U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION

HEARING CHARTER

Behind the Scenes: Science and Education at the Smithsonian Institution

July 21, 2010
2:00 p.m. – 4:00 p.m.
2318 Rayburn House Office Building

1. Purpose:

The purpose of the hearing is to examine the Smithsonian Institution's research activities, educational programs, and management of scientific collections, as well as the intersection between those missions.

2. Witnesses:

- **Dr. G. Wayne Clough**, Secretary, Smithsonian Institution
- **Ms. Claudine Brown**, Director of Education, Smithsonian Institution
- **Dr. Eldredge "Biff" Bermingham**, Director, Smithsonian Tropical Research Institute, Smithsonian Institution
- **Ms. Shari Werb**, Assistant Director of Education at the National Museum of Natural History

3. Overarching Questions:

1. In what areas of research does the Smithsonian Institution (SI) play a prominent role? In what areas of research does SI play a unique role relative to other Federal agencies? How does SI coordinate its own research priorities and programs with those of other Federal agencies, including the National Science Foundation? How does SI collaborate or coordinate with non-profit research organizations, including universities, and with foreign research agencies and organizations?

2. What is the Smithsonian Institution's role in science, technology, engineering and mathematics (STEM) education? What kinds of programs does SI support and for what levels of education? How does SI take advantage of its museums and research institutes to carry out its programs? How is SI's education mission similar to or unique from that of other Federal research agencies, and how, if at all, does the SI coordinate or collaborate with other agencies and with non-governmental entities to achieve its mission? What is the intended role of SI's new Director of Education?

3. What is the Smithsonian Institution's plan for long term management of its scientific collections? In particular, how does SI intend to implement the 2008 recommendations of the Interagency Working Group on Scientific Collections? What are the greatest challenges to long-term preservation and access to scientific collections?

4. Background:

The Smithsonian Institution (SI) was founded in 1846 by the United States Congress in response to a bequest of $500,000 by British scientist James Smithson, donated "to the United States of America, to found at Washington, an establishment for the increase and diffusion of knowledge among men." The original Smithsonian 'Castle' contained a library, lecture halls, exhibits and demonstrations, laboratories, and scientific artifact collections. In the last 160 years, SI has expanded to include 19 museums and galleries and nine research facilities, and 168 other museums around the country are now affiliated with the Smithsonian. SI employs over 6,000 people and has as many volunteers, and publishes *Smithsonian* and *Air & Space* magazines in addition to other scholarly works. The Smithsonian collections include over 137 million objects, specimens, and works of art. In 2009, SI museums and the National Zoo welcomed over 30 million visitors, while Smithsonian websites had over 188 million hits. The Smithsonian is currently the largest museum and research complex in the world.

Governance and oversight

Originally established by an Act of Congress, the Smithsonian is technically a 'federal trust instrumentality' and is not part of the executive branch. The 17-member Board of Regents acts as the Smithsonian's internal governing body. Traditionally, the Chief Justice of the United States is elected Chancellor, with the Vice President and Chief Justice both serving as ex-officio members of the Board. The rest of the board is composed of three Members each from the House and Senate, and nine citizen members authorized by a joint resolution of Congress. The Secretary is elected by the Board, as are the members of the Executive Committee. The current Secretary, Dr. G. Wayne Clough, was named to the position on March 15, 2008, and assumed office on July 1 of that year.

Currently, in the House of Representatives, the Committee on House Administration has legislative jurisdiction, with the Committee on Transportation and Infrastructure having oversight of construction projects. In the Senate, the Committee on Rules and Administration has full legislative jurisdiction. Federal funding falls under the Subcommittee on Interior, Environment, and Related Agencies on the House and Senate Appropriations Committees.

In this Congress, the above Committees have held hearings on Smithsonian budget requests, stimulus-funded projects, asbestos management, GAO recommendations, and broader projects related to specific Smithsonian research activities, but no hearings have been held to examine the overall research agenda and activities at the Smithsonian Institution or focused on SI's educational programs or collections.

Funding

Smithsonian has an annual budget of slightly more than $1 billion, of which about three quarters comes from direct federal appropriations. The remainder is held in general trust funds, separate from federal appropriations in SI's own budget, including revenue from museum and publication sales and licensing as managed by Smithsonian Enterprises, from private donations, and from both federal and non-federal grants and contracts. More than half of the total budget is allocated to salaries and benefits for Smithsonian employees, including researchers and scientists directly employed by the Institution. The Institution is also designated as a 501(c)(3) tax-exempt non-profit organization by the Internal Revenue Service.

For FY 2011, Smithsonian designed its budget around four "grand challenges," which provide the central strategy for planning and framing its efforts: Unlocking the Mysteries of the Universe, Understanding and Sustaining a Biodiverse Planet, Valuing World Cultures, and Understanding the American Experience. In this hearing, we will focus on the museums and research centers that fall under the Under Secretary of Science, fitting into three broad categories: astrophysics (Harvard-Smithsonian Center for Astrophysics, Air and Space Museum), ecology and environmental science (National Zoo/Conservation Biology Institute, Environmental Research Center, Tropical Research Institute, Museum of Natural History) and museum research, conservation, and collections (Museum of Natural History, Museum Conservation Institute, Smithsonian Libraries).

The Fiscal Year (FY) 2011 request for Congressional appropriations totals $797,600,000. This is roughly a 4 percent increase over FY2010 levels, with the largest increases in discretionary funds requested for research on biodiversity (+$2 million) and climate change (+$4 million), digitization and web support (+$1.5 million), and collections care (+$2.45 million). For the first time, in FY 2011, the Smithsonian research appropriations request is large enough to be listed as an individual line item on the Administration's Research and Development budget summary; in the past, the request was too small and fell under "Other" R&D.

Research

In the early years of the Smithsonian Institution, its focus was largely on the science itself. Its first Secretary, American scientist Joseph Henry, focused on research and the "increase of knowledge" rather than its "diffusion," and was unenthusiastic about museums. Although the Institution has evolved to have a strong focus on cultural and historic knowledge as well, the first two of its "Grand Challenges" are directly related to scientific discovery and understanding. SI is a world leader in many areas of scientific research, and houses some of the largest and most acclaimed research programs in their respective fields.

The science-based research centers, as well as several of the Smithsonian's museums and the National Zoo, are overseen by the Smithsonian's Under Secretary for Science, a post currently held by Dr. Eva Pell, while other museums and programs fall under the Under Secretary for History, Art, and Culture.

- **Center for Earth and Planetary Studies (CEPS)**

The Center for Earth and Planetary Studies is the research unit of the National Air and Space Museum, located in the museum complex in D.C. and at the Steven F. Udvar-Hazy Center in Virginia. The Center focuses specifically on planetary and terrestrial geology and geophysics using remote sensing data, with ongoing research programs examining Mercury, Venus, Earth, Mars, and the moon.

- **Conservation Biology Institute (CBI)**

The Smithsonian Conservation Biology Institute includes conservation biology and research programs at the National Zoo and at CBI's Front Royal, VA headquarters, previously known as the National Zoo's Conservation and Research Center. Dedicated to preserving and promoting biodiversity, the Institute has centers for animal care, conservation ecology, conservation education and sustainability, conservation and evolutionary genetics, migratory birds and species survival.

- **Environmental Research Center (SERC)**

The newest of SI's research institutes, the Environmental Research Center is located on 3,000 acres of land bordering the Chesapeake Bay in Maryland, and conducts both research and education programs on the Chesapeake Bay and its watershed. Its research is distinguished from other Chesapeake research facilities by including terrestrial elements in its research, rather than focusing solely on the Bay. SERC scientists also have comparative and interdisciplinary research programs comparing their own coastal ecosystems to others around the world.

- **Harvard-Smithsonian Center for Astrophysics (CfA)**

The Harvard-Smithsonian Center for Astrophysics is the result of a collaboration between the Smithsonian Astrophysical Observatory and the Harvard College Observatory, headquartered in Cambridge, MA, with major research sites in Arizona and Hawaii. It is one of the world's largest astrophysical institutions and owns and operates a number of observatories around the world, including at the South Pole, as well as several satellite observatories. CfA also has an active Science Education Department conducting research on outcome-based teaching and assessments.

- **Museum Conservation Institute (MCI)**

Formerly known as the Smithsonian Center for Materials Research and Education, the Museum Conservation Institute is a leader in the field of collections care and preservation. MCI also conducts technical and interpretational research on museum specimens, including anthropological analyses, and provides consultation to both federal agencies and outside institutions in addition to working closely with the 19 Smithsonian museums. Located in Suitland, MD, the Museum Conservation Institute employs materials scientists, chemists, and specialists in museum conservation and technology.

- **Museum of Natural History (NMNH)**

The Museum of Natural History is the largest of the Smithsonian research centers and houses the scientific research departments of Anthropology, Botany, Entomology, Invertebrate Zoology, Mineral Sciences, Paleobiology, and Vertebrate Zoology. The Museum's research division places a major emphasis on interdisciplinary research, housing programs on the Evolution of Terrestrial Ecosystems, Archaeobiology, Arctic Studies, Human Origins, and Paleoindian studies in addition to discipline-specific research. NMNH also runs several external research facilities, including the Smithsonian Marine Station at Fort Pierce, FL, which conducts research on ecosystems and marine biodiversity, and the Caribbean Coral Reef Ecosystems Program at the Carrie Bow Marine Field Station on Belize's Meso-American Barrier Reef.

- **Tropical Research Institute (STRI)**

Located in Panama, the Tropical Research Institute has conducted research on tropical land- and marine-based ecosystems since 1923. It is the only SI bureau not based in the United States. STRI also hosts a number of research programs in collaboration with outside universities and government institutions, including the Yale School of Forestry and Environmental Studies, the Panama Canal Authority, Panama's Environmental Authority, and Brazil's National Institute for Amazonian Research. It is one of the largest research centers for tropical biology in the world.

A significant portion of the Smithsonian's research is funded by its own direct appropriations. SI researchers are staff scientists with their own research budgets, reviewed periodically for progress, but do not have to go through a standard competitive process. In this way, they are more similar to federal scientists at mission agencies than to their academic counterparts. The National Research Council (NRC) reviewed this funding mechanism in 2003 and found that SI's non-competitive funding mechanisms are especially critical for SI's environmental and large-scale research activities. These often span over long periods of time and would be impractical under a standard three-year competitive grant cycle.

In many cases, Smithsonian scientists also compete for funding from other federal grant–making agencies, including NASA, NIH, DOD, and NSF. The Smithsonian's scientific community includes many of the top experts in their respective fields, and they are very competitive when applying for outside funds from agencies or private grant making organizations.

Education and outreach programs

The Smithsonian's museums and research centers are known for their commitment to education and outreach as well as scientific discovery. There are 32 museum- or research center-level education offices throughout the Institution, offering hands-on workshops for K-12 students as well as lectures and seminars at a more advanced level, in addition to on-site exhibits. More than 150,000 K-12 students and teachers visit the education centers each year. Many have formal, ongoing relationships with school districts, integrating field trips into the schools' existing curricula. Museums and research centers are also increasingly making their educational

resources available online and developing 'hands-on' internet activities to reach students in communities across the country. In addition to its education programs, SI regularly publishes its own scholarly articles and books, and has designed numerous online encyclopedias and portals designed to support all levels of learning, indicating that education and outreach – James Smithson's "diffusion" of knowledge – are significant priorities for the Institution.

On June 20, Claudine Brown joined the Smithsonian as its first ever Director of Education, reporting directly to the Secretary. She oversees the two major educational entities at SI – the Center for Education and Museum Studies and the National Science Resource Center – in addition to coordinating the 32 individual education offices. Brown will also be responsible for developing a comprehensive education plan for SI's education and outreach activities.

The Smithsonian's Center for Education and Museum Studies provides educational information on museum visits as well as numerous educational resources for teachers, parents and students through its website. The National Science Resources Center (NSRC) is jointly operated by the Smithsonian and the National Academies; its mission is to improve the teaching and learning of science, provide professional development opportunities for science teachers, and develop and disseminate research-based curricula.

The Smithsonian's museums, research centers, and education, outreach, administrative and policy offices offer hundreds of internships and research fellowships each year, reaching students from the high school to the post-doctoral level. Most institutions manage their own internships and fellowships, augmented by its equal opportunity and cultural diversity programs for minorities, Native Americans, and persons with disabilities.

The Smithsonian Institution Libraries system (SIL) serves both the research and education communities, and is the largest museum library system in the world. SIL manages 20 museum- and discipline-specific libraries in D.C., Maryland, New York and Panama. SIL is designed as an academic and public library system, in addition to its primary mission of supporting Smithsonian Institution staff and research missions. There are also two Smithsonian-affiliated publishing companies – the Smithsonian Institution Scholarly Press, which publishes scholarly works written by Smithsonian researchers and museum curators, and Smithsonian Books and Harper Collins, publishing books by both SI-affiliated and outside authors.

Scientific Collections

The Smithsonian also has the one of the largest federal object-based scientific collections, serving as a resource for Smithsonian's own research and museum display purposes and for other federal and academic scientists as well. In particular, its natural history collection is the largest in the world, composing about 92 percent of the Smithsonian's 137 million total specimens collected over more than 150 years. Many of the Smithsonian's collections are also available to outside scientists not directly affiliated with SI. Some federal employees from other agencies work out of the NMNH to reduce duplication of collections and to take advantage of the Smithsonian's resources, and those partnerships represent a significant financial contribution to the Museum's collections budget. There are also hundreds of ongoing digital imaging projects aimed at putting collections online and making them available to the public. The Smithsonian's

websites receive eight times as many visitors as the museums, making digitization of Smithsonian collections an integral part of SI's greater education and outreach initiatives.

Other federal departments and agencies also have large scientific collections, such as USDA's collections of plants, insects, diseases, and other agriculture-related specimens, or NIST's calibration collections, used to define and calculate accurate weights and measurements. Some of the Smithsonian's own collections are also shared or maintained with other agencies; the Zoo's collaboration with the U.S. Fish and Wildlife Service is one example. The Smithsonian is believed to have the most individual specimens and artifacts of any collection in the world.

In 2005, the National Science and Technology Council (NSTC)'s Committee on Science created an Interagency Working Group on Scientific Collections (IWGSC) to "examine the current state of Federal scientific collections and to make recommendations for their management and use"[1] at the urging of OMB and the Office of Science and Technology Policy (OSTP). Co-chaired by the Smithsonian Institution and the Department of Agriculture, the IWGSC's report, *Scientific Collections: Mission-Critical Infrastructure for Federal Science Agencies*, noted both the importance and the lack of adequate staffing, funding, and documentation of federal collections. The working group had several recommendations related to cost projections, documentation, agency responsibilities, creation of an online clearinghouse, periodic reports, and improved long-term coordination of federal collections. In the *America COMPETES Reauthorization Act of 2010*, the Committee on Science and Technology included a provision requiring OSTP and the science agencies to implement several of the key recommendations in the 2009 report.

Strategic Plan

In SI's 2010-2015 Strategic Plan, three questions were proposed to measure the success of the Smithsonian's efforts and initiatives:

> Has the Smithsonian:
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> 1. "Made leading contributions to national and global efforts to unlock the mysteries of the universe, understand and sustain a biodiverse planet, value world cultures, and understand the American experience, through collaborative efforts among 19 museums, nine research centers, and numerous outreach and education programs?
> 2. "Harnessed the power of technology to grow and share the Institution's knowledge and collections through exhibition, education, and outreach, and to triple the number of meaningful learning experiences we offer daily?
> 3. Increased the number of visitors, employees, and key partners and stakeholders who rate us as an excellent organization in which to invest, work, and learn, through new and more efficient ways of working and increased collaboration, accountability, and financial stability?[2]

This hearing will examine these same questions, and attempt to identify areas of growth and improvement among Smithsonian research, education, and collections activities.

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[1] National Science and Technology Council, Committee on Science, Interagency Working Group on Scientific Collections. *Scientific Collections: Mission-Critical Infrastructure for Federal Science Agencies.* Office of Science and Technology Policy, Washington, D.C., 2009.

[2] Smithsonian Institution. *Inspiring Generations Through Knowledge and Discovery: Strategic Plan.* Washington, D.C., 2009. 5.