

CITIZEN SCIENCE AT THE SMITHSONIAN



Operation Moonwatch: Philippine Boy Scouts, 1958
Smithsonian Institution Archives

Since its founding, the Smithsonian has always been dependent upon the kindness of strangers to carry out its scientific research mission. Today, a recent resurgence of such efforts is known as “Citizen Science.” The Cornell University Lab of Ornithology, for example, established a citizen science bird observation data collection program in 1966, with live data input since 1997, and in 2011 has over 200,000 observers

participating. In the 21st century, online efforts like the *Encyclopedia of Life*, where specialists worldwide contribute to a

database on all life forms, and the Smithsonian Flickr Commons, where the public identifies events, people, etc., in Smithsonian photographs, continue a tradition of engaging the public in the increase of knowledge, as well as its diffusion. Given the Smithsonian’s unique mission and the esteem in which it is held by the general public, the Institution has always been able to call upon a broad spectrum of private individuals to assist in our scientific endeavors.

Shortly after becoming the first Secretary of the Smithsonian in 1846, Joseph Henry established the Meteorological Project, a basic research project to study the weather and patterns of storms across the continent. To compile the data he needed, in 1847 Henry recruited 150 volunteer weather observers across the country. Observers included military personnel stationed at distant forts, farmers, teachers, doctors, and even telegraph operators. Henry prepared a “Circular” that provided detailed instructions about what observations were to be recorded and how, with blank forms for submission. The Smithsonian often provided the necessary scientific instruments, including thermometers and barometers that would provide standardized readings. The volunteers submitted monthly reports that included several observations per day of temperature, barometric pressure, humidity, wind and cloud conditions, and precipitation amounts. They also were asked to comment on “casual phenomena,” such as thunderstorms, hurricanes, tornadoes, earthquakes, meteors, and auroras.

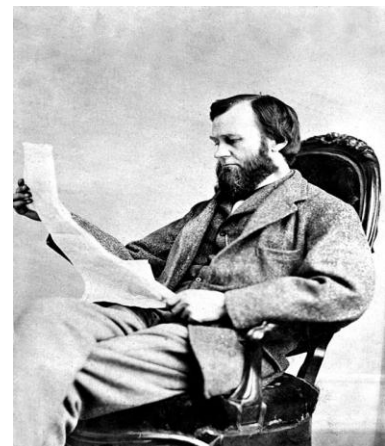
A decade later, the project had more than 600 volunteer observers, including people in Canada, Mexico, Latin America, and the Caribbean. Its cost in 1860 was \$4,400, or thirty percent of the Smithsonian's research and publication budget. A second aspect of Henry's meteorological project was weather telegraphy. Early on, Henry foresaw the storm-warning potential of the telegraph, an invention he had helped pioneer in the 1830s. Realizing that storms in the United States generally moved from west to east, he sought to develop an early warning system for

the Midwest and East Coast. By 1849, Henry worked out an arrangement with a number of telegraph companies to allow free transmission of local weather data to the Smithsonian. By 1857, telegraph stations from New Orleans to New York were cooperating. These dispatches enabled Henry to create a large daily weather map located in the Great Hall of the Castle. Its purpose, Henry wrote, was "to show at one view the meteorological condition of the atmosphere over the whole country."

The Civil War dealt a major blow to the meteorological project. Urgent public business forced weather information off the telegraph lines, and secession cut Henry off from his southern observers. Although he was able to revive the project after the war, Henry began taking steps to transfer its operations to the federal government. In his annual report for 1865, Henry called for the federal government to establish a national weather service capable of issuing storm warnings and other weather predictions. In 1870, Congress passed a bill that put storm and weather predictions in the hands of the U.S. Army's Signal Service. By 1874, Henry convinced the Signal Service to take over the volunteer observer system as well. The weather functions of the Signal Service were transferred in 1891 to the newly established U.S. Weather Bureau, which later became the National Weather Service. That service today, as David Laskin puts it in his 1996 book, *Braving the Elements: The Stormy History of American Weather*, "still adheres to the same fundamental structure and principles that Joseph Henry devised and set in motion." It is important to note, that in all other countries, weather information was considered of military strategic importance and was not made available for the public and researchers to use. Henry established the principle that all this scientific data would be freely available in a democracy. Great Britain just made its data available to the public in the last decade.

When Spencer Fullerton Baird was hired as the first Smithsonian Curator in 1850, he began an ambitious collecting effort across the country and later the globe, building on Henry's volunteer network. Baird distributed natural history "Circulars" requesting information on local flora, fauna, geology, and ethnology. Baird's collectors sent specimens and artifacts to the new National Museum, with detailed provenance information, following Baird's detailed instructions for collecting, preparing and documenting specimens. Baird's father-in-law was Inspector General of the U.S. Army, and General Churchill

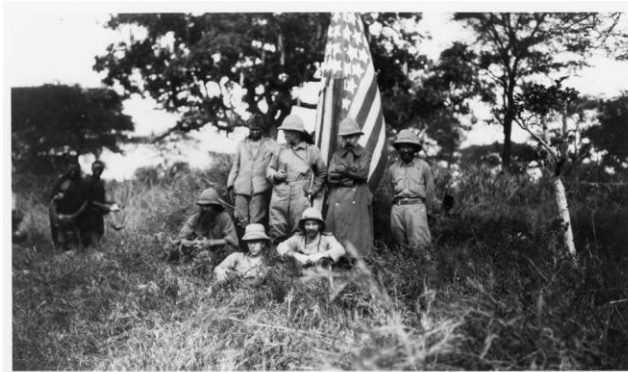
encouraged soldiers to collect for the museum and facilitated transportation of collections back to Washington. Baird's military collectors included such luminaries as General George McClellan, Admiral David Farragut, and Commodore Matthew Perry. Baird expanded Henry's network significantly, to include hunters and trappers in remote locations, professors in the new colleges and universities, members of local scientific academies, and settlers moving west. Indeed, Baird was so successful that he soon wrote that he felt like the sorcerer's apprentice, who could not stop or even slow the flow of materials into



Spencer Fullerton Baird
photographed by William Bell
Smithsonian Institution Archives

the Institution. But Baird reveled in these relationships, maintaining a personal correspondence with hundreds of volunteers – during some of these years, Baird wrote over 6,000 letters per year (over sixteen letters per day) in addition to all his other duties.

In the late 1880s, after Baird’s death, a movement to professionalize science emerged and new barriers were erected to participation in science by amateurs across the U.S. The Smithsonian greatly reduced its role of “correspondents,” much to their dismay and focused on collaboration with other scientific professionals. But amateurs did not disappear entirely, and young naturalists such as Teddy Roosevelt continued to write to the Smithsonian for advice and donate their specimens to the National Museum. Indeed, as he left the White House in 1909, Roosevelt headed off to British East Africa to collect thousands of specimens for the new museum building (now NMNH), funded during his presidency. His collection of lions, elephants, giraffes, hippos and rhinos entranced visitors to the new National Museum building. During World War II, the National Museum organized another major citizen science effort. Early in the war, the Smithsonian focused on sharing its detailed knowledge of remote regions of the Pacific, but as the conflict continued, curators saw an unparalleled collecting opportunity.



Theodore Roosevelt on Smithsonian-Roosevelt African Expedition, 1909, Smithsonian Institution Archives

The Institution prepared *A Field Collector’s Guide to Natural History* and distributed millions of copies to U.S. soldiers. Continuing Baird’s tradition, the *Guide* provided detailed instructions on how to collect artifacts and specimens, preserve and prepare them for shipping, and document what the soldiers had collected. Secretary Alexander Wetmore, among others, maintained a steady correspondence with the young recruits, listening with great sympathy to their tales of the horrors of battles, and encouraging

them to relax in their spare time by observing and collecting the natural world around them. I recently located one of Wetmore’s correspondents, Sammy Ray of Mississippi, who visited the Smithsonian this April to see the letters he had written and specimens, especially birds that he had collected. Ray had just graduated from Louisiana State University with a degree in biology, when he joined the U.S. Navy. He wrote to Secretary Wetmore about the birds he collected on Pacific islands to send to the Museum, noting that he would only collect for the museum “when time and duty permit.”

During the heat of battle at Palau, he reflected “never has my interest in birds been as little as it was here” and “I thought that I had made my last bird skin.” He soon returned to his bird watching and told Wetmore that his natural history interests were a welcome diversion from the stresses of battle. After the war, he continued his natural history studies to become a professor of marine biology at Texas A&M University, and at 91 years old is still an active

scientist and teacher. At the end of World War II, the Smithsonian's National Museum held the premier collection of Pacific natural history specimens and ethnological artifacts, and remains a powerhouse of Pacific science today, due to the ongoing efforts of citizen scientists.

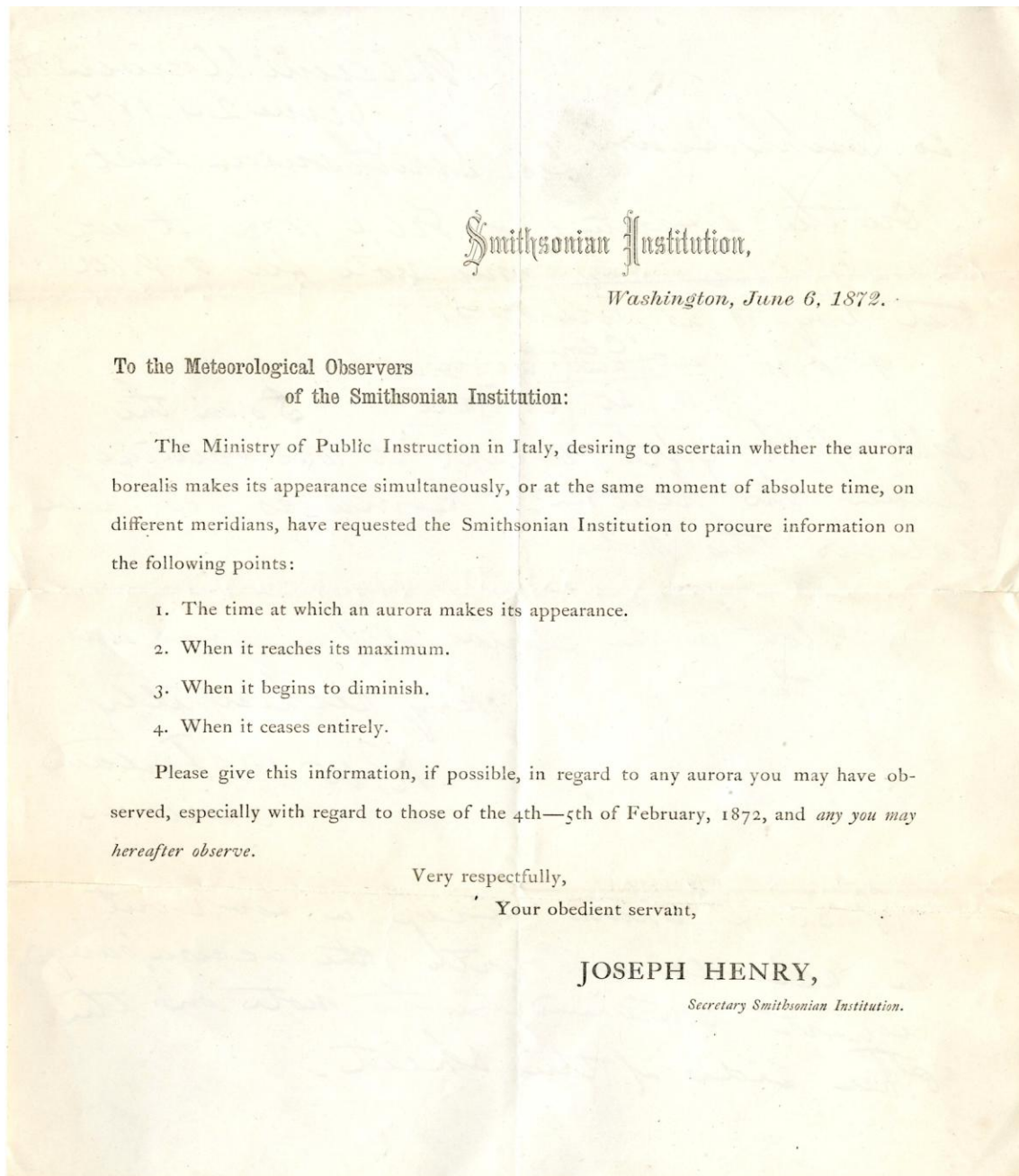
Astronomy has always had a strong tradition of amateur involvement, engaging a broad spectrum of the public in compiling astronomical observations. After the Smithsonian Astrophysical Observatory was created in 1890, its staff encouraged public involvement in the study of the heavens. After World War II, however, these efforts became far more systematic.

The nation was shocked when the Soviet Union launched *Sputnik* in October of 1957, before the U.S. SAO director Fred Whipple was one of the few astronomers who believed the Soviets were capable of this, and SAO was the only organization in the U.S. prepared for the launch. Whipple had established a ring of Baker-Nunn cameras across the globe to photograph the satellite as it circumnavigated the earth. He also created "Operation Moonwatch," a volunteer/amateur effort to compile observations of the satellite, observations that would be used to more accurately determine the shape of the earth. Students in Cambridge, Massachusetts, Boy Scouts in the Philippines, and amateurs in South America used standard equipment and followed a Moonwatch manual to compile standardized observations. As space exploration began, Moonwatch volunteers even tracked the Apollo missions. Until its termination in 1975, the Moonwatch Division coordinated this network of volunteers and amassed a total of nearly 400,000 observations of satellites. The Volunteer Flight Officer Network was established in 1963 by Denver Moonwatch team leader Herbert E. Roth to collect eyewitness reports of satellites and meteor sightings from airline pilots and other flight personnel. Before its termination in 1975, the Moonwatch VFON had grown to include the employees of 118 airlines in 57 countries and had collected approximately 4200 observations. Many of these traditions have been reinvigorated with online information sharing in the 21st century. Continuing Joseph Henry's work, the Smithsonian Tropical Research Institute's Center for Tropical Forest Studies today maintains a global database of climate observations, crucial for the study of climate change and its impact on biodiversity, <http://www.ctfs.si.edu/>.

The *Encyclopedia of Life* project, of which the Smithsonian is a founding partner, draws on the expertise of amateurs and professionals to compile a comprehensive database documenting all life on earth, <http://www.eol.org/>, a project that carries on Spencer Baird's dream of a comprehensive inventory. At Smithsonian Archives, a collection of portraits of little-known scientists in the Science Service collection was placed online in the Smithsonian Flickr Commons. The public responded immediately with biographies of local scientists, mentors, college professors, and family members, providing important supplementary data about these researchers. At the National Zoo's Smithsonian Migratory Bird Center, Peter David Marra created the Neighborhood Nestwatch program, which encourages citizen scientists to help collect data on the survival and productivity of birds found in Washington, D.C. area backyards, http://nationalzoo.si.edu/scbi/migratorybirds/research/neighborhood_nestwatch/.

The first two Secretaries, Joseph Henry and Spencer Fullerton Baird, knew that the Institution's resources were limited and they would have to rely on the enthusiasm and dedication of volunteers/amateurs to achieve their goals. They cultivated these relationships through

correspondence and free publications, knowing their value to the Institution. Both also believed that the Institution's mandate for the "increase and diffusion of knowledge among men" in a democracy should include a broad spectrum of the public in the increase, as well as the diffusion, of knowledge. Since 1847, volunteers have consistently contributed to the Institution's research initiatives, providing untold hours of labor to help the Smithsonian carry out its mandate.



Joseph Henry Circular to Meteorological Observers, 1872, Smithsonian Institution Archives