

The Bell Family Legacies

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Before he became a famous inventor, Alexander Graham Bell opened a school for the deaf in Boston in 1872. He always thought that his main mission in life, and his greatest pleasure, was in teaching the deaf. Royalties from his telegraph and telephone patents allowed him to pursue this mission and make other contributions and discoveries. In 1880 the French government awarded him the Volta prize of 50,000 francs, which was used to help establish the Volta Laboratory for research, invention, and work for the deaf. Bell founded and financed the American Association to Promote the Teaching of Speech to the Deaf in 1890.

Bell was born in Edinburgh, Scotland, on March 3, 1847, the same day and month as his grandfather in 1790. His mother had been deaf from an early age. He attended the University of Edinburgh and the University of London in 1868 without earning a university degree (later in life he would receive multiple honorary degrees). Bell moved to Brantford, Ontario, Canada, in 1870, then to Boston in 1871, where he became professor of “vocal physiology and elocution” at Boston University. He married Mabel Hubbard in 1877. She was 4 years old when she lost her hearing to scarlet fever. Alexander, Mabel, and their two daughters first visited Baddeck, Cape Breton Island, Nova Scotia (“New Scotland”) in 1885, where later they built an estate on nearby Beinn Bhreagh (“beautiful mountain”). Bell conceived of tetrahedral structures for kites, arches, towers, and bridges, and devoted many years on his estate to constructing kites with the intent of learning how to increase the lifting power of aircraft wings. Bell and his closest friend, Samuel Langley, were publicly awarded honorary degrees in aerial architecture. He built a hydrofoil that was clocked at more than 70 mph, and for 12 years it was the fastest boat in the world. Bell also invented a device that performed the same function as an iron lung would years later. He developed methods for detecting icebergs by echolocation, and a way of making freshwater from air vapor for people on life rafts. He even devised an electric apparatus to locate metal, and it was employed (unsuccessfully) to find a bullet in the body of President James Garfield, who was shot by an assassin in 1881. Bell became a U.S. citizen the following year.

Sir Francis Galton, cousin of Charles Darwin, began analyzing the pedigrees of famous men in the 1860s. The Massachusetts State Board of Health engaged Bell in 1878 to

gather statistics on inherited defects, in the pursuit of understanding the laws of heredity. He published a report for the National Academy of Sciences (November 1883) titled “Memoir upon the Formation of a Deaf Variety of the Human Race.” This was the same year that Galton published his *Inquiries into Human Faculty*, in which he introduced the term “eugenics” for programs designed to improve human heredity through selective breeding. In his 1883 paper, Bell reported that deaf parents had a much higher proportion of deaf children than did the population at large, and that unlike those with other defects, the deaf strongly tended to marry the deaf. He did not propose that marriages between congenitally deaf people should be prohibited. Rather, he advocated warning them of the risk beforehand and broadening their opportunities for friendship (and so for marriages) with hearing persons through day schools and speech training. Edward A. Fay was professor of languages at the National College for Deaf Mutes and editor of the *American Annals of the Deaf*. In 1889 Fay headed the census studies of the deaf. Bell gave him all of his records and some of the income from his endowment for research on deafness. Fay published his findings in *An Inquiry Concerning the Results of Marriages of the Deaf in America* in 1895. According to Bell’s biographer Robert Bruce (1973),

Bell’s paper, along with Fay’s follow-up, stands as the soundest, and most useful study of human heredity proposed in nineteenth-century America. By that token, it may also be reasonably counted as Bell’s most notable contribution to basic science, as distinct from invention . . . It is not easy to look back across that abyss to its [eugenics] sunny approach and see the early eugenics movement as the benign application of science to humanitarianism that claimed the sympathy of men like Bell, Galton, and [David Starr] Jordan. To his credit, Bell never proposed that any specific human population was “desirable” or “undesirable.”

For him, eugenics “meant scientific research and discovery, the dissemination of which might encourage those with ‘desirable’ heredity to marry one another for the sake of their own posterity as well as the improvement of the human race.” The history of the eugenics movement has

been amply documented in the literature by authors such as D. B. Paul (1998) and R. Lynn (2001).

From the writings of Charles Darwin, Bell researched the reported tendency to deafness in blue-eyed white cats. Bell claimed to have seen three such cats in 1884 and reported in *Science* that they were indeed deaf. He kept a male and a female, both deaf, for several years, but they failed to produce any young. Shortly after building his estate on Beinn Bhreagh, Bell began raising sheep without knowing much about them. Biographer Catherine Mackenzie (1928) states that Bell was amazed to find they had no front teeth in their upper jaw. He purchased some Vermont Merinos in 1889. About half of the lambs born in his flock during the spring of 1890 were twins. He observed “what seemed a significantly higher percentage of twins were born to ewes having more than the normal two nipples.” The extra nipples were “mere vestiges” in the first generation. Bell began a selective breeding program to (1) increase the number and function (milk secretion) of nipples, and (2) ascertain whether ewes with extra nipples would raise a significantly higher percentage of twins than those with only two nipples. He must have been thinking about what we would now call genetic correlation. If the two traits (extra nipples and multiple births) were highly genetically correlated, then it might be possible to increase productivity and decrease costs by saving lambs with extra nipples for breeding and selling the rest for meat. Eventually Bell developed a flock of ewes “with at least four milk-producing nipples,” but the animals failed to be more fertile and had fewer twins than two-nippled ewes. So it would appear that the two traits were indeed correlated, but negatively so. An anecdote recalled by Mackenzie is that “though the mutton was tough, the wool inferior, and a farmer once complained that local butchers declined to take them even as gifts, the multi-nippled, twin-bearing sheep did, ultimately, appear regularly in pairs.”

The results of his sheep breeding experiments were communicated to the National Academy of Sciences. After about 10 years Bell gave up his research on sheep and sold the flock. He was elected to the National Academy of Sciences in 1883. Four of the five papers he submitted dealt with heredity. His financial support of various branches of science is well documented; for example, he donated \$5000 to start the Smithsonian Astrophysical Observatory and gave \$500 to Albert A. Michelson to study the motion of the earth with respect to the ether (in 1907 Michelson was the first American to win a Nobel Prize in science).

At a meeting sponsored by the American Association for the Advancement of Science (AAAS), the American Breeder's Association was founded in 1903 with James Wilson as president; Willet M. Hayes served as secretary from 1903 through 1912 (Troyer and Stoehr 2003). In 1907 the American Breeder's Association established a number of committees on specific breeding problems. The Committee on Eugenics was the first American group using the “E” name. Its purpose was to investigate and report on heredity in the human race and to emphasize the value of superior blood and the menace to society of inferior blood. Bell was asked to chair that committee. He declined, but served as a committee member.

David Starr Jordan, Chancellor of Stanford University, became chairman. Other members of the committee included the plant breeder Luther Burbank, the sociologist Charles Henderson, and geneticists William Castle and Charles Benedict Davenport. In 1909 Bell served as chairman of a committee on hereditary deafness. *The American Breeders' Magazine* was published quarterly by the American Breeder's Association from 1910 to 1913. Both the organization and publication names were changed between 1913 (volume 4) and 1915 (volume 5) to become the American Genetic Association and *The Journal of Heredity*, respectively. Bell and his son-in-law David Fairchild, the new president of the American Genetic Association, wrote the articles of incorporation for the new society. Bell (1914) contributed the lead article in the first issue of *The Journal of Heredity*.

In 1914 Bell established the Genealogical Record Office of the Volta Bureau to investigate whether human longevity could be inherited. He published his findings in a 1918 pamphlet. Long-lived people tended to have more children than could be explained simply by the duration of their marriages, and those descendants usually lived longer than the average. He concluded that longevity was not heritable in itself, but probably was related to some heritable qualities of vigor or resistance to disease.

Gardiner Green Hubbard (Bell's father-in-law) and Bell himself helped financially to keep the fledgling journal *Science* afloat from 1880 until 1900, when the American Association for the Advancement of Science (AAAS, founded 1848) designated *Science* as its official journal. Thus, with the help of the Bell family, the AAAS remained alive to sponsor the meeting that established the American Genetic Association in 1903. Hubbard also helped found the National Geographic Society in Washington, DC, in 1888, and was its first president. Bell had to take over the presidency of the society in order to save it after the death of Hubbard in 1897. *The National Geographic Magazine* also struggled to remain financially solvent during those early years. Bell persuaded his grandson Gilbert Grosvenor to become the first full-time employee of the society in 1899, and he served as editor of the magazine for more than 50 years. With Bell's advice and a \$1200 yearly contribution, society membership began to grow. Bell was then able to resign as president of the society in 1903. In 1905 membership grew from 3400 in January to more than 11,000 by the end of the year, after which Bell ended his annual subsidy. And the rest, as they say, is history.

Alexander Graham Bell died August 2, 1922, at his estate. Thereafter Mabel Bell began writing an introduction to her husband's last scientific paper, “Saving the Six-Nippled Breed” (Eber 1991). She died the next year. It was Bell's research on his multiple (harmonic) telegraph that led to his invention of the telephone network, whereby two or more messages could be sent simultaneously over the same wire. Today, phone lines allow access to the vast information on the Internet and scientists can communicate with one another virtually instantaneously via voice, e-mail, and fax. These are just a few of the many legacies left to us by the Alexander Graham Bell family.

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