

ACADEMY

FRONTIERS

INSIDE:
Animal Locomotion



The member magazine of the
Academy of Natural Sciences
of Drexel University

SUMMER 2016

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ON THE COVER: *Our beautiful northern diamondback terrapins reside in Outside In, our children's discovery center. Meet our two adult females, Cheerio and Squirtle, and our male, Clem. Clem and Squirtle's babies will be in Outside In until they are old enough to be released into the wild. Photo by Mike Servedio/ANS*



Katie Clark/ANS

Dear Friends,

With the recent events unfolding in Flint, Michigan, we can't help but think about the health of the water that we rely upon every day. For more than 70 years, the Academy has sought to evaluate and protect our rivers, streams, and water supply. We are currently collaborating with the Delaware River Watershed Initiative, a multi-year project sponsored by the William Penn Foundation, to ensure water quality for 15 million people who rely on the Delaware for their drinking water. With our partners, we are working to restore degraded areas, protect undamaged areas, and monitor watershed health.

In early April, four Drexel professors received funds to study ecosystems within the watershed thanks to a \$200,000 grant administered by the Academy with financial resources provided by the William Penn Foundation. These professors' work will complement the work of the Initiative by focusing on studying drinking water contamination, capturing runoff by designing community gardens and wetlands in vacant lots, and evaluating future use and function of our valuable watershed.

Two May events explored the effects of water quality in our local community and ecosystems. A May 3 Town Square delved into the City of Philadelphia's management of lead risk in drinking water. Panelists discussed our city's protection of streams, rivers, reservoirs, and groundwater. In mid-May, we welcomed actor and water quality activist Mark Ruffalo for a full day of Academy events in support of the Delaware River Watershed Initiative. Ruffalo joined our field crew and four students from the Academy's Women In Natural Sciences program to collect insects, measure water temperature and chemical properties, and collect algae for later testing (more on page 6). Later that day he participated in a group discussion with representatives of the Delaware River Watershed Initiative and rallied an audience of water quality advocates in the Academy's auditorium.

Your gift to the Academy helps us to continue our important work to ensure the health of local ecosystems and protect drinking water for our community. I am grateful for your continued efforts to strengthen our scientific enterprise. Thank you to those of you who donated to our 2015–2016 Annual Fund. We could not do what we do without your generous support.

All the best,



George W. Gephart, Jr.
President and CEO

FOUNDED IN 1812, the Academy of Natural Sciences of Drexel University is a leading natural history museum dedicated to advancing research, education, and public engagement in biodiversity and environmental science.

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From radiant blue to fiery red, living frogs around the world offer a glimpse of the vast palette of frog diversity. Frogs are found on nearly every environment on Earth, and they have strange, shocking, and interesting survival strategies. In our next special exhibit, Frogs: A Chorus of Colors (open February 4, 2017), you can check out live frogs of many hues, listen to their colorful chorus, and admire the many ways they swim, hop, glide, and soar. Hop into a frog's world as you inspect frog habitats complete with rock ledges, live plants, and waterfalls. See live frogs in action, search for hidden frogs, create a nighttime frog chorus, spin a zoetrope to see how a frog jumps, and conduct a virtual frog dissection.



Dinosaurs Unearthed

SPECIAL EXHIBITS GALLERY
OPEN THROUGH JANUARY 16, 2017



Back by popular demand—roaring, moving, life-size animatronic dinosaurs invade the Academy of Natural Sciences of Drexel University for a multi-sensory experience for the whole family. State-of-the-art and scientifically accurate—down to the feathers on *T. rex*—*Dinosaurs Unearthed* features more than a dozen realistic, full-bodied dinosaurs, as well as skeletons, fossil casts of skulls, claws, and horns, real specimens of mosasaur and *Spinosaurus* teeth, an *Oviraptor* egg, and the ever-popular coprolite (dino poop). Visitors will experience brand-new interactives, such as a multi-touch table and a scale that tells you how you measure up to different dinosaurs. A Dino Detective touch-screen quiz, chances to control dinosaur movements, and other activities encourage exciting hands-on exploration.

Dinosaurs Unearthed is supported by Buckley & Company, The PFM Group, Santander Bank, and Veritable, LP.

NEW ARTIST

Drawn to Dinosaurs

ART OF SCIENCE GALLERY
OPEN NOW

Drawn to Dinosaurs delves into the science and art of visualizing a living animal based on fragmentary fossils. This intimate exhibit illustrates what scientists can deduce from the fossil record when creating a reconstruction of a skeleton or model and what they must look to artists to interpret. The centerpiece is a full cast of the plant-eating dinosaur *Hadrosaurus foulkii*, discovered in 1858 in Haddonfield, NJ. The Academy created a full cast of this duck-billed dinosaur and put it on display in 1868, becoming the first place in the world where the public could go to see a dinosaur. In March 2016, artist David Zinn offered his own interpretation of *Hadrosaurus foulkii*. Check out the time-lapse video at ansp.org/drawntodinos.



Mike Servidio/ANS



Lauren Duguid/ANS

Presidential Archives: Letters, Hair, and Fossils

ACADEMY LOBBY
OPEN THROUGH JULY 29, 2016

With the Democratic National Convention in Philadelphia, the Academy dug deeply into its collections to showcase some highlights of the museum's connections to presidents—of all political parties—in its 204-year history. This intimate exhibition features unexpected personal items, including albums containing locks of hair from early commanders in chief, Thomas Jefferson's mastodon fossils, revealing correspondence, and other fascinating items that span science and politics.

DINO-MITTEE



SUMMER

MONDAYS
2:30 AT THE T. REX
JULY 11-AUGUST 29
2:30 p.m.
Meet a live dinosaur relative at the *T. rex* and learn how dinosaurs still live among us.



TUESDAYS
REPTILE CART
JULY 5-AUGUST 30
All Day
Use cutting-edge technology to explore the worlds of live snakes, turtles, and lizards at this interactive cart.



WEDNESDAYS
SCIENCE NOW: PALEO EDITION
JULY 6-AUGUST 31
10 a.m.-2 p.m.
We learn more about dinosaurs every day! Come talk about the latest dino discoveries.



THURSDAYS
STORIES WITH MARTY
JULY 7-SEPTEMBER 1
1 p.m.
Join the famously hilarious Marty the Moose and his favorite humans to hear a special dinosaur story and meet a live animal.



FRIDAYS
DINOSAUR HALL TOURS
JULY 8-SEPTEMBER 2
Every Friday at 2 p.m.
Meet under the *T. rex* for ultra-cool dinosaur tours. Bring your most pressing dino questions!



SATURDAYS
DINOSAUR BRICK CLUB "LEGO MY DINO"
JULY 9-AUGUST 27
10 a.m.-1 p.m.
Hang out with fellow LEGO-lovers and build dino-inspired creations.



SATURDAYS
DINOSAUR HALL TOURS
JULY 9-AUGUST 27
Every Saturday at noon, 2, and 4 p.m.
Meet under the *T. rex* for ultra-cool dinosaur tours. Bring your most pressing dino questions!



SUNDAYS
REPTILE CART
JULY 10-AUGUST 28
All Day
Use cutting-edge technology to explore the worlds of live snakes, turtles, and lizards at this interactive cart.



SUNDAYS
DINOSAUR MAKE-AND-TAKES
JULY 10-AUGUST 28
1-5 p.m.
Dig deep and get your hands dirty! Wrap a fossil or make a mini-dig to take home.
*Free with admission to *Dinosaurs Unearthed*



THE HULK IN GAITERS

By Mike Servedio

DURING MY TIME WORKING IN THE COMMUNICATIONS DEPARTMENT AT THE ACADEMY, I'VE HAD A LOT OF INTRIGUING ASSIGNMENTS—taking pictures of specimens behind the scenes, getting close to live animals, and venturing into the field with our scientists, just to name a few. But standing in shin-deep stream water with actor Mark Ruffalo, probably most famous for his portrayal of the Hulk in the 2012 blockbuster “The Avengers,” is high on my list of interesting assignments.

After having spent nearly an hour with the famous actor in Northeast Philadelphia’s Tookany Creek, I can definitely tell you he is more Bruce Banner than Incredible Hulk. Ruffalo visited the creek and spent time with members of the Academy’s Delaware River Watershed Initiative (DRWI), a massive multi-year initiative funded by the William Penn Foundation to protect and restore critical sources of drinking water in the Delaware River Basin. The actor and activist also worked alongside Philadelphia public high school students from the Academy’s Women In Natural Sciences program and streamkeepers from the Tookany/Tacony-Frankford Watershed Partnership. He was engaged from the start, joking with staff as he donned gaiters and asked questions about the team’s tools and research methods.

Academy Senior Director of Environmental Initiatives Roland Wall said, “Mark is a strong activist on water quality issues, and we’re so thrilled that he took the time and got into the creek with our staff and demonstrated how important this issue is.”

Ruffalo is founder of Water Defense, an organization with the mission to “use technology and public engagement to inform people about what is in their water, hold water polluters accountable, and keep our waterways and drinking water sources free from contamination and industrial degradation.” He is especially interested in our local watershed, as he owns a home on the Upper Delaware.

If you peruse Ruffalo’s social media accounts, you will be more likely to find links to articles on the impacts of natural gas drilling and the water crisis in Flint, Michigan, than you will be to discover Hollywood gossip or movie reviews. At an event later in the day at the Academy, Ruffalo passionately called for more people to unite and discuss water quality issues. Like many of the water quality advocates the actor met during his visit, I was inspired by Ruffalo’s passion and his ability to use his celebrity in support of one of today’s most pressing environmental challenges. ∞



Mike Servedio/ANS





Jeff Fusco for ANS

CAITLIN HALLIGAN: THE AMBASSADORS' AMBASSADOR

CAITLIN HALLIGAN IS DRAWN TO “PROBLEM STUDENTS.” She doesn’t mind the ones that are too chatty, and she is patient when others make a mess. She especially likes the pupils that are just plain grumpy.

Lots of teachers help their students stop passing notes, cutting class, and bullying their classmates. Halligan’s job is a little different. In addition to soothing her students’ occasional bad moods, she’s also helping address behaviors such as showing off onstage and even biting. She certainly has her hands full as training and enrichment keeper for the Academy’s live animals.

Romeo the crow was the perfect challenge. From the day he arrived at the Academy, Romeo just didn’t like Halligan. When she was around, he was irritable, unfriendly, and even a bit threatening. Understandably frustrated, Halligan turned to fellow behavioral specialists for advice and began troubleshooting to build a rapport with Romeo.

“I love learning to communicate with animals based on their behaviors,” she says. “It’s like a puzzle, and you have to figure out what patterns might cause problem behaviors.”

First, the pair worked on relationship building. Halligan sat quietly in Romeo’s enclosure until he began to trust her. She soon noticed that he picked up on her moods, both good and bad, and he adjusted his own behavior accordingly. With this added awareness, Halligan made a breakthrough with Romeo. He now says “good boy” on command and even mimics her sounds with his mouth.

Over the years, Halligan has befriended most of the Academy’s live animals. From birds to bunnies and turtles to snakes, she works to keep the animals content so that they train and perform well with the Academy’s educators.

Halligan’s interest in animal behavior developed while she worked in a primate lab at Franklin and Marshall College. During a summer internship at Zoo New England, she focused solely

on animal enrichment and brought back much of what she had learned to her undergraduate lab. She even volunteered for two summers in Holland at a primate and exotic mammal sanctuary, where she worked with a team to build enrichment activities for all of the animals.

Halligan maintains a 12-month calendar of enrichment activities for our animal groups to help our keepers and volunteers take care of them. She knows the vultures like to tear apart boxes, the barn owl prefers to stomp through white paper, and the armadillos enjoy pushing debris into their houses. The bunnies like to pull greens off a clothesline, and the midland rat snake is content when curled up in damp Spanish moss. Barton the porcupine is happiest relaxing with a teddy bear or pillow after a meal of fruits and veggies dangling from a branch.

In addition to redirecting unwanted behavior and enriching animals’ daily routines, Halligan also trains animals to perform positive behaviors so they can appear as the Academy’s live animal ambassadors. She is delighted to share our animals’ best qualities and quirks onstage. She hopes that her live animal shows inspire visitors’ curiosity, love, and respect for the animals and encourage questions about protecting animals in the wild.

“This is a perfect dream position because I get to work with enrichment as well as teaching,” Halligan says. “I am proud of the animals I work with, and I want to show them off!”

~Mary Alice Hartsock

Teenagers 13–16 can get to know Halligan and some of our animals even better during Academy Animal Husbandry Camp on August 8–12. During this brand-new camp, participants will meet live animals, learn about handling and care, attend a wildlife rehabilitation field trip, and work with Academy staff to help prepare a naturalist presentation for Academy guests. Learn more at ansp.org.

ANIMAL LOCOMOTION

With the return of roaring, moving dinosaurs to the Academy's Special Exhibits Gallery, you might be wondering how we know what we know about dinosaur movement. To answer this seemingly simple question, we must consider the complex ways that animal locomotion has changed over time.

Many backboned animals alive today are quite different from the animals from which they evolved, yet they still share many features with their ancestors. Over generations, populations of living things have changed and adapted to their surroundings, applying the most useful attributes of their predecessors and relatives and leaving behind the less useful traits.

Below, Academy Dinosaur Hall Coordinator and paleo-artist Jason Poole demonstrates through illustrations how the movements of backboned animals, including dinosaurs, have developed and adapted over time. From fish in and out of water to reptiles, *T. rex*, and mammals of the land and sea, animals across time have been making the most of what they inherited as they strive to survive in their surroundings.

OUR CAST

The characters that we've chosen to focus on epitomize various inherited motions that evolved over tens of millions of years. Evolution is a branching process that generates diversity, creating a tree of related species that often share distant common ancestors. These species may not be direct descendants of each other, yet their methods of locomotion demonstrate their shared ancestry.

FISH

Our story begins and ends in the water, home to all life billions of years ago. Originating about 530 million years ago during the Cambrian explosion, primitive fish were the earliest vertebrates. Over time, they have developed useful methods of locomotion to propel themselves through the water.

If you've ever watched fish swim, you have probably seen them use an undulating motion, with their whole bodies or parts of their bodies moving rhythmically from side to side. Some fish combine this undulating motion with an oscillating movement of their fins, waving them back and forth at regular intervals. These motions work in cooperation with their long, narrow shape, allowing fish to save energy as they cut through the water.





TIKTAALIK ROSEAE

At least 365 million years ago during the Devonian Era, some creatures began to spend time on land. These animals used the side-to-side body motion seen in fish as they developed features necessary for terrestrial life. Leading up to the first land animals is Tiktaalik roseae, a 375-million-year-old lobe-finned fish discovered by a team of scientists including Academy paleontologist Ted Daeschler. Tiktaalik looks like a cross between primitive fish and the first four-legged animals (tetrapods). With scales, a flat head, a neck, and fins that enclosed a shoulder, elbow, and wrist, Tiktaalik is the first creature in the fossil record to show some of the specialized features that we see in amphibians.

Unlike fish fins, Tiktaalik's fins supported its body as it moved around in shallow streams, ponds, and mudflats, possibly in an effort to avoid large predators living in deeper waters. Tiktaalik had a sprawled posture, with its fin-legs projecting down and to the sides. Its body undulated in a fish-like, side-to-side motion, but it had developed limbs to carry this movement onto land. Eventually, this motion would be passed on to lizards, snakes, crocodiles, and other tetrapods.

REPTILES

With the transition of fish relatives onto land, vertebrates brought the side-to-side motion common in the water to terrestrial living. Reptiles such as crocodiles and alligators, for example, move themselves through water by undulating their tails from side to side. Their undulating spines coordinate the movements of the four legs propelling them on land. Like many reptiles, they also walk in a sprawled posture similar to Tiktaalik's.

DINOSAURS

Today's scientists and engineers use computer models to better understand dinosaur movements. These models look closely at dinosaur anatomy alongside the motions of live creatures to recreate the way dinosaurs may have moved. Even with plentiful skeletal fossils, dinosaur trackways (sets of footprints), and advanced computer modeling, scientists still have questions about dinosaur anatomy and movement. Still, we can begin to imagine what it might have been like to walk among the dinosaurs.

Dinosaurs are descendants of the sprawling Archosaurs, a group that includes ancestors of crocodiles. These animals moved with their legs under their bodies to save energy. With their back legs under their bodies, some dinosaurs'

front "hands" were free for digging, grasping, catching prey, and eating. Dinosaurs maintained a wave-like motion in their movements, but instead of the smooth side-to-side wiggle often seen in fish, dinosaurs integrated up and down motions into their walking and running gaits.

One area where the fish-like, side-to-side motion did appear was in dinosaurs' tails. Scientists know that tail motion was restricted laterally because they have identified ossified (strengthened) tendons that prevented up and down movement. Hadrosaurs, Stegosaurs, and even the famous T. rex waved their tails from side to side, which may have supported and balanced their movement.





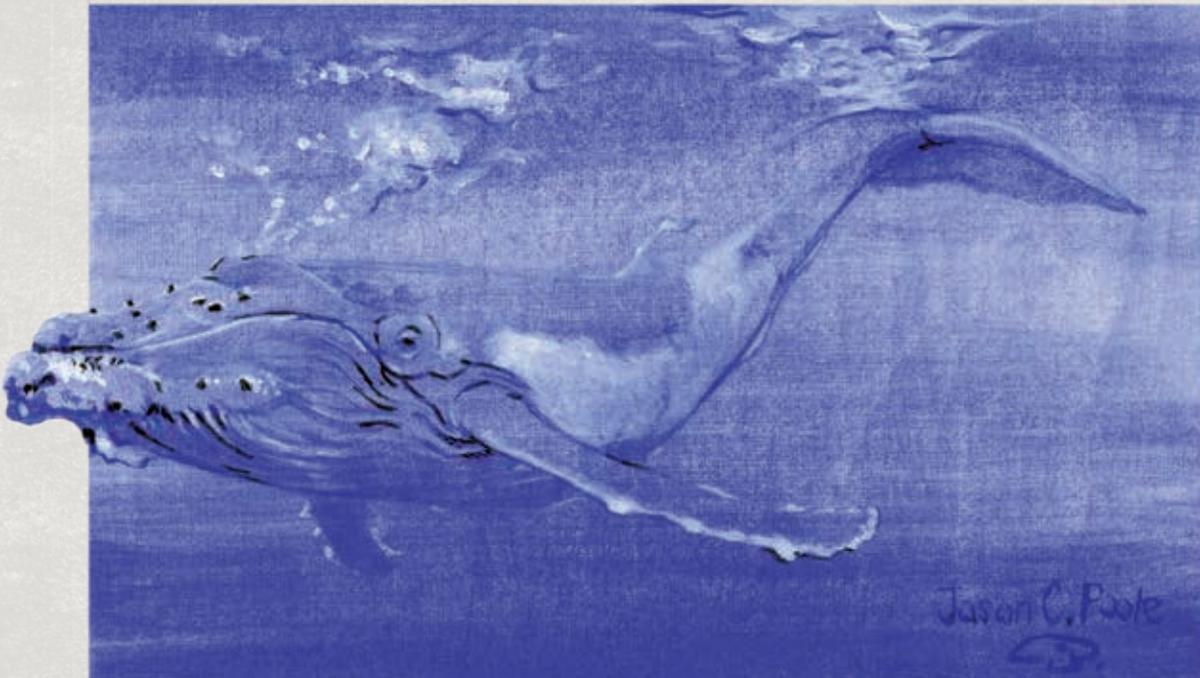
MAMMALS

Just as dinosaurs benefited from moving their legs underneath their bodies, land mammals living long after the dinosaurs continued to perfect this motion. If you watch your pet dog or a zoo mammal move, you can see that their hips swing forward as they take a step. This swinging allows their hind feet to move in their intended direction before they hit the ground.

Over time, mammals' spines developed an up-and-down bowing motion that enabled them to experiment with a wide range of directional motion in their backs. This additional flexibility in

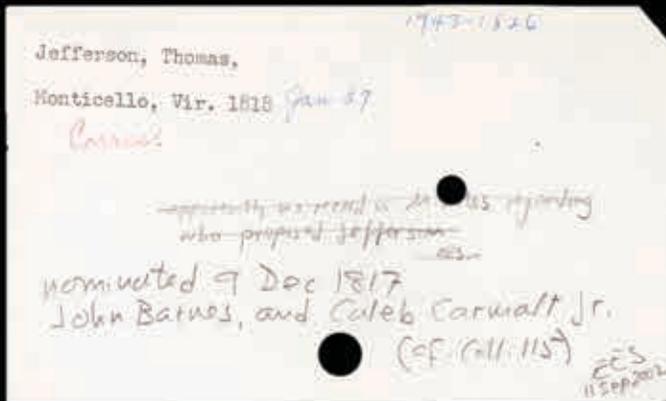
their spines allows animals that walk on all fours to attain faster bursts of speed to capture or avoid prey.

A lineage of hooved mammals that shared similarities with today's hippopotami took this inherited up-and-down spinal motion of four-legged land mammals back into the water. Modern whales are relatives of these creatures. If you watch a YouTube video of whales moving through water, you can see that their backs bow up and down as their streamlined bodies glide through the water.



FAMOUS MEMBERS MAKE THEIR MARKS

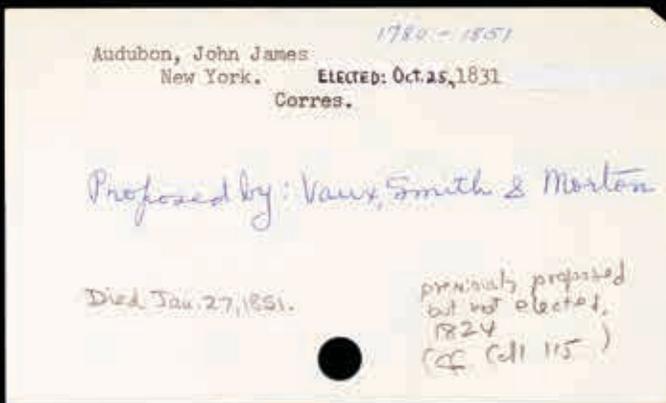
Since our founding in 1812, the Academy of Natural Sciences has served as a forum for scientific discovery. The contributions of great scientists and members during the Academy's early days made today's scientific breakthroughs possible. From Thomas Jefferson to John James Audubon and Marie Curie, the Academy's early members were explorers, reformers, artists, presidents, soldiers, and scientists. Below, Academy Archivist Jennifer Vess shares a selection of membership cards that elegantly document these famous individuals' ties to Academy history.



THOMAS JEFFERSON

DATE OF MEMBERSHIP: January 27, 1818

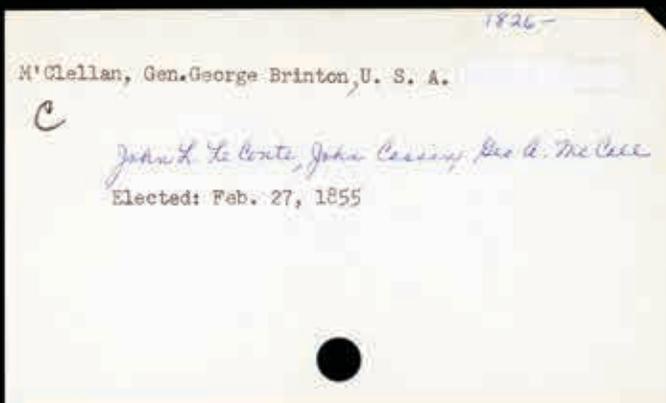
Thomas Jefferson was the first U.S. President to become a member of the Academy, just six years after our founding. Jefferson's interest in archaeology and paleontology fit well with the pursuits of Academy members. His collection is housed in the Academy's Vertebrate Paleontology Department and includes fossils of the American mastodon, giant ground sloth, and woolly mammoth.



JOHN JAMES AUDUBON

DATE OF MEMBERSHIP: October 25, 1831

John James Audubon's acceptance into Academy membership was dramatic. When Audubon's name was first put forward for membership in 1824, he was black-balled. Literally. Members of the Academy voted on the new prospects with a ballot box and white and black marbles. A black marble meant no. Audubon rubbed some people the wrong way, particularly George Ord, then president of the Academy. When Audubon's name came up for membership again in 1831, with 18 other members officially sponsoring his application, he was accepted.



GEORGE B. MCCLELLAN

DATE OF MEMBERSHIP: February 27, 1855

George McClellan is probably best known for his service during the Civil War as one of the generals who led the Union army. He also ran as the Democratic Party nominee for president in 1864. McClellan became an Academy member in 1855. During that time, he served as a soldier, conducted surveys of the west, and worked with the railroads.

Darwin, Charles Robert
 Down, Eng. 1860, ^{elected} Mar 27
 Born Feb. 12, 1809
 Died 1882, Apr. 19th
 Proposed 17 Feb 1860 (at mtg 7 28 Feb)
 Isaac Lea + Joseph Leidy.
 -Soc Coll. 115, v. 2, p. 93. 205

CHARLES DARWIN

DATE OF MEMBERSHIP: March 27, 1860

Many Academy members were intrigued by Charles Darwin's *On the Origin of Species*. The book was published in November of 1859 and Joseph Leidy was so impressed that he wrote to Darwin almost immediately after reading it. Darwin wrote back just as quickly, in March of 1860, the same month he was confirmed as an Academy member. We still have that letter in our archives collection as well as a first-edition of *On the Origin of Species*.

MEMBER Grant, Gen. Ulysses Simpson,
 ADDRESS 1822-1885
 Degr p. 38
 PROPOSED BY Moses Cassin & Leidy
 ELECTED July 25, 1865
 DIED, RESIGNED OR DROPPED July 23, 1885 aged 63 yrs
 Exempt July 25, 1865

ULYSSES S. GRANT

DATE OF MEMBERSHIP: July 25, 1865

Ulysses Grant's membership with the Academy was more honorary than active. He never sought out the Academy, nor did he participate in activities or science. Instead, like modern universities' honorary degrees recognizing famous individuals, this membership was meant to highlight his accomplishments outside the realm of science.

NAME Thomson Sir William (Lord Kelvin)
 ADDRESS Scotland, Glasgow.
 C
 PROPOSED BY John Lubbock, Benjamin Peirce
 Phys.
 ELECTED 1893, Feb. 26th
 DIED 1907, Dec 17
 see notice from Univ. of Glasgow

WILLIAM THOMSON, LORD KELVIN

DATE OF MEMBERSHIP: February 18, 1893

Lord Kelvin was a physicist, best known for his development of an absolute temperature scale (called the Kelvin scale). He was also director of the Atlantic Telegraph Company and pushed for the laying of telegraph cables beneath the Atlantic Ocean, which revolutionized global communication. He visited the United States in 1882.

NAME Curie, Marie Professor
 ADDRESS France, Paris, Rue Curie 12. rue Pierre Curie 1
 C
 PROPOSED BY Samuel J. Dixson + Wilmer Stone
 Physics
 ELECTED 1914, Apr. 21.
 DIED 1934, July 4
 Rel. Pontlot contemporary 1927
 See Sueria July 13, 1937

MARIE CURIE

DATE OF MEMBERSHIP: April 21, 1914

Marie Curie received the Nobel Prize for Physics in 1903 and the Nobel Prize for Chemistry in 1911. She became a member in 1914. In 1921 she came to Philadelphia. We don't know if she managed to visit the Academy, but she did give a presentation at the College of Physicians just a few blocks away. It is likely that at least a few of our members packed into the crowded Mitchell Hall to hear her speak.

VICTORIA SINDLINGER: MEMBER, CONTRIBUTOR, AND ACCOMPLISHED YOUNG ORNITHOLOGIST

ACADEMY MEMBER VICTORIA SINDLINGER HAS BEEN INTERESTED IN BIRDS SINCE SHE WAS FOUR YEARS OLD. Last year, two experiences with the Academy allowed her to explore these fascinating creatures in depth. First, she took an ornithology class with the Academy's former Director of Visual Resources for Ornithology (VIREO) Doug Wechsler. And last September, while attending Members' Night, she struck up a conversation with Academy ornithologists.

That night she learned that the research collection accepted specimen donations, and she quickly realized the Academy was the perfect place to donate the dead birds she had been collecting during her bird-watching travels. Since Members' Night, she has contributed five birds to the collection, including a red-tailed hawk.

"When we came to Members' Night and we saw them skinning birds, we asked where they got them from, and we were told that some were donated," Sindlinger says. "We were excited to find someone that accepted them because we were finding a lot."

Her mother Maribel Sindlinger pipes in, noting, "Mom's not too happy about having them in the freezer. I'm glad the museum is taking them."

Sindlinger told me about her investigation of the wing shapes of local birds, a science fair project she started in 2015. Entitled "Bird Wing Shape Across Different Habitats," the project hypothesized that birds from similar habitats have similar wing shapes and that each habitat supports a unique wing shape. She used a total of 99

bird wing specimens from 52 different bird species, all drawn from the Academy's renowned Ornithology Collection.

The young scientist measured the wings with a wing ruler, calculated the hand-wing index, or distance from the "finger" bones to the longest feathers, and then recorded that data. She gathered habitat and behavior information from Cornell University's "All About Birds" website and summarized and recorded habitat information from *Birds of North America: Eastern Region*. She then assigned each specimen to one of five habitats: forest, marsh, open air, pond and river, or shoreline. She repeated this process for male and female birds if specimens of each were available.

Sindlinger's research confirmed her first hypothesis that birds living in the same habitat have similar wing shapes. She concluded that each habitat does not support a unique wing shape, a finding that contradicted her second hypothesis.

Sindlinger submitted her project to the Homeschool Science Fair as well as the George Washington Carver Science Fair, held at the Academy in February. She won First Place at the Homeschool Fair and in the Life Science Category for sixth-graders at the Carver Fair. She also won the Vince Russo Award for Data Presentation and Best of Fair for all of sixth grade at the Carver Fair.

The Academy is proud to count this young naturalist among our members and contributors. Congratulations, Victoria, for your outstanding accomplishments in the field of ornithology!
~Mike Servedio



Mike Servedio/ANS

SPRING FORWARD

NEARLY 100 ATTENDEES, INCLUDING MORE THAN A DOZEN ACADEMY AND DREXEL TRUSTEES, CAME TOGETHER ON WEDNESDAY, APRIL 13 FOR THE ACADEMY'S ANNUAL SPRING FORWARD DINNER. This stewardship event provided an opportunity for our Leadership Circle donors to hear directly from Academy and Drexel leaders about our shared vision and our plans for the future.

After a cocktail hour in North American Hall, President and CEO George W. Gephart, Jr. presented the theme of the evening, “the cutting-edge.” The Academy is at the forefront of natural and environmental science research and education, he said, including the massive multi-year initiative to protect and restore critical sources of drinking water in the Delaware River Basin. Our success would not have been possible without our powerful partnership with Drexel University.

With guests seated for dinner in Dinosaur Hall, President Gephart introduced Drexel University President John A. Fry. President Fry shared some recent accomplishments of the partnership. The Academy was near the top of a recent ranking of higher education

natural history museums, second only to the Peabody Museum at Yale University, President Fry said.

The Academy’s continued growth and recognition enables us to play a crucial role in supporting Drexel University students. Thus far, the Academy has engaged 168 Drexel students in co-op learning positions through our museum and research enterprise. The Department of Biodiversity, Earth & Environmental Science has been a model for innovation in the Drexel curriculum, growing from 25 to 185 undergraduates in just four years. Students at Drexel now have access to local and international field sites, fossil prep labs, and more than 18 million scientific specimens at the Academy.

President Fry also discussed how the Academy’s leadership role within the Delaware River Watershed Initiative is advancing our stewardship of our planet while supporting the work of Drexel University scholars who share our goals. Drexel researchers in public health and engineering are studying, among other things, the correlation between disease and water use after heavy storms, converting vacant lots

into wetlands, using modeling techniques to study stressors of Delaware Basin Rivers, and creating a microbe genome library to track sources of water contamination.

President Fry closed his presentation with a nod to our shared vision as he introduced Academy President George Gephart. President Gephart provided an overview of exciting new initiatives that will repurpose underutilized resources and improve conditions for our irreplaceable collections. The Academy will continue to highlight our scientific breakthroughs and prioritize our goal of sharing our work with the public, and we are actively pursuing innovative ways to accomplish these goals.

As the world changes and science advances, the Academy recognizes the need to adapt and grow, President Gephart said. He noted that our focus on the future would be impossible without the support of our loyal Leadership Circle contributors and the encouragement of the Drexel University community. These supporters play a prominent role in our successful future, and we could not be more thrilled about the possibilities ahead. 



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ON BEHALF OF THE ACADEMY'S BOARD OF TRUSTEES, we wish to recognize and thank those who have contributed to the Academy between March 1, 2016 and May 31, 2016. Your generosity helps to fund our many programs of research and education, and we are tremendously grateful for your support.

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ACADEMY BOARD OF TRUSTEES

This summer we welcome two new trustees to the Academy Board:



Amy Coes is an American furniture historian specializing in 18th-century Newport and Philadelphia furniture of the Colonial period. Since 1998, she has worked as a consultant for the American Furniture Department at Sotheby's. She serves on the Boards of the Pennsylvania Ballet and the Rosenbach Museum and Library.



Amy Branch is the executive officer of the Iroquois Group, a service provider for independent property and casualty agencies that was founded by her late father Paul Branch. Iroquois currently supports over 2,250 agencies in 41 states and has working relationships with more than 70 insurance carriers nationwide. Branch serves on the Boards of Woodmere Art Museum and Breakthrough of Greater Philadelphia.

This summer our Board will experience an exciting leadership transition:



Cynthia P. Heckscher stepped down this spring after seven years as an Academy Trustee and five years of extraordinary service as Chair of the Academy's Board. Heckscher was instrumental in the hiring of Academy President and CEO George Gephart. Together with Gephart, she guided the institution through its first years in affiliation with Drexel University, as well as a monumental Bicentennial celebration. She demonstrated exemplary leadership during our recent strategic planning process and greatly strengthened the Academy's Board and governance practices during her tenure. She has truly helped our institution unite our historic mission and promising future. Thank you, Cindy, for your outstanding dedication!



We would like to welcome our new Chair of the Board, **Peter A. Austen**! As a Trustee for six years, as well as Chair of the Marketing and Public Experience Committee, Austen has set the tone for many Academy museum initiatives. He has also been an invaluable member of the Development and Governance Committees. Peter, we are thrilled that you will be sharing your time and remarkable talents as you lead the Academy into the future.

Nic D'Amico for ANS



DINO-MITE SUMMER

Explore the world of the dinosaurs and have a blast this summer at the Academy of Natural Sciences! Visit every day for all-new, free special activities and a chance to come face-to-face with roaring, moving, life-size animatronic dinosaurs in *Dinosaurs Unearthed*. You might meet live dinosaur cousins, get the behind-the-scenes scoop during a tour of Dinosaur Hall, join fellow LEGO-lovers and build dino-inspired creations, or share a belly laugh with Marty the Moose during story-telling time. With your *Dinosaurs Unearthed* admission ticket, you can even wrap your own fossil to take home. It'll be the most explosive summer on (the fossil) record! Many tours and activities are free with admission. Get more info at ansp.org/summer.



Christine Danowsky/ANS

DINOS UNEARTHED BIRTHDAY PARTIES

Spend your big day with roaring, moving, life-size dinosaurs! *Dinosaurs Unearthed* is back, and now you can have your own dino-size birthday party. The *Dinosaurs Unearthed* Deluxe Party Package has everything you love about our birthday parties, including a private party room, personal birthday host, and our visitor-favorite exhibits tour. It also includes *Dinosaurs Unearthed* admission for all guests, a deluxe *T. rex* birthday cake, dinosaur paper goods and decorations, dino goodies for the child guests, and a special birthday gift for the honoree. Looking for something else? We offer theme parties for kids who love butterflies, bugs, and animals. Members get special discounts! Visit ansp.org/birthday or call 215-299-1060 for more details and to book.



Mike Servidio/ANS

MEMBERS' NIGHT

Every year, the Academy treats members like you to a special evening during which you can meet our staff, see our collections, and experience the breadth and depth of work that takes place behind the scenes at the museum. Join us on September 30, 2016 for chances to meet our scientists, wander through our collections, and more. Visit ansp.org later this summer for more information and to register.



Mike Servidio/ANS

PHILADELPHIA SHELL SHOW

Thousands of shells will be on display and for sale at the annual Philadelphia Shell Show, October 22–23, 2016, at the Academy of Natural Sciences of Drexel University. The largest of its kind in the Northeast, the show features beautiful, competitive displays on mollusks by collectors, amateur scientists, and artists. Visitors will have the chance to shop an international shell market packed with jewelry, shells, books, and more. Members of the Philadelphia Shell Club will be on hand to answer questions and identify shells you've collected during your travels.

Mike Servidio/ANS



BUG FEST

Join us on August 13 and 14 for our annual celebration of insects! Hundreds of live invertebrates will be on display throughout the museum. You'll see beetles, true bugs, millipedes, centipedes, scorpions, stick insects, cockroaches, caterpillars, tarantulas, and more. Talk with real scientists, learn about insects from all over the world, and see specimens from the Academy's behind-the-scenes collections. Eat bugs, get your face painted, and relax as you enjoy a buggy show. More at ansp.org.



JUST FOR KIDS

Welcome to the Academy Frontiers page for kids, one of the many great ways you can participate in the Academy's Kids Club!

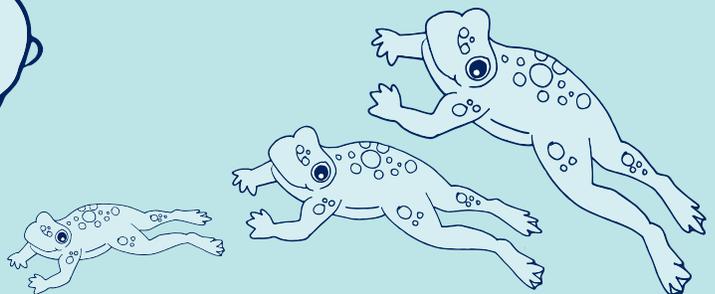
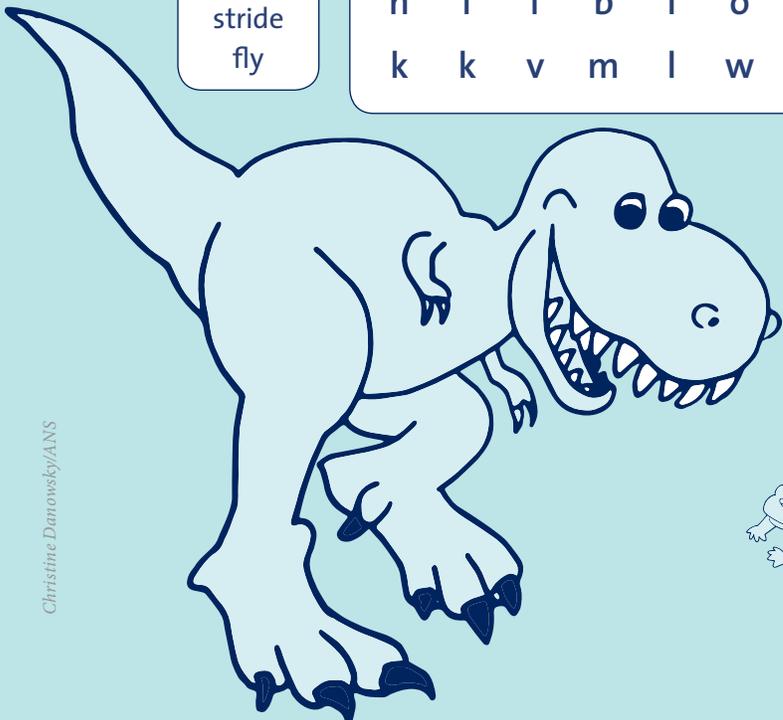
Dive Into a Word Find

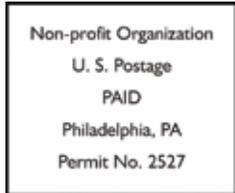
Animals have amazing ways of moving up, down, sideways, and all around! Complete the word find below and find out just a few of the special ways animals get from place to place. For an extra challenge, use a separate sheet of paper to write down what type of animal each word below might be describing.



- crawl
- slither
- swing
- swim
- run
- stomp
- gallop
- propel
- glide
- roll
- jump
- burrow
- flutter
- stride
- fly

v	h	s	c	r	a	w	l	f	x	n	b	d	d	f
w	a	p	s	i	i	s	s	l	i	t	h	e	r	w
z	k	t	t	o	f	w	t	m	k	s	w	i	m	a
g	c	i	r	j	g	y	y	o	h	x	m	o	c	q
e	f	c	i	s	f	p	g	y	m	c	o	r	q	v
x	s	l	d	a	z	g	o	a	j	p	j	u	s	n
f	w	f	e	p	r	o	p	e	l	w	o	n	e	d
e	i	g	l	y	r	j	b	b	t	l	o	w	f	j
u	n	l	u	y	s	p	f	l	u	j	o	j	l	y
l	g	i	u	h	c	j	u	l	g	r	o	p	o	l
e	h	d	x	p	t	s	u	y	u	b	r	f	l	k
y	o	e	p	r	r	y	e	m	j	t	r	o	s	u
x	d	y	g	o	e	b	u	z	p	r	t	r	w	l
n	f	f	b	l	o	n	x	l	r	i	o	e	r	g
k	k	v	m	l	w	x	s	j	o	o	b	m	r	z





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CALENDAR OF EVENTS

JULY

DINOSAURS UNEARTHED IS OPEN!
Now through January 16

*PRESIDENTIAL ARCHIVES:
LETTERS, HAIR, AND FOSSILS*
Now through July 29

DINO-MITE SUMMER
Now through September 2

TINY TOT EXPLORERS
Wednesdays through August 24

ACADEMY EXPLORERS CAMP
Weekdays through September 2

VOTING WITH THE
BALLOT BOX TURTLE
Thursday, July 28, 3 p.m.



Mike Servidio/ANS

AUGUST

ACADEMY TEEN CAMP:
ANIMAL HUSBANDRY
Monday–Friday, August 8–12

BUG FEST
Saturday and Sunday, August 13–14

DINOS AND DONUTS
Saturday, August 27, 9–10 a.m.

SEPTEMBER

2016 FEDERAL DUCK STAMP CONTEST
Friday and Saturday, September 9–10

TOWN SQUARE
WITH ELIZABETH KOLBERT
Wednesday, September 21

SMITHSONIAN DAY
Saturday, September 24

MEMBERS' NIGHT
Friday, September 30, 5–9 p.m.

OCTOBER

SCOUT DAY: DINOSAURS
Saturday, October 15

PHILADELPHIA SHELL SHOW
Saturday and Sunday, October 22–23,
10 a.m.–5 p.m.

NOVEMBER

THANKSGIVING WEEKEND
PROGRAMMING
Friday through Sunday, November 25–27

DECEMBER

ALL-STAR DAYS
Tuesday through Friday, December 27–30



Mike Servidio/ANS

Free for members Fee Registration required

Unless otherwise noted, all events held at the Academy are free with museum admission.

*\$4 Individual, Family, and Family Plus level member fee for *Dinosaurs Unearthed*; Partners' Club level members and above receive free admission. Purchase or renew your membership today at ansp.org/membership.

Visit ansp.org for more information and to register.

