SECRETS OF THE RINGED GIANT
From the President

Ellen V. Futter

On June 12, on a beautiful morning, we broke ground on the new Richard Gilder Center for Science, Education, and Innovation in an uplifting and historic ceremony that brought together the lustrous constellation of people and organizations who are making the Gilder Center a reality—City officials, our award-winning architect and design team, our neighbors, the young people we serve, and the project’s benefactors including, of course, Dick Gilder. The event reflected the hope, potential, and ambition of the new building (see p. 4). Now, full steam ahead! Also this summer, we opened Addressing the Statue, an exhibition providing important context for the Theodore Roosevelt statue that sits on our front steps. The Mayor’s 2017 Advisory Commission on City Art, Monuments, and Markers recommended that the statue remain in place and that the Museum contextualize it. This work is part of the Museum’s increasing focus on cultural representation in our halls, including the addition of new label copy to contextualize the “Old New York” diorama last year.

And we celebrated the 50th anniversary of the Apollo 11 Moon landing with a day-long Spacefest program, including unveiling a beautifully refreshed and updated Arthur Ross Hall of Meteorites. These and other 50th anniversary events reflect an enthusiasm to both celebrate and learn from our institutional past, to incorporate a fuller range of perspectives and voices in our work, and to set the stage for an even more glorious future of discovery and impact.

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MAT alumni (1 to R) Kristina Gustovitch, Darby Young, Alejandra Murdolo, and Syneye Spathl look for fossils during a summer excursion.

In a rocky outcrop on the side of a rural road in the New Jersey Highlands sits a unique geological phenomenon—if you know where to look.

Large slabs of dark metamorphic rock jut upwards from the ground. Then, suddenly, the rock changes into crumbling limestone. This type of formation, known as the Great Unconformity, represents “a huge chunk of missing time,” explains Melanie Hopkins, an associate curator in the Division of Paleontology, as she points it out to a group of New York middle school Earth science teachers who have gathered here on a hot morning in July. “An estimated 700 million years is missing here,” she says, pointing to a thin diagonal fissure. This boundary separates two distinct eras, and geologists can glimpse the change in sediment and the dramatic evolution of marine organisms in the rocks.

The teachers, all graduates of the Museum’s Master of Arts (MAT) in Teaching program—the first urban teacher residency program offered by a museum—are here to learn how to incorporate paleontology into their curricula. Soon, they’re swinging hammers to break rock in search of Cambrian-era fossils. July’s field trip was just the first of many that Hopkins will be leading over the next five years. A trilobite specialist, Hopkins was awarded a CAREER grant from the National Science Foundation (NSF), part of which will support a new program for teachers, the Earth-science Reciprocal Learning Year (EaRLY), built around trips to local fossil dig sites to collect teaching specimens and fossil lab workshops at the Museum. “The goals are to provide teachers with resources and experiences that they can use to help deepen their students’ understanding of Earth science as well as the work of scientists in general,” says Hopkins. The science teachers say they are excited to be in the field—and to bring their knowledge back to their schools.

“I teach 100 students, and it can be difficult to translate geology fieldwork into meaningful experiences,” says MAT alumna Jessica Sharoff, who teaches at Manhattan’s Washington Heights Expeditionary Learning School. “This is the kind of stuff my students would love.”

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 MAT program is supported in part by the National Science Foundation under Grant Number DEE-1832787 and the U.S. Department of Education under Grant Number U336S140026.
Museum Breaks Ground on New Richard Gilder Center for Science, Education, and Innovation

Top: Museum leaders, City officials, community leaders, and New York City schoolchildren gathered at the June groundbreaking. Bottom: A rendering of all ages to current research through cutting-edge exhibitions and innovative education programs in dedicated learning zones.

Hard hats on heads and shovels in hand, Museum leadership and staff, New York City officials, and community leaders gathered June 12 to break ground on the Richard Gilder Center for Science, Education, and Innovation at the site on Columbus Avenue. Also participating were schoolchildren from P.S. 84, representing the thousands of young students who visit and learn at the Museum each year.

“The Museum was chartered by the State of New York in 1869 as an educational institution, and education is at the core of our being,” Chairman Lewis W. Bernard told the assembled crowd. “The Gilder Center will advance the way we conduct science and our collections are presented, in addition to housing a great library and offering new approaches to education.”

Featureing breathtaking architectural forms inspired by natural Earth processes, the spectacular new 250,000 square-foot Gilder Center will add exhibition galleries, a collections core, state-of-the-art classrooms, an immersive theater, and a redesigned library, in addition to linking 10 Museum buildings to improve visitor flow throughout the campus. The Gilder Center will introduce visitors of all ages to current research through cutting-edge exhibitions and innovative education programs in dedicated learning zones.

“This Museum’s science-based research and education, which enhances the public understanding of how science works and what science can tell us, has never been more critical,” said Museum President Ellen V. Futter.

The urgency of scientific work and scientific literacy to civic life was also emphasized by Mayor Bill de Blasio in his remarks. “I hope that this will be where a whole new generation learns a devotion to science, because we’re all responsible for saving this Earth right now, and the generation coming up will have even greater responsibility,” said de Blasio. “So, here at the Gilder Center, I think those connections will be made and those sparks will fly where young people will become devoted to the work of preserving our planet, protecting all of us.”

Manhattan Borough President Gale Brewer also spoke during the ceremony, underscoring that the Gilder Center’s learning zones will serve New York students and teachers. “It is about ensuring that New York City’s young people have access to the best facilities and technology and scientists and programs,” said Brewer.

Also joining in the celebration were Museum Trustee Richard Gilder, for whom the building is named; officials from many of the more than 10 City agencies involved with this project, including Commissioner of Cultural Affairs Tom Finkelpearl and Department of Parks and Recreation Commissioner Mitchell Silver; Museum President Ellen V. Futter; architect Jeanie Gang of Studio Gang, who was named one of TIME magazine’s 100 most influential people of 2019; exhibit designer Ralph Appelbaum of Ralph Appelbaum Associates; and Ramon Pimentel, a graduate of the Museum’s Science Research Mentoring Program and a sophomore at SUNY College of Environmental Science and Forestry, who spoke about his immersion in science at the Museum.

Peltier took the opportunity to recognize the important work of the project architect, Studio Gang, led by Jeanie Gang. “Studio Gang takes an interdisciplinary and sustainable approach to design that prioritizes relationships among individuals, communities, and the environment. For all those reasons, we know our project is in the most excellent hands,” said Peltier.

“This Museum’s science-based research and education, which enhances the public understanding of how science works and what science can tell us, has never been more critical.”

Ellen V. Futter, museum president

For her part, Gang underscored the building’s sustainable features as well as the sense of awe and discovery that her team has worked to create.

“We at Studio Gang find this to be the most exciting project that we’ve ever done,” she said. “This building will be sparking everyone’s curiosity about science and nature as they walk through the doors.”

The American Museum of Natural History gratefully acknowledges Richard Gilder and the Gilder Foundation, Inc., whose leadership support has made the construction of The Richard Gilder Center for Science, Education, and Innovation possible.

The Richard Gilder Center for Science, Education, and Innovation is also made possible thanks to the generous support of the City of New York, the Council of the City of New York, the Manhattan Borough President, the State of New York, the New York State Assembly, and the New York State Senate.

Critical founding support has been provided by David S. and Ruth C. Broida; the Edna and Charles Davis; the Davis Family; the Bezos Family Foundation; the Macaulay Family Foundation; Judy and Josh Weston; the McEwan Family Foundation; Kathy and Adam Patterson and Thomas L. Kemper, Jr.; New York Life Foundation; the Seedlings Foundation in honor of Michael Hack; the Susan S. and Kenneth L. Mullin Foundation; Valerie and Jeffrey Peltier; the Hearst Foundations; Nancy B. and Hart Fessenden; Keryn and Ted Mathus; and the Estate of Margaret D. Bishop.

“Together with the City of New York, the Council of the City of New York, the Manhattan Borough President, the State of New York, the New York State Assembly, the New York State Senate, and many others, we have created a place that will inspire the imaginations, the minds, and the hearts of children and adults alike. This is for the young people of our city and it’s for all of us,” said President and CEO Ellen V. Futter.

AMNH gratefully acknowledges the critical founding support of David S. and Ruth C. Broida, representing the thousands of young students who visit and learn at the Museum each year.

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**Quick-Change Artist**

The emerald swallowtail (Papilio palinurus) is sometimes called a banded peacock, but it might just as easily be called a chameleon. Like the shade-shifting lizard, the emerald swallowtail changes color depending on the angle of the light, and it has a strikingly disparate appearance from one side to the other.

The bright bands on the butterfly’s generally dark, green upper side aren’t caused by pigments but by the surface of unique microstructures in the scales on its wings. When the scales reflect blue and yellow light, their tight arrangement allows the colors to mix together and be perceived as the iridescent green bands from which the butterfly takes its common name.

But when its wings are viewed from another angle, the human eye will see the bands as only yellow or blue, respectively. And viewed from below, an emerald swallowtail looks like a completely different butterfly. Its underventral or ventral side is black and gray with blue, orange, and white spots—coloration typical of the upper side of other swallowtail butterfly species, which likely helps the insect to camouflage itself from predators.

The emerald swallowtail has a wingspan of up to 4 inches (10 cm) and belongs to the family Papilionidae. These large, colorful, mostly tropical butterflies include the largest in the world, such as the birdwing butterflies of the genus Ornithoptera. Native to Southeast Asia, the emerald swallowtail is found primarily in Burma, Peninsular Malaysia, Sumatra, Borneo, Indonesia, and the Philippines. The emerald swallowtail’s caterpillars—like those of the tiger, spicebush, anise, giant, and black swallowtails—resemble bird droppings when small. These cleverly camouflaged larva, like all swallowtail caterpillars, have an oesmometer: a forked-shaped gland that emits a foul smell and can also be extended when it rears its head back in response to a threat. They feed on citrus trees, making the species unpopular with citrus growers.

But the emerald swallowtail is a perennial favorite in live butterfly displays—including ours, The Butterfly Conservatory, overseen by Curator David Grimaldi, and open seasonally each fall through spring. Members enjoy free tickets for The Butterfly Conservatory, which reopens October 12.

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**Small Wonders**

Radiolarians have captivated scientists since these single-celled organisms were first observed under the microscope in the 19th century. Neither animals, plants, nor fungi, these soft-bodied organisms are protists and are notable for their ability to absorb silica from sea water to form elaborate skeletal structures. They are also incomparably beautiful, as seen in the glass model of the radiolarian Elatoma juniperinum from the Hall of Biodiversity pictured here.

While still poorly understood in many ways, radiolarians are thought to hold significant clues to the evolution of life on Earth, as well as insights into changing climatic conditions over time. They have existed for at least 550 million years and are found in all the world’s oceans and other bodies of salt water, from the surface to the seafloor. They travel alone or in gelatinous colonies, some large enough to be seen with the naked eye. Along with other plankton, or free-floating organisms, they are a food source for other marine life. They themselves are known to feed by two methods: ingesting bacteria and other microbes they capture using arm-like extensions called axopods, and through the photosynthesis of symbiotic algae.

Of the reported 15,000 living and fossil species of radiolaria, some 800 to 1,000 species are currently known to inhabit the oceans, where they play an important role in Earth’s carbon-oxygen cycle. Like diatoms, single-celled algae that also form silica skeletons, radiolarians sink after death, trapping atmospheric carbon in the sediment of the deep oceans. The composition and distribution of their fossils are used to estimate past water temperature and salinity in the oceans.

Still, mysteries about these single-celled organisms abound—from their life span to their method of reproduction to the exact nature of their relationship with their algal symbionts. New tools, such as DNA sequencing and increasingly refined imaging techniques, offer researchers the hope of a more complete understanding. But in the meantime, it may be enough for the rest of us to simply admire how, as Charles Darwin said in On the Origin of Species, “from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved.”

Visit amnh.org/pondlife for a three-part video series about local microorganisms.
Saturn’s rings reveal how our solar system’s worlds formed.
ON OCTOBER 15, 1997, THE CASSINI ORBITER carrying the European Space Agency (ESA)’s Huygens probe lifted off from Cape Canaveral aboard a Titan IVB/Centaur and began a nearly seven-year journey to Saturn.

Before reaching its destination, the spacecraft completed two flybys of the brightest planet in our Earth’s sky, Venus, for gravity assists that helped accelerate its journey into the outer solar system. It passed the Earth and our Moon, whizzing by at 700 miles above the eastern South Pacific. It carved through the asteroid belt—only the seventh spacecraft to do so—and joined the Galileo spacecraft orbiting Jupiter on the other side for the first joint spacecraft study of the Jovian system. And before it ever reached Saturn, it beamed back to Earth the first of many new discoveries: two previously unknown moons—Methone and Pallene—orbiting the ringed giant.

For 13 years after its arrival at Saturn, Cassini orbited the planet, studying its magnetosphere and icy rings closely. It sent back more revelations about its sixth largest moon, confirming that Enceladus has active giant plumes that contain organic compounds and water ice fed by a subsurface ocean. Cassini also set new milestones for the exploration of alien worlds, including landing a probe on the most distant planetary body in our solar system to date—an achievement that may very well shape the future of space exploration for the next generation.

The Cassini mission arrives in the Hayden Planetarium dome in January 2020 as one of the many spectacular stories featured in the new Space Show, Worlds Beyond Our Earth. Viewers will fly along with Cassini for unprecedented views of Saturn’s famous rings, which, the mission revealed, are a hot spot for studying the formation of new planetary bodies.

“We absolutely had to tell the extraordinary story of the Cassini mission, which gave us invaluable insights into Saturn’s entire system of worlds,” says Denton Ebel, curator in the Department of Earth and Planetary Sciences, who is overseeing the new Space Show.

THE RINGED GIANT
The sixth planet from our Sun, Saturn was first observed through a telescope by the Italian astronomer Galileo Galilei in 1610. The sight perplexed him. “Saturn is not a single star, but is a composite of three,” he concluded at first, mistaking the planet’s rings for satellite bodies. (We now know that Saturn has at least 62 moons.)

It wasn’t until Dutch astronomer Christiaan Huygens made observations with a more advanced instrument in the 1650s that the iconic rings were described—though Huygens thought he was looking at a single, solid plane. Several decades later, Italian astronomer Giovanni Domenico Cassini observed a gap—known as the Cassini division—that questioned the solid plane. By 1785, French mathematician Pierre Simon LaPlace put forward a theory that Saturn’s rings were made up of small particles.

Two centuries later, the Cassini space mission gave us an even closer look. Observations showed that the structure of the rings was far more complex than previously thought. “What the images captured by Cassini showed us were the rings at a very specific time and date. Toward the end of the mission, Cassini went up and over the rings, and was able to capture the highest resolution images of ring features resembling propellers forming as slight gravitational wakes around tiny moons,” says Carter Emmart, the Museum’s director of astrovisualization, who serves as director of Worlds Beyond Our Earth.

Those moons, tucked into the revolving disks of ice and rock that encircle Saturn are a veritable nursery of new worlds, forming and dissipating. Some of them formed very recently, cosmically speaking—between 10 million and 100 million years ago. “Saturn’s rings are an analog for the evolution of the entire solar system,” says Ebel. “What we now know about the disc structure tells us about how solid bodies grew into larger worlds in our own early solar system, and in solar systems around young stars.”

WHAT CASSINI CARRIED
Cassini was equipped with 12 scientific instruments to probe Saturn and its orbiting bodies. The suite included cameras, instruments to calculate measurements at a distance, and particle sensors to analyze magnetic fields, mass, electrical charges and densities of atomic particles, quantity and composition of dust particles, and radio waves. Then there were the high-tech cameras: a two-part imaging system for capturing wide views as well as high-resolution images of specific details at a range of wavelengths from ultraviolet to infrared, providing valuable information for interpretation back on Earth. The stunning visualizations of Saturn featured in the new Space Show are based in part on Cassini images.

This page: A rendering of an up-close view of the planet’s icy rocky rings.
Opposite: At the end of its mission, Cassini descended through Saturn’s atmosphere, sending back valuable data to NASA until it eventually broke apart.
In the new Space Show, Saturn’s rings are visualized as a dynamic crucible of planetary body formation, letting viewers glimpse a process that scientists think may be parallel to the one that led to the formation of the larger solar system.

“We can’t go back in time to watch how our solar system formed,” says Vivian Trakinski, producer of the Space Show and the Museum’s director of science visualization and producer of the new Space Show. “But the patterns we see in Saturn’s rings as the moonlets are taking shape, carving out lanes and gathering mass from debris around them, allow us to observe a similar system in formation.”

**WHOLE NEW WORLDS**
One of Cassini’s greatest successes came in 2005, when its Huygens probe successfully navigated the thick atmosphere of Titan, Saturn’s largest moon, becoming the first spacecraft to land on a moon other than our own and sending back an uninterrupted datastream of information and images of the world’s atmospheric and surface features upon descent.

“With an extraordinary effort that I still frankly can’t believe, the radio astronomers of the world…gathered together to look at the little telephone signal…coming from the other side of the solar system,” said David Southwood, director of science for the ESA, of the historic event.

What scientists have learned from Huygens’ landing surpassed every expectation. Titan’s landscape terrain is similar to Earth’s, with peaks and valleys and lakes and rivers. Its atmosphere produces weather such as rain, but instead of water, it rains methane. And its surface is strewn with seas filled with a liquefied form of the greenhouse gas. It’s far too cold to be habitable by us, but its atmosphere strongly resembles what Earth was like before it evolved to host life.

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October
SciFest: Research Library Collections Unleashed!
Wednesday, October 2
Doors at 6:30 pm; program starts at 7 pm
Free with RSVP; Cash bar adults 21+
The Museum was founded as a Museum and Library 150 years ago, and the Library’s collections have grown steadily ever since. Join the Library’s Harold Bioschienstein Director Tom Balcone to learn about some of the amazing stories unearthed in its extensive archives and photographs, film, art, and memorabilia collections through the years—and to find out what the future has in store for this vital scholarly and community resource.

Field Trip to the Moon
Monday, October 14
6–6:45 pm
$8 for children, $9.50 for adults
Join us for a virtual trip to the Moon in the immersive Hayden Planetarium. Feel the ground shake beneath you as you experience a thrilling NASA rocket launch. Take a tour of the cosmos guided by a live presenter and orbit the Earth to get an astronomer’s view of a sunrise in space!

The Ancient Volcanoes of Mercury
Monday, October 7
7 pm
How do scientists know there were ancient volcanoes on Mercury? NASA’s MESSENGER spacecraft orbit Mercury with the goal of better understanding the planet’s ancient geologic history. Planetary geologist Brett Denevi discusses her role on the MESSENGER mission and her studies surrounding the origin, composition, and evolution of planetary surfaces.

The 2019 Margaret Mead Film Festival
Thursday, October 17–20
Members receive a discount on tickets.
The Margaret Mead Film Festival features documentary films, shorts, and other media that increase our understanding of the complexity and diversity of peoples and cultures around the world. Inspired by anthropologist Margaret Mead’s groundbreaking use of film and photography, the Mead celebrates ever-changing modes of storytelling, new technologies, and increased access to communities near and far while presenting the best in non-fiction film and hybrid works.

Opening Night Film
Freedom Fields
Thursday, October 17
6:30–7 pm
Free
Hayden Planetarium. Feel the ground shake beneath you as you experience a thrilling NASA rocket launch. Take a tour of the cosmos guided by a live presenter and orbit the Earth to get an astronaut’s view of a sunrise in space!

Mead Dialogue
Collaborations in Cultural Storytelling: Renovating the Northwest Coast Hall
Saturday, October 19
4:30 pm
Free with any Mead ticket or festival pass; RSVP required
VR Lounge: Awakena
Friday, October 18–Sunday, October 20
Starlight Café
Free with any Mead ticket or festival pass; RSVP required
For tickets and additional information visit amnh.org/mead.

The Butterfly Conservatory
Free
The butterflies are back! This popular live-animal exhibition features up to 500 free-flying tropical butterflies from the Americas, Africa, Asia, and Australasia. Housed in a tropical vivarium with flowering plants, see indescribably blue morphos, striking scarlet swallowtails, and more.

Member Entrances
Members and their guests are welcome use one of two Member entrances. The Member entrance located at Central Park West (ground level, via the driveway) at 79th Street is open seven days a week. On Saturdays and Sundays, the weekend Member entrance located at 79th Street (between Columbus Avenue and Central Park West) is also open. Both entrances have digital ticketing kiosks and are accessible by wheelchair and stroller.

T. rex: The Ultimate Predator
Free
Everyone knows Tyrannosaurus rex. But do you know how this mega-predator evolved to become the most fearsome carnivore of the Mesozoic? Meet the entire tyrannosaur family through fossil casts and life-sized models of hatchlings, juveniles, and a full-grown, towering T. rex, with engaging interactive experiences that will reveal the amazing story of this iconic dinosaur.

Addressing the Statue
Free
Now on view in the Akeley Gallery, this exhibition provides insight into the historic equestrian Theodore Roosevelt Statue on the Museum’s front steps and how it is interpreted today.

Accessibility Programs
To learn more, email accessibility@amnh.org or call 212-769-5765. Visitors who are blind or partially sighted are invited to attend tours highlighting exhibits through verbal descriptions and touchable objects. The Museum also offers tours for both deaf and hearing audiences that are simultaneously signed and spoken. And our Discovery Squad Tours were developed specifically for families affected by autism spectrum disorders.

Discovery Room
Free
Monday–Thursday, 11:30 am–1:30 pm
Saturday, Sunday, and public school holidays, 10:30 am–2:35 pm and 2:45–5:10 pm
The Discovery Room offers families, and especially children ages 5–12, an interactive gateway to the wonders of the Museum and a hands-on, behind-the-scenes look at its science.

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

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.

For updates.
For more programs and to purchase tickets, visit amnh.org/calendar.
Halloween Celebration
Saturday, October 26
6–8 pm
$13
More than 30 of the Museum’s popular halls will be open for trick-or-treating, arts and crafts, fun with roaming cartoon characters, and live performances. Past performers and characters have included Curious George® and Clifford the Big Red Dog, a magician, stilt walkers, and performers from the Big Apple Circus. Come in your Halloween costume!

SciCafe: Climate Change and Rising Sea Levels
Wednesday, November 6
Doors at 6:30 pm, program starts at 7 pm
Free with RSVP; cash bar adults 21+ How fast climate changes in the future will depend on our collective actions as individuals, families, communities, and governments. In this presentation, paleoclimatologist Dr. Kristie R. Wilson will review evidence for climate change, natural and manmade, and explore how ice sheets and sea levels have changed in the past.

Oceans: Our Blue Planet
Free
In this giant-screen film, embark on a global odyssey to discover the largest and least explored habitat on Earth. New ocean science and technology has allowed us to go further into the unknown than we ever thought possible. From the coastal shallows to deeper mysterious worlds, hear untold stories of the oceans’ most astonishing animals. Captioning and audio devices are available.

Spooky Space
Tuesday, October 29
7 pm
$12
Monstrous stars, devilish explosions, and frightful collisions! Get in the Halloween spirit and join astrophysicist Jackie Faherty for a virtual tour in the Hayden Planetarium Space Theater highlighting the universe’s scariest phenomena.

November

Weekends to ReMember
Month of November
Members will receive special added benefits on Saturdays and Sundays throughout the month of November! Enjoy free access to your favorite special exhibitions, including The Butterfly Conservatory and Ten: The Ultimate Predator, the 2D/3D giant-screen film, and the Space Show. Stop by any Membership Desk to pick up complimentary collectibles from the Museum’s 150th anniversary. Get a head start on your holiday shopping and enjoy double discounts at all Museum retail shops from November 10–17.

Día de Muertos Party
Friday, November 1
8–11 pm
$45
Celebrate Día de Muertos, Oaxacan-style, at the Museum. Join us for a Mexican verbena featuring a night full of traditional Oaxacan music and drinks.

Día de Muertos (Day of the Dead)
Saturday, November 2
11 am–5 pm
Free
Immerse yourself in the traditions of Día de Muertos in this family-friendly, full-day festival featuring altars dedicated to extinct animal species, performances by Mexican folklore musicians and dance troupes, hands-on craftworkshops, and a craft marketplace.

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The First Seconds of the Universe
Monday, November 4
7 pm
$12
Theoretical astrophysicist Dan Hooper explores what scientists know and what they are still struggling to understand about the very first seconds—and fractions of a second—after the Big Bang. Hooper proposes in his new book, At the Edge of Time that it is in studying these initial moments that we will unlock great truths about the universe. A book signing follows.

A Night at the Museum Sleepover—Special Member Price
Weekends to ReMember
Fridays, November 8 and November 15
6 pm–9 am (recommended for families with children 6–13 years old)
$135
Registration required, call 212-769-5200
Head out with flashlights in search of adventure. Meet your relatives in the Hall of Human Origins. Climb the stairs and enter the age of dinosaurs, standing beneath a fearsome T. rex. Settle down beneath the 64-foot-long blue whale, next to African elephants, or at the base of a stricking volcanic formation, and fall asleep in the halls of one of the world’s most beloved museums.

Spooky Space
Tuesday, October 29
7 pm
$12
Monstrous stars, devilish explosions, and frightful collisions! Get in the Halloween spirit and join astrophysicist Jackie Faherty for a virtual tour in the Hayden Planetarium Space Theater highlighting the universe’s scariest phenomena.

November

Weekends to ReMember
Month of November
Members will receive special added benefits on Saturdays and Sundays throughout the month of November! Enjoy free access to your favorite special exhibitions, including The Butterfly Conservatory and Ten: The Ultimate Predator, the 2D/3D giant-screen film, and the Space Show. Stop by any Membership Desk to pick up complimentary collectibles from the Museum’s 150th anniversary. Get a head start on your holiday shopping and enjoy double discounts at all Museum retail shops from November 10–17.

Día de Muertos Party
Friday, November 1
8–11 pm
$45
Celebrate Día de Muertos, Oaxacan-style, at the Museum. Join us for a Mexican verbena featuring a night full of traditional Oaxacan music and drinks.

Día de Muertos (Day of the Dead)
Saturday, November 2
11 am–5 pm
Free
Immerse yourself in the traditions of Día de Muertos in this family-friendly, full-day festival featuring altars dedicated to extinct animal species, performances by Mexican folklore musicians and dance troupes, hands-on craftworkshops, and a craft marketplace.

SciCafe: Climate Change and Rising Sea Levels
Wednesday, November 6
Doors at 6:30 pm, program starts at 7 pm
Free with RSVP; cash bar adults 21+ How fast climate changes in the future will depend on our collective actions as individuals, families, communities, and governments. In this presentation, paleoclimatologist Dr. Kristie R. Wilson will review evidence for climate change, natural and manmade, and explore how ice sheets and sea levels have changed in the past.

A Night at the Museum Sleepover—Special Member Price
Weekends to ReMember
Fridays, November 8 and November 15
6 pm–9 am (recommended for families with children 6–13 years old)
$135
Registration required, call 212-769-5200
Head out with flashlights in search of adventure. Meet your relatives in the Hall of Human Origins. Climb the stairs and enter the age of dinosaurs, standing beneath a fearsome T. rex. Settle down beneath the 64-foot-long blue whale, next to African elephants, or at the base of a stricking volcanic formation, and fall asleep in the halls of one of the world’s most beloved museums.

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IRIS Lecture: Past Earthquakes, Present Hazards
Tuesday, November 12 6:30 pm
Free; RSVP required
How do scientists understand earthquakes that occurred before modern seismometers? Join geophysicist Susan Hough as she describes the science of past tremors and what they can teach us about present-day earthquake hazards.

Predator
Next
Join geophysicist viewing, exclusively for can teach us about present-day on Saturn, or a mining of past tremors and what they describes his work on X-ray observations of astronomical objects ranging from nearby stars to the most distant quasars.

December
X-ray Astronomy
Monday, December 1 7 pm
$12
Since its launch on July 25, 1999, the Chandra X-ray Observatory has been NASA’s flagship mission for X-ray astronomy. David Helfand describes his work on X-ray observations of astronomical objects ranging from nearby stars to the most distant quasars.

Animal Drawing
Eight Thursdays, December 12–January 30
7–9 pm
$60 (Materials not included)
The Museum’s celebrated dioramas, dinosaur skeletons, and other iconic exhibits serve as the setting for an intensive after-hours drawing course with illustrator and naturalist Patricia Wynne.

Kwanzaa
Saturday, December 28
Noon–5 pm
Free
Join us for the Museum’s annual Kwanzaa event, a celebration of African-American heritage that is rooted in seven principles known as Nguzo Saba, which promote unity, culture, and community development.

Program Credits:

The Margaret Mead Film Festival is supported in part by the National Endowment for the Arts.

The Margaret Mead Film Festival is presented in collaboration with the Mexican State of Oaxaca, an invited cultural partner.

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

Kwanzaa 2019 is provided, in part, by the May and Samuel Radin Family Foundation, Inc. and the family of Frederick H. Leonhardt.

Kwanzaa 2019 is re-presented by Community Works and New Heritage Theatre Group.

The Kwanzaa marketplace is organized by the Harlem Arts Alliance.

SciCafe: Hacking the Stars
Wednesday, December 4
Doors at 6:30 pm, program starts at 7 pm
Free with RSVP, cash bar adults 21+
Can hacking advance astrophysics? Find out how! Take a deep dive into what the Florida Institute of Technology have harnessed hacking to process massive amounts of data and fast-track new research and technologies.

SciCafe: Research Library Collections Unleashed!
SciCafe
Monday, December 17–20
7–10 pm
Free
Join us for a reading of the Museum’s science collections, in collaboration with the Ralph M. Cestone Foundation, Inc. and the family of Frederick H. Leonhardt.

SciCafe: Climate Change and Rising Sea Levels
SciCafe
Monday, December 23
7 pm
Free
Join us for a reading of the Museum’s climate science collections, in collaboration with the Ralph M. Cestone Foundation, Inc. and the family of Frederick H. Leonhardt.

SciCafe: Hacking the Stars
SciCafe
Tuesday, December 25
7 pm
Free
Join us for a reading of the Museum’s space science collections, in collaboration with the Ralph M. Cestone Foundation, Inc. and the family of Frederick H. Leonhardt.

SciCafe: Climate Change and Rising Sea Levels
SciCafe
Monday, December 30
7 pm
Free
Join us for a reading of the Museum’s climate science collections, in collaboration with the Ralph M. Cestone Foundation, Inc. and the family of Frederick H. Leonhardt.

SciCafe: Hacking the Stars
SciCafe
Tuesday, December 31
7 pm
Free
Join us for a reading of the Museum’s space science collections, in collaboration with the Ralph M. Cestone Foundation, Inc. and the family of Frederick H. Leonhardt.
On any given day, visitors to the Museum's Dorothy and Lewis B. Cullman Hall of the Universe are invariably drawn to the impressively large monolith in the southwest corner: the 15.5-ton Willamette meteorite. But for visitors who happen to come to the Museum during the last week of June each summer, there is a special opportunity: to hear about the meteorite from young people from the Confederated Tribes of the Grand Ronde in Oregon, for whom the iconic specimen is not just a remnant from space but an object of special cultural, spiritual, and historical significance known as Tomanowos.

This past summer, Kailiyah Krehbiel, 17, and Isabelle Grout, 15, welcomed visitors and engaged them in conversation about Tomanowos, which is revered as a purifying, cleansing, and healing source through the rainwater that once collected in its many crevices.

“It’s more than just a space rock,” Grout, wearing an “Ask Me” button, explained to a visitor.

“The warriors cleaned their arrowheads in it,” Krehbiel said in response to a visitor’s question. “People washed their faces with water from it because it was powerful. Being around it is very cleansing. It’s a good feeling.”

Grout and Krehbiel were in New York as part of an internship program, which runs each summer and invites students from Grand Ronde to spend three weeks at the Museum with a chaperone (this year’s class was accompanied by Cristina Lara, who was part of the inaugural class of interns, and Teal Reibach of the Chachalu Museum and Cultural Center in Grand Ronde). The program was established in 2000 as part of a historic agreement between the Museum and Grand Ronde to maintain the meteorite in New York, where it would be seen by millions of visitors each year and continue to be revered by the Confederated Tribes of the Grand Ronde in an annual ceremonial visit.

Each year, interns from the Grand Ronde travel to New York City for the program, which immerses them in the Museum. In the first week, they learn about the institution itself and how the Museum studies meteorites and space. During the second week, they explore the history of the Willamette agreement, why the internship was created, and what is involved in the study of anthropology at the Museum. Their third week is devoted to interacting with visitors and engaging them in discussions about the multiple meanings of the meteorite. On their last day, the interns make a final presentation to members of the Museum’s Education Department and invited guests to share what they gained from the experience and what living in Grand Ronde is like today. Throughout, the teens also manage to fit in some sightseeing in New York, visiting the Museum of the City of New York, the Metropolitan Museum of Art, and the National Museum of the American Indian.

But the centerpiece of the program is establishing and renewing a new generation’s connection with Tomanowos. As Kathryn Harrison, who was chair of the Grand Ronde Tribal Council in 2000 when the agreement was made and is now a Museum Trustee, has explained, it is important to feel a palpable link to her ancestors in the presence of Tomanowos. “Here we are and have that same honor and privilege,” she says.

Echoing that sentiment is Lara, who recalled her own experience as part of the first group of students to participate in the program in 2001. “My strongest memory absolutely was meeting Tomanowos,” she says. “That’s what I took away, that feeling of connection and belonging.”

It was a “beginning hook,” she says, for things she is still learning even now as an adult, reading, attending ceremonies, and hearing stories about ancestors. She enjoyed seeing this year’s interns make their own connection to Tomanowos. “I love being able to witness that,” she said.

For more about the history of the Willamette meteorite, see p. 22.
Magnificent Meteorite

As the Museum celebrates its 150th anniversary, each issue of Rotunda will bring you stories about the Museum’s iconic exhibits.

At 15.5 tons, the Willamette meteorite, which is located in the Dorothy and Lewis B. Cullman Hall of the Universe, is the largest iron meteorite found in the United States and one of the largest in the world. Here are a few fascinating facts from its more than 100-year history at the Museum.

OUT OF THIS WORLD

Most metallic meteorites, including the Museum’s “big irons”—Willamette and Ahnighito, which is located in the Arthur Ross Hall of Meteorites—have a quality not found in any metals crystallized on Earth: distinct intergrowths of the iron-nickel minerals called “Widmanstätten patterns” that appear naturally, if rarely, or when the polished surface is etched with a solution of nitric acid. Some have called these patterns “an invisible writing or a language from space.”

ROUTE TO NEW YORK

After the Clackamas were relocated to a reservation in the 1850s, the tribe’s ancestral lands on which Tomanowos rested were owned by the Oregon Iron and Steel Company, which exhibited the meteorite at the Lewis and Clark Exposition in Portland, Oregon, in 1905. A New York philanthropist who visited the fair purchased it and gave it to the Museum, where it was displayed beginning in 1906.

FORGED IN A PLANET

This meteorite’s unique composition—part iron, part nickel—leads scientists to think that it was once part of an iron core of a planet orbiting our Sun that broke apart billions of years ago. There is evidence it sustained two more shocks before crashing into Earth thousands of years ago, traveling at an estimated 30,000 to 50,000 miles an hour.

DELIVERED BY GLACIER

There is no impact crater in Oregon’s Upper Willamette Valley, where the meteorite was located when it first gained widespread attention in 1904. The meteorite likely touched down in an entirely different location—perhaps on an ice cap near what is now the Idaho-Canada border—and was brought to Oregon by melting glaciers from 15,000 to 18,000 years ago.

SPIRITUAL SIGNIFICANCE

The Native peoples of Oregon’s Willamette Valley, the Clackamas, call the meteorite Tomanowos, or a representative of the Sky People. According to Clackamas tradition, Tomanowos sparked a union of sky, Earth, and water when it landed in the valley to collect rainwater in its crevices, endowing the water with healing powers.

SHARED TRADITION

On June 22, 2000, the Museum signed an agreement with the Confederated Tribes of Grand Ronde of Oregon, which includes the Clackamas, to maintain the meteorite in the Museum for scientific and educational use while ensuring access for religious, historic, and cultural purposes. For a story about the annual Grande Ronde internship at the Museum, see p. 20.

HIGH-TECH REPLICA

A faithful, to-scale reproduction of the meteorite was fabricated out of white plastic foam through a process called computer numerical control milling. It was based on a 3D-printed model made from hundreds of photos taken at the Museum last year by Clackamas students working with artist Garrick Imatani.

Museum President Ellen V. Futter with Grand Ronde Tribal Council Chair Kathryn Harrison at the 2000 signing. Harrison now serves as a Museum Trustee.
General Information

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

ENTRANCES
During Museum hours, Members may use the Member entrance on Central Park West (ground level via the driveway), the 81st entrance, and the subway entrance (lower level). On weekends, the 77th Street entrance is also designated for Members.

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

MUSEUM SHOPS
The Museum Shop, Dino Store, Planetarium Shop, Cosmic Shop, T. rex 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.

“We absolutely had to tell the extraordinary story of the Cassini mission, which gave us invaluable insights into Saturn’s entire system of worlds,” says Curator Denton Ebel about the new Space Show, opening in 2020. For more, see p. 8.