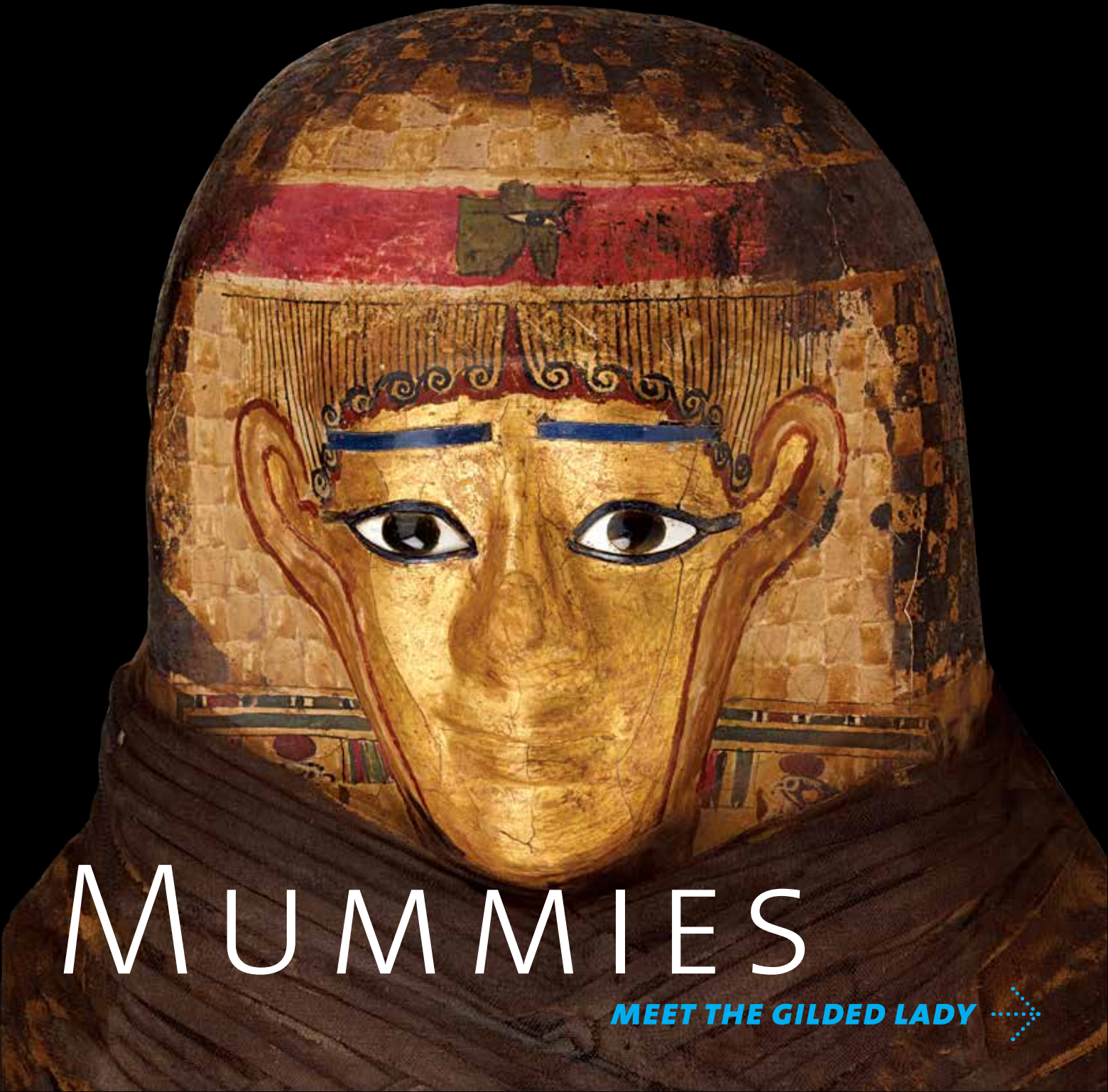


 AMERICAN MUSEUM OF NATURAL HISTORY

ROTUNDA

Member Magazine
Spring 2017 Vol. 42 No. 2



MUMMIES

MEET THE GILDED LADY





Mummy #30007, known as the Gilded Lady, is one of the most beautifully preserved mummies from The Field Museum's collection, and one of 19 now on view in the special exhibition *Mummies*.

For decades, keeping mummies like this one well preserved also meant severely limiting the ability of researchers to study them. The result is that little was known about the Gilded Lady beyond what could be gleaned from the mummy's exterior, with its intricate linen bindings, gilded headdress, and painted facial features.

Exterior details do offer some clues. The mummy dates from 30 BC–AD 395, a period when Egypt was a province of the Roman Empire. While the practice of mummification endured in Egypt, it was being transformed by Roman influences. Before the Roman era, for example, mummies had been placed in wooden coffins, while the Gilded Lady is preserved in only linen wrappings and cartonnage, a papier mâché-like material. Also absent are the hieroglyphics that decorated mummy coffins in earlier times.

Other traditions surrounding the afterlife persisted, as demonstrated by the Gilded Lady's intricately painted headdress. Ancient Egyptians believed that in the afterlife, the dead would still require their eyesight, hearing, taste, and smell—and that these senses could be preserved by a mask.

Scientists have long been eager to examine mummies without risking damage to their fragile contents.

The Gilded Lady's body case does not reveal much about the woman inside, though. Scientists have long been eager to examine mummies without risking damage to their fragile contents. The first x-rays of a mummy were taken in 1896, just a year after the technology was first developed, points out Museum Curator David Hurst Thomas, who is overseeing the *Mummies* exhibition here this spring.



Seeing Inside

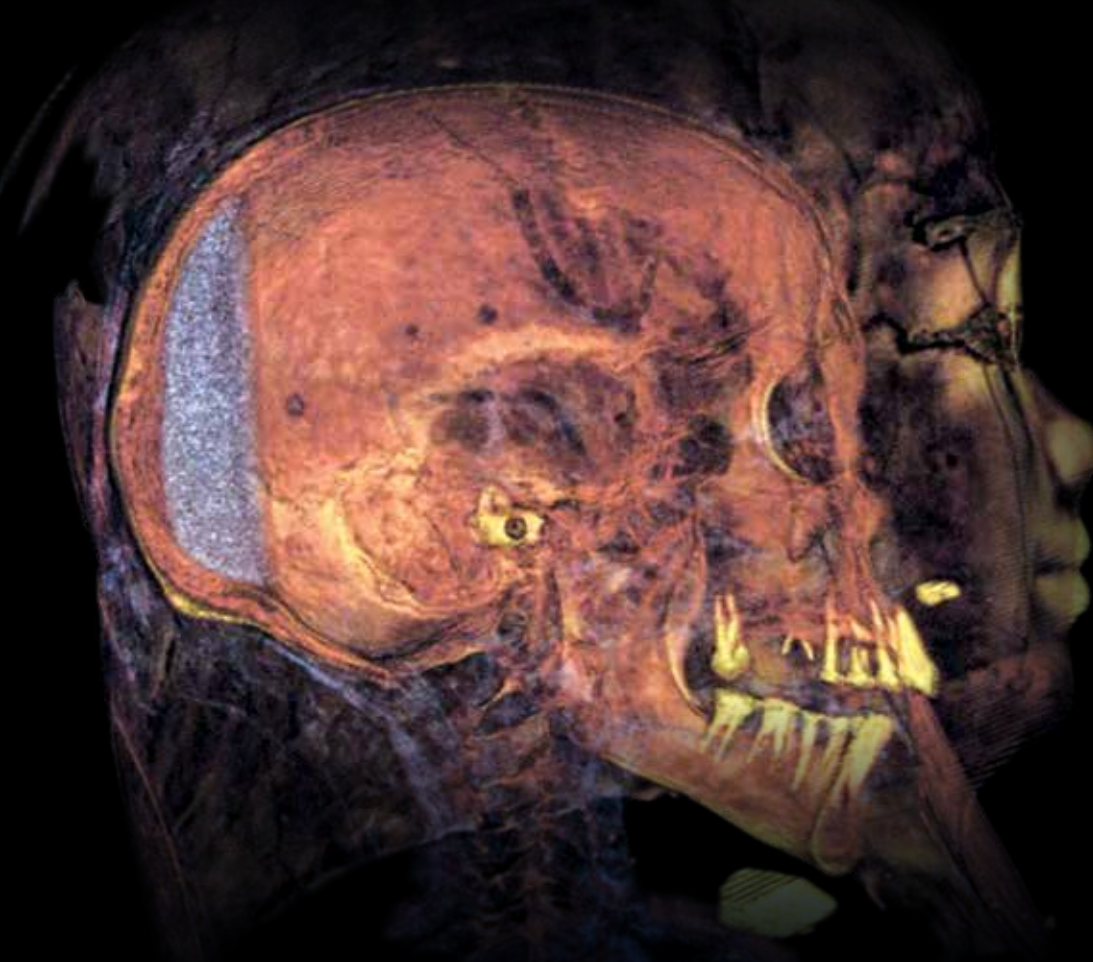
Today, computerized tomography (CT) scanning offers researchers glimpses of mummified individuals like never before. By combining thousands of cross-sectioned x-ray images, CT scans let researchers examine the

inside of mummies, revealing details about the person's age, appearance, and health. "Scans like these are noninvasive, they're repeatable, and they can be done without damaging the history that we're trying to understand," Thomas says.

CT scans of the Gilded Lady reveal that she was probably in her forties. They also suggest that she may have suffered from tuberculosis, a common disease at the time.



© 2015 The Field Museum, A15214d_030A, photographer John Weinstein, CT scan composite © 2015 The Field Museum, Katarina Kaspari, © The Field Museum



Revealing Details

Amazingly, CT scans can also provide details about an individual's appearance. The Gilded Lady, it turns out, had a slight overbite, as seen in the scan above. Another scan, below, provides one more hint about

what she looked like in life: on her scalp, you can see traces of curly hair.

CT scans can also tell us about more than just an individual mummy. The technology helps scientists glean new insights into

how ancient Egyptians preserved their dead. In the image above, for instance, the white lumps under the Gilded Lady's chin and at the back of her skull are thought to be lumps of resin, likely inserted to improve the mummy's odor.

See the Gilded Lady and other mummies that have been recently revealed using state-of-the-art imaging techniques in *Mummies*, open now and free for Members.

Mummies was developed by The Field Museum, Chicago.

The Museum gratefully acknowledges the Richard and Karen LeFrak Exhibition and Education Fund.


Mummies is proudly supported by Chase Private Client.

Face to Face

Using the CT scans of the Gilded Lady, scientists from The Field Museum generated a virtual reconstruction of the skull, then worked with 3D-printing specialists to create an exact physical replica of it without opening or disturbing

the actual mummy in any way.

The research team then collaborated with Élisabeth Daynès, an award-winning sculptor noted for hyper-realistic re-creations of fossil hominids including the *Australopithecus*

known as Lucy. Daynès used the detailed skull model, CT scans, and forensic research to create this portrait: an artist's interpretation of what the Gilded Lady may have looked like in life. 



© EPA/M. Nelson, © 2012. Photo: É. Daynès-Reconstruction Élisabeth Daynès Paris

From the President

Ellen V. Futter



"A child's world is fresh and new and beautiful, full of wonder and excitement," wrote Rachel Carson. These are the building blocks of science, and all children are natural-born scientists. At the Museum, we want every child to keep that wonder and excitement for science and nature—and we'd like some of you adults to renew them as well!

For this reason, the Museum has a continuum of programs encompassing the lifespan, beginning with our youngest visitors. Early science exposure lays the groundwork for future achievement in science while helping develop language and motor skills, cognition, and social interaction. The Museum's early-childhood programs invite our youngest visitors and their caretakers to observe the world, act like scientists, and learn together.

A student may then continue through elementary school with us, participate in our Urban Advantage middle school science initiative, choose from a

variety of after-school offerings for high schoolers, and even undertake an intensive, mentored research project with a Museum scientist as a high school or college student—not to mention our Ph.D. and MAT programs through the Richard Gilder Graduate School, as well as many exciting programs for adults. Of course, you need not aspire to be a scientist to benefit from our broad array of opportunities.

And that's because we want all children and, indeed, all adults to appreciate science and scientific thinking so they may better understand the world around us and participate thoughtfully in our science-based and technology-driven century. At a time when we are faced with environmental threats, climate change, emerging disease, and so many other challenges, the Museum empowers people to make decisions based on evidence and knowledge, and to live in the natural world, guided by an ever-fresh sense of wonder and excitement.

Table of Contents

Mummies, Unwrapped	2
News	7
Close-Up	8
Birding for Beginners	10
Next	12
Dive in, in Discovery Room	18
Time Capsule	20



ROTUNDA

American Museum of Natural History
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ISSN 0194-6110
USPS Permit #472-650
Vol. 42, No. 2, Spring 2017
Rotunda is published quarterly by the Membership Office of the American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024-5192. Phone: 212-769-5606. Website: amnh.org. Museum membership of \$75 per year and higher includes a subscription to Rotunda. © 2017 American Museum of Natural History. Periodical postage paid at New York, NY and at additional mailing offices. Postmaster: please send address changes to Rotunda, Membership Office, AMNH, at the above address.

Please send questions, ideas, and feedback to rotunda@amnh.org.

Clockwise from top left: © AMNH/D. Finnin, AMNH/M. Shanley, University of Michigan Museum of Paleontology, AMNH/R. Mickens, M. Miyares Hollands

Citizen Science Project Seeks Planet Hunters



An artist's rendition of NASA's Wide-field Infrared Survey Explorer (WISE) telescope, which took the photos volunteers are now using to search for a ninth planet in our solar system.

Thanks to modern technology, we're all astronomers now. At least, that's what researchers at NASA, the Museum, and other institutions are hoping to prove with the February launch of Backyard Worlds: Planet 9, a project that lets citizen scientists to contribute to the search for an undiscovered planet.

"It's hard to believe, but our solar neighborhood is still unexplored territory," said Jackie Faherty, a senior scientist in the Museum's Department of Astrophysics and a co-founder of the project. "There are cold worlds hiding just a short distance from the Sun, and Backyard Worlds: Planet 9 is a platform for bringing citizen scientists into the search party."

That search party is looking for a ninth planet in our solar system—one that could be up to 15 times the size of the Earth, and up to 1,500 times as far from the Sun. No one has ever observed this potential planet directly, says Faherty, but scientists think they've seen evidence of its existence in the motions of Kuiper Belt objects, which are distant, icy bodies similar to Pluto.

Backyard Worlds: Planet 9 allows anyone with an internet connection and a computer to explore the cosmos courtesy of images obtained by NASA's Wide-field Infrared Survey Explorer telescope (WISE). In just the first week, the project drew 24,000 volunteers from around the globe, who view millions of "flipbooks," brief animations showing how small patches of the sky changed over several years, and try to spot objects that seem to be moving.

While parts of this search can be done by computers, machines are often overwhelmed by image artifacts, especially in crowded parts of the sky. This visual "noise" includes spikes associated with star images and blurs caused by light scattered inside WISE's instruments. Human eyes, on the other hand, easily recognize important moving objects.

In addition to a potential Planet 9, Backyard Worlds discoveries may include brown dwarfs—objects larger than Jupiter but smaller than stars—and "rogue worlds"—giant planets without a parent star that are hurtling untethered through the cosmos.

What will you discover in the WISE telescope photos? Start exploring at www.backyardworlds.org.

Programs for Planet Hunters

Hone your star-gazing skills at the upcoming Astronomy Live programs in the Hayden Planetarium.

Being Earth-bound got you down? On April 25, explore *Exotic Skies* with Irene Pease and Brian Abbott, who will be showing views of the night sky from other vantage points in the universe.

On May 23, Jackie Faherty and Ted Williams will delve into the *Unsolved Mysteries of the Universe*—including why Earth is the only habitable planet in our solar system.

Get the "space weather" report from Carter Emmart on June 27 with a closer look at the *Earth-Sun Connection* and the daily barrage of solar wind flowing toward our planet.

See listings on pages 13, 15, and 16 for more details and ticket information.



© NASA, © AMNH/D. Finnin

ARTISTS WITHOUT BORDERS

Since reforms were enacted in the 1990s, it has become easier for Cuban artists to work outside of their home nation, with more international recognition and opportunities. “Today’s art environment looks very encouraging given the diversity of aesthetics flourishing in and out of traditional venues. Events and exhibitions stand out with the public and critics, locally and internationally,” says Hollands.

POSTERS, PLUS

While the gallery features dozens of posters from noted graphic designers, visitors can discover the breadth of Cuban art in other media as well, thanks to a pair of interactive touch tables that project selected works of art onto the walls. Each features profiles of Cuban artists working around the world, from painters and photographers to sculptors and performance artists.

PUBLIC, PRIVATE

While most of the posters on display in *jCuba!* were commissioned by state-run cultural institutions, posters advertising private enterprises are increasingly common.

ON POINTE

In addition to visual arts and music, Cuba is known for its rich tradition of dance, including a legacy of producing world-class ballet dancers. A country-wide system of tuition-free schools helps Cuban ballet companies find and nurture talented dancers from a young age.

Made in Cuba

In the special exhibition *jCuba!*, you can see re-creations of lush wetlands and dazzling coral reefs, but these aren’t the only vibrant colors and striking visuals on view. One of the closing sections of this bilingual exhibition features a gallery of contemporary posters from some of the island nation’s most compelling artists and graphic designers.

Posters, often promoting government programs and state-sponsored events, have a long history as one of Cuba’s most iconic art forms. They remain a popular medium for many designers today. “A poster puts your creativity and cunning to the test and challenges you to say something using just a few elements,” says designer Michele Miyares Hollands, an acclaimed Cuban poster artist whose work is featured in the exhibition and who created the Cuban anole artwork for the exhibition’s advertising campaign.

The original posters on view in the exhibition were made by silk-screening, a labor-intensive printing process in which individual colors are applied in separate steps, eventually resulting in a multilayered work where each print is truly one of a kind. Among the works displayed are posters from the *Pensamos Cuba* series, a government-sponsored collection of posters and prints in which artists share their thoughts and feelings on everyday life in Cuba.

“Cuban art ... offers a wide panorama of languages, themes, and modes of expression linked to the diversity of Cuban thought today,” says Hollands. “It channels much of the daily life of the people, acting as a strong critic on important issues.”

The poster by Hollands on this page features an image of Celia Cruz, the “Queen of Salsa” and a Cuban exile. Unable to return home after the 1959 revolution, Cruz and her husband Pedro Knight settled in the United States, where Cruz continued to have an outsized impact on the music world, winning multiple Grammys over a decades-long career.

jCuba! is now on view and free for Members.

Learn screen printing at the Museum. See p. 12



© M. Miyares Hollands



AMNH FARB 5060

Ancient Traces

Despite its nickname, the Museum’s famous dinosaur “mummy”—the duck-billed dinosaur *Edmontosaurus annectens* on display in the Hall of Ornithischian Dinosaurs—has long been thought to be a fossil with a rare imprint of skin. But recent research suggests there may be more to the story.

This distinctive hadrosaur specimen does include an impression of mummified, or dried-out, skin, giving paleontologists a glimpse of ancient tissue that rarely survives. The imprint, which was made in the sand and mud in which the animal was buried, later became petrified, creating a fossil—and, perhaps, preserving something else.

“It’s an inference, but a good one, that a fossilized remnant of the actual skin of our mummy may be preserved,” says Daniel Barta, a doctoral candidate in comparative biology at the Museum’s Richard Gilder Graduate School, citing a 2009 biochemical analysis of a similar specimen published in the journal *Proceedings of the Royal Society of London B*.

A 2015 paper by some of the same researchers found that the skin of hadrosaurs may have been well suited to mummification because it contained pigmented molecules that broke down after death, releasing a substance that killed microbes involved in decomposition. Another complete hadrosaur specimen on view, *Corythosaurus*, also has large areas of skin impressions—and, potentially, fossilized skin.

The presence of skin and even its impressions are rare and exciting finds, offering invaluable information about how the dinosaurs’ skin patterns compare to living reptiles and how they looked in life.

“People are so used to seeing only bones and teeth,” says Barta. “They forget dinosaurs were covered in all the same soft tissue that living animals are.”

To see human-made mummies, visit the *Mummies* exhibition, now on view and free for Members.

Rotunda / Spring 2017 / AMNH.org

IMAGINE THIS

Edmontosaurus lived in the Late Cretaceous period, about 65 million years ago. But visitors can see what it may have looked like in a 1990 illustration by John D. Dawson in its case. It can also be seen in a nearby 1908 oil painting of *Anatotitan*, which is now thought to be the same species as *Edmontosaurus*.

THRILL OF DISCOVERY

This fossil of *Edmontosaurus* was collected in 1908 in the Edmonton Formation in Niobrara County, Wyoming, by Charles H. Sternberg (1850–1943). In his autobiography, *Life of a Fossil Hunter*, he wrote that it was “the most complete skeleton of an extinct animal I have ever seen, after 40 years of experience as a collector” and called it “the crowning specimen of my life’s work.”

STRIKING POSE

Edmontosaurus is mounted as it was found, lying on its back with its knees drawn up and its head and neck twisted backward, a common posture for dead dinosaurs. Scientists debate whether this position reflects the animal’s choking to death or was caused by tendons shrinking back postmortem.

SEALED FOREVER

If an animal dies in an environment that lacks oxygen—like the bottom of a lake or riverbed—most microbes involved in decomposition can’t survive. Natural embalming can also result from being trapped in amber or a sticky substance—like California’s La Brea tar pits—or under certain chemical conditions, such as in the peat bogs of Europe where human bodies were famously preserved.

HOT AND COLD

Animals found in Siberia, Alaska, and other cold regions were likely mummified when buried by massive dust storms kicked up by glaciers moving over land. Natural mummies also can be created by desiccation in extreme dry heat, as in the American Southwest—or in the Egyptian and Peruvian deserts, where archaeologists think such accidental mummification may have inspired human practices.

BIRDING *for* BEGINNERS



New York City kids are more likely to recognize the sound of the city bus than the tune of a bird song. But Noah Burg, who leads the Museum’s seasonal family bird walks for Members, is working to change that, one nascent birder at a time.

Family bird walks begin indoors with a primer on identifying birds and an opportunity to practice using binoculars to observe 100-year-old taxidermy specimens from the Museum’s Ornithology Collection. Binoculars are provided, as is a field guide for beginning birders. (You can download a version from the Museum’s Center for Biodiversity and Conservation at <http://bit.ly/2hPn8Q4>.)

Then, just as Steven Spielberg angled his cameras in *ET* to see the world from a child’s perspective, Burg, who is working toward a Ph.D. degree in biology, leads the group through habitats

in which birds are most accessible to a child’s eye. “By design, we focus on birds that are low down, easy for kids to see,” he says.

The first habitat? The sidewalk!

“We start birding as soon as we walk out of the building,” says Burg, noting that the most common urban birds are non-native, introduced species. Taken out of their native habitats, pigeons traded the cliffs of India for tall buildings; starlings and sparrows, the natural cavities found in Europe for roof eaves in New York. “This is a city of immigrants, and this applies to some of our most iconic city birds as well,” Burg says. “These birds were brought to New York by humans—they didn’t make the journey on their own. They are well suited to living where people are.”

Next, Burg leads the group in search of a greater diversity



**JOIN US
IN MAY**

See the calendar listing on p. 14.

of species in Central Park, which Burg describes as “an oasis of green, an island within a sea of inhospitable territory, where part of the excitement is you never know what you’ll see.”

In spring on the open lawn, there could be White-throated Sparrows, American Robins, and Common Grackles. Near a mix of woods, stream, and pond, Mourning Doves might be seen feeding in the less dense forest and other birds—Gray Catbirds, Blue Jays, Cardinals—are likely to come down from the tree canopy for a drink of water.

At Central Park Lake, where people rent boats, you’ll get hardier birds, ones more accustomed to humans, like Mallards, Double-crested Cormorants, and Canada Geese. Near the quieter Turtle Pond, novice birders can look for wading birds like the Great Egret and Black-crowned Night Heron or catch

a glimpse of Red-winged Blackbirds among the reeds.

Burg encourages his birders to learn to distinguish bird songs using free resources online, including the website of the Cornell Lab of Ornithology. He even plays some calls before the group heads outdoors—but never uses them during the walks. (Playing recorded birdsong outdoors is generally frowned upon by birders, as it tends to unnerve territorial birds from various species who interpret the song as a threat to their space or a potential suitor.) With an introduction to some of the best birding places in Central Park made, and tips for beginning birders imparted, Burg, his charges, and their parents head out of the park.

“We don’t go very far,” says Burg. “Our goal is to make the walk fun and accessible to the kids.”

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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 March 1, 2017. Please check amnh.org/calendar for updates.

APRIL

Celebrate Pacific Northwest Cultures
First Saturdays, April–May 2017
Noon–4 pm
Hall of Northwest Coast Indians
Free

Experience the iconic Hall of Northwest Coast Indians through activities guided by Museum volunteers. Enjoy the interactive Digital Totem and tour the hall with educators from the Haida Gwaii Museum via a telepresence robot.

Cuban Screen Printing Drop-in
Saturday, April 1 and Sunday, April 2
Room 319, third floor
Museum hours
Free

In conjunction with the Museum's exhibition *iCuba!*, renowned Cuban poster artist **Raul "Raupa" Valdes** demonstrates the art of screen printing. Learn about the tradition of poster art in Cuba and create a piece to take home.

Note: All experience levels are welcome. Materials provided.

Morning Bird Walks in Central Park
Tuesdays–Fridays;
April 4–May 26
\$85

Observe the exciting spring migration of birds in Central Park with ornithologists **Paul Sweet** (Tuesdays, 7 am, and Fridays, 9 am) and **Joseph DiCostanzo** (Wednesdays and Thursdays, 7 am). Learn how to use field marks, song, habitat, and behavior to identify birds including warblers, thrushes, tanagers, and orioles as they pass through Central Park en route to their summer homes.

Lunchtime Bird Walks in Central Park
Session 1: Tuesdays,
April 4–April 25
Noon–1:30 pm
\$50

Join ornithologist **Paul Sweet** on walks through Central Park during spring migration. Learn how to identify the varied bird species that pass through New York City using field marks, behavior, and song.

Behind the Scenes Tour: Entomology
Tuesday, April 4
6:30, 7, and 7:30 pm
(hour-long tours)
\$30 per person
Get a rare, Members-only glimpse behind the scenes and explore one of the world's largest and most spectacular collections of invertebrates. Take a guided tour through this massive collection of insects, arachnids, and more with Museum scientists to learn about the diversity, biology, and behaviors of striking animals from around the world.

This tour is appropriate for ages 10 and up. Children must be accompanied by an adult.

SciCafe: Stress and Human Evolution
Wednesday, April 5
7 pm
Free for 21+ with ID
How do trauma, poverty, and racial discrimination influence our health? What about our evolutionary history causes our bodies to respond in this way? Anthropologist **Zaneta Thayer** explores the biological mechanisms through which early-life stress influences biology and health later on.

Exhibitions

Admission is by timed entry only.

Mummies

Free for Members

Discover when, how, and why ancient Egyptians and Peruvians were mummified and find out who they were in life. This show features an up-close look at rarely exhibited mummies as well as interactive touch tables, rare artifacts, and cutting-edge imaging.



iCuba!

Free for Members

Explore the extraordinary biodiversity across the island's remote forests, mysterious caves, expansive wetlands, and dazzling reefs, as well as its culture, its people, and its history.



Baby Animal Encounters
Saturday, April 8
11 am, 1 pm, and 3 pm
\$15 per person

Spring is the season for new discovery, and the beginning of new life for creatures around the world. Meet some of nature's wildest and cutest youngsters, and learn how they grow and learn to adapt to their unique habitats. Zoologist and TV host **Jarod Miller** will introduce you to a diverse group of babies, large and small, from across the animal kingdom.

Milstein Science Series: Amazing Amazon
Sunday, April 9
11 am–4 pm
Milstein Hall of Ocean Life
Free

The Amazon is the most powerful river in the world, and its rapid transformation has the potential to change the global climate. Pouring into the Atlantic Ocean, the great river flows through the world's largest tropical rain forest, one of the most biodiversity-rich places on the planet. Meet live animals, try hands-on activities, and experience dynamic performances in this family-friendly science festival.

Milstein Science Series Immersive Dome Experience: The Jelly Dome
Monday, April 10–Friday, May 26
Museum hours*
Milstein Hall of Ocean Life
Free

Jellies astound scientists with their unique capacity to pulse through the sea, regenerate, and even glow. Dive into the world of jellies and experience a day in the life of these astonishing animals.

*Milstein Hall of Ocean Life hours are subject to change.

Our Path to a New Home in the Planets
Monday, April 10
7:30 pm
\$12

Planetary scientist **Amanda Hendrix** and science writer **Charles Wohlforth** highlight the developments and initiatives that have transformed the dream of space colonization into something that could become reality. The two discuss groundbreaking research and make the case that Saturn's moon Titan offers the most realistic prospect for life without support from Earth.

Science Throwdown: Sea vs. Space
Thursday, April 13
7 pm
\$20

Into the deep or over the Moon—which is more important, intriguing, and inspiring? Explore the merits of sea versus space across a range of judging categories with seafaring siblings **Fabien and Celine Cousteau** and twin astronauts **Scott and Mark Kelly**. This tongue-in-cheek “debate” pits these explorers against each other, and you decide who wins.

Stem Cell Science 5-Part Course
Five Thursdays,
April 20–May 18
6–8 pm
\$240
18+

What are stem cells, and what promise do they hold for the treatment of diseases? Delve into the biology of stem cells, discover new research techniques, and discuss ethical concerns. Learn about current stem cell therapies, the challenges ahead, and potential future treatments. Meet stem cell experts presenting research at the frontiers of the field and observe live stem cells under the microscope.

Earth Day Celebration
Friday, April 21
8 pm
Free

Registration required, call 212-769-5222
Celebrate Earth Day in the planetarium! Observing the Earth from space provides a window on the unique and fragile beauty of our home planet. Earth is both driven by nature and profoundly altered by humans. Director of Astrovisualization **Carter Emmart** guides you through an immersive story of our beautiful planet.



Exotic Skies
Tuesday, April 25
7 pm
\$12

Earth is our window to the cosmos, but did you ever wonder about the view from other places in the universe? **Irene Pease** and **Brian Abbott** take you to some of the most exotic places in our galaxy and beyond.

Countdown to Zero
Free for Members

Developed in collaboration with The Carter Center, *Countdown to Zero* focuses on the scientific innovations that are ridding the world of ancient afflictions, including the 30-year campaign that may soon eradicate Guinea worm disease.



CLOSES 5/29

The Butterfly Conservatory

Housed in a vivarium that approximates their natural habitat with live flowering plants, species in this ever-popular exhibition include iridescent blue morpho butterflies, striking scarlet swallowtails, and large owl butterflies.



CLOSES 5/29

Sackler Brain Brunch
The Science of Sleep and Memory
 Saturday, April 29
 11 am–2 pm
 Brunch included
\$85
18+

Wake up your mind with our first-ever Brain Brunch! Eat, drink, and learn about the enigmatic and important function of sleep. How does sleep deprivation impact brain function? How might loss of sleep affect the way you create memories? Experts in the field discuss the role rest plays in learning, memory, and behavior.



MAY

Lunchtime Bird Walks in Central Park
 Session 2: Four Tuesdays,
 May 2–23
 Noon–1:30 pm
\$50

Join ornithologist **Paul Sweet** on walks through Central Park during spring migration. Learn how to identify the varied bird species that pass through New York City using field marks, behavior, and song.

SciCafe: Ghost Snake Stories in Madagascar
 Wednesday, May 3
 7 pm

Free for 21+ with ID
 Join herpetologist and Museum Curator **Frank Burbrink** on a journey to the remote forests of Madagascar, where his team recently discovered several new species of reptiles, including the elusive “ghost snake.” Hear tales of life in the field and discover how DNA analysis helps identify new species in the lab.

Hall Tour: Lizards and Snakes
 Saturday, May 6
 10:30 am, 1:30 pm
 Free

Registration required; call 212-769-5200
 Join a Museum tour guide to explore exhibits in the Halls of Vertebrate Origins, Reptiles and Amphibians, Biodiversity, and more. Learn about the evolution of lizards and snakes in the fossil record, their biology, behaviors, and the roles they have played in myths and legends throughout history.

This tour is appropriate for ages 10 and up.

Identification Day
 Saturday, May 6
 Noon–4 pm
Theodore Roosevelt Memorial Hall
 Free

The Museum celebrates natural history collections by inviting visitors to bring in their own finds to the annual Identification Day. Scientists will attempt to identify your rarely seen holdings from the Museum’s collections.

Family Bird Walks
 Sunday, May 7
 10:30 am, 1:30 pm, and 4 pm
\$20 per person

Young explorers will learn observational skills, then head out to Central Park with Museum naturalist **Noah Burg** to identify bird species and habitats. Binoculars and bird guides are included.

Recommended for families with children ages 4–10. These programs include approximately 45 minutes of walking. Please wear comfortable shoes and clothing.

Los Sueños del Caribe (Dreams of the Caribbean): People, Land, and Place
 Saturday, May 13
 Noon–5 pm
 Free

Celebrate the natural and cultural diversity of the Caribbean at a family-friendly festival featuring activities and the premiere of a new work of music and poetry co-developed by Grammy-winning Cuban-American jazz legend **Paquito D’Rivera** and students from the **Celia Cruz Bronx High School of Music**.

JUNE

Hall Tour: Hidden Stories
 Saturday, June 3
 10:30 am
 Free

Registration required; call 212-769-5200
 Join a tour guide to learn how the Museum acquired some of its rarest and most beloved treasures. Travel back in time and journey across the globe with some of your favorite explorers to gain a deeper understanding of the Museum’s rich and storied history.

This tour is appropriate for ages 12 and up.

Mars as Never Seen Before
 Monday, June 5
 7 pm
\$12

Get closer to Mars! Using pioneering technology, the Museum uses NASA’s current Mars data to showcase never-before-seen details of the red planet. Join Director of Astrovisualization **Carter Emmart** for a new look at the Martian landscape that takes you beyond the reach of rovers.

SciCafe: Exercise Your Brain
 Wednesday, June 7
 7 pm

Free for 21+ with ID
 Did you know that physical aerobic exercise and meditation can actually change the anatomy, physiology, and function of our brains? Join neuroscientist **Wendy A. Suzuki** for an interactive discussion about how the brain changes in response to its environment. Try some exercises firsthand and discover how your brain can still surprise you.

Fun with Fossils
 Saturday, June 24
 9 am–5 pm
\$95 per person

Pack your collecting bag, old sneakers, and lunch, and travel back in time with **Carl Mehling** from the Division of Paleontology, on an expedition to Big Brook in Monmouth County, New Jersey. The fossil-rich site offers a variety of invertebrate and vertebrate fossils from the Late Cretaceous period, making it ideal for collecting. Feel free to bring your own collecting equipment.



Deep Life: The Hunt for Hidden Biology of Earth, Mars, and Beyond
 Monday, May 15
 7:30 pm
\$12

Geoscientist **Tullis Onstott** provides an insider’s look at pioneering fieldwork on Earth’s thriving subterranean biosphere—a place where scientists once thought life could not possibly exist. Onstott reveals how astonishing new discoveries by geomicrobiologists exploring Earth’s most extreme environments are furthering the search for life elsewhere in the solar system.

A book signing will follow.

New Science, New Solutions: Preparing for the Next Pandemic
 Thursday, May 18
 7 pm
\$12

Pandemics represent a significant threat to public health and security. How is science helping us understand and fight infectious disease? Whether tracking the effect of climate change on the reach of mosquito-borne illnesses, discovering new diseases, or preparing for a zombie outbreak, cutting-edge research illuminates how we will survive the next pandemic.

Unsolved Mysteries of the Universe
 Tuesday, May 23
 7 pm
\$12

Is there life spraying out of the geysers of Saturn’s moon Enceladus? How did our solar system end up with just one habitable planet? What is dark matter, and why doesn’t it interact with any other matter? **Jackie Faherty** and **Ted Williams** tour the universe exploring these unsolved mysteries and explaining how scientists seek to solve them.



2D AND 3D

Humpback Whales

Set in the spectacular waters of Alaska, Hawaii, and the remote islands of Tonga, this ocean adventure offers audiences an up-close look into the mysterious world of one of nature’s most awe-inspiring marine mammals.

Captioning devices are available.



SPACE SHOW

Dark Universe

Narrated by **Neil DeGrasse Tyson**, the 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 more.

Captioning devices are available.

Credits

Mummies was developed by The Field Museum, Chicago.

The Museum gratefully acknowledges the Richard and Karen LeFrak Exhibition and Education Fund.

Mummies is proudly supported by Chase Private Client.

¡Cuba! was developed in collaboration with the Cuban National Museum of Natural History.

Major funding for ¡Cuba! has been provided by the Lila Wallace-Reader’s Digest Endowment Fund.

Significant support for ¡Cuba! has been provided by the Ford Foundation.

Generous support for ¡Cuba! has been provided by the Dalio Ocean Initiative.

¡Cuba! is proudly supported by JetBlue.

Countdown to Zero is presented by the American Museum of Natural History in collaboration with The Carter Center.

Countdown to Zero is proudly supported by Conrad N. Hilton Foundation, Lions Clubs International Foundation, Mectizan Donation Program, and Vestergaard.

This exhibition is made possible by the generosity of the Arthur Ross Foundation.



Earth-Sun Connection
Tuesday, June 27
7 pm

Life on Earth is made possible by its proximity to the Sun. Yet even with the protection of our magnetic field, we face a daily barrage of radiation—the solar wind—which flows outward from the Sun. Should we worry about this “space weather?” NASA heliophysics scientists join Director of Astrovisualization **Carter Emmart** for an immersive look at this beautiful (and potentially dangerous) phenomenon.

Behind the Scenes: Paleontology

See amnh.org for date
6:30, 7, and 7:30 pm
(hour-long tours)
\$30 per person

Take part in this exclusive opportunity to visit the collections of the Division of Paleontology. Follow Museum staffers into the Fossil Preparation Lab to see how fossils are preserved and maintained. Then, visit the Museum’s Big Bone Room to see some of the largest and oldest specimens in the collection.

This tour is appropriate for ages 10 and up. Children must be accompanied by an adult.

Credits:

Support for Celebrate Culture! is provided, in part, by the May and Samuel Rudin Family Foundation, Inc.; the Sidney, Milton and Leoma Simon Foundation; and the family of Frederick H. Leonhardt.

Cuban Screen Printing Drop-in is presented in collaboration with the Pratt Institute.

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

Special thanks to MicroCulture developers PETLab at Parsons and Jane Medonough.

The April SciCafe event is presented in collaboration with The Leakey Foundation.

The Milstein Science Series is proudly sponsored by the Irma and Paul Milstein Family.

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

Stem Cell Science is supported by the Empire State Stem Cell Fund through New York State Department of Health Contract # DOH01-C30157GG-3450000

The Museum greatly 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.

Los Sueños del Caribe: People, Land, and Place is supported in part by an award from the National Endowment for the Arts.

New Science, New Solutions is generously supported by the Abel Shafer Public Program Fund, a fund created by the Arlene B. Coffey Trust to honor the memory of Abel Shafer.

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

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

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.

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

Made possible through the generous sponsorship of Accenture.

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.

APRIL

1

SATURDAY
 Celebrate Pacific Northwest Cultures Celebrate Culture

Cuban Screen Printing Celebrate Culture

2

SUNDAY
 Cuban Screen Printing Celebrate Culture

4

TUESDAY
 Morning Bird Walks in Central Park Begin Nature Walk

Lunchtime Bird Walks in Central Park Begin Nature Walk

Behind the Scenes: Entomology Member Program

5

WEDNESDAY
 Stress and Human Evolution SciCafe

8

SATURDAY
 Baby Animal Encounters Member Program

9

SUNDAY
 Amazing Amazon Milstein Science Series

10

MONDAY
 Immersive Dome Experience: The Jelly Dome Opens Milstein Science Series

Our Path to a New Home in the Planets Hayden Planetarium Program

13

THURSDAY
 Science Throwdown: Sea vs. Space Special Program

20

THURSDAY
 Stem Cell Science Course Begins Adult Course

21

FRIDAY
 Earth Day Hayden Planetarium Program

25

TUESDAY
 Exotic Skies Hayden Planetarium Program

29

SATURDAY
 Sackler Brain Brunch: The Science of Sleep and Memory Adult Course

MAY

2

TUESDAY
 Lunchtime Bird Walks in Central Park Begin Nature Walk

3

WEDNESDAY
 Ghost Snake Stories in Madagascar SciCafe

6

SATURDAY
 Identification Day Special Event

Celebrate Pacific Northwest Cultures Celebrate Culture

Hall Tour: Lizards and Snakes Member Program

7

SUNDAY
 Family Bird Walks Member Program

13

SATURDAY
 Los Sueños del Caribe (Dreams of the Caribbean): People, Land, and Place Celebrate Culture

15

MONDAY
 Deep Life: The Hunt for Hidden Biology of Earth, Mars, and Beyond Hayden Planetarium Program

18

THURSDAY
 New Science New Solutions: Preparing for the Next Pandemic Special Programs

23

TUESDAY
 Unsolved Mysteries of the Universe Hayden Planetarium Program

JUNE

3

SATURDAY
 Hall Tour: Hidden Stories Member Program

5

MONDAY
 Mars as Never Seen Before Hayden Planetarium Program

7

WEDNESDAY
 Exercise Your Brain SciCafe

24

SATURDAY
 Fun with Fossils Member Program

27

TUESDAY
 Earth-Sun Connection Hayden Planetarium Program

SUMMER 2017
SEE AMNH.ORG FOR DATE
 Behind the Scenes: Paleontology Member Program

Dive in, in the Discovery Room



The Discovery Room lets children take part in the natural history on display throughout the Museum, from handling live animals to unearthing fossils.

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; and the V. and L. Marx Foundation.

Members already know that the Museum’s halls are some of the best places on the planet to learn about the natural world. But for those who want to get more hands-on, there’s the Discovery Room, located on the first floor just off the Grand Gallery.

Whether you’re looking to jumpstart your visit, take a break from strolling the halls, or trying to put everything you’ve learned in context, this interactive zone is an amazing resource for you and your family—and the perfect place to spend part of your summer break (see sidebar).

Get Hands On

The Discovery Room is a place where you can engage directly with the science on display throughout the Museum—and often, that science will engage right back! This educational space is home to a variety of live animals, including stick insects and Madagascar hissing cockroaches that kids can hold. (Adults are welcome to hold the cockroaches, too, though it’s usually a harder sell, says Danny Zeiger, assistant director for children and family learning.)

Interacting with animals is just one of the attractions the Discovery Room has in store for budding biologists. In the shadow of a replica baobab tree, kids of all ages can learn about Africa’s wildlife by conducting a field survey of their own, examining specimens from the Museum’s collections by opening drawers and chests to find horns, fossils, and other items they can explore with educators.

Aspiring anthropologists, on the other hand, can take a tour of puppets from around the world, while those with a theatrical flair can stage shows with finger-puppets they craft themselves. Tomorrow’s paleontologists can find out what fieldwork feels like by chipping away at a replica fossil site, then help assemble

© AMNH/R. Micklens



another replica, this time of an ancient crocodile relative.

Older kids, ages 7 and up, can head upstairs to the mezzanine to explore a variety of objects on a real lab bench. Here, professional-grade microscopes provide unparalleled views of insect wings, reptile scales, and even slides of a preserved human brain.

What’s This?

Museum educators and volunteer facilitators are always on hand when the Discovery Room is open (see sidebar for hours), and each of them is happy to field your questions. Educators and volunteers will also guide you through a collection of field manuals and identification aides to help you learn more about everything you come across in your adventures outside the Museum.

Stories and Scientists

In addition to the casual drop-in sessions held every day, the Discovery Room is also a place for programs and special events. On Monday mornings, kids ages 2–5 and their caregivers can come in for Gateway Storytime, an hour of storytelling that introduces the Museum’s collections and helps set the stage for a day at the Museum. One recent storytime helped introduce visitors to the new Titanosaur and other sauropods around the Museum.

Older kids and adults can find out more about what scientists do right from the source during the Discovery Room’s bimonthly Meet the Scientist weekend events, where curators, Ph.D.-degree candidates, and other Museum researchers introduce their work and answer questions from attendees, generally children ages seven and up.

Tips For Your Visit

Early Bird Gets the ...

If you’re planning to stop by the Discovery Room, get there early. Every day, the staff issues 50 passes for each 40-minute-long session in the space. These passes, which are free for Members, are available on a first-come, first-served basis. Most of the year, the Discovery Room opens at 1:30 pm and hosts five sessions each weekday, and opens at 10:30 pm on Saturdays and Sunday, when it hosts eight sessions daily.

School’s Out for the Summer?

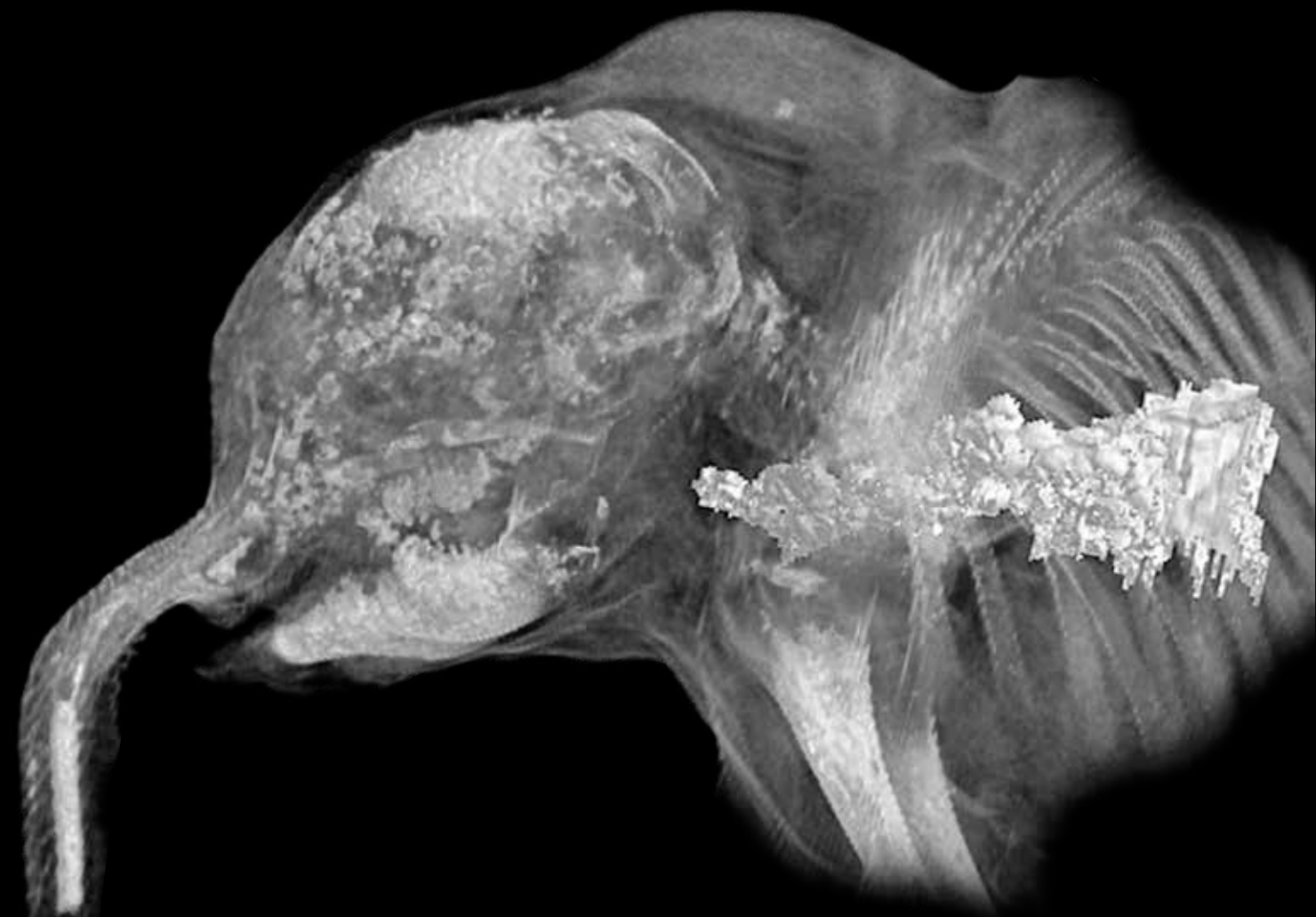
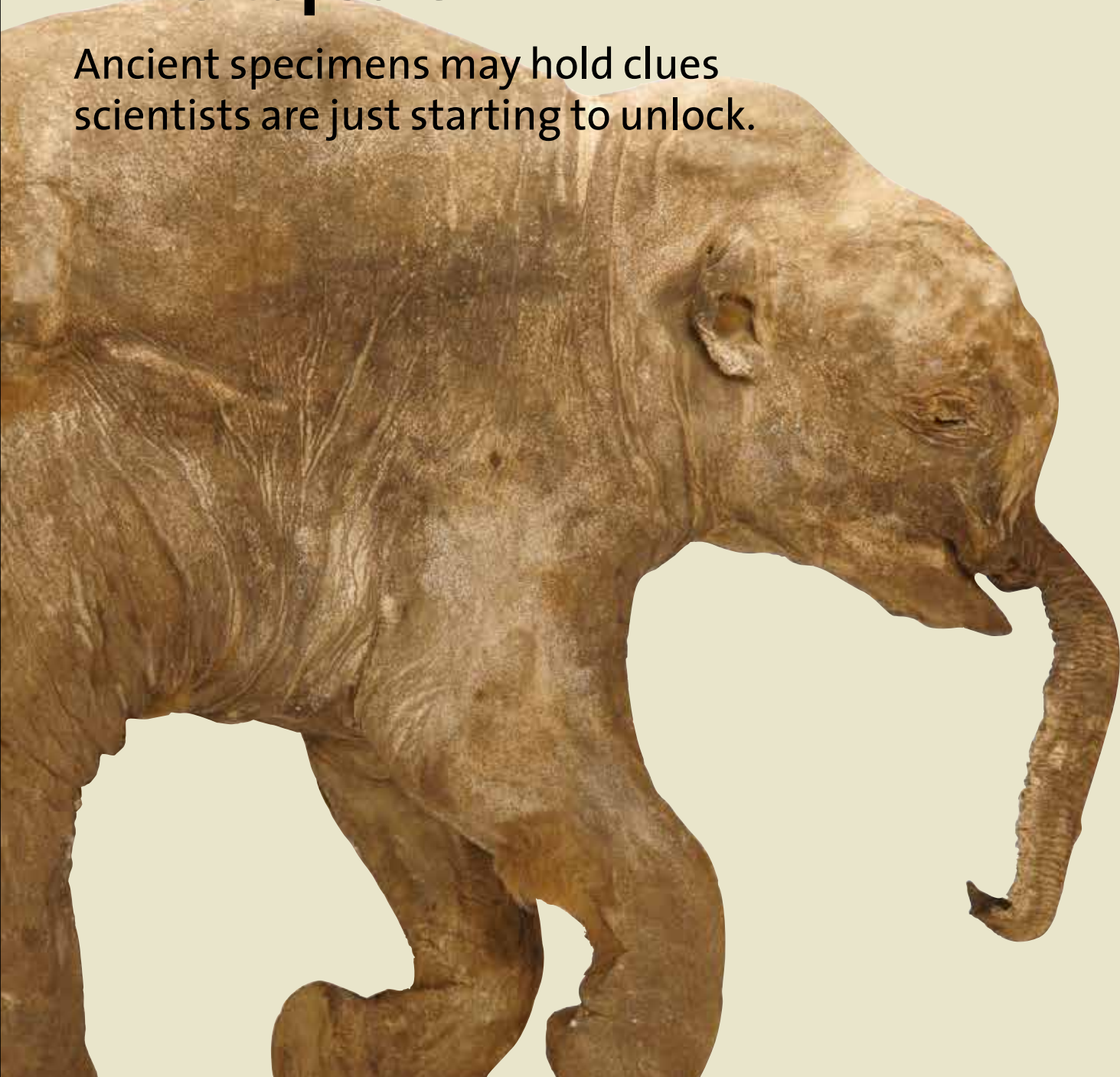
We’re here for you. Between July 1 and Labor Day, the Discovery Room extends its hours of operation, opening its doors from 10:30 am–1:25 pm and 2:15–5:10 pm, seven days a week.

Best Day for a Bath

If letting cockroaches crawl on you isn’t your thing (see story), there are other options for animal interaction. On Wednesday afternoons, visitors can watch the resident bearded dragon get its weekly bath.

Time Capsule

Ancient specimens may hold clues scientists are just starting to unlock.



(Left) The mummified body of Lyuba, one of two baby mammoths discovered in Siberia in the late 2000s. (Right) Computerized tomography scanning allowed researchers to visualize this specimen in unprecedented detail—right down to the sediment in Lyuba's lungs and trunk that likely caused her untimely death.

The baby woolly mammoth on the Museum's fourth floor, displayed right below the hulking frame of the Columbian mammoth, isn't the same type of fossil as its outsized neighbor or the other fossils on view nearby. It's a rare natural mummy, with skin, muscles, and other soft tissue that were preserved centuries ago within a frigid layer of moisture-blocking permafrost.

When the 21,000-year-old specimen washed out of the banks of the Yukon River in 1948, it was one of the best preserved mammoths found in North America. Named Effie for the Fairbanks Exploration,

or F.E., arm of the Alaskan gold mine where it was found, it revealed to scientists new details about the species through measurements, external observations, and comparative studies with other fossils. In short order, it also went on display, becoming the Museum's second most-famous mummified specimen. (For more about the better-known "dinosaur mummy," see the story on page 9.)

Fast-forward 60 years. When two mummified mammoth calves, Lyuba and Khroma, were discovered in Siberia in 2007 and 2008, paleontologists turned to a technology that hadn't been

invented yet when Effie was uncovered. Over the next few years, they produced full-body x-ray computerized tomography (CT) scans of the mammoths, data made richer by the fact that the two calves were close in age and, taken together, revealed new insights about mammoth development.

"We were able to use the CT data to do comparative anatomy," says Zachary T. Calamari, a doctoral candidate in the Museum's Richard Gilder Graduate School who co-authored the 2014 *Journal of Paleontology* study as an undergraduate at the

University of Michigan. Detailed imaging also showed that both animals, which were found at different locations, likely suffocated after inhaling mud.

New imaging technologies, as well as ever-advancing genomic research techniques, have made each finding in the field that much more valuable. They've also vastly increased the potential for new discoveries closer to home—on the shelves of paleontology collections, which hold material that's now yielding more and more insights into ancient organisms.



While she was a fellow at the Museum's Richard Gilder Graduate School, Dr. Abby West sampled extinct musk ox specimens in an attempt to extract ancient DNA.

Take the Museum's Fossil Mammal Collection, one of the world's largest and most important, with some 400,000 specimens. These include remains of ancient animals such as *Paraceratherium*, thought to be the largest land mammal that ever lived, as well as, yes, mammoths, and musk oxen, bison, foxes, coyotes, and more—an estimated 2,800 genera. Such breadth, and the fact that some specimens are not fully fossilized and may even still carry traces of organic material, offers researchers opportunities to study the genetic makeup of animals that died tens or even hundreds of thousands of years ago.

In 2005, a large-scale study based on extinct bison specimens from the Museum's collection, along with specimens from the Yukon and Russia, pioneered an approach that used ancient DNA to analyze the dynamics of populations in deep time. In cases where ancient DNA cannot be extracted in enough quantity or quality, researchers have been able to pull more limited genetic information from collagen, a protein found in bones that, unlike more fragile DNA, can survive for more than a million years when conditions permit.

It's not just evolutionary biologists and paleontologists analyzing these specimens. Geochemists are increasingly turning to fossil collections to gain insights into how ancient populations responded to climate change.

"In the past 10 years, we have been getting more and more requests for sampling our collections," says Curator Meng Jin,

who is curator-in-charge of fossils mammals in the Division of Paleontology and studies early mammalian evolution.

Access to the collection is a special boon to the Museum's graduate students. Last year, Abby West, a paleontologist who received her Ph.D. degree from Columbia University and studied as a graduate fellow at the Richard Gilder Graduate School with Frick Curator of Fossil Mammals Dr. John Flynn,

"The techniques are so good, we're able to work on a finer molecular scale. We don't need that much material, which allows us to study collections once off-limits for sampling."

— ABBY WEST

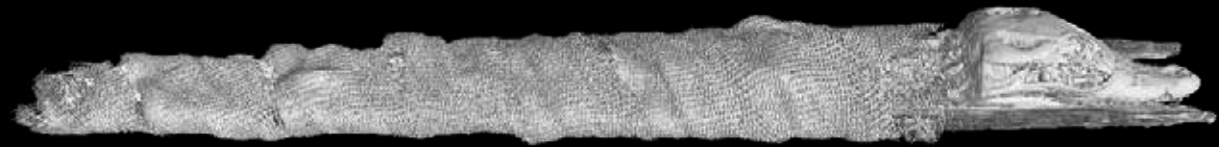
bored tiny samples from 20 specimens of extinct musk oxen in the fossil mammal collection in hopes of extracting ancient DNA. West was working to tease out evolutionary relationships and migration histories by making comparisons to the genomes of living relatives.

The method holds great promise as technology advances, particularly in a field where nearly all specimens are incomplete. "You can get the whole genome now from something the size of a fingernail," says Dr. West. "The techniques are so good, we're able to work on a finer molecular scale. We don't need that much material, which allows us to study collections once off-limits for sampling."

"Twenty years ago, no one would have envisioned this fascinating study," says Dr. Flynn, who is also co-curator for this year's *Mummies* exhibition. "These collections become very important because they allow us to look back in time."

At the same time, non-invasive techniques like CT scanning and other 3D imaging now offer new possibilities to morphologists, researchers who compare the physical characteristics of extinct and modern species. Like the team that analyzed Siberian mammoth calves using CT scans, researchers can now peer through fossil skulls, into nasal cavities, inner ears, and beyond without risking any damage. And they can virtually "unwrap" fossils that are too fragile to remove from the surrounding rocky matrix—opening up avenues of research for decades to come.

Says Ruth O'Leary, who is director of collections, archives, and preparation in the Division of Paleontology, "It's wildly exciting."



CT scan of a hatchling crocodile mummy from the collections of The Brooklyn Museum.

CT Scans and DNA Studies Reveal Two Species of Nile Crocodile

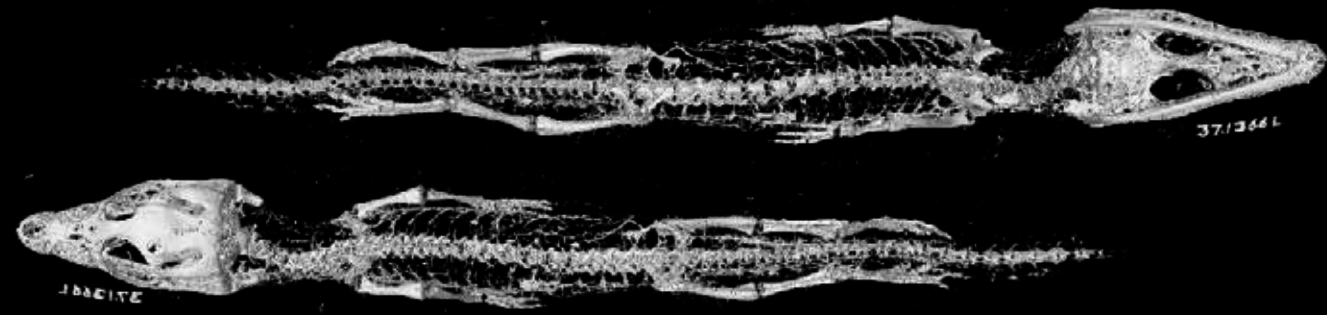
Man-made mummies of animals can also provide scientists with valuable genetic material. Several years ago, Museum Research Associate Evon Hekkala, who studies crocodiles, turned to mummified specimens in anthropological collections while researching the Nile crocodile. Along with colleagues, she sequenced genes from 123 living Nile crocodiles and 57 museum specimens, including a 2,000-year-old mummy of a crocodile hatchling.

"I knew there were all these treasures stored in these institutions," says Dr. Hekkala, who majored in art history as an undergraduate. "When I needed to fill in gaps in my study, I thought, well, maybe I could get DNA from crocodile mummies." She was able to extract and analyze sufficient DNA data to show

that the animal known as the Nile crocodile was actually two different species, *Crocodylus niloticus* and *Crocodylus suchus*. The larger *C. niloticus* turned out to be more closely related to Caribbean crocodiles, suggesting the animals, which can go without eating for up to 10 months, may have crossed to the New World riding ocean currents. Hekkala also thinks that *C. suchus* is the tamer, gentler crocodile that was considered sacred in ancient Egypt and appears in accounts by the Greek historian Herodotus and French naturalist Geoffroy Saint-Hilaire.

Now, Hekkala and colleagues are working with specimens from museum collections to figure out whether all mummified crocodiles were in fact *C. suchus*, and to use the mummified skeletons to arrive at a more complete description of this species.

CT scanning let researchers digitally "unwrap" the crocodile mummy pictured above.



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The Gilded Lady is one of 19 mummies from the collections of The Field Museum on view in the special exhibition *Mummies*, open now and free for Members.

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-percent discount.
Hours are subject to change.

MUSEUM SHOPS

The Museum Shop, Dino Store,
Planetarium Shop, Cosmic Shop,
¡Cuba! Shop, Mummies 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.