IN THE FIELD

Field Museum
Member Magazine

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ON THE COVER
Effigy vessel found in the tomb at a palace by Field Museum team at El Palmillo, Oaxaca, Mexico.
LINDA M. NICHOLAS

Let us know your thoughts about *In The Field* magazine. Email your comments to ITF@fieldmuseum.org

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FEATURES

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Dear Friends,

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I am delighted to join the Field Museum and to have this opportunity to get to know you and this amazing institution. While it's been an unusual (and socially distanced) start to my role, I am grateful for the warm welcome so many of you have extended to me and my wife Marianne. Your love for the Field and your generosity of spirit have already inspired us and made us feel right at home.

In these early days, I have focused on getting to know the immensely talented Field Museum staff who have kept us moving forward in an unprecedented year. Thanks to their ingenuity and experience, we are welcoming visitors to safe public spaces and reaching even more learners of all ages through dynamic virtual platforms. And our scientists continue to publish critical papers to inform solutions for urgent challenges like zoonotic diseases and climate change.

The work of the Field Museum has not slowed—in fact, it has accelerated. Of course, a four-month closure and the absence of tourism has created significant financial challenges. Like museums and cultural institutions around the world, we have had to make difficult decisions. However, we are grateful to be navigating this unprecedented moment with support from our wonderful donors and members. You are part of a long and impressive tradition of philanthropy at the Field—a tradition that continues even now, and that helps to make our work possible each day. Thank you.

I'm very much looking forward to meeting you at the Museum in the coming months. On behalf of all of us at the Field Museum, best wishes for a healthy and happy holiday season.

Warm regards,

Julian Siggers

Julian Siggers, PhD

President and CEO

(See page 12 for an interview with Dr. Siggers)

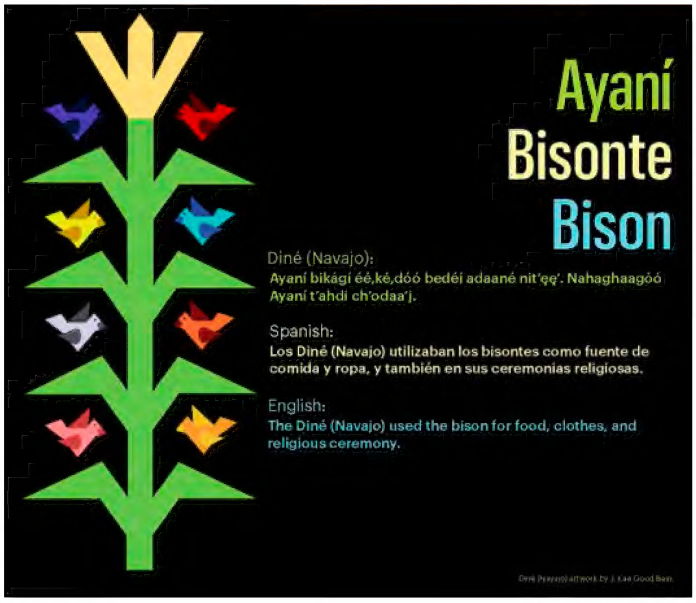
Learn How the Field Museum is Taking Action for Earth's Future

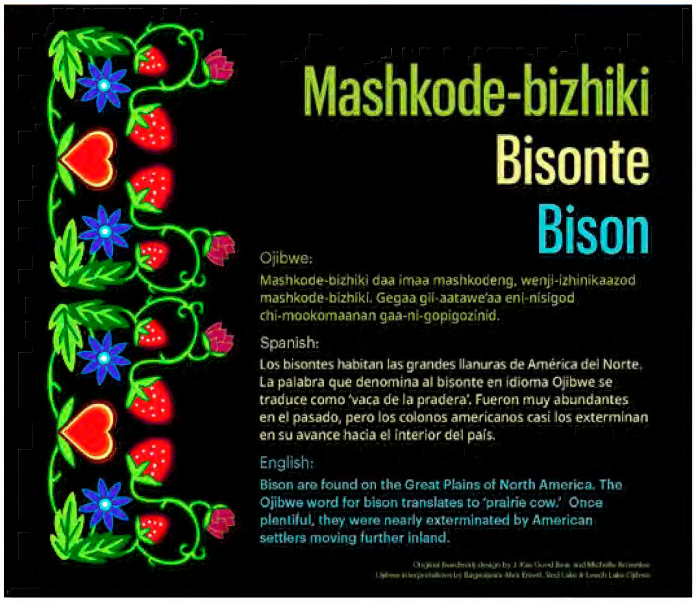
To celebrate more than two decades of protecting the rainforest, training youth, and partnering with communities, the Keller Science Action Center is sharing its stories in a new publication, *Take Action*.

For 25 years, the Field's Keller Center has translated the Museum's science into on-the-ground results that benefit people and nature. Keller Center scientists and educators work in Chicago and in the Amazon to protect our natural heritage and improve the lives of community members. To this day, it is the only museum program like it in the world.

▶ **Copies of *Take Action* are limited. To order your free copy, email action@fieldmuseum.org.**

(Left) Robert Wapahi (Dakota) shares stories in the Pawnee Earth Lodge.





ALL IMAGES FIELD MUSEUM

CELEBRATE NATIVE AMERICAN HERITAGE MONTH

BY J. KAE GOOD BEAR, CONSERVATION TECHNICIAN; **JACQUELINE POZZA**, ASSISTANT EXHIBITIONS REGISTRAR; AND **MADELEINE STRAIT**, REPATRIATION SPECIALISTT

We reside on Native Land. Indigenous peoples have persisted with incredible resiliency, and thousands of Native Americans still call Chicago home, including many who work here at the Field Museum.

To celebrate this resiliency, a group of Native and non-native staff developed public outreach events for Native American Heritage Month last year. Visitors were awed by the science and culture shared with them throughout November.

The 2019 celebration was so successful, Museum staff plan to turn this into a tradition—and not even the limitations of COVID-19 will stop us. Pivoting to digital formats for activities, we are planning a full roster of events, presentations, and programs. Inside the Museum, new exhibition labels were created with two Native language speakers, presenting captions for some of the Field's exhibition cases in Navajo and Ojibwe. Join us online to hear from our Native partners or come for a visit to learn more about this land and its peoples.

(Above) New exhibition labels created for the celebration identify common plants and animals in the Museum's collection in Navajo or Ojibwe, as well as Spanish and English. On your next visit to the Field, see if you can find them all!

Join us on the Field Museum's Facebook page to hear from our scientists and affiliated scholars every Wednesday at 2:30pm.

NOVEMBER 18
Indigenous Art and Science
Presenter: Geneva Good Bear

NOVEMBER 25
100 Years Later: Seed Rematriation and the William Jones Collection
Presenter: Dr. Eli Suzukovich III

(Left) Eleanor Kindness

(Below) Margo Real Bird

ALL IMAGES ADAM SINGS IN THE TIMBER

PHOTOGRAPHING BRAVERY AND BEAUTY

BY ADAM SINGS IN THE TIMBER, EXHIBITION CONTRIBUTOR, APSÁALOOKE NATION

During the spring and summer of 2019, JoRee LaFrance and I started planning our contribution to the *Apsáalooke Women and Warriors* exhibition. From the beginning we wanted to honor and highlight the strength and resiliency of Apsáalookbia, Crow women.

I primarily identify as a documentary photographer. But, by the time I made the portraits for the exhibition, I had been working on a personal portrait project I call *Indigenizing Colonized Spaces* where I photographed Indigenous women wearing their traditional or modern regalia in urban settings.

I wanted to take what I learned from that project and apply it to my portraiture of Crow women, mainly the lighting techniques and posing. Over the course of roughly one week during Crow Fair, I photographed 44 Crow women for the exhibition. But sadly, there wasn't room to display all 44 portraits. We settled on 28 portraits to display. The other 16 are included in the catalog created by the Neubauer Collegium for Culture and Society for the exhibition.

The process of making the portraits was fairly streamlined. To help with lighting, I asked Corrin Lamere, who is also one of the collaborators for my *Indigenizing Colonized Spaces* project, for her assistance. She directed the light and was key to helping speed up my photo making process. In addition to being a long time collaborator and one of the women I photographed for the exhibition, JoRee LaFrance was also instrumental in organizing the women for their portraits.

With each woman, I went through a pre-planned set of poses. I also made portraits ranging from full body to headshots, which gave me a diverse range of images to choose from for each woman.

It was a labor of love and I am immensely proud of the images we produced.

Come see Adam Sings in the Timber's beautiful portraits as well as the work of several other renowned Apsáalooke artists in *Apsáalooke Women and Warriors*. Open now in Fay and Daniel Levin Hall.

Apsáalooke Women and Warriors is jointly organized by the Field Museum and the Neubauer Collegium for Culture and Society at the University of Chicago.

Over the past 20 years, a new generation of archaeologists and historians have unearthed demographic and economic evidence that some pre-modern societies were more egalitarian and less autocratic than previously believed.

The Archaeology of Good Government

By Gary Feinman, PhD

MACARTHUR CURATOR OF ANTHROPOLOGY,
NEGAUNEE INTEGRATIVE RESEARCH CENTER

Most of us learned in school that democracy was uniquely present in Athens and the Roman Republic, and, after a long hiatus, arose again in late pre-modern Europe. However, over the past 20 years, a new generation of archaeologists and historians have unearthed demographic and economic evidence that some pre-modern societies were more egalitarian and less autocratic than previously believed. This deep history has much to tell us about the conditions that sustain democratic governance.

In today's electoral democracies, voting communicates citizen feedback to officeholders. In this regard, well-governed nations today differ from those in the past—even ancient Athens and the Roman Republic, where broad-based elections were not held. Contemporary democracies are a subset of what political scientists refer to as "good governments," which foster the provision of necessary goods and services to their populations. They have checks and balances on the powers of leaders, allow for expression of citizens' voices, and operate through social contracts and rules of law. To be sure, these kinds of governments were not common in the past, but neither are they particularly well-represented in today's world.

In recent research on prehispanic Mesoamerica (1500 BC–AD 1520), my colleagues and I have examined the histories of more collectively organized governments in comparison to relatively autocratic regimes. The latter have leaders with few checks on their power, are characterized by greater degrees of inequality, impose rule by people rather than laws, emphasize social privileges, and offer few opportunities for public expression. They tend to be funded by monopolized resource streams that can be tightly controlled by rulers and their followers, rather than widespread taxation.

Using these points of comparison, David Carballo (Boston University) and I compared 26 ancient Mesoamerican political centers. Some met the characteristics of "good" governance, while others did not. Perhaps the most interesting finding was a correlation between political organization and the length of time centers remained dominant in their regions: centers with good governance were more sustainable and endured longer than autocracies. Our next step in this research is to expand the comparative sample, and to investigate the monopolization of resources and its influence on the distribution of power.

We are not alone in these discoveries. Beyond Mesoamerica, research now indicates some early cities and states had forms of good governance. These include the earliest capitals of Mesopotamia and the Indus Valley as well as certain prehispanic Andean centers. While no past government—whether collective or autocratic—endured forever, a key takeaway is that history in early non-Western societies was not exclusively full of despots. People, both elite and common, had degrees of agency, as they still do today. But, history reveals large-scale coalitions are tenuous—requiring constant maintenance and investment. Today, as we witness a resurgence of autocratic regimes and would-be strongmen, we cannot expect governmental institutions to run themselves—people have to participate and do the work.

ALL IMAGES LINDA M. NICHOLAS

(Far left, top) Pyramid of the Sun and Street of the Dead at Teotihuacan in central Mexico.

(Far left, bottom) Large, central Main Plaza at Monte Albán, Oaxaca, Mexico.

(Left) Classic Maya Palatial Residence at Palenque, Chiapas, Mexico.

Plant specimens collected by Ree and colleagues in the Hengduan Mountains helped them discover the flora's ancient origins.

DEREN EATON

HOW MOUNTAINS CREATE BIODIVERSITY HOTSPOTS

BY KATE GOLEMBIEWSKI, PUBLIC RELATIONS

One of the big questions in biology is why certain plants and animals are found in some places and not others. Mountains are a laboratory for scientists tackling these questions because they are home to rich biodiversity, in part due to all the unique habitats at different elevations. In a new study in *Science*, researchers examined the plant life in China's Hengduan Mountains, the Himalaya Mountains, and the Qinghai-Tibet Plateau. Using DNA to build family trees of species, they learned that the diversity of plants in that region today can be traced back to the formation of mountain ranges 30 million years ago, and monsoons that came later.

The paper focuses on plants growing above the treeline (called the alpine zone) in the Hengduan Mountains of southwestern China. "It's a relatively small area that harbors one-third of all the plant species in China," said Rick Ree, Curator of Flowering Plants and one of the study's authors.

Using statistical models to estimate when and where ancestor species lived, the researchers found that many of the plants first evolved in the Hengduan Mountains. Then, as the Indian tectonic plate collided with Asia, new habitats arose in the mountains formed by the collision. The region also began to experience more intense monsoons, possibly because the mountains altered the prevailing winds.

"The monsoon wasn't simply giving more water for plants to grow, it had a huge role in creating a more rugged topography. It caused erosion, resulting in deeper valleys and more incised mountain ranges," said Ree. "The theory is, if you increase the ruggedness of a landscape, you're more likely to have populations restricted in their movement. Any time you start increasing barriers between populations, you can expect evolution to accelerate."

That's exactly what the team discovered: as the landscape grew more rugged over time, the now-isolated populations of plants evolved into separate species, resulting in the biodiversity we see today.

"The theory is, if you increase the ruggedness of a landscape, you're more likely to have populations restricted in their movement. Any time you start increasing barriers between populations, you can expect evolution to accelerate."

"This study sheds light on the conditions under which we get rich versus poor biodiversity," said Ree. "Mountain ecosystems are very sensitive to things like global warming, because the organisms that live there tend to be dependent on a tight range of elevation and temperature. Understanding how historical environmental change affected alpine plants 20 million years ago can help us predict how today's climate change will affect their descendants."

LESLEY DE SOUZA

(Right) Lesley de Souza (far right) and her team use a seine to collect fishes in the wetlands of the Rupununi Portal.

(Below) A map of the Rupununi Portal, a unique aquatic corridor connecting the pristine lush forests and rivers of the Guiana Shield to the Amazon River.

FOLLOW THE FISH!—CONSERVING AMAZONIAN RIVERS

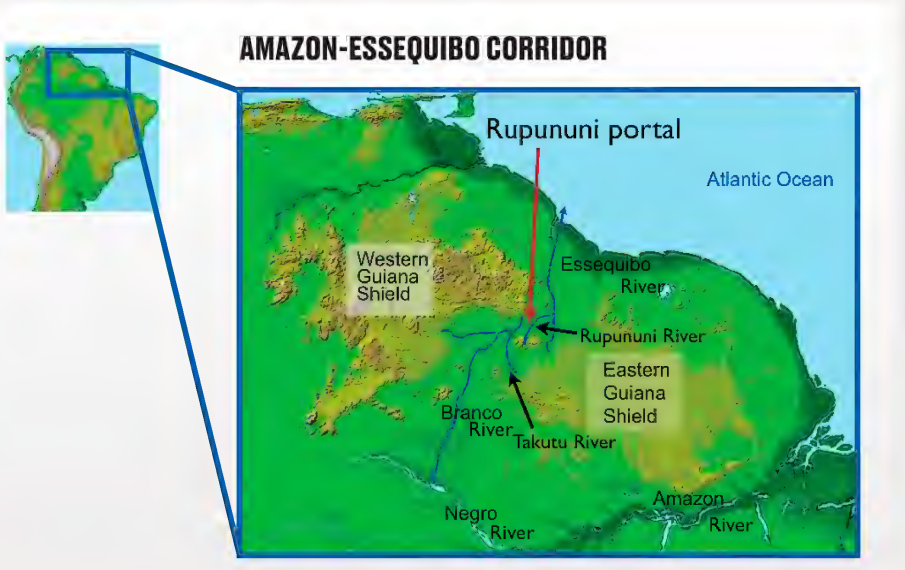
BY LESLEY DE SOUZA, PHD, KELLER SCIENCE ACTION CENTER AND **KATE GOLEMBIEWSKI,** PUBLIC RELATIONS

When you think of the Amazon, images of jaguars, monkeys, or parrots probably come to mind. But many of the rainforest's secrets can be found hidden in its watery depths with fish swimming around its rivers and lakes. And because these animals live in a river network that spans the South American continent, studying them helps conservation scientists understand why connected ecosystems are healthy. A study led by Field Museum scientist Lesley de Souza, PhD, makes a case that protecting a tiny corner of the Guiana Shield can help preserve rivers and biodiversity across the Amazon.

The Guiana Shield is an ancient geological formation of Proterozoic and Archean uplift located in northeastern South America. Its dynamic and complex paleogeographic history created the rich biodiversity seen in the area today. A unique hydrological corridor connects the ancient rivers of the Guiana Shield to the Amazon River basin in central Guyana via the Rupununi Portal. It is the only known seasonal connection uniting two highly diverse rivers. De Souza and her team made several expeditions to the Rupununi. They collected fish in a variety of habitats to better understand where they live and further assess the habitats' conservation value. They found more than 450 species of fish in an area smaller than Connecticut—the entire Mississippi River basin has fewer than 200 species. The diversity is remarkable, from small fish that look like leaves to large air-breathing arapaima with brilliant red fleck scales—in addition to several species new to science. Her team brought specimens back to the Field and completed the arduous task of identifying each one. Analyzing data about fish diversity and surrounding habitats reveals the important role of the Rupununi Portal in maintaining this unique ecosystem.

Conservation efforts often overlook freshwater environments, focusing on land habitats instead. De Souza's analysis helps show the importance of healthy watersheds, too—especially connected ones. And by protecting the lakes and rivers where the fish live, we can help the planet overall. The forests surrounding these bodies of water are vital to help mitigate impacts from climate change.

Creating a protected area in the Rupununi Portal will yield long-term benefits for the entire Amazon, but de Souza emphasizes the immediate local need for protection. "I focus on fish in this area because they're so important for the people," de Souza says. "Indigenous communities are the primary inhabitants of this region, and they are intimately connected to the forests, savannas, and wetlands. Their primary source of protein is fish. In order to maintain fish reproductive cycles and people's livelihoods, the entire system needs to stay intact."



IDENTIFYING THE ARTIST BEHIND A RARE ITEM

BY RYAN SCHUESSLER, EXHIBITIONS

Next year the Field Museum will unveil its new *Native North America Hall*. Re-imagining the hall was guided by the expertise of the Museum's Native American Advisory Committee, a group of 11 Native scholars and museum professionals. The new hall will present contemporary stories told by Native voices alongside the Field's historic collection to showcase thriving Native communities from across the continent. One of the early suggestions was that the exhibition include representation of LGBTQ Native experience. While researching, our team came across the name "Arroh-ah-och," a famous potter from Laguna Pueblo who died in the late 1800s. In her dialect of Keres language, she might have been called a "ku'kwi'muh," instead of a "man" or a "woman." Because Arroh-ah-och was so renowned, our team wondered if there were any pieces of her work in our collection.

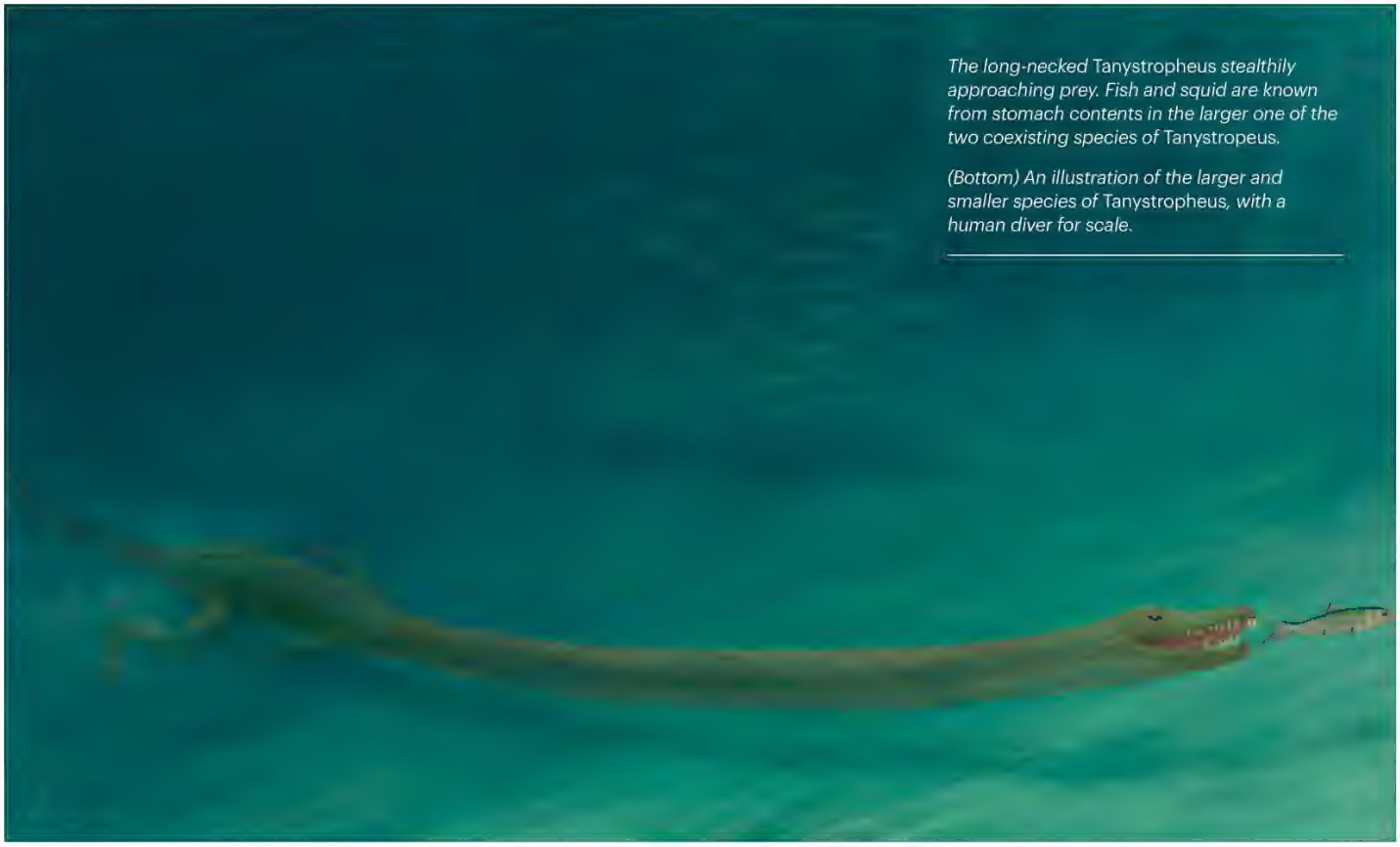
When I reached out to our Native advisors and colleagues in the Southwest for guidance on how to learn more about Arroh-ah-och, they pointed me towards longtime School of Advanced Research (Santa Fe) associate Dwight Lanmon, who had written on how to attribute pots to Arroh-ah-och. The team found a pot in the Museum's collection—which was sent to Chicago in 1893 by a collector in New Mexico—that had designs resembling those Lanmon has attributed to Arroh-ah-och.

I managed to contact Lanmon, who is retired. When I sent him a picture of the pot, he wrote back quickly: "I have no difficulty associating it with Arroh-ah-och. The density of the black "paint" and the clarity of the design link it closely to other jars that I believe were made by the potter." Lanmon later confirmed that a detail in the pot's shoulder bands is also typical of Arroh-ah-och's known work—"more confirmation," he wrote. In a longer write-up for the pot's accession file, Lanmon commented on some technical discrepancies between this vessel and other known Arroh-ah-och, adding that "they suggest a potter who is older [...] perhaps toward the end of her life [...] The fact that the jar also appears to be unused suggests that it was acquired new, shortly before it was displayed at the World's Columbian Exposition in 1893."

There are fewer than 20 known pots that can be confidently attributed to Arroh-ah-och. Lanmon's attribution of this pot to Arroh-ah-och adds an exciting—and rare—piece of context to an already stunning item that has sat in the Museum without a name for more than 125 years. It also means that Arroh-ah-och—who lived and created in a time before European-American ideas of gender and sexuality were imposed onto her society—will have her name, story, and work on display in the Museum's new *Native North America Hall*, opening in November 2021.

FIELD MUSEUM/JOHN WEINSTEIN

(Above) The pot created by Arroh-ah-och that was found in the Field Museum's collections. (Catalog number 22489-B).



The long-necked Tanystropheus *stealthily approaching prey. Fish and squid are known from stomach contents in the larger one of the two coexisting species of* Tanystropeus.

(Bottom) An illustration of the larger and smaller species of Tanystropheus*, with a human diver for scale.*

EMMA FINLEY-JACOB

THE WEIRDEST FOSSIL REPTILE JUST GOT WEIRDER

BY STEPHAN SPIEKMAN, PHD, UNIVERSITY OF ZURICH AND **OLIVIER RIEPPEL, PHD,** ROWE FAMILY CURATOR OF EVOLUTIONARY BIOLOGY, NEGAUNEE INTEGRATIVE RESEARCH CENTER

Two hundred and forty-two million years ago, during the Middle Triassic, there lived one of the most bizarre animals that ever existed. This ancient reptile, called *Tanystropheus*, had a neck that was three times as long as its torso, even though it only consisted of 13 extremely elongated vertebrae. Scientists have been puzzling over how and where this species lived, but our newest study reveals new insights on *Tanystropheus* and shows that it was surprisingly adaptable.

Tanystropheus is mainly known from Monte San Giorgio on the border between Switzerland and Italy, a UNESCO World Heritage Site world-renowned for its Triassic fossils. For over 150 years, paleontologists debated how the weird neck of *Tanystropheus* might have functioned, with some suggesting the animal lived mostly underwater, and others proposing it lived on land.

Using synchrotron radiation CT scanning, we reconstructed a *Tanystropheus* skull in unprecedented detail. The model reconstruction showed that *Tanystropheus* had several very clear adaptations for life in water. The nostrils are located on the top of the snout, much like modern crocodilians, and the teeth are long and curved, common among fish-eating marine reptiles. It likely caught its prey by stealthily approaching it in possibly murky water using its small head and very long neck to remain hidden.

The skull also revealed significant differences between the two sizes of *Tanystropheus* fossils previously found. Scientists had thought the small and large types were juveniles and adults of the same species, respectively. But, microscopic cross sections of bones of the small type show several growth rings, indicating these animals were adults, and thus a separate species. To live in the same environment, the two species evolved different tooth structures and feeding strategies. For example, the smaller one likely ate shellfish while the larger species ate animals like squid. Reconstructing the skull of *Tanystropheus*, allowed us to refine our understanding of this bizarrely proportioned creature, and helped us create a more complete picture of Middle Triassic marine environments.

BEAT SCHEFFOLD

FIELD MUSEUM

The Board of Trustees of the Field Museum named Julian F. Siggers, PhD, as president and CEO earlier this year. Siggers took on the role in September 2020.

Prior to the Field, Siggers was director of the University of Pennsylvania Museum of Archaeology and Anthropology. At the Penn Museum, he oversaw the renovation of 75% of the museum's galleries and public spaces; established an interdisciplinary center for training students in archaeological techniques; and guided the museum to implement new programs that welcomed diverse audiences.

Siggers sat down for a conversation with Field Museum Trustee David Hiller, who chaired the Presidential Search Committee. Hiller joined the Field's Board of Trustees in 2009 and has served in several leadership roles. He retired as the President and CEO of Robert R. McCormick Foundation earlier this year.

David Hiller: How did your love of natural history and science get started?

Julian Siggers: I credit my family for both. My father was incredibly interested in natural history and was a great scuba diver. He was posted to Indonesia, and I spent much of my childhood scuba diving with him. From him, I got a great love of marine biology. But the other half of what I'm interested in—archeological anthropology—comes from my mother, who was a keen anthropologist. No matter where we lived, she was always a docent at a local museum. Her passion got me interested in archeology.

DH: So far, what is your favorite exhibition at the Field?

JS: It would have to be *Ancient Americas*. I was thrilled to walk through the exhibition and would love to share that collection with our visitors. But, I am particularly excited about the opening of the new *Native North America Hall* in late 2021. What I love about that project is the real and meaningful relationships the Field developed with more than 80 different Native American partners who have guided the creation of the exhibition.

DH: Many institutions are wrestling with the challenge of reaching younger audiences when there are so many other streams of entertainment. How can museums continue to engage them?

JS: Much has been talked about Millennials and Generation Z, but, to be honest, I feel they are as open to compelling stories and information as any other generation. There are more platforms for information now for sure, but the thing to remember is nobody has more content than a museum. At the Field, not only are there millions of stories within the collections, but also new discoveries happening in our research labs and in the communities where our scholars work, locally and globally. In many ways, we're in an enviable position of being unlimited content producers. We can share our own stories.

DH: These days we constantly see politics intrude on science and scientific discussions. This isn't a new phenomenon, but what are your thoughts on how to navigate these issues?

JS: One of the things that drew me to the Field was how this museum unapologetically continues to be an advocate for science. And, not only is the museum an advocate, but it is actively translating science into action. For example: the Field Museum, with its partners, is responsible for saving millions of acres of rainforest, critical to protecting the Earth. As a museum, we can never veer from the path of being champions for science.

DH: How can members and donors support the Field especially during challenging times?

JS: We are fortunate to have incredibly generous members and donors, and now more than ever, their philanthropy is moving the Field forward. Their support is the primary reason we're in a comparatively better position than so many other institutions around the country. I invite our members and donors to visit, participate in our special virtual programs, and continue to communicate with us. Their friendship gives us confidence, and I am grateful.

"One of the things that drew me to the Field was how this museum unapologetically continues to be an advocate for science. And, not only is the museum an advocate, but it is actively translating science into action."

FEATHERY ACCENTS—EVOLUTION IN REAL-TIME

BY KATE GOLEMBIEWSKI, PUBLIC RELATIONS

Birds tweet, squawk, and hoot to communicate with each other. But, as Field Museum postdoctoral researcher Valentina Gómez-Bahamón, PhD, just discovered, a tropical bird called the Fork-tailed Flycatcher communicates through the fluttering sounds of its feathers. And, by analyzing recordings of the birds in flight, she found that subspecies with different migration patterns have unique "dialects," which could be driving them to split into completely separate species.

"We already knew from past genetic analysis that the two groups were becoming different species, so we wanted to know if there were any differences in the sounds the males produce with their wings," said Gómez-Bahamón. "We not only confirmed the way these birds make sounds with their feathers, but that the sounds are different for the two subspecies."

Gómez-Bahamón recorded footage of the birds in flight and analyzed the sounds their feathers made. She and her colleagues, including Curator of Birds John Bates, PhD, found that the males produced a high-pitched trilling sound by fluttering the primary flight feathers in their wings.

What's more, the researchers found that the birds' feather sounds matched up with their migration patterns. One subspecies migrates across South America every year, while another subspecies stays put in northern South America year-round. The migratory birds' feather tips are skinnier, which produces a higher pitch.

The distinct sounds made by the migratory and stationary birds are like different dialects or accents. Since the birds use their wing fluttering to communicate with each other, a language barrier could help drive the two subspecies to splitting into fully separate species that can no longer interbreed.

Gómez-Bahamón notes that she's excited to see how these birds' feather fluttering can show how new species arise, a process called speciation. "I'm really proud of this study," she said. "Because I like seeing how different ecological strategies, like migration, can indirectly affect communication signals."

Valentina Gómez-Bahamón takes samples from a Fork-tailed Flycatcher specimen.

ALEX JAHN

Fork-tailed flycatchers perched on branches.

VALENTINA GÓMEZ-BAHAMÓN

Jingmai O'Connor holds a cast of SUE's lower left jaw. (Catalog number PR 2081).

ALL IMAGES KYLE FLUBACKER PHOTOGRAPHY

WELCOME OUR NEW CURATOR OF DINOSAURS: JINGMAI O'CONNOR

BY KATE GOLEMBIEWSKI, PUBLIC RELATIONS

The Field Museum is thrilled to welcome its new associate curator of fossil reptiles: Jingmai O'Connor, PhD, a world expert on flying dinosaurs and the transition of dinosaurs to birds. (All birds are dinosaurs, but not all dinosaurs are birds!) O'Connor focuses on the group of dinosaurs that includes birds, as well as a few of their cousins.

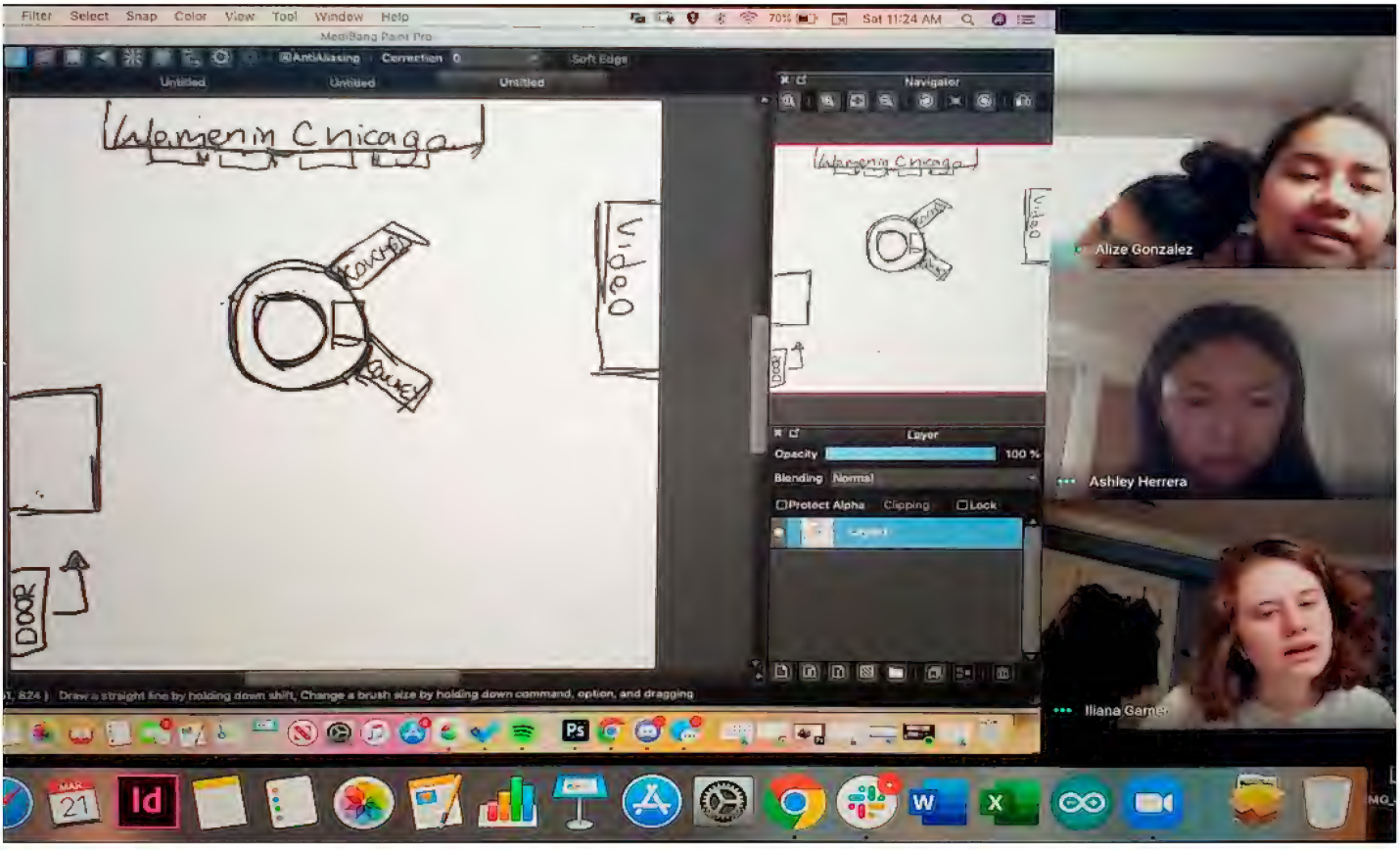
O'Connor is originally from Pasadena, CA, and she received her PhD from the University of Southern California. For the past 10 years, she was a professor at Beijing's Institute of Vertebrate Paleontology and Paleoanthropology. During her time there, she discovered a four-winged *Microraptor* with a new species of lizard in its stomach. She also helped show that a group of dinosaurs, the scansoriopterygids, had bat-like wings and could fly.

O'Connor focuses on birds from the Mesozoic era—the time of the dinosaurs—and she's eager to bring that expertise to the more recent (but still 50-million-year-old) bird fossils at the Field Museum. The Field is home to the world's largest collection of fossils from Wyoming's Green River formation, which includes birds that are perfectly preserved in rock—feathers and all. "These are some of the best Cenozoic fossil birds in the world, and I've never been able to study them before," said O'Connor. "I'm really excited to come to the Field and look at them through the lens of what I know about earlier birds, which I'll also continue studying. I want to always be learning new things."

In addition to her research piecing together the bird family tree and the evolution of flight in dinosaurs, O'Connor says she's looking forward to sharing science with the general public.

"Paleontology is a gateway science," said O'Connor. "People love dinosaurs, and we can use that to get them excited about science overall. When people learn about how science works, they can apply that to their understanding of other people and the environment. It's a powerful tool for change."

HEAR FROM JINGMAI O'CONNOR AND ENJOY THE FIELD'S FIRST EVER VIRTUAL GALA BY GOING ONLINE TO **FIELDMUSEUM.ORG/GALAVIDEO**.



ALL IMAGES FIELD MUSEUM

ENGAGEMENT IN A TIME OF CRISIS

BY LAUREN WAGNER, LEARNING CENTER

During the Museum's four-month closure this spring, the Learning Center continued to reach teen audiences virtually to immerse them in museum learning.

The Field Museum's Youth Council is a yearlong program focusing on teen engagement. Switching to a remote platform, 15 dedicated members have continued to meet weekly. Through hard work and commitment to the Youth Council, the teens flourished during the quarantine and paved the way for new programs and materials for future teens. The students piloted and developed a "Career Chat," which exposed youth to different career opportunities through interviews with Field staff. Participants asked questions and learned about the career paths staff members have taken. The teens also wrote a *Teen Guide* to the Museum and set the groundwork for collaborations amongst other Museum Campus Youth Councils.

By writing a proposal for a virtual Bridge Program, the teen volunteers designed and led a virtual version of the popular summer opportunity. Each day the teens led over 20 eighth grade graduates through activities, discussions, and games. Throughout the week, participants went on virtual tours of the collections and learned how the teens facilitate when they volunteer at the Museum. The virtual Bridge Program culminated with each participant modeling a facilitation with an object from their home that is special to them.

In addition, five teens engaged in the Museum's Teen Exhibit Design pilot. This program started in February 2020 and ran until mid-August. Originally intended to create a physical exhibition within the Museum, the teens adapted their work into a virtual exhibition. The goal was to provide teens a platform to tell an authentic story from their own perspectives, capturing their voices and reflecting personal experiences. They met with staff from Anthropology and Exhibitions to learn the process of creating authentic stories, while working together to make one cohesive virtual exhibition—which was titled *Women: They Inspire*. Each teen had a specific role that mirrored the responsibilities of Exhibitions staff members. While staying apart during COVID-19, Chicago teens were still able to take journeys of discovery with the Learning Center through creativity, commitment, and flexibility. We look forward to expanding virtual opportunities for students as we continue distance learning and navigate a new normal together.

VIEW *WOMEN: THEY INSPIRE* ONLINE AT BIT.LY/WOMENTHEYINSPIRE.

(Top) Three teens in the Exhibition Design pilot program discuss a floor plan for Women: They Inspire *over Zoom.*

(Above) Using computer software, the teens created a virtual exhibition space.

KYLE FLUBACKER PHOTOGRAPHY

(Left) Lynika Strozier participating at the 125th anniversary of Field Museum and launch of the Because Earth Campaign *in 2018.*

(Below) Lynika Strozier in the Pritzker Laboratory for Molecular Systematics and Evolution where she worked on a variety of organisms including birds, ants, lichens and early land plants.

Lynika started at the Field as a summer intern in 2009 and worked on several NSF-funded projects on liverworts, lichens, ants, and birds that led to new biodiversity discoveries.

In Memoriam

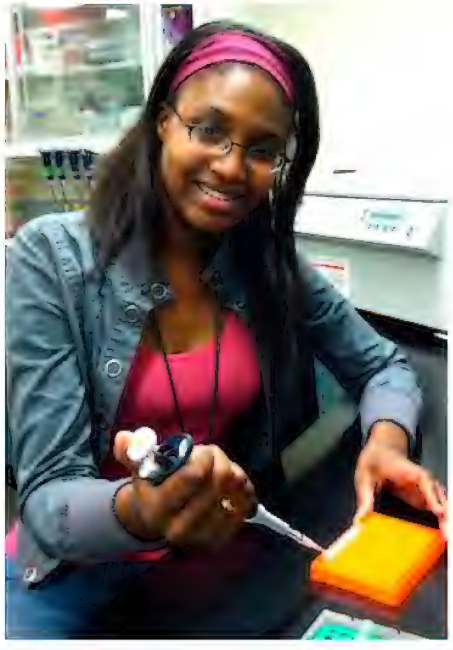
LYNIKA STROZIER

BY MATT VON KONRAT, PHD, MCCARTER COLLECTION MANAGER, **SUSHMA REDDY, PHD,** RESEARCH ASSOCIATE, AND **YLANDA WILHITE,** SENIOR PARTNERSHIP COORDINATOR

Lynika Strozier, a talented 35-year-old Black biology professor, succumbed to COVID-19 complications on June, 07, 2020. Despite facing many challenges throughout her life, she drew upon her grandmother's strength and encouragement to succeed academically. As she told the *Chicago Tribune*, "You get knocked down so many times, you learn to pick yourself up." Strozier started at the Field as a summer intern in 2009 and worked on several NSF-funded projects on liverworts, lichens, ants, and birds that led to new biodiversity discoveries. In March 2020, the Gantz Family Collections Center granted her an honorary appointment of Collections Associate in recognition of her many extraordinary accomplishments and contributions to the Museum's mission for over a decade. During that time, she earned two Masters degrees simultaneously from Loyola University Chicago and the University of Illinois at Chicago.

"Research allowed me to gain the confidence that I never had before," said Strozier at the *Because Earth* Celebration in 2018. She was passionate about mentoring young students and worked with dozens over many years. A Go Fund Me page set up by Lynika's museum colleagues raised nearly $85,000 for her funeral expenses and her surviving family. Now, the Women's Board of the Field Museum is proud to be raising funds for a named internship position through their Women's Board Youth Engagement Endowment campaign.

Lynika's passing was a sudden and tragic loss for the Strozier family, her Field Museum friends, and all who knew her. Throughout her journey, she touched so many hearts, inspiring us all. She was an amazing, caring, hardworking, considerate, and loving person to her friends, coworkers, and colleagues. We will miss her infectious smile, boundless energy, and incredible inspiration.



CORRIE MOREAU

PANDEMICS, A NEW LENS FOR RESEARCH

By John Bates, PhD
CURATOR OF BIRDS AND HEAD OF LIFE SCIENCE, NEGAUNEE INTEGRATIVE RESEARCH CENTER

The current pandemic has affected humans and their societies in every corner of the world. As we strive to control the spread of the COVID-19 virus, scientists at natural history museums like the Field are asking questions about what can be done to avoid events like this in the future.

ADAM FERGUSON

JOHN BATES

JOHN BATES

(Top Right) Volunteers with the Laikipia Rabies Vaccination Campaign give a small puppy its free vaccine.

(Top) Collaborations are critical to study parasites and zoonotic diseases. At his microscope with a Field Museum expedition in Malawi, Dr. Vasyl Tkach of the University of North Dakota collects internal parasites of birds and mammals.

(Above) A scientist extracts a parasite from the wing feathers of a bird specimen collected in the field.

Many of us at the Field Museum have been studying zoonotic diseases—those that jump from animals to humans—for decades. For us, these past nine months of reading virology journal and the news underscore that science is pivotal in addressing and preventing pandemics in the future.

The Field's biological collections document the biodiversity of all life on earth, including the microbes and organisms that live in animals. This concept of the "extended specimen" increasingly informs every aspect of our work. This means we collect parasites and tissue samples along with the primary specimens. It's still unclear how COVID-19 crossed over to humans from nature, but extensive, archived collections of extended specimens will enable scientists to predict future "spillovers," and halt transmission before it can happen.

Solid and accessible biological data is instrumental in assessing how the ranges of hosts, parasites, and diseases are changing over time. For example, Collections Manager of Insects Maureen Turcatel and colleagues are part of a new project, funded by the National Science Foundation, to digitize the Field's extensive holdings of parasites—including fleas, ticks, lice, and mosquitoes collected from hosts in the vertebrate zoology collection. Having broader and faster access to information about these collections will enhance research about disease interactions that relate to humans. Every parasitic relationship offers the opportunity to understand mechanisms that have evolved in nature to combat disease and coexist with parasites.

This research requires the efforts of diverse teams both inside the Museum and beyond. Our Information Technology staff, including Sharon Grant, Janeen Jones, and Kate Webbink, have developed a new data tab to be incorporated into our collections database software to better maintain the digital data connectivity associated with parasites, pathogens, and their host specimens. This new function will be made available to other museums around the world that use this software to help track their extended specimens.

As always, our collaborations extend internationally. MacArthur Curator Bruce Patterson, PhD, and Negaunee Collections Manager Adam Ferguson, PhD, (both of Mammals) are currently leading projects with Kenyan colleagues focused on the phylogeography of East African bats, and monitoring for rabies in Kenyan carnivores, respectively. These are just a few of the Museum's research efforts linked to identifying and understanding zoonotic diseases.

While researchers race to develop a vaccine for the viral threat now facing our world, Field Museum scientists and collaborators worldwide are looking at the bigger picture. Rather than a "too little, too late" reaction to future pandemics, with data, research, and expertise rooted in natural history collections, we can work proactively to address pandemics before they cause major catastrophes across the globe.

ALL PHOTOS MATTHEW P. NELSEN

FUNGUS: THE IDEAL LIFE PARTNER

BY MATTHEW P. NELSEN, PHD, RESEARCH SCIENTIST, NEGAUNEE INTEGRATIVE RESEARCH CENTER

While some people may think fungi are specialized plants, they are actually unique organisms more closely related to animals. Plants can make their own food through photosynthesis, but animals and fungi can't. Instead, fungi get nutrients by decomposing dead organisms or through symbiotic relationships with living organisms. Recently, my colleagues and I have published two different studies revealing how lichen symbioses originated, diversified, and influenced our world over geological timescales.

Fungal symbioses are all around us, but are easily overlooked. The splotches you see on the rocks or tree bark are lichens—composite structures created by a symbiotic relationship between fungi and green algae or cyanobacteria or both.

Lichens have long played a central role in our understanding of symbiosis and even served as a prime example when the term symbiosis was coined more than 140 years ago. But despite this legacy, we know very little about how symbiosis came to be.

So, earlier this year, I collaborated with colleagues at the Field Museum, the Botanical Garden Museum in Berlin, and Stanford University to publish a paper in *Geobiology* demonstrating that lichens originated after vascular plants—or plants that have conductive tissues for carrying water throughout the organism. This conflicts with long-held ideas that lichens colonized dry land habitats several hundred million years ago and made it more hospitable for the evolution of plants. Instead, lichens are relatively young—well, in geological time at least!

By knowing when the first lichens evolved, we can then piece together a more accurate understanding of the timeline over which symbiosis evolved. Once we sorted out the origin of lichens, we then turned our studies to the largest group of lichen fungi—a group more diverse than birds! Using resources in the Field's Grainger Bioinformatics Center, we analyzed the evolutionary history of over 3,300 species. The study published in *Proceedings of the National Academy of Sciences (USA)*, revealed a complex evolutionary history underlying this group, which included lichen fungi switching, losing, and regaining symbiotic partners. Moreover, we found diversification patterns differed from those seen among decomposer and root symbiotic fungi—illustrating the variable evolutionary dynamics among fungi. Together, our work at the Field Museum is providing greater insight into the evolution of symbiosis. These data allow us to better understand which symbiotic partners stick together or break apart, and how their ecological contributions have shifted through time.

(Above, left) Pilophorus robustus, *a stalked lichen growing in wet depressions in the Alaskan tundra. This is related to some of the more widely-known lichens, such as: the reindeer lichen, the pixie cup lichen and the matchstick lichen.*

(Above, right) Matthew Nelsen collecting rock lichens in the Alaskan tundra in August 2019.

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Hidden History in Our Collection

Topaz comes in a variety of colors, some of which are relatively common even in gem grade stones. However, one color of topaz that is exceedingly rare in gem grade is red topaz (also called ruby topaz). Red stones make up less than half a percent of all faceted stones, and large, inclusion-free stones are almost unheard of. This 97.45 carat stone in the *Grainger Hall of Gems* is the world's largest of its kind and quality.

It was mined in Russia during the 19th century and acquired by the Field Museum in 1894. In 2008, it was set in rose gold by Chicago jewelry designer, Lester Lampert, for the exhibition. He named his creation, with our stone, "Blaze," after the brilliance shown by the piece. **See this exquisite gem and several others in the *Grainger Hall of Gems*.**

(Left) Microfading of the purple color on a fan from the Marshall Islands. (Catalog number T2019.11.12).

(Above) Close-up of microfading showing the test spot.

PRESERVING VIBRANT COLORS IN COLLECTIONS

BY JP BROWN, REGENSTEIN CONSERVATOR, GANTZ FAMILY COLLECTIONS CENTER

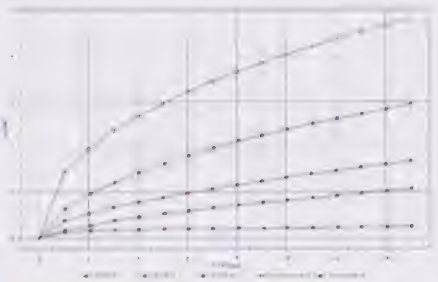
Every hour the Museum's lights are on, some of the colors of the collections on display fade. The fading is imperceptible over a day, but the brighter the light, and the longer the item is on display, the more the colors change. Over months and years, this irreversible damage builds up.

The question is: how much time on display is too much?

Until recently, museum workers used a rule of thumb to make these decisions, but this was not very satisfactory. For example, not all blue colors are lightfast—or resistant to fading when exposed to light. What we want to know is how quickly a particular blue on a particular item will change.

To answer this question, I have been working with the Getty Conservation Institute to refine a simple instrumental method called "microfading." The technique uses a tightly focused fiber optic light beam—less than half a millimeter in diameter—to fade a small area of color on the actual object and measure the color change with a spectrometer. We have to use a spectrometer because the amount of fading is imperceptible to the human eye. In ten minutes, the equipment can simulate five years of light exposure.

SpectralViewer output showing spectrum response.



SpectralViewer output showing color shifts compared to ISO Blue Wool Standards.

My contribution to the project has been to rewrite a software package called SpectralViewer that automates the test. The basic idea of microfading has been around for 20 years, but the equipment was expensive, and the data acquisition and analysis were complex—it was easy to make mistakes. The equipment for the test is much more affordable now, but there was a bottleneck in the acquisition and analysis of the process. The new software will make microfading results more rapid and accurate.

Based on results from the new microfading test procedure, the Field Museum and our colleagues around the world will be able to predict how fast collections will change color under different lighting intensities and durations, and know how long they can keep specific items on display without damage. The Field's conservation team has recently built and begun using a microfadeometer on collection items.

FOSSIL-WITHIN-A-FOSSIL REVEALS ICHTHYOSAUR DIET

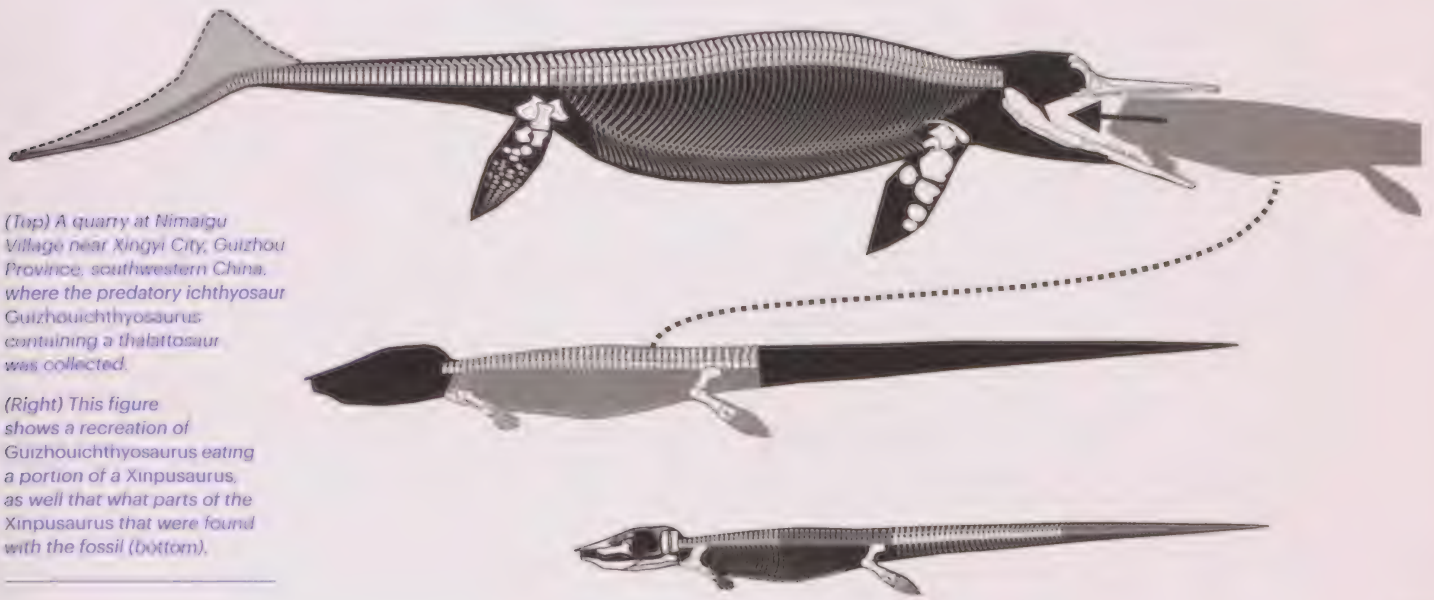
BY OLIVIER RIEPPEL, PHD, ROWE FAMILY CURATOR OF EVOLUTIONARY BIOLOGY, NEGAUNEE INTEGRATIVE RESEARCH CENTER

Ichthyosaurs are stars in the world of "dinosaur" toys and "dinosaur art," but, as your favorite preschooler will readily inform you, they were not dinosaurs. They were marine reptiles that arose in the late Lower Triassic (about 250 million years ago), and went extinct in the Late Cretaceous, a few million years before the dinosaurs did. Resembling huge toothy dolphins, ichthyosaurs were among the top aquatic predators of their day, and have remained an object of fascination since they were first discovered in the mid-1800s.

Despite their reputation, not all ichthyosaurs were behemoths. Tooth size and shape provide clues as to what various ichthyosaurs ate—from the small, rounded teeth of *Cartorhynchus*, suggesting a diet of shellfish, to the large, serrated teeth of the 28-foot giant Thalattoarchon, which indicate an appetite for large prey. Somewhere in between was *Guizhouichthyosaurus*, whose closely set, conical teeth pointed to a menu of fish and squid. However, during research on a 16-foot *Guizhouichthyosaurus* specimen excavated in 2010 near Xingyi, southwestern China, my colleagues from Peking University and the University of California–Davis were surprised to find that it contained the trunk (minus head, neck and tail) of another marine reptile species, a thalattosaur called *Xinpusaurus*.

This animal would have been just a bit smaller than *Guizhouichthyosaurus* in life, about 13 feet long—direct evidence, as my colleagues and I proposed recently in the journal *iScience*, that *Guizhouichthyosaurus* not only fed on small, slippery fare, but was a very capable macropredator as well. An isolated *Xinpusaurus* tail excavated at the same site suggests that the ichthyosaur dismembered its prey before ingesting the tasty bits, perhaps by thrashing it back and forth, like large crocodilians and killer whales.

This fossil-within-a-fossil not only represents the oldest known record of large animal predation by a marine reptile, but the oldest example of such megapredation by any group. It advances our understanding of life in the sea 250 million years ago. Expanding the roster of macropredators to include less-likely suspects like *Guizhouichthyosaurus* indicates that by the Middle Triassic, a complex food web had already been restored in the seas after the devastating mass extinction at the end of the Permian.



(Top) A quarry at Nimaigu Village near Xingyi City, Guizhou Province, southwestern China, where the predatory ichthyosaur Guizhouichthyosaurus containing a thalattosaur was collected.

(Right) This figure shows a recreation of Guizhouichthyosaurus eating a portion of a Xinpusaurus, as well that what parts of the Xinpusaurus that were found with the fossil (bottom).

THE FIELD LOYALTY CLUB

The Field Museum is grateful for decades of generous support from all members of the Field Loyalty Club. Their 20-plus years of dedication strengthens our mission and sets a philanthropic example for fellow supporters, visitors, and friends.

This list reflects the newest inductees to the Field Loyalty Club—the "Class of 2019"—who became 20-year Museum supporters last year.

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Field Loyalty Club Spotlight:
Connie and Dennis Keller

BY GINEVRA S. RANNEY,
INSTITUTIONAL ADVANCEMENT

Connie and Dennis Keller remember childhood visits to the Field Museum and credit those adventures as the source of their commitment to the natural world. They have been museum supporters for 40 years, and were early champions for Field Museum conservation, recognizing the unique role a natural history museum could play in protecting the planet and its people.

At our first-ever virtual gala on October 17th, Connie and Dennis Keller received the Marshall Field V Award for Distinguished Leadership, the Museum's highest honor, given to those who offer exemplary service and philanthropy at the Field Museum. The Award was presented—over Zoom—by Trustees Marshal Field V and Judith S. Block, the 2019 Honoree.

Connie joined the Field Museum Women's Board in 2003 and, two years later, the Board of Trustees. She served as Co-Chair of the Science Action Center and was the second woman to Chair the Board of Trustees (2015-2018). Over the years, she worked closely with Museum leaders and staff to build the Action Center into the world-renowned leader it is today.

"30 million acres in the Amazon, 200 global partners, and more than 10,000 children in the Chicago region served: we can trace the impact of Field Museum conservation directly to Connie and Dennis. Their exemplary leadership is reflected in all we do," said President and CEO Julian Siggers.

Connie and Dennis Keller were among the first to declare their confidence in the Museum with a $10 million gift to the *Because Earth* Campaign and are serving as Co-Chairs of the Campaign. Their historic commitment established an endowment for Field Museum conservation, and the Keller Science Action Center was named to recognize their generosity.

The couple's impact as philanthropists and champions for nature is evident from Oak Brook, to Africa to the Amazon.

We are deeply grateful to Connie and Dennis Keller for their leadership and many contributions to the Field Museum community. Thank you!

FIELD MUSEUM

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Strengthen your future and ours. With this type of gift, you can feel secure knowing you will receive stable retirement income, while supporting critical scientific discoveries.

For more information or to start your charitable gift annuity, please contact Kyle Daniels, Planned Giving Coordinator, at: **plannedgiving@fieldmuseum.org.**

Member I Spy

What eats meat and stands on two feet? If you said a *T. rex*, you would be correct! But it could also be an eagle, or even you! Many animals have similar adaptions to others that seem to have nothing in common with them at all. Scientists researching evolution at the Field Museum study these similarities and differences to learn everything they can about life on Earth.

On your next visit to the Field, explore the wonders of nature by taking this page with you to **see if you can spy animals with these seven traits**. Send a photo collage of your findings to ITF@fieldmuseum.org for a chance to win an exclusive member tote bag and be featured in the next issue of *In The Field!*

- ☐ I spy something with a beak.
- ☐ I spy something with long claws.
- ☐ I spy something with bright, colorful wings.
- ☐ I spy something with horns.
- ☐ I spy something with big, sharp teeth.
- ☐ I spy something with spots.
- ☐ I spy something with a shell.

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