



AMERICAN MUSEUM OF NATURAL HISTORY

ROTUNDA

Member Magazine
Fall 2018 Vol. 43 No. 3



BEE BRIGADE



*SPOTLIGHT ON MUSEUM
VOLUNTEERS*

From the President

Ellen V. Futter



For many of us, fall means back to school, with new possibilities and adventures. It is all that for the Museum, too, as we launch new opportunities for people of all ages. This fall, we also commemorate an important education milestone, the 10th anniversary of our first incoming class to the Richard Gilder Graduate School.

When it launched, the Gilder Graduate School was a bold, even audacious idea. The first freestanding, museum-based Ph.D.-granting graduate school in the Western Hemisphere and only the second in the world, it sought to bring a multidisciplinary approach to training a new generation of creative, technology-savvy, and socially engaged young scientists.

And it has done just that. As of this fall, our highly selective program in comparative biology has conferred Ph.D. degrees on 29 young

biologists, who are employed as scientists in academic, government, or NGO settings or have been funded to continue their research.

Today, the Gilder Graduate School also houses the Museum's equally groundbreaking Master of Arts in Teaching Science program. What began as a pilot program authorized by the New York State Board of Regents to bring an innovative approach to preparing Earth Science teachers to teach in underserved schools is now a fully formalized part of the Museum's efforts to enhance K-12 science education, with 94 graduates as of this year.

So, this fall, as we graduate a new group of brilliant scientists and science teachers, we invite you to join us in commemorating the Museum's pioneering vision to do even more to improve the practice and public understanding of science in our country.

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ROTUNDA

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Climate Change Exhibit Reopens in Hall of Planet Earth



A new climate change installation in the David S. and Ruth L. Gottesman Hall of Planet Earth features a dynamic media wall with large-scale imagery, animations, text and graphics, and interactive panels where visitors can engage with the evidence of climate change.

This summer, the Museum reopened the climate change exhibit in the David S. and Ruth L. Gottesman Hall of Planet Earth with comprehensive updates to a section about one of the most urgent scientific issues of our time: climate change. The new installation is anchored by a dynamic media wall and interactive panels where visitors can engage with the evidence of climate change. Updates, which had been in development since 2016, also included new content in the hall's sections on past climates and on convection.

"One of the greatest current threats to life on Earth is climate change, which has largely been induced by human activity," says President Ellen V. Futter. "And one of the most important responsibilities of the Museum is to present the scientific topics of our times to the public in ways that are comprehensible, accessible, and engaging"

The Gottesman Hall of Planet Earth is one of the most popular Museum exhibition halls for teachers and school groups from pre-K through college, and it serves as a learning lab for graduate students in the Museum's Master of Arts in Teaching Science program in the Richard Gilder Graduate School.

When the hall opened in 1999, climate change was one of the five major focus areas, and this update ensures that the hall remains current by reflecting scientific advances that have taken place in the last 20 years. The new section puts more emphasis on how climate change affects the world today as well as what might happen in the future if the current course continues.

New content panels and interactive stations based on data from organizations including NASA and NOAA let visitors explore three main themes: "How Climate Works," "Our Warming World," and "Consequences of Climate Change." Opposite the climate change wall, an updated exhibit about past climates features new content to help visitors make direct connections between how scientists study past and present climate.

Other updates to the hall include a new overview film and an updated exhibit about mantle convection—the rising and sinking regions of the mantle that transport heat from deep within the Earth to the surface and drive plate tectonics.

Members receive free admission to the Gottesman Hall of Planet Earth.

Identified: 200-Million-Year-Old Theropod Dinosaur Print

When Museum Members Marisa, Mitchell, and Amadeo Klages-Bombich of Staten Island came to the annual Identification Day in June, they brought in a mysterious garage-sale find: a rock slab with a faint impression.

"We suspected it might be a footprint, but didn't know if it was the real thing," says Marisa.

At first glance, Senior Museum Specialist Carl Mehling wasn't convinced either. But when the light hit the rock at just the right angle, "there it was!" he says. "I went from giving it a 50 percent chance to being 90 percent sure."

According to Mehling, the print was left by a theropod that stood between 4 and 5 feet tall, likely 200 million years ago.

The family returned to the Museum over the summer for a behind-the-scenes tour with Mehling and will be on the lookout for more fossils—in their own backyard, and beyond.



The Klages-Bombich family examine a fossil footprint with Senior Museum Specialist Carl Mehling over the summer.

Portrait © AMNH/D. Finnin, Page 10: © Peter Schouten, Page 20: © AMNH/R. Mickens, Page 22: © AMNH/D. Finnin

© AMNH/D. Finnin, © AMNH/R. Mickens

ONGOING RESEARCH

Museum archaeologists Charles Spencer and Elsa Redmond have spent decades conducting fieldwork in Oaxaca to explore Zapotec culture. They recently excavated a Zapotec palace that dates to 300–100 BC, one of the earliest palaces ever found by archaeologists in Mesoamerica.

RARE HONOR

The 1897–98 expedition during which this urn was collected was financed by New York-born philanthropist Joseph Florimond Loubat, who also underwrote the building of the Museum’s first Hall of Mexico and Central America in 1899. After the hall’s renovation in 1970, the Mexican Government awarded the Museum the Order of the Aztec Eagle, the highest award given outside the country.

HALL HIGHLIGHTS

The Hall of Mexico and Central America offers an anthropological overview of pre-Columbian cultures with more than 1,400 artifacts dating from 2,000 BC to 1521. They include exquisite Costa Rican gold pieces, and replicas of massive Maya sculptures, a large Olmec stone head, and a calendar stone marking an Aztec military victory, the original of which is in the National Museum of Anthropology in Mexico City.

ARCHAEOLOGY FOR KIDS

Know a budding archaeologist? Visit the Museum’s website for kids, OLogy, to explore the interactive story “Up Close With a Zapotec Urn.” You’ll find out all about its discovery, what it takes to conserve an ancient artifact, and more—all as told by the urn itself!



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© AMNH/D. Finnin

Lightning Legacy

Tucked on a shelf in the Anthropology Collection on the Museum’s fifth floor is a striking clay urn produced by the Zapotec, who lived for thousands of years in Mexico’s Oaxaca Valley and created one of the New World’s earliest urban civilizations, which flourished from 500 BC to AD 700.

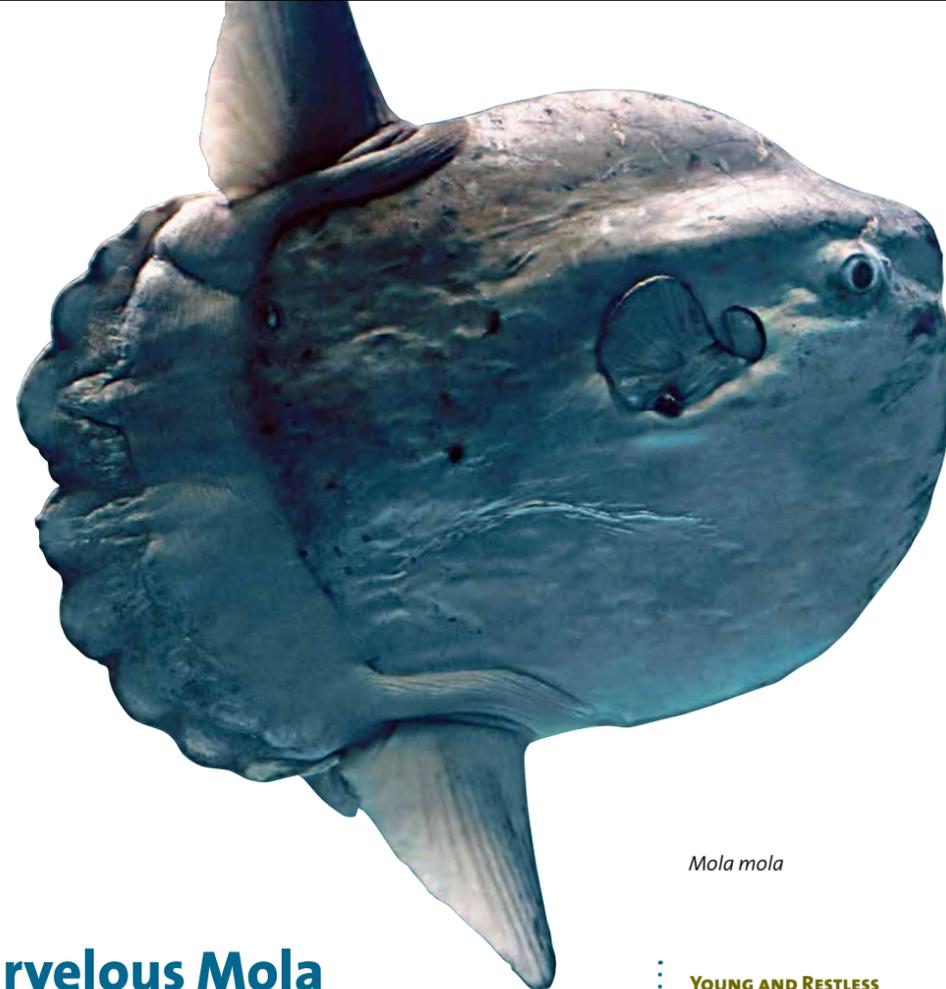
The urn is one of five found above a doorway to a Zapotec tomb in the village of Xoxocotlán during a Museum expedition in 1897 led by Marshall Saville (1867–1935), the Museum’s first curator of Mexican and Central American archaeology. Saville’s work helped establish a foundational knowledge of the material culture of the Zapotec.

“The Museum has the largest and most important collection of Zapotec urns outside of Mexico itself,” says Charles Spencer, curator in the Division of Anthropology who has worked in Oaxaca since 1971. “The key reason for their scientific significance is straightforward: Most of the urns in our collection were recovered by Saville in the late-19th century using the most sophisticated methods of the time, which included recording the precise archaeological location of each piece and documenting the excavations with photography. As it happens, they were all in funerary contexts, associated with the tombs of high-status individuals. It is the combination of the urns themselves plus their archaeological provenience that has made it possible for contemporary researchers to decipher the function and meaning of the Zapotec urns.”

The urn pictured here most likely represents an ancestor of the deceased wearing the mask of Cocijo, or lightning—the most powerful force in the Zapotec world. It was long thought that the urns represented deities that would guide the spirits of the deceased, but more recent scholarship suggests they reflect the Zapotec culture’s veneration of ancestors.

Beside serving as clues to the Zapotec culture, the urns in the Museum’s collection are an invaluable resource for a wide range of related Mesoamerican research. Museum conservator Samantha Alderson, for example, has analyzed pigment samples from Zapotec urns to learn more about the painted decoration, while visiting botanists have studied the impressions of real corn on the urns to understand the evolution of maize and to track trade and cultural contacts.

See more Zapotec funerary urns and a replica of a Zapotec tomb in the Hall of Mexico and Central America.



Mola mola

The Marvelous Mola

Mola may not be a household name, but the various species of this genus of sunfish are found in temperate and tropical seas all over the world and can reach nearly 11 feet (3.5 meters) in length and weigh up to 5,070 lbs (2,300 kg).

To live large, these marine giants grow fast: in captivity, young sunfish can pack on more than 800 pounds in just over a year. To drive home the point, in a June 1956 article in *Natural History* magazine titled “From Atom to Colossus,” E. W. Gudger, then the Museum’s associate curator of fishes, included a chart comparing the larva of the most commonly known species, *Mola mola*, and its mother to a 150-pound rowboat next to 60 ocean liners weighing 80,773 tons each!

Size gives the *Mola mola* several advantages. Females produce enormous numbers of eggs: one 4-foot (1.2 meter-long) female was estimated to be carrying 300 million eggs. The *Mola mola* also has a broad thermal range, from 56°F to 86°F, allowing it to dive more than 3,000 feet deep (914 meters). There is slim preliminary evidence that the ocean sunfish may be able to tolerate low oxygen levels, but that would be a boon, as such conditions are among a growing list of concerns in today’s oceans, along with human pollution and global sea temperature rise.

As adults, their appetite for jellyfish means ocean sunfish are helping combat another modern marine threat. “As we overfish the ocean, in some regions, jellies can move in to fill those open niches,” says marine biologist Tierney Thys, who has tracked ocean sunfishes all over the globe. “As these local jelly populations increase, we need to keep our populations of jelly eaters—like the *Mola mola*—intact.”

See life-sized animations of the *Mola mola* and other marine giants on a 180-degree screen in *Unseen Oceans*, which is free for Members.

©iStock/a.bardonian

YOUNG AND RESTLESS

Fossils suggest that the genus *Mola* is a relative newcomer, descended from ancient Tetraodontiformes about 40 million years ago. The first bony fishes, on the other hand, appeared 500 million years ago.

FORM AND FUNCTION

Mola is Latin for “millstone”—a reflection of the fish’s shape, which it inherited from its pufferfish-like ancestors. The common name ocean sunfish was inspired by its behavior: this species can be observed floating at the water’s surface, as if sunbathing, perhaps warming up after deep dives.

MISTAKEN IDENTITY

For years, the Guinness World Records listed the *Mola mola* as the world’s heaviest bony fish. But Japanese researchers have determined that the specimen on which the original designation was based, a roughly 9-foot-long, 5,071-pounder caught off Kamogawa, Japan, in 1966, is a different species: the bump-head sunfish *Mola alexandrini*.

ON THEIR OWN

While *Mola mola* school as adolescents, as adults they become loners, which makes them less susceptible to commercial fishing. They remain at risk of being swept into nets with other fish, but when this happens, their thick protective hide and calm temperament make them less likely to hurt themselves before being released.

B E E S I N T H E C I T Y

MUSEUM
SCIENTISTS
ARE
HELPING
POLLINATORS
STAY
HAPPY
AND
HEALTHY



Museum scientists Sarah Kornbluth and Corey Smith look for bees on the High Line's Interim Walkway, an area where stem-nesting species are known to bed-down for winter.

stretching 1.45 miles along Manhattan's west side, the High Line is an urban oasis, and not just for strolling New Yorkers. More than 500 species and cultivars of plants and trees grow around the tracks of this once-active elevated freight train line. And the popular greenway is also a vital year-round habitat for a diverse population of bees—which have been getting a little help from two Museum researchers ahead of the winter nesting season.

The collaboration between the Museum and the High Line began about two years ago, when entomologists Corey Smith and Sarah Kornbluth received a call from the High Line. Planning and designing manager Nicole De Feo had been interested in learning more about how the park was serving as a habitat for local bees. She turned to the Museum looking for experts.

Smith, a specialist in the Division of Invertebrate Zoology,

and Kornbluth, a field associate, were immediately intrigued. Though they have studied bees in places such as Wisconsin, Oregon, the southwest United States, and in France, this was a project that would have immediate, and visible, impact right in their backyard. They quickly came up with a proposal: a survey of pollinators between the spring and fall of 2017, to identify which species call the High Line home. By figuring out which species were stem-nesting, the park's gardening team could create more nesting spots by limiting plant cutbacks and boost the resident bee population.

"A unique thing about this project is that the High Line really wanted something to come out of it—they want a healthy ecosystem in their park," says Smith, who works with Curator Emeritus Jerome Rozen and helps manage the Museum's extensive bee collection. "Focusing on our local bee fauna, and one locality, has been quite the departure for me."

Starting out, Smith and Kornbluth knew that nearly half of

New York's 416 known native bee species are digger bees, or ground-nesting solitary bees, which require at least 1 foot of soil in which to burrow and lay their eggs. And while the High Line has no shortage of plants—the park's gardens are a mix of curated beds and wild growth, conceived by planting designer Piet Oudolf to resemble the "self-seeded" landscape that overtook the elevated rails in the 1980s and 1990s—its soil beds tend to be on the shallower end. That leaves limited options for ground-nesting species. For that reason, as Smith and Kornbluth began their survey of the High Line's bees, they found that a majority of the park's bees are stem- and cavity-nesting species that raise their young in hollow twigs or tiny crevices.

CARPENTER BEES WERE NOT TERRIBLY COMMON ON THE HIGH LINE, BUT HOPEFULLY WITH ALTERED CUTBACK PLANS WE WILL SEE MORE OF THEM IN THE COMING YEARS.

Corey Smith
Division of Invertebrate Zoology

Every other week during the six-month survey, the pair walked the High Line, usually surveying separately, beginning at its northernmost point on 54th Street and working their way south.

"Unlike other fieldwork I've done, collection on the High Line was a chance to interact with the public and share information with people from near and far," says Kornbluth. "And it is a bit of a trip to be netting in a social environment."

In addition to honey bees on the High Line, some of the most common species spotted include five of New York's 15 yellow-faced or masked bees in the genus *Hylaeus*. Pollinator hotspots include the park's wild growth area on the Interim Walkway on 51st Street, where most of the stem-nesting species were found. There may be a few reasons for this: this un-curated area doesn't see a lot of foot traffic, nor is there plant cutback in the spring. That makes it an ideal spot for small carpenter bees, *Ceratina*

calcarata, to bed down for the winter. "These little critters were not terribly common on the High Line, but hopefully with the altered cutback plans, we will see more of them in the coming years," says Smith.

Further south, flowering plants like wild tulip (*Tulipa sylvestris*) and prairie smoke (*Geum triflorum*) in the Wildflower Field and Radial Plantings on 28th Street attract bumblebees, such as *Bombus impatiens*. These eusocial bees are especially welcome in the park. Not only are they generalists known to fertilize nearly any flowering plant, but they also have the ability to sonicate: using their muscles, they create vibrations to loosen pollen that would otherwise be inaccessible. "This ability makes *Bombus* an excellent pollinator of a number of plants that honey bees tend to stay away from," says Smith.

Smith and Kornbluth are still in the process of analyzing data, but already they have been able to make meaningful recommendations to the park's horticulture staff. Earlier this year, staff and volunteer gardeners left undisturbed the dried stems of four different plant species, including astilbe (*Astilbe chinensis*) and hedgenettle (*Stachys officinalis*), in order to preserve nesting spots for carpenter bees. The entomologists also suggested bundling plant waste in the park's onsite compost for bees to nest in.

"This study has helped us flesh out our knowledge of what bees are in the city," says Kornbluth. "Sharing information about which bees live in our city and what resources they utilize could be helpful as a guideline for other parks and gardens interested in supporting wild bee populations."

Findings from the survey are already being shared with the public and the broader community of green space advocates. An illustration included in the fall High Line magazine featured bees and butterfly species alongside their companion plants, and the park has plans to create a more extensive field guide for teachers. And in September, De Feo, Smith, and Kornbluth presented their findings from the study at the 14th annual *Cities Alive* conference.

"It's been a great collaboration with the Museum," says the High Line's De Feo. "We've learned so much about the nesting habits of our bees, and this work is really valuable to how we manage our cities and green infrastructure." 🐝

Exhibits about honey bees and other pollinators will be a major feature of the new Susan and Peter Solomon Family Insectarium, part of the Museum's Richard Gilder Center for Science, Education, and Innovation.

BEES AT THE MUSEUM



750,000

The number of specimens in the Museum's bee collection, one of the largest in the world. Nearly all of the **20,000 known bee species** are represented. The majority are solitary bees, but Curator Emeritus Jerome Rozen has helped amass what is likely the world's largest collection of eggs, larvae, and pupae.

35,000

Bumblebee specimens—of which **200 species** are represented, or about **5 percent of the total collection**.

1,174

Bee type specimens, or specimens that are used to scientifically describe a particular species, in the Museum's collection.

40 %

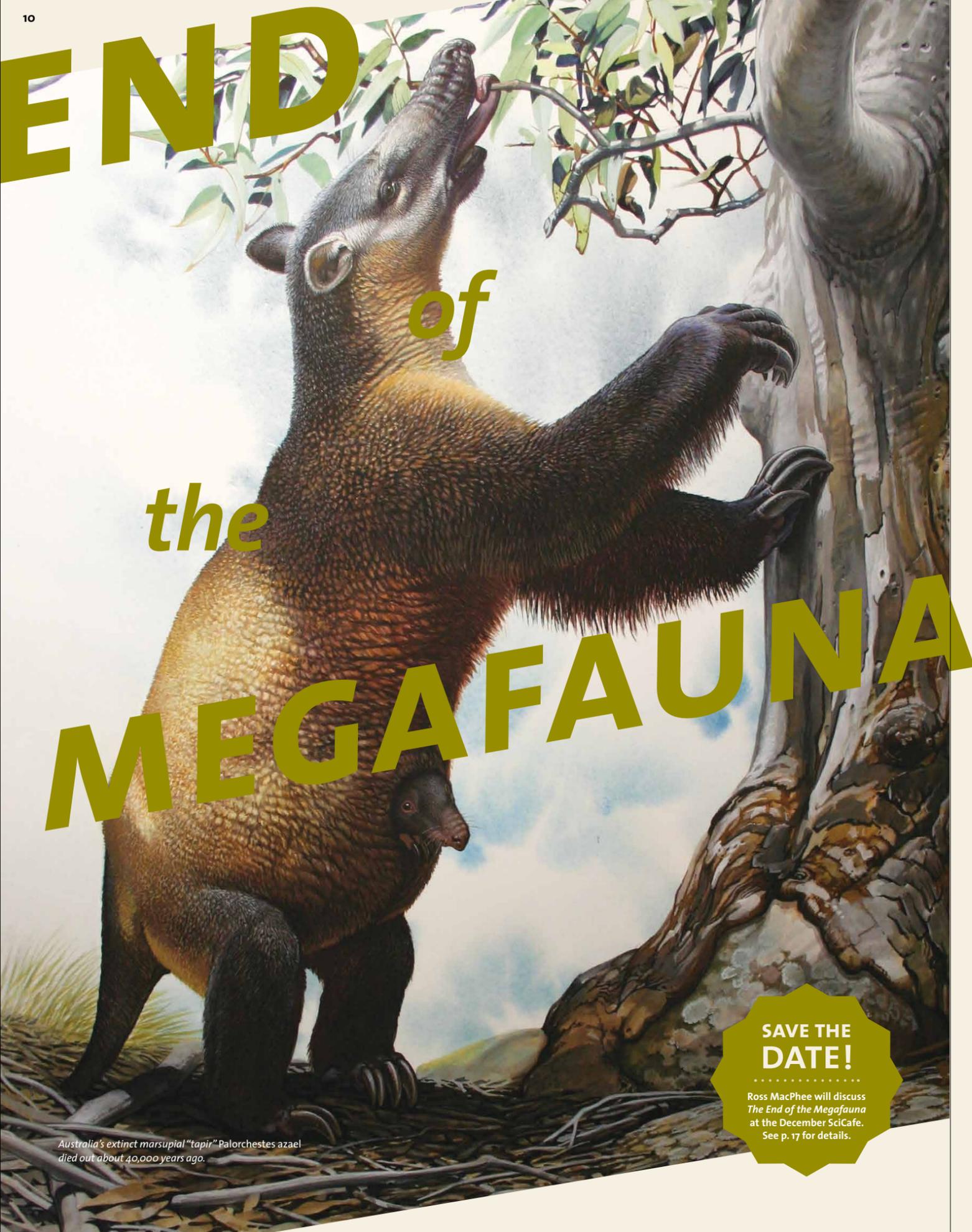
Specimens in the Museum's bee collection included in the **American Museum Bee Database Project**, an initiative that archives and georeferences data from museum specimens and is used to study changes in worldwide bee populations.

1 %

Specimens in the collections are **honey bees**, the most widely-known bee group.



Corey Smith examines specimens collected during the six-month survey in the Museum's lab.



END of the MEGAFUNA

SAVE THE DATE!

 Ross MacPhee will discuss *The End of the Megafauna* at the December SciCafe. See p. 17 for details.

Australia's extinct marsupial "tapir" Palorchestes azeal died out about 40,000 years ago.

Illustrations: ©2019 by Peter Schouten, Ross D.E. MacPhee photo: © C. Fleming

What happened to the world's LARGEST—and STRANGEST—animals?

Adapted from *End of the Megafauna: The Fate of the World's Hugest, Fiercest, and Strangest Animals* by Ross D. E. MacPhee with illustrations by Peter Schouten. © 2019 by Ross D. E. MacPhee. Illustrations copyright © 2019 by Peter Schouten. Used with permission of the publisher, W.W. Norton & Company, Inc. All rights reserved.

By Ross D. E. MacPhee
 Curator, Department of Mammalogy

The American Museum of Natural History is world famous for its vertebrate paleontology halls, where the story of vertebrate life is traced from its beginnings to the near present, as told by the most direct form of evidence we have: the fossils themselves. In the Lila Acheson Wallace Wing of Mammals and Their Extinct Relatives visitors marvel at mounted skeletons of vanished beasts, prodigious in number and variety. Many of the species seem quite familiar, not only because of frequent cameos in movies, but also because they have reasonably close living relatives.

At one end of the wing are a Columbian mammoth and an American mastodon. Both are very definitely proboscidean, or elephantlike, in body form, although their last common ancestor lived about 25 million years ago. On the North American mainland, populations of mammoths and mastodons were still living as recently as 12,000 years ago; all were gone 1,000 or so years later. A couple of island-bound groups of woolly mammoths struggled on, but these too had disappeared by 4,200 years ago. Asian and African elephants persisted. These magnificent beasts didn't. Why?

Elsewhere in the hall are members of Xenarthra, today an almost exclusively South American group that includes living armadillos, tree sloths, and anteaters. The largest of the living xenarthrans is the giant anteater (*Myrmecophaga tridactyla*), but as late as 12,000 to 15,000 years ago there were several much larger xenarthran species in both North and South America that may have weighed as much as 2,000–4,000 kg. Among these was gigantic *Lestodon*, whose closest living relatives, the two- and three-toed tree sloths *Choloepus* and *Bradypus*, weigh no more than 5 kg. They made it, *Lestodon* didn't. Why?

Many other Quaternary species prospered in their native environments for hundreds of thousands of years or more without suffering any imperiling losses. But beginning about 50,000 years ago, something started happening to large animals. Species sometimes disappeared singly, at other times in droves. Size must have mattered, because their smaller close relatives mostly weathered the extinction storm and are still with us.

So why did these megafaunal extinctions occur?

A short but honest reply would be that there is no satisfactory answer—not yet. The debate continues as fresh leads are traced and dead ends abandoned or refashioned in order to accommodate new evidence. It's a great time to be a Quaternary paleontologist! 🦒



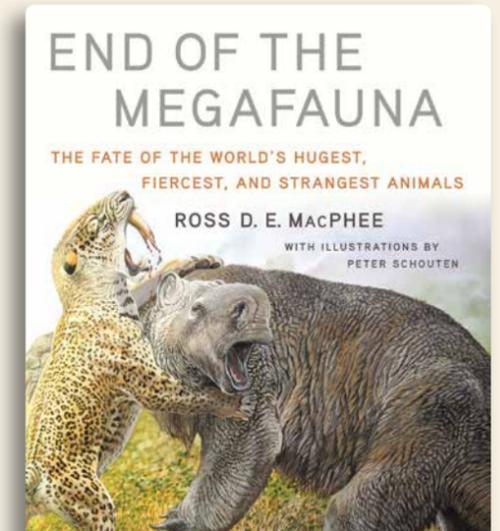
MAMMOTH ON THE MENU

When people hear that I am a Quaternary paleontologist who works in places like Siberia and Yukon, I am sometimes asked rather startling questions, such as: "Have you ever found a mammoth mummy?" and "Did you eat it?"

Despite what you see in the movies, tundra mummies weren't flash frozen or suddenly covered by advancing ice. Instead, they simply died, from whatever cause, and rotted in place while drifting sediments covered them, only to be discovered by people—or their dogs—many millennia later.

So, to set the record straight, I have not, ever, eaten the flesh of a mammoth or any other beast encountered on the frozen tundra. The reason is easy to relate in the form of another question: "Would you eat that road pizza of a deer you saw at the side of the interstate last week?"

— Ross D. E. MacPhee



End of the Megafauna will be available from the Museum shops, including amnhshop.com.

SAVE 20% during Member Double Discount Days: December 1–8



Anthony Komotar leads Spanish-language tours for visitors.

VITAL VOLUNTEERS

Volunteers are at the heart of the Museum's everyday operations

In the 30 years since she first began as a Museum volunteer, Eleanor Schwartz has done everything from sorting and indexing boxes of field notes from past expeditions to reviewing historic letters, identifying gems like a note to Museum founder Albert S. Bickmore from novelist Edith Wharton and a letter from Roy Chapman Andrews to Gold Medal about the role its flour played in celebratory pancakes in the field—resulting in a generous complimentary supply!

Schwartz is one of the more than 1,000 volunteers who help keep the Museum—and its mission—moving forward, day in and day out. Over the past year alone, Museum volunteers contributed more than 100,000 hours in a variety of roles, both visitor-facing and behind the scenes.

“The Museum’s volunteers are among the most dedicated and committed anywhere,” says President Ellen V. Futter. “Through their passion, knowledge, time, and generosity, these important members of the Museum community assist our scientists, educators, and staff in their work, and help our millions of visitors to be better informed and inspired by the Museum.”



Museum tour guide Vickie Costa has been volunteering since 1998.

There are teaching volunteers who work with visiting New York City school students, and others who staff information desks, serve as volunteer educators in various halls, or lead tours in different languages.

Anthony Komotar, who holds a Ph.D. degree in pharmaceutical sciences, leads Spanish-language tours of the Museum every Friday. “What I enjoy most is continuing to learn and sharing that knowledge with others,” says Komotar.

Tours for children on the autistic spectrum, for visitors who are blind or partially sighted, and for the deaf and hard of hearing are also staffed largely by specially trained volunteers.

“Each volunteer is an ambassador who shares his or her love of science and natural history with everyone who walks through our doors,” says Nicole Winns, associate director of Visitor Services. “Their passion is contagious.”

Still others work directly with Museum scientists, helping to carry out cutting-edge research in labs or to care for world-class collections.

Arnold Fleisher, a retired doctor of veterinary medicine, spends his days peering at protists through a microscope in the lab of Eunsoo Kim, associate curator in the Division of Invertebrate Zoology. Fleisher previously worked on the early development of fruit flies with Curator Rob DeSalle.

“I promised myself if I ever got the opportunity—I don’t say



Eleanor Schwartz has been volunteering at the Museum for 30 years.

retirement, I say I’m onto my next career—I knew I had to do something to give back,” he says.

Fleisher has been giving back for nearly 20 years, but he is still a relative newcomer. This year, three volunteers were cited for 40 years of service, two more celebrated 50 years along with Schwartz, and another group of 10 marked 25 years. Perhaps one reason volunteers stay is the special camaraderie and shared passion for science. “The volunteers here are the kindest, most generous human beings I’ve ever met—and curious,” says Vickie Costa, a tour guide who met her late husband, Carl Zydney, when they were both volunteers in the Gottesman Hall of Planet Earth in 2001.

Wrapping up her latest project this summer—organizing the papers of ornithologist Joseph James Hickey—Schwartz was already looking forward to her next assignment. “Whatever the Library asks, I do,” she says. 📖

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THERE FROM THE START

The Butterfly Conservatory: Tropical Butterflies Alive in Winter returns this month! Meet three volunteers who have been helping guide visitors through this annual exhibit since the popular attraction first opened in 1998.



MARY LUTZ

Mary loves the emerald swallowtail butterfly (*Papilio palinurus*) because children get excited when they discover that its green stripes change color to yellow or blue.



DIANA ENGEL

One of Diana’s favorite species is the atlas moth (*Attacus atlas*) because of its huge size. (By the way, all butterflies are actually moths in the order Lepidoptera.)



HANNAH SAYAH

Hannah looks for visitors with bright red nail polish and asks them to place their hands behind the clear wings of her favorite species, the glasswing butterfly (*Greta oto*). There’s always delight when you see nails glisten on the other side.

Members enjoy free tickets for *The Butterfly Conservatory*, which reopens [October 6](#).

Programs and Exhibits

For more programs and to purchase tickets, visit amnh.org/calendar.

For updates and reminders, sign up for monthly Calendar Highlights for Members by sending your membership number and request to subscribe to members@amnh.org. The Museum does not trade, rent, or sell this information.

Tickets

Tickets are available by phone at 212-769-5200, Monday–Friday, 9 am–5 pm, or by visiting amnh.org. Please have your membership number ready.

Availability may be limited. Please purchase tickets in advance.

Please be aware that ticket sales are final for all Member programs. All programs go ahead rain or shine. There are no refunds unless the program is canceled by the Museum.

Please check amnh.org for Member ticket prices for live animal exhibits and giant-screen 2D and 3D films.

Information about programs is current as of August 31, 2018. Please check amnh.org/calendar for updates.

OCTOBER

SciCafe: The Milky Way as You've Never Seen It Before
Wednesday, October 3
7 pm

Free with cash bar 21+ with ID
Museum astrophysicist **Jackie Faherty** discusses her current work visualizing and studying the universe using newly-released data from the Gaia catalog. Featuring over 1.3 billion stellar distances, this unprecedented dataset is helping astronomers map the Milky Way like never before.

Hall Tour: Earth as a Peppercorn
Saturday, October 13
10:30 am

Free
Registration required; call 212-769-5200
Can you picture the size of our solar system? Join a Museum tour guide and embark on a scale walk of the solar system, where Earth is the size of a peppercorn, and each step covers more than 5 million miles. Examine the vast range of sizes, from subatomic particles and objects on the human scale to the largest objects in the observable cosmos, to gain a better understanding of our place in the universe.

Family Party
Tuesday, October 16

Tickets and packages may be purchased online by visiting amnh.org/familyparty or by calling 212-496-3495.
The Museum's annual Family Party is a beloved tradition and the best family party in New York City. This exciting benefit event features fascinating educational activities and spectacular entertainment for children of all ages.

Field Trip to the Moon
Wednesday, October 17
6–6:30 pm, 6:45–7:15 pm

\$8 for children; \$12.50 for adults
Join us for a virtual trip to the Moon at one of two evening screenings this October in the immersive Hayden Planetarium. Feel the ground shake beneath you as you experience a thrilling NASA rocket launch. Take a guided tour of the cosmos and orbit the Earth to get an astronaut's view of a sunrise in space!



The 2018 Margaret Mead Film Festival
Thursday, October 18–Sunday, October 21

Members receive a discount on tickets. For tickets and additional information visit amnh.org/mead.
The Margaret Mead Film Festival screens documentaries that increase our understanding of the complexity and diversity of the peoples and cultures that populate our planet. This year's festival showcases resilience in motion through a range of programming. Here are just a few of the week's highlights:



Opening Night Film—Stolen Daughters: Kidnapped by Boko Haram
Thursday, October 18
\$13

Unseen Oceans
Free

Meet the elusive giants of the sea, including whales, sharks, giant squid; sink beneath the waves in a virtual submersible theater; and marvel at the vivid fluorescence displayed by marine creatures but invisible to us...until now.



Our Senses: An Immersive Experience
Closes January 2
Free

Explore 11 funhouse-like spaces that dare you to trust your senses—and show you how or why what we perceive is not simply what is occurring around us. See a garden through the eyes of a bee or butterfly, test your skills at tracking sounds, try to unpack a scent, and much more.



Highlights of the Mead:

Collectively
Saturday–Sunday, October 20–21
\$13

Mixed Media Lounge
Friday–Sunday, October 19–21
Northwest Coast Hall
Free with any Mead ticket or festival pass

Coppers from the Hood: Petrel
Thursday–Sunday, October 18–21
Grand Gallery
Free with any Mead ticket or festival pass

Mead Mixers
Friday–Sunday, October 19–21
Cafe on One or Cafe on 4
Free with any Mead ticket or festival pass

Award Ceremony
Sunday, October 21
Wallach Orientation Center
\$13

Halloween Celebration
Saturday, October 27
\$13

More than 50 of the Museum's popular halls will be open for trick-or-treating, arts and crafts, fun with roaming cartoon characters, and live performances. Past performers and characters have included Curious George® and Clifford the Big Red Dog®, a magician, stilt walkers, and performers from the Big Apple Circus. Come in your Halloween costume!

A Natural History of the Senses
Five Mondays, October 29–November 26
6–8 pm
\$240

In this special five-part course, we examine the science of sensory experience across the Tree of Life. Hear from neuroscientists and field biologists how sensory systems in humans and other animals are tuned to detect a diverse array of stimuli that guide behavior.

Spooky Space
Tuesday, October 30
7 pm
\$12

Join astrophysicist **Jackie Faherty** for a virtual tour in the dome highlighting the universe's most frightening phenomena, from monster asteroids that have and will head for Earth to the deadly radiation that young stars pour onto newly born planets.

NOVEMBER

Take Flight: An Evening Bat Encounter and Reception
Friday, November 2
6:30–8 pm
\$35 for 21+ with ID

Join us for a Members evening bat encounter with **Joseph D'Angeli**, director of the Wildlife Conservation and Education Center. Learn more about the vital roles these creatures play as pollinators of some of our favorite plants, including the *Agave tequilana*. See bats from around the world and enjoy a cocktail with renowned Museum scientists!

Accessibility Programs

To learn more, email accessibility@amnh.org or call 212-313-7565
Visitors who are blind or partially sighted are invited to attend tours highlighting exhibits through verbal descriptions and touchable objects. The Museum also offers tours for both deaf and hearing audiences that are simultaneously signed and spoken. And our Discovery Squad Tours were developed specifically for families affected by autism spectrum disorders.

Discovery Room

Free
Monday–Thursday, 1:30–5:30 pm
Saturday, Sunday, and public school holidays, 10:30 am–1:25 pm and 2:15–5:10 pm

The Discovery Room offers families, and especially children ages 5–12, an interactive gateway to the wonders of the Museum and a hands-on, behind-the-scenes look at its science.

Gateway Storytime

Free
On Friday mornings during the school year, children ages 2–5 are invited to the Discovery Room for storytime. Space is limited and tickets are distributed on a first-come, first-served basis.

The Butterfly Conservatory
Opens Saturday, October 6
Free

This popular live-animal exhibition features up to 500 free-flying tropical butterflies from the Americas, Africa, and Asia. Housed in a tropical vivarium with flowering plants, see iridescent blue morphos, striking scarlet swallowtails, and more.



Backyard Wilderness
Opens Friday, September 14
Members enjoy special benefits

Discover the unexpected wonders of nature that are in our own neighborhoods and communities. See animal inhabitants in rare and breathtaking detail, moving along forest floors and pond bottoms, captured by cameras mounted inside dens and nests.

Captioning devices and audio description devices are available.



Animal Encounter: Bats with Joseph D'Angeli
Saturday, November 3
 11 am (recommended for younger children), 1 pm, 3 pm (all ages welcome)
\$15

Get an up-close and personal introduction to bats from around the world! Bat expert **Joseph D'Angeli** will host this unforgettable presentation for families with many species of bats, including the world's largest: a Malayan flying fox.

Día de Muertos (Day of the Dead)
Saturday, November 3
 Noon–5 pm
Free

Immerse yourself in the traditions of *Día de Muertos* in this family-friendly, full-day festival featuring altars dedicated to extinct animal species, performances by Mexican folklore musicians and dance troupes, celebrations honoring extinct species, hands-on artisanal workshops, and a craft marketplace.



Scott Kelly: Infinite Wonder
Monday, November 5
 7:30 pm
\$20 Members

Astronaut and best-selling author **Scott Kelly** returns to the Museum for a special showcase of his latest book, *Infinite Wonder*. This collection of photographs of Earth, taken from Commander Kelly's unique perspective 250 miles above the planet's surface, offers both an artistic appreciation of our planet and a passionate argument for conservation.

SciCafe: Engineering Technologies Inspired by Nature
Wednesday, November 7
 7 pm

Free with cash bar
 21+ with ID
 Mechanical engineer **Tak-Sing Wong** draws technological inspiration from the natural world, and has invented some of today's most intriguing and potentially useful new materials: a self-healing surgical film and a solution to treat the surfaces of medical devices. Learn about the wide range of possible applications for these new materials.

Hall Tour: Hall of Human Origins
Saturday, November 10
 10:30 am

Free
 Registration required; call 212-769-5200
 Join a Museum tour guide in the Spitzer Hall of Human Origins to find out how humans fit into the remarkable biodiversity of life on Earth. Examine some of our closest and most distant relatives to better understand our place within the Tree of Life.

Double Discount Days
Sunday, November 11–18

Get out in front of holiday shopping with twice your regular Member discount! For a week in November, Members save 20 percent on purchases in the Museum's retail shops and online store. Just have your membership card handy at checkout.



Weekend to ReMember
Friday–Sunday, November 16–18
 For details, including up-to-date scheduling, email members@amnh.org

In celebration of their commitment to the Museum, Members enjoy extra free tickets and guest passes, exclusive early morning access to special exhibitions (Saturday and Sunday only), special tours and lectures, drop-in activities for children, double shop discounts, and more!

Origami Holiday Tree
Opens Monday, November 19
Free

Visit the Museum this holiday season to see one of New York's most beloved displays, the Origami Holiday Tree—an annual tradition for more than 40 years. Produced in partnership with OrigamiUSA, the tree is decorated with more than 800 hand-folded paper models.



InSight Lands on Mars
Monday, November 26
 2 pm
Free

Join Hayden Planetarium Director of Astrovisualization **Carter Emmart** for a live simulation of the landing of the InSight Mission to Mars' Elysium Planitia using the open source software OpenSpace.

The Perfect Planet
Tuesday, November 27
 7 pm
\$12

Astrophysicist **Jackie Faherty** joins forces with *Broken Earth* series author **N.K. Jemisin** to examine what makes Earth unique compared to others in our solar system and beyond. Find out where artists and scientists alike look for life beyond Earth, from Io to Enceladus and beyond.

Animal Drawing
Eight Thursdays, November 29–January 17
 7–9 pm
 Various Halls
\$160 (Materials not included)
 The celebrated dioramas, dinosaur fossils, and other iconic Museum exhibits serve as the setting for an intensive after-hours drawing course with illustrator and naturalist **Patricia Wynne**. Learn about the gifted artists who created the Museum's world-class dioramas as you sketch subjects in their "natural" environments.



Probing Asteroids in Space
Tuesday, December 4
 7:30 pm
\$12

Research Associate **Harold C. Connolly Jr.** provides an in-depth dispatch on the progress of the OSIRIS-REx and Hayabusa2 spacecraft missions, which are currently probing asteroids Bennu and Ryugu. Director of Astrovisualization **Carter Emmart** and Curator **Denton Ebel** join Connolly to share visualizations of these active missions.

SciCafe: End of the Megafauna
Wednesday, December 5
 7 pm

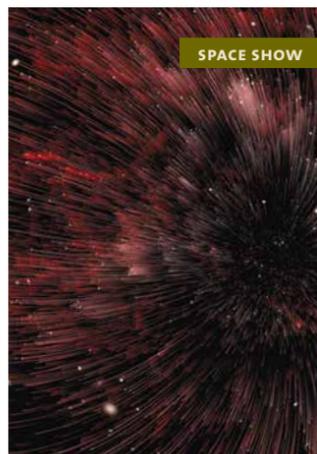
Free with cash bar
 21+ with ID
 Until a few thousand years ago, gorilla-sized lemurs and 500-pound birds roamed the Earth. These "megafauna" lived on every habitable continent. Today, almost all of them are gone. What caused their disappearance? Curator **Ross D. E. MacPhee** searches for answers in his new book.

DECEMBER

Double Discount Days
December 1–8

Get out in front of holiday shopping with twice your regular Member discount! For a week in December, Members save 20 percent on purchases in the Museum's retail shops and online store. Just have your membership card handy at checkout.

Dark Universe
 Narrated by **Neil deGrasse Tyson**, Frederick P. Rose Director of the Hayden Planetarium, this Space Show celebrates pivotal discoveries and the cosmic mysteries that remain. Gaze up at the Milky Way from Mt. Wilson Observatory in California, plunge into Jupiter's atmosphere with a NASA probe, and find out what scientists are learning about dark matter and dark energy.



Captioning devices are available.

Member Entrance is Now Open!
 We are delighted to welcome you and your guests at the Member entrance located on Central Park West (ground level, via the driveway) at 79th Street. Open daily, as during on holidays and special events! Please note that the entrance is accessible by wheelchair.

Exhibition Credits

Lead funding for *Unseen Oceans* and its educational resources is provided by **OceanX**, an initiative of the **Dalio Foundation**.

The American Museum of Natural History gratefully acknowledges the **Richard and Karen LeFrak Exhibition and Education Fund**.

Unseen Oceans is generously supported by **Chase Private Client**.

Our Senses is generously supported by **Dana and Virginia Randt**

Generous support for *The Butterfly Conservatory* has been provided by the **Eileen P. Bernard Exhibition Fund**.

Backyard Wilderness is released by **SK Films**, the film is an **Arise Media/ Archipelago Films** production in collaboration with **HHMI Tangled Bank Studios**.

Dark Universe was created by the **American Museum of Natural History**, the **Frederick Phineas and Sandra Priest Rose Center for Earth and Space**, and the **Hayden Planetarium**.

The Museum also gratefully acknowledges major funding from the **Charles Hayden Foundation**.

Presented with special thanks to **NASA** and the **National Science Foundation**.

Dark Universe was developed by the **American Museum of Natural History**, New York (www.amnh.org) in collaboration with the **California Academy of Sciences**, San Francisco, and **GOTO INC**, Tokyo, Japan.

Winter Solstice and the Year Ahead

Thursday, December 20
7 pm
\$12

Celebrate the solstice and get ready for the cosmic year ahead. **Ted Williams** and **Irene Pease** conduct this tour around the Sun and preview important astronomical and scientific happenings you won't want to miss.



Kwanzaa
Saturday, December 29
Noon–5 pm
Free

Join us for a celebration of African-American heritage rooted in seven principles known as Nguzo Saba, which promote unity, culture, and community development. The festival features a live musical performance, and a marketplace that showcases local artisans.

Program Credits:

The SciCafe series is proudly sponsored by Judy and Josh Weston.

SciCafe: Engineering Technologies Inspired by Nature and related activities are generously supported by the Science Education Partnership Award (SEPA) program of the National Institutes of Health (NIH).

The Museum gratefully acknowledges The Mortimer D. Sackler Foundation, Inc. for its support to establish the Sackler Brain Bench, part of the Museum's Sackler Educational Laboratory for Comparative Genomics and Human Origins, in the Spitzer Hall of Human Origins, offering ongoing programs and resources for adults, teachers, and students to illuminate the extraordinary workings of the human brain.

The Margaret Mead Film Festival is made possible by the New York State Council on the Arts with the support of Governor Andrew M. Cuomo and the New York State Legislature.

Special support provided by the Academy of Motion Picture Arts and Sciences.

Support for the Margaret Mead Film Festival is provided, in part, by the May and Samuel Rudin Family Foundation, Inc. and the family of Frederick H. Leonhardt.

Support for Hayden Planetarium Programs is provided by the Horace W. Goldsmith Endowment Fund.

Select Hayden Planetarium Programs are sponsored by JetBlue.

The Annual IRIS/SSA Lecture Series is presented in collaboration with the Incorporated Research Institutions for Seismology and the Seismological Society of America. Kwanzaa 2018 is provided, in part, by the May and Samuel Rudin Family Foundation, Inc. and the family of Frederick H. Leonhardt.

Kwanzaa 2018 is co-presented by Community Works and New Heritage Theatre Group.

The Kwanzaa marketplace is organized by the Harlem Arts Alliance.

The Museum's Día de Muertos Festival is presented in collaboration with the Mexican State of Oaxaca, an invited cultural partner.

Support for Día de Muertos is provided, in part, by the May and Samuel Rudin Family Foundation, Inc. and the family of Frederick H. Leonhardt.

The Halloween Celebration is made possible with the support of The Rudin Foundation, Inc.

The Discovery Room was made possible by a grant from the Edward John Noble Foundation.

Additional support has been provided by the Ralph M. Cestone Foundation, the Louis and Virginia Clemente Foundation, the Ducommun and Gross Family Foundation, the Larkin Family, the V. and L. Marx Foundation, and the Jane and Frances Stein Foundation.

OCTOBER

3
WEDNESDAY
SciCafe: The Milky Way as You've Never Seen It Before
Family Program

6
SATURDAY
The Butterfly Conservatory Opens

13
SATURDAY
Hall Tour: Earth as a Peppercorn
Member Program

16
TUESDAY
Family Party
Member Program

17
WEDNESDAY
Field Trip to the Moon
Member Program

18–21
THURSDAY–SUNDAY
The Margaret Mead Film Festival
Special Event

27
SATURDAY
Halloween Celebration
Family Program

29
MONDAY
A Natural History of the Senses
Adult Course begins

30
TUESDAY
Spooky Space
Astronomy Live

NOVEMBER

2
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Animal Encounter: Bats with Joseph D'Angeli
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Family Program

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Scott Kelly: Infinite Wonder
Frontiers Lecture

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Family Program

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Astronomy Live

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SATURDAY
Kwanzaa
Family Program

25th Annual
FAMILY PARTY

TUESDAY, OCTOBER 16

The Museum invites you to the annual Family Party—one of its most beloved traditions and the best family party in New York City. This exciting benefit event features fascinating educational activities and spectacular entertainment for children of all ages.

TUESDAY, OCTOBER 16

5–7:30 PM

Tickets and packages can be purchased online by visiting amnh.org/familyparty or by calling 212-496-3495.

Page 14–15: © AMNH, HBO, SK Films, © AMNH/D. Finnin
Page 16–17: NASA/Bill Ingalls, © AMNH/C. Chesek, © AMNH

2018 By the Numbers

2018 was a big year at the Museum, from milestone anniversaries for the Richard Gilder Graduate School and *The Butterfly Conservatory*, to record attendance for programs in the Discovery Room. But none of these achievements would be possible without the support of our Members and the vital contributions you make to work in science and education. Let's take a look at some of the things you've made possible at the Museum this year.

130,876 VISITORS

dropped in at the **Discovery Room** for hands-on activities, storytime, or Meet the Scientist programs, making 2018 a record-breaking year for attendance.



12 FOOT-TALL

giant amethyst geode was on view in the Grand Gallery through April 2018. The specimen, recently acquired from Uruguay, is one of the largest in the world and will be a centerpiece in the new Allison and Roberto Mignone Halls of Gems and Minerals.



500 FREE-FLYING

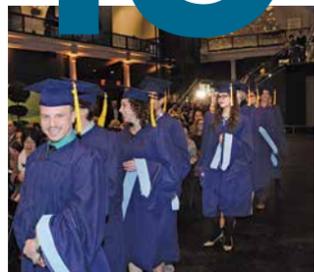
tropical butterflies and moths from three families of Lepidoptera delighted visitors in 2018 at *The Butterfly Conservatory*, which is free for Members!



3 NEW EXHIBITS

in the **Gottesman Hall** of Planet Earth got a major update, including exhibits about climate change, paleoclimate, and convection, ensuring this popular 20-year-old hall remains a valuable resource for visitors, including school groups.

10 YEARS



since the first class entered the **Museum's Richard Gilder Graduate School**, with 29 Ph.D. graduates and 94 graduates of the Master of Arts in Teaching (MAT) program. MAT alumni teach more than 8,400 students in high-need schools across New York State.

844 PARTICIPANTS

in the **Family Science Program**, a partnership with the New York City Housing Authority (NYCHA) to increase access to New York's cultural institutions for children in public housing.

20 GENE SEQUENCES



Plasmodium gene sequences analyzed by Museum scientists to create the most comprehensive Tree of Life for malaria parasites to date.

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92,500 STUDENTS

at 295 schools across all five boroughs participated in the **Urban Advantage Middle School Science Program**, a partnership of the New York City Department of Education and a consortium of eight cultural institutions led by the Museum.

99 MILLION-YEAR-OLD



piece of **Burmese amber** from the Museum's collections was found to contain the first fossil evidence that ticks fed on dinosaurs.

HELP MAKE 2019 A YEAR TO REMEMBER

When you make a tax-deductible gift to the Museum's Annual Fund, you're helping us to continue sharing knowledge and research about science, the natural world, and diverse cultures. To make a gift, visit amnh.org/annualfund.

Mind Games

Take your brain for a spin

Our brains are constantly bombarded with information from our senses, and they're trying to keep up as they shape our perceptions. When there's incomplete information—for instance, when we look at an optical illusion—our brains fill the gaps as best and as fast as they can. It's a time-honed evolutionary advantage: survival depends on quick reactions.

But these fast reactions aren't always right. If you've visited the special exhibition *Our Senses: An Immersive Experience*, you may remember the wall of faces in one of the galleries. From far away, you probably saw rows of identical protruding faces instantly recognizable as the legendary physicist Albert Einstein. But look up close, and you see that the faces are indented. That's because your brain was tricked—it was correcting the indented image into a more familiar one.

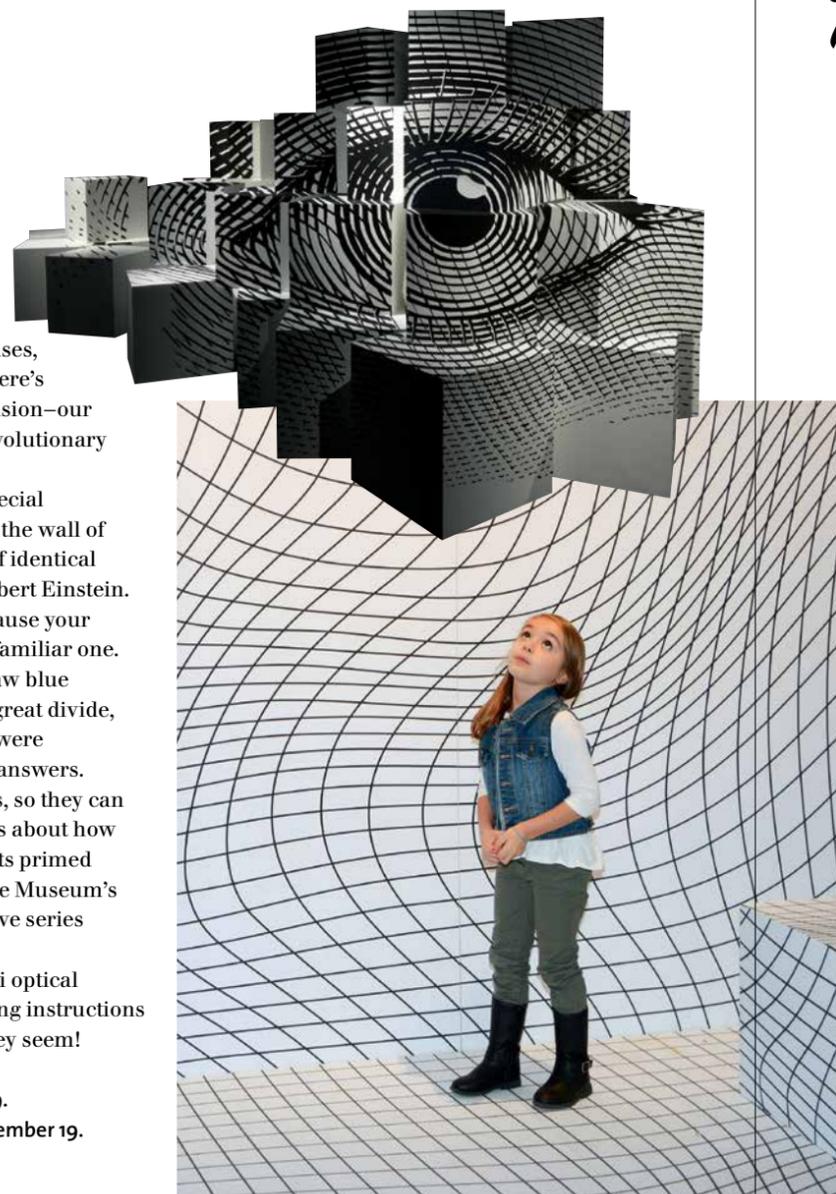
And remember *The Dress* that went viral in 2015? Some people saw blue with black, while others were convinced it was white and gold. The great divide, it turned out, was due to a difference in perception. All of our brains were compensating for ambiguous lighting—but coming up with different answers.

Optical illusions reveal the usually hidden processes of our brains, so they can be fun—and a bit disquieting. After all, they shake up our assumptions about how we experience the world. To see how your brain fills in, selects, or gets primed to interpret information—or even just plain “tricked”—visit OLogy, the Museum's website for kids, and search for “optical illusions” to find an interactive series of mind-bending examples.

Or, take your senses for a quick spin by creating your own origami optical illusion. Just cut out the square on the opposite page, follow the folding instructions below, and—no spoilers, but remember, things aren't always what they seem!

See *Our Senses: An Immersive Experience* before it closes on January 2, 2019. Members see the exhibition for free! The Origami Holiday Tree opens November 19.

Our Senses is generously supported by Dana and Virginia Randt.



Explore how your brain pieces together scraps of information from your sensory organs and then fills in the gaps when you visit the special exhibition *Our Senses*.

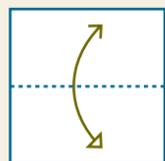


ORIGAMI 101

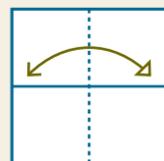
VALLEY FOLD

A fold that creates a valley in the paper—like a hot dog bun.

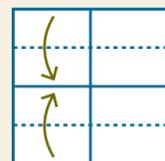
KNOW HOW TO FOLD 'EM: SPINNING TOP



1. Start with the spiral graphic face-down. Crease in half horizontally. Unfold.



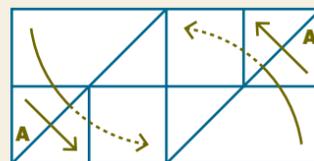
2. Crease in half vertically. Unfold.



3. Valley fold the top and bottom edges to the horizontal center line.

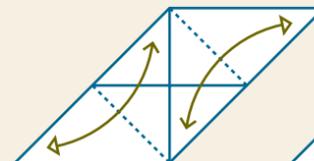


4. Valley fold the top left corner down to the vertical center line. Unfold. Repeat the same for the opposite corner, and unfold.

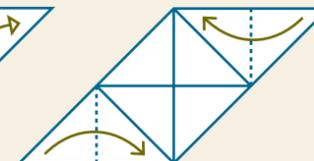


5. Fold the small corner flaps labeled A underneath. Tuck the top left and bottom right corners under the top layer.

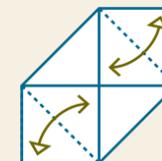
© AMNH/D. Finnin, © AMNH/R. Mickens, Origami model courtesy of Yami Yamauchi.



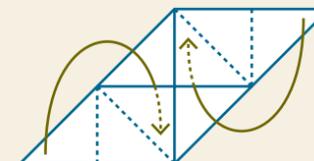
6. Fold the left point to the top corner, and the right point to the bottom corner. Unfold both flaps.



7. Valley fold both upper right and lower left points horizontally.



8. Valley fold the bottom left and top right triangles to the center and unfold.



9. Unfold so the model looks like Step 7. Tuck the corner into the pocket. Repeat on the other corner.



10. Finished! Turn the model over and spin it!

Membership

Central Park West at 79th Street
New York, New York 10024-5192
amnh.org



©AMNH/D. Finnin



Many species of bees call New York City home. Find out how Museum scientists are helping parks and gardens create a healthy ecosystem for local bee populations on p. 6.

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,
the Rose Center/81st Street,
and through the subway (lower level).

RESTAURANTS

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

MUSEUM SHOPS

The Museum Shop, Dino Store,
Planetarium Shop, Cosmic Shop,
Senses Shop, Unseen Oceans Shop,
and Online Shop (shop.amnh.org)
offer Members a 10-percent 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: **B** (weekdays) or **C** 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 can park
for a flat fee of \$10 if entering after 4 pm.
To receive this rate, show your membership card
or event ticket when exiting the garage.

ACCESSIBILITY



For information on accessibility,
email accessibility@amnh.org
or call 212-313-7565.