and modes of scholarship.

In December 2012 Jane Pickering was appointed Executive Director of the HMSC. As the former Director of Public Programs and Deputy Director at Yale's Peabody Museum of Natural History, she brings nearly 25 years of curatorial and public programming experience to the HMSC. She is responsible for collaborating with faculty leaders of each museum and other stakeholders to develop the public-facing functions of the museums, including exhibits, education, special programs, development, and administration and operations.

Since the HMSC's establishment, a record 240,000 visitors have come to visit the museums, participate in their programs and listen to free evening lectures. The museums also hold classes for grades K–12 and have a wealth of instructional resources for teachers as well as for Harvard faculty and students. For a full list of exhibitions, lectures and other events, visit the HMSC website at hmsc.harvard.edu.

A Gift for the New Marine Life Gallery

MCZ Faculty member George Putnam III and his wife, Kathy, have made a very generous donation to the Harvard Museums of Science & Culture that will go toward the creation of a new gallery of marine life in the Harvard Museum of Natural History. The exhibit will feature the diverse collections of the MCZ, a full-scale immersive diorama of New England marine communities, historical displays and interactive multimedia that offer real-time experiences exploring the latest findings of Harvard-based research on ocean life. The work will also include a complete renovation and redesign of the gallery space that currently includes the *Fishes* exhibition and Asia display. The new exhibit will open in May 2015 in time for the next commencement.

• **Aktipis SW, Giribet G** (2012) Testing relationships among the vetigastropod taxa: A molecular approach. *J Mollusc Stud* 78:12-27

• Alben S, Witt C, Baker TV, Anderson EJ, **Lauder GV** (2012) Dynamics of freely swimming flexible foils. *Phys Fluids* 24:051901

• Anderson C, Liu L, Pearl D, **Edwards SV** (2012) Tangled trees: The challenge of inferring species trees from coalescent and non-coalescent genes. In *Evolutionary Genomics: Statistical and Computational Methods, vol. 2* (Anisimova M, ed) 3-28 Springer (Humana): New York

• **Andrade SCS,** Strand M, Schwartz M, Chen H, Kajihara H, von Döhren J, Sun S, Junoy J, Thiel M, Norenburg JL, Turbeville JM, **Giribet G**, Sundberg P (2012) Disentangling ribbon worm relationships: multi-locus analysis supports traditional classification of the phylum Nemertea. *Cladistics* 28:141-159

• Ardila NE, **Giribet G**, Sánchez JA (2012) A time-calibrated molecular phylogeny of the precious corals: reconciling discrepancies in the taxonomic classification and insights into their evolutionary history. *BMC Evol Biol* 12:246

• Basset Y, **Eastwood R**, Sam L, Lohman DJ, Novotny V, Treuer T, Miller SE, Weiblen GD, **Pierce NE**, Bunyavejchewin S, Sakchoowong W, Kongnoo P, Osorio-Arenas MA (2012) Cross-continental comparisons of butterfly assemblages in tropical rainforests: implications for biological monitoring. *Insect Conserv Diver* 6:223-233

• Berg Robertson AM, **Biewener AA** (2012) Take-off and landing flight muscle function in the pigeon (*Columba livia*). *J Exp Biol* 215:4104-4114

• **Blevins E, Lauder GV** (2012) Rajiform locomotion: three-dimensional kinematics of the pectoral fin surface during swimming by the freshwater stingray *Potamotrygon orbignyi*. *J Exp Biol* 215:3231-3241

• Bonneaud C, Balenger SL, Zhang J, **Edwards SV**, Hill GE (2012) Innate immunity and the evolution of resistance to an emerging infectious disease in a wild bird. *Mol Ecol* 21:2628-2639

• Borazjani I, Sotiropoulos F, Tytell ED, **Lauder GV** (2012) On the hydrodynamics of the bluegill sunfish c-start escape response: three-dimensional simulations and comparison with experimental data. *J Exp Biol* 215:671-684

• Britz R, **Hartel KE** (2012) On the synonymy of *Caristius groenlandicus* Jensen and *Pteraclis fasciatus* Borodin (Pisces: Caristiidae). *Zootaxa* 3546:85-88

• **Campbell-Staton SC**, Goodman RM, **Backström N, Edwards SV, Losos JB, Kolbe JJ** (2012) Out of Florida: mtDNA reveals patterns of migration and Pleistocene range expansion of the green anole lizard (*Anolis carolinensis*). *Ecol Evol* 2:2274-2284

• Chadwell BA, Standen EM, **Lauder GV**, Ashley-Ross MA (2012) Median fin function during the escape response of bluegill sunfish (*Lepomis macrochirus*). I: Fin-ray orientation and movement. *J Exp Biol* 215:2869-2880

• Chadwell BA, Standen EM, **Lauder GV**, Ashley-Ross MA, (2012) Median fin function during the escape response of bluegill sunfish (*Lepomis macrochirus*). II: Fin-ray curvature. *J Exp Biol* 215:2881-2890

• **Clouse RM, Giribet G** (2012) On the Cyphophthalmi (Arachnida, Opiliones) types from the Museo Civico di Storia Naturale "Giacomo Doria." *Bull of the MCZ* 160:241-257

• **Danos N, Lauder GV** (2012) Challenging zebrafish escape responses by increasing water viscosity. *J Exp Biol* 215:1854-1862

• de Bivort BL, **Clouse RM, Giribet G** (2012) A cladistic reconstruction of the ancestral mite harvestman (Arachnida, Opiliones, Cyphophthalmi): portrait of a Paleozoic detritivore. *Cladistics* 28:582-597

• Delaney NF, Balenger S, Bonneaud C, Marx CJ, Hill GE, Ferguson-Noel N, Tsai P, Rodrigo A, **Edwards SV** (2012) Ultrafast evolution and loss of CRISPRs following a host shift in a novel wildlife pathogen, *Mycoplasma gallisepticum*. *PLoS Genetics* 8:e1002511

• Dimitrov D, Lopardo L, **Giribet G**, Arnedo MA, Álvarez-Padilla F, Hormiga G (2012) Tangled in a sparse spider web: single origin of orb weavers and their spinning work unravelled by denser taxonomic sampling. *Proc R Soc B* 279:1341-1350

• **Domingues VS, Poh Y-P, Peterson BK**, Pfennigs P, Jensen J, **Hoekstra HE** (2012) Evidence of adaptation from ancestral variation in young populations of beach mice. *Evolution* 66:3209-3223

• Dou L, Cao G, **Morris PJ**, Morris RA, Ludäscher B, Macklin JA, **Hanken J** (2012) *Kurator*: A Kepler package for data curation workflows. International Conference on Computational Science, ICCS 2012. *Procedia Comp Sci* 9:1614-1619

• Eckalbar WL, Lasku E, **Infante CR**, Elsey RM, Markov GJ, Allen AN, Corneveaux JJ, **Losos JB**, DeNardo DF, Huentelman MJ, Wilson-Rawls J, Rawls A, Kusumi K (2012) Somitogenesis in the anole lizard and alligator reveals evolutionary convergence and divergence in the amniote segmentation clock. *Dev Biol* 363:308-319

• Edgecombe GD, **Vahtera V**, Stock SR, Kallonen A, Xiao X, Rack A, **Giribet G** (2012) A scolopocryptopid centipede (Chilopoda: Scolopendromorpha) from Mexican amber: synchrotron microtomography and phylogenetic placement using a combined morphological and molecular data set. *Zool J Linn Soc-Lond* 166:768-786

• **Edwards SV** (2012). Afterward [on genetics and the evolutionary history of avian brood parasitism, a response to chapter by Langmore and Spottiswoode]. In *Host Manipulation By Parasites* (Hughes DP, Brodeur J, Thomas F, eds) 116-118. Oxford University Press: New York

• **Edwards SV**, Cameron Devitt S, **Fujita M** (2012) Phylogeography In *Encyclopedia of Theoretical Ecology* (Hastings A, Gross L, eds) 557-565. University of California Press: Berkeley

• Esposito CJ, Tangorra JL, **Flammang BE, Lauder GV** (2012) A robotic fish caudal fin: effects of stiffness and motor program on locomotor performance. *J Exp Biol* 215:56-67

• Frederickson ME, Ravenscraft A, **Miller GA**, Arcila Hernández LM, Booth G, **Pierce NE** (2012) The direct and ecological costs of an ant-plant symbiosis. *Amer Nat* 179:768-778

• **Giribet G** (2012) Espiralados. In *El árbol de la vida: sistemática y evolución de los seres vivos* (Vargas P, Zardoya R, eds) 202-209. P. Vargas Gómez: Madrid

• **Giribet G** (2012) Protóstomos. In *El árbol de la vida: sistemática y evolución de los seres vivos* (Vargas P, Zardoya R, eds) 196-201. P. Vargas Gómez: Madrid

• **Giribet G**, Edgecombe GD (2012) Reevaluating the Arthropod Tree of Life. *Annu Rev Entomol* 57:167-186

• **Giribet G, Sharma PP,** Benavides LR, Boyer SL, **Clouse RM**, de Bivort BL, Dimitrov D, **Kawauchi GY, Murienne JY**, Schwendinger PJ (2012) Evolutionary and biogeographical history of an ancient and global group of arachnids (Arachnida: Opiliones: Cyphophthalmi) with a new taxonomic arrangement. *Biol J Linn Soc* 105:92-130

• **Giribet G**, Tourinho AL, Shih C, Ren D (2012) An exquisitely preserved harvestman (Arthropoda, Arachnida, Opiliones) from

For the cover story of *Science,* **Jason Kolbe, Jonathan Losos** and colleagues published "Founder effects persist despite adaptive differentiation: a field experiment with lizards."

Jason Kolbe, Jonathan Losos and colleagues contributed the cover story "Climatic niche shift predicts thermal trait response in one but not both introductions of the Puerto Rican lizard *Anolis cristatellus* to Miami, Florida, USA" to *Ecology and Evolution.*

"Passive robotic models of propulsion by the bodies and caudal fins of fish" by **George V. Lauder, Brooke Flammang** and colleagues was the cover story in *Integrative & Comparative Biology*.

Thom Sanger, Jonathan B. Losos and colleagues contributed "Repeated modification of early limb morphogenesis programmes underlies the convergence of relative limb length in *Anolis* lizards" as the cover story of *Proceedings of the Royal Society B.*

Talia Moore and colleagues at the University of California, Berkeley, contributed the cover story **"**Tail assisted pitch control in lizards, robots and dinosaurs" to *Nature*.

the Middle Jurassic of China. *Org Divers Evol* 12:51-56

• **González VL, Giribet G** (2012) A new cryptic species of carditid bivalve from the Gulf of California (Mollusca, Bivalvia, Archiheterodonta, Carditidae). *Malacologia* 55:235-250

• **Goodbody-Gringley F, Woollacott RM, Giribet G** (2012) Phylogeography and connectivity of the scleractinean coral *Montastraea cavernosa* (Linneaus, 1767) in the Western Atlantic. *Mar Ecol* 33:32-48

• **Goodbody-Gringley G, Woollacott RM, Giribet G** (2012) Population structure and connectivity in the Atlantic scleractinian coral *Montastraea cavernosa* (Linnaeus, 1767). *Mar Ecol* 33:32-48

• Guil N, **Giribet G** (2012) A comprehensive molecular phylogeny of tardigrades—adding genes and taxa to a poorly resolved phylum-level phylogeny. *Cladistics* 28:21-49

• Guil N, **Giribet G** (2012) Ecdisozoos. In *El árbol de la vida: sistemática y evolución de los seres vivos* (Vargas P, Zardoya R, eds) 232-239. P. Vargas Gómez: Madrid

• **Hoekstra HE** (2012) Genomics: Stickleback is the catch of the day. *Nature* 484:46-47

• **Johnson CH, Woollacott RM** (2012) Seasonal patterns of population structure in a colonial marine invertebrate (*Bugula stolonifera*, Bryozoa). *Biol Bull* 222:203-213

• **Johnson CH**, Winston JE, **Woollacott RM** (2012) Western Atlantic introduction and persistence of the marine bryozoan *Tricellaria inopinata*. *Aquat Invas* 7:295-303

• Kawauchi GY, **Sharma PP, Giribet G** (2012) Sipunculan phylogeny based on six genes, with a new classification and the descriptions of two new families. *Zool Scr* 41:186-210

• Kleinteich T, **Maddin HC**, Herzen J, Beckmann F, Summers AP (2012) Is solid always best? Cranial performance in solid and fenestrated caecilian skulls. *J Exp Biol* 215:833-844

• **Kolbe JJ**, Leal M, Schoener TW, Spiller DA, **Losos JB** (2012) Founder effects persist despite adaptive differentiation: a field experiment with lizards. *Science* 335:1086-1089

• **Kolbe JJ**, Vanmiddlesworth P, Losin N, Dappen N, **Losos JB** (2012) Climatic niche shift predicts thermal trait response in one but not both introductions of the Puerto Rican lizard *Anolis cristatellus* to Miami, Florida, USA. *Ecol Evol* 2:1503-1516

• **Kronauer DJC, Pierce NE**, Keller L (2012) Asexual reproduction in introduced and native populations of the ant *Cerapachys biroi*. *Mol Ecol* 21:5221-5235

• Kronforst MR, Barsh GS, Kopp A, Mallet J, Monteiro A, Mullen SP, Protas M, Rosenblum EB, Schneider CJ **Hoekstra HE** (2012) Unraveling the thread of nature's tapestry: the genetics of diversity and convergence in animal pigmentation. *Pigm Cell Melanoma R* 25:411-433

• **Küpper C**, Augustin J, **Edwards SV**, Székely T, Kosztolányi A, Burke T, **Janes DE** (2012) Triploid plover female provides support for a role of the W chromosome in avian sex determination. *Biol Lett* 8:787-789

• **Küpper C, Edwards SV**, Kosztolányi A, et al (2012) High gene flow over large geographic distances in a polyandrous shorebird. *Mol Ecol* 21:5864-5879

• **Lauder GV, Flammang B**, Alben S (2012) Passive robotic models of propulsion by the bodies and caudal fins of fish. *Integr Comp Biol* 52:576-587

• **Lee JY**, Joseph L, **Edwards SV** (2012) A species tree for the Australo-Papuan fairy-wrens and allies (Aves: Maluridae). *Syst Biol* 61:253-271

• Libby T, **Moore TY**, Chang-Siu E, Li D, Cohen D, Jusufi A, Full RJ (2012) Tail assisted pitch control in lizards, robots and dinosaurs. *Nature* 481:181-184

• Lopez-Darias M, Schoener TW, Spiller DA, **Losos JB** (2012) Predators determine how weather affects the spatial niche of lizard prey: exploring niche dynamics at a fine-scale. *Ecology* 93:2512-2518

• **Losos JB, Woolley ML, Mahler DL**, Torres-Carvajal O, Crandell KE, Schaad EW, Narváez AE, Ayala-Varela F, Herrel A (2012) Notes on the natural history of the little-known Ecuadorian horned anole, *Anolis proboscis*. *Breviora* 531:1-17

• **Maddin HC**, Anderson JS (2012) Anatomy of the inner ear of Gymnophiona, and its bearing on hypotheses of lissamphibian origins. *Fieldiana: Life & Earth Sciences* 5:59-76

• **Maddin HC, Jenkins FA**, Anderson JS (2012) The braincase of *Eocaecilia micropodia* and the origin of caecilians. *PLoS One* 7:e50743

• **Maddin HC**, Russell AP, Anderson JS (2012) Phylogenetic implications of the morphology of the braincase of caecilian amphibians. *Zool J Linn Soc-Lond* 166:160-201

• Maia A, Wilga C, **Lauder GV** (2012) Biomechanics of locomotion in sharks, rays and chimeras. In: *Biology of Sharks and Their Relatives, 2nd edition* (Carrier JC, Musick JA, Heithaus MR, eds) 125-151. CRC Press: Boca Raton, Florida

• McCarroll MN, **Lewis ZR**, Culbertson MD, Martin BL, Kimelman D, Nechiporuk AV (2012) Graded levels of Pax2a and Pax8 regulate cell differentiation during sensory placode formation. *Development* 139:2740-2750

• Miller J, Dikow T, Agosti D, Sautter G, Catapano T, Penev L, Zhang Z-Q, Pentcheff D, Pyle R, Blum S, Parr C, Freeland C, Garnett T, **Ford LS**, Muller B, Smith L, Strader G, Georgiev T, Bénichou L (2012) From taxonomic literature to cybertaxonomic content. *BMC Biology* 10:87

• **Novo M**, Alnodóvar A, Fernández R, Trigo D, Díaz-Cosín DJ, **Giribet G** (2012) Appearances can be deceptive: different diversification patterns within a group of Mediterranean earthworms (Oligochaeta, Hormogastridae). *Mol Ecol* 21:3776-3793

• **Novo M, Riesgo A,** Roldán C, **Giribet G**, Díaz Cosín DJ (2012) A place for nourishment or a slaughterhouse? Elucidating the role of spermathecae in the terrestrial annelid *Hormogaster elisae* (Clitellata: Opisthopora: Hormogastridae). *Zoomorphology* 131:171-184

• Oeffner J, **Lauder GV** (2012) The hydrodynamic function of shark skin and two biomimetic applications. *J Exp Biol* 215:785-795

• **Peterson BK, Weber JN, Kay EH, Fisher HS, Hoekstra HE** (2012) Double Digest RADseq: an inexpensive method for *de novo* SNP discovery and genotyping in model and non-model species. *PLoS One* 7:e37135

• **Rabeling C**, Verhaagh M, Garcia MVB (2012) Observations on the specialized predatory behavior of the pitchfork-mandibled ponerine ant *Thaumatomyrmex paludis* (Hymenoptera: Formicidae) *Breviora* 533:1-8

• Raposo do Amaral F, **Edwards SV**, Miyaki CY (2012) Eight anonymous nuclear loci for the squamate antbird (*Myrmeciza squamosa*), cross-amplifiable in other species of typical antbirds (Aves, Thamnophilidae). *Conserv Genet Resources* 4:645-647

• Reaney LT, Yee S, **Losos JB**, Whiting MJ (2012) Ecology of the flap-necked chameleon *Chamaeleo dilepis* in southern Africa. *Breviora* 532:1-18

• **Riehl C** (2012) Parental care and reproductive skew in a communally breeding cuckoo: hard-working males do not sire more young. *Anim Behav* 84:707-714

• **Riesgo A, Andrade SC, Sharma PP, Novo M, Pérez-Porro AR, Vahtera V, González VL, Kawauchi GY, Giribet G** (2012) Comparative description of ten transcriptomes of newly sequenced invertebrates and efficiency estimation of genomic sampling in non-model taxa. *Front Zool* 9:33

• **Riesgo A,** Díaz Cosín D, Roldán C, **Giribet G** (2012) Nursery or slaughterhouse? What is the role of the spermathecae wall of *Hormogaster elisae* (Annelida: Oligochaeta). *Zoomorphology* 131:171-184

• **Riesgo A, Pérez-Porro AR**, Carmona S, Leys SP, **Giribet G** (2012) Optimization of preservation and storage time of sponge tissue samples to obtain quality mRNA for Next-Generation Sequencing with Illumina platforms. *Mol Ecol Resour* 12:312-322

• Russell JA, Funaro CF, Giraldo YM, **Goldman-Huertas B**, Suh D, **Kronauer DJC**, Moreau CS, **Pierce NE** (2012) A veritable menagerie of heritable bacteria from ants, butterflies, and beyond: broad molecular surveys and a systematic review. *PLoS ONE* 7:e51027

• Rykken JJ, **Farrell BD** (2012) Discovering the wilderness in parks and protected areas. In *The Management of Insects in Recreation and Tourism* (Lemelin RH, ed) 306-322. Cambridge U Press: Cambridge, UK

• **Sanger TJ, Mahler DL**, Abzhanov A, **Losos JB** (2012) Roles for modularity and constraint in the evolution of cranial diversity among *Anolis* lizards. *Evolution* 66:1525-1542

• **Sanger TJ**, Revell LJ, Gibson-Brown JJ, **Losos JB** (2012) Repeated modification of early limb morphogenesis programmes underlies the convergence of relative limb length in *Anolis* lizards. *Proc R Soc London* 279:739-748

• **Sharma PP**, Buenavente PAC, Clouse RM, Diesmos AC, **Giribet G** (2012) Forgotten gods: Zalmoxidae of the Philippines and Borneo (Opiliones: Laniatores). *Zootaxa* 3280:29-55

• **Sharma PP, Giribet G** (2012) Out of the Neotropics: Late Cretaceous colonization of Australasia by American arthropods. *Proc R Soc B* 279:3501-3509

• **Sharma PP, González VL, Kawauchi GY, Andrade SCS, Guzmán A**, Collins TM, Glover EA, Harper EM, Healy JM, Mikkelsen PM, Taylor JD, Bieler R, **Giribet G** (2012) Phylogenetic analysis of four nuclear protein-encoding genes largely corroborates the traditional classification of Bivalvia (Mollusca). *Mol Phylogenet Evol* 65:64-74

• **Sharma PP**, Schwager EE, Extavour CG, **Giribet G** (2012) Evolution of the chelicera: a *dachshund* domain is retained in the deutocerebral appendage of Opiliones (Arthropoda, Chelicerata). *Evol Dev* 14:522-533

• **Sharma PP**, Schwager EE, Extavour CG, **Giribet G** (2012) Hox gene expression in the harvestman *Phalangium opilio* reveals divergent patterning of the chelicerate opisthosoma. *Evol Dev* 14:450-463

• Song S, Liu L, **Edwards SV, Wu S** (2012) Resolving conflict in eutherian mammal phylogeny using phylogenomics and the multispecies coalescent model. *Proc Natl Acad Sci USA* 109:14942-14947

• Šťáhlavský F, Boyer SL, Harvey MS, **Giribet G** (2012) First cytogenetic study of a member of the harvestman family Pettalidae (Opiliones: Cyphophthalmi). *Aust J Entomol* 51:299-302

• **Stuart YE, Losos JB, Algar AC** (2012) The island-mainland species turnover relationship. *Proc R Soc B* 279:4071-4077

• Talavera G, Lukhtanov VA, **Pierce NE**, Vila R (2012) Establishing criteria for higher-level classification using molecular data: the systematics of *Polyommatus* blue butterflies (Lepidoptera, Lycaenidae). *Cladistics* 29:166-192

• **Tong W, Hoekstra HE** (2012) *Mus spicilegus*. *Curr Biol* 20:858-859

• **Vahtera V**, Edgecombe GD, **Giribet G** (2012) Evolution of blindness in scolopendromorph centipedes (Chilopoda: Scolopendromorpha): insight from an expanded sampling of molecular data. *Cladistics* 28:4-20

• **Vahtera V**, Edgecombe GD, **Giribet G** (2012) Spiracle structure in scolopendromorph centipedes (Chilopoda: Scolopendromorpha) and its contribution to phylogenetics. *Zoomorphology* 131:225-248

• **Vélez S,** Mesibov R, **Giribet G** (2012) Biogeography in a continental island: population structure of the relict endemic centipede *Craterostigmus tasmanianus* (Chilopoda, Craterostigmomorpha) in Tasmania using 16S rRNA and COI. *J Hered* 103:80-91

• Wake DB, Rovito SM, Maisano JA, **Hanken J** (2012) Taxonomic status of the enigmatic salamander *Cryptotriton adelos* (Amphibia: Plethodontidae) from northern Oaxaca, Mexico, with observations on its skull and postcranial skeleton. *Zootaxa* 3579:67-70

• Wakeling JM, Lee S, **Arnold-Rife A, de Boef Miara M, Biewener AA** (2012) A muscle's force depends on the recruitment patterns of its fibres. *Ann Biomed Eng* 40:1708-1720

• Warrick D, Hedrick TL, Fernández MJ, Tobalske B, **Biewener AA** (2012) Hummingbird flight. *Curr Biol* 22:472-477

• Wheeler QD, Knapp S, Stevenson DW, Stevenson J, Blum SD, Boom BM, Borisy GG, Buizer JL, de Carvalho MR, Cibrian A, Donoghue MJ, Doyle V, Gerson EM, Graham CH, Graves P, Graves SJ, Guralnick RP, Hamilton AL, **Hanken J, Wilson EO**, et al (2012) Mapping the biosphere: Exploring species to understand the origin, organization, and sustainability of biodiversity. *Syst Biodivers* 10:1-20

• Whiteman NK, Gloss AD, Sackton TB, Groen SC, Humphrey PT, Lapoint RT, Sønderby IE, Halkier BA, Kocks C, Ausubel FM, **Pierce NE** (2012) Genes involved in the evolution of herbivory by a leaf-mining, drosophilid fly. *Genome Biol Evol* 4:900-916

• Wilga CD, Maia A, Nauwelaerts S, **Lauder GV** (2012) Prey handling using whole body fluid dynamics in batoids. *Zoology* 115:47-57

• **Wilson EO** (2012) *The Social Conquest of Earth*. Liveright Publishing Company of W.W. Norton & Company: New York

• **Wilson EO**, Harris A (2012) *Why We Are Here*. Liveright Publishing Company of W.W. Norton & Company: New York

• Worsaae K, Sterrer W, Kaul-Strehlow S, Hay-Schmidt A, **Giribet G** (2012) An anatomical description of a miniaturized acorn worm (Hemichordata, Enteropneusta) with asexual reproduction by paratomy. *PLoS ONE* 7:e48529

• **Wu S**, Wu W, Zhang F, Ye J, Ni X, Sun J, **Edwards SV**, Meng J, **Organ CL** (2012) Molecular and paleontological evidence for a post-Cretaceous origin of rodents. *PLoS ONE* 7:e46445

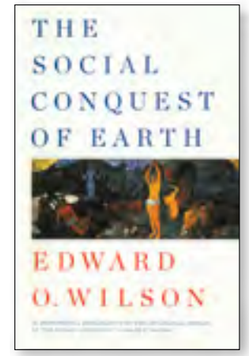
• **Wu Y**, Wang Y, **Hanken J** (2012) Comparative osteology of the genus *Pachytriton* (Caudata: Salamandridae) from southeastern China. *Asian Herpetol Res* 3:83-102

• **Wu Y**, Wang Y, **Hanken J** (2012) New species of *Pachytriton* (Caudata: Salamandridae) from the Nanling Mountain Range, southeastern China. *Zootaxa* 3388:1-16

• Zhang Q, **Edwards SV** (2012) The evolution of intron size in amniotes: a role for powered flight? *Genome Biol Evol* 4:1033-1043

• **Zimkus BM**, Lawson L, Loader SP, **Hanken J** (2012) Terrestrialization, miniaturization and rates of diversification in sub-Saharan frogs (Anura: Phrynobatrachidae). *PLoS ONE* 7:e35118

For the cover story of *Genome Biology and Evolution*, **Naomi Pierce** and colleagues published "Genes involved in the evolution of herbivory by a leaf-mining, drosophilid fly."



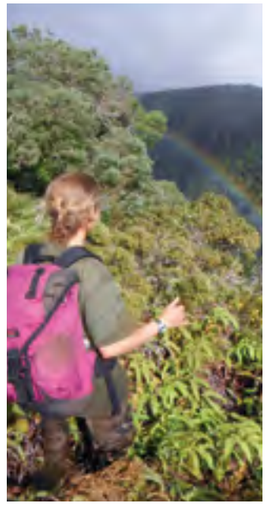
The Social Conquest of Earth is a new book by **Edward O. Wilson**.

As the cover story of *Asian Herpetological Research*, **Yunke Wu** and **James Hanken** published "Comparative osteology of the genus *Pachytriton* (Caudata: Salamandridae) from southeastern China."

MCZ Grant Recipients Academic Year 2012–2013

Grants-In-Aid of Undergraduate Research (GUR)

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



Darko Cartoras

Recipient	Faculty Sponsor/ Academic Dept.	Project Title	Amount
Saad Amer	Charles C. Davis/ Organismic and Evolutionary Biology	Ecology and evolution of the microsoroid ferns of French Polynesia	$2,032
Armaghan N. Behlum	Bence P. Olveczky/ Organismic and Evolutionary Biology	Calibrating the dosage of Muscimol necessary to temporarily suppress cortex	$2,300
Mia S. Bertalan	Lauren O'Connell/ Center for Systems Biology	Poison dart frog toxins as anti-microbial/ anti-fungal agents	$1,250
Emily A. Burke	Gonzalo Giribet/ Organismic and Evolutionary Biology	Phylogeny of Bdellouridae: genetic diversity and population structure of commensal flatworms	$2,500
Inanna L. Carter	Charles Davis/ Organismic and Evolutionary Biology	Insect herbivore community of Hawaiian lobeliads	$2,233
Alexander J. Cunha	Andrew Richardson/ Organismic and Evolutionary Biology	Marine nutrient flux in the Klamath River	$2,500
Tyler W. Gamble	Jonathan B. Losos/ Organismic and Evolutionary Biology	Structural microhabitat use in Utilan anoles (*Norops bicaorum, N. utilensis, N. sericeus*)	$2,500
Emily E. Groopman	Richard W. Wrangham/ Human Evolutionary Biology	Energetic consequences of food processing on lipid and protein-rich foods	$2,412
Fiona V. Jevon	J. William Munger/ School of Engineering and Applied Sciences & Andrew Richardson/ Organismic and Evolutionary Biology	Red maple decline at the Harvard Forest	$700

Emily Groopman

Inanna Carter

Szabolcs Safian

Didem Sarikaya

Recipient	Faculty Sponsor/ Academic Dept.	Project Title	Amount
Courtland A. Kelly	Charles C. Davis/ Organismic and Evolutionary Biology	Climate change and flowering time in New England	$2,500
Alexander M. Kim	Gonzalo Giribet/ Organismic and Evolutionary Biology	From the Gulf of Guinea to the bridge of the world: transoceanic dispersal and human-mediated invasion in a pantropical genus of freshwater prawns	$1,043
Sang Il Kim	Brian D. Farrell/ Organismic and Evolutionary Biology	A systematic review of the *Dorcus velutinus* species group (Coleoptera: Lucanidae) through an integrative taxonomic approach [Fall Cycle]	$1,260
Sang Il Kim	Brian D. Farrell/ Organismic and Evolutionary Biology	Undiscovered diversity in the stag beetle populations of the *Dorcus velutinus* species group (Lucanidae: Coleoptera) [Spring Cycle]	$1,645
Mai T. Le	Scott V. Edwards/ Organismic and Evolutionary Biology	The evolution of genetic pathogen (*Mycoplasma gallisepticum*) resistance in the North American house finch	$2,500
Sarah J. Scalia	Hopi E. Hoekstra/ Organismic and Evolutionary Biology	*In situ* hybridization to understand burrowing behavior of *Peromyscus*	$1,411
Alexandra Stote	George V. Lauder/ Organismic and Evolutionary Biology	Disc-suction performance of echeneid fishes	$2,500
Tristan W. Wang	Charles C. Davis/ Organismic and Evolutionary Biology	Physiology and distribution of filmy ferns of French Polynesia	$2,032
		Total Awards	**$33,318**

Kyle O'Connell

Alexander Kim

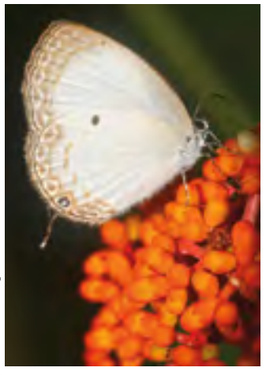
Robert G. Goelet Summer Research Awards

Goelet Awards support MCZ graduate student summer research projects. Funds support travel to field sites and related subsistence expenses incurred in pursuit of research objectives. These grants are made possible through a gift from Mr. Robert G. Goelet.

Recipient	MCZ Department	Project Title	Amount
Nicole L. Bedford	Mammalogy	The natural history of burrowing in the oldfield mouse, *Peromyscus polionotus*	$3,275
Zachary Lewis	Herpetology	Field collection of lungless salamander embryos	$1,625
		Total Awards	**$4,900**

Rowan Barrett

Rowan Barrett



Marianne Espeland

Andrey Frolov

Igor Khorozyan

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
Viktor Baranov	National Academy of Science, Ukraine	Underestimated groups of non-biting midges (Diptera, Chironomidae) in Bergen University Museum collection	$1,000
Brendan E. Boudinot	University of Utah	The male ants of Central America; keys to and diagnoses of the subfamilies and genera	$1,500
Adam J. Brunke	University of Copenhagen	A world revision of *Bolitogyrus* (Coleoptera: Staphylinidae: Staphylininae)	$1,500
Caroline Chaboo	University of Kansas	Systematics of leaf beetles (Coleoptera: Chrysomelidae): immature stages, fossils, faunistics, and genera revisions	$1,200
Elisandra A. Chiquito	Universidade de São Paulo, Brazil	The genus *Nectomys* Peters, 1860 (Cricetidae: Sigmodontinae): systematics and biogeography	$1,400
Susan M. Drymala	North Carolina State University	Taxonomic assessment of a new paracrocodylomorph (Archosauria, Suchia) from the Late Triassic of North Carolina	$1,500
Michael Elias	University of New South Wales	Systematics of *Orthotylini* (Insecta: Heteroptera: Miridae) of the southwest Pacific	$1,500
Georg Fischer	California Academy of Sciences	Taxonomy of *Pheidole* from Madagascar	$1,500
Andrey V. Frolov	Russian Academy of Sciences	Revision of Madagascar Orphninae	$1,450
Francisco Hita Garcia	California Academy of Sciences	Taxonomic revision of the myrmicine ant genus *Tetramorium* Mayr (Hymenoptera: Formicidae)	$740
Igor Khorozyan	Georg-August Universität Göttingen, Germany	Using computed tomography to study the skull of the holotype Anatolian leopard *Panthera pardus tulliana* (Valenciennes, 1865)	$1,200
Tomáš Lackner	Czech University of Life Sciences	Systematic revision of the genera of the Saprininae subfamily	$1,500
Francisco Tiago M. Melo	Federal University of Pará, Brazil	Revision of species in the genus *Diplectanum* Diesing, 1858	$1,500
Mark T. O'Shea	University of Wolverhampton, UK	The systematics and distribution of the endemic New Guinea forest snakes of the genus *Toxicocalamus* (Serpentes, Elapidae)	$1,500
Daniel N. Proud	University of Louisiana at Lafayette	Taxonomic work on Cosmetidae and other harvestmen (Opiliones) of Central America	$1,500
Jacob R. Saucier	University of Wyoming	Characterizing genetic and morphological variation in the *Cantorchilus modestus* complex	$1,500
Marianna V.P. Simões	University of Kansas, Lawrence	Systematics of tortoise beetle tribe Dorynotini Monrós & Viana, 1949 (Coleoptera, Chrysomelidae, Cassidinae)	$1,062
Theodore Sumnicht	University of Utah	Taxonomic revision of *Cerapachys*	$1,250
Carly M. Tribull	Richard Gilder Graduate School, American Museum of Natural History	Taxonomic revision of the subfamily Gonatopodinae (Hymenoptera: Dryinidae)	$1,500
		Total Awards	**$25,802**

Putnam Expedition Grants

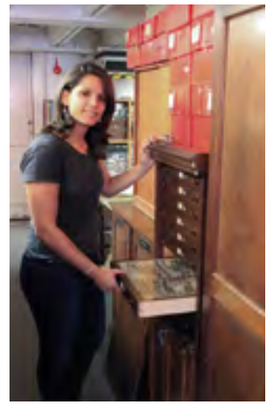
Putnam Expedition Grants are intended to support MCZ faculty-curators, postdoctoral fellows and graduate students in collecting specimens and data relating to the study of comparative zoology. Priority is given to projects that collect living specimens in regions where habitats are threatened or fossil specimens in regions most likely to hold important clues for unraveling evolutionary strategies. These grants are made possible by a gift from Mr. and Mrs. George Putnam, Jr., '49.

Recipient	MCZ Department	Project Title	Amount
Rowan D. H. Barrett	Mammalogy	Evolution in action in the Sand Hills of Nebraska	$11,080
Leonora S. Bittleston	Entomology	The insect communities of convergently evolved pitcher plants in Borneo	$7,140
Scott V. Edwards	Ornithology	Genetics and winter incidence of the pathogen *Mycoplasma gallisepticum* on house finches and other birds	$5,690
Marianne Espeland	Entomology	Phylogeny of the *Euchrysops* section (Polyommatinae): Biogeography and the evolution of feeding habits and wing coloration	$7,436
Rosa M. Fernández	Invertebrate Zoology	Exploring cryptic diversity in soil animals: a case study in earthworms and harvestmen	$10,385
Patrick S. Gorring	Entomology	Systematics and determinants of diversity in *Monochamus* (Coleoptera: Cerambycidae)	$4,120
Emily H. Kay	Mammalogy	Habitat and temporal isolation in two *Peromyscus* sister species	$6,557
Sarah Lemer	Invertebrate Zoology	Collecting bivalves of the family Pinnidae in the Philippines	$10,192
Jonathan B. Losos	Herpetology	Field studies of the evolutionary diversity of Colombian *Anolis* lizards	$9,710
Ricardo Mallarino	Mammalogy	The genetic and developmental basis of adaptive traits: coat color variation in *Peromyscus* of the Tularosa Basin, New Mexico	$5,842
Christina Pauline Riehl	Ornithology	Evolution of parasitic and cooperative strategies in a communally breeding cuckoo	$5,000
Bruno A. Souza de Medeiros	Entomology	Insect-host interactions and rates of evolution in a community of palm weevils	$4,750
		Total Awards	**$87,902**

Miyata Grants

The Ken Miyata Fund for Field Research Awards are intended to enable herpetological fieldwork by MCZ graduate students and postdoctoral fellows. Non-herpetological fieldwork may be eligible when there are no deserving herpetological projects. These grants are made possible by a gift from Dr. Barbara Jil Wu, Ph.D. '81 and Mr. Eric Larson, A.B. '77.

Recipient	MCZ Department	Project Title	Amount
Katherine E. Boronow	Herpetology	The impact of an intraguild predator, *Anolis equestris*, on prey behavior and evolution	$4,200
Ambika Kamath	Herpetology	Can anthropogenic change drive variation in mating systems in the South Asian agamid lizard *Sitana ponticeriana*?	$4,320
		Total Awards	**$8,520**



Marianna Simões

Theo Sumnicht

Francisco Hita Garcia

Ambika Kamath

Awards & Recognition

Mike Busada © National Geographic

Edward O. Wilson with paleontologist Louise Leakey

Emeritus

Edward O. Wilson was one of three recipients of the 2013 Hubbard Medal from the National Geographic Society. The medal, which recognizes distinction in exploration, discovery and research, is the Society's oldest and most prestigious award.

Faculty

Scott Edwards will serve a two-year term as the Director of the Division of Biological Infrastructure at the National Science Foundation. DBI empowers biological discovery by supporting the development and enhancement of biological resources, human capital and centers.

Gretchen Ertl

Hopi Hoekstra

Hopi Hoekstra has been selected as a Howard Hughes Medical Institute Investigator, beginning in the fall of 2013. The appointment provides the flexible support necessary to move an investigator's research in creative new directions. Prof. Hoekstra is also the recipient of the 2013 Estela Medrano Award from the Pan American Society for Pigment Cell Research, which recognizes a young scientist "that has made, or has the potential to make, transformative contributions that span traditional discipline boundaries relevant to pigment cell biology." In January, she was featured in *The New York Times* **"Profiles in Science."**

Staff

Stefan Cover, Curatorial Assistant in the entomology collection, and **Pedro Ramirez**, Research Assistant at the Concord Field Station, were each honored by Harvard for 25 years of service to the University.

Congratulations to **Alison Pirie**, Faculty & Collections Assistant in Mammalogy and Ornithology, on her retirement after nearly 38 years of service to the MCZ. We thank her for her unwavering positive attitude and dedication to the MCZ and wish her the best!

Marie Studer, EOL Learning + Education Director, and **Linda S. Ford**, Director of Collections Operations, were recognized with Impact Awards for their sustained, superior performance and exceptional effectiveness in the Faculty of Arts and Sciences.

Victoria Wilke

Linda Ford

Catherine Weisel, Museum Project Coordinator, received a Dean's Distinction Award, which recognizes outstanding citizenship and exceptional contributions in support of the Faculty of Arts and Sciences' mission.

Postdoctoral Fellows

Rowan Barrett was the recipient of the 2013 Theodosius Dobzhansky Prize in recognition of his accomplishments and future promise of an outstanding young evolutionary biologist. The award is given by the Society for the Study of Evolution.

Melissa Aja

Hillary Maddin

Hillary Maddin was awarded Canada's Banting Postdoctoral Fellowship. The fellowship provides funding to the very best postdoctoral applicants, both nationally and internationally, who will positively contribute to the country's economic, social and research-based growth.

Ian Wang received a 2013 Jasper Loftus-Hills Young Investigators' Award from the American Society of Naturalists. The award recognizes outstanding and promising work by investigators early in their postdoctoral career.

Graduate Students

Christopher Laumer

Shane Campbell-Staton received an NSF Doctoral Dissertation Improvement Grant for his project titled, "Temperature-dependent phylogeography and limits of thermal tolerance in *Anolis carolinensis*."

Emily Jacobs-Palmer won the Hamilton Prize for best student presentation at the 2013 Evolution Meetings for her work on the genetics of sperm morphology in deer mice.

Emily Kay was the recipient of the George W. Barlow Award from the Animal Behavior Society for the top-ranked research proposal to encourage excellence in graduate student research in the field of animal behavior.

Christopher Laumer received an NSF Doctoral Dissertation Improvement Grant for his project titled "Scalable phylogenomics at the species level: a novel target-gene approach to tracing the global diversification of prorhynchid flatworms (Platyhelminthes)."

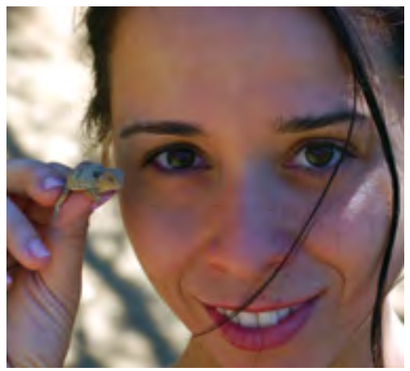
Zachary Lewis received the Sigma Xi Grant in Aid of Research for his proposal titled "The developmental genetic basis of lung loss in lungless salamanders." Lewis also claimed first prize in the campus photography competition *Glimpse into Life Science: Scientific Artwork by Harvard Graduate Students*, hosted by the Harvard Integrated Life Sciences.

Martha Muñoz is the recipient of a John Parker Merit Fellowship and a Graduate Student Council Conference Grant, both from Harvard. She also received a Broadening Participation Award from the Society for Integrative and Comparative Biology.

Yunke Wu received a postdoctoral fellowship from the United States Department of Agriculture. Wu will be continuing his research at Cornell University.

Kate Eldridge

Scott Edwards and Alison Pirie



Shea Lambert

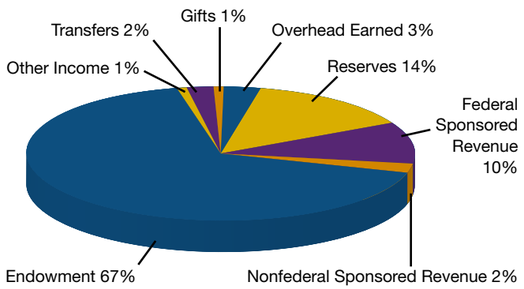
Martha Muñoz

Financial Data

These charts describe the income and expenses of the Museum of Comparative Zoology in fiscal year 2013.

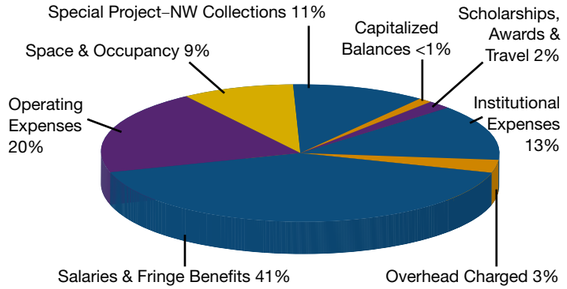
Endowment income funds much of the Museum's activities, including acquisition and maintenance of collections, most faculty and staff salaries, capital projects, facilities renovation and maintenance. Included in **Endowment** income is the annual distribution, revenue generated from assets purchased through endowments and endowed funds decapitalized per donor request. **Transfers** include Harvard University-funded faculty research, financial support for the Ernst Mayr Library and other Harvard-funded projects. **Other Income** comprises miscellaneous income from publication subscriptions, royalties, sales and fees, and other cost recovery from other MCZ-sponsored activities. **Reserves** represent the amount of carry-forward balances used to cover an operating deficit. **Overhead** is funding paid from MCZ-based sponsored projects to the MCZ to cover facilities and administrative costs for those projects. It is shown as both income (**Overhead Earned**) and expenses (**Overhead Charged**). **Special Project–NW Collections** includes deployment of collections to the newly constructed space in the Northwest Building. Building expenses such as maintenance, facility improvements and utilities are captured in the **Space & Occupancy** category. **Operating Expenses** consist of equipment purchases, supplies, consultant and conference fees, as well as annual subventions to the Department of Organismic and Evolutionary Biology (OEB) for administrative services. 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, the Harvard College Library, and general operating support to the Harvard Museum of Natural History.

Income



Endowment	$13,838,180
Reserves	$2,877,361
Federal Sponsored Revenue	$1,941,582
Overhead Earned	$663,289
Nonfederal Sponsored Revenue	$464,415
Transfers	$441,937
Gifts	$181,900
Other Income	$121,662
Total	**$20,530,326**

Expenses



Salaries & Fringe Benefits	$8,487,000
Operating Expenses	$4,102,685
Institutional Expenses	$2,712,515
Special Project–NW Collections	$2,228,675
Space & Occupancy	$1,902,236
Overhead Charged (Sponsored)	$663,289
Scholarships, Awards & Travel	$419,276
Capitalized Balances	$14,650
Total	**$20,530,326**

Faculty-Curators

Andrew A. Biewener
Charles P. Lyman Professor of Biology; Director, Concord Field Station

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

Brian D. Farrell
Professor of Biology; Curator of Entomology

Gonzalo Giribet
Professor of Biology; Alexander Agassiz Professor of Zoology; Curator of Invertebrate Zoology

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

Hopi E. Hoekstra
Professor of Biology; Professor of Molecular and Cellular Biology; Alexander Agassiz Professor of Zoology; Curator of Mammalogy

Farish A. Jenkins, Jr.
Professor of Biology; Alexander Agassiz Professor of Zoology; Curator of Vertebrate Paleontology

George V. Lauder
Professor of Biology; Henry Bryant Bigelow Professor of Ichthyology; Curator of Ichthyology

Jonathan B. Losos
Monique and Philip Lehner Professor for the Study of Latin America; Curator of Herpetology

James J. McCarthy
Professor of Biological Oceanography; Alexander Agassiz Professor of Biological Oceanography; Acting Curator of Malacology

Naomi E. Pierce
Sidney A. and John H. Hessel Professor of Biology; Curator of Entomology

Robert M. Woollacott
Professor of Biology; Curator of Marine Invertebrates

Emeritus Faculty

Kenneth J. Boss
Faculty-Curator, Emeritus; Professor of Biology, Emeritus

A.W. "Fuzz" Crompton
Faculty-Curator, Emeritus; Fisher Professor of Natural History, Emeritus

Herbert W. Levi
Faculty-Curator, Emeritus; Alexander Agassiz Professor of Zoology, Emeritus

Richard C. Lewontin
Professor of Biology, Emeritus; Alexander Agassiz Professor of Zoology, Emeritus

Edward O. Wilson
Honorary Curator in Entomology; Pellegrino University Professor, Emeritus

Postdoctoral Fellows, Research Associates & Visiting Scholars

Sonia Da Silva Andrade
Invertebrate Zoology, Giribet Lab

Allison Arnold-Rife
Concord Field Station, Biewener Lab

Niclas Backström
Ornithology, Edwards Lab

Rowan D. H. Barrett
Mammalogy, Hoekstra Lab

Andres Bendesky
Mammalogy, Hoekstra Lab

Gilberto Neves Bento
Mammalogy, Hoekstra Lab

María del Rosario Castañeda
Herpetology, Losos Lab

Celine Clabaut
Mammalogy, Hoekstra Lab

Savel Daniels
Invertebrate Zoology, Giribet Lab

Vera Domingues
Mammalogy, Hoekstra Lab

Rodney Eastwood
Entomology, Pierce Lab

Marianne Espeland
Entomology, Pierce Lab

Rosa Maria Fernandez Garcia
Invertebrate Zoology, Giribet Lab

Heidi Fisher
Mammalogy, Hoekstra Lab

Brooke Flammang
Ichthyology, Lauder Lab

Adam Freedman
Herpetology & Mammalogy, Losos & Hoekstra Labs

Matthew Fujita
Ornithology, Edwards Lab

Gabriel Gartner
Herpetology, Losos Lab

Masaru Hojo
Entomology, Pierce Lab

Natalie Holt
Concord Field Station, Biewener Lab

Travis Ingram
Herpetology, Losos Lab

Milan Janda
Entomology, Pierce Lab

Christopher Kenaley
Ichthyology, Lauder Lab

Julia Klaczko
Herpetology, Losos Lab

Sarah Kocher
Entomology, Pierce Lab

Sebastian Kvist
Invertebrate Zoology, Giribet Lab

Jean-Marc Lassance
Mammalogy, Hoekstra Lab

Sarah Lemer
Invertebrate Zoology, Giribet Lab

Matthew Lim
Entomology, Pierce Lab

Mark Liu
Ornithology, Edwards Lab

David Lubertazzi
Global Ant Project, Wilson Lab

Hillary Maddin
Herpetology, Hanken Lab

Ricardo Mallarino
Mammalogy, Hoekstra Lab

Marie M. Manceau
Mammalogy, Hoekstra Lab

Gabriel Miller
Entomology, Pierce Lab

Gerard Talavera Mor
Entomology, Pierce Lab

Mary O'Connell
Ornithology, Edwards Lab

Brant Peterson
Mammalogy, Hoekstra Lab

Nadine Piekarski
Herpetology, Hanken Lab

Yu-Ping Poh
Mammalogy, Hoekstra Lab

Christian Rabeling
Entomology, Pierce Lab

Frank Rheindt
Ornithology, Edwards Lab

Thomas Sanger
Herpetology, Losos Lab

Lori Shapiro
Entomology, Pierce Lab

Emma Sherratt
Herpetology, Losos Lab

Flavia Termignoni
Ornithology, Edwards Lab

Anu Veijalainen
Entomology, Farrell Lab

Ian Wang
Herpetology, Losos Lab

Li Wen
Ichthyology, Lauder Lab

Charles D. Williams
Concord Field Station, Biewener Lab

Alexander Ziegler
Invertebrate Zoology, Giribet Lab

Graduate Students

Christopher Baker
Entomology, Pierce Lab

Maude Baldwin
Ornithology, Edwards Lab

Nicole Bedford
Mammalogy, Hoekstra Lab

Leonora Bittleston
Entomology, Pierce Lab

Katherine Boronow
Herpetology, Losos Lab

John Boyle
Entomology, Pierce Lab

Rebecca Buckman
Invertebrate Zoology, Giribet Lab

Shane Campbell-Staton
Ornithology, Edwards Lab

Glenna Clifton
Concord Field Station, Biewener Lab

Mark Cornwall
Entomology, Pierce Lab

Amanda Evans
Entomology, Farrell Lab

Kara Feilich
Ichthyology, Lauder Lab

Kadeem Gilbert
Ornithology & Herpetology, Edwards & Losos Labs

Vanessa Gonzalez
Invertebrate Zoology, Giribet Lab

Patrick Gorring
Entomology, Farrell Lab

Alexis Harrison
Herpetology, Losos Lab

Michael Brent Hawkins
Herpetology, Hanken Lab

Emily Jacobs-Palmer
Mammalogy, Hoekstra Lab

Zofia Kaliszewska
Entomology, Pierce Lab

Ambika Kamath
Herpetology, Losos Lab

Emily Kay
Mammalogy, Hoekstra Lab

Evan Kingsley
Mammalogy, Hoekstra Lab

Christopher Laumer
Invertebrate Zoology, Giribet Lab

Zachary Lewis
Herpetology, Hanken Lab

Jeanette Lim
Ichthyology, Lauder Lab

Hillery Metz
Mammalogy, Hoekstra Lab

Talia Moore
Herpetology & Concord Field Station, Losos & Biewener Labs

Martha Muñoz
Herpetology, Losos Lab

Ivo Ros
Concord Field Station, Biewener Lab

Elizabeth Sefton
Herpetology, Hanken Lab

Allison Shultz
Ornithology, Edwards Lab

Bruno Souza de Medeiros
Entomology, Farrell Lab

Yoel Stuart
Herpetology, Losos Lab

Wenfei Tong
Mammalogy, Hoekstra Lab

Kira Treibergs
Marine Invertebrates, Woollacott Lab

Yunke Wu
Herpetology, Hanken Lab

MCZ PERSONNEL

Xuemai Zhai
Biological Oceanography, McCarthy Lab

Associates

Gary Alpert
Associate of Entomology
Harvard University

Bruce Archibald
Associate of Entomology
Simon Fraser University

Aaron Bauer
Associate of Herpetology
Villanova University

Reinier Beeuwkes, III
Associate of Zoology
Ischemix Company

Andrew Berry
Associate of Population Genetics
Harvard University

Elizabeth Brainerd
Associate of Ichthyology
Brown University

Jae Choe
Associate of Entomology
Ewha Womans University

Janet Collett
Associate of Population Genetics
University of Sussex

Bruce Collette
Associate of Ichthyology
National Marine Fisheries Service

David Bruce Conn
Associate of Invertebrate Zoology
Berry College

James Costa
Associate of Entomology
Western Carolina University

Catherine Craig
Associate of Invertebrate Zoology
Harvard University

Harlan Dean
Associate of Invertebrate Zoology
Harvard University

Lloyd Demetrius
Associate of Population Genetics
Harvard University

Philip DeVries
Associate of Entomology
University of New Orleans

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

Ben Evans
Associate of Herpetology
McMaster University

Richard Glor
Associate of Herpetology
University of Kansas

Kelvin A. Guerrero
Associate of Entomology
Systematic Entomologist/
Environmental Consultant

Michael Hadfield
Associate of Marine Biology
Kewalo Marine Laboratory

Anthony Herrel
Associate of Herpetology
Muséum National d'Histoire Naturelle, Paris

Berthold Holldobler
Associate of Entomology
Arizona State University

Gustavo Hormiga
Associate of Invertebrate Zoology
George Washington University

Alan Kabat
Associate of Malacology
Attorney, Bernabei & Wachtel

Leslie S. Kaufman
Associate of Ichthyology
Boston University

Timothy Laman
Associate of Ornithology
National Geographic

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

Joanna Larson
Associate of Herpetology
Harvard University

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

Duane McKenna
Associate of Entomology
University of Memphis

Russell Mittermeier
Associate of Herpetology
Conservation International

William Montevecchi
Associate of Ornithology
Memorial University of Newfoundland

Piotr Naskrecki
Associate of Entomology
Conservation International

Martin Nweeia
Associate of Mammalogy
Harvard School of Dental Medicine

Diane B. Paul
Associate of Population Genetics
Harvard University

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

Stewart Peck
Associate of Entomology
Carleton University

Paulo Petry
Associate of Ichthyology
The Nature Conservancy

Steve Poe
Associate of Herpetology
University of New Mexico

Michael Rex
Associate of Malacology
University of Massachusetts, Boston

Jury Rudyakov
Associate of Invertebrate Zoology
Commonwealth of Massachusetts

Jessica Rykken
Associate of Entomology
Harvard University

Chris Schneider
Associate of Herpetology
Boston University

Andrea Sequeira
Associate of Entomology
Wellesley College

Scott R. Shaw
Associate of Entomology
University of Wyoming

Joel Sohn
Associate of Ichthyology
Golden Mountain Trading Company

Stephen Tilley
Associate of Herpetology
Smith College

James Traniello
Associate of Entomology
Boston University

David Wagner
Associate of Entomology
University of Connecticut

David Wake
Associate of Herpetology
University of California, Berkeley

Marvalee Wake
Associate of Herpetology
University of California, Berkeley

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

Jacqueline Webb
Associate of Ichthyology
University of Rhode Island

R. Haven Wiley
Associate of Ornithology
University of North Carolina

Cheryl Wilga
Associate of Ichthyology
University of Rhode Island

Judith Winston
Associate of Marine Biology
Virginia Museum of Natural History

Staff

Melissa Aja
Faculty/Collection Assistant, Herpetology

Adam Baldinger
Curatorial Associate, Invertebrate Zoology, Malacology & Marine Invertebrates

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

Penny Benson
Curatorial Assistant, Malacology

Emily Braker
Curatorial Assistant, Collections Operations

Constance Brichford
Curatorial Assistant, Collections Operations

Ronnie Broadfoot
Circulation/Reference, Ernst Mayr Library

Christopher Carden
Cataloger, Biodiversity Heritage Library

Judith Chupasko
Curatorial Associate, Mammalogy

Stefan Cover
Curatorial Assistant, Entomology

Jessica Cundiff
Curatorial Associate, Invertebrate & Vertebrate Paleontology

Joseph DeVeer
Head of Technical Services, Ernst Mayr Library

Katherine Eldridge
Curatorial Assistant, Ornithology

Anne Everly
Lab Manager, Herpetology

Charles Farnum
Curatorial Assistant, Entomology

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

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

Linda S. Ford
Director, Collections Operations

Brendan Haley
Senior Database Manager

Karsten Hartel
Curatorial Associate, Ichthyology

Rachel Hawkins
Curatorial Assistant, Entomology

Kathleen Horton
Faculty/Collection Assistant, Entomology

Amie Jones
Faculty/Collection Assistant, Entomology

Maureen Kelly
Project Programmer, Biodiversity Informatics

Laura Leibensperger
Curatorial Assistant, Invertebrate Zoology

Jennifer Lenihan
Curatorial Assistant, Invertebrate Zoology

Lisa Litchfield
Administrator, Concord Field Station

David Lowery
Project Programmer, Biodiversity Informatics

Joseph Martinez
Curatorial Assistant, Herpetology

Juri Miyamae
Curatorial Assistant, Collections Operations

Richard Monk
Database Programmer/Consutant, Collections Operations

Paul Morris
Biodiversity Informatics Manager

Robert Morris
IT Specialist/Consultant, Biodiversity Informatics

April Mullins
Acquisitions & Technology Specialist, Ernst Mayr Library

Catherine Musinsky
Faculty/Collection Assistant, Mammalogy

John Nevins
Laboratory Systems Manager for Biological Oceanography & Marine Biology

Somer O'Brien
Staff Assistant, Concord Field Station

Mark Omura
Curatorial Assistant, Mammalogy

Philip Perkins
Curatorial Associate, Entomology

Alison Pirie
Faculty/Collection Assistant, Ornithology & Mammalogy

Bridget Power
Faculty/Collection Assistant, Invertebrate & Vertebrate Paleontology

Jignasha Rana
Research Assistant, Entomology

Murat Recevik
Curatorial Assistant, Malacology

Mark Renczkowski
Curatorial Assistant, Invertebrate Paleontology

Constance Rinaldo
Librarian, Ernst Mayr Library

Alana Rivera
Curatorial Assistant, Collections Operations

José Rosado
Curatorial Associate, Herpetology

Mary Sears
Head of Public Services, Ernst Mayr Library

Diane Sheridan
Faculty/Collection Assistant, Invertebrate Zoology

Margaret Starvish
Faculty/Collection Assistant, Ichthyology

Tsuyoshi Takahashi
Curatorial Assistant, Herpetology & Collections Operations

Jennifer Thomson
Faculty/Collection Assistant, Populations Genetics

Diana Tingley Turmenne
Curatorial Assistant, Collections Operations

Jeremiah Trimble
Curatorial Associate, Ornithology

Catherine Weisel
Museum Projects Coordinator

Ken Wilcox
Building Superintendent, Concord Field Station

Victoria Wilke
Curatorial Assistant, Collections Operations

Andrew Williston
Curatorial Assistant, Ichthyology

Jonathan Woodward
Curatorial Assistant, Herpetology & Collections Operations

Robert Young
Special Collections Librarian, Ernst Mayr Library

Breda Zimkus
Project Manager for Genetic Resources

Temporary Staff

Sarah Cohen
Malacology

Ann Downer-Hazell
EOL Learning + Education Group

Gwendolyn Fougy Henry
Ernst Mayr Library

Jyhjong Hwang
Collections Operations

Richard Knecht
Invertebrate & Vertebrate Paleontology

Jessica Mitchell
Ernst Mayr Library

Valerie Root
Ernst Mayr Library

Kaitlin Sheridan
Invertebrate Zoology

Robert Stymeist
Ornithology

Tatiana De Souza Vargas
Collections Operations

Encyclopedia of Life, Learning + Education Group

Tracy Barbaro
Project Coordinator

Jeffrey T. Holmes
Digital Learning Editor

Marie M. Studer
Learning + Education Director

Administration for the Department of Organismic & Evolutionary Biology

Krista Carmichael
Senior Research Administrator

Rebecca Chetham
Executive Director

Irv Dumay
Building Manager

Paul Dwyer
Mailroom Staff Assistant

Jeannette Everritt
Administrative Coordinator

Jason Green
Accounting Assistant

Philip Norton
Assistant Building Manager

Monica Oyama
Accounting Assistant

Kristin Pennarun
Senior Research Administrator

Christopher Preheim
Coordinator of Academic Programs

Damari Rosado
Associate Director of Administration

Anna Salvato
Manager of Financial Operations

Deborah Smiley
Web Project Manager

Geoff Tierney
Associate Director of Finance & Research Administration

Laura Tomaino
Human Resources Coordinator

The MCZ deeply appreciates the additional support and contributions of numerous interns and undergraduate students during the 2012–2013 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. John D. Constable
Mr. Robert G. Goelet
Mr. George Putnam, Jr.
Mr. George Putnam, III
Dr. Barbara Jil Wu
Mr. Paul J. Zofnass
President Drew Gilpin Faust

Acknowledgements

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

Editors

James Hanken, *Director*

Catherine Weisel, *Museum Projects Coordinator*

Copy, Design & Production

Cyndi Wood
Creative Project Management, Inc.
www.creativeprojectmgmt.com

Museum of Comparative Zoology
26 Oxford Street
Cambridge, MA 02138

617.495.2460
www.mcz.harvard.edu