

CATALYST

DENVER MUSEUM OF NATURE & SCIENCE MAGAZINE
AUTUMN 2016

INSIDE ///

MUMMIES: NEW SECRETS
FROM THE TOMBS

EXTREME MAMMALS

WILD AFRICA 3D





**Yes
on
4B!**

SCFD is tried and true as a national model of funding for the arts. Please support SCFD in November to keep the wonder alive for everybody.

Culture for all.



Scientific & Cultural Facilities District

Dear Members:

Literally millions of lives have been positively impacted by the Scientific & Cultural Facilities District (SCFD) thanks to you. The SCFD is such a simple way for citizens to enrich cultural life in Colorado. Each time you shop in the seven counties surrounding Denver, a mere one penny of every \$10 you spend helps pay for high-quality arts and cultural experiences for people of all ages.



SCFD renewal is on the November 8 ballot. Voter approval will extend the SCFD *without* raising taxes. The sales tax allocation will remain unchanged, and this important investment will continue to provide nearly \$55 million each year to 300 arts, cultural, and scientific organizations throughout our community!

Since its creation in 1988, the SCFD has been a unique funding system that is the envy of metro areas around the country. The SCFD directly benefits diverse audiences in Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, and Jefferson Counties. SCFD renewal has been approved twice before, in 1994 and 2004, showing that voters recognize the amazing impact arts and culture have on urban, suburban, and rural areas alike.

- More than 4.25 million students are treated to enriching experiences each year—most often for free.
- 5.2 million people enjoy more than 100 SCFD Free Days each year and 4.25 million receive reduced admission.
- Citizens now have access to twice the number of organizations since the SCFD's founding.
- SCFD organizations generate \$1.85 billion annually in economic activity, create 10,205 jobs, and spur \$520 million in tourism.
- At the Museum, SCFD funds support exhibitions and science education programs and scholarships.

We invite you to collaborate with us on reauthorization! Volunteer for the campaign, post a yard sign, and spread the word about SCFD to your friends and neighbors, especially those who are among the thousands of citizens who are new to the metro area. Find out more about these opportunities at yescscfd.com.

And, most important, if you feel strongly about maintaining an excellent cultural community in Colorado, make your voice heard and vote yes on 4B on November 8. As always, we appreciate you, our members, and your ongoing support.

George Sparks
President and CEO

You may contact George Sparks by e-mail at president@dmns.org

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FIND IT @ DMNS.ORG

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- Membership renewals and purchases

Join Our Community:



ON THE COVER

From the anthropology collections

Ceramic vessel
AC.11283
Paracas Culture
ca. 600–100 BC
South coast of today's Peru
This culture is represented in *Mummies: New Secrets of the Tombs*.



Rick Wicker



JOURNEY TO EARTH'S EPIC PLACES IN IMAX

Wild Africa 3D opens Friday, September 23. Go on a beautiful ride across, over, and through Africa, the most dramatic continent on Earth. Our guide through this geological wonder is water, which shapes wild Africa from its jungles to its deserts, conjuring up life wherever it journeys on its eternal continental cycles. See the stunning vision of thousands of pink flamingos gathered on a beach, watch a tiny lizard dance in the desert, encounter a family of gentle gorillas, and follow a herd of swimming elephants.

Mummies: Secrets of the Pharaohs opens Friday, October 14. The ancient past comes to spectacular life in this fascinating look at Egypt in the time of the pharaohs. Part historic journey and part forensic adventure, the film follows researchers and explorers as they piece together archaeological discoveries and genetic clues from mummies. Carefully detailed reenactments open a window into the daily life of antiquity and the unique process of Egyptian mummification in this cinematic adventure 3,000 years in the making. Presented in 2D.

Members save on IMAX tickets every day! Find showtimes @ dmns.org/IMAX.

BRING A FRIEND FOR FREE

Bring a friend to the annual Night at the Museums during Denver Arts Week. On Saturday, November 5, the Museum will be open for free for all guests from 5 to 10 p.m. The entire Museum will be available, including the exhibitions *Extreme Mammals* and *Mummies: New Secrets from the Tombs* (discounted admission available for *Mummies*). Find a complete list of events for Denver Arts Week @ denver.org/denver-arts-week.

HEAVENS ABOVE

During the evening hours of September and October, the autumn stars cover much of the eastern and southern regions of the night sky. Often referred to as the “Celestial Sea,” this area includes Aquila, Aquarius, Capricornus, and Delphinus. The constellations are relatively close to each other along the southern horizon in an expanse nearly devoid of bright, deep sky objects. Within the constellation Piscis Austrinus or “Southern Fish” is Fomalhaut (pictured below), the lone bright star in this part of the sky. It can be observed with an unobstructed, clear view. For observers at midnorthern latitudes, Fomalhaut stands due south around 11 p.m. in early October and 10 p.m. at midmonth.

Perhaps the most conspicuous constellation of a northern autumn sky is Pegasus, the winged horse of Greek legend, high in the sky from October to late November. North and east of Pegasus is the constellation Andromeda, harboring the nearest major galaxy to our own, the Andromeda Galaxy (M31). The galaxy is easily seen with the unaided eye as a faint, hazy patch above Andromeda’s star Mirach. Above Andromeda, Cassiopeia offers many fine star clusters to an observer with binoculars or a telescope. Find out more about the autumn sky @ dmns.org/heavensabove.



© NASA/ESA/SkySurveyor 2



BRINGING SCIENCE TO LIFE FOR STUDENTS

As guests enjoy the Museum each day, little do they know that a special broadcast studio behind the scenes is sharing science education with students just down the street or thousands of miles away.

Virtual Science Academy takes students on a scientific adventure right in their own classrooms. Award-winning interactive experiences bring the best of the Museum directly to the students, featuring content that aligns with academic curriculum and national science standards. The teachers connect to the Museum using a computer, webcam, and the Internet.

Scientists in Action, another distance learning program, offers students an opportunity to connect with real scientists through a live broadcast from a field site or research lab. The broadcasts are offered once a month for free.

Teachers are invited to discover even more about what the Museum has to offer during the annual fall Educators Night on Monday, September 26. This free event will feature snacks and a cash bar and more than 80 SCFD partner organizations presenting performances, activities, and program information. Reservations are required. Find out more @ dmns.org/teachers.

SAPIENS.ORG TAKES A DEEPER LOOK AT HUMANS

Several years ago, Chip Colwell, curator of anthropology, set out to help change how anthropologists communicate their work. He observed that many scholars had not only discovered fascinating insights into the human condition but could inform important societal issues with good social science. The challenge was the lack of a venue where anthropologists could reach a broad public with their knowledge and ideas.

Colwell secured a grant from the Wenner-Gren Foundation, and in January 2016 *SAPIENS* was launched. This editorially independent online magazine is dedicated to publishing anthropology’s most timely, exciting, and relevant news and research. In its first five months, *SAPIENS* attracted 200,000 readers from every country in the world (except North Korea). Syndication partnerships have been established with major science news outlets such as *Discover* magazine, *Scientific American*, *Slate*, and *The Atlantic*. The editorial office for *SAPIENS* is housed at our Museum.

Publishing nearly daily, *SAPIENS* reaches into every corner of the human experience. Topics are wide-ranging: the “Hobbit” discovery in Indonesia, the European migration crisis, the Zika virus, and research about romantic kissing among humans, how “friending” on Facebook contributes to individual identity, and why parents do or do not vaccinate their children. Until just a short time ago, many such discoveries would have been published in an academic journal and discussed only among scholars. Now anthropology is for everyone, and you will find it @ sapiens.org.

MUSEUM SHOP SALE AND MEMBERS APPRECIATION: NOVEMBER 4–6

Mark your calendars! With great appreciation for your membership support, we invite you to kick-start your holiday shopping with us and enjoy special rewards all weekend long!

- Save 20%* in the main Museum Shop as well as in the *Extreme Mammals* and *Mummies* exhibition shops.
- Save 20% in T-Rex Cafe—an extra 10% off for lunch.
- Save 10% on gift memberships.
- Save 50% on IMAX and Planetarium tickets.

Your purchases support the Museum’s science education and research. Thank you for being a member!

*Everyday 10% discount applies to DVDs, CDs, and books. Special offers are valid in person only November 4–6, 2016, and cannot be redeemed over the phone or online.

PARDON OUR DUST

Please note that Gates Planetarium will be closed through Monday, September 19, for an equipment upgrade.





EXTREME MAMMALS SHOW THEIR AMAZING STUFF

Step right up and meet some of the most extraordinary animals of all time in the new temporary exhibition *Extreme Mammals*, opening on Friday, September 23. Spectacular fossils, vivid reconstructions, and lifelike models trace the ancestry and evolution of mammals, showing how and why some of them could attract the attention of carnival barkers and curiosity seekers.

Although these animals seem to have been created by Dr. Seuss, we know they are real because of scientific evidence. Extinct mammals are viewed with awe because they are so distinct from familiar living organisms, yet modern mammals are astonishing as well when considered with fresh eyes. In *Extreme Mammals*, the animals are compared to their ancestors, closest relatives, or contemporaries to document and explain what is normal and what is extreme. Even humans are out of the ordinary with large brains for our body size and the ability to walk upright on two legs.

Dynamic media displays, animated computer interactives, hands-on activities, and dozens of fossils, casts, and taxidermy specimens illustrate how life on Earth has evolved, why animals sharing key characteristics look and behave so differently from one another, and how there can be such unexpected diversity within a single group. Some lineages died out while others diversified to form groups of well-known mammals living today.

From the largest land mammal ever—an 15-foot-tall, 20-ton extinct vegetarian named *Indricotherium*—to the tiny 50-million-year-old, 1-inch *Batodonoides*, you will meet a cast of characters full of surprises.

- the biggest marsupial to walk Earth
- a giant pig whose teeth grew through the top of its snout
- “walking” whales and seals
- an ungulate with a camel-like body and a nose like an elephant
- a car-sized relative of the armadillo
- an enormous extinct Irish elk from the Pleistocene

“Mammals are older than dinosaurs and, unlike dinosaurs, mammals survived Earth’s last major extinction event 66 million years ago and have gone on to flourish throughout the world,” said Tyler Lyson, the Museum’s vertebrate paleontologist and curatorial advisor for the exhibition. “But this is only partly what makes them so fascinating. Diversity among mammals is vast, and the way they continue to adapt to

their changing environments tells us much about our ever changing planet.”

10 THINGS TO DO

- See fossils and lifelike models of an incredible cast of characters, from the smallest mammal ever, which could have perched on a pencil, to the largest land mammal, weighing in at 20 tons.
- Crawl into a model of a glyptodont shell, located near a complete fossil skeleton of this car-sized relative of the armadillo.
- Be awed by an Irish elk skull with a gigantic eight-foot-wide set of antlers, showing an extreme example from the Pleistocene.
- Discover many examples of extreme mammals of Colorado, such as a bighorn sheep, bison, and mountain lion.
- Dress up as your own extreme mammal, mixing and matching costume pieces, and share the experience with #MammalMakeover.
- Explore an intricately detailed diorama of Ellesmere Island, 600 miles from the North Pole, 50 million years ago, with unusual animals living in a distinctly different environment from today.
- Learn how local research by Museum scientists is providing a deeper understanding of Earth’s last major extinction and insights for the future.
- Check out the earliest known complete monkey skull ever found in South America, perfectly preserved in volcanic ash.
- Examine an amazing replica specimen of one of the last-known Tasmanian wolves,

a species that went completely extinct as recently as the mid-1930s.

- End your experience at the green screen and take your photo with some extreme mammals, which you may purchase or share!

MEMBERS TIPS

Extreme Mammals will be open from Friday, September 23, through Sunday, January 8, in Phipps Gallery, Level 3.

Find members-only events—including Preview Day on Thursday, September 22,—on the inside back cover of this magazine.

Admission is free for members. Please be prepared to present your membership card at the entrance to the exhibition.

Weekday afternoons after 2 p.m. and early weekend mornings tend to be less busy in the temporary exhibitions. School groups generally visit during weekday mornings.

Complimentary Museum admission tickets that came with your membership may be used for entry into *Extreme Mammals*.

Find out more about the exhibition and related programs @ dmns.org/mammals.



Extreme Mammals is organized by the American Museum of Natural History, New York (www.amnh.org), in collaboration with the California Academy of Sciences, San Francisco; Cleveland Museum of Natural History; and the Canadian Museum of Nature, Ottawa, Canada.

Below, left: *Batodonoides vanhouteni* was the smallest mammal that ever lived, with an estimated body weight of just 1.3 grams; right: *Ambulocetus natans* was a “walking whale” that lived nearly 50 million years ago. Photos: © AMNH/D. Finnin





MUMMIES: NEW SECRETS FROM THE TOMBS UNRAVELS ANCIENT MYSTERIES

Scientific findings that time could not erase from ancient Egyptian and Peruvian mummies are revealed in the new temporary exhibition *Mummies: New Secrets from the Tombs*, opening on October 14 at the Museum, one of only five stops on the U.S. tour.



The exhibition is a rare glimpse at a collection of mummies from The Field Museum in Chicago, many displayed for the first time. Using modern technology and noninvasive research techniques, scientists avoided the hazards of unwrapping the fragile specimens and uncovered a wealth of new discoveries. Medical scanning, DNA sampling, and advanced reproduction techniques revealed a storehouse of natural and cultural information with extraordinary detail.

Mummies: New Secrets from the Tombs is unusual because it goes beyond the typical exploration of mummification in royal Egypt and dives into preparations for the afterlife practiced by the Peruvian cultures of Chinchorro, Paracas, Chancay, Nazcan, and later Incan peoples. Mummification practices in Peru predate those of Egypt by 2,000 years.

The experience features real coffins and mummies, appearing alongside archaeological treasures such as stone sarcophagi fragments, pots and other everyday objects for the afterlife, and animal mummies, all displayed in beautiful historic exhibit cases. Guests explore the new findings through exhibits of the CT scans, interactive touch tables, 3D-printed casts of bones and burial figurines, and forensically reconstructed sculptural busts by acclaimed artist Élisabeth Daynès.

“We are thrilled to be one of only five U.S. museums to host this exhibition,” said Dr. Michele Koons, curator of archaeology. “Not only are these mummies rarely seen but the story of Peruvian mummies is rarely told. This gives the public an opportunity to continue their historic fascination with Egyptian mummies as they learn about other cultural approaches to mummification as well as the amazing new science that modern technology is revealing.”

HIGHLIGHTS

- A Predynastic mummy from Egypt whose mummification occurred naturally in the hot dry sand about 5,500 years ago. Some scholars believe this natural process gave Egyptians the idea for artificial mummification.
- A replica mummy’s mask from the Chinchorro of Peru and Chile, who practiced mummification long before the Egyptians. The clay masks rarely survived intact; a modern sculptor made the stunning replica using ancient materials and methods.
- Rarely seen mummy “bundles” from Peru whose CT scans and X-rays reveal fascinating cultural details about these individuals’ lives and deaths.
- Interactive touch tables that digitally unwrap mummies and allow guests to focus on key features and more deeply explore the new findings.
- An intricately mummified baby crocodile, buried as an offering to an ancient Egyptian god, as well as mummified cats, baboons, birds, and gazelles and their CT scans.



- The “Gilded Lady,” a mummy from Roman-era Egypt that has not been seen in public since the 1893 Chicago World’s Fair. Beneath the golden mask on her coffin, CT scans revealed a 40-year-old woman with curly hair. Her forensically reconstructed face hyper-realistically portrays what she would have looked like when she was alive.
- The mummy of an Egyptian teenager who was mysteriously buried in a coffin created for a grown man 200 years earlier. A facial reconstruction shows the teen’s features.

MEMBERS TIPS

Mummies: New Secrets from the Tombs will be open from Friday, October 14, through Sunday, February 5, in Anschutz Gallery, Level 3.

See the back cover for your invitation to exclusive opportunities to experience *Mummies*, including Members Preview Day on Thursday, October 13!

Members receive a discount on tickets to this surcharged exhibition and timed tickets are required. Book your print-at-home tickets for *Mummies* @ dmns.org and avoid a handling fee.

Reservations are also available at 303.370.6000 (daily, 9–5). There is a \$2 fee per ticket by phone. Afternoon is the best time to call.

Weekday late afternoons and weekend early mornings tend to be less busy in our temporary exhibitions. School groups generally visit during weekday mornings.

Giving Club members may redeem their *Mummies* “anytime” tickets by heading straight to the exhibition for quick and easy access, even if it’s sold out. Complimentary guest tickets that came with your membership may be upgraded for admission to *Mummies*.

Expand your experience with the IMAX film *Mummies: Secrets of the Pharaohs* (presented in 2D). Members save on IMAX tickets every day!

For tickets and more information, visit dmns.org/mummies.

Facing page: Scans of this mummy of an Egyptian teen boy revealed another mystery—he is encased in a coffin built for an adult (A115249d_007C). This page, left: This intricately wrapped mummified baby crocodile is among several animal mummies on exhibit (A115211d_015A); above: This “false head” would have sat atop a mummy from the Chancay culture in what is now Peru (A115204d_012C). Photos: © 2015 The Field Museum/John Weinstein

Mummies: New Secrets from the Tombs was developed by The Field Museum, Chicago.

THE CURTIS VOLUMES OF THE NORTH AMERICAN INDIAN

By Jude Southward and Brent Wagner

Edward S. Curtis (1868–1952) was an American photographer who set out to produce a monumental study of the native peoples of North America at the turn of the 20th century. Known as “Shadow Catcher,” Curtis visited 80 tribes and created a unique photographic record of their traditional ways of life. Although 500 copies of a 20-volume set entitled *The North American Indian* were originally intended, financial challenges arose and only about 275 sets were printed in the early 1900s before the publication fell into near obscurity. In the 1970s, prints and original copper plates were discovered in a bookstore in Boston. The images were published, sparking renewed interest in Curtis’s work.

Original volumes of *The North American Indian* are rare and have become extremely valuable. When we discovered the Museum has two volumes in its rare books collection—*Vol. 3: The Teton Sioux, Yanktonai, and Assiniboin* (pictured right), and *Vol. 12: The Hopi*—the books were immediately prioritized for conservation treatment and became a joint project between Bailey Library and the Avenir Conservation Center.

The volumes were in rough condition. The half-leather and cloth bindings on both volumes were deteriorated and detached from the text blocks. Each plate had a protective interleaving sheet, but many of these were yellowed and creased. The pages were “over sewn,” resulting in restricted opening that can cause further damage over time.

We selected the Northeast Document Conservation Center (NEDCC) in Andover, Massachusetts, as the best place for the volumes to be treated. Founded in 1973, the NEDCC is recognized for its experience in completing challenging treatments for significant book and paper collections. As the Museum’s lead conservator, Jude hand-carried the volumes on a flight from Denver to Boston, and delivered them to the center in person. Mary Patrick Bogan, the director of book conservation, and Jude

discussed goals for the project and outlined the treatment options.

To stabilize the volumes, treatment included surface cleaning, mending tears with Japanese paper, reinforcing the sewing and repairing the original binding by rebacking the volumes with airplane linen and toned Japanese paper. Custom phase boxes were constructed to the exact dimensions of the volumes, providing long-term stability during storage. Brent, our head librarian, made the return trip to the East Coast to pick up the volumes when they were completed. They have been safely returned to the rare books collection in Bailey Library.

As Curtis intended, *The North American Indian* is more than a series of breathtaking photographs. Curtis accompanied his photographic documentation with copious notes on the culture and traditions of each tribe; he also recorded their native languages on wax cylinders. This massive array of ethnographic information includes analyses of social hierarchies, geography, sociology, warfare, ceremonies, musicology, costume, and mythology. Though his scholarship was self-taught, Curtis presents a view of the Indian, and of America itself, that is at once expansive and intimate.

Curtis’s design to document every Indian tribe west of the Mississippi was logistically ambitious, not to mention financially daunting. In need of financial support, he contacted Theodore Roosevelt, for whom he had done some family photography. Roosevelt introduced Curtis to J. P. Morgan, who was impressed with Curtis’s work and offered \$75,000 for a series to contain 1,500 photographs in 20 volumes. Morgan was to receive 25 sets and 300 prints.

The first volume appeared in 1907 to a favorable review in *The New York Herald*, calling it “the most gigantic undertaking in the making of books since the King James edition of the Bible.” Morgan died in 1913, just before the completion of

the ninth volume. Despite partial funding from the Morgan family, the project was very expensive and debts crippled Curtis’s business. Soon after volumes 19 and 20 were completed in 1930, his North American Indian Company went bankrupt, after failing to sell enough subscriptions to pay the printing costs. The photogravure printing plates and all other artifacts became the property of Curtis’s creditors and the printing companies. The plates were rediscovered in the 1970s at the Lauriat Bookshop and were purchased by The Curtis Collection in 1982.

The 500 sets were never completed. An estimated 272 sets were finished, many of which have been broken up, while an estimated 85 remain in institutional collections. The Museum is pleased to be home to these rare volumes, where they will be held in perpetuity for future research and enlightenment.

DISCOVER MORE

Jude Southward is chair of the Avenir Conservation Center and Brent Wagner is chair of the Bailey Library and Archives. Find out more @ dmns.org/science/collections.

The Northeast Document Conservation Center also contributed to this article.

Digital versions of all volumes of *The North American Indian* are available at the Curtis Library website at Northwestern University @ curtis.library.northwestern.edu/curtis/toc.cgi.

Conservation treatment for Vols. 3 and 12 of *The North American Indian* was funded through the Bailey Library annual book budget, with support from the Susan Grant Raymond Fund and the Phipps Anthropological Fund.

Bailey Library is now home to a republication of the entire 20-volume set of *The North American Indian* thanks to longtime Museum supporters Dick and Sonnie Talley. They were created by Christopher Cardozo, an artist and leading authority on Edward Curtis.



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YOUNG PROFESSIONALS
after DARK SOIREE*Illumination**Join us* FOR AN
ELECTRIFYING EVENING
AS WE CELEBRATE THE
SCIENCE OF LIGHT.

NOVEMBER 18, 2016 9:30 PM–1 AM

TICKETS ARE \$50 MEMBERS/\$60 NONMEMBERS
LIVE ENTERTAINMENT TWO DRINKS APPETIZERS DESSERTSCOCKTAIL ATTIRE DMNS.ORG/YP**SEPA** SCIENCE EDUCATION
PARTNERSHIP AWARD
Supported by the National Institutes of Health**MUSEUM RECEIVES \$1 MILLION GRANT
FROM THE NIH**

The Museum was recently awarded \$1 million from the National Institutes of Health Science Education Partnership Award Program to conduct citizen science-based research about taste, one of the largest research grants in the Museum's history.

The studies will take place over four years in the Genetics of Taste Lab, home to a distinctive model of research using crowdsourced data from Museum guests who volunteer to participate. The NIH grant, led by Nicole Garneau, PhD, principal investigator and curator of health sciences, will start with a sour taste study that launches in November. Previous studies in the lab, which is located in *Expedition Health*, have helped to debunk the term "supertaster," have provided evidence that fat is the sixth taste, and have explored how the human microbiome—the unique group of bacteria in and on each person's body—effects the way we taste sweet.

The grant will also fund research into how citizen scientists learn in community labs, and how citizen science projects might attract more diverse participants. The Museum is partnering with Joseph Polman, professor of learning sciences and human development at the University of Colorado, to conduct this additional layer of research.

"This type of research is designed to be for the people by the people," Garneau said. "Citizen science and crowdsourcing encourage everyday people to get involved in real and authentic science that is most relevant to their lives. This grant funds the first large-scale study on designing citizen science, and we are thrilled to be at the forefront. We're grateful to the NIH for this amazing grant."

Find out more @ dmns.org/genetics.

**UPGRADE TODAY AND ENJOY BEHIND-
THE-SCENES NIGHT**

Thank you for your membership support! You not only receive great benefits but your membership gift helps the Museum inspire and serve our community.

We invite you to upgrade your membership today and join the Giving Club in time to enjoy the perennially favorite event, Behind-the-Scenes Night. This free evening will be held on Wednesday, October 19, and features special access to Museum scientists, treasures, and collections not on public display as well as complimentary hors d'oeuvres and a cash bar.

Additional Giving Club benefits greatly increase your access to the Museum:

Free "anytime" vouchers to all surcharged exhibitions, including the fascinating *Mummies: New Secrets from the Tombs*, October 14–February 5, and *Vikings: Beyond the Legend*, opening next spring. No reservations are needed, even if it's sold out! The number of vouchers you receive is determined by your membership level.

Free IMAX and Planetarium tickets for yourself or friends and family.

Invitations to exclusive events throughout the year that provide Giving Club-only access to Museum scientists, exhibitions, and the latest scientific research.

Enjoy a whole new level of membership that will greatly enrich your Museum experience. It is easier and more affordable than ever to become a Giving Club member with monthly installments starting at just \$25 per month! Find out more @ dmns.org/join/giving-club.

**LEGACY SUPPORTERS LOOK TO
THE FUTURE**

The Museum was delighted to honor the Edwin Carter Legacy Society at their annual spring luncheon. Seventy members and their friends enjoyed a presentation by Dr. Steve Lee, chair of the Space Science Department and curator of planetary science. Lee shared behind-the-scenes stories about his research work with the Hubble Space Telescope and the Mars Reconnaissance Orbiter mission.

The Legacy Society was formed by Museum friends and volunteers who believed in supporting the Museum through a planned gift. The group's namesake, Edwin Carter, was a dedicated naturalist who nearly single-handedly assembled one of the most complete collections of Colorado fauna in existence. This collection eventually became the nucleus for the Museum's founding in 1900. This type of dedication—past, present, and future—allows the Museum to continue to serve our community and encourage lifelong learning and scientific discovery.

Supporters who notify us that they have named the Museum or the DMNS Foundation in their will, trust, or as a beneficiary are invited to join this exclusive group and be recognized in the Museum's Annual Report and through invitations to the annual luncheon and other special events.

Find out more @ dmns.planmylegacy.org, or by calling Mary Pat Rooney, advancement manager, at 303.370.8251.

**VOLUNTEERS MAKE A DIFFERENCE**

Mirie Austin was starting a new chapter in her life and turned to the Museum. "I was an empty nester, and I thought it would be fun," she said. That was 35 years ago. She volunteered at the Information Desk, where she helped guests enjoy their visits for many years, before she joined the Lecture Committee "doing what's needed, greeting guests, directing traffic."

Austin (pictured above with George Sparks) was among the volunteers receiving milestone awards during this year's volunteer recognition awards. Ellie Jones, Dottie Vickland, and Bettie Jo Page were all recognized for 30 years. Carolyn Dain, Delores Eckrich, Patrick Ervin, Sharon Hannu, Bob McCarroll, Dena Meade-Hunter, Robert Rushforth, Bob Torbenson, Betty Walters, Sue Ware, Bob Wilson, and Phyllis Zumwinkel were recognized for 25 years.

In 2015, 1,800 volunteers of all ages and backgrounds contributed an astounding 236,786 hours across the Museum. Whether volunteering in an administrative area, in an exhibit hall, in a lab, or in many other ways, these faithful supporters have a lasting impact on the success of the Museum. Thank you, volunteers!

There's a place for you too at the Museum. Find out more @ dmns.org/join/volunteering.

Below left: Dr. Steve Lee, curator of planetary sciences, with Mark and Donna Dale Turner, members of the Edwin Carter Legacy Society. Below from left: Museum volunteers David Kessel and Don Brandborg look on as two young members enjoy Behind-the-Scenes Night for Giving Club members.





THE REAL REASON TURTLES HAVE SHELLS

By Tyler Lyson, PhD

It is common knowledge that the modern turtle shell is largely used for protection. No other living vertebrate has so drastically altered its body to form such an impenetrable protective structure as the turtle. However, I led an international team of paleontologists to determine the initial function of the broad ribs that make up the proto shell found in the earliest fossil turtles. Our research suggests this modification was initially for burrowing underground, not for protection. Our findings were recently published by *Current Biology*.

Why the turtle shell evolved is a very Dr. Seuss-like question, and the answer seems pretty obvious—it was for protection. But just like the bird feather did not initially evolve for flight, the earliest turtle shell was not for protection but rather for digging underground to escape the harsh South African environment where these early proto turtles lived.

The early evolution of the turtle shell has long puzzled scientists. We knew from both the fossil record and observing how the turtle shell develops in modern turtles that one of the first major changes was the broadening of the ribs. While distinctly broadened ribs may not seem like a significant modification, it has a serious impact on both breathing and speed in quadrupedal animals. Ribs are used to support the body during locomotion and play a crucial role in ventilating the lungs. Distinctly broadened ribs stiffen the torso, which simultaneously interferes with breathing, shortens an animal's stride length, and slows it down.

The integral role of ribs in both locomotion and breathing is

likely why we don't see much variation in the shape of ribs, which are generally pretty boring bones. The ribs of whales, snakes, dinosaurs, humans, and pretty much all other animals look the same. Turtles are the one exception, where they are highly modified to form the majority of the shell.

A big breakthrough came with the discovery of several specimens of the oldest (260-million-year-old) partially shelled proto turtle, *Eunotosaurus africanus*, from the Karoo Basin of South Africa. Some of these specimens were discovered by two of my coauthors, Roger Smith and Bruce Rubidge, from the University of Witwatersrand in Johannesburg. But the most important specimen was found by an 8-year-old South African boy named Kobus Snyman on his father's farm in the Western Cape of South Africa. This specimen, which is about 15 cm long, comprises a well-preserved skeleton together with fully articulated hands and feet.

I'd like to shake Kobus's hand because without him both finding the specimen and taking it to his local museum, the Fransie Pienaar Museum in Prince Albert, the discovery of the real reason turtles initially developed shells would not have been possible.

DISCOVER MORE

Dr. Tyler Lyson is curator of vertebrate paleontology. Find out more about his research @ dmns.org/science/museum-scientists/tyler-lyson. The team's research is published @ www.cell.com/current-biology/home.

Pictured above: This artistic rendering by Andrey Atuchin shows the early proto turtle *Eunotosaurus* burrowing into the banks of a dried up pond to escape the harsh arid environment 260 million years ago in South Africa. A herd of *Bradysaurus* congregates around the remaining muddy water.

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