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MOLECULAR LAB REINVIGORATES CENTURIES OF BIODIVERSITY RESEARCH

PHILADELPHIA—Anthony Geneva selects a freshwater mussel tissue sample from frozen storage,” extracts the DNA, then fires up a thermocycler to create trillions of copies of the gene he wants to analyze.

Next it's on to a DNA sequencer to decode the genetic information of that gene. That's when it gets really interesting.

It's all in a day's work for Geneva, manager of The Academy of Natural Sciences' Laboratory for Molecular Systematics and Ecology, on the third floor of the museum's research wing. Another of his tasks is to maintain the frozen tissue collection in a bank of ultracold freezers, at minus 80 degrees Celsius to preserve the tissues' DNA. The collection includes thousands of tissue samples from plants and animals, especially birds. If there is a problem with the freezer, Geneva's cell phone is notified immediately so he can respond.

Since its founding in 2004, the molecular lab has invigorated the Academy's long-standing tradition of biodiversity research and preservation. It has allowed scientists to use genetic information, or DNA, to reconstruct evolutionary history and to learn about relationships between species by comparing their DNA sequences. The combination of scientific expertise, important specimen collections and the molecular facility make the Academy one of the global centers for biodiversity research.

“The presence of a laboratory for molecular research in a museum setting, where vast collections and active researchers provide the raw materials for analysis is really special,” said lab Director Dr. Daniel Graf. “It is a pairing with great potential for new insights.”

In the late 1800s, Gregor Mendel, the Augustinian friar who is the subject of a special exhibit at the Academy May 24 through September 28, 2008, was the first to determine how offspring inherit characteristics from their parents. Scientists later learned that DNA is the molecule that carries genetic information from parent to child.

“Mendel's meticulous research laid the foundation for modern genetic theory, and we apply some of those same techniques to evolutionary biology,” Graf said.

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Graf has a special interest in African freshwater mussels. Using the lab to compare his newly collected specimens from the Nile and Congo rivers with older specimens from the Academy's collection, Graf's findings are informing the National Science Foundation's "Assembling the Tree of Life" initiative. Other Academy scientists using the lab's molecular facilities for their research include:

- Drs. John Lundberg and John Sullivan of the Academy's Ichthyology Department found, much to their surprise, that the closest living relative of a particular Mexican catfish species is found in distant Africa rather than nearby Central America. This discovery raises many questions that, without DNA, scientists might not have even known to ask.
- Dr. Benjamin Torke, an Academy botanist and post-doctoral research fellow in the lab, is investigating the genetic diversity of the tropical tree genus *Swartzia*, which has 133 known species. Many of the species are native to the Amazon rain forest and are known to have useful antifungal characteristics.
- Anthony Geneva, lab manager, is using the DNA of South Pacific island geckos to challenge the old view of how many different species there are in the region and how they are distributed. His findings shed light on how a 1,000-year-old trading route may have influenced the distribution of some gecko species in New Caledonia.

"The findings of our laboratory projects help people make informed decisions on how to manage their environments with an eye toward conservation," said Geneva. "How can we say anything about the ecology of a species or how to manage it as a natural resource unless we know what to call it, where it is found, and how to distinguish it from other species."

For more information about the Laboratory for Molecular Systematics and Ecology, go to:
<http://www.ansp.org/research/lmse/>

For more information on "Gregor Mendel: Planting the Seeds of Genetics," go to
www.ansp.org/mendel/

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Founded in 1812, The Academy of Natural Sciences is the oldest natural history museum in the Americas and is a world leader in biodiversity and environmental research. The mission of the Academy is the encouragement and cultivation of the sciences.

The Academy is located at 1900 Benjamin Franklin Parkway and is open Monday through Friday from 10 a.m. to 4:30 p.m. and weekends until 5 p.m. Admission is \$10 for adults, \$8 for children ages 3–12, seniors, students with college I.D. and military personnel, and free for children under 3. There is a \$2 fee for "Butterflies!"