DINOSAURS AMONG US
OPENS MARCH 21

THE TITANOSAUR
ARRIVES THIS MONTH
From the President

Ellen V. Futter

Last November, I was pleased to announce that the Museum’s Trustees had approved an exciting conceptual architectural design for our new Gilder Center for Science, Education, and Innovation by MacArthur Fellow Jeanne Gang. The new facility will open in 2020 and be located on the Columbus Avenue side of the Museum campus.

Many of you who visit the Museum frequently or volunteer here know that we are bursting at the seams—last year, we welcomed a record five million visitors, and we are on pace to match or exceed that number this year. The new Gilder Center will help us accommodate and serve that growing audience, and its location will allow us to create new linkages with existing halls that currently terminate in dead ends. This will create more satisfying, effective, and intellectually cogent journeys of discovery through the Museum. But it is not just about accommodating a growing audience. We are building the new Gilder Center because our times demand it and technology makes possible new ways of seeing and exploring the Museum, both onsite and online. At a time when science literacy and science education are critical to our nation’s future, the new Gilder Center will allow us to create new kinds of learning spaces and to employ new exhibition techniques to present science’s 21st-century frontiers—on the microscopic level, at the ocean’s depths, or inside the human body. And it will highlight and make accessible the Museum’s research and collections—all to improve students’ and the public’s understanding of the world in which we live.

We are extremely excited to be moving forward with development of the innovative and important Gilder Center, and I look forward to keeping you updated in the months and years ahead.

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Conceptual Design for Gilder Center Announced

In November, the Museum’s Board of Trustees endorsed the conceptual design for the Richard Gilder Center for Science, Education, and Innovation, a new building that will invite visitors to experience the Museum not only as a place of public exhibitions but as an active scientific and educational institution.

“The Gilder Center embraces the Museum’s integrated mission and growing role in scientific research and education and its enhanced capacity to make its extensive resources even more fully accessible to the public,” said Museum President Ellen V. Futter.

The conceptual design for the Gilder Center links 10 Museum buildings through 50 connections, linking galleries and other spaces to vastly improve visitor circulation.

For additional information about the Gilder Center, visit amnh.org/GilderCenter.

News at the Museum

Coming Soon: The Titanosaur

Researchers have inferred that this dinosaur, a giant herbivore that belongs to a group known as titansauruses, weighed in at around 70 tons. The gigantic animal lived in Patagonia between 100 and 95 million years ago, during the Late Cretaceous period, when the region was mostly forest.

“Titanosaur fossils have been unearthed on every continent, and an abundance of discoveries in recent years has helped us appreciate the deep diversity of this group,” says Michael Novacek, the Museum’s provost for science and curator in the Division of Paleontology.

The January unveiling of the Museum’s new dinosaur is part of a special year of events, exhibitions, and digital offerings that highlight the dramatic developments in paleontology over the past few decades.

“Paleontology has become less geological and more biological in the last 20 years or so,” says Mark Norell, Macaulay Curator and Chair of the Division of Paleontology, as well as the curator of the upcoming exhibition Dinosaurs Among Us. “Our access to advanced and extremely precise scientific tools like CT scanners and other x-ray imaging techniques lets us ask questions beyond ‘what species is this, and when did it die?’ Now we can look at complex topics like the evolution of dinosaur brains and the presence and color of dinosaur feathers.”

In preparation for adding this colossal new exhibit, in September the Museum removed a life-sized—but, by comparison, diminutive—model of a juvenile Barosaurus that had been on display since June 1996.

The Titanosaur exhibit is free for Members or with Museum admission.

Generous support for the Titanosaur exhibit has been provided by the Susan S. and Kenneth L. Wallach Foundation.
A Perennial Favorite

In The Butterfly Conservatory, it’s easy to pick out the paper kites (Idea leuconoe) with their striking—dare we say sophisticated?—color pattern of black and white. The species, also known as the large tree nymph and the rice paper butterfly, is a perennial at the popular seasonal live-animal exhibition, which is overseen by David Grimaldi, curator in the Division of Invertebrate Zoology.

Denizens of dense forests and coastal mangrove swamps, paper kites range from Thailand to Malaysia, the Philippines, Taiwan, and Borneo. Their large wings—spanning up to 4.5 inches—allow them to glide, even sail through their habitat. While the wings are somewhat yellowish toward the body, the highly recognizable black and white markings may serve a protective purpose: warning predators familiar with the species’ unpleasant taste, caused by a toxin called danaidone that is passed by the male to the female during mating.

“It is very likely that they do advertise themselves,” says Dr. Grimaldi, noting, however, that more typically animals that are waringly colored (aposematic) tend to have red, yellow, and black in a banded pattern, as seen in various insects, frogs, snakes, and butterflies.

The paper kite was first described in 1854 by German entomologist Wilhelm Ferdinand Erichson (1809-1848) from a specimen found on what was then the Philippine island of Luzon, today known as Luzon. Erichson was a physician who became enthralled with entomology during his university years, publishing his first entomological papers while still studying medicine. Although he died just short of turning 40, his career in entomology was exceptional, especially his role in the study of rove beetles, compiling the first complete worldwide classification of the family Staphylinidae.

“There’s no doubt in my mind that Erichson was a genius and one of the most important, if not the most important, entomologists of all time,” wrote Museum Curator Emeritus Lee Herman in the July 18, 2001, Bulletin of the American Museum of Natural History, comparing Erichson’s effect on the field to Mozart’s classification of the family Staphylinidae.

“and Chair of the Division of Paleontology, named a species of archosaur found in the quarries there Efﬁgia akefﬁae in her honor.”

Then and Now
Ghost Ranch is in a beautiful desert region that has been used as a setting in several Westerns. But when Coelophysis roamed the area, it was a much different place—a lush, wet river delta, dotted with lakes and replete with plant life.

Fossil Forge
The four quarries at Ghost Ranch and other sites are rich in fossils of dinosaurs and their crocodylian relatives, often dating from the same time period. This suggests that this area was teeming with life for millions of years.

Start Small
While we tend to think of dinosaurs as giants, they started small like Coelophysis, with enormous examples evolving later on. “This was one of the first dinosaurs, or at least it represents an early dinosaur body plan,” says Nesbitt. “And this is probably what all early dinosaurs looked like.”
NEW RESEARCH IS BLURRING THE LINE BETWEEN DINOSAURS AND MODERN BIRDS.
The extinction of non-avian dinosaurs holds a stubborn place in our imagination, but in reality dinosaurs never vanished from the Earth. Many died out, certainly, but their evolutionary legacy lives on all around us in birds. Whether it’s the pigeon on your windowsill or the chicken on your dinner plate, chances are you don’t go a day without encountering dinosaurs.

This spring, the Museum will present Dinosaurs Among Us, a new exhibition detailing the unbroken line between ancient birds and modern birds that is marked by features from feathers to fused clavicles. (That’s right, turns out that, like the turkey, Tyrannosaurus rex had a wishbone—though we wouldn’t recommend tugging on it.) And much of the work behind this field could shed light not only on the shape and size of dinosaur brains, but on how they influenced dinosaur behavior. Paleontologists already know that these prehistoric titans shared some amazing traits with modern birds, such as big optic lobes to help coordinate the visual information they processed. But knowing what the brain looked like, we can begin to make at least some broad inferences about their behavior.

Using these brain imprints, Balanoff and colleagues can explore the external morphology—the outer shape—of the brain in greater detail than ever, plowing intriguing new information about the volume and shape of different regions. For example, CT scanning has offered paleontologists a detailed view of the dinosaur cerebrum, a center for cognition and coordination in the brain. As it turns out, this region tends to be very large in dinosaurs that are closely related to birds. For instance, Balanoff’s research strongly suggests that these ancient avian relatives developed big brains long before flying was in the picture, laying the cerebral foundation that made the eventual development of powered flight possible. This means that, similar to the way bigger brains in primates served as a precursor to walking on two legs, bigger brains in dinosaurs primed them for flight. How much of those big brains appeared slowly, over the course of millions of years, Balanoff says, though pointing out that there is no longer a meaningful line demarcating where dinosaurs end and birds begin. “That’s how evolution works.”

Watching birds and dinosaurs fly side by side, Balanoff notes, “a lot of different things are happening at once.” Like some birds, they are living fossils. “It can be a slow and messy process, but eventually we end up with the amazing feathered tyrannosaur (Yutyrannus huaysi), a small four-winged dromaeosaur (Anchiornis huxleyi), and an extinct-dinosaur nest containing remains of the adult that guarded the hatchlings.”

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

Dinosaurs Among Us is proudly supported by Chase Private Client.

**INTRODUCING MEMBER PREVIEW DAYS**

**FRIDAY, MARCH 18, SATURDAY, MARCH 19, AND SUNDAY, MARCH 20 10:30 AM TO 4:30 PM**

For members at the $105 level and above, admission is free. Entry only. Tickets available starting March 1 by calling 212-769-5200.

Be among the first to explore the connection between ancient dinosaurs and modern birds at the new special exhibition Dinosaurs Among Us before it opens to the public.

Join us for a weekend of exclusive Member Preview Days in the LeFrak Family Gallery beginning Friday, March 18.

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**TURKEY OR T. REX?**

FEATHERS

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WISHBONE

A fused clavicle bone is called a furcula, but you may know it better as that Thanksgiving staple, the wishbone. This bone is a key to flight in birds and also occurs in dinosaur species, including Velociraptor.

EGGS

The dinosaur birthing process probably looked much like that of modern birds. Fossil evidence shows that some dinosaurs laid eggs in a nest, and thus not great candidates for preservation in the fossil record.

The wishbone may know it better as that Thanksgiving staple, the wishbone. This bone is a key to flight in birds and also occurs in dinosaur species, including Velociraptor.

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**IMAGE CAPTIONS**

An Archaeopteryx fossil that will be on display in Dinosaurs Among Us, set next to an illustration of the dinosaur in life.

CT scan images can help researchers visualize the brains of dinosaurs like Archaeopteryx.

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**NEW SPECIAL EXHIBITION**

Dinosaurs Among Us will examine how one group of dinosaurs evolved into the fascinating living creatures we call birds. From flight to feathers, nests to wishbones, and brains to lungs, the exhibition will highlight the continuities between living dinosaurs—birds—and their extinct ancestors.

Curated by Mark Norell, Macaulay Curator and Chair of the Division of Paleontology, this exhibit will feature ancient, recently discovered fossils, and lithic models, including a 23-foot-long feathered tyrannosaur (Yutyrannus huaysi), a small four-winged dromaeosaur (Anchiornis huxleyi), and an extinct-dinosaur nest containing remains of the adult that guarded the hatchlings.

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**“ONCE WE KNOW WHAT THE BRAIN LOOKED LIKE, WE CAN BEGIN TO MAKE AT LEAST SOME BROAD INFERENCES ABOUT THEIR BEHAVIOR.”**
A recent Museum graduate brings science to her middle school students.

Okay, we know learning can be fun, but this much fun? Christina Lee’s general science class at Girls Prep Bronx Middle School is a riot of giggles as two dozen seventh graders run, jump, and dance in place. The goal: to get their hearts pumping. A buzzer sounds and the girls return to their seats. Suddenly, there is total silence—you could hear the proverbial pin drop—as they press a finger to their necks or hold a hand over their hearts to count their heartbeats for 50 seconds. Lee urges them on with a hint of humor: “You’re all alive. You all have a pulse.” They will repeat the pattern several times. And what they are getting, aside from some unexpected exercise, is an object lesson in the scientific method: State a hypothesis—the longer you exercise, the faster your heart beats—gather data, evaluate it, and draw a conclusion as to whether the hypothesis is true or not. Today, Lee is teaching students how to record and analyze results, a follow-up to a lesson about experimental variables. Over the next few months, she will be applying all of these fundamental principles to topics in chemistry, physics, and astronomy.

“Christina is incredibly creative,” says Martha Zornow, principal of the new Bronx charter school, which is in its second year. “She does a very good job of designing experiments.” Two years ago, Lee, 26, was a member of the first group to graduate with the Museum’s Master of Arts in Teaching (MAT) degree in Earth and space science. The innovative program, launched to address a shortfall of science teachers for grades 7–12 in underserved schools, began as a pilot in 2012 under the New York State Board of Regents. The only such program to be based at a museum, MAT offers participants a unique experience: a fully funded 15-month urban residency program co-designed by education specialists and scientists, with experience in the classroom and an intensive science course led by Museum researchers. Lee, for example, spent seven weeks during her second summer as a Kathryn W. Davis Graduate Teaching Fellow working with Curator James Webster and Dr. Patricia Nadeau, geologists in the Museum’s Department of Earth and Planetary Sciences and MAT faculty members, researching the role different pressures and temperatures play in the behavior of crystallizing magma before a volcanic eruption.
“Our MAT graduates are teaching in high-need schools and in many cases are offering Earth science for the first time.”

“It’s incredibly important for MAT candidates to be able to take part in the behind-the-scenes process of science,” says Nadeau, who is a Kathryn W. Davis Postdoctoral Scholar. “Everything that’s in the textbooks they use to teach their students is the result of someone’s hard work, in a lab or out in the field, so it’s great that they get a chance to be directly involved in that process before heading off to their classrooms.”

The value of this approach is proven in practice. “The principals are very excited about the passion for science and depth of knowledge our graduates are bringing into their classrooms,” says Dr. Rosamond J. Kunzler, co-director of the MAT program and senior director for science education at the Museum.

When the current crop of 16 teachers in training graduate from MAT this year, they’ll join the ranks of 50 MAT graduates already teaching in New York state schools. While it is still too soon to appraise the full impact of the program, preliminary results are promising. Not only has the number of science teachers increased in target schools, the number of students in those schools taking the Earth Science Regents exam has more than doubled—an indication that MAT teachers are having a positive effect on science literacy where it is most needed.

“Our MAT graduates are teaching in high-need schools and in many cases are offering Earth science for the first time,” says Dr. Kunzler. “They are teaching students who are disproportionately poor, under-represented in the sciences, and in limited English proficiency programs or special education programs. Given that Earth science can be a gateway to the more advanced courses students need for today’s careers in science and technology, it is essential that all students have the opportunity to take it.”

Lee herself is especially interested in motivating girls to pursue science. While girls appear to be catching up with boys in math and science through high school, statistics show that gender differences emerge at the college and postgraduate levels, with far fewer women than men attaining degrees in engineering, computer science, math, and the physical sciences. The numbers are even more pronounced among black and Hispanic women. Lee, who taught Earth science in her previous job at Sunset Park High School in Brooklyn, is now covering general science, chemistry, physics, and astronomy, hoping to help bridge the gap.

“This being an all-girls’ school was a deciding factor in my coming here,” says Lee, who earned her undergraduate degree in geology at Bryn Mawr, a women’s college where the geology department was founded by Florence Bascom, the first woman to earn a Ph.D. degree from Johns Hopkins University.

“The women’s education at Bryn Mawr really shaped me,” says Lee. “In most universities, science is driven by male students, but when you erase that it’s more comfortable. I definitely see that with these girls. They are normally so self-conscious but because there are no boys, they aren’t afraid to take chances.”

“Christina is really aligned with our goals,” says Zornow. “We want girls to experience science, to be hands-on in science, to do science. To learn to formulate a question and test it.”

Back in the classroom, exactly to that end, the girls calculate their results after measuring heartbeats per minute following 10, 20, and 50 seconds of exercise. Lee writes the numbers on a graph projected on a white board. Averaging to account for errors, the heartbeats per minute for 10 seconds of moving average 95. After 20 seconds, 114 beats per minute. After 30 seconds, 149. Clearly, the trend is moving in the direction of proving the hypothesis. But they still need to collect more data, so the conclusion will wait for another day. The girls gather their work sheets, stow them for further research, and move on to their next class.

Behind them on the classroom wall is a poster with a quote from someone else who knew something about women and striving to make the most of oneself, Eleanor Roosevelt. “The future,” she said, “belongs to those who believe in the beauty of their dreams.”

With deepest appreciation, the Museum acknowledges Kathryn W. Davis for her generous founding support of the Master of Arts in Science Teaching (MAT) Program.

Leadership support for the MAT program is provided by The Shelby Cullom Davis Charitable Fund.

The 15-month MAT program is supported in part by the New York State Education Department, the National Science Foundation under Grant Numbers DRL-1149444 and DUE-1340606, and the U.S. Department of Education under Grant Number 1T31ES0026.

Support Systems

A key component of the Museum’s MAT program is training teachers through real classroom experience—and with plenty of support along the way.

Studies show that between 40 and 50 percent of new teachers quit the profession within five years. But the Museum’s MAT graduates get exceptional professional development for two years with a system called “induction,” in which they are supported by staff from the Museum’s Gottesman Center for Science Teaching and Learning. Staff visit the new teachers at their schools, mentor them, and help them determine the best ways to achieve specific objectives.

“The goal is to help them to be effective faster,” explains Cristina Tozzone, one of the induction specialists. “Teaching is a career, and nobody gets it right the first time out. But when you have support—and the research shows this—you make bigger leaps. You grow so much faster.”

“It makes it a lot easier if you’re on your own,” agrees Lee.

Know an Aspiring Science Teacher?

Spread the word: applications for the MAT program’s Class of 2017 are due January 31.

The 15-month MAT program includes two summer residencies at the Museum: a seven-week science practicum with Museum curators and postdoctoral fellows. During the academic year, while completing more coursework, MAT candidates co-teach four days per week in high schools, mentored by an experienced classroom teacher. They are also supported by a faculty member and receive additional support throughout their first two years of independent teaching (see Support Systems sidebar).

Tuition for the 15-month MAT program is free and candidates receive a stipend. Graduates must commit to four years of teaching in underserved schools in New York State. Visit amnh.org/learn-teach/mat for more information.
**Programs and Events**

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

For updates and reminders via email, 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 cancelled by the Museum.

Information about programs is current as of December 1. Please check amnh.org/calendar for updates.

**Exhibitions**

Entrance is by timed entry only.

**Dinosaurs Among Us**

Opens to the public, March 21

Free for Members at the $105 level and above

Dinosaur Among Us will feature ancient fossils and life-like models to show how one group of dinosaurs evolved into the fascinating creatures we call birds. Member Preview Days begin Friday, March 18.

**The Secret World Inside You: The Human Microbiome**

Free for Members at the $105 level and above

New research shows that, rather than make us sick, many of the bacteria living in and on our bodies are often key to our health. Come explore the new world that’s been discovered in human bodies.

**Opulent Oceans**

Free for all Members

This exhibition features illustrations of sea creatures by generations of explorers, from rare and beautiful scientific works in the Museum Library’s collections.

**Frontiers Lecture: New Horizons: The Pluto Encounter**

Monday, February 8

7:30 pm

Free for 21+ with ID

Join New Horizons’ Deputy Project Scientist Cathy Olkin and the Museum’s Director of Astrovisualization Carter Emmart as they share the latest scientific findings and high-resolution images from the edge of our solar system.

**Journey Around the Sun**

Tuesday, January 26

7 pm

$12

Dr. Debra Tinling will compare human-induced sea level rise, a consequence of global warming, with the natural variability in sea level height caused by El Niño and other phenomena. Participants will come away from this day-long seminar fluent in the science of climate change.

**SciCafe: Mending a Broken Heart**

Wednesday, February 3

7 pm

Free for 21+ with ID

Stem cell researcher Jeffrey Karp explains how scientists are drawing inspiration from nature, building on the biology and chemistry of gecko feet, spider webs, porcupine quills, and more. Learn how biologically inspired glue can connect devices in a beating human heart.

**SeismoDome: Sights and Sounds of Earthquakes and Global Seismology**

Thursday, January 14

7 pm

Free; registration required; call 212-769-5200

Experience immersive displays of earthquakes and seismic waves from the last decade, viewed both from space and deep inside the globe in the Hayden Planetarium.

**The Art of Diorama**

Six Thursdays, January 28–March 3

3–9:30 pm

$195

Discover how dioramas are made from start to finish, and how this work reveals new details about the early history of the universe.

**Walk on the Wild Side**

Eight Wednesdays, January 6–February 24

9–9:30 pm

Free for Members at the $105 level and above; registration required; call 212-769-5106

Join a fitness experience like no other! After a brisk Wednesday morning walk through the Museum’s halls, enjoy a light breakfast in the Akeley Hall of African Mammals.

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**SciCafe: Amazing Anemones**

Thursday, January 7

3–9:30 pm

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Join Associate Curator Estefania Rodriguez for an exciting underwater journey to meet sea anemones and learn how much there is still to be discovered about these animals that live in every known marine environment.

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**The Titanosaur**

Opens Friday, January 15

Free for all Members

Another must-see exhibit is coming to the Museum’s world-famous Fossil Halls. See a cast of a 122-foot-long dinosaur, a species so new that it has not yet been formally named by the paleontologists who discovered it.

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Romance Under the Stars
Sunday, February 14
6 pm—9:30 pm
$25 (includes 90 minutes of open bar and hors d’oeuvres)
Celebrate Valentine’s Day with a unique night at the Hayden Planetarium, including cocktail hour in the Hall of the Universe complete with open bar, hors d’oeuvres, live music, and some stellar romance stories from the ancient past.

Adult Digital Flight School
Wednesdays, February 17–March 30
6–8 pm
$95
Amaze your friends and family by taking the controls of the Hayden Planetarium and lead your own tour through the cosmos. In this seven-week course, Brian Abbott and Nathan Bellamy train you to lead your own live presentations for invited guests in the Hayden Planetarium dome.

Sackler Brain Course: The Neurobiology of Attachment
Saturday, February 20
9 am–4 pm
$85
What happens in babies’ brains to facilitate attachment to their caregivers? How do these essential and emotional connections form? In this one-day course, a group of experts will lead you through recent insights into the neurobiology and behavior of early childhood attachment.

The Secret World Inside You: Master Class
Five Mondays, February 22–March 21
11:30–8:30 pm
$260
Get hands-on with the human microbiome inside the Museum’s fall exhibition, The Secret World Inside You, as you learn from leaders in the field about the present and future of microbiome research and conduct experiments to discover your own microbial signature!

Baby Animals Tour
Sunday, February 28
10:30 am–11:30 am
Free; registration required; call 212-769-5200
See how newborn birds, gurlas, dinosaurs, and other baby animals learn to survive and thrive during this special tour of the Akeley Hall of African Mammals, with stops in the bird and dinosaur halls.

A Brief History of the Universe
Tuesday, February 23
7 pm
$24
Emily Rice and Brian Levine will break the laws of physics in the Hayden Planetarium, travelling back in time to the Big Bang to understand how it shaped the universe, then return to Earth with a new comprehension of how cosmological history has led us to where we are now.

Spotlight Asia
Sunday, February 21
Noon and 7 pm
Free for all Members
Award-winning Nai-Ni Chen Dance Company brings the Year of the Monkey to a year characterized by cleverness, curiosity, and playful mischief. The Museum’s Lunar New Year festival celebrates Asian art and culture through contemporary choreography, traditional storytelling, and hands-on activities taught by local artisans.

March

Game Night Gone Wild
Tuesday, March 15
7–11 pm
$35 (two drinks included)
Join us at a cocktail hour in hand for an exciting evening of digital and physical games that tease, challenge, and entertain your brain. Trust your cognitive skills while scientists explain what games can teach us about our complex, mysterious, magnificent brains.

SciCafe: Swarms of Aerial Robots
Wednesday, March 2
7 pm
Free for 21+ with ID
Join robotist Vijay Kumar, UPS Foundation Professor at the University of Pennsylvania, as he describes the advantages of using tiny, autonomous, aerial robots for search and rescue, first response, and precision farming.

The Cosmic Web: Mysterious Architecture of the Universe
Monday, March 14
7:30 pm
$160
The celebrated dioramas, dinosaur exhibits, and halls of the Museum serve as the settings for an intensive after-hours drawing course with illustrator and naturalist Patricia Wynne.

Animal Drawing
Eight Thursdays, March 17–May 5
7–9 pm
$160
Distinguished astronomer J. Richard Gott discusses how ambitious telescope surveys are transforming astronomy, and what the structure of the so-called “cosmic web” says about the origins—and fate—of the universe.

Member Preview Days: Dinosaurs Among Us
Friday, March 18
5–8 pm
Free for members of the 505 level and above. Reserve tickets by calling 212-769-5200 starting March 1. Explore the newest exhibition, Dinosaurs Among Us, before it opens to the public!

Sun-Earth Day
Saturday, March 19
11 am–5 pm
$50
After Sun-Earth Day, join us in the Hayden Planetarium as we teach our youngest astronomers about the methods and tools used to observe the night sky, followed by a viewing through telescopes on the Arthur Ross Terrace, weather permitting.

Dinosaurs Among Us, Before It Opens!
Opening Day! The celebrated dioramas, dinosaur exhibits, and halls of the Museum serve as the settings for an intensive after-hours drawing course with illustrator and naturalist Patricia Wynne.

MEMBERS Only!
$10
Dinosaurs Among Us is proudly supported by Chase Private Client.

Spring Break
March 18–27
$160
Take your children on an hour-long journey that takes you from the formation of Earth to the very depths of our universe. One hour, unlimited access.

Sackler Brain Course: The Neurobiology of Attachment
Saturday, March 26
9 am–4 pm
$85
What happens in babies’ brains to facilitate attachment to their caregivers? How do these essential and emotional connections form? In this one-day course, a group of experts will lead you through recent insights into the neurobiology and behavior of early childhood attachment.

Baby Animals Tour
Sundays, April 3–May 15
10:30 am–11:30 am
Free; registration required; call 212-769-5200
See how newborn birds, gurlas, dinosaurs, and other baby animals learn to survive and thrive during this special tour of the Akeley Hall of African Mammals, with stops in the bird and dinosaur halls.

A Brief History of the Universe
Tuesday, April 12
7 pm
$24
Emily Rice and Brian Levine will break the laws of physics in the Hayden Planetarium, travelling back in time to the Big Bang to understand how it shaped the universe, then return to Earth with a new comprehension of how cosmological history has led us to where we are now.

Spotlight Asia
Sunday, April 10
Noon and 7 pm
Free for all Members
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Take your children on an hour-long journey that takes you from the formation of Earth to the very depths of our universe. One hour, unlimited access.
Spring Lunchtime Bird Walks in Central Park
Session 1: Four Tuesdays, March 29–April 19
Session 2: Four Tuesdays, April 26–May 17
9:30 am–10:30 am
$50
Observe the exciting spring migration of birds in Central Park with ornithologists Paul Sweet (Tuesdays, 7 am, and Fridays, 9 am) and Joseph DiCiccostanzo (Wednesdays and Thursdays, 7 am). Learn how to use field marks, song, habitat, and behavior to identify birds including warblers, tanagers, and orioles as they pass through Central Park.

Field Trip to the Moon
Thursday, March 31
6:45–7:15 pm
$15 adults, $10 children
Power up your imagination and take a virtual trip to the Moon from the Hayden Planetarium! A live presenter will guide you on your journey through space—to a real astronaut. You’ll experience a NASA rocket launch, view Earth from space, and perhaps make some starry discoveries along the way.

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

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.

Support for Hayden Planetarium Programs is provided by the Schaffner Family and the Horace W. Goldsmith Fund.

The Universe in Time
Tuesday, March 29
7 pm
$12
Throughout the vast and expanding universe, stars revolve and evolve, galaxies collide and merge with one another. Join Brian Abbott and Brian Levine to view the Hubble Space Telescope as they discuss how stars, galaxies, and the universe took shape, and how they evolve through time.

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Explore AT THE MUSEUM

MicroRangers To The Rescue!
A new mobile app from the Museum brings an invisible world to life

The world’s most amazing ecosystems are in danger, and it’s up to you to save them! That’s the premise of MicroRangers, a new mobile game for Android and iOS smartphones that uses augmented reality to turn the Museum’s first floor into a series of animated adventures that highlight how microbial life can impact the health and security of larger life forms like towering trees, charismatic animals, and, yes, humans.

“Most biodiversity is too small to be seen without a microscope. But those microbes are just as important as other forms of life in keeping ecosystems healthy,” says Susan Perkins, who advised on MicroRangers and is co-curator of The Secret World Inside You exhibition about the human microbiome.

The game has been in development since 2014, as Museum educators have worked with high schoolers in Museum programs as well as with game designers at Playmatics and Grossmedia to create a unique experience based on iconic exhibits and dioramas that many longtime Members know well—just participants in a focus group, but co-designers of their game’s characters—in large part, Joseph says, to show that the Museum is not just a place youth can come to learn, but one where they can contribute.

“From the very start, we wanted young people to be not just participants in a focus group, but co-designers of their own science education,” says Joseph.

And while MicroRangers has already been a learning experience for the youth and staff who helped develop the game, designers say the ways people play the game will provide design lessons for the future. How users are playing the game and what activities and interactions they embrace or ignore will help to shape the experiences offered by future Museum games.

“The ideal Museum visit is also the ideal game,” says Joseph. “You connect with exhibits, connect with the people around you, and learn something new.”

MicroRangers is free and available to download from the iOS App Store and Google Play. To learn more, visit amnh.org/MicroRangers, and visit the Membership desk in the Theodore Roosevelt Rotunda to pick up augmented reality coins to play the game. (Limited quantities, while supplies last.)

MicroRangers is generously supported by a grant from the Anna-Maria and Stephen Kellen Foundation.

MORE GAMES FROM THE MUSEUM

From CD-ROMs to space flight simulators to card games produced for special exhibitions, the Museum has been developing engaging, educational interactive experiences for decades. MicroRangers is the latest, but here are a few other new games now out from the Museum.

GUTSY
A card game developed as a companion to The Secret World Inside You, Gutsy lets you take lessons about the microbiome home and share them with others. Learn more about the way that different microbes interact in the human body and get an up-close and personal understanding of the many species that call you home. Developed by veteran game designers and Curator Susan Perkins, Gutsy is a fast-paced card game that combines education and entertainment.

Now available in Museum shops.

PETROSAURS: THE CARD GAME
Developed alongside the 2014 special exhibition Pterosaurs: Flight in the Age of Dinosaurs, Petrosaurs: The Card Game challenges players to build functioning food chains using a shared deck of 51 cards representing various ancient forms of life, including flowers, fish, and the flying phenoms of the title. The player with the most chains at the end of the game wins! Visit bit.ly/PetroSaursGame to download the game for free.

OLogy
Digital learning has been an area of focus since the launch of the Museum’s award-winning science website for kids, Ology, where interactive lessons and web-based games have been available to anyone with an Internet connection since 2005. Visit bit.ly/OlogyMicrobiOlogy to see Ology’s MicrobiOlogy section!

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Behind the Scenes: Fossil Prep

In more than a century of fossil collecting, Museum scientists have brought back hundreds of thousands of specimens: dinosaurs, birds, fish, mammals, and more from throughout Earth’s history and from every corner of the globe.

Just discovering a specimen, though, doesn’t make it useful to science. “One of the things people don’t understand about collecting fossils is that we go out on an expedition, and it’s hard work—but what really takes the time is the preparation to expose these things,” says Mark Norell, Macaulay Curator and Chair of the Division of Paleontology.

Here’s how a specimen goes from being encased in stone to ready for the spotlight—or at least the microscope.

1. **TAKE NOTE**
First things first: paleontologists record everything about the condition of a newly uncovered fossil. They record for posterity where, when, and by whom a fossil was excavated, indicate estimates of how many fossils are in a given block, and offer preliminary identification of the animal.

2. **PROTECT WITH PLASTER**
A fossil find usually needs to be encased in plaster to make the trip back to the Museum. “Plaster bandages are a good choice because they dry faster than regular plaster,” says Senior Principal Preparator Ana Balcarcel. They are wrapped around the specimen, serving the same purpose as around a broken limb, immobilizing the specimen and protecting it from harm.

3. **HANDLE WITH CARE**
Fossil finds are packed in wooden and metal crates and surrounded with another layer of packing material—often the same newspaper that might protect your china on the way to a new apartment—and shipped back to the Museum.

4. **HIT THE BOOKS**
Before any work is done to remove the fossil, Museum preparators hit the published literature to bone up on the specimen they’re about to begin extracting, or similar related creatures if an identification hasn’t been made.

5. **SPLIT TOOLS**
Tools of the trade range from needle-like chisels to tiny jackhammers. For stable specimens, much of the extraction work is done using handheld pneumatic jackhammers capable of pulverizing rock to chip away at the stone bit by bit, revealing the fossil. For more delicate work, on unstable fossils, or finishing touches made closer to the bone, preparators use needles, brushes, and sharp sculpting tools to remove the final vestiges of rock from a fossil.

6. **TAKE A PICTURE (IT’LL LAST LONGER)**
While most of the work is still done with traditional tools, new technology is slowly beginning to change the field. Computed tomography (CT) scans of fossils can provide scads of information about what’s contained inside. “Sometimes a scan can guide prep work, revealing the structure of the specimen within the matrix, making the process a little easier,” says Ruth O’Leary, director of collections, archives, and preparation in the Division of Paleontology.

7. **BACK UP YOUR WORK**
Once a fossil is extracted, or as exposed as it can safely be, preparators often back up their hard work by making a silicon mold that can be used to create casts of the fossil. These casts, most often made from a polyester resin, are key to paleontological research. They make it easier to study the specimen without handling it.

An Enigmatic Fossil Fragment

Not all fossil discoveries take place at far-flung locations. Last June, paleontologist Carl Mehling was leading a Member trip to Big Brook, New Jersey’s famous Late Cretaceous site, when 13-year-old Braden Vande Plasse showed him a small piece he’d found. At first, says Mehling, he was ready to dismiss it as “just a rock,” but a closer look revealed “a very clear biological structure.”

“My gut was leaning towards a bone or some other vertebrate structure,” says Mehling, who’s been collecting fossils in the area since 1988 but was still stumped as to what kind of animal this may have been. “I asked Braden if he would be willing to donate the piece to the Museum—and thankfully, he was.”

Back at the Museum, Mehling began his investigation. Since fishes are the most common vertebrate fossils at Big Brook, he first turned to Curator John Maisey, a fossil fishes expert. With a quick look under a dissecting microscope, Dr. Maisey confirmed the piece was a tooth or a tooth plate. A tip from Maisey’s Ph.D. student Allison Bronson led Mehling to realize that the tooth might belong to a Mesozoic lungfish—and after consulting the Museum’s collection of fossil lungfish teeth, he decided there were some good matches to this new fossil.

But several days later, a serendipitous email from a Texas researcher about a different fossil specimen that bore a strong resemblance to the Big Brook find led Mehling to a different conclusion: Vande Plasse’s fossil was likely a fragment of a tooth plate from some as-yet unidentified, likely marine, Cretaceous fish rather than a lungfish. Mehling is currently preparing a paper that may help him find other experts to identify the find.

Carl Mehling takes a look at a fossil found by Museum Member Braden Vande Plasse.
**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, Shop for Earth and Space, Cosmic Shop, The Secret World Inside You Shop, and Online Shop (amnhshop.com) 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: ④ (weekdays) or ⑦ to 81st Street; ① to 79th Street, walk east to Museum
Bus: M7, M10, M11, or M104 to 79th Street; M79 to Central Park West
Parking Garage: Open daily, 8 am–11 pm; enter from West 81st Street. Members 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.

The feathered dinosaur *Khaan mckennai*, discovered in the Mongolian desert by a team of paleontologists including Mark Norell, Macaulay Curator and Chair of the Division of Paleontology, is one of the many intriguing species featured in the upcoming exhibition *Dinosaurs Among Us*. Members at the $105 level and above are invited to view the exhibition before it opens to the public on March 21. See page 9 for details.