Rotunda

American Museum of Natural History

Members’ Magazine
Winter 2011 Vol. 36 No. 1

Spotting New Species

Science at the Museum

Field Work Worldwide: a Snapshot

Building the Tree of Life

Research in High-Res
As we usher in 2011, the Museum is preparing a number of new ways for you to “enter” the Museum and more easily access everything it has to offer, whether your visit begins on Central Park West or at amnh.org. While the restoration of the Central Park West side of the Museum is under way, we are pleased to have already created a new path into the Museum—literally! The iconic Barosaurus mount in the Theodore Roosevelt Rotunda has long dominated this grand space, but with foot traffic diverted around it. Late last year, without disturbing or moving the beloved Barosaurus, her young one, or the attacking Allosaurus, we removed the center section of the exhibit’s platform so that visitors can walk straight into the Museum—and directly between and under the dueling dinosaurs. This 8-foot-wide opening becomes a new “welcome mat” to the Museum while offering a fresh, exhilarating point of view on the largest freestanding dinosaur mount in the world.

In the age of the virtual, enhancing access to the Museum is not merely a matter of improving the physical entryway. The Museum is also increasingly using new media in pioneering ways to bring its science, exhibitions, and education to visitors—wherever, whenever. In addition to the recently launched AMNH Explorer, Dinosaurs, and Cosmic Discoveries iPhone apps, the Museum is preparing to unveil a spectacular new website about dinosaurs, which will bring the Museum’s world-renowned fossil collection to the public in a number of intriguing ways, including videos on fossil hunting, an interactive “Dinosaurs A-Z” encyclopedia, cladograms, and more. This exciting new website is just a glimpse of a completely redesigned amnh.org that is coming this spring. Stay tuned!

The Tree of Diagnosis is one of 64 pieces in the new exhibition Body and Spirit: Tibetan Medical Paintings. Just as Western medical historians prize classic texts, whether Henry Gray’s 1858 Anatomy Descriptive and Surgical or Walter B. Cannon’s 1932 The Wisdom of the Body, students of Tibetan medicine value scroll paintings that illustrate traditional medical knowledge and procedures. Sixty-four modern copies of such medical paintings from the Museum’s collection are the subject of a new special exhibition, Body and Spirit: Tibetan Medical Paintings, which opens January 25 in the Audubon Gallery on the Museum’s fourth floor. Curated by Laila Williamson, senior scientific assistant in the Division of Anthropology, with host curator Laurel Kendall, chair of the division, the exhibition will run through July 17.

In the 17th century, a series of paintings was commissioned for use as teaching aids in a medical school founded in Lhasa, Tibet, by Sangey Gyaltsen, regent to the Fifth Dalai Lama and author of the Blue Beryl, an important commentary on the classic Tibetan medical text Four Tantras. The fate of the original paintings, which were created between 1687 and 1703, is unknown. But in the late 1990s, Romio Shrestha, a Nepalese artist, and his students reproduced 79 paintings, painstakingly rendering their intricate details in vegetable and mineral dyes on canvas. These Tibetan Medical Paintings, acquired and conserved with the support of Emily H. Fisher and John Alexander and exhibited with the support of a generous gift from the Estate of Marian O. Naumburg, are believed to be among only a handful in existence, providing a unique and rich history of medicine in Tibet.

Among the paintings on display in the exhibition are depictions of human anatomy; the process of human development from conception to birth; 302 points of the body vulnerable to injury; and the origins of dreams and how they bring the sleeper to either the Beautiful realm of the gods or the ugly realm of tormented spirits. “A tree of diagnosis” conveys how a doctor makes a diagnosis and treats diseases by observing, touching, and questioning the patient. Other paintings illustrate various Tibetan medical implements, therapies, and remedies—one of them, an elixir of many ingredients, including honey, yak butter, garlic, and flowers, that works through the healing power of the Buddha to give the patient “the body of a 14-year-old with the prowess of a lion, strength of an elephant, complexion of a peacock, speed of a trained horse, and the life span of the Sun and Moon.”

For details, visit amnh.org.

The Museum separated the two dinosaurs late last summer.

Watch a video of the ceremonial first cut in the mount at amnh.org/news.

The Art of Medicine

For 20 years, visitors entering the Museum’s majestic Theodore Roosevelt Rotunda have been greeted with a dramatic representation of an imagined prehistoric encounter: a Barosaurus rearing up to protect her young from an attacking Allosaurus. Now visitors can become part of this scene by walking between the Allosaurus and the towering Barosaurus, the tallest freestanding dinosaur mount in the world. Last summer, the Museum separated the two long-time combatants by cutting an 8-foot-wide pathway through the fiberglass and steel platform they had shared since the mount was first installed in 1991. In preparation for the task, a team from Research Casting International (RCI), the company that installed the original mount, secured the skeletons in part by lassoing the neck of the Barosaurus. In addition to the original mount, the Barosaurus and treading the supporting rope to the top of the vaulted ceiling, 100 feet above the floor.

Watch a video of the ceremonial first cut in the mount at amnh.org/news.

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Stay tuned!

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The Art of Medicine

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The Butterfly Brief: Heliconius cydno

Butterflies that belong to the Heliconius genus, known colloquially as longwings, have discovered the secret to butterfly longevity. Like most members of the order Lepidoptera, longwings spend most of their lives as caterpillars, feeding on leaves and growing swiftly. After moulting several times, the mature caterpillar leaves the plant to pupate in the ground. When they emerge from their pupae, they become butterflies and fly off to cover vast distances. However, the butterflies’ warm tropical habitats—with their high humidity and temperatures—pose challenges. To counter these, many butterflies use a defense mechanism, known as Mullerian mimicry, which involves being similar in color to other species. These defenses protect them from predators, allowing them to live for months. Yet, their lifespan isn’t what gives these butterflies their name; their striking coloration is what makes them so remarkable.

In preparation for the Museum’s Butterfly Conservatory: Tropical Butterflies Alive in Winter, over a month was spent recreating the butterflies’ warm tropical habitats—with their high humidity and temperatures—to cover vast distances. However, the butterflies’ warm tropical habitats—with their high humidity and temperatures—pose challenges. To counter these, many butterflies use a defense mechanism, known as Mullerian mimicry, which involves being similar in color to other species. These defenses protect them from predators, allowing them to live for months. Yet, their lifespan isn’t what gives these butterflies their name; their striking coloration is what makes them so remarkable.

Tropical Butterflies Alive in Winter, which runs through May 30.

Follow the Thread: A Mandarin Coat

In 1901, budding anthropologist Berthold Laufer sent a brilliant blue silk robe he had bought in Shanghai to the American Museum of Natural History with a simple note: “Coat of a mandarin, for the summer.” Within a few years, fakes would flood the market, says Curator Kendall Kentland, chair of the Division of Anthropology, but the time and place of this purchase indicates that it is “the real thing,” a coat that could only have been worn by a scholar-advisor to the Imperial Court during the Qing dynasty, which lasted from 1644 to 1911.

Part of the Museum’s extensive collection of textiles, this coat exemplifies the rigidly defined rules of Imperial Court dress in which an elaborate system of colors and motifs telegraphed rank. The dragon, for example, is the highest ranking “yang” or male symbol, and a sign of the Emperor’s power. The water represented at the bottom of the robe reflects the legendary role of dragons in East Asia’s traditional agrarian societies as denizens of lakes, rivers, and seas, who once a year ascend to the heavens to bring on the rain. Overall, the decoration suggests a mandarin of the fourth to sixth rank.

Laufer, who would go on to become the premier Sinologist of his generation, was sent to China by Franz Boas, then director of the Museum’s Anthropology Division and the acknowledged father of the field in America. Boas had secured a grant of $13,000 (about $400,000 today) from New York banker Jacob H. Schiff to cover Laufer’s expenses for three years to gather “collections which illustrate traditional agrarian societies as demarcated by lakes, rivers, and seas.”

Go behind the scenes of the Division of Anthropology’s ethnographic collections on February 24 on a Members-only tour. See page 16 for more details.
The Museum has a long tradition of exploration. Today, field work is still a core component of research and collection. Below is just a small sampling of 2010 field expeditions.

**In the Field**

**Ben R. Oppenheimer**
Curator of Physical Sciences
Dr. Oppenheimer worked at the Palomar Observatory in California on a survey of nearby stars of exoplanets and discovered objects orbiting several famous stars.

**David Hurst Thomas**
Curator of Anthropology
Dr. Thomas continued archaeological survey and excavation on St. Catherines Island, documenting the earliest known human presence on the island.

**Lorenzo Prendini**
Associate Curator of Invertebrate Zoology
Dr. Prendini, who studies scorpions, carried out fieldwork in Namibia, Puerto Rico, US Virgin Islands, Mona Island, South Africa, Mozambique, Australia, Chile and Mexico.

**Charles Spencer**
Curator of Anthropology
Dr. Spencer continued the excavation and analysis of a Zapotec ceremonial precinct dating to 300-100 BC in Oaxaca, Mexico.

**Ross MacPhee**
Curator of Vertebrate Zoology
Dr. MacPhee, who curated the End of the Earth, continued his fieldwork in west Antarctica.

**John Maisey**
Curator of Paleontology
Dr. Maisey carried out fieldwork in Arkansas, where he collected a fossil shark from the Fayetteville Shale.

**Alex de Voogt**
Assistant Curator of Anthropology
Dr. de Voogt traveled to Nubia to describe a new and unusual dromaeosaur.

**Melanie L. J. Stiassny**
Curator of Vertebrate Zoology
Dr. Stiassny traveled to the Congo, continuing survey work on the fishes of the Congo River Basin.

**Mark Norell**
Curator of Paleontology
Dr. Norell traveled to Romania to describe a new and unusual dromaeosaur.

**Mark Siddall**
Curator of Invertebrate Zoology
Dr. Siddall carried out fieldwork in the Peruvian Amazon, where he described a new leech.

**Roan Macpherson**
Curator of Vertebrate Zoology
Dean Richard Gilder Graduate School
Dr. Flynn, who researches the evolution of mammals and Mesozoic vertebrates, carried out fieldwork in western Madagascar and the Peruvian Amazon.

**John Sparks**
Associate Curator of Vertebrate Zoology
Dr. Sparks’s work included surveys of marine fishes in Vietnam to continue research on bioluminescence and the evolution of hearing.

**John Flynn**
Curator of Paleontology
Dean Richard Gilder Graduate School
Dr. Flynn continued his research of mancala and mancala-like games in the Middle East.

**Edmond Mathez**
Associate Curator of Physical Sciences
Dr. Mathez studied the Bushveld Complex, an enormous fossil magma body in South Africa and the world’s major source of several important metals.

**George Harlow**
Curator of Physical Sciences
Dr. Harlow returned to the Motagua Valley in Guatemala to study the origin of jade.

**Christopher Raxworthy**
Associate Curator of Vertebrate Zoology
Dr. Raxworthy traveled to Madagascar, Mauritius, and the Seychelles to continue his studies of endemic chameleons.

**Michael Novacek**
Curator of Paleontology
Dr. Novacek is one of the team leaders of the annual American Museum of Natural History/Mongolian Academy of Sciences expeditions to the Gobi Desert.

**Ross MacPhee**
Curator of Vertebrate Zoology
Dr. MacPhee, who curated Race to the End of the Earth, continued his fieldwork in west Antarctica.

**Christopher Raxworthy**
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Dr. Raxworthy traveled to Madagascar, Mauritius, and the Seychelles to continue his studies of endemic chameleons.

**Jin Meng**
Associate Curator of Paleontology
Field work took Dr. Meng to remote parts of China as he continued research on the evolution of rodents and rabbits.

**Laurel Kendall**
Curator of Anthropology
Dr. Kendall visited Borneo to explore prospects for a work of ikat weaving and documentation of its manufacturing process.

**Ben R. Oppenheimer**
Associate Curator of Physical Sciences
Dr. Oppenheimer worked at the Palomar Observatory in California on a survey of nearby stars of exoplanets and discovered objects orbiting several famous stars.

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**Melanie L. J. Stiassny**
Curator of Vertebrate Zoology
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To walk the fourth floor of the Museum—peering at the jagged “teeth” of armored fish Dunkleosteus, ducking under the 23-foot wingspan of the flying reptile Pteranodon, studying the long curved tusks of the elephant relative Mammutthus—is, in a sense, to walk the tree of life.

Each branching point represents the arrival of an evolutionary innovation—jaws, water-tight eggs, hooves, respectively—that unites one group of animals and distinguishes them from lineages that lack the feature. Known as synapomorphies, or shared traits derived from a common ancestor, these are the tracks of evolution. Scientists have used trees to order life since before Charles Darwin first scribbled a spiky diagram in his notebook. In the 1950s, German biologist Willi Hennig formally proposed that trees of life should reflect evolutionary relationships among organisms, founding cladistics: a method for grouping organisms into ancestor-descendent clades, from the Greek word for “branch,” based on shared, derived features. But it took a Museum scientist, ichthyologist Gareth Nelson, to disseminate the idea among English-language biologists. Together with students and colleagues at the Museum—including another ichthyologist, Donn Rosen, paleontologists Eugene Gaffney and Niles Eldridge, ornithologist Joel Cracraft, and invertebrate specialists Norman Platnick and Randall T. Schuh—Nelson steadfastly argued the case for cladistics as the tool to test classification during academic talks, in research papers, and even on napkins over meals.

So began the “cladistics wars” of the 1960s and 1970s that pitted those who build trees with cladates against biologists who favored competing schools of taxonomy: phenetics, which does not use evolutionary relationships and instead relies on an expert to determine groupings using observable traits; and evolutionary systematics, which considers evolutionary relatedness in a less rigorous way.

“Cladistics changed everything and brought true hypothesis testing that maps evolutionary paths onto the Tree of Life,” says Curator Darrel Frost, one of the experts to lead the way for this new method. “It blew everything out of the water.”

Semenal work that applied cladistics to classification during this time included Gaffney’s paper on fossil turtles, which was published by the Museum. “I was a grad student in Arizona when Gene Gaffney’s 1975 Bulletin of the American Museum of Natural History was published,” says Curator Darrel Frost, a herpetologist. “It blew everything out of the water.”

Cladistics is now the commonly used taxonomic system, and many Museum scientists have spent their careers using evolutionary relationships to refine the Tree of Life, from trunk to the twigs (see sidebar). While cladistics was initially limited to analyzing morphological, or observable, characteristics, two recent technological leaps—DNA sequencing and the power of supercomputing—have allowed scientists to produce ever-more intricate and testable cladograms, with significant applications that include drug development and conservation initiatives.

“We couldn’t design drugs or vaccines for pathogens without understanding the relationships of organisms and the evolutionary process that produced the tree,” says Curator Rob DeSalle.

New streams of funding from federal initiatives such as the Assembling the Tree of Life (AToL), a project from the National Science Foundation, secured in part by the efforts of Museum scientists, is furthering these research efforts. “Building trees is now a big enterprise,” says Cracraft. “It is also spawning significant applications that include drug development and conservation initiatives.”

Today, Museum scientists continue the work of building and revising trees of life using cladistics and drawing on the latest available technology, which includes genetic analysis and supercomputing. Some examples from curators and their colleagues include:

- John Flynn’s molecular research on carnivores found that seals moved from land to water independently of sea lions and walruses.
- Jin Meng described surprising mammal fossils, including one that ate small dinosaurs, that lived during long-past geological periods, very few have left living and modified descendants.
- John Maisey analyzed amphibian evolutionary relationships in what is still the largest phylogenetic study of vertebrates ever undertaken.
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Spotting New Species

A tawny bat peers down its leafy nose from a photo taped to the wall over Curator Nancy Simmons’ desk. She thinks it is an unknown species. “Colleagues in Belize sent me this photo,” she says. “I keep it as a reminder of the species still waiting to be discovered.” Many Museum scientists spend their careers cataloging new life. In recent years, this work has gained new urgency because of the increasingly rapid disappearance of species around the world, termed “loss of species still waiting to be discovered.”

Findings take special focus and dedication. These animals tend to be from relatively inaccessible areas, overlooked by previous generations, or just very good at looking like their closest relatives. The list below is a mere fraction of the hundreds of new species described by Museum scientists and their colleagues since 2004.

**Astelia vanuauensis**
Vanua Levu, Fiji
Curator David Crimmler, Division of Invertebrate Zoology

- Often found rolled in banana leaves, this small fly’s broad shiny face and black and yellow body seem to float when it runs across a surface. It is found in the ruggedly tropical island for which it is named, Fiji’s second largest.

**Plasmodium gemini**
Sunda Province, Papua New Guinea
Associate Curator Susan Perkins, Division of Invertebrate Zoology

- Detected in blood samples drawn from lithids, this simple single-cell parasite is one of 200 species of malaria parasites that have been found in birds, mammals, and squamates. This species tends to “twin” in the cells of its host, the modest forest dragon.

**Phreatobius sanguijuela**
Sanguijuela Catfish
Democratic Republic of the Congo
Curator Scott Schaefer, Division of Vertebrate Zoology

- Blood-red and blind, this catfish popped up in a 20-foot well dug to draw water from an underground spring. Its closest relative is 6,000 miles down the Amazon River, so the discovery hints at undiscovered diversity that is probably highly endangered because of its shrinking habitat.

**Antipodactis scotiae**
Rayed Sea Anemone
Southern Ocean near Antarctica
Assistant Curator Estefanía Rodríguez, Division of Invertebrate Zoology

- Of an ancient lineage yet morphologically simple, this sea anemone snatches food from the water column using salmon-colored tentacles that fade to white. This new species—also credited to a new family—was collected from a depth of 6,000 feet in frigid polar seas.

**Hadogenes soutpansbergensis**
Soutpansberg Flat Rock Scorpion
Soutpansberg range, South Africa
Associate Curator Lorenzo Prendini, Division of Invertebrate Zoology

- With bodies flat as pancakes, these seldom-seen scorpions squeeze into deep crevices made when sandstone weathered. The species has an elongated tail with a venomous sting and narrow pinching pedipalps—the second pair of limbs—to capture prey in confined spaces.

**Curralium cronini**
Ginnieville, Florida
Curator Randall T. Schuh, Division of Invertebrate Zoology

- So recent that its description required the creation of a new family as well as a new genus and species, this true bug is ruby red. It is native to the southeastern U.S. and probably evaded detection because it is only slightly larger than the period at the end of this sentence.

**Peroperux pallidopetra**
Pale-winged Dogfly Bat
Lowland Ecuador and Peru
Curator Nancy Simmons, Division of Vertebrate Zoology

- With wings as clear as windows and soft brown fur, this insect-eating bat lives in the rainforests of Amazonia. The agile flyer belongs to a group of bats that often evades survey nets because of their sensitive echolocation system.

**Calloimma peltierorum**
Peltier’s Chameleon
Tsaratanana Massif, Madagascar
Associate Curator Christopher Rayworth, Division of Vertebrate Zoology

- Roughly barred by tiny spines lining its chin, this shape-shifting chameleon can raise lobes behind its eyes to threaten competitors or predators. It is found hiding onto slim branches with pincer-like feet in the rainforest atop Madagascar’s tallest mountains.

**Microlestes scelley**
Black Hover Wasp
Northern Vietnam
Associate Curator Susan Perkins, Division of Invertebrate Zoology

- Often found rolled in banana and wild ginger leaves, this wasp’s broad shiny face and black and yellow body seem to float when it runs across a surface. Its tiny relatives—in its immediate family—are very good at looking like their closest relatives—other didelphid opossums—are the most basal group (from the earliest branch) of marsupials living today.

**Eustenogaster nigra**
Black Hover Wasp
Northern Vietnam
Curator James Carpenter, Division of Invertebrate Zoology

- Suited completely in black, this hover wasp is among the most basal social wasps. The fine brown nests of this species—used by adults for winter protection—look like inverted flasks hanging from fibers or wires and have fewer than 20 cells for offspring.

**Osteolaemus osborni**
Central African Dwarf Crocodile
Gongo Basin, Central Africa
George Amato, Director of Sackler Institute for Comparative Genomics

- One of the few crocodiles that have not been formally described by Museum scientists and their colleagues since 2004. This group has not been seen at Mt. Pinos since the 1940s but was thought to have a more northeastern population in the Sierra Nevada. However, new genetic research on Museum skins shows that O. osborni is extinct: the Sierra population is a different species, O. fuliginosus.

**Paretropius lamenabe**
Giant Red Fish
Mahajamba River, Madagascar
Associate Curator John Sparks, Division of Vertebrate Zoology

- A giant among gobies spiders at one-tenth of an inch, this arachnid is taco-shaped and salam-hued. This species and more than 40 of its petite relatives were discovered by meticulously sorting the leaf litter in which they reside.
elicate, with the eerie beauty of a 19th-century engraving, the gray-and-white cross-section of *Nautilus pompilius*—an object of ongoing research by Museum paleontologist Neil Landman—is the product of a cutting-edge, high resolution, computed tomography (CT) scanner. Acquired by the Museum this summer with a grant from the National Science Foundation, the GE Phoenix V/home’s Dual-Tube CT Scanner is one of only four of its kind in the country and allows researchers to look deep inside both small and large specimens without destroying them in the process.

“We can see spatial detail not available in dissection, and some parts are so delicate they would be otherwise missed,” says Dr. Landman, curator in the Division of Paleontology who, with geologist Denton Ebel, associate curator in the Division of Physical Sciences, and Curator Darrel Frost, a herpetologist, wrote the successful grant application for the scanner. “Three-dimensional visualization is such an important part of our thinking now—you can put your arms around the object you are studying.”

For each image, the scanner, as a rule, takes 1,500 to 1,700 x-ray images as the sample is rotated in the x-ray beam, at a level of resolution 100 times that of a typical medical scanner used on humans. These images are then used to create a 3D image of the entire specimen—essence, a stack of virtual dissection slices—that can be manipulated, rotated, and studied from every angle, revealing unprecedented details of its internal structure. “We can only capture so much of the morphology from the surface,” explains Landman. “You want to get insights into the interior.”

In the case of the *Nautilus pompilius* pictured above—a newly hatched specimen recovered in Fiji in the 1950s—Landman is interested in what the interior chambers can tell him about the animal’s buoyancy, a key factor in its survival after birth. Little is known about nautiloids, a group whose ancestors are so old—400 million years—that the extinct creatures are called “living fossils.” No one even knows where these invertebrates lay their eggs, which develop slowly to hatch at the largest size of all invertebrates and then take 15 years to reach reproductive maturity. (Landman recently gave a presentation at a Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) conference in France, where he cautioned that due to its slow development and rate of growth, “this is an animal that doesn’t want to overfish because it may never recover.”)

Since its installation, the dual-tube CT scanner has lent itself to the study of a host of diverse specimens: meteorites by Ebel; rare bat skulls by Nancy Simmons, chair of the Division of Vertebrate Zoology; an early 20th-century knife from Egypt by Alex de Vogt, assistant curator in the Division of Anthropology; the reproductive systems of female spiders by Matthias Burger, a postdoctoral researcher; and the gut contents of a termite entombed in amber by David Grimaldi, curator in the Division of Entomology. The scanner is also accessible to researchers from other institutions, including art conservators who use it to assess fine cracks in antiquities. Rebecca Rudolph, laboratory manager for the Museum’s Microscopy and Imaging Facility, notes that previously, Museum scientists were forced to go off-site for CT scanning, either to a hospital to use a medical scanner or to a facility such as the University of Texas.

For researchers who intend to cut into a specimen eventually, the CT scanner allows them to zero in on the most promising areas for physical analysis, as well as capture a 3D image of the interior while it’s still intact. “It takes a lot of guesswork out of the equation,” says Landman. And those antique engravings and the early naturalists whose discoveries inspired them? Landman said he was thinking only recently about what would happen if someone from another era were suddenly dropped into a 21st-century imaging lab. “They would think it was magic,” he said. “Absolute magic!"

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**A Defensive Discovery**

Edward Stanley, a doctoral candidate in comparative biology at the Museum’s Richard Gilder Graduate School, made a surprising discovery using the new state-of-the-art CT scanner: the presence of tiny osteoderms, or bony plates, along the legs of the cag lizard *Pseudocordylus subviridis*. This particular lizard was thought to have such plates, which are believed to serve as protective armor, only on its head and tail.

A graduate of the University of St. Andrews in Scotland with a master’s degree from Villanova, Stanley is aiming to tease apart the evolutionary history of a family of African “girdled lizards” (*Cordylidae*). Osteoderms are embedded in the skin and not attached to the skeleton, exactly the kind of evidence that can be disturbed in dissection. Seeing these features in place using the CT scanner gives him a set of clearly defined characteristics for sorting out the relationships among species. This technique, says Stanley, “allows you to see traits and patterns that were simply not observable before.”

Girdled lizards are vulnerable to predators from the air and on the ground. It appears that the slower-moving the species, the more heavily they are armored, presumably protecting them from attacks by mongooses, snakes, and other land predators. The less-armored species seem to have evolved a quickness needed to evade diving-birds. While it is too early to say for certain, Stanley’s research, which focuses on the correlation between amount of armor and speed, suggests that *Pseudocordylus subviridis* fits the latter category. Several members of this lizard family live high up in the mountains where avian predators are common, and this lightly armored form has evolved multiple times independently in these environments.

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This image of a *Pseudocordylus subviridis* highlights its tail armor.
**Programs and Events**

**January**

**SciCafe**
Wednesday, January 5
Doors open at 7 pm
Free admission, cash bar
3+ with ID

An informal evening of science, cocktails, and conversation. Visit amnh.org/scicafe for details.

**How I Killed Pluto with Mike Brown**
Monday, January 10
7:30 pm
$15
9:30 Members

Hear the dramatic account of the most tumultuous year in modern astronomy.

**Twinkling Stars: Mythic Creatures in the Sky**
Tuesdays, January 11 and January 18
4:30–6 pm
For grades 2 and 3, one adult per child has option to attend $60 for a child with one adult

This introduction to the night sky was developed for budding astronomers.

**Adventures in the Global Kitchen: Wine and Aging**
Wednesday, January 12
6:30 pm
$25
Dr. Joseph Maroon discusses resveratrol, an enzyme found in red wine that has been shown to slow the effects of aging.

**Members’ Only Tours**
Saturday, January 15
3:45–6 pm
Free (registration required)

An insider’s introduction to all the Museum has to offer. The tour meets in the Portrayal Room.

**Windows on Nature: Akexley Hall of African Mammals**
Wednesday, January 19
6:30–9 pm
$35 per person

One expert panel will discuss Kingdom Under Glass with Jay Kirk
Thursday, January 13
6:30–6 pm
$12

Jay Kirk will discuss Kingdom Under Glass: A Tale of Obsession, Adventure, and One Man’s Quest to Preserve the World’s Great Animals, his sweeping biography of explorer and taxidermist Carl Akeley, for whom the Museum’s Akeley Hall of African Mammals is named.

**One Step Beyond**
Friday, January 14
9 pm–1 am
$21+ with ID

Enjoy a night of drinks and dancing in the Rose Center for Earth and Space and a complimentary screening of a Space Show.

**BrainFEST!**
Saturday, January 15
1–5 pm
Free

Learn about the brain with puzzles and games for the whole family.

**Neuroeconomics: Decision Making and the Brain**
Thursday, January 20
6:30 pm
$15 Members
$25 New York University’s Paul Glimcher and Curator Rob DeSalle will discuss neuroeconomics.

**A Night at the Museum: Sleeperoom**
Friday, January 21
Members’ price $19 per person
This unique after-hours opportunity will thrill kids ages 7 to 15 and their caregivers.

**Wild, Wild World: Wolves**
Saturday, January 22
11 am–noon, 1–2 pm
Members’ tickets are $8 children, $10 adults
Learn about the vital role wolves play in sustaining a healthy ecosystem.

**Evolution of the Brain Hall Tour**
Sunday, January 23
3–4:30 pm
Free (registration required)

Join guide Eileen Flood on a tour that focuses on brain development and evolution.

**SciCafe**
Wednesday, February 2
Doors open at 7 pm
Free admission, cash bar
3+ with ID

An informal evening of science, cocktails, and conversation. Visit amnh.org/scicafe for details.

**ArchaeoAstronomy**
Thursdays, February 3 and 10
(For grades 7 and 8)
4–6 pm
Free

Learn about the brain through a sweeping biography of explorer and taxidermist Carl Akeley, for whom the Museum’s Akeley Hall of African Mammals is named.

**Brain Workshop**
Sundays, January 30 and February 6 and 13
11 am–12:30 pm (For grades 3 and 4)
1:30 pm–3:30 pm (For grades 5 and 6)
$10

Discover the roles of celestial bodies and events in the cultures of ancient peoples.

**Meet the Scientist**
Saturday, February 5
Free with Museum Admission
Visitors ages 7 and up can meet a scientist in the Discovery Room.
Call 212–515–7015 for details.

**Winter Wildlife Weekend**
Saturday, February 5–Sunday, February 6
$55 per person, double occupancy
$400 single occupancy

Please register by January 19 by calling 212-769-5606. Join ornithologist Paul Stuart on this two-day birding and wildlife expedition to Long Island’s Montauk Point. Flocks of sea ducks gather to forage on these rocky shores; gannets plunge for fish off the point; and other winter visitors include Bonaparte’s Gulls, loons, and grebes. Price includes transportation by private coach, one night at the Born Free Motel (rooms include private bathroom and kitchenette), and dinner at Shagwong Restaurant on Saturday night.
The Reality of Parallel Universes and the Deep Laws of the Cosmos with Brian Greene
Monday, February 7
7:30 pm
$15.50 Members
Theoretical physicist Brian Greene will discuss models of parallel universes.

From the Field: Revisiting Akeley’s Gorillas
Wednesday, February 9
6:30 pm
Free to the first 75 Members (registration required)
Stephen C. Quinn will share works, including a panoramic plein-air painting, completed on a recent trip to the eastern Congo basin.

Windows on Nature: Birds
Thursday, February 10
6–7:30 pm
$35 per person
Author of Windows on Nature: The Great Habitat Dioramas of the American Museum of Natural History
Stephen C. Quinn leads this tour of masterpiece dioramas featuring birds.

One Step Beyond
Friday, February 11
9 am–1 pm
$25
Enjoy a night of drinks and dancing in the Rose Center for Earth and Space and a complimentary screening of a Space Show.

Wild, Wild World: A Dog’s Mind
Saturday, February 12
11 am–noon, 1–2 pm
Members’ tickets are $50 adults, $25 children. Cognitive scientist Alexandra Horowitz will lead live, interactive demonstrations.

Members-Only Highlights Tour
Sunday, February 13
3–4:30 pm
Free (registration required)
An insider’s introduction to all the Museum has to offer. Tour meets in the Portrait Room.

Global Weekends
Saluting Our Jazz Elders
Saturday, February 19
1–5 pm
Free with Museum admission
Enjoy performances by renowned jazz artists at this celebration of African-American History Month.

Insights from the Hubble Telescope with Jackie Faherty
Tuesday, February 22
6:30–8 pm
$35 per person (includes one hour of open bar and appetizers)
Celebrate Valentine’s Day in the Hayden Planetarium. The evening will begin with a cocktail hour, followed by a view of the night sky and some of the greatest romance stories of all time.

A Night at the Museum Sleepover
Friday, February 18
Members’ price is $19 per person
This unique after-hours opportunity will thrill kids ages 7 to 15 and their caregivers.

March and Beyond
Philadelphia International Flower Show
Sunday, March 6
9 am–6 pm
$10 (Includes transportation by private coach and garden tea)
Please register by February 21
Join fellow Members on a visit to the 2011 Philadelphia International Flower Show, which celebrates the City of Life with full-scale garden and floral displays.

Explore the Great Swamp
Saturday, May 14
9 am–4 pm
$50 (Includes transportation by private coach; bring your lunch)
Please register by April 28
Ornithologist Paul Sweet and herpetologist David Kitzian lead a trip to New Jersey’s Great Swamp Refuge, which consists of 7,600 acres of varied habitats and has become a resting and feeding area for more than 244 species of birds.

Credits
Public programs are made possible, in part, by the Rita and Fritz Markau Fund for the Public Understanding of Science.

Living in America: Rain and the Tibetan Creative Mind is made possible with public funds from the New York State Council on the Arts, a state agency administered by the Department of Cultural Affairs, New York City, and the New York City Department of Cultural Affairs.

Support for Global Weekends is made possible, in part, by the Ford Foundation, the May and Samuel Greenland Family Foundation, Inc., the Tokai Family, and the family of Frederick H. Leonhardt.

SciCafe is made possible by Judy and Josh Weston.

Popular Science is the media partner for Hayden Planetarium monthly astronomy programs and lectures.

The Museum’s Youth Initiatives programming is generously supported by the leadership contribution of the New York Life Foundation.
For an extraordinary group of New York City students, going to class means passing a Neanderthal skeleton, a 94-foot-long model of a blue whale, and a family of brown bears—and that’s just on the first floor.

These are the 13 students now enrolled in the Richard Gilder Graduate School at the American Museum of Natural History, which in 2008, became the first museum in the Western Hemisphere—with the authority to grant the Ph.D. degree. In 2004, the Museum made history by enrolling its first class. Just last year, the New York State Board of Regents granted full institutional accreditation to the Richard Gilder Graduate School, a landmark decision that recognized the strength of the new program and the Museum’s long track record of training graduate students in partnership with leading institutions that include Columbia University, New York University, Cornell University, City University of New York, and Stony Brook University.

The Museum’s inaugural doctoral program is in comparative biology, with an interdisciplinary emphasis spanning the origins, history, and diversity of life on Earth. Here, the Richard Gilder Graduate School students—who come to study from all over the world (see sidebar)—have several distinct advantages. The Museum’s internationally recognized staff of curators and other scientists are their faculty. The Museum’s world-renowned collections of more than 50 million specimens and cultural artifacts are available for their research projects. The Museum’s active field work program offers students the opportunity to conduct research all over the globe. And some of the most advanced, state-of-the-art scientific facilities in the world are available on site at the Museum.

“Of all the programs we have here in the rich history of the Museum, there is no more interesting and exciting program for students than the Graduate School,” says John Flynn, dean of the Richard Gilder Graduate School.

Cardinal turtle, a new species of sea turtle, was named for students in the comparative biology program. This species was discovered by graduate student Brittany Yoder during a field trip to the Galapagos Islands.

“With all that the program has to offer, graduate students have a broad range of training opportunities to carry out original research. Edward Stanley, who studies African “girdled lizards” (Cordylidae), draws on the Museum’s world-class collection of squamate reptiles, frozen tissues in the Ambrose Monell Cryo Collection, and state-of-the-art CT machine (see page 15.) Shaena Montanari has access to an unparalleled collection of specimens from the Museum’s paleontology collections and uses advanced fossil preparation methods in her study of the diet and metabolism of dinosaurs. And for the last two years, she has traveled to the Gobi desert on field expeditions with Museum faculty—just another example of how coming to school at the Museum is, in fact, a gateway to an exciting, bigger world.

For more about the Richard Gilder Graduate School at the Museum, visit rgg.amnh.org.

World Class

Richard Gilder Graduate School students come to study at the Museum from all over the world.

Class Entering 2008

• Zachary Baldwin
  Plymouth, New Hampshire
  Advisor: Darrel Frost

• Bryan Falk
  Boise, Idaho
  Advisor: Susan Perkins

• Antonia Hulon
  Flushing, New York
  Advisor: Christopher Raxworthy

• Sebastian Keist
  Helsingborg, Sweden
  Advisor: Mark Siddall

• Sharna Montanari
  Ridgefield, Connecticut
  Advisor: Mark Norell

Class Entering 2009

• John Denton
  Gainesville, Florida
  Advisor: Melanie L. J. Stiassny

• Alejandro Grojales
  Bogotá, Colombia
  Advisor: John Sparks

• Edward Stanley
  Dorset, England
  Advisor: Darrel Frost

• Isabelle Vea
  Paris, France
  Advisor: David Grimaldi

Class Entering 2010

• Phil Barden
  Phoenix, Arizona
  Advisor: David Grimaldi

• Annel Payne
  Wolcott, West Virginia
  Advisor: James Carpenter

• Pedro Peloso
  Belém, Brazil
  Advisor: Darrel Frost

• Dawn Roje
  Las Vegas, California
  Advisor: John Sparks

Build Your Brain With Ology

By the time a baby is a few months old, almost all the neurons of the brain are in place. But millions of new connections form as people go through life, especially during childhood and adolescence—as many as 100 trillion in all. The synapses you use the most grow stronger, while unused connections weaken and fade away. So your brain is shaped by your body chemistry, but by everything you think, feel, and do. It’s what allows us to compensate for injury or disease. Scientists call this ability of the brain to change in response to experience plasticity. Learn more in the current exhibition, Brain: The Inside Story, or on Brain Ology, the latest addition to Ology, the Museum’s website for kids. It’s packed with games, puzzles, and science, including three activities that explore brain plasticity.

Brain games. Mental and physical exercise helps the brain stay healthy longer. Developed to help us process visual signals more quickly, games like Jewel Diver, Sweep Seeker, and Bird Safari may help people over 50 with complex tasks like driving (and work on kids’ brains too). The games get harder as you get better—and they’re not easy to start with!

Read With Your Fingers. Scientists who studied the brains of blind people have discovered that the area of the brain normally used for seeing, the visual cortex, may be “reasigned” to sense touch. Use thumbtacks and a Braille key to create a message, then “see” what it’s like to read with your eyes closed. Slipping Away. You can’t improve your reflexes because they’re hardwired into your system. But you can improve your response by doing something new and over again. Test your reaction time and compare it with a friend’s. Who can catch the ruler the fastest? How do your reaction times change?

For more from Brain Ology, visit amnh.org/ology.

Cosmic Discoveries

Have you downloaded the Museum’s latest app yet? Launched this fall as part of the commemoration of the 10th anniversary of the Museum’s Rose Center for Earth and Space, Cosmic Discoveries features nearly 1,000 stunning astronomical images, from the powerful telescope that points to the majestic Horsehead Nebula, culled from the Museum’s archives and Science Bulletins as well as from dozens of space agencies and observatories around the world. The app also features eight stories on a range of subjects, including comets and galaxy clusters. It’s easy to get on the way—so when you’re not watching the skies, keep an eye out for more cosmic adventures! Cosmic Discoveries follows up on the successes of the Museum’s Dinosaurus app and AMNH Explorer, which Gizmodo called “nothing less than state-of-the-art.”

1. Some festivities to commemorate the 100th anniversary of the Smithsonian Institution and the 10th anniversary of the Museum’s Rose Center for Earth and Space were held on the Arthur Ross Terrace.

2. The app also features eight stories on a range of subjects, including comets and galaxy clusters. It’s easy to get on the way—so when you’re not watching the skies, keep an eye out for more cosmic adventures! Cosmic Discoveries follows up on the successes of the Museum’s Dinosaurus app and AMNH Explorer, which Gizmodo called “nothing less than state-of-the-art.”

3. Astronaut Michael Massimino, a veteran of the fourth Hubble Space Telescope servicing mission, signed autographs for visitors.
Grandfather and Grandson Set Record for Sleepovers

When Gregory Cox was a teenager attending the Food and Maritime Trades School in the 1960s, he sometimes took advantage of a midday switch from the East Side campus to the West Side to skip school and head to the American Museum of Natural History.

“I didn’t take the [school] bus, I took the subway;” he recalls over the phone from his home in Brooklyn. “They never caught me!”

Cox, who lives in Brooklyn, went on a career in ship repair, like his father, grandfather, and great-grandfather before him. Now retired and a Family-level Member, he loves sharing his longstanding affection for the Museum with his grandchildren, Shannon Gonsalves and Shane and Shamus Drucker of Staten Island.

Cox is so keen on the sleepover experience that he carries around descriptions of the program he printed from the Museum’s website to hand out in doctors’ offices and elsewhere, encouraging others to experience the sleepovers for themselves. “I appreciate that he tells them about it,” says Martinez. “He’s a great support.”

At age 3, Cox’s youngest grandson Shamus is still too young for a sleepover; Shannon, 16, was too old when the program began four years ago for kids 8 to 12 (the age range has since been expanded to 7 to 15), and although Cox says he saw her through an avid dinosaur phase when she was younger, she is now more likely to visit the Museum with a boyfriend.

“She outgrew me,” he says, noting that, on the other hand, at Shane’s age “grandparents are everything.”

And even though Shane will outgrow the program in a few years, Cox still treasures many, many years of Museum visits and even sleepovers ahead. “By the time Shane outgrows me, I’ll have the little guy!” he says.

Members receive a discount for Night at the Museum Sleepovers. For more information, visit amnh.org/sleepovers.

Reminders for Members

Members Open House
Thursday, February 17
6–8:30 pm
For Contributor and Higher-Level Members
Kindly RSVP before
February 14
by calling 212-769-5606
Explore the halls at your leisure at this Members-only evening that includes a wine reception.

Walk on the Wild Side
Wednesday, March 16
6:30–9 pm
For Supporter and Higher-Level Members
Kindly RSVP before
March 2
by calling 212-769-5606
This celebratory evening in the Rose Center for Earth and Space includes cocktails, star gazing, and more.

Don’t Miss

Philadelphia International Flower Show
Sunday, March 6
9 a.m.–9 p.m
Free for Members
at the Contributor level and up
Space is limited; call 212-769-5606 to register
Join fellow Members on a visit to the 2011 Philadelphia International Flower Show—“Springtime in Paris”—which celebrates the City of Light with full-scale garden and floral displays that recreate scenes from left Bank cafés, walks along the Seine, and more.

Museum photo © AMNH/D. Finnin, Hibiscus photo © istockphoto.com/Hsing-Wen Hsu

Grandfather and Grandson Set Record for Sleepovers

“Batman! Superman! Spiderman!” shouted a crowd of young campers, eager to share the names of their favorite superheroes, as guide Michael Malave kicked off his “super power” tour through the Milstein Hall of Ocean Life and the Akeley Hall of African Mammals.

“When you look around the hall, you can see many animals, and each of them has an ability that helps them to succeed and survive,” explained Malave in the pack of superhero enthusiasts. “This is much like how superheroes use their powers to win and beat the bad guys.”

Malave, who studies applied math at Marist College, was one of 12 students selected for last year’s Museum, Marine and Employment Program (MEEP), a summer internship that trains college-age students from the New York City area to develop and lead free themed tours for camp groups who flock to the Museum’s halls each weekday. In 2010, MEEPers, as the student guides are affectionately known, led more than 580 tours in a span of six weeks—an average of more than 20 tours a day.

Part of the Museum’s science education pipeline, a slate of programming that extends from early childhood courses to programs for undergraduates, MEEP is also one of many youth initiatives supported by New York Life Foundation. “The Museum is a leader in providing science education, and MEEP offers college students a valuable opportunity to both learn about and get work experience in this important field,” says Christine Park, president of the New York Life Foundation.

Our young campers also see MEEPers as role models, as they explain complicated ideas in ways that inspire children of all ages.

—Margaret Jacobs, Director of Youth Initiatives

MEEPers spend their first month training with Museum staff to learn the content of the Museum’s halls while crafting original 45-minute tours based on personal or academic interests. Once staff and supervisors approve the tours, which cover topics that range from deep-sea creatures to shamanic practices, MEEPers have the rest of the summer to perfect their presentation. Their challenge: to be ready to improvise on the spot depending on their audience, which could be three-year-olds one day and college or even graduate students the next.

MEEPers also work in pairs behind touch-carts—portable stations stocked with artifacts and specimens placed throughout the Museum—to demonstrate objects to visitors during the summer rush in the halls or in the Discovery Room.

“MEEPers not only gain extensive knowledge of science and culture at the Museum that support their academic and career goals, they also sharpen their leadership and communications skills,” says Margaret Jacobs, director of youth initiatives at the Museum.

“Our young campers also see them as role models, as they explain complicated ideas in ways that inspire children of all ages.”

—Margaret Jacobs, Director of Youth Initiatives

The variety of tours each year reflects the diversity of the MEEPers’ interests. Hannah Sherman, a bioanthropology major at Skidmore College, led tours through the “alien worlds” on Earth and beyond that took campers from the Rose Center for Earth and Space to the Milstein Hall of Ocean Life. Sherman says working as a MEEPer—specifically, making science accessible to the general public—has inspired her to pursue a career in science and the media.

“I was obsessed with the Museum as a kid, so I’ve come full circle,” she says. “I love communicating science to people, so you need a Ph.D. to understand most science magazines. The Museum and other channels can bridge that gap.”

On Frieda Bemun’s popular tour of the David H. Koch Dinosaur Wing, campers examined the long, graceful neck of the Barosaurus and the terrifying teeth of the Tyrannosaurus rex while learning about how physical form relates to anatomical function. Like most MEEPers, Bemun, a biology major at Brooklyn College, at times struggled to explain certain terms to younger campers.

“These are complex concepts, and the first day a lot went out the door,” Bemun says. “The kids wander off, some absorb with their ears, some with their eyes. I realized I shouldn’t be offended.”

Alix Cotumaccio, assistant director of youth initiatives, points out that along with gaining confidence and communication skills, MEEPers also get to know scientists and other staff—and leave with a renewed enthusiasm for the institution.

For Bemun, who grew up in New York, the internship reaffirmed her connection to the Museum. Her dream now is “to work here forever.”

Applications for the summer 2011 program are due April 18.
Email mep@amnh.org for more information.

MEEP is generously supported by the leadership contribution of New York Life Foundation.
Save the Date!
Upcoming Events at the Museum

**March**

- The annual Isaac Asimov Memorial Debate will explore “The Theory of Everything... Still Searching?”

**April**

- 4/12 Join us for the 21st Annual Environmental Lecture and Luncheon.
- 4/15 Members will have the first chance to see the exciting new exhibition *The World’s Largest Dinosaurs* at this exclusive preview. Free for Members.
- 4/16 *The World’s Largest Dinosaurs* opens to the public.
- 4/28 Dance the night away at the annual Museum Dance, the social event of the season.

**May**

- 5/12 The Museum holds its annual Corporate Dinner.
- 5/28 *Frogs: A Chorus of Colors* returns with more than 200 live frogs representing 25 species from Argentina to Vietnam.

**June**

- 6/15 Get an astronaut’s view of a sunrise from space on Field Trip to the Moon, a virtual trip guided by a live presenter.
General Information

Hours
Museum: Open daily, 10 am–5:45 pm; closed on Thanksgiving and Christmas.

Entrances
During Museum hours, Members may enter at Central Park West at 79th Street (second floor), the Rose Center/81st Street, and through the subway (lower level).

Restaurants
Museum Food Court, Café on One, Starlight Café, and Café on 4 offer Members a 15% discount. Hours are subject to change.

Museum shops
The Museum Shop, DinoStore, The Shop for Earth & Space, Cosmic Shop, Brain Shop, and Online Shop (amnhshop.com) offer Members a 10% discount.

Phone numbers
Central Reservations 212-769-5200
Membership Office 212-769-5606
Museum Information 212-769-5100
Development 212-769-5151

Transportation and parking
Subway: (weekdays) or (7) to 81st Street; (1) to 79th Street, walk east to Museum
Bus: M7, M10, M11, or M104 to 79th Street; M79 to Central Park West
Parking Garage: Open daily, 8 am–11 pm; enter from West 81st Street. Members receive a discounted rate of $10 if entering after 4 pm. To receive this rate, you must show your membership card or event ticket when exiting the garage.

Papilio blumei, above, is a butterfly of the swallowtail family. See more than 500 free-flying tropical butterflies in the Museum’s Butterfly Conservatory, a vivarium that approximates their natural habitat.