CATALYST

DENVER MUSEUM OF NATURE & SCIENCE MAGAZINE

JUNE | JULY 2013

INSIDE ///

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Return to the Ice Age. In Mammoths and Mastodons, enormous life-size models, fossil tusks and skulls, touchable teeth, spear points, cave paintings, and interactive displays bring the Ice Age back to life. You will learn the story of Lyuba, the most complete and best preserved baby mammoth ever found, and enjoy a point of pride for Colorado as you relive the discovery of the exceptional Ice Age fossil site unearthed near Snowmass Village.

MAMMOTHS AND MASTODONS
TITANS OF THE ICE AGE

ADVANCE RESERVATIONS RECOMMENDED

DENVER MUSEUM OF NATURE & SCIENCE

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SCFD

This exhibition was created by The Field Museum, Chicago. Illustration by Velizar Simeonovski © The Field Museum.

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Dear Members,

Anticipation is building at the Museum. We are now less than a year away from opening our new wing on the south side of the building! This 126,000-square-foot expansion will continue the Museum's tradition of offering excellent science experiences for our community.

I am honored to announce that the top three floors of the new addition have been named the Morgridge Family Exploration Center. This vibrant name honors our lead donor to this project—the Morgridge Family Foundation—and conveys the many wonderful programs and activities that will serve millions of visitors for generations to come. The Morgridge Family Exploration Center will feature a beautiful glass expanse connecting the Museum and City Park, a second temporary exhibition gallery, a lively atrium space, engaging science studios for 21st-century students, and a brand-new Discovery Zone for early learners.

The Discovery Zone is made possible by a generous gift from Kaiser Permanente. Located on Level 2, this highly experiential area will expose early learners to science through the joy of hands-on play. We are grateful to Kaiser for their ongoing commitment to the Museum.

We feel incredibly fortunate that we have raised 90 percent of the $70 million in funding for this project thanks to Better Denver voters, community leaders and philanthropists, government partners, corporations, and foundations. As members you are already our stalwart supporters, and I am pleased to present a special opportunity for you to leave a lasting mark on our community.

We have launched the new campaign, Inspire Curiosity!, as we continue to fulfill our commitment to ensuring that all Coloradans have access to the wonders of science and nature. With your gift of $500 or above for the new Morgridge Family Exploration Center, you will not only help us fulfill our mission but you will be recognized on a beautiful Nature Art Wall in the new wing. There is more information on the inside back cover of this magazine.

The Museum and the millions of visitors we serve each year feel fortunate and deeply grateful to you, our members, and the many other generous supporters who are making this all possible.

George Sparks
President and CEO

You may contact George Sparks at president@dmns.org.

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ON THE COVER

From the zoology collections

Knobbly sea star
(or horned sea star)
Protoreaster nodosus
ZC.13586
Queensland, Australia
Mid-20th century

Rick Wicker

Catalyst, Issue 17

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catalyst@dmns.org

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AN ELUSIVE KONOVALENKO SCULPTURE


Rick Wicker

The "Konovalenkos" have been a visitor favorite at the Museum for nearly 30 years. Konovalenko: Gem Carvings of Russian Folk Life on Level 3 is the best public display of sculptures by Russian sculptor Vasily Konovalenko found anywhere in the world.

This spring, curator of archaeology Steve Nash and staff photographer Rick Wicker continued their quest to photograph every known Konovalenko sculpture. Thanks to donors Jane Quinette and the Jim and Elaine Wolf Foundation, Steve and Rick traveled to Moscow and received access to 24 sculptures at the Samotsvety, or State Gems Museum, and to three in private collections. Especially unprecedented was their opportunity to photograph two more sculptures in the Gokhran, a highly secure building that serves as the reserves of the Diamond Fund for the Russian Federation and houses some of their most precious gemological assets. One of the pieces at the Gokhran, entitled *Likbez*, has never before been photographed. It is pictured above.

Likbez, known also as *Liquidation of Illiteracy*, is unlike any other Konovalenko sculpture because it depicts four people (more than in other works) engaged in a serious and important task—learning to read. A Red Army officer, who has broken an arm, perhaps in battle during 1917's Russian Revolution, stands over three peasants intently engaged in their lessons. Two have written an *A* in chalk on slate blackboards. The woman in the back has her tongue sticking out the right side of her mouth, indicating intense concentration. The depiction of the furniture is particularly curious. Konovalenko has made it look like the very expensive (and very Russian) Karelian birch furniture that is still held in high-esteem today.

Liquidation of Illiteracy is not whimsical or jolly like most of Konovalenko's other pieces. According to his wife, Anna, it is one of the last pieces he made while working for the Soviet government and before the family emigrated to the United States in 1981. The piece may have been commissioned by the government or it may reflect Konovalenko's general unhappiness or simply the gravitas of the subject and context.

Find out more about Steve's and Rick's amazing trip to Russia and see more photos on Steve's blog @ www.dmns.org/nashlab.

NEW B-CYCLE STATION AT THE MUSEUM

The Museum is now home to a B-cycle rental station. In March, the popular bike-sharing program began rolling out 30 new stations around Denver, including one at the Museum near the main entrance. Since the program was launched in our city in 2010, bicyclers have ridden more than a million miles on B-cycles. Museum members may take advantage of a special offer and receive a 7-day pass for only $14 through August 31. Find out more @ denver.bcycle.com, click JOIN HERE, and use promo code DMNS7DAY.

CONSTRUCTION UPDATE

Work continues on the Morgridge Family Exploration Center, on schedule for a February 2014 opening! The mechanical equipment has been installed in the penthouse and is now covered by a roof. Framing to support the limestone and brick exterior for Levels 1–3 is partially in place, and work has begun on the glass walls of the Science Studios. Meanwhile, below ground on Levels B1 and B2 in the collections preservation areas, the walls are up and being painted, and the equipment to maintain the required temperature and humidity continues to be connected. The next steps on Level B1 are to connect to the electric main feed and the existing steam line. Find out more about this exciting project in a new video posted @ www.dmns.org/futureplans.

SCI-FI FILM SERIES 2013

Now in its third year, the Sci-Fi Film Series has become a summer tradition! The Museum is partnering with the Denver Film Society again to present the popular series.

Every Wednesday, from July 10 to 31, a science fiction film will be screened, followed by a discussion hosted by a Museum scientist and Vincent Piturro, English and film professor at Metropolitan State University of Denver. These post-screening discussions will break down the science behind these alternative possibilities and separate fact from fiction. This year's selections are *Limitless, Jurassic Park 3D, Primer,* and, new this year, a viewer's choice. The locations for the films alternate between Phipps IMAX Theater and the Sie FilmCenter on Colfax.

Cast your vote for the viewer's choice and find out more about the schedule and tickets @ www.dmns.org/scififilmseries.

HEAVENS ABOVE

Earth's only natural satellite, the moon, has often been the object of "first light" for countless telescopes in the four centuries since Galileo first studied the mysterious orb. But you hardly need a telescope to enjoy the moon. If observed even briefly on a regular basis, you will notice its wandering path through the constellations of the zodiac, its relentless progressions of phases, frequent conjunctions with planets and bright stars, an occasional eclipse, or the phenomena of earthshine and intriguing atmospheric effects.

Major features of the moon's surface can be observed by simply looking up at it. The two most distinctive terrains are the lighter colored lunar highlands, known as the lunar *terra*, Latin for "land," and the darker plains called lunar *maria*, Latin for "seas." The highlands consist of countless overlapping craters, the result of impacts by meteors. Most of the craters on the near side are named for famous people in the history of astronomy, such as Tycho, Copernicus, and Ptolemaeus. Features on the far side have more modern references, such as Gagarin, Korolev, and Hertzprung. The maria cover 16 percent of the lunar surface and are the result of ancient lava flows that filled low-lying areas, mostly inside immense impact basins. The so-called likeness of the "man in the moon" is formed from patches of both the terra and the maria.

Find out what's happening in the skies in June and July @ www.dmns.org/heavensabove.

The Museum continually strives to reduce its carbon footprint, no matter the size of the project or opportunity. Going paperless and no longer using paper bags, receipts, and gift wrap in the Museum Shop has several advantages:

- reduces waste sent to landfills
- conserves natural resources
- saves energy by reducing manufacturing and transportation costs
- provides an opportunity to advance our guests' own environmental goals

All financial savings from going paperless goes right back to supporting science education and research at the Museum. In 2012, the Museum Shop recycled one ton of paper, the equivalent of saving 24 mature trees; going paperless will provide an even more significant impact.

Thank you for being part of the solution!

SUMMER OF IMAX

Phipps IMAX Theater reaches its 30th anniversary this summer, so we invite you to create your own film festival as you select from some new films and some returning favorites picked by the public. You will step into the cool darkness of the theater and find yourself swept away on many adventures, taking you from the ocean's darkest depths to the far corners of the universe. The IMAX Theater offers an immersive experience, with a powerful 3D digital projection system, digital surround-sound, and a four-and-a-half-story-tall screen.

BUY THREE, GET ONE FREE

See three IMAX films, get one free! Pick up your punch card at any admissions desk or use the form printed on the next page. Phipps IMAX Theater is open daily. Find showtimes and ticket information @ www.dmns.org/imax.

DEEP SEA 3D

Dive deep and swim with some of the most extraordinary sea creatures way below the ocean surface. Discover the peculiar and amazing behavior of these mysterious and colorful creatures, from the unusual wolf eel to the giant Pacific octopus to the fearsome-looking sand tiger shark. Narrated by Johnny Depp and Kate Winslet, with an original score by Danny Elfman.

FLIGHT OF THE BUTTERFLIES 3D

Scientific adventure. Compelling detective story. Stunning sight to see. In this dazzling film, you will experience the inspiring story of one scientist's passion for studying monarchs and see up close the lifecycle of these beautiful creatures. Get a butterfly's-view of the world as you fly over North America and into Mexico's isolated mountains where you will encounter hundreds of millions of fluttering monarchs.

GALAPAGOS 3D

This vividly immersive trek takes you into the waters surrounding the volcanic archipelago of the Galápagos, made infamous by Charles Darwin's 1835 exploration of the area. Travel alongside marine biologists in this living laboratory where you'll see sea lions, giant tortoises, moray eels, and massive schools of fish. Experience the Galápagos in a way Darwin never could have imagined.

HUBBLE 3D

This gripping story of hope, crushing disappointment, dazzling ingenuity, bravery, and triumph recounts the amazing journey of the Hubble Space Telescope, arguably the most important scientific instrument since Galileo's original telescope and the greatest success in space since the moon landing. This film will change the way you see the universe.

TITANS OF THE ICE AGE 3D

Go back 10,000 years to the otherworldly landscapes of North America, Europe, and Asia as dazzling computer-generated imagery brings this mysterious era and its giant animals to life. Come face-to-face with Ice Age icons, such as saber-toothed cats, dire wolves, and woolly mammoths, as they share the land with early humans who feared and relied upon these majestic beasts.

ROCKY MOUNTAIN EXPRESS 2D

Climb on board a steam train and enjoy breathtaking vistas through the Canadian Rockies as you learn the epic story of the construction of Canada's first transcontinental railway. Presented in 2D with spectacular cinematography, archival photographs, and the powerful energy and rhythms of a steam locomotive, this film will capture the hearts of train enthusiasts and history buffs alike.

IMAX FUN FACTS

- The original Phipps Auditorium opened in 1940 and had a glorious run as a landmark on Denver's cultural map, offering travel films, lectures, Saturday morning nature movies and cartoons for kids, and music concerts.
- Phipps Auditorium opened as an IMAX Theater with the film *To Fly!* on July 1, 1983, 75 years to the day after the Museum opened to the public in 1908.
- Phipps IMAX Theater was the first IMAX screen in Colorado when it opened in 1983.
- The theater received major technological upgrades in 2010, including the addition of a digital 3D projection system.
- Before the IMAX Theater went digital, the film platters weighed upward of 300 pounds and were 51 inches wide, holding up to 60 minutes of film running 24 frames per second.
- An IMAX 3D digital file weighs about two pounds because it is delivered on a hard drive.
- The IMAX screen is painted silver to maximize the amount of light reflected back to the audience.
- Ninety-six different films have been presented in the IMAX Theater in the last 30 years, taking millions of Museum visitors around the universe and back.

Present in person to cashier to be punched for each film purchase. Valid for one person only. Valid May 31 – September 2, 2013. No cash value. Free film cannot be reserved by phone or online. Punch card not applicable toward group rates or combination tickets. Visit www.dmns.org/imax for more information and showtimes.

*Free ticket applies to your next visit. Promo code 34

Member# _____

Name _____

BISON, BEETLES, AND IMMIGRANTS

BY FRANK T. KRELL, PhD

Imagine the Denver metro area 200 years ago: Wide-open plains, few trees, sparse human population, but an enormous number of roaming bison. An estimated 30 to 60 million of these animals dominated and shaped the landscape of the Great Plains, by grazing—and pooping about 10 times a day. Sixty-million bison would have covered more than 7,800 square miles of prairie a year with their excrement, an area 51 times the size of the City and County of Denver. Countless dung beetles broke up the bison patties and mixed this natural fertilizer with the soil. Other invertebrates such as millipedes, termites, and flies also used the dung; in turn, these animals were food sources for a wide variety of birds, reptiles, and mammals. Unfortunately, we have no records of this activity whatsoever.

Photos: Rick Wicker

Two hundred years ago, the scientific study of insects was well-established in Europe. In the 1750s, Swedish physician and biologist Carl Linnaeus had introduced a binominal naming system for plants and animals, giving each species a genus (similar to a family surname) and a species name (similar to a given name). A flood of comparable studies of fauna and flora of Europe and other parts of the world soon followed. Colorado, however, had to wait. Botanist Edwin James began exploring the natural history of our state in 1820, followed by the expeditions of topographic engineer and naturalist John Charles Fremont in the 1840s. The first scarab beetle recorded in Colorado was published in 1853, and the first proper dung beetle (a subgroup of scarabs) in 1858. In 1902, the English-born entomologist Henry Frederick Wickham published the *Catalogue of the Coleoptera of Colorado,* an account of all beetle records known from Colorado up until that time, listing 117 species of scarab beetles. The first catalog of Colorado's beetles was the last. This is the most recent record of Colorado's beetle fauna available, and a reference work dating back over 110 years cries out for an update, particularly for a group of organisms of major ecological and economic relevance.

Two significant events transformed the Great Plains in the 19th and 20th centuries: the nearly complete eradication of the bison, and the introduction of exotic plants and animals, namely grasses and dung beetles that accompanied European settlers and their livestock. In many parts of North America, the descendants of these European immigrants make up more than 90 percent of today's dung beetle populations. Baseline data on the insect fauna before this transformation are missing, preventing us from reliably reconstructing the original fauna and natural history of the massive area between the Mississippi River and Rocky Mountains. We are now facing another major transformation of our environment with a potentially significant climatic change and ongoing habitat degradation. Is the current fauna sufficiently documented to determine the beetles' reaction to this upcoming transformation and to predict potential problems? Not with a beetle catalog dated 1902. Wickham's 117 listed scarab species are just more than a third of the number to be expected in Colorado.

In 2007, I initiated the Colorado Scarab Survey, a statewide collecting program of scarab beetles, based at our Museum. The aim is to produce a book of all Colorado scarabs with keys, illustrations, natural history information, and distribution maps. An important part of the survey is our Bison Beetle Project. We monitor the dung beetle fauna of bison dung at the Bijou Creek property of the Plains Conservation Center, where they introduced a bison herd in 2007.

Among the main results of this study, we expect to determine similarities and differences among the dung beetles of introduced cattle and native bison, and how the dung beetle fauna changes through the seasons and eventually over the years after reintroducing a once most abundant natural resource: bison poop. If the presence of bison in an area results in a recovering, more efficient dung beetle fauna, bison herds may help to maintain soil quality in rangelands. Our work is a long-term study, and questions will not be answered overnight. First results, however, such as a handful of new state records, being species recorded in Colorado for the first time, will be published this year.

You may be familiar with the Museum's long-running Colorado Spider Survey, in which hundreds of people have captured various arachnids and brought them to the Museum. The Scarab Survey is similar, so if you find a June bug or a dung beetle, contact us and contribute to our survey as a citizen-scientist.

Facing page: Frank Krell with a darkling beetle (*Glyptasida sordida*). Above: Dr. Krell runs a light trap to attract insects during a summer field trip at Bijou Creek at the Plains Conservation Center.

FIND IT @ DMNS.ORG

Dr. Frank Krell is curator of entomology in the Zoology Department. Find out more about his research @ www.dmns.org/krell-lab.

If you have questions about the Colorado Scarab Survey or find an interesting beetle, you may send an e-mail to frank.krell@dmns.org.

MARSHOSAURUS FOSSILS

BY JOSEPH SERTICH, PhD

Imagine you are a time-traveling naturalist, sent back 150 million years to today's Dinosaur National Monument in northwestern Colorado to collect information about dinosaurs. From a treetop perch, you observe lumbering herbivorous giants, such as the long-necked sauropod dinosaurs *Diplodocus* and *Camarasaurus*, the plated *Stegosaurus*, and the fleet-footed *Dryosaurus*, cruising along sandy riverbanks that will someday form the rocks of the Late Jurassic Morrison Formation. Suddenly, from the shadows of the forest edge, something catches your eye. It's a medium-size dinosaur, maybe 15 feet long, standing on its hind legs. Its long, narrow skull is lined with blade-like, razor sharp teeth. It pauses in the shadows, sizing up a young *Stegosaurus* for a potential midday snack. From your vantage point you can tell that it is definitely a carnivorous dinosaur, known as a theropod, but it's smaller and more slender than the *Allosaurus* you've been observing all day. It lacks the horns over its nose and eyes that a *Ceratosaurus* carries, but what is it? Could it be? Are you looking at one of the rarest carnivorous dinosaurs of the Late Jurassic, *Marshosaurus*?

Photos: Rick Wicker

Marshosaurus bicentesimus remains one of the least understood Late Jurassic *theropod* dinosaurs, although it was first recognized in 1976 as distinct from the common Morrison carnivores *Allosaurus* and *Ceratosaurus*. The genus, *Marshosaurus*, honors the preeminent 19th-century paleontologist Othniel Charles Marsh, a major player in the great "Bone Wars" of the Gilded Age. The species names, *bicentesimus*, denotes the year of its description, the bicentennial of the United States.

To date, *Marshosaurus* is known from only four fragmentary skeletons, including portions of the skull, pelvis, and vertebral column. These specimens are scattered all over the country at museums like the Natural History Museum of Utah in Salt Lake City and the Carnegie Museum of Natural History in Pittsburgh. However, the specimen housed at our Museum, DMNH 3718, is the most complete ever found.

The Denver *Marshosaurus* has large portions of the skull, including the two upper jaw bones (premaxilla and maxilla), a bone from the top of the snout, the nasal, the jugal (cheekbone), and the back of the skull with the braincase. Select portions of the rest of the skeleton include several vertebrae, bones from the back and neck, and ribs. Altogether, this specimen truly gives paleontologists our best ever glimpse of a *Marshosaurus* and tell us a great deal about its size, shape, and relationship to other dinosaurs.

Though its position in the great family tree of dinosaurs remained mysterious for decades, paleontolgists now believe that *Marshosaurus* was a member of a group of carnivorous theropod dinosaurs known as megalosauroids. This group includes the first dinosaur ever found, *Megalosaurus*, a slightly older beast from the Jurassic of England, along with a variety of other strange carnivores. In fact, based on features of the skeleton, the famous fin-backed, crocodile-snouted *Spinosaurus* and its kin may be an offshoot of this group and closely related to *Marshosaurus*.

Along with the bones of *Marshosaurus* pictured here, an amazing array of other fossils was discovered at the site in Dinosaur National Monument. The remains of at least six other animals made their way back to Denver from the quarry, including an amazing partial skull and skeleton of the small, two-legged herbivore *Dryosaurus*, parts of the iconic dinosaur *Stegosaurus*, and pieces of an ancient crocodile. In addition to the truly unique specimen of *Marshosaurus*, these specimens provide a singular glimpse into the 150-million-year-old ecosystem of the Morrison Formation.

Nearly all fossils collected from Dinosaur National Monument during the modern era are property of the National Park Service and reside in the visitor center's collection. So how did dinosaurs from the monument end up in our collection? The Museum's *Marshosaurus* was discovered on a piece of land within the monument designated as a "school section," meaning that the land had been set aside for the maintenance of public schools before the monument was established. Rather than being controlled by the Park Service, the land was managed by the Colorado State Historical and Preservation Office, which dictated that the specimen should be sent to a Colorado repository, our Museum! Collected in 1991, the specimen was cleaned onsite in our prep lab, a process that took nearly 18 years of periodic work to complete.

Now housed among the Museum's many other amazing dinosaurs fossils in the paleontology collections, our *Marshosaurus* has become the focus of many research projects. Like the mysterious creature you spotted among the trees, it is just a matter of time before it emerges from the shadows of its more famous Jurassic relatives.

SEE IT

The *Marshosaurus* fossils are temporarily on display in the Schlessman Family Earth Sciences Laboratory at the end of Prehistoric Journey on Level 3.

Facing page: An assortment of bones from *Marshosaurus*.
Above: The dinosaur's upper jaw bone with some teeth still intact.

FIND IT @ DMNS.ORG

Dr. Joe Sertich is curator of vertebrate paleontology. Find out more about his research @ www.dmns.org/science museum-scientists/joseph-sertich.

ENJOY SPECIAL BENEFITS FOR THE WHOLE FAMILY!

Upgrade your membership today to the Giving Club and experience exclusive events and perks for your family, including this summer's IMAX Night! Membership in the Giving Club provides unique access to the Museum, allowing you to receive new opportunities for discovery and learning, while providing critical support for the Museum.

IMAX Night: All Giving Club members are invited to a special night in Phipps IMAX Theater on Thursday, June 6. Bring the whole family and go to the movies, IMAX style! Enjoy complimentary movie munchies and soft drinks.

"Anytime" Tickets: All Giving Club members receive free "anytime" tickets to all surcharged exhibitions, including MythBusters: The Explosive Exhibition, coming this fall, and Maya: Hidden Worlds Revealed, opening in early 2014. This benefit guarantees quick and easy access to temporary exhibitions, making your visit even more convenient. No reservations needed, even if it's sold out! The number of tickets you receive is determined by your membership level.

Behind-the-Scenes Bonus: On Wednesday, October 23, Giving Club members will be treated to an exclusive Behind-the-Scenes Night. This free event will offer unique opportunities to meet Museum scientists, explore treasures and collections not on public display, and enjoy a buffet and cash bar.

Membership in the Giving Club starts at $300. Find out more about Giving Club levels and benefits @ www.dmns.org/join/giving-club.

EDWIN CARTER LEGACY SOCIETY LUNCHEON

Members of the Edwin Carter Legacy Society were honored at an annual luncheon on April 25 with a special showing of the IMAX film *Flight of the Butterflies 3D* and lunch with Nicole Garneau, curator of human health. Legacy Society members receive special invitations to events throughout the year and recognition in the Museum's annual report.

The Edwin Carter Legacy Society honors individuals who have made a gift through their estate plan to provide a long-term financial resource for the Museum's mission to promote the study, understanding, and enjoyment of the universe, nature, science, and human cultures. The society is named for naturalist Edwin Carter, whose collection of Colorado fauna was the nucleus for the Museum when it was established in 1900.

"My decision to include a bequest to the Museum in my estate plan was an easy one to make because I wholeheartedly support its mission," said Peg McKechnie, a member of the Legacy Society. "Beginning with my first involvement as a Galaxy Guide when Space Odyssey opened in 2003 to my volunteer work today as a team leader for temporary exhibits, I continue to grow and learn and delight in sharing the knowledge I have gained. The Museum is one of the treasures of Denver, and we need to be sure it will always be available to 'inspire curiosity and excite minds of all ages.'"

Legacy Society donors may designate a planned gift to the Museum through bequests, life income gifts, trusts, insurance policies, IRAs, or other gift arrangements. These future gifts either become part of the DMNS Foundation that provides oversight of the Museum's endowment as an essential long-term financial resource, or they may go directly to the Museum to support daily operations.

Find out more by e-mailing legacy.gifts@dmns.org.

Above: June and Jim Englehorn are longtime supporters of the Museum and have made a lasting commitment through the Edwin Carter Legacy Society. He has been a volunteer in the Earth Sciences Department for 26 years.

SUMMER FUN FOR YOUNG PROFESSIONALS

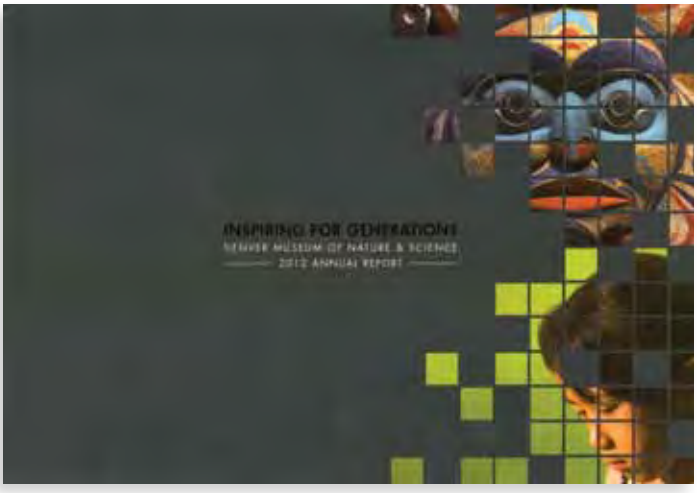
Back by popular demand! The second annual Science on Tap, a special event for the Museum's Young Professionals, is set for Monday, July 22, from 6 to 9 p.m. at Denver Beer Company. Mix and mingle with other YPs while learning about the science and history of craft brewing in Colorado. The guest scientist for the evening will be Dr. Nicole Garneau, curator of human health. Denver Beer Company will create a signature beer just for the occasion.

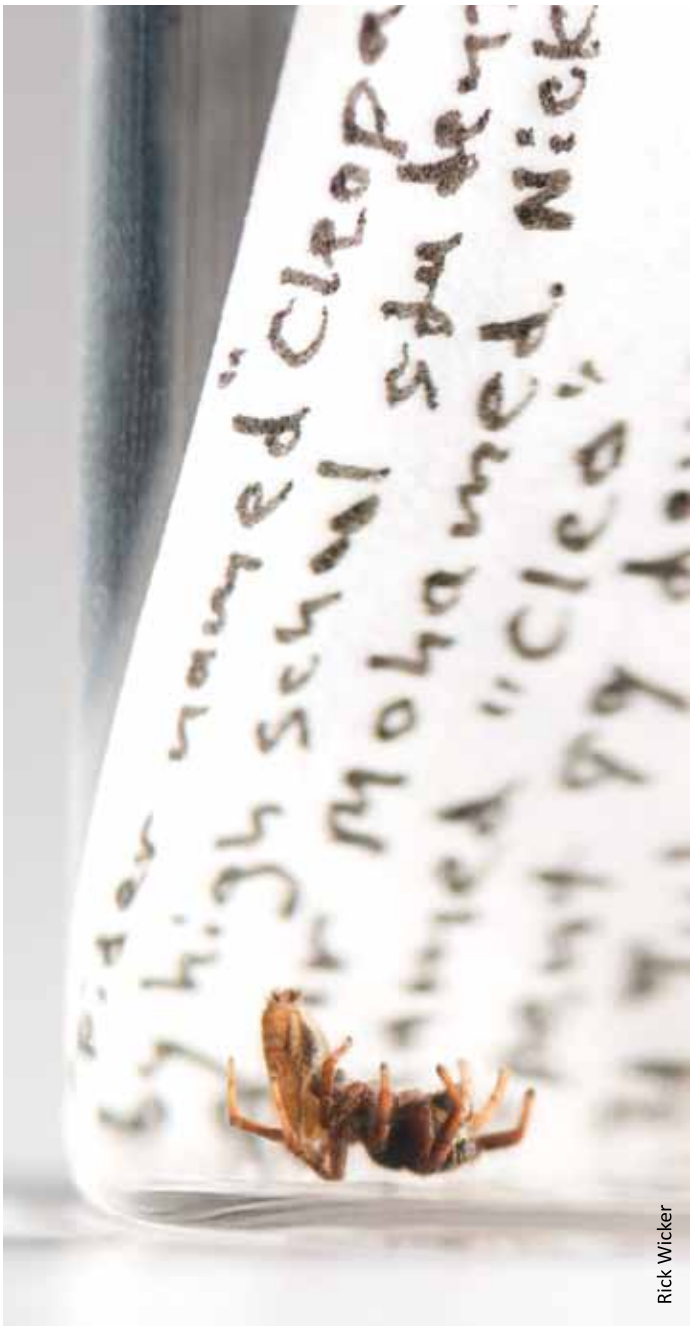
The Young Professionals are a group of leaders who not only support the mission of the Museum but also receive a full year of benefits designed specifically for them.

Join today to gain access to Science on Tap and many other benefits of being a Museum YP member. Find out more @ www.dmns.org/join/young-professional-membership.

DID YOU KNOW?

You helped make 2012 an amazing year. Memberships provided more than $4.1 million in income, representing 8 percent of our operating budget. The Museum served 1.3 million visitors in 2012, including more than 338,000 students and teachers who received free admission and scholarships for programs. Find out more in the 2012 Annual Report @ www.dmns.org/annualreport. Thank you for your support.





JUMPING WEIGHTLESS

BY PAULA E. CUSHING, PhD, AND STEFANIE COUNTRYMAN

"C'mon baby, come to mama. You want to fly to space, don't you?" said Stefanie Countryman of BioServe Space Technologies in Boulder, as she stood on a patio table to capture a zebra jumping spider crawling on the wall of her house.

In 2012, Egyptian high school student, Amr Mohamed, won a contest sponsored by YouTube proposing that the zebra jumping spider, *Salticus scenicus* (family Salticidae), be sent to the International Space Station (ISS) to test its ability to alter its prey-capture behavior in the near-zero gravity environment of space. BioServe Space Technologies specializes in designing, building, and flying hardware that accommodates life-science experiments on the ISS and was responsible for transforming the jumping spider idea into an actual space experiment.

On July 21, 2012, Japan launched a robotic cargo ship called HTV-3 to the ISS. The ship arrived six days later, and the astronauts unloaded its cargo, including habitats housing the zebra jumping spider and a Johnson jumping spider, *Phidippus johnsoni*. Amr Mohamed had named the zebra jumper Cleopatra, Cleo for short, and he named the Johnson jumping spider Nefertiti, or Neffi. Both spiders were provided with water and fruit flies, and both survived on the ISS for the duration of their 99-day flight. They also learned to capture their live prey in the near-zero gravity of the ISS by lunging rather than jumping on the flies. While on the ISS, these arachnonauts traveled over 41 million miles and circled Earth 1,584 times, making them the world's most well-traveled spiders.

The astronaut who tended the spiders during their time on the ISS, Sunita Williams, became quite fond of her eight-legged traveling companions. Sunita carefully loaded Cleo and Neffi onto the CRS-1 Dragon capsule on October 28, 2012, for their return to Earth. Unfortunately, Cleo died during the return flight. BioServe generously donated Cleo's body, her habitat, and a "Bon voyage, Cleo" note signed by all three ISS astronauts to the Museum for our arachnology and scientific instruments collections.

Neffi survived the return trip to Earth. Stefanie retrieved her and, within a day or two of being back in Earth's atmosphere, provided the spider with fresh fruit flies and filmed her prey-capture behavior. In the video, one fly flew directly to the spider, which she was able to grab successfully. In her second prey-capture attempt, Neffi, perched on the back wall of the habitat, focused on a fly walking on the floor in front of her. She oriented toward the fly, then suddenly leapt at it. But she overshot her mark, hit the opposite wall of the habitat, fell down on her back, clambered back up, and leapt again. She tried to jump on flies three more times and failed. Stefanie reported that it took the spider about 24 hours to reacclimatize to Earth's atmosphere and begin successful prey-capture jumps again.

Neffi was hand-carried to the Insect Zoo at the National Museum of Natural History at the Smithsonian by our former chief curator, Kirk Johnson. Unfortunately, Neffi died within two weeks of arriving at her new home. Her body is deposited in the Smithsonian arachnology collection.

SEE IT

Cleo (pictured left), her habitat, and her special message from the astronauts are on display in a case in the lobby of Gates Planetarium. You will also see another "arachnonaut" from a previous mission.

FIND IT @ DMNS.ORG

Dr. Paula Cushing is curator of invertebrate zoology and leader of the Colorado Spider Survey. Find out more @ www.dmns.org/science/museum-scientists/paula-cushing.

Stefanie Countryman is BioServe's business development manager and K–12 education program director. She and Paula collaborated on a space spider project in 2008 as well.

See more photos on the digital version of *Catalyst* @ www.dmns.org/catalyst.

INSPIRE CURIOSITY!

Become a lasting part of the new Morgridge Family Exploration Center and help excite and inspire generations to come. Compose a special message to honor family or cherished friends … remember a loved one … celebrate your children or grandchildren … recognize your business or an important milestone.

YOUR LASTING TRIBUTE.

For $500 or $1,000 we invite you to personalize a leaf that will be displayed on a new Nature Art Wall on the second-floor entryway to the new wing, home to a brand-new Discovery Zone for young children, a second temporary exhibition gallery, and engaging science studios for 21st-century learners.

BE AN INSPIRATION. GIVE TODAY.

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Your support will help ensure that generations of Coloradans will view the world with a sense of awe, renewed respect for science, and fully energized curiosity.

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DENVER MUSEUM OF
NATURE&SCIENCE
2001 Colorado Boulevard
Denver, Colorado 80205-5798

MEMBERS-ONLY OPEN HOUSES

Thursday, June 27 • 6–9 p.m. or
Thursday, July 25 • 6–9 p.m.

Enjoy this FREE exclusive evening for families and adults as you help us celebrate the **10th anniversary of Space Odyssey!**

- Explore all your favorite **experiments and demos in Space Odyssey.**
- Catch mini **presentations by space scientists** and educators.
- Take in the **best view of Denver** from the Anschutz Family Sky Terrace.
- Check out the **skies through telescopes** (weather permitting).
- Experience the wonders of the cosmos in **Gates Planetarium.**
- Enjoy hands-on **space-themed** activities.
- See **Mr. Bones,** the walking dinosaur.
- Stroll through our **award-winning exhibitions** at night—the entire Museum will be open!

This evening is FREE for members, with an optional prepurchased dinner of baked penne pasta, fresh garden salad, garlic bread, punch, and cookies. Dinner price: $9 adult or junior member, $6 child member (ages 3–12).*

ADVANCE RESERVATIONS REQUIRED FOR EVENT AND DINNER at 303.370.6000 (daily, 9–5) or at www.dmns.org/memberevents. Reservations to enter the Museum will be timed at 6:00, 6:15, 6:30, 6:45, 7:00, 7:15, 7:30, and 7:45 p.m. Dinner reservations due one week prior to each event.

*Limited seating for dinner served until 8 p.m. No walk-up tickets will be available. For this evening only, members may bring a guest at a special price of $5 for admission, or dinner and admission for $14.

Please bring your membership card and photo ID for admission to the event. The sky terrace will be open weather permitting. IMAX will not be open this evening.