

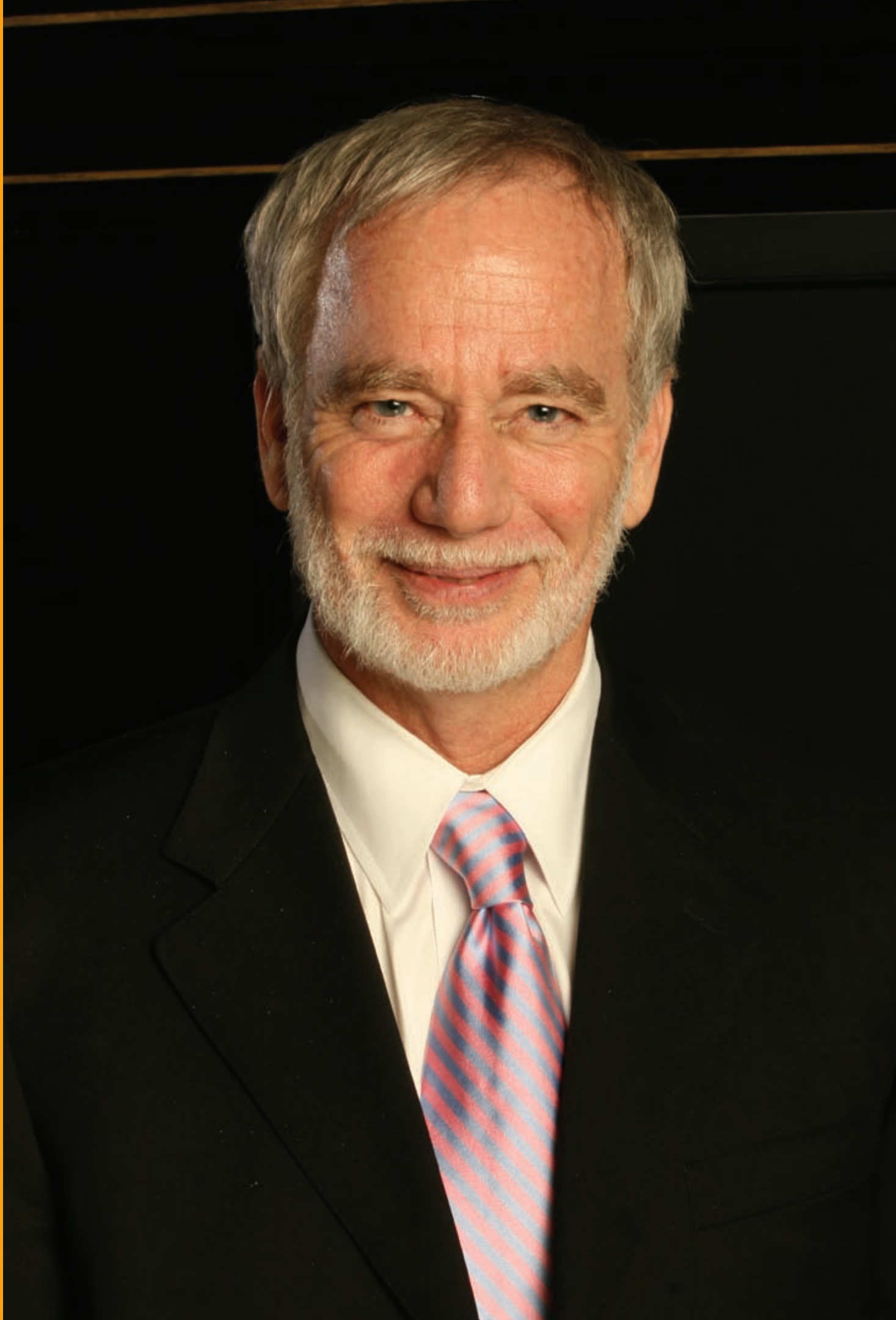
THE  
ACADEMY  
OF NATURAL  
SCIENCES



2006  
ANNUAL  
REPORT

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CONNECTING  
PEOPLE  
TO NATURE  
SINCE 1812



## MESSAGE FROM THE PRESIDENT

As the new President of the Academy, I am delighted to be here in Philadelphia. I am awed by its rich history, even while I envision a future marked by innovation.

The Academy was founded in 1812 and is the *oldest* natural science research institution in the Americas. Among its early acquisitions are a collection of fossils from Thomas Jefferson, plants from the Lewis and Clark expedition, Audubon's birds (not just paintings, the birds themselves!), and fish from Napoleon's nephew.

Now, nearly two centuries later, the Academy is recognized internationally for research, exhibits, educational programs, and its still growing collection (300,000 new specimens this year!) of 17 million natural history specimens and artifacts.

The year 2006 was special because of an extraordinary discovery by our paleontologist Dr. Ted Daeschler. He and his colleagues discovered *Tiktaalik rosae*, a fossil species illustrating the evolutionary transition of fish to limbed animals. This extraordinary find excited both the scientific community and captured the public imagination. Dubbed the "fishapod," the discovery was among the top science stories for 2006.

In other places and other ways, Academy scientists and educators continued their steady contributions to developing new knowledge of life on earth and sharing it with others, as you can see in the following pages of this report.

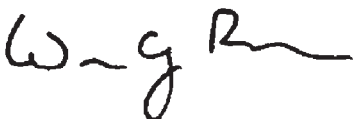
The Academy is moving forward toward its 200<sup>th</sup> anniversary in 2012 and beyond with four basic goals:

- Improving understanding of the diversity, ecology and evolution of life.
- Developing and applying science to improve the quality of the environment.
- Advancing public interest and engagement in natural sciences and environmental issues.
- Preserving the heritage of natural science in specimens, images, words, and numbers.

These goals—diversity of life, environment, education and preservation—are DEEP and wide. Our vision is to thrive and lead for the next two centuries, and we have much to do to make that a reality. Among other steps, we must:

- Invest in our building to improve its basic infrastructure, including environmental controls, sustainable technology and accessibility.
- Develop new permanent exhibits that will showcase the depth and breadth of the Academy's magnificent collections and provide an unforgettable, immersive experience.
- Upgrade and reinterpret the existing permanent exhibits, including Outside-In for children, the paleontology hall, and many of the dioramas.
- Expand our educational space and augment our programs for bringing more people of all ages closer to nature.
- Recruit additional talented staff, including curators, post-doctoral scientists, graduate students and interns, all of whom will help keep our research and programs recognized as "cutting edge."
- Expand our environmental work internationally, with an initial new focus in Asia and the oceans.

This is an ambitious agenda and its implementation will require the commitment and support of our staff, trustees, members, donors and volunteers. I thank all of you for your support of the Academy this past year and in the years before, and I look forward to our work together in making the Academy glow for her 200<sup>th</sup> birthday.



Bill Brown

## Academy Scientist Shakes the World

When a scientific discovery graces the cover of *Nature* and is named one of the Top 10 science stories of the year, it is an accomplishment. When that same discovery captures the front pages of newspapers worldwide and is spotlighted on Comedy Central, it is a phenomenon.

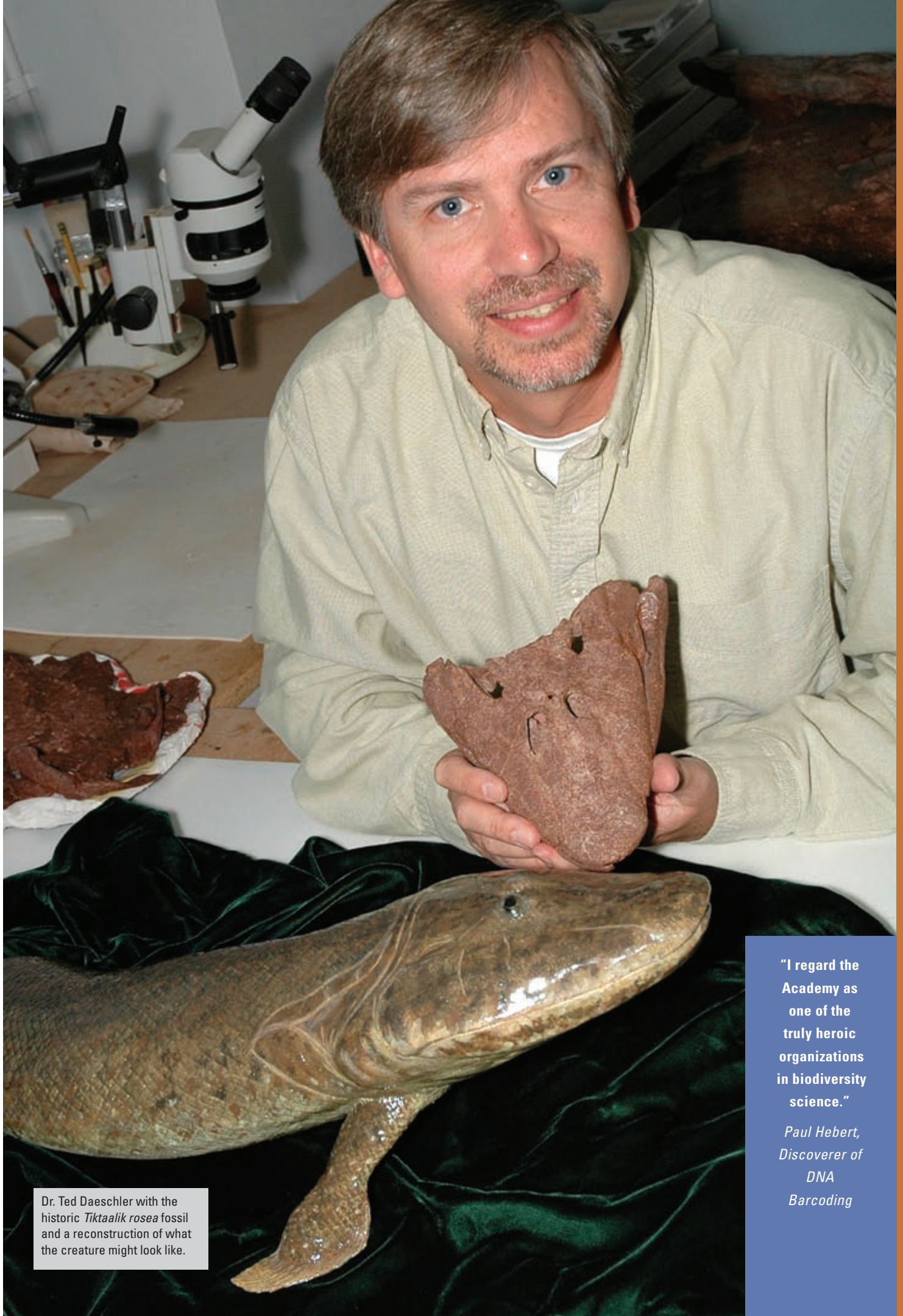
Such was Dr. Ted Daeschler's discovery of *Tiktaalik rosae*, a 375-million-year-old fossil with features displaying the evolutionary transition from fish to limbed animals. Using the skeletal structure of *Tiktaalik* and the deposits where it was found, Daeschler and his team proved the existence of an animal that lived on the bottom of shallow waters and, perhaps, even moved out of the water for short periods.

"The find is a dream come true," said Daeschler, the Academy's associate curator of vertebrate biology and co-leader of the expedition to Ellesmere Island in the Canadian Arctic. "We knew that the exposed Devonian rocks there had the potential for preserving fossils documenting this important evolutionary transition."

While the science community buzzed with excitement over the find, Daeschler's work was featured in hundreds of news outlets including the "NewsHour with Jim Lehrer" on Public Broadcasting System, "Science Friday" on National Public Radio, the Canadian Broadcasting Corporation's "Quirks & Quarks" science show and Comedy Central's "The Colbert Report."

Forgoing the traditional Latin or Greek to name the fossil, the team consulted the area's Nunavut residents, who suggested *Tiktaalik* (tic-TA-lick), the Inuktituk word for large, shallow water fish. The second part of the name, *roseae*, honors an anonymous supporter. Other funding came from the National Science Foundation, National Geographic Society and the researchers' home institutions.





Dr. Ted Daeschler with the historic *Tiktaalik rosea* fossil and a reconstruction of what the creature might look like.

"I regard the Academy as one of the truly heroic organizations in biodiversity science."

*Paul Hebert,  
Discoverer of  
DNA  
Barcoding*





"The Academy's two greatest contributions are to whet the appetite of children for science and to create innovative ways to measure changes in the environment."

*Ruth Patrick,  
The Academy of  
Natural Sciences*



## SCIENCE

### Patrick Center Creates Knowledge for Change

Whether it's the status of eels in Pennsylvania or the status of global climate change, The Patrick Center for Environmental Research continues to undertake work important to understanding human impact on the environment.

While the American eel will never be celebrated as a cuddly creature, it remains important to commerce and the environment. Eels support commercial food fisheries, are sport fish bait and a vital food source for wildlife. A team led by Fisheries Senior Scientist Dr. Richard Horwitz from The Patrick Center for Environmental Research conducted a comprehensive study of young, unpigmented so-called "glass eels." This study builds upon earlier Patrick Center research to understand eel biology and how it is affected by habitats, dams and contaminants in the Delaware River Basin.

The Patrick Center also has been a leader in assessing the impacts of dams/impoundments and dam removal, and is now working with water resource managers to manage water discharge from large dams in ways that simulate more natural conditions beneficial to the health of aquatic communities. Patrick Center scientists studied Gathright Dam in north central Virginia and made recommendations to the State of Virginia for improving water quality and potentially enhancing cold-water fisheries downstream.

Patrick Center scientists, along with researchers from Villanova University and the University of South Carolina, continued to work on a large-scale project to determine the impact of predicted climate change on low-salinity tidal marshes in the Delaware Estuary. These marshes serve as important nurseries for local fisheries, and our research will help evaluate estuarine-wide impacts and make recommendations for protection and management.

Dr. Don Charles was installed as the first-ever Ruth Patrick Chair in Environmental Science, and a specific objective of his research is to develop clear-cut algae-based indicators of water quality and nutrient impairment. These indicators are critical to monitor changes within watersheds over time and identify those waters that require additional protection. Charles' other main objective is to help state and federal agencies use algae-based indicators as part of their monitoring, assessment and remediation programs to protect and manage our rivers and streams.

### Ornithological Work Continues Flying High

Ornithologist Dr. Nate Rice continued his globe-trotting field work, collecting research specimens that could prove invaluable to public health authorities. During two trips to Australia, his collection work helped sample and track the movement of avian-borne viruses such as avian influenza. From each of the nearly 1,000 new specimens collected, numerous samples from liver, lungs and digestive tracts were isolated for analysis by epidemiologists. These specimens offer a twofold value: offering new research material for systematists and illustrating how avian viruses are spread by migratory birds.

Meanwhile, VIREO (VIsual REsource for Ornithology), now offering 130,000 images of 6,650 bird species, retained the mantle of most comprehensive bird-image bank in the world. Half of the world's estimated 10,000 bird species can now be seen at [www.ansp.org/vireo](http://www.ansp.org/vireo), VIREO's online image database. The site expanded to 35,000 images and so did its audience—as it recorded an all-time high of 335,651 searches.

Well into its third decade of service, VIREO provides a centralized, well-curated collection of avian photos from the world's most talented wildlife photographers. VIREO licenses bird images for a wide variety of scientific, commercial and non-profit uses and also sells digital images and slide sets for lectures.

### Laboratory for Molecular Systematics and Ecology

The Laboratory for Molecular Systematics and Ecology was established in 2004 as a facility for Academy scientists to enhance their research with the application of molecular data. By integrating information from DNA with their in-depth knowledge of plants and animals, our scientists can unravel the complex, and often surprising, evolutionary relationships among species. The ability to precisely identify species and their relationships is fundamental to our research in evolutionary biology and ecology, and its applications in areas such as conservation biology and resource management.

Shared by Academy scientists and our colleagues, the Laboratory is directed by Dr. Daniel Graf and managed by Anthony Geneva. In 2006, the Lab supported a number of research projects:

- Dr. Nat Weston and Dr. Melanie Vile gathered genetic data on bacteria in tidal freshwater marshes to gauge the effects of salt-water intrusion such as might occur with rising sea level.
- Dr. Lucinda McDade and research assistant Carrie Kiel optimized the amplification and sequencing of the Waxy gene, which had not been previously used in the study of the tropical flowering plant family Acanthaceae. This family, found in both the New World and Old World tropics, had until now defied rigorous genetic analysis.
- Post-doctoral fellow Dr. Benjamin Torke studied diversification of the tropical tree genus *Swartzia*, which has 133 known species, many of which are native to the Amazon rain forest, and are known to have medicinal properties.
- Data collected by Dr. Dina Fonseca and Jason Weintraub in the first genetic analysis of the Regal Fritillary butterfly in the eastern United States will help in managing the few remaining populations in Pennsylvania.
- Graduate student Natalie Blake, working with Dr. Gary Rosenberg, compared the accuracy of molecular versus morphological data in identifying species of land snails in Jamaica. Natalie is one of the first Jamaican citizens to receive training in molecular systematics.
- Dr. Daniel Graf and Carrie Kiel used mussels newly collected in the Nile and Congo rivers, along with older museum specimens, to test hypotheses about the origins of African freshwater mussels.
- Post-doctoral fellow Dr. Dennis Uit de Weerd, working with Gary Rosenberg, undertook a phylogenetic analysis of Caribbean land snails. Their results reveal surprisingly large groups of species on each island evolving from a few original colonizing species.
- Dr. Nate Rice completed a comprehensive database of tissue samples from 13,000 birds—one of the world's largest frozen ornithology collections. In addition to inhouse research, the samples are loaned to researchers worldwide for genetic analysis.

### Success Breeds Success in Mongolian Outreach

For more than a decade, The Academy of Natural Sciences has had a growing presence in Mongolia. Led by Mongolian Institute Director Dr. Clyde Goulden and Dr. Jon Gelhaus, associate curator in Entomology, Academy staffers have discovered new species, examined water quality, studied aquatic ecology and trained young Mongolians to be scientists.

Much of the research was summarized last year by the publication of “The Geology, Biodiversity and Ecology of Lake Hövsgöl, Mongolia.” In addition, Goulden continues to lead the effort to include this lake and surrounding watershed as a U.N. World Heritage site.

We equipped the first laboratory in Mongolia for the study of aquatic insects in the capital Ulaanbaatar, and developed the capacity of the Mongolian Academy of Sciences to house its own collections.

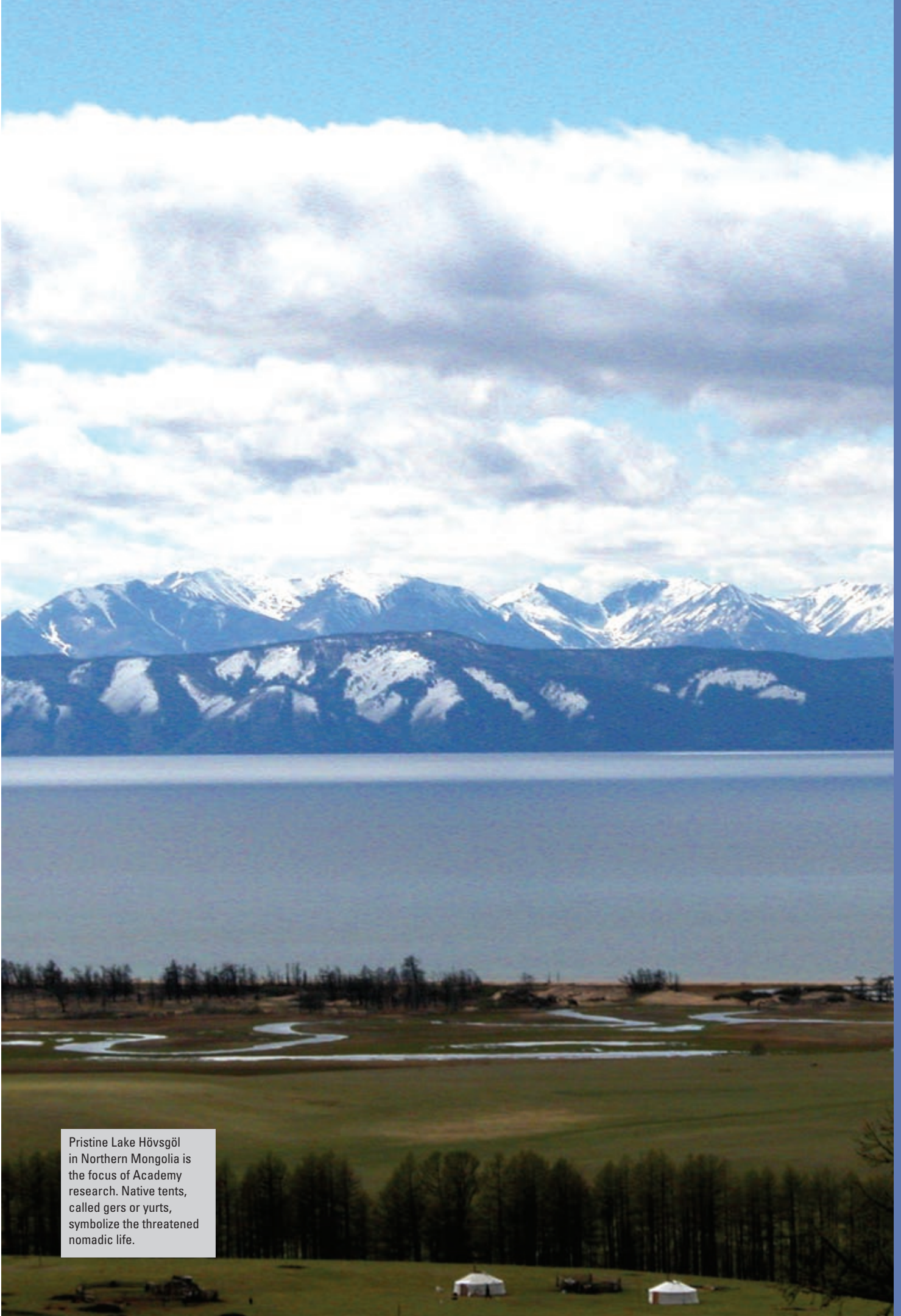
At one point last year, no less than five Academy staffers were in Mongolia on various missions:

Goulden completed a World Bank-funded, five-year study of the Lake Hövsgöl watersheds, examining the combined effects of global climate change and increasing grazing pressures on the vegetation, animals and water quality. About 23 young Mongolians trained with mentor scientists from around the world to document climate change, plant biomass and other ecological measures.

Gelhaus and his colleagues used a National Science Foundation grant to sample the aquatic organisms and water quality of more than 200 streams, rivers, lakes and wetlands in northern Mongolia. Our goals have been to explore the poorly known aquatic insects







Pristine Lake Hövsgöl in Northern Mongolia is the focus of Academy research. Native tents, called gers or yurts, symbolize the threatened nomadic life.





"We can't  
predict the future  
of a species  
without knowing  
its past."

*Dan Graff,  
The Academy of  
Natural Sciences*

Collections continue to  
be at the heart of the  
Academy's mission.



of this 300,000 square kilometers area, take water chemistry and habitat assessment measures, train Mongolian scientists, develop Mongolian scientific infrastructure, and translate our basic research into applications to improve the nation's water-quality monitoring efforts.

Dr. Mark Sabaj, Ichthyology collections manager, mounted an expedition to find the elusive Amur catfish and other fish for the worldwide All Catfish Project. He obtained tissues for molecular studies unavailable anywhere else.

Librarian and Senior Fellow Robert Peck was named to the U.S. delegation for the 800th anniversary of Chengghis Khan celebration. His reporting on the event was published in "The Philadelphia Inquirer."

Dr. Christian Jersabek, our rotifer specialist, carried out his second year of field work, uncovering numerous new species of these tiny aquatic invertebrates.

Future plans include expansion of water quality and insect survey studies to western Mongolia, developing native-language educational materials focusing on the ecology, protection and sustainable use of Mongolian aquatic resources.

### Collections: In Service of Science

Like the tip of an iceberg, the collections of the Academy go well beyond what visitors see on the museum floor—in fact, more than 17 million beyond. Away from public view, curators and collections managers acquire, catalogue, and conserve biological specimens that document the amazing biodiversity of life on Earth—from the tiniest of diatoms to dinosaur skeletons. They are used primarily for study by research scholars but also for teaching as well.

Last year, for example, the Ornithology department loaned more than 1,000 specimens to researchers at 20 institutions in six countries. At the same time, it accessioned nearly 2,000 specimens. Other departments were equally productive. Entomology accessioned more than 147,000 specimens. Ichthyology and Malacology each loaned more than 2,000 items. All in all, the Academy accessioned a staggering 294,960 specimens and images into its collections and loaned more than 11,000 items.

## EDUCATION

### Education Programs Make the Grade

From discovery lessons to home schoolers, Academy education programs fire the imaginations of tens of thousands of area children. Last year, 55,936 school children visited the Academy and 33,601 of them participated in an education program. Outside-In, the Academy's hands-on nature center hosted more than 25,508 kids eager to touch their world. Even students who could not visit us were engaged, as 29,122 attended our Academy on the Go outreach program. Also served were more than 150 teachers who attended Academy workshops and educational support programs.

For more than two decades, Women in Natural Sciences (WINS) has nurtured female public students through hands-on science classes, scientific literacy and skill-building activities. Last year, 50 girls participated in our WINS program. All 14 graduates of the class of 2006 received college scholarships.

The 29th annual George Washington Carver Science Fair gave 251 young adults from the Philadelphia School District and the Archdiocese of Philadelphia a chance to strut their academic stuff. The companion George Washington Carver Summer Scholars program builds upon that experience.

Meanwhile, Community Ambassadors in Science Exploration (CASE) trains teens and adults from underserved communities to be peer presenters of interactive science workshops.

SENSES—Supporting and Enriching Natural Science Education in Schools—served 2,168 students through 113 lessons taught at the six partner schools in 2006. Academy teachers and naturalists help the schools integrate science into their reading, literature and mathematics curriculum.

There was also lots of fun to go along with the learning as 6,401 scouts and their families attended the safari overnight and badge programs while 4,156 visitors celebrated their special day with an Academy birthday party.

In 2006, the Academy's Town Square programming continued to grow and diversify. Programs dealt with subjects ranging from global warming to conservation of African wildlife, and



welcomed such notable speakers as “New York Times” environmental reporter Andrew Revkin, award-winning conservationists Mark and Delia Owens, and Dr. David Wake, one of the world’s experts on declining amphibian populations. The Academy’s own Dr. Ted Daeschler was featured in May as he unveiled his discovery of the fossil *Tiktaalik rosea*, the “fish that walked.”

Also beginning last year, Town Square became one of the partners in the Philadelphia Urban Sustainability Forum, a series of public roundtables designed to make Philadelphia “the greenest city in America.” In addition to monthly discussions on Philadelphia’s environment and quality of life, the forum hosted a capacity crowd to hear Jaime Lerner, internationally renowned city planner and mayor of Curitiba, Brazil, the world’s most sustainable city.

As the year ended, a four-part series on the work and impact of Charles Darwin was presented in partnership with the Franklin Institute. This series brought together some of the world’s experts to discuss the importance of the theory of evolution and how it affects society, science and public policy.

## LIBRARY

### The Latest Chapter of Ewell Sale Stewart Library is Exciting

Peering through the windows of its massive doors, a passerby gets the impression that the Ewell Sale Stewart Library is just another hushed area of learning. Yet, while the decibel level may be low, the excitement runs high. While the library’s primary client is the Academy scientific and program staff, it also serves a host of others, including Academy members, scientists, historians, artists, graduate students, corporations and members of the public with advanced interests in the natural world.

In 2006, the library loaned 1,744 items to other institutions for exhibits, including its treasured Audubon copper plate and Hans Sloane’s “A voyage to the islands Madera, Barbados, Nieves, S. Christophers and Jamaica...” published in London in 1707–25. A few rare books, including Redoute’s “Lillies” and Volume 2 of Gould’s “Birds of Australia” underwent conservation at the Conservation Center for Art and Historic Artifacts.

The library display cases hosted two notable public exhibits. “A Cabinet of Curiosities” spotlighted the scientific collections of Academy member Reuben Haines (1786–1831) while “Alfred Russell Wallace—A Naturalist in Darwin’s Shadow” paid homage to the man who helped Darwin discover the principles of evolution.

The Friends of the Library hosted several successful events including a joint presentation with the Pennsylvania Horticultural Society in which the Botany Department’s Curator Emeritus Dr. Ernie Schuyler presented a lecture on botanical art before Linneaus, using the library’s early works as examples.

To the delight of visitors and books, the library received a new heating/air conditioning system.

Adding to the excitement was Librarian and Fellow of the Academy Robert Peck who spent a busy 2006 presenting dozens of lectures in locales as far-flung as Australia, New York City and Shepherdstown, WV.

Many millions will share his natural-history expertise as advisor and on-screen expert for the PBS documentary on the life and art of John James Audubon, completed last year and premiering July 2007. The film features many close-ups of the Audubon birds, most from the library’s





*Carolina Parakeet.*

PRINCEPS CAROLINENSIS. Linn.  
 Males: Kinnels Zilung-1  
 Weib: See: Kinnels Zilung-1

Painted by John G. Bourne, F.R.S.E.

Engraved by Thomas G. Smith.





**"My five sons  
and I loved  
visiting the  
Academy when  
they were  
growing up  
and now I visit  
with my  
grandchildren."**

*Sue Reynolds,  
Contributing  
Member*



exclusive collection.

## EXHIBITS

### Museum Exhibits: Butterflies and Bones, Mollusks and Frogs

In November 2006, butterflies returned to the Academy for the grand opening of the new permanent exhibition dedicated to showing off these and other insect species that undergo metamorphosis. Set in a cleanly designed, lavishly lit space, *Butterflies!* features interactive computer stations, a pupae glass-case chamber and, best of all, tropical butterflies.

Drawn from Malacology's outstanding collection, a vibrant and colorful exhibit of shells was mounted on the main staircase landing. Shelled animals are the second biggest family of creatures on earth. And, as these specimens prove, some of the most beautiful.

More than 180,000 visitors flocked to see several fascinating traveling exhibits. From January through May 14, crowds delighted in *Frogs: A Chorus of Colors*. Through the authentically recreated habitats, people marveled at the live creatures and learned about their delicate connection to the environment. From May 27–Sept 17, slipping out of your skin was never so easy—or interesting—as *Bones: An Exhibit Inside You* exposed visitors to mechanics of bones, methods of mending them and ways of keeping them healthy and strong.

The Academy also welcomed new Director of Exhibits Barbara Ceiga to the fold in August.



*Butterflies!* is an immersive experience enabling the mind, the senses, and the spirit to take flight.

# PARTNERS MAKING IT POSSIBLE

The Academy of Natural Sciences gratefully acknowledges its supporters for their ongoing generosity.

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## VOLUNTEERS

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Some are in the public eye, helping eager children pan for shark's teeth in Outside-In or answering questions from curious adults about the *Giganotosaurus carolinii* in Dinosaur Hall. Others work behind the scenes, helping scientists care for collections or maintaining vital databases. Recruited and placed by long-time Volunteer Coordinator Lois Kuter, volunteers make the Academy a stronger organization, better able to advance its mission on many fronts. They contribute to scientific endeavors and to visitors' enjoyment. In turn, they find enrichment in their service to the cause and in the intellectually vibrant setting of the Academy.

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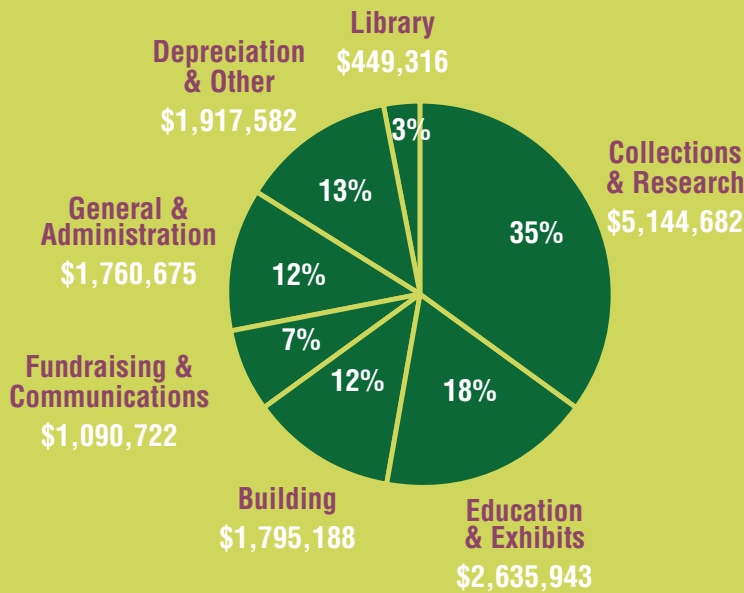
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*Piotr Naskrecki,  
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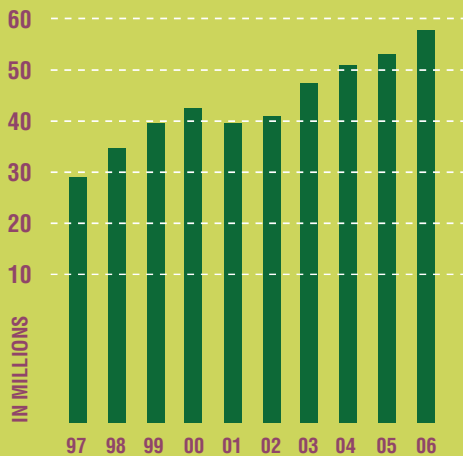
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\$14,795,108

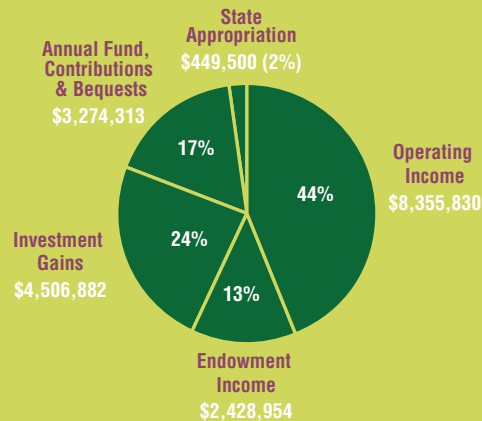


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