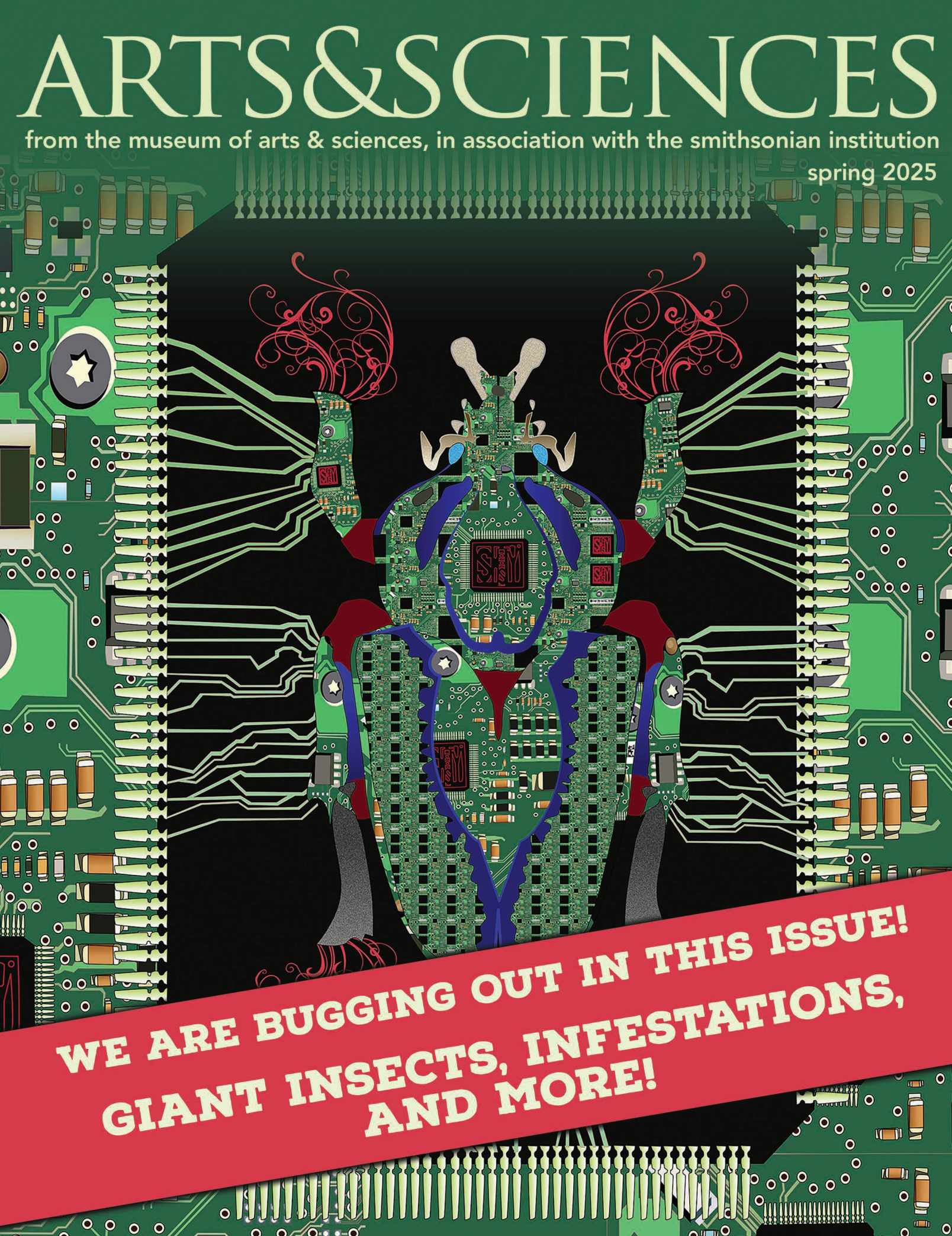
ARTS&SCIENCES

from the museum of arts & sciences, in association with the smithsonian institution

spring 2025



WE ARE BUGGING OUT IN THIS ISSUE!

GIANT INSECTS, INFESTATIONS, AND MORE!

ARTS&SCIENCES
IN THIS ISSUE

Dear Members,

Happy 2025! As of this writing, we have walked into February, and I am always amazed at how time flies. Last year was a banner year for the Museum, filled with incredible milestones that reflect the dedication of our staff, the guidance of our Board, and the support of members like you.

One of the most significant achievements of the past year was our reaccreditation from the American Alliance of Museums (AAM). This is a difficult designation to achieve, and I am immensely grateful for the excellent work of our team and the support of our Board in meeting the rigorous standards required for this honor.

We also saw tremendous growth in membership, with a 32% increase in member households and a 97% rise in new members. Our well-received *Megalodon: The Largest Shark That Ever Lived* exhibit, which opened in February 2024, brought in the highest number of new members in a single month! Attendance across the Museum grew by 7%, while our Planetarium saw an impressive 35% increase, thanks to the debut of our Planetarium 2.0 upgrades. Additionally, through our partnership with Volunteer-VC, we expanded our volunteer base by over 300%, strengthening our ability to engage with and serve the community.

These exciting successes are laying the foundation for the Museum's future. In the previous issue, I shared key aspects of our long-term vision, including a new museum building on Nova Road, much-needed upgrades and renovations to our existing spaces, a focus on unifying our campus, and the exploration of a refreshed brand to reflect this transformation. The Board of Trustees and I are working closely with Aegis, our project management firm, to bring this vision to life. In the coming months, we will be selecting an architect and continuing to collaborate with key community partners to ensure everything falls into place.

This year, we have an exciting lineup of exhibitions, including *Shoosty Bugs: An Art Infestation*, *It's a Ship Show: Florida's Maritime Canvas*, *Bugs Outside the Box*, and *Echoes of the Past: The History of the Gramophone*. And be sure to read on—we have a special announcement about a major exhibit coming this fall!

Thank you for your continued support of the Museum and for sharing in our journey. Your enthusiasm for where we are today—and where we are headed—means the world to us.

With gratitude,
Tabitha Schmidt

UPCOMING PROGRAMS

SOAPBOX History

July 8, 2025 | 2:00pm
Soapbox History: The 'Cabinet of Curiosities' and Early Museum Collecting with Registrar/ Collection & Visual Information Specialist, Stephanie Shaw

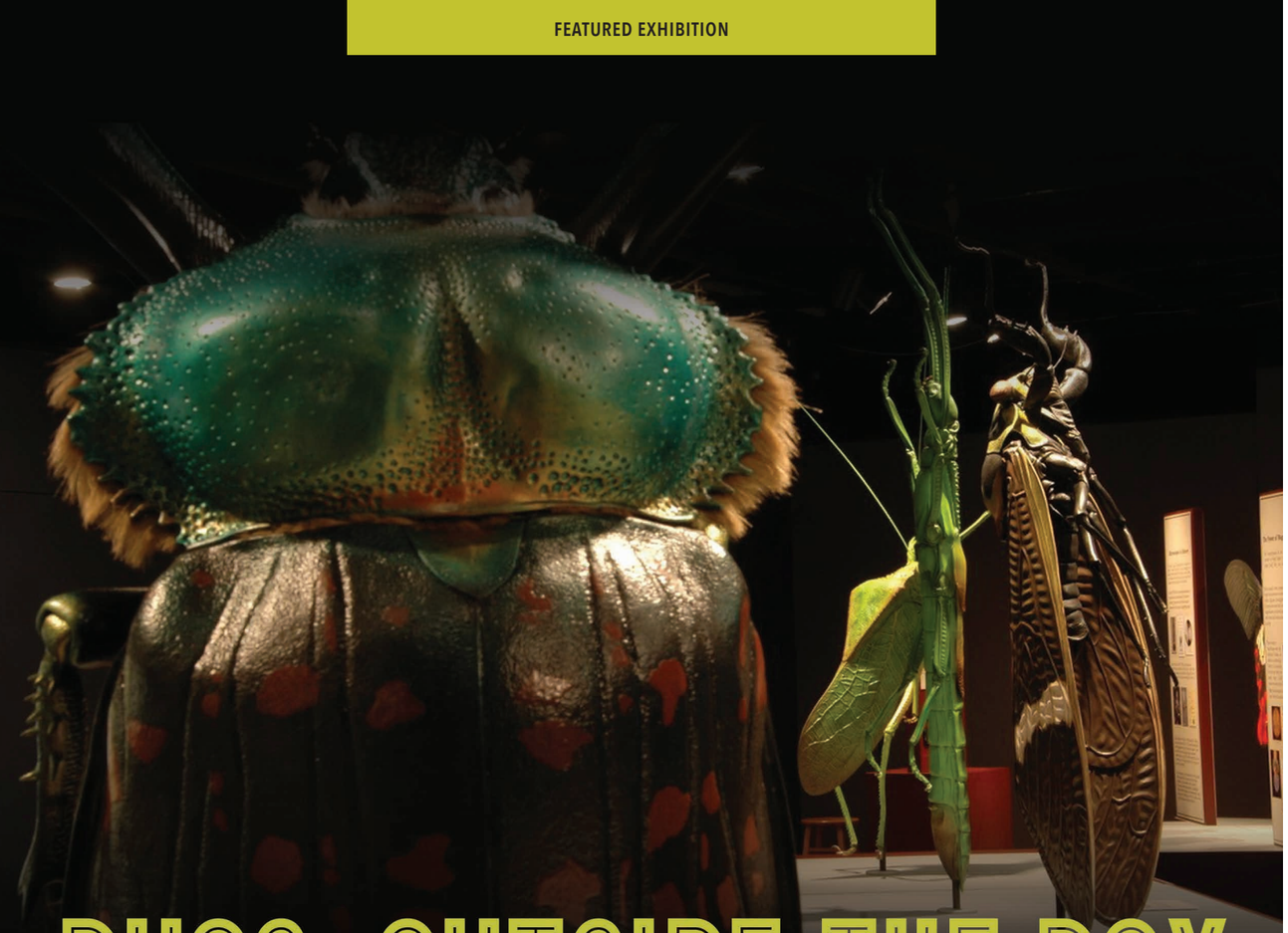
August 12, 2025 | 2:00pm
Soapbox History: D-Day: A Day that Changed History with Exhbition Coordinator, Ryan Lowry

September 9, 2025 | 2:00pm
Soapbox History: Women in Paleontology with Planetarium Educator, Katie Wedderstrand

October 14, 2025 | 2:00pm
Soapbox History: Ancient Egypt & Women as Pharaohs with Education Coordinator, Caitlyn Montgomery

November 11, 2025 | 2:00pm
Soapbox History: TBA

December 9, 2025 | 2:00pm
Soapbox History: Tales from the Silk Road with Chief Curator, Tamara Joy



BUGS: OUTSIDE THE BOX

Discover the Elegance within the Science

By Tamara Joy, Chief Curator of Art

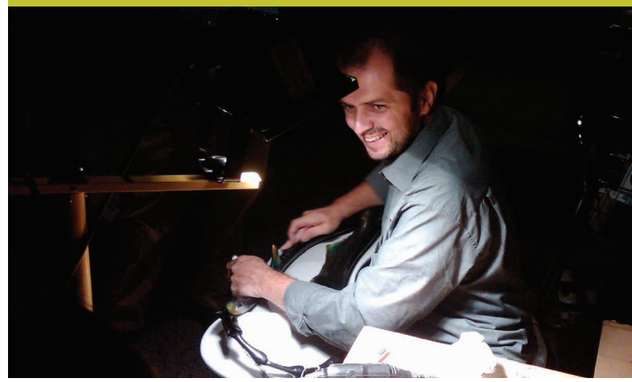
The world of insects is all around us. Cleverly camouflaged or flamboyant in their displays, their diminutive size frequently keeps them from attracting our attention. Important to science and necessary in the natural world, the unexpected artistry and beauty of insects can usually only be fully appreciated under a magnifying glass.

BUGS: Outside the Box is a natural history exhibition that presents two concurrent themes: the melding of art and science throughout the natural world, and the significance of museum collections. These themes along with other important topics are presented through a series of enlarged insect sculptures. Each sculpture highlights a distinctive feature, hidden within some of the tiniest creatures in the natural world, beyond our powers of observation. The sculptures are grouped to represent diverse topics including lifecycles, metamorphosis, and ecological pressure. You will encounter butterflies with five-foot wingspans and stare into the eyes of four-foot-long beetles. Adjacent to the oversize sculptures are hands-on replicas of various insect body parts for more in depth exploration and understanding.

Insects and arthropods adapt and evolve over time to further the survival of their species. *Bugs* will invite you to discover the purpose behind their Amazing Armor: Why do insects wear their skeletons on the outside of their body? How are these imposing exteriors and massive jaws useful or ornamental? Examples of Extraordinary Architecture include incredibly long antennae that are used as "arms" or the tiny scales of a butterfly's wings that create the species' extraordinary range of color. The Art of Camouflage illuminates a variety of "undercover" attributes that allow some bugs to travel incognito, such as impersonating the smallest detail of a tropical leaf. A Stick insect is a perfect example of how not to get eaten!

The exhibition also explores the sciences of taxonomy and magnification. Museums have been documenting the natural and human-caused worlds for centuries. Key individuals throughout history have been instrumental in devising a systematic way to document their findings, and in a way that can be interpreted by professionals around the world. But what makes up a collection? Visitors can learn about creating and categorizing collections, and what types of scientific reasoning are applied to facilitate the discovery process.

ABOUT THE SCULPTURE ARTIST



Bugs Outside the Box artist, Lorenzo Possenti.

The methods used to create the sculptures are as fascinating as the models themselves. Lorenzo Possenti is the artist/entomology enthusiast who created these scientifically accurate works of art. Using powerful magnification and actual specimens of each animal, Lorenzo painstakingly creates each sculpture with remarkable accuracy. The exhibition includes a display case with a selection of tools and construction artifacts including original masters, molds, unpainted casts, and a photo story of Lorenzo at work in his studio.

***Bugs: Outside the Box* will be on view at MOAS from June 14, 2025 to October 19, 2025**

SHOOSTY CHAT

A CONVERSATION WITH STEPHEN SHOOSTER, CREATOR OF "SHOOSTY BUGS"

Stephen Shooster is a fine artist and writer born in 1958 in Chester, Pennsylvania. Before joining the family's small telephone-answering service business, he earned a BFA from the University of Florida. Stephen's art is influenced by his early life experiences, his career in technology, his extensive writing and exploration of the Holocaust and most importantly, his inquisitive nature. His commitment to freedom and his belief in art as an expression of freedom are key influences in his works. His artistic process begins with writing, which he describes as "thinking on paper." His visual world is inspired by multiple themes and styles, including music, the natural world, and a wide range of conceptual art.

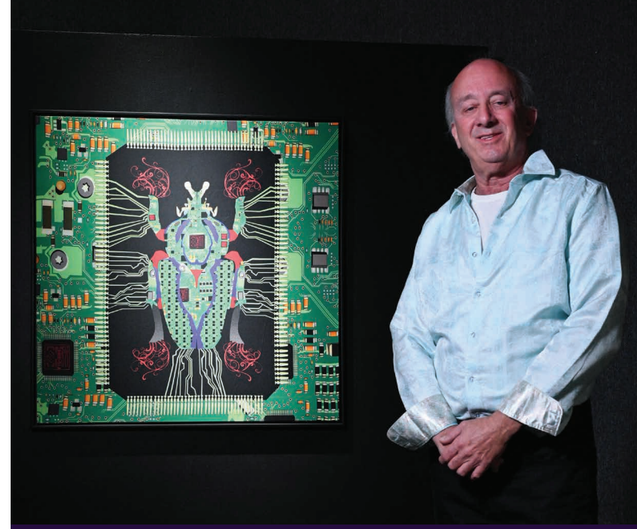
Please share your background as an artist and how your journey led to this exhibit.

I attended the University of Florida (1976-82) to pursue a degree in fine art with a minor in architecture. My dad said I couldn't be an artist for my career, but Michelangelo's father said the same thing to him. That's why I studied architecture! Upon graduation, he asked me to join his small telephone answering service. By 1988, AT&T released 1-800 numbers to the world, and I decided to build a call center. I built it from scratch, installed all the equipment, and immediately started developing the software. Our company grew from 10 to thousands of employees, including all my siblings, their spouses, and our parents. This led to a career of over 40 years that afforded me the freedom to take care of my family while spending quality time making art and writing.

Tell us about your creative process. How did you generate the initial ideas for this collection, and what design challenges do you face?

The study of fine art is one of the only skills you can do by yourself at whatever pace you want to go. I begin by finding something to draw that interests me. This leads me to be constantly on the lookout for patterns, preferably ancient patterns. It helps that I run a few Facebook groups with over 30K members between them: Art Nouveau and Art Deco, Art Brut, and Japanese Wood-block Printing.

As for challenges, by creating on silk I am working with one of the oldest materials in the world using the most advanced techniques. It is cutting-edge artwork. I need to consider the inks, fabric, printers, and work staff. I especially must pay attention to the duplex printing. It requires perfectly



Artist Stephen Shoosty with *Integrated Goliathus CPU*

duplicated art with a color shift. Any difference will show because silk has transparent qualities.

Your artwork extends far beyond insects, though "bugs" is the central theme at the MOAS exhibit. What do you find to be so compelling about bugs?

I love making art. It hardly matters to me what the theme is; I will always find a way to put my twist on it. This show is not just about bugs. It is about patterns of the world and ultimately about the extent of the human imagination. How can anybody not admire bugs when they are not causing mischief? Bugs represent the widest range of diversity in the animal kingdom, and the more I work on this project, the more I learn about them.

In 2007, a simple sketch of a bug ignited a creative spark in me. Recovering from an injury, I was in a silly mood and made a bug watercolor. By this time, I had been painting for almost 50 years. Since each bug is a small drawing, I get plenty of practice and experimentation, so I can see my skills growing and my artwork evolving.

Ladybug Lifecycle and Dandelions, Stephen Shooster

Some of the bug highlights that I've learned include:

- Silk is created from a gland near the mouth of the caterpillar.
- Pollinators are crucial to life on this planet. Most flowers depend on bugs to pollinate them.
- The white silk moth *Bombyx mori* only eats white Mulberry leaves. This is the same plant used to make paper in Japan!
- Ladybugs bleed a smelly fluid from their knees when upset.
- Ants don't have lungs. They breathe through their bodies.
- The Dragonfly has a 95% kill ratio, the highest in the animal kingdom.
- Dung Beetles are the strongest animals in the world.

What is your favorite piece in this exhibit?

I like them all. Each has a story to tell. I especially like the main piece in the show. It's a five-panel composition that was a collaboration with the MOAS team. They pushed me to new levels I didn't realize I had. I also like *Ladybugs and Dandelions*. If you look at them carefully, you will see why.

What do you want guests to take away from *Shoosty Bugs: An Art Infestation*?

We have entered a new period of art, which I call Chromatic Fusionism. "Chromatic" refers to the science of colors and materials, while "fusionism" refers to humanity. Between advanced printing and drop-shipping, the possibility of covering the world in fabrics with just a few keystrokes is a very real possibility. I want guests to feel the elegance of my shapes and fabrics and be inspired to see more. Eventually, I want people to wear my clothing while touring the gallery so they can become part of the exhibition.

Both the artist and the viewer know that the bugs on display do not exist in the real world. Except that they do exist in the mind of the artist and of the viewer where it stimulates that most potent human attribute — imagination.

Hopefully, guests will begin to see bugs not as pests, but as one of the greatest creations on our planet.

Shoosty Bugs: An Art Infestation will be on view at MOAS from April 5, 2025 to January 4, 2026

EXPEDITION: DINOSAUR

UNEARTH THE PAST

EXPEDITION: DINOSAUR ROARS INTO MOAS!

Step back in time and embark on a prehistoric adventure as "Expedition: Dinosaur" comes to life at MOAS! This thrilling exhibit will open to members on October 10th and open to the public on October 11th. Experience the fascinating world of dinosaurs with towering animatronic creatures, hands-on interactive displays, and cutting-edge technology that showcases the latest discoveries in paleontology.

Imagine standing face-to-face with a roaring Albertosaurus or controlling the movements of an Amargosaurus! "Expedition: Dinosaur" doesn't just tell the story of these magnificent creatures—it immerses you in the science behind their existence, from the groundbreaking discoveries of the 19th-century "Bone Wars" to today's high-tech fossil analysis.

Visitors will step inside a paleontologist's campaign tent, sift through interactive fossil displays, and more! Engaging exhibits explore the behaviors of these ancient giants, revealing how they lived, fought, and—eventually—disappeared in the K-T Extinction Event. From fossilized footprints to 3D modeling, every corner of this exhibition offers a new way to experience the mysteries of the Mesozoic Era.

Perfect for dino enthusiasts of all ages, "Expedition: Dinosaur" is an awe-inspiring blend of history, science, and adventure. Mark your calendars and prepare for an unforgettable journey through time—because at MOAS, adventure awaits!

Infestations *to* AVOID

By Stephanie Shaw,
Registrar / Collection & Visual Information Specialist

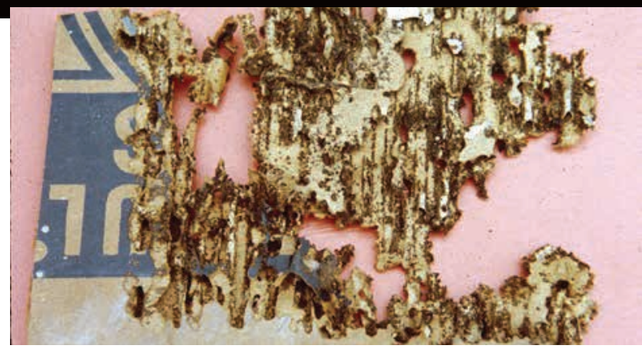
If you are familiar with the adage "the best defense is a good offense," then you already know the secret to safeguarding a collection. When it comes to the long-term preservation of heritage objects, prevention is key. Heritage institutions such as museums recognize ten major threats to collections, known as the "agents of deterioration." These range from major hazards like fire and water to everyday risks such as temperature and light. If left unchecked, these agents may cause irreversible damage. The peskiest of these threats are pests, which fall into four major categories: microorganisms, insects, rodents, and birds or bats. This article will focus on insects, but the information and resources provided apply to all pest types.

The advancement of synthetic pesticides intensified during World War II to combat insect-borne illnesses and boost food production. The widespread use of conventional pesticides continued after the war and became common practice in collections management. It was not until the early 1960s, with the release of Rachel Carson's book *Silent Spring*, that the negative effects of conventional pesticides were brought to light. Increased awareness of environmental, health, and safety concerns steered heritage institutions toward preventive practices and the use of non-chemical alternatives, otherwise known as Integrated Pest Management (IPM). This holistic approach to pest control helps avoid infestation without putting objects or staff at risk.

PREVENT

The first step is to develop an IPM plan, which involves establishing site-specific policies and designating responsible staff—often from multiple departments. To prevent infestation, collection storage spaces must be inhospitable to pests. This is achieved by following national museum standards on collection storage spaces, object integration, proper care, and housekeeping. The more barriers between the outside world (buildings and rooms) and heritage objects (cabinets and boxes), the easier it will be to protect them from infestation.

Building and storage space surveys are conducted to identify and address problem areas. IPM guidelines advise keeping shrubs, plants, and other foliage away from building exteriors to avoid attracting pests to heritage facilities. Limiting the number of external doors in collection storage and ensuring all doors are properly sealed will both block pests' access and help regulate temperature and humidity levels. Staff must also consider other access points, such as pipes, drains, and vents. Rodents need only a ¼-inch gap to enter a structure, and insects require even less.



Silverfish damage. (Clemson University – USDA Cooperative Extension Slide Series, Bugwood.org)

Incoming objects, whether through acquisition or loan, must be quarantined before being added to collections. An object may look pest-free on the outside, but insects often live beneath the surface. Incoming items are isolated in a temporary holding space for at least 24 to 48 hours. This prevents museums from bringing hidden infestations into their collections and allows the items to acclimate to current environmental conditions. Before storage, objects must be thoroughly inspected and cleaned. Careful consideration must be given to how each item is stored and whether additional housing is appropriate. Cardboard has no place in collection storage, as it is a cellulose-based material held together with adhesives, both of which serve as food sources for insects. Best practice dictates using archival, acid-free materials for object enclosures.

Routine housekeeping is a crucial step in preventing infestation. Storage furniture should be cleaned every six months. Objects are stored a minimum of six inches off the floor to facilitate cleaning and protect against floods. Pests gravitate toward dark, warm spaces, so particular attention must be paid to closed drawers, the backs of paintings, and textile linings. The frequency with which objects are cleaned depends on their location and protective measures. For example, items on display may need to be inspected and cleaned more often to remove any dust, surface dirt, or residue—all of which can attract pests.

MONITOR

Through regular inspections and environmental monitoring, museums can detect pests and mitigate their survival in collections. Sustained low temperature and relative humidity (RH) in storage spaces reduce the likelihood of infestation. The ideal levels for discouraging pests are below 70°F and 65% RH. Maintaining these levels year-round is both challenging and expensive, as diverse climates can stress HVAC systems. Some insects can survive in cooler, drier environments, so it is important that objects undergo inspection on a regular basis.

Designated staff must know what signs to look for during routine inspections, as the pest itself is seldom seen. Evidence of insects includes frass (bug excrement), cast skins or casings, and damage to objects. Frass typically matches the color of the infested material and may take the form of pellets, chips, sand, or sawdust. Insects can spend up to 80% of their lives in the larval stage, which is also when they inflict the most damage. Insect damage can appear in the form of holes in wood surfaces, loss of hair or fibers, grazed surfaces, and webbing.

Documentation is vital in collection management and a key component of IPM. Staff must be able to log, map, and record all pest management actions in collections. Setting traps is an easy, inexpensive way to collect pest-related data and comes in many forms. Sticky traps work best for insects that crawl along floor-wall joints or hide in dark, concealed areas. If the type of insect is known, pheromone traps can be very effective, as they are designed to attract specific pests. Hanging traps are useful for controlling and monitoring flying insects. Traps must be chosen wisely and replaced regularly, as they can potentially attract other pests to storage spaces.

Webbing clothes moth. (Clemson University – USDA Cooperative Extension Slide Series, Bugwood.org)

IDENTIFY

There are millions of insect species, so proper identification is vital. Identifying pests leads to valuable information about their biology, ecology, and life cycles. This knowledge helps customize IPM methods to address specific types of infestation. Helpful resources like museumpests.net provide interactive image databases to aid in pest identification.

Florida institutions are particularly susceptible to insects that thrive in humid environments, known as moisture pests. The most common of these are silverfish, firebrats, and book lice. These insects are omnivorous—while they prefer starch-based materials, they can also survive on protein and cellulose.

Other common museum pests are classified based on their preferred materials, including fabric, wood, and stored products. Fabric pests feed on protein-based materials and are one of the only organisms capable of digesting keratin. The two most common fabric pests are carpet beetles and clothes moths. While most moths are attracted to light, clothes moths prefer dark areas. Wooden objects or furniture are subject to wood-boring beetles, termites, and carpenter ants. Drywood termites, common throughout Florida, can be difficult to detect, as entire colonies can live within wooden structures. The most recognized stored product pests are cigarette and drugstore beetles. Cigarette beetles are capable of chewing through books and manuscripts, while drugstore beetles are often found in pharmaceuticals and herbal medicines.

RESPOND

At the first sign of pests, affected objects are immediately isolated in a separate holding space or sealed in polyethylene bags to prevent spreading. Contaminated items remain in isolation until treatment can be administered. Chemical treatments such as pesticides or fumigation are a last resort and must be approved by a curator or conservator. Exposure to conventional pesticides can cause permanent damage to collections and even alter the DNA of natural history specimens. While natural products may seem like a suitable alternative, not all are safe for collections. Staff are responsible for researching appropriate treatment methods and are encouraged to consult conservators for advice on at-risk objects.

While manipulating temperature is useful for preventing pests, it is also an effective treatment for infestation. Freezing is a simple, non-toxic method suitable for most organic objects. Each item is wrapped in archival tissue and sealed in polyethylene bags before freezing to control moisture content. At -4°F, objects remain frozen for a minimum of one week. Heat treatment is also an option but is not suitable for many objects and poses a higher risk.

More complex solutions such as anoxic fumigation can be used to treat infestation. However, these remedies are highly technical, costly, and time-consuming. While it is essential that staff know how to respond to pests, efforts and resources are better spent on prevention. A well-managed IPM plan works to avoid infestation and preserve heritage objects for future generations.

SILK

WRAPPED IN MEANING

By Tamara Joy, Chief Curator

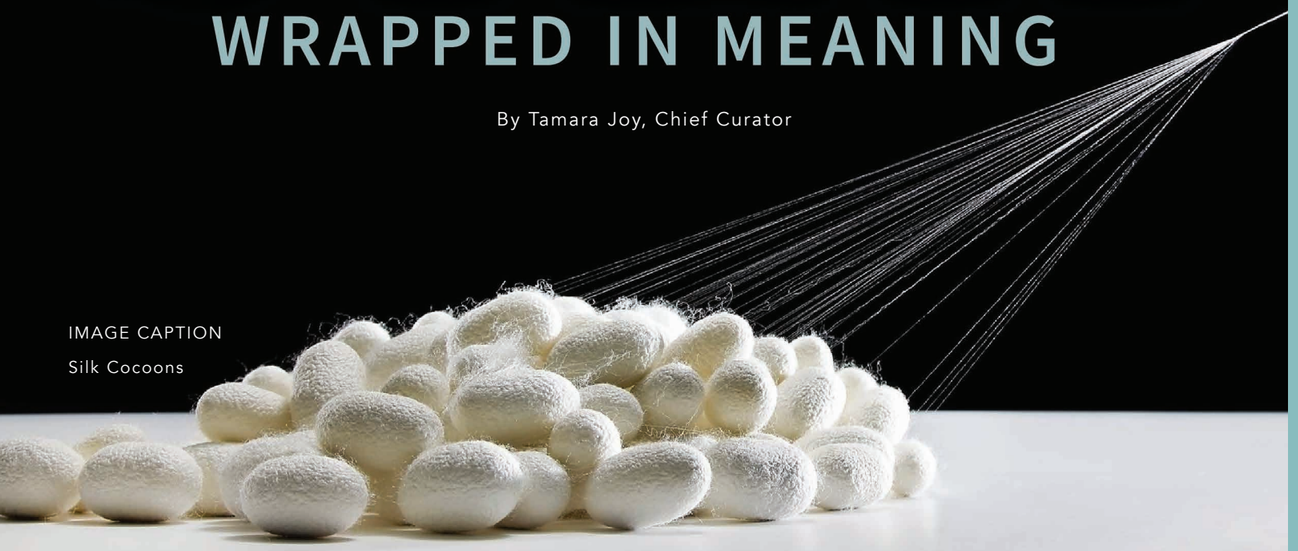


IMAGE CAPTION

Silk Cocoons

The Road to Silk

Veiled in taboos and ritual, the ancient Chinese guarded the secret of silk production, or *sericulture*, for centuries, contributing to its elusive and legendary status. The original process is attributed to Fo Xi, the emperor who initiated the raising of silkworms and the cultivation of mulberry trees to feed them. Xi Lingshi, the wife of the Yellow Emperor whose reign dated from 2677 to 2587 BCE, is regarded as the legendary *Lady of the Silkworms* for having developed the method for unraveling the cocoons and reeling the silk filament. Archeological evidence of silk fabric and silk cocoons from northern and southern China dating as far back as 4000-5000 BCE, suggests that sericulture has an earlier origin than legends reveal.

Early in Chinese history, silk was reserved for Emperors and Empresses, but eventually it was adopted widely throughout society for a variety of purposes, such as for fishing lines, for making paper, and for musical instrument strings. It also became a generalized medium of exchange, like gold or money. Chinese farmers paid their taxes in silk. Civil servants received their salary in silk. When China opened trade under the Han dynasty (206 BCE – 220 CE), silk became one of the most sought-after trade items. In the form of royal gifts and tribute, this richly woven cloth was transported from China across vast and remote distances along what came to be known as the *Silk Road*. This 4,000-mile-long network of routes connected East Asia to Europe, India, and Africa and was used by traders for more than 1,500 years. Long after its demise in the fifteenth century, "silk road" remains a metaphor for commercial and creative exchange between tremendously diverse cultures. Highly valued textiles, glass, jade, lapis lazuli, gold, silver, salt, spices, tea, herbal medicines, foods, fruits, flowers, horses, musical instruments, and architectural, philosophical, and religious ideas traveled these routes. But it was the lustrous, jewel-colored, ethereal silk fabrics that gave this epic super-highway its name - a time when silk was as resplendent as gold.

Silks are produced by several worms of the order *Lepidoptera*, which include moths and butterflies, as well as several members of the class *Arachnida*, or spiders. Moths appeared at least 200 million years ago. About 100 million years ago, moths started flying during the day rather than at night, taking advantage of the nectar-rich flowers that co-evolved with bees. According to Akito Kawahara, Curator of Lepidoptera at the Florida Museum of Natural History, this single event led to the evolution of all butterflies.

The evolution of flying insects, or *pterygotes*, required a unique strategy for the development of wings. Flight demanded power and control, but wings also needed to be light enough to be

IMAGE CAPTIONS

1. *Bombyx mori* silk moth
2. Silk caterpillar spinning cocoon
3. Silk moths emerging from cocoons

1

2

3

IMAGE CAPTIONS (from left to right)
Album of Silk Production
Artist unknown
Color on paper
19th Century, Qing dynasty
Metropolitan Museum of Art

Feeding caterpillars
Drying cocoons
Dyeing silk thread
Spinning and weaving silk

supported by diminutive *pterygotes*. Over time, insects like butterflies and moths developed a truly extraordinary transitional phase that solved the problem – a complete physical metamorphosis, or *holometaboly*. This phase allows for an inactive developmental stage dedicated to the forming of complex wing structures. These insects hatch as worm-like larvae that enter a quiescent pupal stage before emerging as winged adults that bear no resemblance to their first form. During this process silkworms excrete a liquid gel through their glands that dries into a threadlike filament, wrapping around the worm and forming a cocoon.

One of the native Chinese varieties of silkworm with the scientific name *Bombyx mori* is uniquely suited to the production of superb high-quality silk. Traditional sericulture is quite labor-intensive. The silkworm, or caterpillar, takes adult form as a blind, flightless moth that immediately mates, lays about 400 eggs in a four- to six-day period, and then abruptly dies. The eggs must be kept at a warm temperature for them to hatch. Once the caterpillars hatch, they are stacked in layers of trays and given chopped up leaves of white mulberry to eat. After four or five weeks, they will grow to about 10,000 times their original weight. When large enough, a worm builds its silk cocoon over three to four days. A single filament of *Bombyx mori* silk can measure up to a mile long. The high tensile strength allows the filament to be unwrapped without breaking. To do this, the cocoon is first boiled. This kills the pupae inside and dissolves the gum resin or *seracin* that holds the cocoon together. Cocoons may then be soaked in warm water and unwound or be dried for storage, sale, and shipment. Several filaments are combined to form a silk thread and wound onto a reel.

The Power of Silk

Silk has always been recognized for its superpowers. A single silk cocoon can produce a continuous, protein-based filament from 300 to 1,000 yards in length, contributing to its luxurious drapability. It keeps one cool in summer, warm in winter. Highly absorbent, silk uses color dyes much more efficiently than cotton, wool, or linen. It is fire and rot resistant. The triangular, prism-like fiber allows cloth to refract incoming light at different angles, which gives it a unique luster. Most significantly, silk is the strongest natural fiber filament known to humans.

Bombyx mori silk is actually superior to synthetic materials in many ways. By weight, silk is stronger than steel and more flexible than nylon. Dupont's development of *nylon* in the mid-20th century eventually replaced silk in the production of many products, including parachutes. But during the early years of WWII, it was the lightweight, undyed silk parachutes that helped to camouflage thousands of airmen against the sky when they were forced to bail out of failing aircraft. Members of the *Caterpillar Club*, an exclusive group of soldiers who managed to survive these deadly descents, embraced their club's motto, "Life depends on a silken thread."

Medical sutures braided from silk filaments have been used for centuries. Today, silk scaffolds are applied in wound healing and tissue engineering of bone, cartilage, tendon, and ligament tissues. Aarathi Prasad, a molecular geneticist, writes about the development of reengineered "smarter silk" in *Silk: A World History*. Examples include artificial blood vessels made of silk for repair of heart and other organs; dissolvable gears, bolts, and nuts that could be implanted for surgical repair. Fiorenzo Omenetto, Professor of Biomedical Engineering at Tufts University, envisions "silk plastic" cups or bags and silk electronics as a "perfectly biodegradable antidote to plastic." With imagination, the potential for scalable technology seems limitless.

The Poetics of Silk

Moths and butterflies are deeply connected to the Human experience. The mysterious and magical nature of their physical metamorphosis has been woven into our stories of life and death. They have become popular symbols of transformation in art, poetry, and religion. At the same time, the abrupt transformation of the body has also inspired misunderstanding and fear of change. Franz Kafka's famous novella *Metamorphosis*, about a man who becomes an insect, is a psychological allegory of the individual's isolation and alienation from family and society.

Silkworm is a poem written by Zhang Yu around 1100 CE in Song Dynasty China. She describes a woman who raises silkworms in the countryside and sells the silk in the city, earning a meager living. As she returns home, she passes wealthy city dwellers adorned in silk clothes. She weeps

for the tireless silkworm breeders who will never be able to afford to wear the coveted cloth. This powerful and emotive poem highlights the social division experienced by those who live in perpetual poverty.

Entered the city yesterday,
Returning with tear-filled towels
Covered all over with silk,
Are not the silkworm breeders

In his poem *Silkworms* (1957) Douglas Alexander Stewart reflects on the tragic, cyclical existence of the silkworm being kept their entire lives in a box, not attempting escape, bound by ancestral voices that trap them in a dream, "but like the ghosts of moths crouch silent there" Much like the human condition, their natural lifecycle is a prison.

Even in the young, each like a little dragon
Rampant and green upon his mulberry leaf,
So full of life, it seems, the voice has spoken:
They hide where there is food, where they are safe,
And the voice whispers, 'Spin the cocoon,
Sleep, sleep, you shall be wrapped in me soon.'

Some cultures recognize moths as spiritual guides, or physical manifestations of those that have passed on and are journeying to the afterlife. Recently deceased relatives might return in the form of a moth or butterfly. Yosa Buson (1716-1784), one of Japan's most revered poets, wrote the beloved haiku:

On a one-ton temple bell
A moon moth
Folded into sleep
Sits still

IMAGE CAPTIONS

The Silk Worm by Lou Mayer Cover Illustration of Puck Magazine; Illustrates the symbiotic relationship between silk and wealth V. 76, no. 1964, October 24, 1914
Courtesy Library of Congress

Silkworms represent the path of the Buddha – rather than be hapless victims, silkworms are self-aware agents of compassion, bodies of bodhisattvas transformed by the glorious art of noble sacrifice. Since traditional Buddhist, Hindu and Jain production techniques do not allow for the killing of the pupae in the cocoon, silk moths are allowed to hatch, and the resultant filaments are shorter and coarser than the Chinese variety. This cloth is referred to as *Ahimsa Silk*, or Peace Silk.

For more than 4,000 years, silk garments, furnishings, and accessories continue to connote luxury and status. Yet, the power of silk's transformative qualities and mystical source are even more profound. Today, the Dalai Lama offers visitors a white scarf of Ahimsa silk as a reminder that we can also serve as enjoys of self-sacrifice and compassion, which will generate unparalleled generosity and ethereal beauty in return – like the silkworm.

2024 Impact Report

Total Attendance
85,846

6.9% increase from 2023

Includes groups, members, and general admission.

BE OUR GUEST

Complimentary admission for underserved communities **15,731**

Complimentary admission for active duty and veterans ★★★★★ **1,996**

MEMBERSHIP

Total Membership Households
3,706

33% increase from 2023

Member Retention
74%

As of December 31, 2024

New Members
1,666

96% increase from 2023

MUSEUM OUTREACH

Total Outreach Attendees **4,487**

Lohman Field Study Students **4,884**

HIGHLIGHTS OF 2024

- MOAS receives accreditation from the American Alliance of Museums
- *Megalodon: World's Largest Shark* exhibition opens
- *The Lohman Planetarium receives a major upgrade with Planetarium 2.0*
- *Audubon's Birds of Florida* exhibition opens

PASSPORT TO FLORIDA

Passport is the Museum's largest fundraiser of the year. This year's event coincided with the *Audubon's Birds of Florida* exhibition.

Exceeded the 2023 record by 34% by raising $323,635 through sponsorships, auction items, and outright gifts.

LOHMAN PLANETARIUM

ASTROPHOTOGRAPHY SHOWCASE

By Curator of Science, Seth Mayo

Rosette Nebula
Photographed by Seth Mayo

A key focus of our Planetarium 2.0 campaign last year was to enhance our telescope collection, enabling us to share the stunning nature of our universe. With newly acquired astronomy cameras and specialized filters, we are able to capture astounding astronomical targets that help us understand and appreciate these complex and distant objects. The images showcased here were taken with our new equipment and are now featured in our Lohman Planetarium shows — soon to be displayed in exhibits throughout MOAS.

A special thank you to Lowell and Nancy Lohman for their support in acquiring these telescopes, allowing us to explore and share the wonders of the universe.

Equipment Information

Telescope: 71mm Williams Optics GT Refractor
Mount: ZWO AM5
Camera: ZWO ASI2600MC
Filters: Optolong L-Quad Broadband & L-Extreme Narrowband

THE ROSETTE NEBULA

The Rosette Nebula is one of the most picturesque objects in our local universe. Lending to its name, the vibrant gas clouds of this nebula have the layered appearance of a giant cosmic rose, powered by the bright stars in the center. This was captured near MOAS through our 71 mm refracting telescope for a total of nearly 7 hours of exposure time. Seen through a special filter that isolates certain wavelengths of light, the vibrant hues of pink and red represent the vast amounts of hydrogen gas that stretches about 150 light-years across and lies 5,200 light years away in the winter constellation of Monoceros, the Unicorn.

THE PLEIADES STAR CLUSTER

As a tight grouping of stars, the Pleiades star cluster is a favorite celestial object among stargazers. Often mistaken for the Little Dipper, this dazzling cluster is also known as the Seven Sisters due to the number of its brightest stars that are visible to the naked eye in dark skies. However, this cluster reveals itself further through a wide field telescope in the cumulative 5 ½ hours of exposure captured by our Planetarium team that reveals serene clouds of dust that envelope the cluster's massive young stars, reflecting brilliant blue light towards the camera. This deeper observation reveals hundreds of stars in the cluster that are located approximately 450 light-years away in the fall and winter constellation of Taurus, the Bull.

Pleiades Star Cluster
Photographed by Seth Mayo

THE GUILD OF THE MOAS
MUSEUM OF ARTS & SCIENCES

GIANT INSECTS

Your Worst Nightmare

By Zach Zacharias, Senior Curator of History

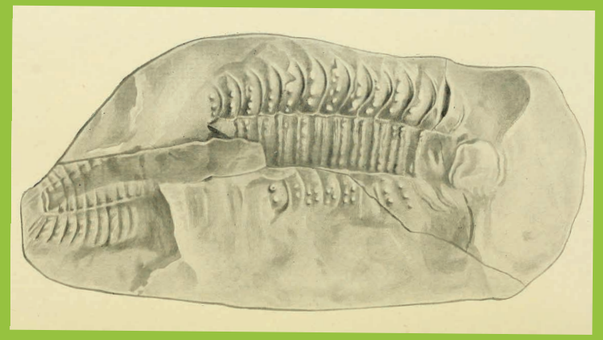
If you could travel back 350 million years to the Carboniferous Period, your worst nightmare—giant insects straight out of a horror movie—would be a reality. That's right! There was a time when enormous insects ruled the land. Insects are one of evolution's greatest achievements, and Earth during this time was an ideal environment for life—some of it truly bizarre. It was evolution's playground.

All insects belong to the arthropod family, a group that includes other invertebrates like crustaceans, arachnids, scorpions, lobsters, and shrimp. Arthropods are the most successful group of animals on Earth in terms of diversity and population, with millions of species both living and extinct.

A World of Giants

Giant butterflies, scorpions, millipedes, and dragonflies dominated the land. But why were they so massive? Earth was a vastly different place—so different that humans could not survive. The atmosphere contained 35% oxygen—one and a half times more than today. If you time-traveled to this era, you would experience nausea, dizziness, blurred vision, and severe respiratory issues—ultimately leading to death.

The planet was covered in lush tropical vegetation, including cycads, ferns, and swamps, which produced immense amounts of oxygen. This incredibly humid period, known as the Carboniferous, is also called the "Coal Age" due to the vast deposits of coal that formed during this time. The Carboniferous Period spanned from 359 million to 299 million years ago.



Arthropleura-Giant Millipede Fossil Illustration

Monsters of the Sky

If you looked up, you might hear the loud buzzing of a giant insect known as Paleodictyoptera, meaning "ancient netted wing." This massive insect, often mistaken for a butterfly, had a wingspan of over 22 inches, making it ten times larger than modern butterflies. No need to fear, though—Paleodictyoptera was a harmless herbivore, feeding on plant juices with its long, tubelike mouthparts.

A more menacingaerial predator was Meganeura, a giant dragonfly-like insect. Discovered in the 1880s in the coal-mining regions of France, Meganeura had a wingspan of over two feet, making it the largest flying insect in Earth's history. This apex predator of the Carboniferous was comparable in size to today's peregrine falcon. With large compound eyes providing 360-degree vision, Meganeura was a sight predator—fast and maneuverable. Scientists believe it could reach speeds of 40 miles per hour and most likely fed on other giant insects and even small amphibians consuming its weight in food every 30 minutes!

Meganeura-Giant Dragonfly Fossil
Carboniferous Period

Even the Waters Weren't Safe

If you thought staying in the water would be safer, think again. Lurking beneath the surface was Megarachne servinei, a bizarre aquatic arthropod. Once thought to be a giant spider, Megarachne was actually a type of sea scorpion, growing 20 inches long with a leg span of three feet. This formidable predator inhabited freshwater swamps, as evidenced by fossils found in Argentina. With paddle-like limbs and a segmented body, it likely hunted or scavenged smaller arthropods, fish, and other aquatic animals.

Megarachne Servinei Giant Sea Scorpion
Carboniferous Period

Ancient Cockroaches: The Survivors

The Carboniferous Period was also home to the four-inch-long Blattodea, an ancestor of modern cockroaches. These giant roaches thrived in the dense, swampy forests of the time, feeding on decaying plant material, fungi, and detritus. Some early cockroach species may have been social, possibly laying the groundwork for termite evolution in later periods. Today's cockroaches are much smaller, but their incredible resilience has allowed them to survive for hundreds of millions of years.

Why Did the Giant Insects Disappear?

So, what led to the extinction of these massive insects? Scientists believe several factors contributed:

Formation of Pangaea

As continents merged into a single supercontinent, weather patterns changed drastically. The once-lush rainforests collapsed, leading to a drier environment unsuitable for giant insects.

Oxygen Decline

The oxygen levels that once fueled their enormous size dropped from 35% to about 23%, closer to modern levels. This made it harder for large insects to survive and grow enormous.

Rise of New Predators

The appearance of flying reptiles, birds, and pterosaurs created new competition, outcompeting giant insects for dominance in the skies.

Climate Change

With shifting temperatures and ecosystem transformations, many of these massive arthropods could not adapt quickly enough.

While some giant insect species survived into the Permian Period, they eventually vanished. However, their modern descendants still thrive. Today, insects make up 80% of all life on Earth, with an estimated 10 quintillion (10,000,000,000,000,000,000) insects alive at any moment. Scientists believe millions of insect species remain undiscovered.

What If Giant Insects Still Existed?

Imagine if these giant insects were still around today—especially in Florida's warm, swampy climate! They would undoubtedly thrive, turning modern ecosystems into something straight out of a sci-fi nightmare. Thankfully, while their ancestors remain with us, the age of giant insects is long gone... for now.

Sensory Sunday

at the Museum of Arts & Sciences

First Sunday of the Month

10am-11:30am

NEXT SENSORY SUNDAYS

April 6, 2025
May 4, 2025
June 1, 2025
July 6, 2025
August 3, 2025
September 7, 2025
October 5, 2025
November 2, 2025
December 7, 2025

This program is designed for families of children, teenagers, and young adults with disabilities who are neurodiverse, on the autism spectrum, or have sensory processing disorders or cognitive disabilities. The museum will be closed to the general public to allow visitors to enjoy the museum in a calm environment.

At 11:00am, visitors can enjoy a sensory-friendly children's planetarium show!

Advanced registration is required.
Purchase admission online at MOAS.org
or by calling the Museum at 386.255.0285

Free for MOAS members
or included in paid museum admission.

MOAS
MUSEUM OF ARTS & SCIENCES

352 S. Nova Road, Daytona Beach, FL 32114
MOAS.org | 386.255.0285

Bugs in Space

February 20, 1947: Atop a repurposed German V-2 rocket, a small capsule was bound for the stratosphere. As engineers initiated the final countdown, they set the stage for what would become a historic first: sending living organisms into space. Onboard, the capsule's occupants—oblivious to their role in making history—launched from the White Sands Missile Range in New Mexico, reaching an altitude of 68 miles (above the established boundary of space, the Kármán line) before returning unscathed. This mission, though significant, is little known today. Long before Neil Armstrong took his fateful small step for humankind and even before Alan Shepard became the first American in space, the humble fruit fly was the true pioneer of the "Space Age."

1

Why Fruit Flies?

Drosophila melanogaster, more commonly known as the fruit fly, has been used for research since the early 1900s. Much of this research was led by Thomas Hunt Morgan, a professor in experimental zoology at Columbia University, as he strove to find evidence for mutation theory, an alternative to evolution by natural selection, which states that new species are formed by the unexpected and sudden emergence of alterations—or mutations—in their defining traits.

In 1910, Morgan and his students began studying the fruit fly in the newly established "Fly Room" at Columbia. The team painstakingly examined thousands of fruit flies with a microscope and magnifying glass. Through this work, they were able to confirm the chromosomal theory of inheritance, the idea that genes are units of inheritance and are found in the chromosomes. This research into fruit flies would go on to win Morgan a Nobel Prize in 1933.

While not the first to experiment with fruit flies, his research helped biology become the experimental science we know it as today. It also highlighted the role fruit flies played as a model organism, a non-human species that is studied extensively to understand biological phenomena with the expectation that it can be applied to other living organisms, including humans.

Fruit flies are fantastic model organisms due to their rapid life cycle, substantial number of offspring per generation, and simple genetics. They have many visible characteristics, such as wing color and length, which eliminate the need for dissection, and in 2000, their complete

2

genome was sequenced. About 75% of known human disease genes have a match in fruit flies' genomes, and about 60% of genes are thought to be conserved between the two species, which solidifies the fruit fly as one of the most useful model organisms we have.

A Case for Bugs in Space

Thomas Hunt Morgan's research established a precedent that led to many advancements in medicine and the study of genetics through model organism research. In 1946, another Nobel Prize was awarded within this field to a scientist named Hermann Joseph Muller for his research on the effects of tissue mutation from X-rays. His work in discovering the production of mutations from radiation was groundbreaking, specifically on the question of its effects on cellular tissue during human spaceflight.

Earlier in the decade, scientists were working to also understand the newly discovered relationship between energetic cosmic rays and the Earth's magnetosphere. Earth has a region within its magnetic field, known now as the Van Allen radiation belts, which were not fully understood at the time but were considered potentially damaging to living organisms. The biggest

concern was the potential for this "cosmic radiation" to cause mutation to cellular structures and harm any living organism traveling through it.

The year following Muller's Nobel Prize win, our brave fruit flies would visit space to test this very concept. As the effects of the "cosmic radiation" within the Van Allen belts on a person's physiology were still unknown, this would be a critically important first step before any future astronauts traveled beyond Earth's orbit. Therefore, our model organism was first sent to study the effects of radiation and to see how these "cosmic rays" might impact them.

When the capsule from the V-2 rocket parachuted back to Earth, the scientists on the ground found that the fruit flies were still alive and well and that the radiation from the Van Allen belts appeared to have no immediate effect on them. Our intrepid insect explorers made it back and paved the way for future explorers—bug and human alike—to pioneer into the final frontier!

3

Astro-Bug Spotlight: Nefertiti the Spidernaut

4

Ever since the first group of fruit flies launched into space, researchers have continued to send many critters into Earth's orbit for the pursuit of science, forming an "astronaut bug corps" of sorts!

In 2012, the winners of the YouTube Space Lab international science competition were announced. The competition challenged teenagers (14-18) to propose an experiment for the ISS. One of the winners, Amr Mohamed from Egypt, designed an experiment named: "Can you teach an old spider new tricks?" As a result, Nefertiti the Spidernaut was launched aboard Kounotori 3 by the Japan Aerospace Exploration Agency (JAXA) on July 21, 2012. She stayed aboard the ISS for a 100-day mission, in which scientists explored how a jumping spider, who leaps to catch its prey, would adapt to microgravity. Nefertiti was able to return to Earth, staying at the Insect Zoo at the National Museum of Natural History in Washington to live out the rest of her life.

Astro-Bugs in the 21st Century

At the dawn of a new space age, fruit flies and other bugs continue to be an important asset when studying the effects of long-term spaceflight. Aboard the ISS is the Fruit Fly Lab, a platform that allows long-duration fruit fly experimentation. It is thanks to these small but mighty bugs that we have been able to learn so much.

Without their noble first excursion, mammals—dogs, cats, monkeys, but namely humans—would not have been able to travel into space with the assurance that cosmic radiation would not cause severe harm. But the research continues. A new era of exploration, where humanity ventures beyond the Moon towards worlds like Mars, is dawning, and with it comes new challenges.

So, our intrepid insects will continue to boldly go where no bug has gone before.

IMAGE CAPTIONS

1. A German V-2 Rocket, identical to the one that launched the fruit fly experiment. The V-2, or Vengeance weapon 2 was a ballistic missile created by Nazi Germany during WW2. After the war, the rocket system, along with Germany's top rocket scientist would be captured by U.S forces during "Operation Paperclip". Credit: Getty Images

2. Drosophila melanogaster, often referred to as the fruit fly or lesser fruit fly, is one of the most studied organisms in biology. Often found in orchards and kitchens, the fruit fly would make history as the first living organism to travel into space. Credit: National Fruit Fly Council

3. Two astronauts conduct an experiment involving "Nefertiti the Spidernaut" While onboard the International Space Station. Experiments like the one above help scientist understand the effects of long duration spaceflight on living organisms. Credit NASA

4. Nefertiti the Spidernaut. Credit: NASA

MOAS
MUSEUM OF ARTS & SCIENCES
In Association with the Smithsonian Institution

352 South Nova Road
Daytona Beach, FL 32114
www.moas.org