Prototype
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The Lemelson Center
for the Study of Invention & Innovation
Smithsonian
National Museum of American History

Detail from a view of Pennsylvania Avenue with the U.S. Capitol in the background, 1870–1900. Courtesy of the Library of Congress.

Transforming the Nation's Capital into a Place of Invention

Amanda Murray, Lemelson Center Project Assistant

Had your train rolled into the District of Columbia around 1870, you might not have thought it a particularly innovative place. Or even a particularly pleasant place. You might have been too distracted by the smell.

The Washington City Canal, part of Pierre L'Enfant's plan, fell into disuse in the late 1850s and became a stagnant open sewer. By 1870, the District was home to over 130,000 people who lacked basic sanitation. Things began to change with the Organic Act of 1871. A new city government took on the formidable task of modernizing the nation's capital. Alexander Shepherd, director of D.C.'s Board of Public Works, spent over $20 million to improve the city. Railroad tracks and streets were graded, sidewalks paved, bridges built, a water and sewer system installed, and trees planted. The squalid Tiber Creek section of the Washington City Canal was covered over and a new street—the future Constitution Avenue—was built in its stead.

Washington's Reconstruction-era status as a swampy, undeveloped town belied the visionary activity brewing there. Federal agencies like the U.S. Patent Office made the city a science hub, where inventors and entrepreneurs convened and organizations sprouted to support invention, discovery, and economic development. At the helm of the Smithsonian Institution as its first Secretary, Joseph Henry made extraordinary contributions to the organization of American science, in addition to his own pioneering research in electromagnetism. In 1871, Henry founded the Philosophical Society of Washington, based on the Saturday meetings he hosted at his home for prominent men interested in science. The Society advanced science and learning, and fostered open debate among its members.

Joseph Henry, first Secretary of the Smithsonian. From the Smithsonian Institution Archives.

Another, perhaps surprising, participant in the city's transformation was Alexander Graham Bell. His connections to a growing network of science advocates and institutions reveal the capital as a burgeoning hot spot of innovation at the end of the 19th century.

In 1879, Bell moved with his family from Boston to Washington, where later he founded the Volta Laboratory with his Volta Prize winnings for the invention of the telephone. Bell envisioned that the lab would rely chiefly on his cousin Chichester Bell and colleague Charles Sumner Tainter, but also host a variety of revolving specialists. Complementing the lab was a special annex at Bell's home devoted to gatherings of the city's intellectual elite, including politicians, government officials, scientists, artists, writers, and musicians.

This network of connected individuals reflected the growth in formal, institutional support for Washington's scientific community. By 1900 there were ten scientific

societies in Washington with a total membership exceeding 4,000. Congress founded the National Academy of Sciences in 1863; the Academy elected Bell as a member in 1883. The Cosmos Club, a gathering place for men of science and letters, began in 1878 in the home of geologist John Wesley Powell, director of the Smithsonian Bureau of Ethnology. The Anthropological Society was organized in 1879, the Biological Society in 1880, and the Chemical Society in 1884. Alexander Graham Bell's father-in-law, Gardiner Hubbard, founded the National Geographic Society in 1888, and Bell became its president in 1897. In 1898, Bell was elected to the Smithsonian's governing Board of Regents. He befriended Samuel Langley, then the Smithsonian Secretary, and the two men collaborated on aeronautical experiments.

For all this growth, one must remember that efforts to organize science in the second half of the 19th century did not extend equally to all practitioners. For example, in 1870, Dr. Nathan Smith Davis, founder of the American Medical Association (AMA), deliberately excluded the racially integrated National Medical Society from admission to the AMA. Ultimately, in 1884, a separate medical society was organized by a biracial group of physicians: the (still vital) Medico-Chirurgical Society of the District of Columbia.

Alexander Graham Bell Grosvenor, age 9, and Charles G. Abbot, Secretary of the Smithsonian Institution, inspect the photophone (left) and the graphophone (right) invented by Chichester Bell, Alexander Graham Bell, and Charles Sumner Tainter. Science Service photo, October 1937.

Bell and fellow inventors at the Volta Laboratory made cutting-edge advances in recorded sound. In 1880 and 1881, Bell and Tainter deposited sealed boxes at the Smithsonian as insurance against competitors, proof of their inventions' precedence. The boxes went unopened until 1937. Inside were descriptions and illustrations of the Volta Lab's earliest successful sound-recording inventions, plus the devices themselves: the photophone, progenitor of modern fiber optics, which enabled the transmission of sound on a beam of light; and the graphophone, a "talking machine" to rival Thomas Edison's phonograph. The Smithsonian's Volta Laboratory collection grew in 1947, when Tainter's widow donated ten volumes of his *Home Notes*, detailed accounts of daily projects at the Volta Laboratory during the 1880s.

The Bell story sheds light on a historic network of individuals and organizations—both private and federal—dedicated to supporting revolutionary technologies and their inventors. Bell's work and connections in Washington augment our understanding not only of his inventive career but of the city's evolution as well, and offer a unique lens through which to view the rebuilding of a capital city, and indeed, a nation.

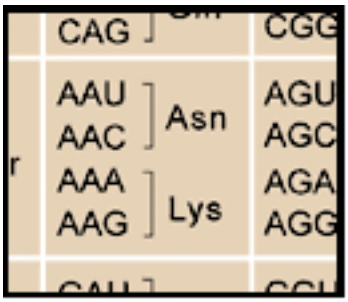

Illustration detail from Nirenberg's chart of the 64 three-letter combinations that form the genetic code. An image of his handwritten chart may be seen on the National Library of Medicine website. Courtesy of the Office of History, National Institutes of Health.

Notes from the Director

Cracking the Genetic Code

Arthur Molella, Jerome and Dorothy Lemelson Director

Biomedical research lost one of its titans recently with the death of Marshall Nirenberg, the Nobel Prize–winning biochemist who, with the help of colleagues at the National Institutes of Health (NIH) and elsewhere, cracked the genetic code in 1961. His experiment showed how RNA transmits encoded information in DNA and directs the building of proteins (the National Museum of American History owns a copy of his 1965 chart detailing the 64 three-letter combinations describing all possible amino acids).

Marshall Nirenberg performing experiment, around 1962. Courtesy of the National Institutes of Health.

I had the privilege of meeting this quietly modest man a couple of times, as NIH is just up the pike from here. That's Rockville Pike, the spine of the so-called I-270 biotech corridor, but Nirenberg worked there long before the region acquired its current moniker. The area's great research organizations, like NIH and the nearby National Institute of Standards and Technology—which has garnered its own share of Nobel Prizes—are cornerstones of the new technology corridor. But they rest on over a century of institution-building, both private and public, in and around the Washington area, as described elsewhere in this issue of the newsletter.

Nirenberg was the first federal employee to win the Nobel Prize in physiology or medicine. It made him an instant celebrity. While tempted by job offers in academe and elsewhere—they were surely his for the asking—Nirenberg ended up spending his entire career at NIH. He said he just couldn't see giving up the freedom he had there to pursue his research. It's the sort of thing that private industrial research labs used to do, but say they can no longer afford.

Federal science agencies tend to treasure their Nobel laureates. We are fortunate indeed that government entities like NIH continue to do the far-horizon research that launches and sustains our nation's high-tech networks, the incubators of new technologies. A clear case, in my view, of government money well spent.

Pamphlet for loose-leaf binders for the AutoLock Binder Company, undated. From the Alexander Binder Company Records, Archives Center, National Museum of American History, Smithsonian Institution.

From the Collections

Inventing for Business in Washington, D.C.

Alison Oswald, Lemelson Center Archivist

In 1879, Alexander Graham Bell moved to the nation's capital, a burgeoning city undergoing rapid modernization after the Civil War. Here, Bell created his Volta Laboratory and began experiments on sound-recording devices. Other inventors, including Samuel Langley, Emile Berliner, and Herman Hollerith, were also drawn to government and scientific resources in D.C., where they exchanged ideas with scientists, politicians, writers, and artists in the city's many private salons, including one at Bell's home. The federal government's support of scientific research and economic development resulted in a "creative class" that formed a network of invention and discovery. But some lesser-known inventors were also toiling away in the nation's capital, operating thriving businesses—one of these was Clinton B. Alexander (1873–1966).

A mining engineer by training, Alexander moved to Washington from Pennsylvania around 1900. From 1915 to 1965, Alexander patented and sold various items for businesses and record keeping, including a plumb adjuster, paper punch, tape splice, and loose-leaf binder. Business filing systems of the 19th and 20th centuries revolutionized the way firms conducted their daily activities and influenced the way documentation was created, stored, and organized. The development of letter cabinets, document file boxes, lateral files, and sectional filing cabinets has shaped the modern office, and Alexander's small business made a contribution.

The loose-leaf binder (U.S. Patents 1,165,305, 1915 and 1,434,579, 1922) was Alexander's most successful invention improvement. The binders were of "rugged structure" with few parts and Alexander noted that they were "mechanically efficient devices" for holding paper and bills. The binders were sold under the name Autoset Company and Autolock Company. The Autoset Company/Autolock Company and the Alexander Instrument Company formed part of the Alexander Binder Company, located at 467 C Street NW in Washington, D.C. It was a small family business for its entire existence—both Clinton Alexander's wife (Maria Dixon Alexander) and son (William B. Alexander) participated in the firm. Alexander also sold other inventions through the Alexander Instrument Company.

Advertisement for the Crescent Portfolio. From the Alexander Binder Records, Archives Center, National Museum of American History.

The Alexander Binder collection at the Museum consists of records and business materials created between the 1910s and 1965. Most of the collection deals with the binders sold under the Autoset/Autolock company names. Business and sales information and materials from competitor companies are also included. The vast majority of this collection is textual material, especially business

ephemera used to improve the business, or sales records between Alexander and his suppliers and customers. There are also material samples, such as grommets, extenders, fabric samples, printing plates, and sample binders from both the Autoset Company and its competitors.

What motivated this engineer-turned-office supply businessman is unknown. Alexander's inventive contributions to the office supply world were, no doubt, used by many D.C. offices. Today we continue to rely on filing cabinets and binders, but we generate staggering amounts of documentation in both the paper and digital world. We're able to store many of our digital documents, images, and audio and video files on devices the size of our thumbs. The rise of new technologies allows us to increase storage capacity and retrieve, migrate, and share information easily. But it just doesn't have the same feel as a binder in your hands.

To learn more about the collection, see the online finding aid.

The Washington Monument. Photo by Nathan Mountjoy.

Inventive Ideas for Hands-On Fun

Design and Build a Monument

Tricia Edwards, Lemelson Center Education Specialist

Washington, D.C., is home to more than twenty memorials and monuments. One of the most famous is the Washington Monument (completed in 1885), built in honor of George Washington, our nation's first president.

A monument is something constructed to honor or remember a person or event. It might be a building, a statue, or a pillar. If you could design your own memorial or monument, what would it look like? Would it be tall like the Washington Monument? Or would it have a look all its own? Think about who or what you would like to honor with a monument. It could be someone famous or a person from your own family. It could commemorate a major world event or simply a day that's important to you. Use your imagination and creativity to design and build a model of your monument!

Download the activity and get busy!

Bell's phonautograph. Courtesy of Alexander Graham Bell National Historic Site of Canada.

Have You Seen?

Alexander Graham Bell's idea for the telephone was sparked by his studies of the human ear. Like his father, Bell worked as a speech therapist and taught deaf people. Both his mother and his wife Mabel were deaf.

In 1874 Bell built a phonautograph—a device that could draw the vibrations of a human voice—to teach his deaf students how to visualize sound. Constructed out of an actual human ear, Bell's phonautograph led him to consider that voice sounds might be conveyed electrically.

If you visit the *Invention at Play* exhibit at the Museum, you can try out a replica of the phonautograph. And learn more about Bell before you visit on the *Invention at Play* website!

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Contact us at prototype@si.edu.
General Smithsonian Visitor Information: 202-633-1000

There's more online:

Lemelson Center website

National Museum of American History Frequently Asked Questions