

ACADEMY

**INSIDE:**  
Birds of the Amazon

# FRONTIERS

The member magazine of the  
Academy of Natural Sciences  
of Drexel University  
SPRING/SUMMER 2019



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ON THE COVER: Academy Ornithologists traveled to the world's largest lowland tropical forest wilderness to survey birds, including this Fork-tailed Woodnymph (*Thalurania furcata*), and their parasites. Photo by Jason Weckstein/ANS.

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Dear Friends,

At the Academy, summer is a time for new beginnings. June is the month many of us think of as the official start of summer, and summer at the Academy means field season! This year, our scientists will travel to California, Long Island, Mexico, the Galápagos Islands, Jamaica, nearby streams in the Delaware River watershed and many other locations near and far. They will conduct research on the environment and gather specimens for our scientific collections, which will be used for further studies by scientists around the world.

Summer — July 1 in particular — also marks a change in leadership at the Academy, as David E. Griffith begins his term as Chair of the Academy's Board of Trustees. Dave, who previously spent more than 40 years in the for-profit world, has served as executive director and head coach of Episcopal Community Services for six years. A lifelong outdoorsman, he is acutely aware of the impacts of climate change and plans to dedicate part of this next chapter of his life to service of the environment. As he begins his term, both he and I want to express our deep gratitude for the exceptional leadership of our outgoing Board Chair, Peter Austen. In addition to leading my own recruitment, he has also been a driving force in the creation of our new strategic plan. Thank you, Peter, for all your support and collaboration, as well as the momentum you have helped create throughout the Academy.

From transitions in our leadership to sharing emerging science news, the Academy is always seeking new ways to engage you, our loyal members. In this issue of *Academy Frontiers*, we will take you through a few recent findings, introducing several new species our scientists helped discover. We will also guide you on a journey deep into the Amazonian rainforest, where our ornithologists collected birds found nowhere else on Earth. In our Spotlight, you will meet two of your fellow members who worked alongside Academy scientists to assess a stream running through their property. And finally, you will uncover ways that you and your family can become better stewards of our rapidly changing planet.

As our new fiscal year begins on July 1, I want to take a moment to express my gratitude for your ongoing support, and especially for your contributions to the Academy's annual fund. Thank you for making our research, exhibits and public programs possible. We could not do what we do without your generosity.

With thanks and best wishes,



Scott Cooper, PhD  
President and CEO



Jeff Fusco for ANS

**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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Nathan H. Rice/ANS

After a day of collecting in the Amazon rainforest, Academy scientists Jason Weckstein (at left), Nate Rice and a team processed bird specimens and preserved their parasites and tissue samples for future study.

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# CALENDAR OF EVENTS

## JULY

### SUMMER CAMP

Weekdays through August 30

Mike Serradio/ANS



Academy Science Camp invites campers ages 5–12 to learn about natural science at Philly's Dinosaur Museum. Each week of camp explores an exciting new theme such as dinosaurs, insects or superheroes and features an off-site field trip! Weeks are selling out quickly so reserve today and save with your membership discount. Find out more at [ansp.org](http://ansp.org), where you can learn about our summer programs for teens and tots.

### TINY TOT EXPLORERS

Wednesdays through August 28

Five Five Collective for ANS



Calling all explorers 2–5 years old! Along with your favorite adult, join us in exploring nature through songs, games, hands-on fun and museum adventures. Tiny Tot Explorers meet on selected mornings from 11 a.m.–noon, and a snack is provided! You may register for a single session or an entire series. Weekly themes and more at [ansp.org](http://ansp.org).



**OPEN THROUGH JANUARY 20, 2020**

Special Exhibits Gallery

Embark on a globetrotting expedition around Pangea, where dinosaurs reign throughout the land. *Dinosaurs Around the World* introduces visitors to more than a dozen animatronic dinosaurs on a voyage from the ferocious plains of Africa and the tropical beaches of Antarctica, to the inland seas of North America and the polar darkness of Australia. Find out how continental drift, sea level fluctuations and volcanic activity allowed dinosaurs to disperse to all corners of the globe. Learn about paleontological research, touch fossil casts, discover and name your own dinosaur, investigate what dinosaurs may have looked like in life and find modern-day dinosaurs right in your own backyard! 🌐



### UPCOMING EVENTS

#### Dino-mite Summer

July 1–August 31 📅

#### Academy Science Camp

Weekdays, July 8–August 30 💰🌐

#### Tiny Tot Explorers

Select Wednesdays, July 10–August 28, 11 a.m.–noon 💰🌐

#### Museum Open Early: Access to Science

Sunday, July 14, 9 a.m. 📅🌐

#### Scientist Saturday: Malacology

Saturday, July 20, 1–4 p.m. 📅

#### Dinos After Dark

Wednesday, July 24, 4–8 p.m. 📅

#### Teen Beginner Animal Training and Husbandry Program **SOLD OUT!**

Weekdays, July 15–19 💰🌐

#### Teen Advanced Animal Training and Husbandry Program **SOLD OUT!**

Weekdays, July 22–26 💰🌐

# CALENDAR OF EVENTS

## AUGUST

### BUG FEST

Saturday and Sunday, August 10–11, 10 a.m.–5 p.m. 



Mike Serradito/ANS

Join us on August 10 and 11 for our annual celebration of insects! See hundreds of live bugs, 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. Free for members or with general museum admission.

### Teen Invertebrate Husbandry Program

Weekdays, August 12–16  

### Scientist Saturday: Diatoms

Saturday, August 17, 1–4 p.m. 

### Dinos After Dark

Friday, August 23, 4–8 p.m. 

### Museum Open Early: Access to Science

Sunday, August 25, 9 a.m. 

### Butterflies Closed for Refresh

Monday, August 26–Friday, September 6

## SEPTEMBER



### College Fest

Saturday, September 7, 10 a.m.–5 p.m. 

### Grandparents Day, Bring Your Favorite Adult for Free

Sunday, September 8, 10 a.m.–5 p.m. 

### Smithsonian Museum Day

Saturday, September 21, 10 a.m.–5 p.m.  

### Scientist Saturday: Fossils


Saturday, September 21, 1–4 p.m. 

### Dinos After Dark

Friday, September 27, 4–8 p.m. 

## OCTOBER

### Members' Night

Friday, October 18, 5–9 p.m.  

### Scientist Saturday: Wetlands

Saturday, October 19, 1–4 p.m. 

### DOOR 19: DEATH AND TAXIDERMY

Thursday, October 24, 6–9 p.m.  



Mike Serradito/ANS

Nothing is certain but death and tax ... idermy! At the Academy, we're no strangers to the most bizarre science that life (and death) have to offer. At Door 19: Death and Taxidermy, explore our spookiest specimens and weirdest things in jars behind the scenes. Meet a couture taxidermist and a ghost hunting crew. Discover decomposition, practice preservation and geek out over gravestones. Come in costume or come as you are for a scarily fun evening featuring frightfully good food and an open bar.

### Dinos After Dark


Friday, October 25, 4–8 p.m. 

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

Visit [ansp.org](http://ansp.org) for more information or to register.

\*Fee for *Dinosaurs Around the World*. Family Plus members and above see this exhibit for free.

Purchase, upgrade or renew your membership today at [ansp.org/membership](http://ansp.org/membership).

 Free for members

 Fee

 Registration required

# Academy Scientists Announce New Species

By Emily Storz

The continued discovery and documentation of new species shows life on Earth can still surprise us — and it's clear that conservation and proper cohabitation of this world is increasingly important.

Scientists at the Academy helped discover and recently published a few new slimy, shelled and fossilized species. Below is a brief look at the newly discovered fish, algae and mollusks — all recently added to the catalog of life. 🌱



Partial skull of *Eusthenopteron jenkinsi* viewed from the front and from above.

Paleontologist Ted Daeschler, PhD, and his colleagues have uncovered a treasure trove of Late Devonian-age (375 million years old) fossils from Ellesmere Island, Nunavut, Canada. Those collections include a new species of lobe-finned fish that they recently named to honor their late colleague, Farish A. Jenkins, Jr. The new species, *Eusthenopteron jenkinsi*, is part of a group of aquatic predators from the Late Devonian that were closely related to the earliest limbed animals.

*Daeschler is curator of Vertebrate Zoology at the Academy and associate professor in the Drexel University Department of Biodiversity, Earth & Environmental Science.*



*Ochlochaete incrustans*

Botanist Richard M. McCourt, PhD, was part of a team that encountered a rare and unusual green alga during a broad survey of California's stream algae. The specimen represented a new species of the primarily marine genus *Ochlochaete*. *Ochlochaete incrustans* grows in dense, lime-encrusted mats in fast-flowing streams.

*McCourt is curator of botany and director of the Center for Systematic Biology and Evolution at the Academy. He is professor in the Drexel University Department of Biodiversity, Earth & Environmental Science.*

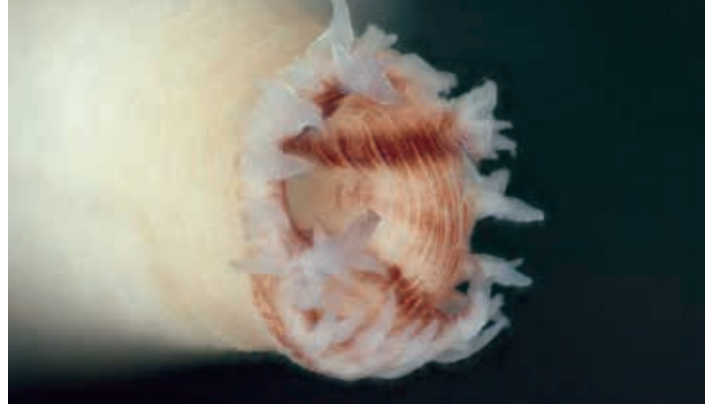
## BEHIND THE SCENES

Marvin Altamia



*Tamilokus mabinia*

Malacologist Gary Rosenberg, PhD, was part of team that described a new and anatomically divergent genus and species of wood-boring bivalve (Teredinidae) from the Philippines, named *Tamilokus mabinia*. Including *Tamilokus*, the total number of genera in this economically and environmentally important group of wood-boring bivalves grows to 17.



Reuben Shipway

Rosenberg is Pilsbry Chair of Malacology at the Academy and professor in the Drexel University Department of Biodiversity, Earth & Environmental Science.

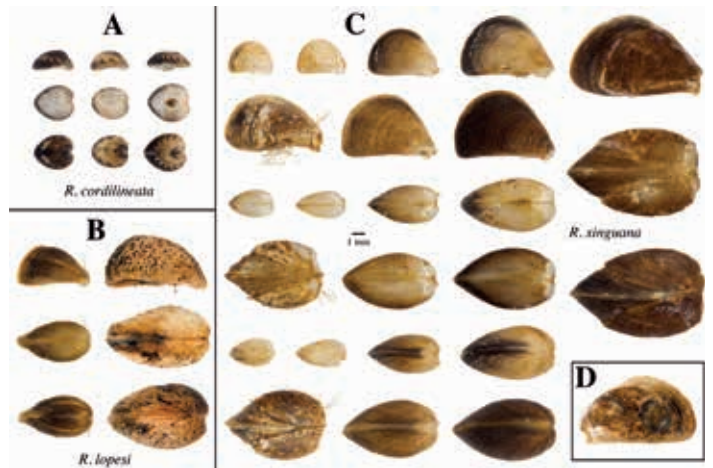
L.M. Sousa



Holotype of *Platydoras birindellii*

Ichthyologist Mark Sabaj, PhD, was part of a team of researchers that uncovered a new species of *Platydoras* from the Rio Xingu Basin in Brazil. Named for Brazilian colleague José Birindelli, *Platydoras birindellii* is commonly found in rocky clearwater rapids and is identified, in part, by its uniformly dusky fins.

Sabaj was also involved in the discovery of two new species of minute bivalves from the rapids of clearwater tributaries to the lower Amazon River. The name *cordilineata* is derived from the Latin words *cordis* (heart) and *lineatus* (marked with lines), which references the distinctive shape and color pattern of the new species. The second minute bivalve, *xinguana*, is named to



Mark Sabaj/ANS

honor the 20 indigenous peoples in the Xingu Basin who consider the river to be sacred. Despite their small adult size (less than 1.5 centimeters in length), female *xinguana* brood young and release them into the environment as tiny shelled juveniles less than one millimeter long. The two new species belong to the same family as the zebra mussel (*Dreissena*), a species native to Europe and widely invasive in U.S.

Sabaj is curator of ichthyology at the Academy. His work described above was part of the *iXingu* Project funded by the National Science Foundation.



Nathan H. Rice/ANS

# THE GREAT UNVEILING: Amazonian Birds Added to Academy Collection

By Mary Alice Hartsock

LEFT TO RIGHT: Guira Cuckoo (*Guira guira*), House Wren (*Troglodytes aedon*), American Pygmy Kingfisher (*Chloroceryle aenea*), Red-breasted Meadowlark (*Leistes militaris*), Blue-gray Tanager (*Thraupis episcopus*), Yellow-rumped Cacique (*Cacicus cela*)

Jason Weckstein/ANS



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On a quiet Friday afternoon in early April, 15 people packed into the Academy's Serengeti diorama for a party. It wasn't an ordinary celebration ornamented with twinkle lights, gowns and cocktails. In fact, the attire was casual, and a slightly musty aroma lingered in the air. But there were feathers, and lots of them, imported from across the world.

The event was a Brazilian birds unveiling party, the first of its kind at the Academy. Ornithologists Jason Weckstein and Nate Rice had brought back the first cache of birds from the country to be added to the Academy's Ornithology Collection since the 1920s. The scientists and their colleagues collected and preserved the birds, along with thousands of tissue and parasite samples, during three collaborative expeditions to the region.

Weckstein and Rice were more than eager to show off their finds. They had not glimpsed the birds since the team collected the specimens in the field and processed and preserved them for transport to the Museu Goeldi in Belém, Brazil, and the Academy. For more than a year since collection, the bird specimens had remained in storage alongside the world's largest collection of Amazonian birds at the Museu Goeldi. Now the onlookers, including fellow scientists and Academy supporters, were jostling for an initial look at the Academy's share of these beautiful specimens. The researchers had a captive audience, and they began their narrative.

In November 2015 and the summers of 2016 and 2017, researchers from the Museu Goeldi, Universidade do Pará, the University of North Dakota, The Field Museum and the Academy traveled to the world's largest lowland tropical forest wilderness to survey birds and their parasites. One of their goals was to analyze genetic data for the birds and their parasites and to reconstruct their evolutionary histories. They visited several remote locations, all sites where no one has collected and analyzed birds and their parasites in modern times.

Some of these locations are so isolated that the birds that live within them cannot leave, which makes these areas ideal for studying the evolution of species over time. Surrounded by rivers on all sides, the birds spend most of their lives in the forest understory. Their wings do not allow them to travel long distances or cross open water to breed outside their region. These geographic barriers create areas of endemism, in which certain regions (often surrounded by water) harbor species that are found nowhere else in the world.



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Of course, to find birds that, due to their geography, cannot leave an area, the researchers had to travel far off the beaten path. On one particular trip, Weckstein, Rice and colleagues took two flights to reach Porto Velho, Rondonia, Brazil. They then used four-wheel drive trucks and high-clearance vehicles to travel an unpaved section of the Trans-Amazonian Highway, which culminates at the town of Lábrea. Deeply rutted and tacky with mud, the treacherous 120-mile stretch of road took nearly a day to navigate.

The crew set up camp in a wooden cabin on the forest edge 10 miles outside Lábrea, alongside a small tributary of the Rio Purús. During their two week stay, they collected bird study skins, tissue samples and parasites from nearly 400 birds. They took notes on the prevalence and intensity of parasite infections, documenting how many hosts carried the parasites and the degree to which these hosts were infected. They closely documented where the birds were found, their physical characteristics, what was in their stomachs and other important data.

Their diligence paid off when they uncovered species new to the Academy's extremely comprehensive Ornithology Collection and new material for the Museu Goeldi's extensive collection as well. The specimens they collected will serve many purposes today and in the future, including providing data for a number of collaborative projects with their Brazilian colleagues on the diversity of malarial parasites across the world. Specimens collected from the project are now housed in both the Museu Goeldi's and Academy's collections.

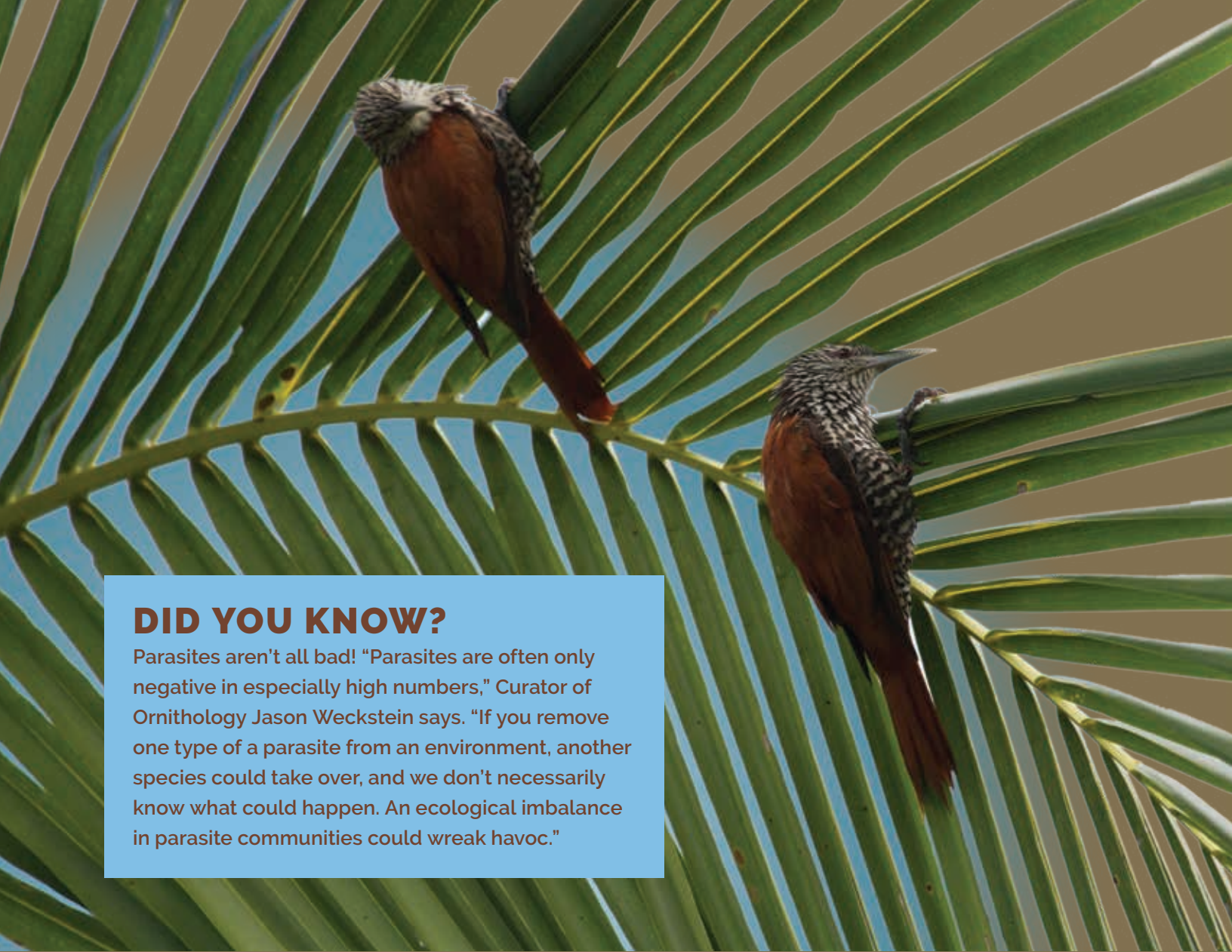
Former Academy post-doctoral researcher Alan Fecchio, now at Universidade Federal do Mato Grosso in Cuiaba, Brazil, Academy postdoctoral researcher Spencer Galen and Weckstein are conducting one such study of malarial parasites in birds. Co-operative education students from Drexel University are staining blood films for microscopy and extracting DNA from the samples collected in Brazil. Brazilian graduate students working in the Academy's Ornithology Department and Laboratory of Molecular Systematics and Ecology are using these specimens for their dissertation projects.

The researchers hope to gain a better understanding of the basic principles of how pathogens and parasites are transmitted and evolve. After all, the more we know about parasites and their relationships with their hosts, the better prepared we will be to understand how parasite diversity is generated and maintained. We may gain insights on how diseases and parasites travel between birds and even between wildlife and humans. 🌿



LEFT TO RIGHT: Black-chinned Antbird (female) (*Hypocnemoides melanopogon*), Stripe-necked Tody-Tyrant (*Hemitriccus striaticollis*), Buff-breasted Wren (*Cantorchilus leucotis*), White-winged Parakeet (*Brotogeris versicolorus*), Fork-tailed Flycatcher (*Tyrannus savana*), Common Tody Flycatcher (*Todirostrum cinereum*)

Jason Weckstein/ANS



## DID YOU KNOW?

Parasites aren't all bad! "Parasites are often only negative in especially high numbers," Curator of Ornithology Jason Weckstein says. "If you remove one type of a parasite from an environment, another species could take over, and we don't necessarily know what could happen. An ecological imbalance in parasite communities could wreak havoc."

Above: Point-tailed Palm Creeper (*Berlepschia rikeri*)



Vasyly V. Tkach

Academy scientists worked in partnership with colleagues from the Museu Paraense Emilio Goeldi and Universidade do Pará during three collaborative expeditions for a joint project funded by the National Science Foundation and cosponsored by the Brazilian National Science Foundation. Also pictured here are colleagues from University of North Dakota and the Field Museum.



a Doering.  
Herr. Doering's Buchhandlung  
1851

Marie Bernslein  
Philadelphia July 15/09

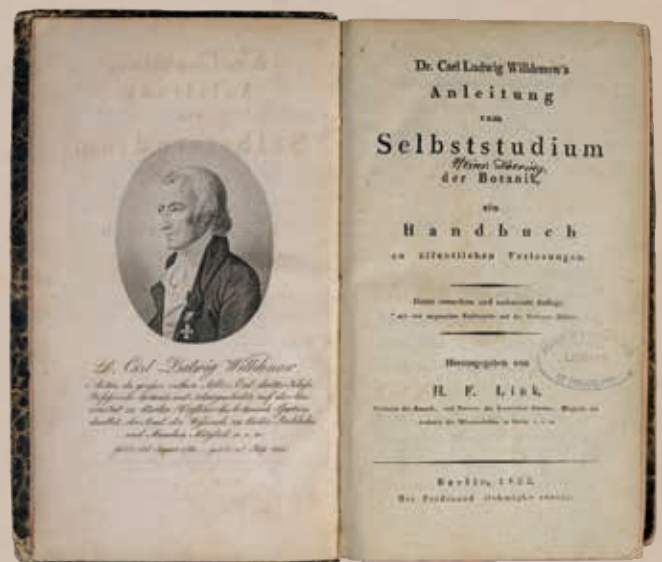
## A Relic of Botany History

By Bridget Arthur Clancy, Cataloging and Serials Librarian

The Academy Library contains a treasure trove of titles — rare, unusual and important for research. Friends and supporters contact us regularly regarding book donations, and though we appreciate the consideration, we often decline because a title is already in our holdings. Occasionally, though, something is offered that we don't already own and that perfectly complements our collections.

Early this spring, we were contacted by a volunteer in our Entomology Department whose friend had purchased a book at an estate sale and thought it might be an excellent addition to the library.

The title on offer, *Dr. Carl Ludwig Willdenow's Anleitung zum Selbststudium der Botanik: ein Handbuch zu öffentlichen Vorlesungen* (*Dr. Carl Ludwig Willdenow's Guide to Self-Study of Botany: A Handbook for Public Lectures*, 1822) was not in our holdings, though we have other items related to Willdenow, as well as *Willdenowia*, the journal that bears his name.



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Willdenow is a major figure in the field of botany, considered to be the individual who laid the foundation for the field of phytogeography (the geographical distribution of plants). His father introduced him to the study of plants at a young age, and by his teenage years, he had created his own herbarium. As a young man, he pursued further studies in chemistry with one of the leading scientists in Berlin. His formal education focused on pharmacy and medicine, and upon completion of his studies, he took over his father's apothecary in Berlin.

By 1787, Willdenow had published a flora of Berlin. He was well-known for his informal lectures on botany and for leading small groups on field trips around the city. In 1788, he met German explorer and naturalist Alexander von Humboldt and the two became lifelong friends, with Willdenow becoming a mentor to the young scientist. Though Willdenow seldom left Germany during his lifetime, he described numerous plants sent to him by von Humboldt from the latter's travels in South America. His reputation increased when he published the introductory textbook *Grundriss der Kräuterkunde zu Vorlesungen entworfen (Outlines of Herbalism, Designed for Lectures)* in 1792, intended to replace Linnaeus' work *Philosophia botanica (The Philosophy of Botany, 1751)*, considered obsolete at the time.

In 1801, Willdenow was named the principal botanist at the Berlin Academy of Sciences, as well as curator at the Berlin Botanical Garden. During his curatorship, the botanical garden became one of the most comprehensive in Europe. He traveled to Paris in 1810 to assist von Humboldt, but illness forced his return to Berlin shortly after his arrival. He died in 1812, soon after being named a professor at the new University of Berlin.

The item donated to the library is relatively small and is in excellent condition, with only minor deterioration of the pages and a slightly worn spine. The back of the book contains four plates with colors just as vibrant as they likely were upon initial publication.

Though we were thrilled to add this book to our holdings, we were yet to discover the most exciting aspects of the donation. There are several handwritten notations on the inside flyleaf, giving us some indication of the book's provenance through 1909. Additionally, while cataloging the book, we discovered that the Academy's library is one of only 11 libraries in the world to hold this title — and only one of four libraries in North America!

Since its publication in 1822, this small volume has clearly done some traveling. Though we will never know the complete story of its past, its future resides in our library. 🌸





## LYNN AND TONY HITSCHLER: Stewards of a Stream

**I**t was a sunny day in April 2018 in a peaceful section of Ridley Creek. Bass, trout, sunfish, fallfish, minnows and common shiners swam along a slow, rippling current. American eels slithered along the stream's muddy bottom, and mayflies buzzed along the reedy banks.

Suddenly, the water parted and a rubber boot appeared, followed by another, and another. A team of Academy scientists was wading into the river, gear in hand, to capture this tranquil moment in time. They were there thanks to Academy members Lynn and Tony Hitschler, on whose Chester County property this scene was unfolding.

“We invited the Academy to come assess the stream because we were curious about the real health of the stream, how much life it supported, the quality of the water and the biodiversity within the stream,” says Lynn.

Both Tony, who was previously involved with the Nature Conservancy, and Lynn, who is on the board of American Rivers, are members of the Academy's Lewis and Clark Circle of Giving. As avid fishermen and passionate naturalists, they have been supporting the Academy since the mid-1970s. The Hitschlers are adamant about being good stewards of the environment, including the waters that run through their

property, which has been legally protected. They have learned how to plant properly along stream banks to maintain streamside insect populations and have avoided clear cutting to prevent stream bank erosion.

“Every stream goes to a river, and rivers go to the oceans,” Lynn says. “We understand the value of a stream that has been protected.”

The Hitschlers wanted to know if their work had paid off, so they invited Academy fish scientists Rich Horwitz, Paul Overbeck and Mark Sabaj to assess and record the species in the stream. They also brought in Lauren McGrath and Nora Deramo from Willistown Conservation

## MEMBER SPOTLIGHT

Trust to identify aquatic insects. They invited friends and relatives to bring their children to participate in the stream electrofishing and to learn from the work.

“We wanted the kids to experience the knowledge of the scientists and to actually see, touch, feel and hear about what was being discovered in this little part of the world that we all work so hard to protect,” Lynn says.

Everyone — from the scientists to the Hitschlers to the children — put on waders and gear and got into the water. The scientists explained how and why you electrofish a stream, which involves sending an electric current into the water to temporarily stun (but not injure) the fish to assess abundance,

density and species composition. They made sure everyone understood what they were doing and why, and then they helped the children scoop fish into nets, handle them carefully, identify them, measure them and record the information for science.

“It was magical, sticking your hand into the belly of mother nature,” Lynn says. “What stood out to us were the teaching abilities of the scientists. They were so communicative and helpful at teaching everyone, from the very young to the very old.”

Even the scientists were surprised at the variety of life they found in the stream. With an abundance of American eels (some 2 feet long!), white suckers, rock bass, pumpkin-

seed and redbreast sunfishes, bluegills, minnows, common shiners and many more species, it took the scientists nearly a full day to assess and record their finds.

Not only were the Hitschlers and their friends thrilled to work alongside the scientists, but they also learned that their stewardship of the stream is well worth their effort. The Academy returned this spring to reassess the stream and record how its biodiversity is changing over time.

When it comes to their property, cultivating the stream is among their highest priorities. “It is our mission as caretakers of this stream for a period of time until we pass it on to the next generation,” Lynn says. “We are very fortunate.” ~*Mary Alice Hartsock*



The Hitschlers invited children of friends and family members so they could witness science in action.



Academy scientist Paul Overbeck measures a 20-year-old American eel.



*Semotilus corporalis* (fallfish)



*Luxilus cornutus* (common shiner)



*Lepomis auritus* (redbreast sunfish)

## ACADEMY SUPPORT

On behalf of the Academy's Board of Trustees, we wish to recognize and thank those who have contributed new gifts and pledges to the Academy between **August 16, 2018** and **May 15, 2019**. Your generosity helps to fund our many programs of research and education, and we are tremendously grateful for your support.

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# READING LIST:

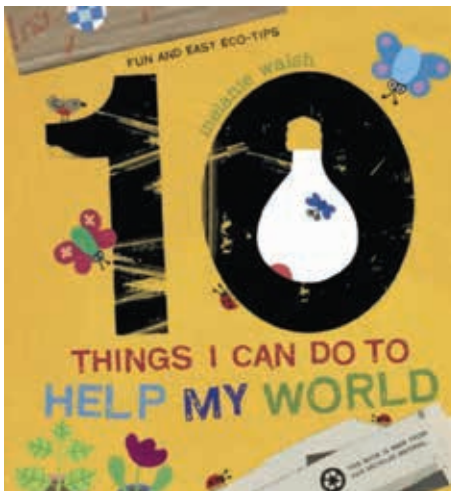
## Taking Care of the Environment

By Mary Alice Hartsock

As a member of the Academy (and an inhabitant of our planet), you probably care deeply about keeping the environment clean. You likely take steps to be an environmental steward, perhaps rinsing and sorting your recycling, composting, conserving water, reusing items and more. You may even encourage members of your household to do the same. But have you considered how to explain the importance of these

actions to your kids, grandkids, nieces, nephews or friends? How will you help to prepare the next generation to work hard to make the planet a more sustainable place?

Whether you're seeking a starting point for conversation, you want to further your own knowledge or you're looking to join a global movement, the reading list below will help you find a place to start. 🌱



### TODDLER THROUGH PRE-K

#### *10 Things I Can Do to Help My World*

By Melanie Walsh

*10 Things I Can Do to Help My World* gives very young children (and their adults) a foundation from which to begin talking about conserving natural resources. Made from 100% recycled material, the book will catch the attention of little ones through touch-worthy die-cut pages, lift-the-flap design and kid-friendly illustrations. In addition to tips such as planting seeds, recycling and turning off the faucet, *10 Things I Can Do to Help My World* provides simple, tangible explanations of how certain actions will make a difference.

You and your toddler may also enjoy reading *The Earth Book* by Todd Parr.



### K-2

#### *Compost Stew*

By Mary McKenna Siddals

Composting enables you to turn your organic waste — items such as fruit peels, food scraps, coffee grounds, leaves and more — into a resource that can help nourish your soil and spruce up your yard. At the same time, you can prevent the very same items from being thrown into a landfill, where they will break down slowly and produce methane, contributing directly to global warming. This fun, rhyming ABC book takes readers through items that could be used to make compost but that may otherwise be thrown away. Naming an alphabet's worth of items from apple cores and eggshells (crushed, of course) to dryer lint and zinnia heads, *Compost Stew* is an excellent tool to get youngsters interested in what happens to our “trash.”

Your child may also like *Why Water's Worth It* by Lori Harrison.

## KIDS AND FAMILIES

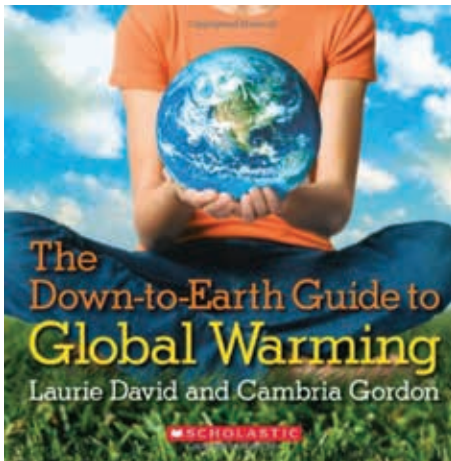


### GRADES 2–5

#### *One Plastic Bag: Isatou Ceesay and the Recycling Women of the Gambia* By Miranda Paul

Set in Njau, Gambia, and based on the life of Isatou Ceesay, Miranda Paul's *One Plastic Bag* portrays what can happen when a cheap, convenient item is improperly discarded, time after time. Broken basket cast aside, young Isatou carries her fruits in a found plastic bag. When it tears, she “drops it to the dirt like everyone does.” Over the years, however, Isatou sees this garbage multiply and resolves to make a change. Eventually, she brings others to support her work and upcycle alongside her. Artist Elizabeth Zunon's collage illustrations from recycled materials echo the book's focus on turning trash to treasure.

Your young reader may also like *Rachel Carson and Her Book That Changed the World* by Laurie Lowler.

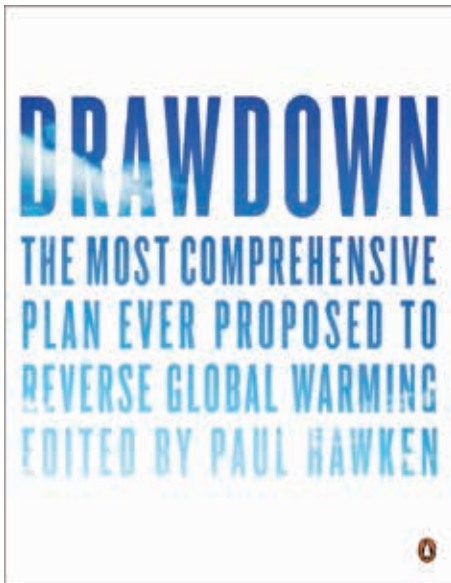


### LATE ELEMENTARY AND MIDDLE SCHOOL

#### *The Down-to-Earth Guide to Global Warming* By Laurie David and Cambria Gordon

This easily digestible guide takes readers through the science behind climate change and describes a host of ways that kids can make a difference, from recycling to choosing careers in the field of sustainability. Co-authored by Laurie David, the Oscar-winning producer of *An Inconvenient Truth*, and Cambria Gordon, it is packed full of photographs, graphs, cartoons and other illustrations that help illuminate this complex topic for younger audiences. *The Down-to-Earth Guide to Global Warming* leaves kids feeling empowered and prepared to spur change in their homes, schools and communities.

Your middle-school reader may also be interested in *Tracking Trash: Flotsam, Jetsam, and the Science of Ocean Motion* by Loree Griffin Burns.



### TEENS AND ADULTS

#### *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming* Ed. Paul Hawken

In *Drawdown*, an international coalition of researchers, professionals and scientists offers a set of practical solutions to climate change. Through a collection of short, accessible essays, editor Paul Hawken identifies 100 economically viable actions that are already in effect around the globe. He makes the case for how, if deployed on a global scale over the next three decades, these solutions could help us to reach drawdown — the point in time at which greenhouse gasses peak and begin to decline on a year-to-year basis. From girls' education, plant-rich diets and reducing food waste to solar energy and improved land use practices, *Drawdown* offers a truly wide-ranging and upbeat take on reversing global warming. Available in the Academy Shop.

Teens may also enjoy *The Green Teen: The Eco-Friendly Teen's Guide to Saving the Planet* by Jenn Savedge and *Generation Green: The Ultimate Teen Guide to Living an Eco-friendly Life* by Linda Sivertsen and Tosh Sivertsen.

Adults may also be interested in *The Uninhabitable Earth: Life After Warming* by David Wallace-Wells.

# Experience Nature Through Reading



Reading as a family can be an excellent gateway to the natural world. *Step Gently Out* by Helen Frost and Rick Lieder encourages an exploration of the insect world. Featuring macro photography and poetic text, the book asks readers to consider what would happen if they looked at the outside world in a different way — quietly and carefully.

Find a copy of the book at your local library. Then step outside with your family for a closer look at bees, spiders, fireflies and more.

Don't have the book on hand? No problem! Follow the prompts below and learn about nature on your own.



Take a trip to your local park. Sit quietly in a grassy area. Fix your eyes on a patch of grass or a flower bed. Then answer the following questions:

- How many colors do you see?
- What plants do you see?
- What animal(s) do you see?
- How big are they?
- What kinds of animals do you think they are?
- Do the animals look soft or spiky?
- How are the animals interacting with the plants?

Watch for a bee flying through the air. Answer the following questions.

- Do you hear the bee making noise as it flies around?
- Where do you think it is going?
- Where might it be coming from?
- What is the bee doing?

Now find the bee in your copy of *Step Gently Out*.

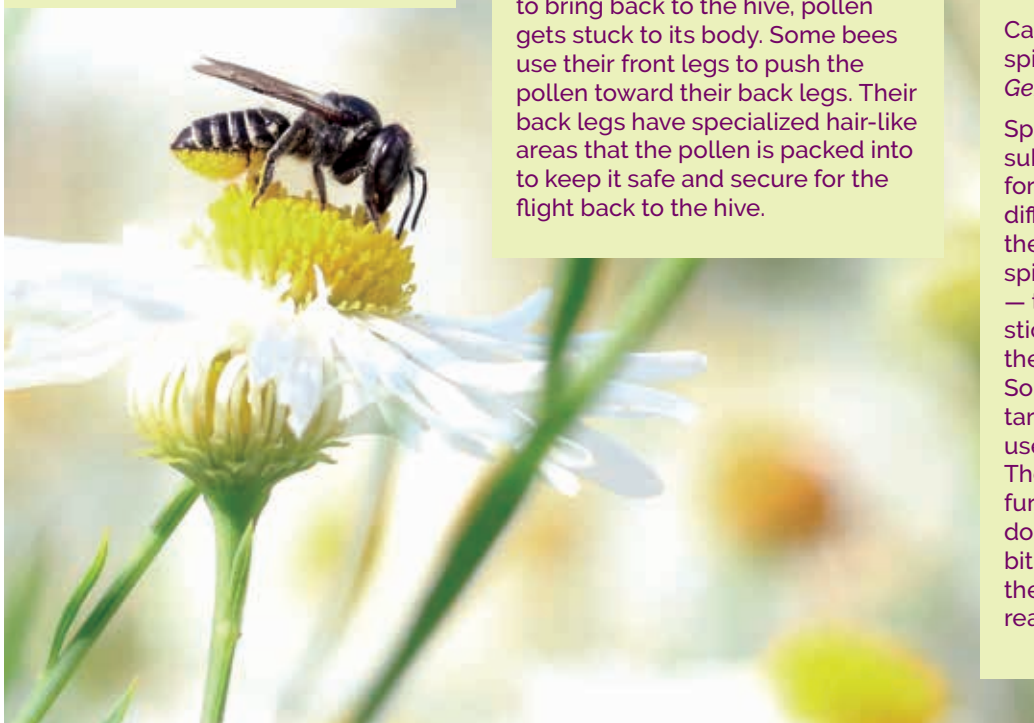
If you look closely at the back legs of the bee in the picture, you'll see a yellow lump attached to its legs. What you're looking at is this bee's very full pollen basket, or corbicula. As a bee collects pollen to bring back to the hive, pollen gets stuck to its body. Some bees use their front legs to push the pollen toward their back legs. Their back legs have specialized hair-like areas that the pollen is packed into to keep it safe and secure for the flight back to the hive.

Let's get moving. Take a walk through the park. Find a spiderweb!

- How many threads can you see?
- Can you count them?
- What do you think the spider uses its web for?
- Is there a spider in the web?
- Do you see any other insects in the spider's web?
- How big is the spider that made the web?
- How do you think it would feel to walk on a skinny thread like this animal?

Can you find the spider and spiderweb in your copy of *Step Gently Out*?

Spider silk is an amazing substance, and spiders produce it for different reasons and use it in different ways. Some spiders, like the orb-weaver spider in the book, spin sticky webs to catch their food — though they can produce both sticky and non-sticky silk when they are constructing their webs! Some spiders, like many of the tarantulas that live at the Academy, use their silk to line their burrows. The trapdoor spider goes one step further, making a type of hinged door to its burrow out of silk and bits of plants. Many spiders wrap their eggs in spider silk until they're ready to hatch.



Isabelle Betancourt

Leafcutting bees (Megachilidae) have hairs for collecting pollen on the underside of their abdomens.

Take an active role in caring for the planet. Test your knowledge, and color the picture to help your family become your neighborhood's top recycler!



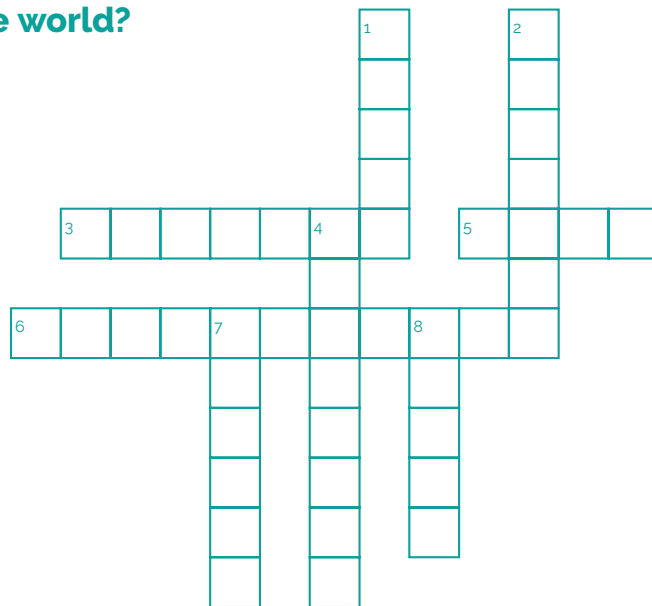
**What do you know about taking care of the world?  
Complete the crossword below!**

**DOWN**

- 1. To use again or more than once
- 2. Decayed organic material used as a plant fertilizer
- 4. A place to dispose of refuse and other waste material by burying it
- 7. To make smaller or create less
- 8. The planet on which we live; the world

**ACROSS**

- 3. Converting waste into reusable material
- 5. Decomposition animal with a slender, soft body and no limbs
- 6. The surroundings in which a person, animal or plant lives



**Recycling Challenge**

Water bottles and magazines and aluminum cans, oh my! What items does your family recycle? Draw these items in and around the recycle bin, and then post this page by your family's recycle bin to help them learn more about how they can help.



*Christine Danowski/ANS*

DOWN: 1. Reuse 2. Compost 4. Landfill 7. Reduce 8. Earth; ACROSS: 3. Recycle 5. Worm 6. Environment



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- Talk with scientists
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