

# ROTUNDA

 AMERICAN MUSEUM OF NATURAL HISTORY

Member Magazine  
Spring 2012 Vol. 37 No. 2

# Know How They Glow

Creatures  
of Light  
Opens  
March 31

# From the President

Ellen V. Futter



As spring brings warmer days, New Yorkers begin to emerge from the cocoon of winter and reach out to a wider world. The Museum does that all year long through an extensive program of traveling exhibitions and Space Shows. This spring, the Museum has 15 of its exhibitions "on the road," from *Einstein to Mythic Creatures*, as well as six Space Shows, and Science Bulletins appearing in 22 venues. *Traveling the Silk Road* opens at the National Museum of Australia on March 31; *Race to the End of the Earth* is on view at the Palazzo Ducale in Genoa, Italy; *Brain: The Inside Story* is at China's Guangdong Science Center; and the list goes on.

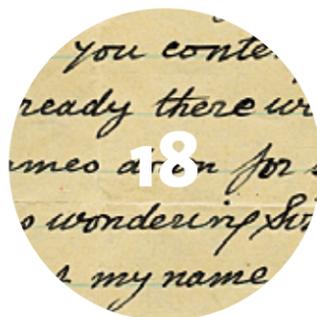
The Museum has become one of the world's leading developers and distributors of natural history exhibitions, which have been presented in more than 200 venues in 33 countries since 2003. These shows often represent important partnerships, including our two exhibitions this

spring: *Beyond Planet Earth* was organized with MadaTech: The Israel National Museum of Science, Technology & Space in Haifa; and *Creatures of Light* is presented with Ottawa's Canadian Museum of Nature and the Field Museum in Chicago.

The world is also coming to us. In 2011, some 40 percent of our visitors came from outside the United States. To welcome them, and all non-English speakers, we offer floor plans in 10 languages: English, Spanish, German, French, Portuguese, Japanese, Russian, Italian, Chinese, and Korean; and audio translations of the Space Show in Chinese, French, German, Italian, Japanese, and Spanish. And 426 staff members speaking 37 languages wear "I speak..." buttons identifying their language skills to visitors. In all these ways, we are increasingly serving a diverse international and domestic audience and bringing the wonders of the Museum to many millions both here in New York and abroad.

## Table of Contents

News	3
Close-Up	4
Shining Armor	6
Fieldwork in Extreme Environments	10
Luminous Lures	12
Next	14
Explore	18
Members	20
Seen	22



## ROTUNDA

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ISSN 0194-6110  
USPS Permit #472-650  
Vol. 57, No. 2, Spring 2012  
*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 \$95 per year and higher includes a subscription to *Rotunda*. © 2012 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.

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# Celebrating Burroughs' Legacy, 175 Years After His Birth



Naturalist John Burroughs remains an influential voice in American nature writing.

This April marks the 175th anniversary of the birth of noted naturalist John Burroughs, a canonical figure in American nature writing, friend of Theodore Roosevelt, and key voice in the early 20th-century nature study and conservation movements. A Museum hall dedicated to the naturalist lies tucked to the side of the Hall of Northwest Coast Indians, showcasing Burroughs' handwritten manuscripts, field glasses, and even his cane—all reminders to those who walk and write in his footsteps that there is still much to be learned from nature.

"John Burroughs is timeless," says Lisa Bresloff of the Museum's Education Department, who is also the secretary of the John Burroughs Association, which has been headquartered at the Museum since 1921. "He embodied the Museum's mission of studying and understanding nature, and his legacy lives on in our research and education efforts."

Since 1926, the John Burroughs Association has awarded the John Burroughs Medal to authors who share Burroughs' acute eye for nature, dedication to field study, and creative yet controlled prose style. The prestigious award has recognized various influential writers over the years. Rachel Carson, who received the award for *The Sea Around Us* in 1951, said in her acceptance speech, "In presenting me with the John Burroughs Medal you have welcomed me into an illustrious company, and you have given *The Sea Around Us* one of its most cherished honors." Other medal winners have included Aldo Leopold for *A Sand County Almanac*, John McPhee for *The Control of Nature*, and Barry Lopez for *Of Wolves and Men*—though the judges make their decision based on an author's entire body of nature writing.

This spring, the John Burroughs Association will once again hold a private awards luncheon on Monday, April 2, to present the John Burroughs Medal, along with awards for an outstanding nature essay and natural history books for children. The recipient of this year's medal is Edward Hoagland for *Sex and the River Styx* (Chelsea Green Publishing).

For more about John Burroughs, visit [amnh.org/news](http://amnh.org/news) in April.

# Research Reveals Microraptor Colors

A team of American and Chinese researchers has revealed the color and detailed feather pattern of *Microraptor*, a pigeon-sized dinosaur with long feathers on its hind limbs that lived about 130 million years ago.

By comparing the patterns of pigment-containing organelles from a *Microraptor* fossil to those in modern birds, the scientists determined that the dinosaur's plumage was iridescent with hues of black and blue, like the feathers of a crow. Their results were published by the journal *Science* in March.

"This study gives us an unprecedented glimpse at what this animal looked like when it was alive," says Mark Norell, chair of the Museum's Division of Paleontology and one of the paper's authors.

Although its anatomy is very similar to birds, *Microraptor* is placed in the family Dromaeosauridae and is a close relative to *Velociraptor*. Knowledge about *Microraptor*'s plumage could help scientists zero in on the evolutionary transition from non-avian dinosaurs to birds.

The research also shows that *Microraptor*'s tail fan, which was once thought to be a broad, teardrop-shaped surface meant to help with flight, is actually much narrower with two protruding feathers likely evolved for social interactions. This new finding suggests the importance of display in the early evolution of feathers.

Watch a video interview with Mark Norell on [amnh.org/news](http://amnh.org/news). Search for "microraptor."



This artistic reconstruction shows *Microraptor*'s crow-like sheen.

Photos © AMNH; microraptor images © University of Texas/Jason Brougham

**LYSANDRA CORMION**

In 1989, it was discovered that *Lysandra cormion*, pictured below, is a hybrid of two blue butterflies, *Polyommatus coridon* and *Polyommatus daphnis*. But this does not preclude it from being a distinct species—in fact, some new species evolve through hybridization. DNA analysis would be needed to settle the question.

**GLOBETROTTERS**

In 1945, Nabokov suggested that various New World *Polyommatus* blue butterflies had crossed the Bering Strait from Asia and flown as far south as Chile millions of years ago. His theory, long overlooked by the scientific community, was validated in 2011 when a team of scientists performed DNA analysis that proved Nabokov was right all along. The labels of the Museum's *Polyommatus* collection brim with Nabokov's name, since he identified many of the species.

**TINY TRADEMARKS**

While at the Museum, Nabokov learned how to inspect microscopic butterfly genitalia for species-specific clues from mentor William P. Comstock. Now a standard practice in entomology to distinguish otherwise-indistinguishable species, this technique greatly aided Nabokov's taxonomy work at Harvard's Museum of Comparative Zoology, where he spent seven years as a research fellow and *de facto* curator of Lepidoptera from 1941 to 1948.

**NABOKOV'S NAMESAKES**

Many lepidopterists have named new butterfly species after characters in Nabokov's books—including *Madeleinea lolita*, named for the title character of his most famous work, and *Pseudolucia humberi*, for that book's narrator, Humbert Humbert. Various species bear the Latin *nabokovi*, and the genus *Nabokovia* was named after the writer-scientist.

**THE BUTTERFLY EFFECT**

Butterflies appear throughout Nabokov's works, but his scientific pursuits affected his writing in subtler ways. In his essay "On a Book Entitled *Lolita*," Nabokov identified the mountain pass that Humbert Humbert traverses at the end of the book as the trail where Nabokov caught the first known female *Lycaeides sublivens*. He calls this scene one of the hidden "nerves of the novel."

**Nabokov's Type:  
*Lysandra cormion***

In his poem "On Discovering a Butterfly," *Lolita* author Vladimir Nabokov wrote of "the secluded stronghold" where specimens are kept "safe from creeping relatives and rust." When Nabokov caught a frosty-blue butterfly in France in 1938, he brought it to the stronghold of the American Museum of Natural History, where it still sits with a bright red label, crowning it the first and official representative, or holotype, of *Lysandra cormion*.

While Nabokov is most famous for his fancy prose style, he was also devoted to lepidopterology, the study of moths and butterflies. After fleeing Russia in 1940, Nabokov started his American life volunteering in the Museum's entomology collections. He once told an interviewer, "It is not improbable that had there been no revolution in Russia, I would have devoted myself entirely to lepidopterology and never written any novels at all."

The *L. cormion* specimen was only the beginning of the author's contributions to the collections. In 1941, Nabokov sent nearly 500 field-caught butterflies to the Museum as he traveled with his family from the East Coast to California with stops in the Southwest. David Grimaldi, curator in the Division of Invertebrate Zoology, and Suzanne Rab Green, a curatorial assistant, are in the process of transferring these butterflies from small wax envelopes to display cases, relaxing the specimens in a vinegar vapor to soften and spread their brittle wings.

"Thanks to this treasure and Nabokov's careful handwritten notes on each envelope, we can map his journey across the country," says Dr. Grimaldi. Using the butterfly specimens as guideposts and Google Earth software, the team has plotted Nabokov's "lepping" trip westward. On this particular expedition, Nabokov discovered *Neonympha dorothea* with the help of a special research permit from the Museum that allowed him to take his butterfly net to the rim of the Grand Canyon.

The Department of Entomology receives near-monthly inquiries about Nabokov's work and collections from documentary filmmakers, writers, professors, and other curious minds. Nabokov may have been right when he predicted of his collections that the "locality labels pinned under these butterflies will be a boon to some twenty-first-century scholar with a taste for recondite biography." He laid his trails well.

See specimens that Nabokov studied at the Museum in a glass display case at the entrance to the vivarium in *The Butterfly Conservatory*, open through May 28.



© AMNH/D. Finnin

**Beetle-Wing Body Art: Shuar Ear Ornaments**

When dressing for special occasions, the Shuar people of the upper Amazon adorn themselves with ornaments made from materials found in the surrounding rain forest: feathers, plant fibers, animal parts, wood, and stone. Along with colorful headdresses and necklaces, men wear dramatic ear ornaments like those pictured here, which are made from toucan feathers, glass beads, and the iridescent wing covers of the giant ceiba borer beetle, *Euchroma gigantea*.

The Shuar are one of several Jivaroan tribes who occupy some 7.5 million acres along the border between Peru and Ecuador. The ear ornaments came to the Museum in the 1930s as part of a large collection donated by Dr. Harvey Bassler, a Standard Oil geologist who spent more than a decade studying unexplored areas of the western Amazon basin in search of petroleum. An amateur herpetologist with an interest in local wildlife, Bassler kept a menagerie of rain forest animals in Iquitos and collected thousands of biological specimens for research. He was also one of the first outsiders to spend time among the isolated indigenous peoples of the region, becoming an expert on the cultures of northwestern Amazonia and collecting artifacts in the process.

On completion of his assignment in South America, Bassler shipped 22 tons of books and specimens—including some 10,000 amphibians and reptiles, one of the largest collections of its kind from a single collector—to the Museum in 1954. He later joined the staff to help organize the material.

Members might remember the ornaments shown here from the Museum exhibition *Body Art: Marks of Identity*, which ran from 1999 to 2000. Other examples of Shuar craftsmanship can be found in the Hall of South American Peoples, where more than 70 items from the Bassler collection are on exhibit, including a back ornament made from the wing covers of another colorful beetle, *Chrysophora chrysochlora*.

For more about the Division of Anthropology's collections, visit [research.amnh.org](http://research.amnh.org).



Catalog no. AMNH.40.0/35.04

**THE TALENTED DR. BASSLER**

Harvey Bassler made his mark as a geologist, herpetologist, and anthropologist with deep knowledge of the western Amazon, an area that was largely unknown in his time. From 1921 through 1931, he journeyed by dugout and raft through turbulent rivers and trekked in remote jungles while mapping and surveying for oil, visiting villages and collecting wildlife, fossils, and artifacts along the way. Bassler returned to the Amazon during World War II to help the U.S. government search for rubber sources.

**A BEAUTIFUL FAMILY**

The ceiba borer beetle is a member of the Buprestidae family of beetles, also known as metallic wood-boring or jewel beetles because of their glossy iridescence. This family is among the largest family of beetles, with some 15,000 species in 450 genera, many with vivid colors and eye-catching patterns. Their elytra, or wing covers, have also been used in jewelry in Japan, China, India, and southeast Asia.

**JIVARO CULTURE**

The Jivaroan people include the Shuar, Achuar, Huambisa, and Aguaruna tribes of Peru and Ecuador. The tribes speak Jivaro or Quechua and subsist by farming, hunting, and fishing. Bassler spent considerable time with the Jivaro, despite their reluctance to welcome outsiders. Historically, they are reputed to be the only tribe to have revolted successfully against the Spanish Empire, killing some 2,500 European settlers in 1599.

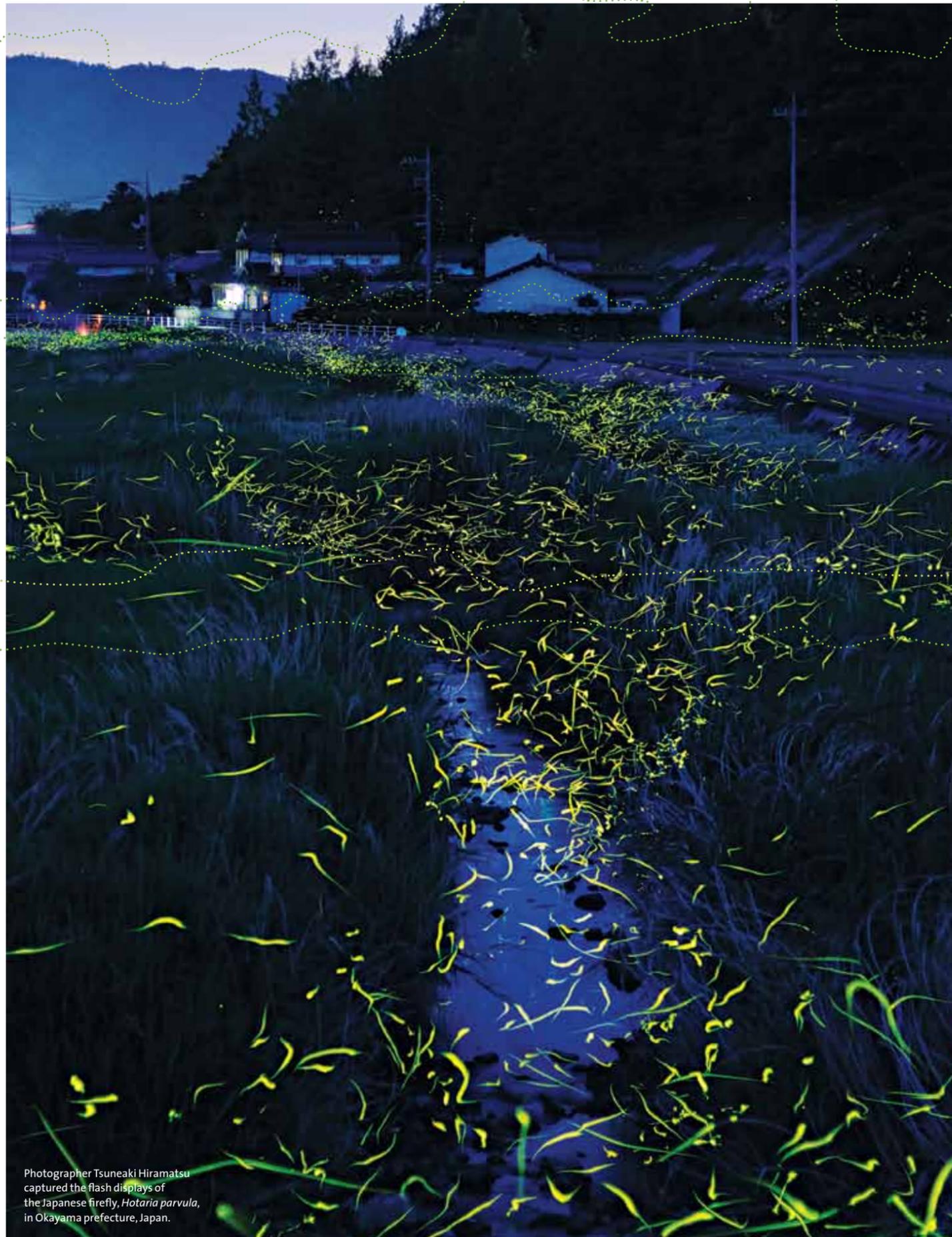
**SOUTH AMERICAN SOURCE MATERIAL**

The Museum's South American ethnographic collection, one of the largest of its kind in the United States, includes more than 21,000 objects from more than 200 tribes. The Hall of South American Peoples is notable for the diversity of its collection, with items from nearly every part of the continent and especially rich collections from the Amazon rain forest, the Gran Chaco region, and Tierra del Fuego.

**FLIGHTS OF FANCY**

Among the most brilliant artifacts in the Museum's South American collection are the feathered creations of the Jivaro, Kayapó, and Waiwai peoples of the Amazon. Using various materials along with the dazzling feathers of toucans, parrots, macaws, and hummingbirds, members of these tribes crafted exquisite ornaments as well as utilitarian items, such as baby carriers.

Courtesy of the Division of Anthropology



Photographer Tsuneaki Hiramatsu captured the flash displays of the Japanese firefly, *Hotaria parvula*, in Okayama prefecture, Japan.

# Shining Armor

## Fireflies signal to seduce a mate, stun a menace, or snag a meal

Firefly expert Marc Branham has been heading to the field in search of fireflies for almost two decades. Once, as a graduate student in the 1990s, he caught four *Photinus consimilis* specimens. While he reached for his collection vials, Branham put the fireflies between his lips.

"I didn't bite or chew, but my lips went numb, my throat constricted, and I tasted something very astringent," he recalls. "It was not a pleasant experience."

Branham was actually getting a powerful message, from a chemical called lucibufagin, a warning of distastefulness to predators and a relic of fireflies' first use of bioluminescence. The summer light shows that will soon begin throughout the eastern United States function as brilliant billboards for mates. But the full story of fireflies' glowing ability, which Branham, a professor of entomology at the University of Florida and a former Theodore Roosevelt Postdoctoral Fellow at the Museum, has spent his career studying, is much more complex. Firefly flashes we see today are the result of a chain of evolutionary events that is still changing in real time, though it's a chain whose links have always been about communication.

**Ancient adult fireflies had no fire at all.** They signaled to mates with chemicals called pheromones, which are still used by some fireflies today. That's why many Californians have never seen the familiar New England scene of a meadow filled with flashing lights, even though multiple species live on the West Coast—most fireflies west of Kansas attract mates strictly with pheromones.

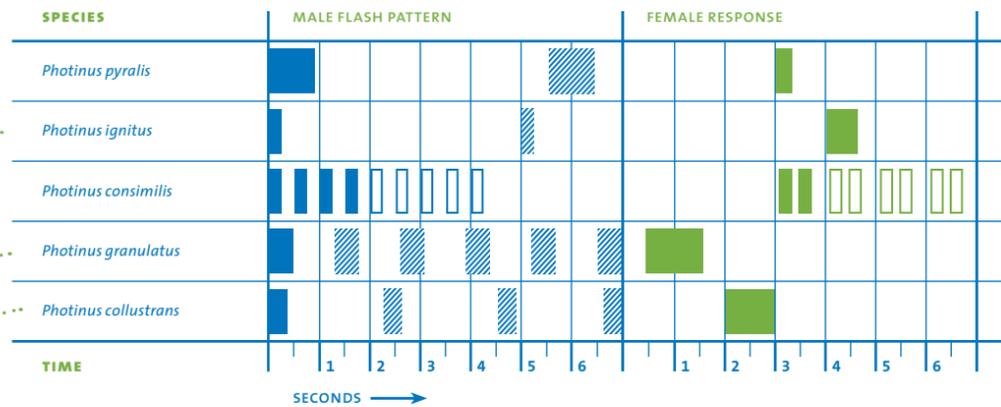
Firefly bioluminescence began in eggs and larvae and only later evolved for courtship displays. The process of a trait being co-opted for another purpose, also known as exaptation, can be seen throughout the animal kingdom. Feathers, for instance, were likely used by dinosaurs for insulation or flashy displays before being fine-tuned for powered flight.

Experts think firefly bioluminescence has been sending a signal from the beginning. It likely started as a warning rather than a welcome—an advertisement that a predator's lips could go numb if, like Branham, he got too close.

The insects' eggs and larvae appear in clusters, a key to this strategy's success. "If the predator samples one, it will associate that experience with that signal, and the others in the group will immediately benefit," explains Branham.

This attention-grabbing warning system functions much like the strident yellow and black of wasps or the bright spectrum of poison dart frogs. Only fireflies have a particular challenge: conveying their repulsiveness without natural light to show their bright colors. "If you glowed in the dark, that would be a pretty obvious signal to communicate you tasted bad," says Branham.

Firefly larvae's glowing ability eventually carried over to adults as well, and there, it still serves as protective gear. That explains, in part, how a trait that seems to turn the insects into blazing bull's-eyes can survive in a world of predators. Fireflies can exude the defensive chemical from their joints to the outside of their body for immediate tasting. "They don't have to die to train the predator," says Branham, a well-coached firefly pursuer.



This table shows the diverse timing and repetition of flash dialogues from five North American firefly species. Shaded boxes represent repeating sequences. Blank boxes indicate "optional" flashes that reflect variation among individuals, including, in the case of *P. consimilis*, the responding female's level of interest.

## Member Preview on Thursday, March 29, 4–8 pm

Members are invited to see *Creatures of Light: Nature's Bioluminescence* at a special preview on Thursday, March 29, beginning at 4 pm. View the exhibition and stay for a wine reception from 6 to 8 pm. Please RSVP by calling the Membership Office at 212-769-5606.

## *Creatures of Light: Nature's Bioluminescence* Opens Saturday, March 31

*Creatures of Light* introduces visitors to the astonishing variety of organisms that produce light. The exhibition unfolds through a series of immersive environments, beginning in a forest of bioluminescent mushrooms and taking visitors through a meadow filled with fireflies, a bioluminescent bay in Puerto Rico, coral reefs, and the deep sea to highlight the ways in which different animals produce and use light to attract mates and prey and to threaten predators. Along the way, see live flashlight fish and special equipment, including a scale model of a deep-sea submersible.

The exhibition is curated by John Sparks, associate curator and curator-in-charge in the Department of Ichthyology at the American Museum of Natural History.

*Creatures of Light: Nature's Bioluminescence* is organized by the American Museum of Natural History, New York ([amnh.org](http://amnh.org)), in collaboration with the Canadian Museum of Nature, Ottawa, Canada, and The Field Museum, Chicago.

Generous support for *Creatures of Light* has been provided by the Eileen P. Bernard Exhibition Fund.

**Flashing flirted its way up the firefly family tree.** The insects' evolutionary history shows a strange metamorphosis unfolding. Firefly eyes grow bigger, more bug-like, as the insects' light organs enlarge. Their antennae, used like a nose to follow pheromones, shrink into stubs. The more important bioluminescent courtship signaling became throughout their history, the more the trappings of invisible communication faded out.

When Branham began his research on Lampyridae, the beetle family consisting of fireflies, he assumed such a beloved animal would be a textbook case in entomology. Branham was shocked to learn how little scientists knew about the common insect.

What researchers did know was that each species of bioluminescent adult firefly has its own flash fingerprint. Males fly through the air and search for females with a species-specific light display. Some flash only once. Some emit "flash trains" of up to nine carefully timed pulses. Others fly in specific aerial patterns, briefly dipping before sharply ascending and forming a "J" of light. A few even shake their abdomens from side to side and appear to be twinkling. "So if you're looking over a field," says Branham, "You can pretty accurately tell how many species are in that area."

What scientists did not fully understand was how these signaling systems radiated into this diverse ensemble. Branham suspected it might have to do with female preference. As males dart through the air, performing luminous gymnastics for sex, females sit, often immobile, on vegetation, waiting to start a flash dialogue with the right male. "Females are pretty choosy about who they flash back to," Branham explains. And they should be: females have a great investment in the offspring since the eggs are more expensive than sperm to produce.

To test his theory of female choice, Branham resorted to the unnatural. He created a computer-driven robotic firefly that could mimic the flash pattern of each species he studied. Branham could also tweak parameters like light color, intensity, and timing and enter the field to gauge how mates reacted. When he made the artificial firefly pulse at strobe-light speeds, beyond those possible in nature, females sparked like live wires.

Source for table: Lloyd, James E. (1966). Studies on the Flash Communication System in Photinus Fireflies.

Like any complex trait, bioluminescence is molded and tweaked by various, often competing, forces.

When a female firefly selects a male with a fast enough flash, she'll deliver a precisely timed response and point her abdomen, or lantern, in the direction of her chosen suitor. That's because he's not the only one vying for her.

Lower-quality "sneaker" males that specialize in eavesdropping on flash dialogues may try to intercept the signal and mate with her first. The threat of these satellite males makes firefly courtship serious business, since the success of the female's offspring and the survival of her own genes depend on her mate being up to snuff.

Whether male fireflies flash at all is also a product of rival pressures. Males are competing for females in the game of sexual selection, but that's only one dimension of natural selection, the struggle to survive.

A firefly's potent lucibufagins, once the insect's best defense against being eaten, repel every predator but one—a rogue genus of fireflies known as *Photuris*. Firefly experts call them the "femmes fatales." They can attract the male of another species by flashing the female response he's hardwired to seek, and then devour him when he tries to mate. These aggressive mimics curiously lack protective lucibufagins of their own but are unfazed by their effects; after eating a male, the female acquires some of his defensive chemical and can ward off her own predators and perhaps even pass the protection to her offspring.

Femmes fatales, satellite sneakers, seductive signals, and protection from predators—together these selective pressures shape firefly signaling into the ever-evolving patchwork it is today, showing how bioluminescence is far from a static trait. "Things get a lot more complex and interesting when you try to drill through these systems and see how they're shaped, how they're used, in the lives of organisms," says Branham.

Though for the familiar firefly, luminescing has always been about sending a message. It's just a matter of whom they're luring—or eluding. 🦋



Hiramatsu combined slow-shutter speed photos for stunning images of flashing fireflies.

## As Firefly Numbers Seem to Slide, Researchers Ponder Effects on Ecosystems

If fireflies disappeared, humans would miss out on spectacular summer entertainment. But how could a loss in firefly numbers shape an ecosystem?

Firefly larvae are voracious predators, feeding on snails, slugs, and earthworms and keeping the ecosystem in delicate balance. Many are stocking up on food for their whole adulthood, throughout which they will never eat. Some climb trees in pursuit of arboreal snails. Others have gills like fish that allow them to dive for aquatic snails, whose shells they then use for protection like hermit crabs. In parts of Asia, a large mollusk called an apple snail has ravaged important crops like rice, and firefly larvae are being explored as a potential form of biocontrol to protect those nations' food supply.

"Just think how poetic it could be if we had fireflies control snails in these agricultural systems as larvae and produce entertainment as a byproduct as adults," says Marc Branham, an entomologist at the University of Florida.

Researchers are still investigating whether firefly numbers are dwindling. "If you ask anybody out there, they will tell you that it seems like there aren't as many fireflies out now as there were 10 or 20 or 40 years ago," explains Branham. The lack of data on older population numbers makes verifying their decline difficult. "But it's pretty clear that there are some locations where people used to see many fireflies, and now you don't see any."

If fireflies are in fact in danger, humans' own flair for all things luminescent may be to blame. Neighborhoods that stay lit through the night may severely disrupt firefly mating behavior because the insects gauge when to flash based on how dark it is outside. One Florida species flashes for a precise 27 minutes each night, but without the correct lighting cue, these insects won't understand when it's time to start signaling and find a mate. Other factors, such as herbicides and pesticides, as well as habitat loss to urbanization, might be affecting the lightning bug as well.

# FIELDWORK IN EXTREME ENVIRONMENTS



IN EXCERPTS FROM  
INTERVIEWS, SCIENTISTS  
BEHIND CREATURES  
OF LIGHT SHARE STORIES  
FROM THE FIELD

John Sparks and David Gruber  
photographed the corals of Bloody Bay Wall  
in the Caribbean for *Creatures of Light*.

**Ichthyologist John Sparks, curator of *Creatures of Light*, recalls two challenging expeditions in Madagascar in search of new species of blind cavefishes.**

We were in Ankarana Reserve in far northern Madagascar, a surreal landscape of exposed karst formations. These are one-of-a-kind formations of permeable rocks, with rivers and streams in between. It's kind of like Swiss cheese, with water running through it. We were looking for a species of blind cavefish endemic to this region.

But first, we had to make our way through the piles of bat guano [dung]. The cavefishes, which lack pigment and have no eyes, eat some of the invertebrates that are in the water, but a lot of them survive mainly on guano. There are enormous piles of it in these caves, 20- to 30-foot mounds. When you get closer, the mounds seem to come alive, with millions of clicking, rustling cockroaches that run over your feet and up your legs. It's just like a scene out of an Indiana Jones movie.

Once we got to the water, we snorkeled around to see if we could catch anything. What's really interesting about the cavefishes is that even though they lack eyes, they're surprisingly difficult to catch. They're highly specialized for life in the cave, with elongate snouts bearing well-developed sensory pores and canals, so they have extremely high sensitivity to water movement. They sense you approaching and just dive into the sediment—and once the sediment is stirred up, forget it. But we were lucky to find specimens that turned out to be a new species, with partially developed eyes and some pigment, a light tan.

We nearly missed a great find a few years ago in southwestern Madagascar. There, the limestone runs in massive plateaus that collapse in places creating, sinkholes that must be accessed using climbing gear. I had forgotten my diving mask and went back to the camp with a colleague. By the time we got back, two members of our team who'd been swimming around for an hour in the sinkhole yelled out, "There's no fish in here. Let's move on." But it was a sinkhole like I'd never seen before: deep, relatively clear water. It looked really promising. I couldn't believe there weren't any fish there. So I said, "We'll take a look."

We went in and swam around for maybe an hour or so, and then I spotted a bizarre looking fish. We stayed in there for nearly three or four hours, and I was able to get two specimens of a new species of blind cavefish, totally different from anything that had been found before, pigmented and dark brown all over, and both anatomically and genetically unique. Although we all got quite sick from swimming in that sinkhole, which is reflected in the species' name—which translates as "seriously ill" in Malagasy—finding such a strange new fish made it all worthwhile.

Read about the research behind the exhibition  
and more at [amnh.org](http://amnh.org).

**Museum Research Associate David Gruber, assistant professor at The City University of New York (CUNY), describes a diving trip in 2011.**

We wanted to include a panoramic image of a magnificent coralscape in *Creatures of Light*, and Bloody Bay Wall [off Little Cayman Island] was the perfect place.

But capturing Ansel Adams-like vistas are impossible under water, where sections of the light spectrum—especially reds—are absorbed within a meter. We need to get in very close to our subject and use flash photography to capture the reef's true color. We have to repeat this process hundreds of times over the wall face. Then, the small consecutive images are painstakingly stitched together to create a life-sized, true-color view.

Underwater photographer Jim Hellemn developed this process to create a 20-foot by 70-foot true-color image of the Bloody Bay Wall in 1999. Returning to the wall 12 years later (with the support of a National Science Foundation Connecting Research to Public Audiences grant) allowed us to overlay the images and really see the way a coral wall ages. Some of the corals are disappearing, some of the sponges have gotten huge, and some new things have taken up residence on the wall. It's amazing.

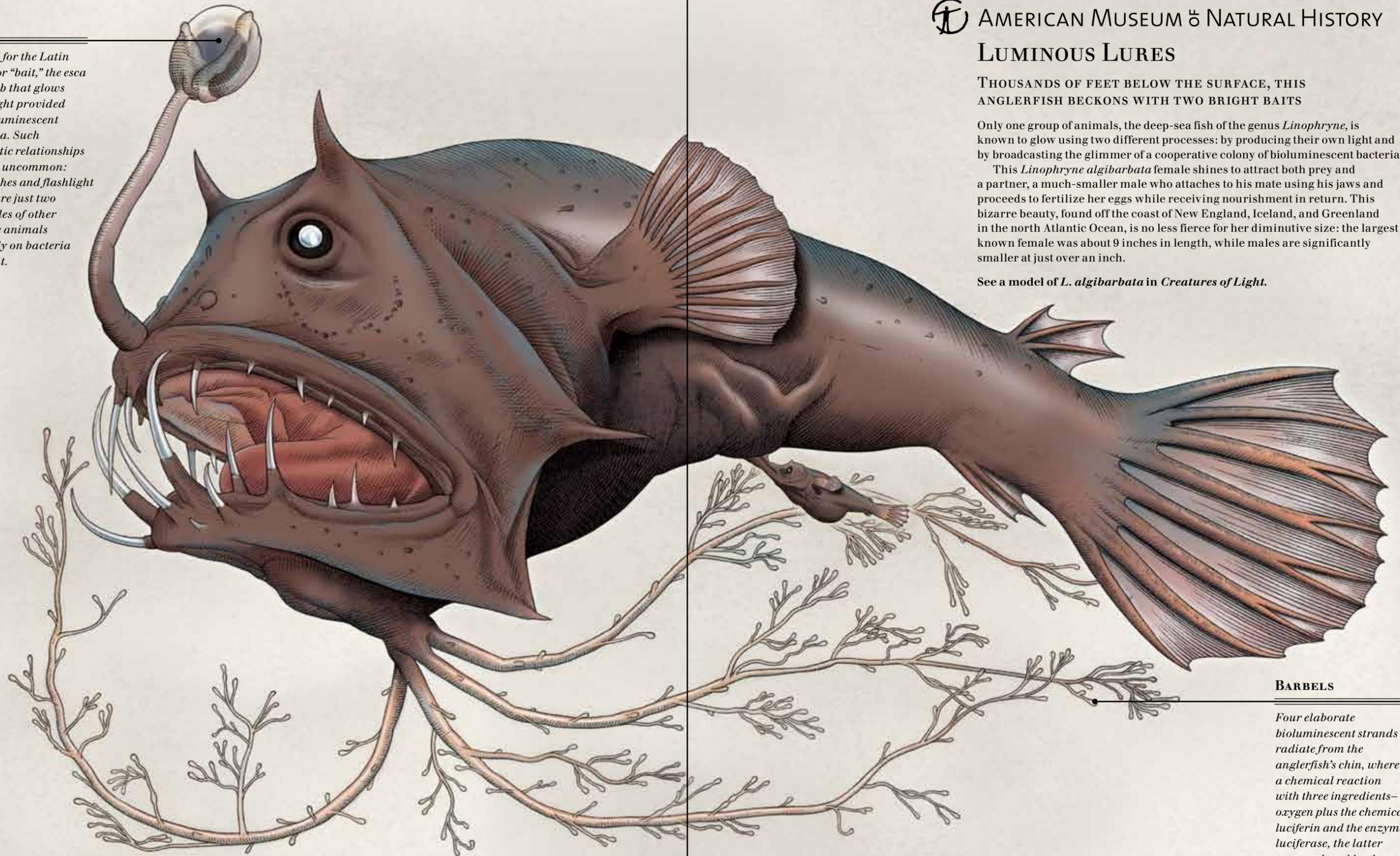
We also wanted to apply Jim's methods to photograph the coralscape at night to capture a phenomenon few people encounter in person or in photographs: marine biofluorescence. As you can imagine, capturing natural biofluorescence is even more of a challenge. Fluorescence on the reefs works a bit like those glowing posters where you need to shine a black light on them in the dark to see their glow. Corals have the same biological property: proteins in their tissue absorb light and then emit it back as biofluorescence. On our dives, we shine blue light—a specific wavelength of pure blue, using very sharp-edged filters, science-grade filters we equip so they can go under water—and the corals emit back in otherworldly green and red.

For this trip, we left at dusk, and descended down a vertical cliff that drops thousands of feet below the surface to start photographing. It's a challenge. We can't use any lights because we're only interested in the light emitted by the corals and reef-dwelling organisms, which makes it difficult to see if we're in the right focus frame. So we use a red laser to give our lenses something to focus on. We often also use a measuring stick to keep the camera lens at a set distance from the wall so our images will have the same focus distance. We're under water, breathing through a regulator, and it's totally dark except for the red focus point. John [Sparks] swims alongside, guiding us across the wall, making sure we don't drop down too deep. And then we shoot. Shoot, shoot, shoot. The results are cool and unveil a hidden beauty—you'll see them in the exhibition. ☺

Don't miss the Bloody Bay Wall interactive exhibit in *Creatures of Light*.

## ESCA

Named for the Latin word for "bait," the esca is a bulb that glows with light provided by bioluminescent bacteria. Such symbiotic relationships are not uncommon: ponyfishes and flashlight fishes are just two examples of other marine animals that rely on bacteria for light.



LINOPHRYNE

ALGIBARBATA

## AMERICAN MUSEUM OF NATURAL HISTORY LUMINOUS LURES

THOUSANDS OF FEET BELOW THE SURFACE, THIS ANGLERFISH BECKONS WITH TWO BRIGHT BAITS

Only one group of animals, the deep-sea fish of the genus *Linophryne*, is known to glow using two different processes: by producing their own light and by broadcasting the glimmer of a cooperative colony of bioluminescent bacteria.

This *Linophryne algibarbata* female shines to attract both prey and a partner, a much-smaller male who attaches to his mate using his jaws and proceeds to fertilize her eggs while receiving nourishment in return. This bizarre beauty, found off the coast of New England, Iceland, and Greenland in the north Atlantic Ocean, is no less fierce for her diminutive size: the largest known female was about 9 inches in length, while males are significantly smaller at just over an inch.

See a model of *L. algibarbata* in *Creatures of Light*.

## BARBELS

Four elaborate bioluminescent strands radiate from the anglerfish's chin, where a chemical reaction with three ingredients—oxygen plus the chemical luciferin and the enzyme luciferase, the latter two produced by the anglerfish—generates energy that is thrown off as light.

## Programs and Events

For more programs and to purchase tickets, visit [amnh.org/calendar](http://amnh.org/calendar).

For updates and reminders, sign up for monthly eNotes for Members by sending your membership number and request to subscribe to [members@amnh.org](mailto: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](http://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.

### APRIL

#### Masters of the Planet with Ian Tattersall

Monday, April 2  
6:30 pm  
Free for Members (Registration required; call 212-769-5200)  
Hear Curator Emeritus **Ian Tattersall** discuss his book.

#### Early-Morning Spring Bird Walks in Central Park

Begin on Tuesday, April 3  
\$85  
Observe bird migrations on an eight-week walk series.

#### SciCafe: Island Birds and Biodiversity

Wednesday, April 4  
7 pm  
Free  
**Chris Filardi** of the Museum's Center for Biodiversity and Conservation presents.

#### Wild, Wild World: Baby Animals with Jarod Miller

Saturday, April 7  
11 am  
1 pm  
2:30 pm  
\$12  
Meet animal youngsters with TV host **Jarod Miller**.

#### A Night at the Museum Sleepover

Friday, April 13  
Friday, May 25  
Saturday, June 2  
Friday, June 22  
Saturday June 30  
Member price is \$119 per person  
Break out your sleeping bags on this after-hours adventure.

#### Asteroids: Friends or Foes with Richard Binzel

Monday, April 16  
7:30 pm  
Member price is \$13.50  
Professor **Richard Binzel** discusses near-Earth asteroids.

#### The Parent-Child Bond: Behind the Science of Attachment

Four Tuesdays, April 17–May 8  
7–9 pm  
Member price is \$216  
Four-session adult course.

#### Member Open House

Thursday, April 19  
6–8:30 pm  
Free for Adventurer Members and above (Registration required; call 212-769-5606)  
Learn about the Museum's research and tour halls after hours.

#### Spaceship Earth with Carter Emmart

Thursday, April 19  
6:30 pm  
Member price is \$13.50  
Celebrate Earth Day 2012 with the Museum's annual appreciation of Earth as seen from space in the Hayden Planetarium dome.

#### Members-Only Highlights Tour

Saturday, April 21  
10:30 am–Noon  
Free (Registration required; call 212-769-5200)  
Join a guide for an insider's introduction to the Museum.

#### Milstein Science Series Bioluminescence: Creatures of Light

Sunday, April 22  
11 am–4 pm  
Free for Members  
Bring the family to explore light-producing species with scientists in this special program in the Milstein Hall of Ocean Life.

## Exhibitions and Attractions

Admission is by timed entry only.

#### Creatures of Light: Nature's Bioluminescence

Opens **Saturday, March 31**  
Free for Members  
Be dazzled by the world's variety of bioluminescent organisms by exploring how and why they glow and the ways scientists study and use bioluminescence.

#### Beyond Planet Earth: The Future of Space Exploration

Free for Members  
Find out about robotic missions to explore our universe and what it will take to build a lunar elevator, deflect deadly asteroids, travel to Mars, and more.

#### The Butterfly Conservatory: Tropical Butterflies Alive in Winter

Through **Monday, May 28**  
Member tickets are \$12.50 adults, \$8 children  
This annual favorite returns with up to 500 live, free-flying tropical butterflies housed in a vivarium that approximates their natural habitat.

#### Picturing Science: Museum Scientists and Imaging Technologies

Free for Members  
More than 20 sets of spectacular large-format images showcase the wide range of research being conducted at the Museum using various optical tools.

### MAY

#### Creatures of Light After-Hours Tour

Tuesday, April 24  
6:30 pm (family tour)  
7 pm  
7:30 pm  
Free (Registration required; call 212-769-5200)  
Be dazzled by *Creatures of Light* in this after-hours tour.

#### Imaging Japan's Earthquake with Miaki Ishii

Tuesday, April 24  
6:30 pm  
Free for Members  
Learn how **Miaki Ishii** uses seismometers to study Japan's 2011 earthquake.

#### Global Kitchen: French Paradox

Wednesday, April 25  
6:30 pm  
\$30  
**Mireille Guiliano** shares treats from *French Women Don't Get Fat*.

#### Global Weekends New Orleans: Culture Remixed

Saturday, April 28  
Noon–6 pm  
Free for Members  
Celebrate National Jazz Appreciation Month by honoring New Orleans.

#### SciCafe: The Evolution of Skin

Wednesday, May 2  
7 pm  
Free  
Understand the evolution of skin with biological anthropologist **Nina Jablonski**.

#### Global Kitchen: Tequila and Chilies

Thursday, May 3  
6:30 pm  
\$30  
Learn about and taste tequila and chilies.

#### Exploring Sharks Family Tour

Saturday, May 5  
10:30 am–11:45 am  
Free (Registration required; call 212-769-5200)  
Discover sharks on this tour for young Members. Space is limited.

#### A World of Sharks

Sunday, May 6  
3–4:30 pm  
Free (Registration required; call 212-769-5200)  
Explore the diverse world of sharks with a Museum guide. Space is limited.

#### Behind the Scenes in Paleontology: Ancient Sharks

Wednesday, May 9  
6:30–7:30 pm (family tour)  
7–8 pm  
7:30–8 pm  
\$35  
Join Curator **John Maisey** to learn about rare shark fossils. **Children must be 12 years of age or older**; space is limited.

#### Beginnings Tour

Saturday, May 12  
3–4:30 pm  
Free (Registration required; call 212-769-5200)  
Celebrate Mother's Day by seeing "beginning" through many lenses on this tour led by a Museum guide.

#### Luna's Sea

Saturday, May 12  
Sunday, May 13  
11 am and 2 pm  
\$22

Explore the ocean through dance, puppetry, and black-light theater in this family-friendly program presented in conjunction with *Creatures of Light*.

#### The Birth and Death of Stars with Walter Lewin

Monday, May 14  
7:30 pm  
Member tickets are \$13.50  
MIT Professor Emeritus **Walter Lewin** discusses star life cycles.

#### Whale Watch Weekend

Friday, May 18–Sunday, May 20  
\$800 per person, double occupancy  
\$900 single occupancy  
Please register before April 1  
Space is limited on this weekend trip with **Jay Holmes** for private whale watching.

#### Discovery Room Anniversary Event

Saturday, May 19  
Noon–4 pm  
Free for Members  
Celebrate 10 years of hands-on exploration of nature, science, and culture.

#### Family-Friendly Highlights Tour

Sunday, May 20  
3–4:30 pm  
Free (Registration required; call 212-769-5200)  
Join a tour of the Museum's most popular displays.

*Credits*  
*Creatures of Light: Nature's Bioluminescence is organized by the American Museum of Natural History, New York (amnh.org), in collaboration with the Canadian Museum of Nature, Ottawa, Canada and The Field Museum, Chicago.*

*Generous support for Creatures of Light has been provided by the Eileen P. Bernard Exhibition Fund.*

*Beyond Planet Earth: The Future of Space Exploration is organized by the American Museum of Natural History, New York (amnh.org), in collaboration with MadaTech: The Israel National Museum of Science, Technology & Space, Haifa, Israel.*

*Beyond Planet Earth is made possible through the sponsorship of Lockheed Martin Corporation.*

*And is proudly supported by Con Edison.*

**Around the World in 60 Minutes**

**Tuesday, May 29**  
6:30 pm  
Member tickets are \$13.50  
View the sky as it appears in different parts of the world.

**Ft. Tryon Park and the Cloisters Lecture**

**Thursday, May 31**  
6–7 pm  
\$5 (Registration required; call 212-769-5200)  
**Sidney Horenstein** describes the geology and history of Ft. Tryon Park and the Cloisters.

**JUNE**

**Birding in the Catskills**

**Saturday, June 2**  
8 am–5 pm  
\$90  
Explore birding hotspots in the Basha Kill Wildlife Management Area with ornithologist **Paul Sweet**.

**Ft. Tryon Park and the Cloisters Walking Tour**

**Saturday, June 2**  
10 am  
\$20  
Take in Ft. Tryon Park and the Cloisters with geologist **Sidney Horenstein**.

**SciCafe: Forgetting Fear**

**Wednesday, June 6**  
7 pm  
Free  
Neuroscientist **Daniela Schiller** discusses how to modify emotional memories.

**Milstein Science Series: Great Barrier Reef**

**Sunday, June 10**  
11 am–4 pm  
Free for Members  
Learn about the fragile Great Barrier Reef and its wildlife through presentations by scientists, an immersive dome experience, and more.

**Global Kitchen: Tiki**

**Wednesday, June 13**  
6:30 pm  
\$30  
**Jeff “Beachbum” Berry** shares the history of the tiki bar.

**Summer Star Sail**

**Thursday, June 14**  
8–10 pm  
\$95  
Set sail with astrophysicist **Charles Liu** to watch the sun set and stars emerge.

**Members-Only Highlights Tour**

**Saturday, June 16**  
3–4:30 pm  
Free (Registration required; call 212-769-5200)  
Join a guide for an insider’s introduction to the Museum.

**Alex Filippenko**

**Monday, June 18**  
7:30 pm  
Member price is \$13.50  
Join astronomer **Alex Filippenko** to learn about supernovae and dark energy.

**Spotlight on Meteorites**

**Saturday, June 23**  
3–4:30 pm  
Free (Registration required; call 212-769-5200)  
Learn what meteorites tell us about the origins of Earth and our solar system on this tour.

**Grand Tour of the Universe**

**Tuesday, June 26**  
6:30 pm  
Member price is \$13.50  
Tour the entire observable universe in the Hayden Planetarium.

*Program credits:*  
*The Presenting Sponsor of the Museum’s cultural programming is*  
**MetLife Foundation.**

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

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

*SciCafe: The Evolution of Skin and SciCafe: Forgetting Fear are made possible by a grant from Science Education Partnership Award (SEPA) from the National Institutes of Health (NIH).*

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

*The Museum’s Youth Initiatives are generously supported by the leadership contribution of the*  
**New York Life Foundation.**

Beyond Planet Earth credits, continued from page 15

*Major funding has been provided by*  
**The Lila Wallace-Reader’s Digest Endowment Fund.**

*Additional support is generously provided by*  
*Marshall P. and Rachael C. Levine, Drs. Harlan B. and Natasha Levine, and Mary and David Solomon.*

*Presented with special thanks to NASA.*

*The presentation of Picturing Science at the American Museum of Natural History is made possible by the generosity of the*  
**Arthur Ross Foundation.**

*Journey to the Stars was developed by the American Museum of Natural History, New York, in collaboration with the California Academy of Sciences, San Francisco; GOTO INC, Tokyo, Japan; Papalote Museo del Niño, Mexico City, Mexico, and Smithsonian National Air and Space Museum, Washington, D.C.*

*Journey to the Stars was created by the American Museum of Natural History, with the major support and partnership of*  
**NASA, Science Mission Directorate, Heliophysics Division.**

*Made possible through the generous sponsorship of*  
**Lockheed Martin.**

*And proudly sponsored by*  
**Accenture.**

*Supercomputing resources provided by the Texas Advanced Computing Center (TACC) at The University of Texas at Austin, through the TeraGrid, a project of the National Science Foundation.*

**APRIL**

**2 Monday**  
Masters of the Planet with Ian Tattersall

**3 Tuesday**  
Early-Morning Spring Bird Walks in Central Park begin

**4 Wednesday**  
SciCafe: Island Birds and Biodiversity

**7 Saturday**  
Wild, Wild World: Baby Animals with Jarod Miller

**13 Friday**  
Night at the Museum Sleepover

**16 Monday**  
Asteroids: Friends or Foes with Richard Binzel

**17 Tuesday**  
The Parent-Child Bond begins

**19 Thursday**  
Member Open House

Spaceship Earth with Carter Emmart

**21 Saturday**  
Members-Only Highlights Tour

**22 Sunday**  
Milstein Science Series  
Bioluminescence: Creatures of Light

**24 Tuesday**  
Creatures of Light After-Hours Tour

Imaging Japan’s Earthquake with Miaki Ishii

**25 Wednesday**  
Global Kitchen: French Paradox

**28 Saturday**  
Global Weekends  
New Orleans: Culture Remixed

**MAY**

**2 Wednesday**  
SciCafe: The Evolution of Skin

**3 Thursday**  
Global Kitchen: Tequila and Chilies

**5 Saturday**  
Exploring Sharks Family Tour

**6 Sunday**  
A World of Sharks

**9 Wednesday**  
Behind the Scenes in Paleontology: Ancient Sharks

**12 Saturday**  
Beginnings Tour

*Luna’s Sea*

**13 Sunday**  
*Luna’s Sea*

**14 Monday**  
The Birth and Death of Stars with Walter Lewin

**18 Friday**  
Whale Watch Weekend begins

**19 Saturday**  
Discovery Room Anniversary Event

**20 Sunday**  
Family-Friendly Highlights Tour

**25 Friday**  
Night at the Museum Sleepover

**28 Monday**  
**The Butterfly Conservatory closes**

**29 Tuesday**  
Around the World in 60 Minutes

**31 Thursday**  
Geology and History of Ft. Tryon Park and the Cloisters Lecture

**JUNE**

**2 Saturday**  
Ft. Tryon Park and the Cloisters Walking Tour

Birding in the Catskills  
Night at the Museum Sleepover

**6 Wednesday**  
SciCafe: Forgetting Fear

**10 Sunday**  
Milstein Science Series  
Great Barrier Reef

**13 Wednesday**  
Global Kitchen: Tiki

**14 Thursday**  
Summer Star Sail

**16 Saturday**  
Members-Only Highlights Tour

**18 Monday**  
Alex Filippenko

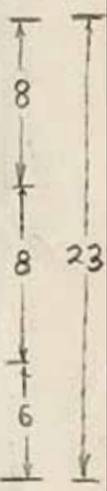
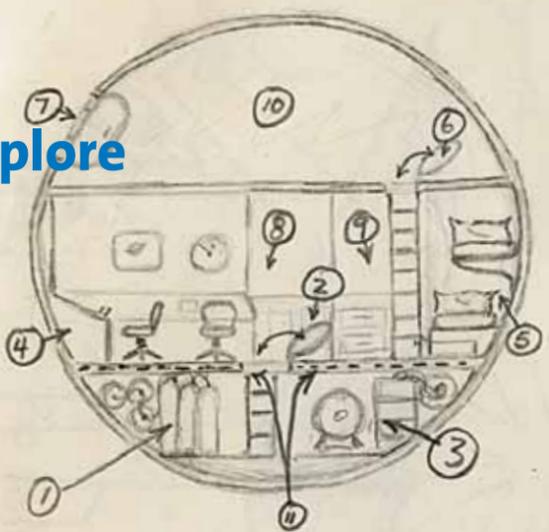
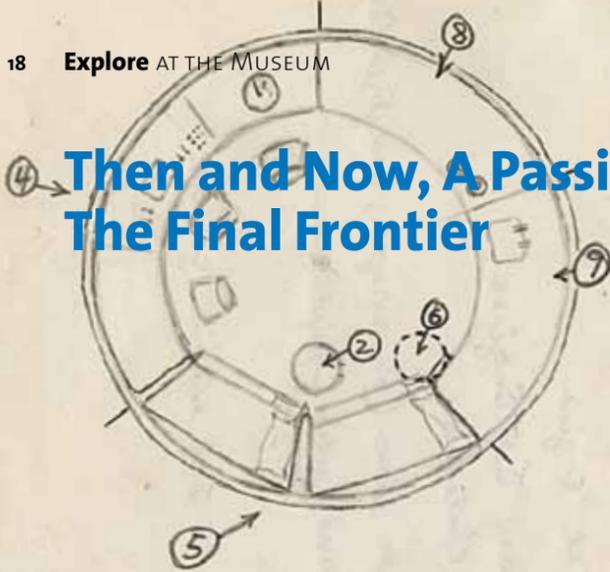
**22 Friday**  
Night at the Museum Sleepover

**23 Saturday**  
Spotlight on Meteorites

**26 Tuesday**  
Grand Tour of the Universe

**30 Saturday**  
Night at the Museum Sleepover

# Then and Now, A Passion to Explore The Final Frontier



⑩ Magnetic Field - to simulate gravity  
 : Space Suit should contain lead sole on Boots to permit individuals to remain up-right after leaving planet. Suit should also contain

- ① Oxygen
- ② Hatch-down
- ③ Equipment for pressurizing cabins
- ④ Instrument Panel (controls radio, doctor etc)
- ⑤ 4 Bunks
- ⑥ Hatch-up
- ⑦ Hatch-in/out
- ⑧ Living area (food storage etc)
- ⑨

In 1950, as part of a publicity campaign, the Hayden Planetarium began accepting reservations for what was billed as the first trip into space. After ads appeared in newspapers and the story was picked up by BBC broadcaster Alistair Cooke, letters poured in from as near as Newark and as far as Northumberland, with requests to book trips to the Moon, Mars, and beyond.

Some were accompanied by elaborate drawings of spacecraft, others by offers to serve as crewmembers on the flight. All came from applicants who wrote passionately about becoming the first to experience a trip to outer space, and the result is a treasure trove of letters that capture the public fascination with space exploration, a selection of which are now available for viewing on [amnh.org/beyond](http://amnh.org/beyond).

Some letter-writers had very practical concerns. "I have to take a vacation from school," wrote Horace, who also asked whether bringing his dog would incur extra fees. Others were curious about what they could do to prepare, or if there was expertise they could offer. Larry from Denver wrote to ask for advice on what field "of business or engineering I should enter" in college "to best prepare for a job with an interplanetary travel agency." Charlotte inquired about "Earth-moon communications" and volunteered her experience as an amateur radio operator in "maintaining a radio station."

There were amateur astronomers who were cautiously delighted—"I don't doubt we could send a ship to a planet," wrote Leopold, "but I wonder if I'll live to see it"—as well as entrepreneurs like John, who requested a reservation for the red planet so that he could "open the first hot dog stand on Mars."

Today, aspiring space tourists can get a glimpse at some possible future missions in the Museum exhibition *Beyond Planet Earth: The Future of Space Exploration*, on view now through August 12. Sixty years have passed since the first letters booking trips to Mars and the Moon arrived, and the future seems right around the corner.

Visit [amnh.org/beyond](http://amnh.org/beyond) to view the Hayden Letters.

## Readers Respond: Sign Me Up!

Late last year, a selection of the Hayden Letters was posted on the *Beyond Planet Earth* website, [amnh.org/beyond](http://amnh.org/beyond). The Museum included a web survey: If you could tour another planet, where would you go? Below are a few of the responses.

"My choice is...Saturn, because it is the most beautiful planet in our solar system, and on my way there I would also see its moons, especially Titan, and its rings."

"My first choice is Mars, to see the largest known mountain. Second choice is Jupiter, so I can see a gaseous planet up close... but where would I stand?!"

"As more planets like Kepler 22b are found, I'd love to be able to visit any that could support human life. Now that we know the speed of light isn't an obstacle, warp drives can't be far behind, so this should be doable in a couple years!"

"Mars will be the stepping stone for mankind space exploration. Being one of the first humans to get there will be an historical accomplishment. There is nothing like being a pioneer."

January 8, 1953  
 Seattle

Dear Sirs;

I would like a reservation on the trip to the Moon that is supposed to leave in 1975. I am in the 8th grade in [redacted] Jr. High School, Seattle. By the time the space ship is ready to leave I will be about 36 years old. If the reservation costs any money please write and tell me, so I can send the money to you. I am willing to

Space SR

P.S. I hope you will send me a reservation.

Dear Sir,

In a Broadcast I heard recently, Alistair Cooke Observing in respecting comm the Moon which you contemplate, he said that already there were people putting their names down for such a passage, & I was wondering Sir, if you would kindly put my name down as well, as I would very much like to be one of those lucky ones to make such a trip, especially as I have just recently seen your remarkable film - 'Destination Moon', & I think that after seeing that such a trip is possible.

Awaiting Yours

OFFICIAL HAYDEN PLANETARIUM APPLICATION

Interplanetary Tour Reservation

You are one of the first to request space tour reservation. Your name and address will be kept on file in the HAYDEN PLANETARIUM archives.

Please list the information requested below and mail this form to Interplanetary Tour Reservations, Hayden Planetarium, New York 24, N. Y.

NAME..... LAST **ROSEMARY** AGE **20**

ADDRESS..... CITY **ISSAQUAH** STATE.....

Check tour desired:  Moon  Mars  Jupiter  Saturn

Peru, R.R.1  
 May 15, 1950

Gentlemen:

I have thoroughly discussed and read the article in the Parade which comes with one of the Sunday papers and I was very much interested. I have always wondered what it would be like to go to the moon or one of the planets. Space travel has always interested me a great deal. I am 17 years old now and I expect to live to see the day when I, as well as other people, can take long space trips. It would be an experience one would rarely for

When I talk about friends and part of to make fun of my

LAST CHANCE

See *Beyond Planet Earth* before it closes August 12. Free for Members.

two round trip tickets to the Moon in June 12, or 13, 1974. We wish you would send us a pamphlet all about the trip and timetable for my Science Class at School. Thank you very much.

Sincerely Yours  
 John  
 grad.

two round trip tickets to the Moon in June 12, or 13, 1974. We wish you would send us a pamphlet all about the trip and timetable for my Science Class at School. Thank you very much.

WARREN ROSTER  
 WARREN ROSTER

## New Member Lounge: A Place Apart

### Summer Camps

Send your child to camp at the Museum this summer. Visit [amnh.org](http://amnh.org) for offerings for elementary school students, and check out the middle-school slate below.

7/9–7/13

#### Middle School Digital Universe Flight School

Learn to navigate our solar system, galaxy, and beyond using Digital Universe, the Museum's cutting-edge 3-D digital map of our universe.

7/16–7/27

#### Middle School Evolution Institute

Explore the amazing diversity of life on our planet while tapping Museum resources such as the fossil halls, genetics labs, and world-famous collections.

7/30–8/10

#### Middle School Virtual Worlds Institute: What Happened to the Neanderthals?

Use fossil and genetic evidence to investigate this question while working with 3-D digital software and Museum collections.

8/13–8/24

#### Middle School Virtual Worlds Institute: Cretaceous Seas

Travel back in time to resurrect a prehistoric marine animal by designing realistic 3-D digital models.

#### Applications are due June 1.

For fees and other information, please call 212-313-7893. The Museum's Youth Initiatives are generously supported by the leadership contribution of the **New York Life Foundation**.



The new Member Lounge is the perfect place to take a break in the middle of a busy day at the Museum.

Beyond the walls of the Museum's public spaces are offices, labs, collections, classrooms, and more. Now, there is also a lovely new amenity for Members Voyager level and above: a quiet sanctuary called the Member Lounge.

"We are very excited about opening this space to these Members," said Louise Adler, the Museum's director of Membership. "We hope it will be a place where they feel more deeply engaged with the Museum and the community they've joined."

Located on the second floor along the corridor leading to the regular coat check in the northeast corner of the Theodore Roosevelt Rotunda, the Member Lounge is a cozy wood-paneled room with a decorative fireplace that dates from the opening of the Theodore Roosevelt Rotunda in 1936. The space was recently outfitted with comfy furniture—a couch, armchairs, wing chairs—in a color scheme of rich reds and subtle earth tones.

Here, Members can begin their visit with coat checking and enjoy complimentary coffee, tea, and hot chocolate. A Membership Associate is always on hand to answer questions and process tickets. There is also an assortment of Museum-related books on the coffee table, and a side table holds copies of *Rotunda*, program pamphlets, the Museum

calendar of events, and other materials.

The Member Lounge is also the perfect place to take a break in the middle of a busy day at the Museum. The lighting is low-key, while tall windows offer pleasing views of Central Park West to the east and Theodore Roosevelt Park to the north.

Above the fireplace hangs an oil portrait by Daniel Huntington (1816–1906) of Robert Leighton Stuart, a Museum founder who also served as the Museum's vice president and then president from 1875–1881. Four of the wood-paneled walls are graced by magnificent photographs of hand-colored prints from the Museum Research Library's rare copy of John James Audubon's *The Birds of America*, published between 1827 and 1858. They depict the Forked-tailed Flycatcher, Broad-winged Hawk, Brown Pelican, and the Zenaida Dove.

"Members are really liking it here," said Denis Mordkovich, one of four Museum Associates assigned to the lounge. "They all say how great the coffee is—and the coat check."

On your way in or out, don't miss the small bas-relief portrait of Theodore Roosevelt in the door frame, the nose beneath his trademark pince-nez glasses rubbed smooth—one imagines, for good luck.

© AMNH/D. Finnin

## Masters of the Planet: Early Hominid Toolmakers

In his new book, *Masters of the Planet: The Search for Our Human Origins*, Curator Emeritus Ian Tattersall traces the success of *Homo sapiens* over other early humans. In the excerpt below, Tattersall discusses the significance of crude stone tools and their lessons for the story of human evolution.

Whoever it was, exactly, that had made the Gona tools and the Bouri (and Dikika) cut-marks [on mammal bones], these extraordinary finds are witness to a revolutionary behavioral innovation among hominids. Extensive coaching of a bonobo called Kanzi—a star in ape "language" experiments, and a cognitively admirable representative of his species—failed to teach him to hit one rock with another at exactly the angle and force necessary to detach a sharp flake. He rapidly got the idea of using such flakes to cut a cord that held a piece of food just out of his reach; but he never really picked up the principles of shaping stones. Eventually he developed a preference for throwing a rock on the floor to shatter it, and then picking through the fragments to find a sharp one.

### Natural selection is, quite simply, in no position to drive new features into existence.

— IAN TATTERSALL,  
*Masters of the Planet*

This may actually have had as much to do with Kanzi's hands as his brain and learning capacities. Making stone tools is not only hard on the hands, but it also requires a hand that is capable of holding objects precisely. Our hands, with their broad palms, long thumbs, and ability to oppose the thumb to the tips of all the other fingers, are ideally structured to manipulate objects. This ability demands the rearrangement of a whole host of palm muscles to promote delicate movement rather than strength. The hands of living apes are, in contrast, very differently proportioned. They are much longer and narrower than human hands, and the muscles

and tendons are arranged to flex the long fingers with enormous power—which is exactly what you want when you spend most of your life hanging on to tree branches.

What's more, because of the apes' knuckle-walking proclivities—whereby they bear the weight of the front of the body on the outside of the flexed fingers when they're ambling around on the ground—the tendons of the apes' hand flexor (closing) muscles are shorter than those of the straightening extensor muscles, making it impossible to extend both the wrist and fingers at the same time. This kind of strongly flexing hand is far from ideal for making tools, an activity that requires hugely precise movement and placement of the digits.

Exactly why the early hominid toolmakers already possessed hands that were up to this unusual task is not clear. Logically, there must have been some advantage to losing the specialized grasping capacities of the apes, a development that we already see quite strongly expressed in the hand bones from Hadar despite the still-curved fingers. And chances are there were no knuckle-walkers in their ancestry. But whatever the countervailing benefit was, it wasn't the ability to make stone tools, which as far as we can tell only started to be done well after the australopiths and their various physical characteristics, including the manual ones, were already well ensconced.

Still, even though we are in the dark as to the exact circumstances, there is a really important lesson to be gained from this episode in human evolution: you can't use a structure until you have it. As a result, most of our so-called "adaptations" actually start life as "exaptations": features that are acquired through random changes in our genetic codes, to be co-opted only later for specific uses. Natural selection is, quite simply, in no position to drive new features into existence, no matter how advantageous in theory those features might be.

Excerpted from *Masters of the Planet* by Ian Tattersall. Copyright © 2012 by the author and reprinted by permission of Palgrave Macmillan, a division of Macmillan Publishers Ltd.

FREE FOR MEMBERS

Ian Tattersall discusses his new book at a special program. See page 14 for details.

### Tour Spain's Prehistoric Caves with Curator Emeritus Ian Tattersall

From May 30 through June 8, Ian Tattersall leads an expedition to view stunning examples of Paleolithic art in Spain, with special access to sites such as the caves of La Peña in San Román de Candamo to view images of deer, horses, buffalo, and bulls.

"The Ice Age painted caves of southern France are well known, and those still open to the public are widely visited," says Dr. Tattersall. "The Spanish decorated caves

of the same period are much less frequented, yet are equally spectacular." The trip also includes visits to the caves at Puente Viesgo, the Altamira Museum, and a live dig at the caves on Monte la Haza.

For details about this expedition, as well as a list of others in 2012 and early 2013, visit [amnhexpeditions.org](http://amnhexpeditions.org) or call 800-462-8687.



Image courtesy of the Tito Bustillo Cave



**1.** Performing arts group Story Pirates led activities at SpaceFest! on January 15.  
**2.** On December 31, the Museum celebrated Kwanzaa with a day of performances and an international marketplace.

**3.** The Hayden Planetarium's Space Theater hosted a 200-person cooperative space game during Cosmic Cocktails and Space Arcade on January 26.  
**4.** SpaceFest! on January 15 included stargazing on the Arthur Ross Terrace.

**5.** On February 18, Darryl "DMC" McDaniels performed at the Museum's Global Weekends: African-American Musical Mosaic program with IMPACT Repertory Theatre choir.  
**6.** One Ring Zero performed their album *Planets* on January 26 during Cosmic Cocktails and Space Arcade.

Photos © AMNH/R. Mickens



**1.** Sam Saegh and Junior Council Co-Chairs Jessica and Mark Kleinknecht celebrated the opening of *Beyond Planet Earth: The Future of Space Exploration* at a December 11 reception.  
**2.** Curator Michael Shara spoke about the themes of the exhibition on December 1.

**3.** Sunny Newsome and Carla Franklin joined Junior Council Members and guests in a tour of the exhibition.  
**4.** Junior Council Steering Committee members Iain and Zoe Wilson pose in front of the model of the Mars Rover *Curiosity*.

Photos © AMNH/R. Mickens

**Save the Date!**  
**Upcoming Events at the Museum**



**APRIL**  
 4/25 The 22nd Annual Environmental Lecture and Luncheon will focus on urban conservation. For more information, call 212-496-3457.

Register an elementary school student for a five- or three-day **Museum summer camp**, from Astro Adventures to Fossils and DNA. For more information, call 212-313-7893.

**MAY**  
 5/12 The 20th annual **Corporate Dinner** honors the IBM Corporation Chairman of the Board Samuel J. Palmisano. For more information, please call 212-769-5932.

5/19 Celebrate 10 years of the Museum's **Discovery Room**, an interactive gateway to the wonders of the Museum. Free for Members.



**JUNE**  
 6/7 Enjoy a Member Breakfast in the fourth-floor Fossil Halls, visit *Creatures of Light*, and see a live-animal presentation. Free for Adventurer-level Members and above.

6/16 Bring your shells, rocks, feathers, and other finds to share with scientists at the Museum's annual **Identification Day**. Free for Members.

6/11-24 Don't miss *Rekindling Venus*, a special immersive **video installation** by Australian artist **Lynette Wallworth** in the Milstein Hall of Ocean Life inspired by the Great Barrier Reef.



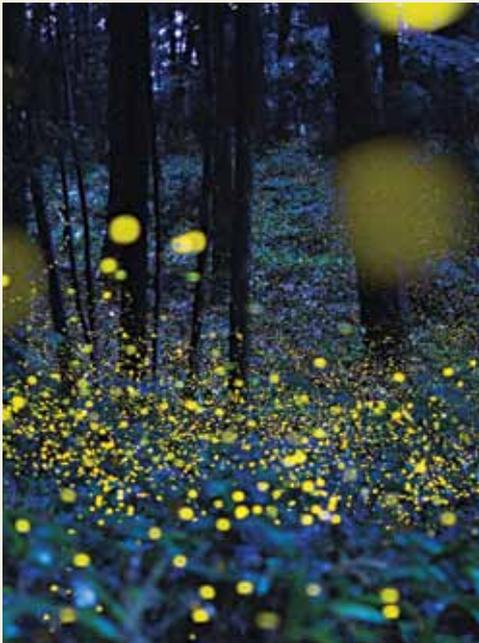
**JULY**  
 7/28 The new live-animal exhibition *Spiders Alive!* opens to the public.

**FALL**  
 The restored **Theodore Roosevelt Memorial Hall** and the **Hall of North American Mammals** re-open to the public.

Central Park West at 79th Street  
New York, New York 10024-5192  
[amnh.org](http://amnh.org)



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Tsuneaki Hiramatsu has been taking photos of fireflies in Okayama prefecture, Japan, since 2008. He uses long exposures and combines multiple images to produce spectacular photos of firefly signals. Find out more about how and why fireflies flash in *Creatures of Light: Nature's Bioluminescence*, which opens on March 31.

## General Information

### HOURS

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

### ENTRANCES

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

### RESTAURANTS

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

### MUSEUM SHOPS

The Museum Shop, DinoStore, Shop for Earth and Space, Cosmic Shop, Beyond Planet Earth Shop, Creatures of Light Shop, and Online Shop ([amnhshop.com](http://amnhshop.com)) offer Members a 10% discount.

### PHONE NUMBERS

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

### TRANSPORTATION AND PARKING

Subway:  (weekdays) or  to 81st Street;  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.