

**Testimony in Support of FY 2019 Funding for the
National Science Foundation**

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Submitted by:

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Subcommittee on Commerce, Justice, Science and Related Agencies

The Natural Science Collections Alliance appreciates the opportunity to provide testimony in support of fiscal year (FY) 2019 appropriations for the National Science Foundation (NSF). **We encourage Congress to provide the NSF with at least \$8.45 billion in FY 2019.**

The Natural Science Collections Alliance is a non-profit association that supports natural science collections, their human resources, the institutions that house them, and their research activities for the benefit of science and society. Our membership consists of institutions that are part of the international community of museums, botanical gardens, herbaria, universities, and other institutions that contain natural science collections and use them in research, exhibitions, academic and informal science education, and outreach activities.

Scientific collections are a vital component of our nation's research infrastructure. These specimens and their associated data (genetic, tissue, organism, paleontological, anthropological, and environmental samples) constitute a unique and irreplaceable library of Earth's history.

Natural science collections advance research that improves public health, agriculture, natural resource management, biodiversity conservation, and American innovation. Current research involving natural science collections also contributes to the development of new cyberinfrastructure, data visualization tools, and improved data management. A few examples of how scientific collections have saved lives, enhanced food production, and advanced scientific discovery include:

- On January 15, 2009, US Airways flight 1549 was forced to land in the Hudson River shortly after take off. The plane's engines failed after it flew through a flock of birds. Luckily, no one was killed in the accident. Per government policy, museum scientists determined from the remains of these birds that they were Canada Geese. The scientists then gathered stable isotope data from feathers and tissue from the engines and compared these samples to museum specimens of geese from known North American localities. The comparative analyses determined that a flock of migratory Canada Geese from the Labrador region of Canada were involved. Using this information, LaGuardia Airport developed a management plan to reduce the risk of future bird strikes.

- In 1993, a deadly new disease appeared in the southwestern United States. Using NSF-supported biological collections at Texas Tech University and University of New Mexico, the agent was determined to be Hantavirus carried by a few species of rodents. When rodent populations increased following an El Niño weather event, the animals spread into human environments and increased the transmission of Hantavirus. With the vector known, it was possible to lessen the risk to humans by reducing opportunities for disease transmission. Using other specimens, scientists have now identified more than 40 other strains of Hantavirus worldwide that are carried by bats, moles, and shrews. Similar work is underway to identify the carrier of Ebola in Africa.
- Citrus bacterial canker disease wreaks havoc on fruit crops in Florida. Using plant specimens collected a century ago, scientists have analyzed the bacterium and traced its source. Knowledge of how the bacteria spreads allows scientists to develop effective control methods and to protect the U.S. citrus industry.

There are more than 1,600 biological collections in the United States, the result of more than 250 years of scientific investigation, discovery, and inventory of living and fossil species. Collections are housed at museums, universities, botanic gardens, and government managed laboratories and archives. The institutions that care for scientific collections are important research infrastructure for the United States that also provide students with hands-on training opportunities.

The NSF plays a unique role in protecting and expanding access to our nation's scientific collections. NSF supports research that uses existing collections as well as studies that gather new natural history specimens. NSF's Directorates for Biological Sciences (BIO) and Geosciences (GEO) support research and student training opportunities in natural history collections. The NSF is also an important supporter of biological research infrastructure, such as natural history museums, living stock collections, and field stations. These place-based research centers enable studies that take place over long time periods and variable spatial scales.

NSF funds state-of-the-art work to digitize high priority specimen collections. The result of this effort is that irreplaceable biological specimens and their associated data are now accessible through the Internet to researchers, educators, and the public. More than 95 million specimens are now online, with millions more awaiting digitization. This effort involves biologists, computer scientists, and engineers in multi-disciplinary teams who develop innovative imaging, robotics, and data storage and retrieval methods. These new tools expedite the digitization process and contribute to the development of new products and services of value to other industries. Museum specimens and associated data represent an extraordinary resource for teaching core concepts in science.

In addition to supporting research, NSF's science, technology, engineering, and mathematics (STEM) education programs enhance the ability of museums, botanic gardens, zoos, and other research institutions to provide science learning opportunities for students. NSF's Advancing Informal STEM Learning program is furthering our understanding of informal science education

outside of traditional classrooms. The program is especially valuable at broadening participation in science for underrepresented groups.

Conclusion

Preservation of specimens is in the best interest of science and taxpayers. Quite simply, it is not possible to replace this important aspect of our heritage. Specimens collected decades or centuries ago are increasingly being used to develop and validate models that explain how species (including viruses, parasites, and pathogens) have dispersed around the world, as well as how and when they have or might infect humans.

The NSF is the primary funding source that provides support to institutions to help them preserve endangered collections, to help increase access to specimens for research and education, and to support the development of new tools and resources that enable innovative new research using the collections.

Investments in NSF programs that support natural science collections research and education are essential if we are to maintain our global leadership in innovation. Please support funding of at least \$8.45 billion for NSF for FY 2019.

Thank you for your thoughtful consideration of this request and for your prior support of the National Science Foundation.