Director’s Message

This year, the MCZ celebrates its 150th anniversary. Louis Agassiz’s vision to build a zoological museum that would provide a comprehensive resource for scientists from Harvard and beyond came to fruition long ago. Today, this vision is sustained through the efforts of a dedicated contingent of faculty-curators, staff, and students. Although scientific theories, controversies, and methods may evolve, the core mission of the Museum remains paramount: to serve as a world-renowned center for research and education in evolutionary and comparative biology through the maintenance and study of scientific collections. This annual report, the first in thirty years, chronicles important activities of the past year, highlights noteworthy accomplishments, and provides an annual record of this remarkable institution.

The past academic year is defined by many successes and opportunities. As does any institution with a long history, we constantly seek to improve our facilities. This year, we extensively renovated several collection rooms and made more modest improvements to many others. The herpetology library was transformed into a multi-purpose facility for course lectures, specimen-based labs and seminars; it also provides a workspace for curatorial staff and visiting scientists. Looking forward, we anticipate relocating several collections to a state-of-the-art belowground facility in Harvard’s new NorthWest Building and, in November 2009, installing two whale skeletons to float over the main staircase at its 52 Oxford Street entrance.

The MCZ recognizes the importance of sharing data with the larger scientific community. To that end, we continue our multiyear effort to digitally capture essential information regarding our 21+ million specimens. Once migrated to MCZbase, our museum-wide database, these data are fully searchable online. MCZbase facilitates worldwide collaborations through integration with other global biodiversity databases, among them the Encyclopedia of Life and the Global Biodiversity Information Facility.

The MCZ is both a research and a teaching museum, hence I am particularly proud of our active involvement in, and support of, Harvard’s education programs. Undergraduate and graduate courses offered by our faculty-curators always are in high demand. Additionally, an in-house grants program funds curator-supervised research projects by students that typically take them out of the classroom and into the field.

The MCZ’s collections and research continue to be showcased in the Harvard Museum of Natural History. Opening in spring of 2010, a temporary exhibition will focus on the diversity and evolution of horns and antlers in mammals. New England Forests, a permanent exhibition opening in spring of 2011, will feature the role of forests in carbon sequestration and address threats from invasive species.

As we begin the MCZ’s next 150 years, we remain committed to our ambitious agenda to promote and enable cutting-edge research, to teach the next generation of professional zoologists and educated laypersons, to forge partnerships with a global network of scientists, and to ensure the longterm conservation and utility of our invaluable collections. I am grateful for the dedication and hard work of everyone associated with the MCZ who insure this institution’s success.

James Hanken
Director
Innovative Research, Rich Collections, and a Vibrant Future

For 150 years, the Museum of Comparative Zoology (MCZ) at Harvard University has been an eminent center for research and education focused on the comparative relationships of animal life, devoted to the advancement of evolutionary biology and biodiversity science, and dedicated to the preservation, order, and use of its collection and archives.

The MCZ was founded in 1859 primarily through the efforts of Louis Agassiz, a brilliant lecturer and natural history scholar from Switzerland. As a leading institution for modern zoological research, the MCZ honors Agassiz’s desire to illuminate the structures of living things, their natural classification, and the relationship with their surroundings.

**Innovative Research**

Today, the Museum of Comparative Zoology is comprised of 14 faculty-curators who oversee the Museum’s 12 departments: Biological Oceanography, Entomology, Herpetology, Ichthyology, Invertebrate Paleontology, Invertebrate Zoology, Malacology, Mammalogy, Marine Invertebrates, Ornithology, Population Genetics, and Vertebrate Paleontology. The faculty-curators also retain a professorial appointment through Harvard’s Department of Organismic and Evolutionary Biology, conducting research and educating Harvard’s undergraduate and graduate students. An active and productive roster of faculty, researchers, postdoctoral fellows, and graduate students contribute to the world’s knowledge in the fields of systematics, evolution, biomechanics, genetics, behavior, and ecology.

The MCZ’s Ernst Mayr Library and its archives assist the work of the Museum by providing and preserving information resources and services that support the research and teaching activities of the Harvard community. The Concord Field Station, a 62-acre research facility located in Bedford, Massachusetts, houses specimen preparation facilities and the largest specimens from some of the MCZ’s collections.

**Rich Collections**

Museum collections are an integral and fundamental component of zoological research and teaching. The MCZ holds one of the world’s richest and most varied resources for studying the diversity of life, with more than 21 million extant and fossilized specimens in ten research collections. As a premier university museum and research institution, the specimens and their related data are available to researchers and educators worldwide.

The Harvard Museum of Natural History was established in 1998 as the public face of the Museum of Comparative Zoology and other natural history museums at Harvard. The HMNH showcases the incomparable collections of its parent museums and the research of scientists across the University as well as an array of educational programs for school age children to adults.

**International Initiatives**

The Museum of Comparative Zoology is active in several global projects that are exploring evolutionary relationships and the diversity of life through collaborative research and data sharing. New information in the field of comparative zoology is generated continuously, and the MCZ is proud to participate in these innovative efforts to capture, integrate, manipulate, and share these data:

- **Encyclopedia of Life**, an unprecedented effort to make information on Earth’s 1.8 million identified species freely accessible through the Internet.
- **Biodiversity Heritage Library**, an effort to digitize the published literature of biodiversity into one comprehensive web-based collection.
- **Assembling the Tree of Life**, a U.S. National Science Foundation program that seeks to reconstruct the evolutionary origins of all living things by demonstrating their genealogical relationships.
- **Biodiversity Informatics** initiatives that develop and integrate specimen databases and collection records to provide unprecedented access to primary biodiversity information. Such initiatives include the Global Biodiversity Information Facility (GBIF), FishNet 2, HerpNet, Mammal Networked Information System (MaNIS), Ornithological Information System (ORNIS), and VetNet.

**The Vision of Louis Agassiz**

Agassiz began raising funds for a grand, new museum that would illustrate patterns of organic similarity through morphology, embryology, paleontology and geographic distribution, primarily to provide material for scientific research by professionals.

When the MCZ opened in 1859, Agassiz filed the Museum with his personal collection, specimens gathered from Harvard faculty and students on collecting expeditions, and fossil collections purchased from Europe. According to Mary Winkler, author of Reading the Shape of Nature, “Probably the most novel and important difference between the MCZ and any existing collection was that Agassiz’s new museum was a training ground for a new generation of professional zoologists.” Agassiz’s students played a central role in the Museum, with responsibilities for collecting and curating specimens, as well as research.

The 150-year anniversary of the MCZ will be commemorated with a series of lectures beginning in October 2009. Director James Hanken will speak on “This Brick Ark: Celebrating the Museum of Comparative Zoology’s First 150 Years and the Beginning of the Next 150.” Dr. Cristian Samper, Director of the National Museum of Natural History at the Smithsonian Institution, will examine “Natural History Museums and Society,” and Dr. Michael Novacek, American Museum of Natural History Paleontologist, Senior Vice-President and Provost of Science, will discuss the importance of “Natural History Museums in the Environmental Century.”

February 10, 2009: MCZ specimens are among the first objects to be photographed and “synthed” by using innovative Photosynth digital-imaging technology from Microsoft.

Photosynth combines digital photos of a single object to produce a three-dimensional, on-screen image that can be zoomed and rotated.
Prof. Giribet’s research focuses on the evolutionary biology of invertebrates—including arachnids, myriapods, insects, and crustaceans—in locations around the world, and he is also interested in philosophical aspects of sequence data analysis, emphasizing homology-related issues.

Brian D. Farrell
Professor of Biology
Curator of Entomology
Prof. Farrell’s research is broadly concerned with whether the diversity of species on earth is a cause or consequence of the diverse roles different species play in ecosystems, particularly between insects and plants. The Farrell Lab serves as a base for the Beetle Tree of Life project, a collaborative and comprehensive phylogenetic study of this most diverse group of animals.

James Hanken
Professor of Biology
Alexander Agassiz Professor of Zoology
MCZ Director
Curator of Herpetology
Prof. Hanken utilizes laboratory-based analyses and field surveys to examine the evolution of morphology, developmental biology, and systematics in amphibians. Current areas of research include the evolution of cranial and dermal patterning in vertebrates; the developmental basis of life-history evolution; systematics, taxonomy, and evolution of neotropical and Asian salamanders; and amphibian declines and conservation.

Gonzalo Giribet
Professor of Biology
Alexander Agassiz Professor of Zoology
Curator of Invertebrate Zoology
Prof. Giribet’s primary research focuses on the evolution and biogeography of invertebrate animals. Working in molecular systematics since the field’s early days, he is also interested in philosophical aspects of sequence data analysis, emphasizing homology-related issues.

Andrew A. Biewener
Chair, Department of Organismic and Evolutionary Biology
Prof. Biewener’s research focuses on the biomechanics, neuromuscular function, and control of animal movement. His goal is to understand general principles that govern the biomechanical and physiological design of vertebrate neuro-musculoskeletal systems.

Tony Rinaldo
MCZ Faculty-Curator
Prof. Rinaldo utilizes laboratory and field approaches to investigate the behavior, ecology, and evolutionary aspects of freshwater fishes, particularly fishes and amphibians. His current studies include examining the interface between functional morphology of the feeding apparatus and trophic ecology, and how functional morphological features relate with patterns of diversity and evolutionary rates.

Karel F. Liem
Alexander Agassiz Professor of Ichthyology
Curator of Ichthyology
Prof. Liem’s research focuses on the evolutionary biology of fish and land animals, in the Canadian Arctic. Prof. Liem’s research interests include genomics of host-parasite co-evolution in House Finches and their bacterial pathogens.
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.

Prof. McCarthy has served on national and international planning committees, advisory panels, and commissions relating to oceanography, polar science, and the study of climate and global change for federal agencies, intergovernmental bodies, and international organizations. For the past two decades Prof. McCarthy has worked as an author, reviewer, and as a co-chair with the Nobel Peace Prize winning Intergovernmental Panel on Climate Change (IPCC) heading the working group addressing impacts of and vulnerabilities to global climate change at the Third IPCC Assessment. He was also one of the lead authors on the Arctic Climate Impact Assessment, and a Vice-Chair of the 2007 Northeast Climate Impacts Assessments.

Prof. McCarthy, former Director of the MCZ from 1982 to 2002, 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.

Robert M. Wollacott
Professor of Biology
Curator of Marine Invertebrates

Prof. Wollacott’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.

In Memoriam
On the 3rd of September 2009, the MCZ lost a dear friend and colleague, Karel F. Liem, Henry Bryant Bigelow Professor of Ichthyology. In addition to his distinguished research career in the evolutionary morphology of fishes, Karel was an esteemed lecturer, author, and mentor. Karel and Hettty, his wife, were treasured members of the Harvard community, serving as master and co-master of Dunster House for 12 years and leading international cultural and ecological tours through the Harvard Museum of Natural History travel program. Karel’s professional contributions, personal warmth, and raucous laughter will be missed tremendously.

A symposium celebrating Karel’s life and work will be held at the annual meeting of the American Society of Ichthyologists and Herpetologists in Providence, Rhode Island, in July 2010.

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 Reviews and the Bulletin of the Museum of Comparative Zoology.

Alfred W. Crompton
Faculty-Curator Emeritus
Fishes Professor of Natural History, Emeritus

Prof. Crompton, former Curator of Mammalogy, was the Director of the MCZ from 1970-1982 and the former Director of the Peabody Museum of Natural History, Yale University and the South African Museum, Cape town. 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 for 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.

Robert W. Crampton
Professor of Biology
Curator of Marine Invertebrates

A former Curator of Arachnology, Prof. Crampton’s research focuses on taxonomy of new world orb weaving araneid spiders 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. He has made his extensive collection of drawings of orb weavers’ genitalia available online.

Herbert W. Levi
Faculty-Curator Emeritus
Professor of Biology, Emeritus

An evolutionary geneticist, Prof. Levi 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. Levi’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 Organization 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.

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

Prof. Wilson is considered the founder of sociobiology and evolutionary psychology, and has developed the base 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 Holdobler) 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.

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 Organization 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.
Courses in 2008–2009 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 (and Cassandra G. Estavaret)  
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 53: Evolutionary Biology** *(undergraduate)*  
Hope E. Hoekstra (and Andrew J. Berry)  
Micro- and macro-evolution, ranging from population genetics through molecular evolution to the grand patterns of the fossil record.

**OEB 91r: Supervised Reading: Mammalogy** *(undergraduate)*  
Hope E. Hoekstra  
Classification, distribution, life histories, economic importance, techniques of field study, method of collection, and preservation of mammals.

**OEB 113: Paleobiological Perspectives on Ecology and Evolution** *(undergraduate)*  
Charles R. Marshall  
Introduction to the analysis of key problems in paleobiology, with an emphasis on how evolutionary and ecological processes operate on geologic timescales.

**OEB 121a: Advanced Structure and Physiology of the Vertebrates** *(undergraduate)*  
Andrea A. Biewener, George V. Lauder (and Daniel E. Lieberman)  
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 121b: Advanced Structure and Physiology of the Vertebrates** *(undergraduate)*  
Andrea A. Biewener, George V. Lauder (and Daniel E. Lieberman)  
Optional extension of initial project undertaken in OEB 121a into a thesis research project.

**OEB 139: Evolution of the Vertebrates** *(undergraduate)*  
Farish A. Jenkins, Jr.  
Origination and evolution of the major groups of vertebrates, with emphasis on the anatomical and physiological transformations that occurred during the transitions to diverse lineages of fish, amphibians, reptiles, birds, and mammals.

**OEB 155r: Biology of Insects** *(undergraduate)*  
Naomi E. Pierce (and Michael R. Canfield)  
Introduction to the major groups of insects—life history, morphology, physiology, and ecology—through a combination of lecture, lab, and field exercises.

**OEB 157: Global Change Biology** *(undergraduate)*  
James J. McCarthy (and Paul R. Mauroc)  
Examines natural and anthropogenic changes in the earth system and their impact on the structure and functioning of terrestrial and oceanic ecosystems.

**OEB 173: Comparative Biomechanics** *(undergraduate)*  
Andrew A. Biewener (and Jacques Dumais)  
An exploration of how animals and plants contend with their physical environment, considering their biomaterial properties, structural form, and mechanical interaction with the environment.

**OEB 181: Systematics** *(undergraduate)*  
Gonzalo Giribet and Charles R. Marshall  
Theory and practice of systematics, emphasizing issues associated with homology statements and alignments, methods of tree reconstruction, and hypothesis evaluation.

**OEB 190: Biology and Diversity of Birds** *(undergraduate)*  
Scott V. Edwards (and Daniel E. Lieberman)  
Introduction to the biology of birds covers avian origins, physiology and anatomy, higher-level systematics and field characters, speciation processes, nesting and courtship behavior, vocalizations, mating systems and sexual selection, cooperative breeding, demography, and conservation.

**OEB 211r: Form, Function, and Evolution** *(undergraduate)*  
Karel F. Liem  
Evolutionary mechanisms underlying the diversity in design of living vertebrates.

**OEB 223: Biology of Invertebrates** *(undergraduate)*  
Hopi E. Hoekstra  
An integrated approach to the taxa of invertebrates, emphasizing how chemical, physical, genetic, ecological, and geologic processes contribute to the origin and maintenance of biological diversity.

**OEB 230: Speciation** *(undergraduate)*  
Hopi E. Hoekstra  
The latest advances in speciation with a focus on controversial issues and new approaches.

**OEB 234: Topics in Marine Biology** *(undergraduate)*  
Robert M. Woollacott  
Human impacts on marine life and ecosystems of the sea.

**OEB 255: Nature and Regulation of Marine Ecosystems** *(undergraduate)*  
James J. McCarthy  
A presentation of topics of current interest in marine ecosystems, with emphasis on identification and quantification of biological and environmental factors important in the regulation of community structure in the intertidal, deep benthic, and planktonic realms.

**OEB 261r: Developmental Mechanisms of Evolutionary Change** *(graduate)*  
James Haukens (and Akhbar Alkhawan)  
Graduate seminar course in evolutionary developmental biology discussing the latest advances in understanding the cellular and molecular developmental mechanisms that underlie important evolutionary phenomena.
OEB 334: Behavioral Ecology
Naomi E. Pierce

OEB 355: Ichthyology and Functional Anatomy of Fishes
Karel F. Liem

OEB 341: Coevolution
Brian D. Farrell

OEB 345: Biological Oceanography
James J. McCarthy

OEB 355: Evolutionary and Ecological Diversity
James Hanken

OEB 362: Research in Molecular Evolution
Scott V. Edwards

OEB 367: Evolutionary and Ecological Diversity
Jonathan Losos

OEB 370: Mammalian Evolutionary Genetics
Hopi E. Hoekstra

FRESHMAN SEMINAR
Freshman Seminar 31v: The Beasts of Antiquity and their Natural History (undergraduate)
Farish A. Jenkins, Jr. (and Kathleen M. Coleman)
A study of the animals of the ancient Mediterranean basin, offering parallel introductions to the classics and to organismal and evolutionary biology. Includes first-hand study of specimens in the Musuem of Comparative Zoology and coins and artifacts from Harvard’s collection of antiquities.

LIFE SCIENCES
LIFESCI 2: Evolutionary Human Physiology
George V. Lauder, Andrea A. Biewener (Peter T. Ellison and Daniel E. Lieberman)
Explores human anatomy and physiology from an integrated framework, combining functional, comparative, and evolutionary perspectives on how organisms work.

CORE CURRICULUM
SCIENCE B-53: Marine Biology (undergraduate and Gen Ed Credit Course)
Robert M. Woollacott
Explores the life histories and adaptations of marine life and the ecosystems of the sea.

SCIENCE B-65: Evolutionary Biology (undergraduate)
Jonathan Losos
The process of biological evolution, the way the biosphere and its inhabitants have changed through time, and how human actions affect the evolutionary process.

ENVIRONMENTAL SCIENCE AND PUBLIC POLICY
ESPP 90f: Global Change and Human Health (undergraduate)
James J. McCarthy (and Paul R. Epstein)
Explores hypothesized linkages between changes in ecosystems, climate, and the epidemiology of certain infectious diseases.

ESPP 91r: Supervised Reading and Research (undergraduate)
James J. McCarthy (and members of the Committee)
Supervised reading and research on topics not covered by regular courses of instruction.

HARVARD EXTENSION SCHOOL AND HARVARD SUMMER SCHOOL
BIOS E-225: Human Impacts on Marine Communities
Robert M. Woollacott
How anthropogenically-driven events are impacting the structure and function of marine communities.

BIOS E-25: Comparative Functional Anatomy of the Vertebrates
Karel F. Liem
Introduction to vertebrate evolution, development, and function with discussion of the structure, function, and evolutionary patterns of each major organ system.

BIOS S-74: Marine Life and Ecosystems of the Sea
Robert M. Woollacott
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-21: A Comparative Anatomical Perspective of Human Origins and Health
Karel F. Liem
A functional perspective of comparative vertebrate anatomy, with concentration on the important evolutionary transformations of selected organ systems and their functional meaning during the diversification of the major groups of vertebrates.

BIOL S-112: Study Abroad at Oxford: Darwin and the Origins of Evolutionary Biology
Naomi E. Pierce (and Andrew Berry)
The history of thought on evolution from its mythic beginnings in creation stories through the theories of Charles Darwin.

BIOL S-113: Study Abroad at Oxford: Darwin and Contemporary Evolutionary Biology
Naomi E. Pierce (and Andrew Berry)
The history of evolutionary biology in the post-Darwinian world, following strands of thought either introduced or ignored by Darwin in The Origin of Species through to the present.

BIOL S-165: Study Abroad in Malaysia: The Biodiversity of Borneo
Naomi E. Pierce (Camphill Webb, Charles Davis, and Paul Moorcroft)
The evolutionary and ecological processes that lead to the amazingly high biodiversity on Borneo, as well as the issues that seriously threaten that diversity today.
Collections: Critical to the Study of the Earth’s Biodiversity

The Museum of Comparative Zoology was founded on the concept that collections are an integral and fundamental component of zoological research and teaching. The MCZ contains more than 21 million specimens in ten research collections that comprise one of the world’s richest and most varied resources for studying the diversity of life. As a premier university museum and research institution, the MCZ’s specimens and their related data are available to researchers and educators worldwide, and use of the collections in student research and teaching is also encouraged.

Digital Specimen Records Migrate to MCZbase

In order to make the MCZ’s historically and scientifically significant holdings increasingly accessible to researchers and the public, the MCZ is migrating all digital specimen records to MCZbase, a new centralized database. MCZbase has been populated with more than one million specimen records, and this data capture effort is a museum-wide priority. In addition, existing specimen images are being linked to the relevant data record. MCZbase conforms to emerging standards for natural history collections and will facilitate data sharing with organizations like the Global Biodiversity Information Facility (GBIF), Encyclopedia of Life (EOL), MarxIS, HerpNet, ORNIS, FishNet 2, and VerNet.

Collections Highlights

Entomology

The insect collection is among the richest and most historically significant in North America, second only to the Smithsonian Institution for primary type holdings. Records for all of the 28,000 primary types are online and 17,000 type specimens and labels have also been digitized. Ongoing digitization and imaging projects include the Caribbean Islands Biodiversity Project, the Boston Harbor Islands Biodiversity Project, and the Butterfly Collection Database/Imaging Project.

Herpetology

The herpetology collection is nearly unparalleled in research opportunities, containing more than 325,000 specimens of great historical value. Specimen data is available for search online and through VerNet and GRIF. All of the standard catalog data has been migrated to MCZbase. Digital imaging of type material is ongoing; all amphibian types, turtles, crocodilians, and about two thirds of the lizards are completed, and digital X-ray images are being uploaded as they are obtained. The original catalog ledgers have all been digitized and will be linked to MCZbase, decreasing physical use to aid in their preservation.

Ichthyology

The ichthyological collection is among the best in the world, with specimens dating back to the late 1700s. The fish collection has been fully renovated and collection data are available online. Traditional preparations have been databased and almost 8,000 digital images—with emphasis on primary types—are available along with more than a thousand digital X-rays of specimens. These X-rays are a great asset, in many cases, providing an X-ray and photograph to a researcher has been as effective as sending a specimen on loan.

Invertebrate Paleontology

The department houses the extant Echinodermata, Bryozoa, Urochordata, and some of the Brachiopoda. The echinoderm collection is one of the largest in the world, containing more than 200,000 specimen lots. The collection is type-rich, and contains historical specimens from the late 19th and early 20th centuries. Recent and ongoing projects include databasing the collection, rehousing all fluid-preserved specimens, and assessing the collections’ storage needs for current and future curation.

Ornithology

The ornithology collection is one of the most diverse collections of its kind containing every genus of birds and approximately 85% of the known species of birds, including 2,300 primary type specimens. The collection is rich in historical specimens, with an extensive archive of extinct birds. More than 90% of the collection has been databased. Additionally, the Aves 3D project—made possible by a National Science Foundation grant—will construct an open access online database containing three-dimensional digital skeletal scans.

Vertebrate Paleontology

The vertebrate paleontology collection has approximately 90,000 specimens of fossil fish, amphibians, reptiles, birds, and mammals. Specimen data capture has been completed from the historic catalog ledgers and totals more than 42,000 specimen records. These records will be searchable online after their migration to MCZbase in FY 2010.

Ernst Mayr Library

The Library maintains approximately 360,000 books and journals, as well as a collection of archival materials and natural history art. Over the previous academic year, 901 books were added to the collection, circulation increased to 13,000 transactions, and interlibrary loan transactions increased to 3,000 transactions. The Ernst Mayr Library averages about 100 visits per day and undergraduate use of the Library is up to 16% of the total from 10%. Lending has more than doubled in the last year, as have borrowing requests from Ernst Mayr Library users. The Library continues its efforts to enhance the presentation of library resources on course websites. Staff members are active in local projects such as building general and specific intranet portals (iSites) for the sciences, international projects such as the Biodiversity Heritage Library, Harvard library committees, professional associations, and publishing.

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MCZ Research Making Headlines

**Using DNA to Reorganize the Tree of Life**

A groundbreaking study published in *Nature* by Gonzalo Giribet and colleagues has introduced a potent methodology for mapping the animal tree of life. The study presented a wide-ranging DNA-based survey of 77 species of animals, where new data from 29 species representing 21 important phyla in the animal kingdom—more than half of which had never been examined using the researchers’ method of genomic analysis—were studied alongside better-characterized specimens.

After incorporating new data from protozoa—including worms, sea spiders, squids, snails, and comb jellies—the researchers found that the resulting phylogenetic trees were unexpectedly reorganized. Most surprising was evidence contradicting a long-held hypothesis that placed sponges on the most primitive branch of the taxonomic tree. Instead, the data strongly indicated that comb jellies—gelatinous zooplankton—deserved that position.

**The Genetics of Evolution**

In a commentary in *Evolution*, evolutionary geneticist Hopi E. Hoekstra and evolutionary biologist Jerry Coyne challenged a popular idea about the molecular mechanisms that underlie evolutionary change, generating considerable discussion and controversy in the scientific community. The idea they challenged is that shifts in how genes are regulated, rather than alterations in the genes themselves, are the key to evolution. Dubbed “evo-devo,” the field emerged when developmental biologists proposed that mutations in regulatory DNA called cis elements underlie evolutionary change, generating considerable discussion and controversy in the scientific community. The idea was challenged by Hoesktra’s research helps explain Darwin’s process of natural selection on a molecular level by showing how natural selection modifies the DNA of genes and their expression to adapt members of a species to their particular circumstances.

MCZ News

Professor Hoekstra was also featured in the 2009 *National Geographic* article “Modern Darwin’s” Florida’s oldfield mice have lighter coats when living on the beach than when dwelling inland, making them less visible to predators. Prof. Hoekstra and colleagues have traced the color difference to the change of a single nucleotide in a single gene, which cuts down the production of pigment in the fur.

Other findings included the disappearance of the entire taxonomic group of Coelomata—animals with fluid-filled body cavities—due to earlier deficient taxon sampling, and resolution of a long-standing debate about the relationships among centipedes and millipedes, arachnids, and jawed insects such as ants and beetles. The spiders, rather than the insects, clustered more closely with the centipedes and millipedes.

The study, funded by three collaborative grants from the National Science Foundation’s Protostome Assembling the Tree of Life Project, was recognized by *Discover* magazine as one of the Top 100 Stories of 2008.

**Facilities Upgrades**

**Herpetology Library and Collection Rooms**

During the year the herpetology library (B06) was renovated to function as a multi-purpose room, with a digital projector, audiovisual equipment, laboratory tables, and desks installed for classroom use. Additionally, high-density compactor units were installed in the area previously occupied by the Anolis lizard collection, and reprints and books were moved onto the shelves. In the lizard (B09) and snake (B14) rooms, 8 new tank racks and 32 new stainless steel tanks were installed to house large and oversize reptiles.

**Ichthyology Collection Rooms**

The final phase of renovating four major ichthyological collection rooms (B13, B15, B17, and B18X) was completed. Floors were lowered, rooms were refitted to maximize space, and compacting shelving was installed, allowing almost all of the collection to fit into the four rooms. A part of this phase was the installation of 9 new tank racks and 31 new stainless steel tanks in three rooms. The placement of the largest tanks now stored in a temporary location will be completed in FY 2010.

**Malacology Collection Rooms**

Two dry collection rooms (454, 455) were renovated this year, and newly installed metal cabinets replaced wooden cabinets. Specimen lots of more than 18,600 species were arranged alphabetical by family, genus, and species within 3,200 new metal drawers. Books and serials within the departmental library have been cataloged into the HOLLIS system and journals were inventoried, assigned, and arranged by call numbers.

**Vertebrate Paleontology Collection Rooms**

Two dry collection rooms (452, 453) were renovated this year, and newly installed metal cabinets replaced wooden cabinets. Specimen lots of more than 18,600 species were arranged alphabetical by family, genus, and species within 3,200 new metal drawers. Books and serials within the departmental library have been cataloged into the HOLLIS system and journals were inventoried, assigned, and arranged by call numbers.
Farish A. Jenkins, Jr.

Vertebrate claws are typically a keratinous sheath overlaying the end of a digit, but this type of claw is rare in amphibians. In an article in Biology Letters, authors David C. Blackburn, James Hanken, and Farish A. Jenkins, Jr. show that certain African frogs have a different type of claw that is unique in design among living vertebrates. Certain African frogs struggle and kick violently when picked up, raking their skin. The researchers completed the first detailed anatomical study and interpretation of these specialized structures since their discovery more than 100 years ago.

The authors examined museum specimens of 63 species in seven arthroleptid frog genera and found that in two genera, Arthroleptus and Triebellobatanaus, certain toe bones are distinctly claw shaped with pointed tips. Flexing the claw causes it to break free of the bone and pierce the skin, exposing the barb-like tip. Due to the remarkable regenerative capacity documented in many amphibians, subsequent healing of the skin and connective tissue would be unsurprising, but this healing—and a return of the claw to functionality—is still to be determined. The research was covered by AAAS Science News and was named as one of its top 10 stories of 2008.


Nature’s 15 Evolutionary Gems

Given that many concepts of Darwinian evolution are still being defined, or even challenged, Nature prepared the resource “15 Evolutionary Gems” to illustrate the empirical existence of evolution and the mechanisms that drive it.

Number 2 in “Gems from the Fossil Record,” “From Water to Land” recognizes the significance of the discovery of Tiktaalik by Farish A. Jenkins, Jr., and colleagues.13 More than 360 million years ago, land-dwelling tetrapods emerged from an aquatic ancestry. The animals that made this landmark evolutionary transition were long suspected to be shallow-water, fleshy finned fishes (Sarcopterygii), but direct fossil evidence remained elusive. In 2006, Professor Jenkins and colleagues described well-preserved fossils of Tiktaalik from Arctic Canada that document the existence of an amphibian-like fish with distinct similarities to tetrapods—from flexible neck to limb-like fin structure—thus filling an important evolutionary gap in the fossil record.

Surprising Concealed Weapons: Claws in Frogs

The researchers introduced a large ground-feeding predatory lizard to six small islands in the Bahamas, with six other islands as controls. They found that the lizard’s prey—the smaller Anolis sagrei—spent more time higher up in vegetation on the islands with the predator; natural selection favored larger size in females and longer legs in males. Their research showed that the introduction of a predator could cause individuals of a prey species to change their behavior—and also cause an evolutionary response—to improve survival.


MCZ Projects and Initiatives

Engaging Students and the Public

EOL’s Learning and Education Group at the MCZ works to generate global awareness of EOL as a collaborative learning tool, exploring and promoting new and exciting uses that foster understanding and appreciation of biological diversity.

Through the Undergraduate Initiative, the Learning and Education Group is making it possible for students to contribute to species pages through EOL content partners Mushroom Observer, AmphibiaWeb, and Animal Diversity Web, who then serve the student submissions through EOL. Via Mushroom Observer (www.mushroomobserver.org), students at Harvard and three other universities assembled fungal species accounts that were added to EOL in early 2009. Harvard herpetology students prepared species accounts for AmphibiaWeb (www.amphibiaweb.org) as their course project, and the educational resource Animal Diversity Web (animaldiversity.org)—with species accounts written by nearly 3,000 students from 35 universities—is now being served through EOL.

EOL is also partnering with the National Geographic Society and the National Park Service to organize and participate in the BioBlitz system, where scientists, naturalists, educators, and students document all living things in a geographically defined ecosystem in a 24-hour blitz and upload their findings to EOL. The collaborators are also creating web-based educational materials and resources that utilize EOL (www.nationalgeographic.com/field/projects/bioblitz.html).

Another Learning and Education Group effort is INVOLV—a visualization of life on earth for educational purposes—being developed in collaboration with computer scientists at Harvard. The visualization—displayed on an interactive, multitouch tabletop computer screen and a high-resolution data wall—debuted at HMNH in the arthropod exhibit in summer 2009 (www.involveb-l.org).
The research of MCZ faculty-curators and the MCZ’s rich natural history collections were featured in two new exhibitions at the HMNH—Evolution and The Language of Color—overseen by HMNH Executive Director Elisabeth Werby.

Opening in April 2009, the permanent exhibition Evolution fulfills the museum’s mission to be the public face of the important work occurring beyond its galleries. Farish A. Jenkins’ discovery of the missing link between fishes and terrestrial vertebrates—Tiktaalik roseae—greets visitors in both fossil and model form. Other MCZ research topics include a display on the evolution of Anolis lizards on Caribbean islands—research conducted by Jonathan Losos—and the investigation into the evolution of mammalian ear bones from reptilian jawbones by Alfred “Buzz” Crompton. The exhibit also includes a “trophic pyramid” of beetles, conceived by Brian D. Farrell, with each specimen representing approximately 1,000 species.

The Language of Color was originally a temporary exhibit, but due to an overwhelming public response, it will remain a permanent exhibit at HMNH. The exhibit explores how animal colors are produced, the varied ways in which color is perceived, and the diverse messages that animal colors convey. The exhibition employs specimens from the MCZ’s vast collections and highlights the cutting edge evolutionary research being conducted by its faculty-curators. The opening lecture, “Nature’s Palette: The Biological Significance of Color,” was given by Hopi E. Hoekstra. Professor Hoekstra’s research into the genetic mechanism that allows the adaptation of camouflage coloration in two subspecies of mice is illustrated in a display on the oldfield mouse of central Florida, which are brown Island and white when living on coastal beaches. Featuring the research of Jonathan Losos, a display of Anolis lizards shows their extraordinary species variation and demonstrates how diversity in animal color, size, and behavior is shaped by variations in habitat and lifestyle.

Harvard Museum of Natural History

In September 2008, the Institute of Museum and Library Services (IMLS) awarded MCZ’s Ernst Mayr Library a planning grant of $40,000 to plan an efficient, cost-effective, large-scale digitization workflow with enhanced metadata for biodiversity library materials designated as “special collections.” Under the direction of Librarian Connie Rinaldo and Judy Warnement, Librarian of the Harvard University Botany Libraries, the Ernst Mayr Library and its partners propose to identify solutions for the challenges of digitizing these rare and valuable book and other materials by developing and comparing various technological, economic, and process models.

The IMLS grant will benefit the Biodiversity Heritage Library (BHL), a project initiated in 2005 to digitize the published literature of biodiversity held in major natural history museum libraries, botanical libraries, and research institutions into one comprehensive web-based collection. The Ernst Mayr Library is one of ten institutions participating in the BHL project, playing a leading role in digitization of rare collections and art. To date, BHL has more than 14,000 titles and 37,000 volumes available online. The BHL is also a key component of the Encyclopedia of Life, with links to almost 15 million pages of BHL digitized biodiversity literature from the EOL species pages.

ILMS & The Biodiversity Heritage Library

Awards & Recognition

On March 20, the Harvard Foundation presented the 2009 Scientist of the Year award to James J. McCarthy at the annual Albert Einstein Science Conference, “Advancing Minorities and Women in Science, Engineering, and Mathematics.” Prof. McCarthy was honored for his outstanding work in climate science and marine biology, as well as his studies of climate change across the Arctic region. Prof. McCarthy is the Alexander Agassiz Professor of Biological Oceanography and was Director of the MCZ from 1982 to 2002.

In June, Jonathan Losos received the 2009 E.O. Wilson Naturalist Award from the American Society of Naturalists. The award, established in recognition of Professor Wilson’s lifetime contributions to ecology and evolutionary biology, is given each year to a scholar who has made significant contributions to the knowledge of a particular ecosystem or group of organisms. Prof. Losos’ work with anole lizards in the West Indies has contributed fundamentally to understanding of the roles of natural selection, competition, and niche evolution in shaping assemblages of Anolis species. Four current and former members of the Losos lab from MCZ and Washington University won the American Society of Naturalists’ 2009 Young Investigators’ Prizes: Renee Duckworth, Luke Harmon, Jason Kolbe, and Brian Langerhans. The Young Investigators’ Prizes recognize outstanding and promising work by investigators who received their doctorates in the three years preceding the award or who are in their final year of graduate school.

Scott V. Edwards was elected to the 2009 class of Fellows of the American Academy of Arts and Sciences, joining one of the nation’s most prestigious honor societies and center for independent policy research. Founded in 1780, the American Academy of Arts and Sciences studies complex and emerging problems and conducts a wide range of interdisciplinary, long-term policy research endeavors.

The 2009 Whitley Award was presented to graduate student Dino Martins by HRH The Princess Royal, Princess Anne, during a ceremony at the Royal Geographical Society, London, on May 13, 2009. The award recognizes his work with East Africa Natural History Society to inform small-scale farmers of the vital role insects play in pollinating crops and encourage them to adopt conservation-friendly methods of agriculture.

Jesse Weber, a graduate student in Hopi E. Hoekstra’s lab, was awarded the W.D. Hamilton Award for Outstanding Student Presentation at Evolution 2009, the joint annual meeting of the Society for the Study of Evolution, the Society of Systematic Biologists, and the American Society of Naturalists.
...tracking the development of new model systems in Trends in Genetics 24:553-560.


**MCZ Grant Recipients Academic Year 2008–2009**

**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 research collections, laboratories, and facilities.

<table>
<thead>
<tr>
<th>Recipient + Faculty Sponsor</th>
<th>Project Title</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noor M. R. Beckwith + Naomi E. Pierce</td>
<td>Isolating the stimulus for chemotaxis behavior in leaf mining Drosophilid fly larvae</td>
<td>$2,495</td>
</tr>
<tr>
<td>Adam T. Clark + Brian D. Farrell</td>
<td>Developing and testing species diversity models on the MCZ's Boston Harbor Islands ATBI site</td>
<td>$1,390</td>
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<tr>
<td>Laura Horton + Naomi E. Pierce</td>
<td>The effect of ant attendance on the aggregation patterns of Jalmenus evagoras larvae</td>
<td>$2,500</td>
</tr>
<tr>
<td>Kirsten Kester + Colleen M. Cavanaugh</td>
<td>Investigating temporal genetic variation in the deep-sea vent mussel symbions of Bathymodiolus thermophilus</td>
<td>$2,500</td>
</tr>
<tr>
<td>Robert P. Kinkham + Andrew Berry</td>
<td>Genetic constraints to sexually antagonistic selection in bluebirds</td>
<td>$2,500</td>
</tr>
<tr>
<td>Krzysztof M. Kozak + Hopi E. Hoekstra</td>
<td>Evolution of tail length variation in the deer mouse (Peromyscus maniculatus) [Fall cycle]</td>
<td>$2,000</td>
</tr>
<tr>
<td>Krzysztof M. Kozak + Hopi E. Hoekstra</td>
<td>Evolution of tail length variation in the deer mouse (Peromyscus maniculatus) [Spring cycle]</td>
<td>$2,500</td>
</tr>
<tr>
<td>Mato Lagator + Scott V. Edwards</td>
<td>Large-scale multi-focus analysis of evolutionary history in the house finch, Carpodacus mexicanus</td>
<td>$1,657.40</td>
</tr>
<tr>
<td>Joanna Larson + Hopi E. Hoekstra</td>
<td>Genetic relatedness and sex-biased dispersal of Mus spicilegus</td>
<td>$5,000</td>
</tr>
<tr>
<td>Timothy Truer + Naomi E. Pierce</td>
<td>Impacts of land use on tropical insect biodiversity</td>
<td>$2,500</td>
</tr>
<tr>
<td>Gil S. Weintraub + Richard W. Wrangham</td>
<td>The energetic significance of thermal and non-thermal processing of starch-rich foods: implications for human evolution diet</td>
<td>$3,000</td>
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<tr>
<td>Jane C. Xie + Hopi E. Hoekstra</td>
<td>The genetic basis of sexual morphology in Peromyscus (deer mice)</td>
<td>$5,000</td>
</tr>
</tbody>
</table>

**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.

**Miyata Grants**

Miyata Grants are intended to enable herpetological fieldwork by MCZ graduate students. Non-herpetological fieldwork may be eligible when there are no deserving herpetological projects.

<table>
<thead>
<tr>
<th>Recipient</th>
<th>Project Title</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martha Muñoz</td>
<td>Local adaptation and morphological variation in the Guadeloupean Anolis marmoratus species complex</td>
<td>$5,073</td>
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<tr>
<td>Yoel Stuart</td>
<td>The evolutionary response of Anolis carolinensis to competition with an invasive species, Anolis sagrei</td>
<td>$10,333</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Recipient</th>
<th>Project Title</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erin Blevins</td>
<td>Influence of environment on locomotion by yellow stingray, Urobatis jamaicensis</td>
<td>$1,610</td>
</tr>
<tr>
<td>Alexis Harrison</td>
<td>Evolutionary change in the invasive lizard Anolis sagrei</td>
<td>$11,290</td>
</tr>
<tr>
<td>Collin Johnson</td>
<td>Effects of self-fertilization in bryozoans</td>
<td>$2,015</td>
</tr>
</tbody>
</table>

**TOTAL AWARDS**

$30,022.40

$87,535

$57,535

$10,333

$14,915
**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 using the MCZ’s collections.

<table>
<thead>
<tr>
<th>Recipient</th>
<th>Institutional Affiliation</th>
<th>Project Title</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lilia Akhmetova</td>
<td>Zoological Institute, Russian Academy of Sciences</td>
<td>Taxonomic studies of the genus Aphodius (Coleoptera, Scarabaeidae) of Russia with emphasis on the species described by V. Balthasar</td>
<td>$1,040</td>
</tr>
<tr>
<td>Lina Maria Almeida-Silva</td>
<td>Universidade de São Paolo, Brazil</td>
<td>Generic revision of the neotropical and neanarctic spiders of the Macrobrachionae Petrunkevitch (Araneae: Amaurobiidae)</td>
<td>$1,500</td>
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<tr>
<td>Cesio Oliveira Azvedo</td>
<td>Universidade Federal do Espirito Santo, Brazil</td>
<td>Type analysis and key to the Atrotropical Bethylidae (Hymenoptera, Chrysididae)</td>
<td>$1,500</td>
</tr>
<tr>
<td>Aylin Alegre Barroso</td>
<td>Instituto de Ecología y Sistematíca, Cuba</td>
<td>Systematic and compared morphology of Blaintidae, Thorell, 1879 in Cuba (Arachnida: Olipeiones: Laniatores)</td>
<td>$1,000</td>
</tr>
<tr>
<td>Elizabeth Borda</td>
<td>Scripps Institute of Oceanography, University of California, San Diego</td>
<td>Photo-documentation and databasing of museum types of fireworms (Annelida-Amphinomida)</td>
<td>$1,001</td>
</tr>
<tr>
<td>David J. Clarke</td>
<td>Field Museum of Natural History</td>
<td>Biodiversity and speciation in Australasian soils: revisionary systematics and morphology of the rove beetle subfamily Euathelinae (Coleoptera: Staphylinidae)</td>
<td>$1,500</td>
</tr>
<tr>
<td>Estevam L. Cruz da Silva</td>
<td>Pontificia Universidade Catolica do Rio Grande do Sul, Brazil</td>
<td>Revision of the subfamily Phocininae (Araneae, Trechaleidae)</td>
<td>$1,500</td>
</tr>
<tr>
<td>Annelise D’Angiolelia</td>
<td>Museu Paraense, Emilio Goeldi, Brazil</td>
<td>Taxonomy, molecular phylogenetic and biogeography of Anolis chrysolepis Dumeril &amp; Bibron, 1873 (Squamata: Polychrotidae)</td>
<td>$1,500</td>
</tr>
<tr>
<td>Andrej Frolov</td>
<td>Zoological Institute, Russian Academy of Sciences</td>
<td>Revision of the Atrotropical species of the genus Orphus Macleay</td>
<td>$850</td>
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<tr>
<td>Fabio Akashi Hernandes</td>
<td>Universidade de São Paolo, Brazil</td>
<td>Taxonomic revision of the type specimens of the family Bdelidae (Acari: Prostigmata) of the MCZ</td>
<td>$1,480</td>
</tr>
</tbody>
</table>

**Recipient** | **Institutional Affiliation** | **Project Title** | **Amount** |
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Robert A. Johnson</td>
<td>Arizona State University</td>
<td>A revision of South American species of harvester ants in the genus Pogonomymex</td>
<td>$1,000</td>
</tr>
<tr>
<td>Andrew D. Marshall</td>
<td>The University of Queensland, Australia</td>
<td>Investigation of Manta genus of devil rays</td>
<td>$750</td>
</tr>
<tr>
<td>Arebe Ameha Mengistu</td>
<td>Universitat Basel, Switzerland</td>
<td>Amphibian diversity and conservation in the Ethiopian Highlands</td>
<td>$1,500</td>
</tr>
<tr>
<td>Kathryn E. Mickie</td>
<td>University of Kansas</td>
<td>Unraveling the systematics of palaeosoricid fishes—lower actinopterygians in need of complete revision</td>
<td>$1,200</td>
</tr>
<tr>
<td>Monika I. Páez</td>
<td>El Museo de Zoología de la Pontificia Universidad Católica del Ecuador</td>
<td>Systematics of the Hyoidea bocagii Clade (Anura: Dendrobatidae)</td>
<td>$1,500</td>
</tr>
<tr>
<td>Roberta Paresque</td>
<td>Universidade de São Paolo, Brazil</td>
<td>Patterns of speciation and diversification of rodents of the genus Dolichoonyx (Rodentia: Cricetidae)</td>
<td>$750</td>
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<tr>
<td>Christian Rabelling</td>
<td>University of Texas, Austin</td>
<td>The evolution of obligate social parasitism in the ant genus Taxona</td>
<td>$1,100</td>
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<tr>
<td>Marcelo Salles Rocha</td>
<td>Instituto Nacional de Pesquisas da Amazônia, Brazil</td>
<td>A systematic revision of “Pimelodus group” (Siluriformes: Pimelodidae)</td>
<td>$1,000</td>
</tr>
<tr>
<td>Aldo Alberto José Santos</td>
<td>Universidade Federal de Minas Gerais, Brazil</td>
<td>Taxonomic revision of the neotropical species of the orb-weaving spider genus Eustala (Araneae: Araneidae)</td>
<td>$1,500</td>
</tr>
<tr>
<td>Bernardo Ferrreira Santos</td>
<td>Universidade Federal do Espirito Santo, Brazil</td>
<td>Systematics of neotropical Crystinae (Hymenoptera, Ichneumonidae)</td>
<td>$1,500</td>
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<tr>
<td>Jae-Choon Sohn</td>
<td>University of Maryland</td>
<td>A taxonomical study of the North American Yponomeutoidea (Insecta: Lepidoptera)</td>
<td>$740</td>
</tr>
<tr>
<td>Sergey Tarasov</td>
<td>Kaluga State Pedagogical University (Russia) and University of Copenhagen (Denmark)</td>
<td>1) Toward the revision of the oriental Orthoptagius (Coleoptera, Scarabaeidae, Scarabaeinae) 2) Revision of the oriental genus Cassius (Coleoptera, Scarabaeidae, Scarabaeinae)</td>
<td>$1,400</td>
</tr>
<tr>
<td>Ilya Temkin</td>
<td>Smithsonian Institution National Museum of Natural History</td>
<td>Towards a global revision of pteriodean bivalves: The importance of MCZ’s historical collections</td>
<td>$800</td>
</tr>
<tr>
<td>Michael C. Thomas</td>
<td>The Museum of Entomology, Florida State Collection of Arthropods</td>
<td>Revision of Laemmphoidea species of harvester ants in the genus Pogonomymex</td>
<td>$1,200</td>
</tr>
</tbody>
</table>

**TOTAL AWARDS** | **Amount** |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>$30,311</td>
<td></td>
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</tbody>
</table>
Financial Data

These charts represent the Museum of Comparative Zoology's income and expenses for fiscal year 2009. Endowment income funds much of the Museum’s activities, including acquisition and maintenance of the collections, faculty and staff salaries, capital projects, and facilities renovations and maintenance. Transfers include Harvard University-funded faculty research and financial support for the Ernst May Library. Other income comprises interest from all remaining balances at the end of the fiscal year, miscellaneous income from publication subscriptions, royalties, sales and fees, and revenue generated from assets purchased through endowments.

Faculty-Curators
Andrew A. Biewener
Charles P. Lyman Professor of Biology; Director, Conocph Field Station; Chair, Department of Organismic and Evolutionary Biology
Scott V. Edwards
Professor of Biology, Alexander Agassiz Professor of Zoology, Curator of Ornithology
Brian D. Farrell
Professor of Biology, Curator of Entomology
Gonzalo Giribet
Professor of Biology, Curator of Invertebrate Zoology
James Hanken
Professor of Biology, Alexander Agassiz Professor of Zoology, Curator of Herpetology, Director, Museum of Comparative Zoology
Hopi E. Eberlein
John L. Loeb Associate Professor of the Natural Sciences; Curator of Mammalogy
Farah A. Jenkins, Jr.
Professor of Biology, Alexander Agassiz Professor of Zoology, Curator of Vertebrate Paleontology; Professor of Anatomy in the Harvard-MIT Division of Health Sciences & Technology (Harvard Medical School)
George L. Lauder
Professor of Biology, Alexander Agassiz Professor of Zoology, Curator of Ichthyology
Karel F. Liem
Professor of Biology, Henry Bryant Bigelow Professor of Ichthyology, Curator of Ichthyology
Jonathan Losos
Professor of Biology, Monique and Philip Lehman Professor for the Study of Latin America, Curator of Herpetology
Charles R. Marshall
Professor of Biology and of Geology, Curator of Invertebrate Paleontology
James J. McCarthy
Professor of Biological Oceanography, Alexander Agassiz Professor of Biological Oceanography, Acting Curator of Malacology
Naomi K. Pierce
Sabra D. and John H. Hessel Professor of Biology, Curator of Entomology
Robert M. Woodland
Professor of Biology, Curator of Marine Invertebrates

Emeritus Faculty
Kenneth J. Boss
Faculty Curator Emeritus; Professor of Biology, Emeritus
Alfred "Fuzzy" Crompton
Faculty Curator Emeritus
Herbert W. Levri
Faculty Curator Emeritus; Professor of Biology, Emeritus
Richard C. Leviton
Professor of Biology, Emeritus; Alexander Agassiz Professor of Zoology, Emeritus
Edward O. Wilson
Honorary Curator of Entomology; Kellogg University Professor Emeritus

Postdoctoral Fellows
Miguel Alcaraz
Ornithology, Edwards Lab
Sonia Andrade
Invertebrate Zoology, Giraud Lab
Marco Archehti
Entomology, Pierce Lab
Allison Arnold-Riehe
Concord Field Station, Bineman Lab
Camille Bonneaud
Ornithology, Edwards Lab
Rose Carlson
Ichthyology, Lauder Lab
Andrew Carroll
Concord Field Station, Bineman Lab
David C. Collier
Herpetology, Loos Lab
Nina Domingues
Mammalogy, Hoekstra Lab
Anna Dubiec
Ornithology, Edwards Lab
Rodney Eastwood
Entomology, Pierce Lab
Heidi Fisher
Mammalogy, Hoekstra Lab
Xuan Nguyen
Entomology, Pierce Lab
Megan Fredericksen
Entomology, Pierce Lab
Anthony Herrel
Herpetology, Loos Lab
Tim Higham
Concord Field Station, Bineman Lab
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Herpetology, Loos Lab
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