

A MAN FOR ALL TIMES

AT&T SMALL-BUSINESS TELEVISION COMMERCIALS TODAY FEATURE FOUNDER ALEXANDER GRAHAM BELL AS A SMALL BUSINESSMAN. FOR AT&T PEOPLE, BELL'S LIFE ESTABLISHED THE COMPANY'S LEGACY FOR INNOVATION. BUT BELL'S INTERESTS, INVENTIONS AND INNOVATIONS RANGED FAR BEYOND THE TELEPHONE-FROM DEVELOPING EARLY MEDICAL DEVICES TO AVIATION.

[This story was written especially for Focus. Edwin Grosvenor, Alexander Graham Bell's great-grandson, has edited several national magazines and lives in the Washington, D. C., area. Grosvenor has done extensive research into Bell's life. His book of experiments designed by Bell for children will be published soon by the National Geographic Society.Ed.]

The invention of the telephone gave Alexander Graham Bell financial success and finally allowed him to marry sweetheart Mabel Hubbard. A year later, in 1877 they crossed the Atlantic to honeymoon in his native Scotland.

Mabel had stood by Alec during the long, arduous experiments to transmit speech electrically. But even

she didn't always know what to expect from this unpredictable, over-curious man. One day, he would use up all the sugar cubes in their honeymoon cottage, dropping them in hot water to find out where the little bubbles came from. The next, in the romantic ruins of an ancient abbey, he would spend the entire day filling his notebook with sketches of hooded crows in flight and machines that might carry a man into the air.

"What a man my husband is," wrote Mabel to her parents. "I am perfectly bewildered at the number and size of the ideas with which his head is crammed. ... Flying machines to which telephones and torpedoes are to be attached occupy the first place just now."

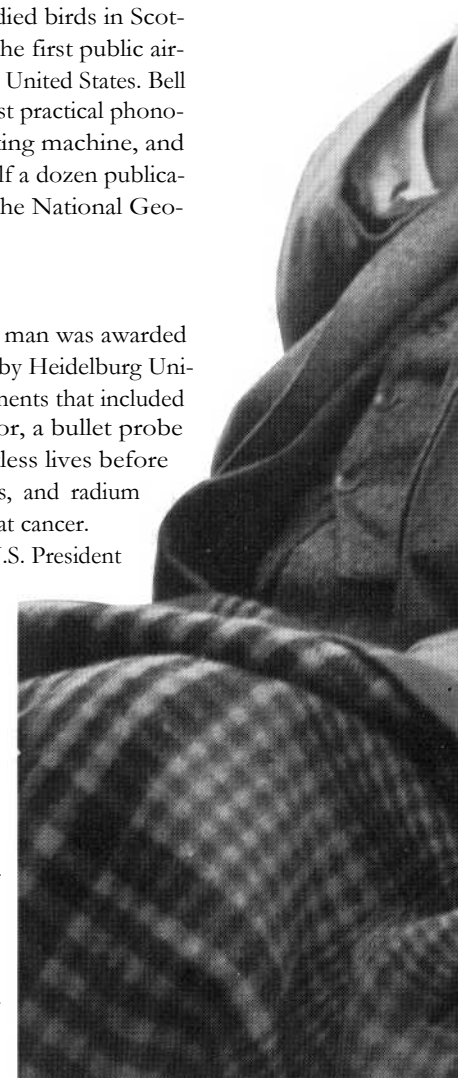
While Bell's name is synonymous with the telephone, this energetic, sometimes eccentric, genius spent only about five years in communications. He used related fame and fortune achieved at an early age to finance a lifetime of creativity. In aviation alone Bell conducted some 1,200 experiments in the 35 years after he first studied birds in Scotland, leading to the first public airplane flight in the United States. Bell developed the first practical phonograph and dictating machine, and helped launch half a dozen publications, including the National Geographic.

IN MEDICINE

This Renaissance man was awarded a medical degree by Heidelberg University for experiments that included an early respirator, a bullet probe that saved countless lives before the use of X-rays, and radium implants to combat cancer.

On July 2, 1881, popular new U.S. President James Garfield was walking through Washington's railroad station when a crazed office seeker, angry over a recent rejection, shot Garfield in the back.

The wounded president was taken to the White House and for days lay in critical condition while doctors poked unwashed fingers into his wound. They knew the bullet lodged near the spine, but didn't dare begin surgery until they found it. Simon Newcomb, a prominent physicist and Bell's friend, tele-



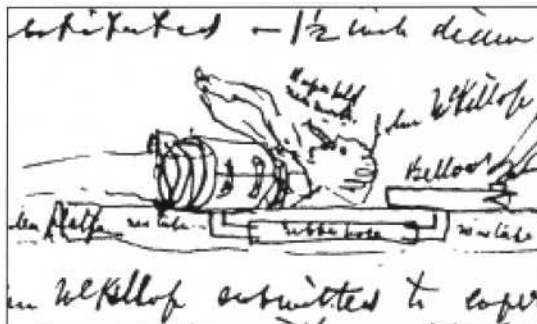
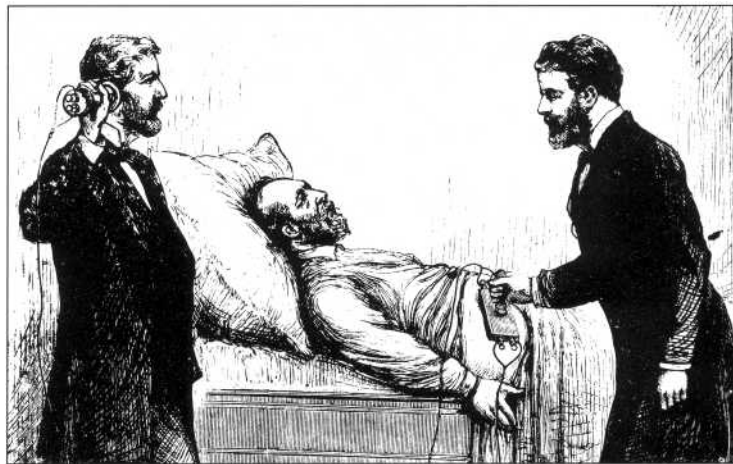
graphed the inventor to ask if he could turn his experiments with induction coils into a telephonic device for locating bullets.

Within days Bell had an apparatus ready. He went to a butcher's shop with a revolver, shot a bullet into a side of beef and, waving the handpiece over the meat, easily located the bullet. He contacted the White House and told them to move the president to a bed without metal box springs.

The press, reporting every detail about the president's progress, repeated rumors of Mr. Bell's secret device. As the inventor arrived at the White House, an expectant crowd cheered. But when the bullet probe passed over the president's body, all Bell could hear in the receiver was a steady buzz. Despite

his best efforts, it wouldn't work, and Bell left bitterly disappointed. Doctors, who had been skeptical anyway, passed word to reporters, who denounced Bell as a charlatan.

Later it was discovered that the president's mattress, as well as the box spring, had metal coils. Subsequently improved upon by others, Bell's bullet probe saved countless lives in the Boer War, the Sino-Japanese War and World War I.



Bell's efforts in medicine included (above) a telephonic bullet probe first used in an attempt to find a bullet lodged near President Garfield's spine. His 1892 sketch (left) of a "vacuum jacket" was a forerunner to the iron lung.

DEVILS IRON LUNG

Soon after President Garfield died, the Bell's infant son Edward was born prematurely and died several hours later. He was "a strong and healthy little fellow," wrote Mabel, and "might have pulled through if they could once have established regular breathing." Typically, Bell channeled his grief into his work, experimenting long hours on a respirator he called the "vacuum jacket."

Mabel penned Bell's dictation into his journal Sept. 2, 1882. "To induce artificial air," he wrote, the "way is to manipulate the body, squeezing the lungs that they shall expel air." Noting that suction also was required for inhalation, he proposed a rigid apparatus to cover the body's midsection. A pumping action would lower the diaphragm "causing a partial vacuum in the lungs which the atmospheric air instantly fills."

Years later, at Bell's lab in Nova Scotia, the inventor tried a revised vacuum jacket to help drowning victims. In the name of science, his workmen picked a sheep from the herd and tossed it into the Bras D'Or Lake. Unconscious, the animal was brought ashore and the device attached. Soon Bell was pumping air rhythmically into the hapless sheep's lungs. Its eyes opened eventually and the animal struggled to its feet.

One devout Scot among the workers, terrified when Bell brought the animal back from the dead, fled the scene muttering in Gaelic. Bell inquired what had been said. "This man is surely the devil," was the translation, "and I'll have no part of his work." After the man refused to return, Bell sent him severance pay. But the man never accepted the "devil's" money.

I AM A GRAPHOPHONE

The phonograph was one of Edison's great inventions.

But the device as we know it, and the dictating machine, were developed by Bell and his associates. Patents they won were Bell's most lucrative ventures other than the telephone.

Edison's phonograph recorded on tinfoil, with the needle riding up and down. Sound reproduction wasn't very clear, and replaying distorted the recording. Edison put the invention aside.

Bell saw possibilities. He experimented in his

Washington, D.C., Volta Lab, named after the famed Italian prize he was given for the telephone. He and his cousin, Chichester Bell, and associate Summer Tainter developed a round cylinder of wax

that recorded much more faithfully. The needle zig-zagged sideways in grooved tracks instead of up and down.

"I am a graphophone, and my mother was a phonograph," the machine played back. Edison, much to his chagrin, later had to buy rights to Bell's patent to develop the phonograph commercially. Tainter and Chichester Bell, using machinery

adapted from sewing machines, developed the patent into a dictating apparatus and began production in Connecticut. Their enterprise later became the Dictaphone Co.

A FAMILY OF MAGAZINES

America was a land of opportunity, and Bell knew the key to self-improvement was education. This belief led him to support six new magazines, beginning with the scholarly Science magazine in the 1880s.

Bell's most notable success in publishing was one he didn't want at first. Father-in-law Gardiner Greene Hubbard was the first president of a small lecture group in Washington known rather grandiosely as the National Geographic Society. When Hubbard died in 1897, his widow prevailed on Bell to become president, reasoning that the inventor's fame could help keep alive the society that meant so much to her husband.

When the society's membership dwindled to less than a thousand, Bell had to take action. He hired recent college graduate Gilbert Grosvenor to be the first full-time employee and encouraged efforts to remake the society's scholarly journal into a national publication with "dynamical pictures" of life and action.

Bell volunteered to pay the editor's salary, which was helpful since the young man soon became his son-in-law. Bell helped him in his struggle against a board of directors intent on keeping the Geographic erudite.

As Bell

wrote, "THE WORLD AND ALL THAT IS IN IT is our theme." It was a formula that led the society to

become the largest educational institution in the country, with more than 10 million members.

TO GET INTO THE AIR

Aviation historians seem to remember the Wright brothers to the exclusion of other major contributors. Bell and his colleagues conducted some 1,200 experiments in aviation over a 20-year span, leading to the first U.S. public flight and patents for the aileron and three-wheeled undercarriage now universally used.

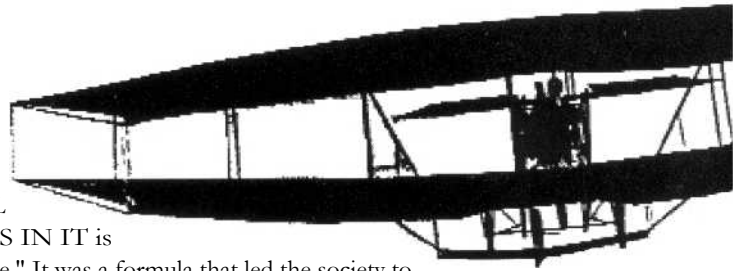
In 1891, Bell began experimenting seriously in aviation. His labs produced a bewildering assortment of propeller types, wing designs, lightweight engines, and primitive jets and rockets. Through the 1890s, Bell kept a friendly rivalry and collaboration with Samuel Langley, director of the Smithsonian Institute.

Bell and Langley faced ridicule from the press and disdain from scientists for their quixotic experiments. The experts pointed out that even if an aeroplane model could be made to fly, when constructed full-size its weight would be too great for its lifting surface. Bell's old friend Lord Kelvin, president of the prestigious Royal Society of London, tried vigorously to dissuade him from attempts that "could only lead to disappointment, if carried on with any expectation of leading to a useful flying machine."

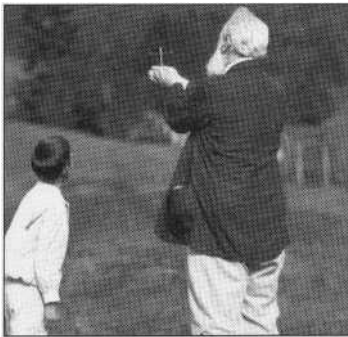
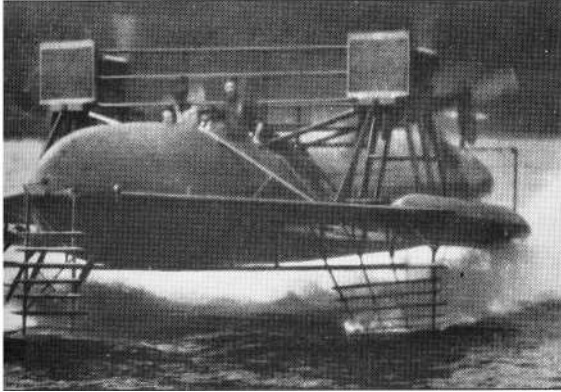
But Bell couldn't be dissuaded, and was thrilled to witness Langley's first successful unmanned flight in 1895. "I shall count this day as one of the most memorable of my life," Bell wrote his friend. The next year, Bell photographed Langley's 16-foot model flying the extraordinary distance of half a mile.

After the daring German pioneer Otto Lilienthal died in a glider crash, Bell became obsessed with safety and his own experiments turned to kites. After all, he reasoned, a kite is really a flying machine tethered to the ground, so it can be used to study the principles of aerodynamics that will lead to manned flight. If the kite were constructed of many little cells like a brick building, it should be more stable. His kites with little tetrahedral units became increasingly complex until one comprised of more than 3,000 silk-covered cells carried a man aloft.

But as Bell was sidetracked with kites, two aviation newcomers, Orville and Wilbur Wright, supplied by the Smithsonian with Langley's and Bell's writings on aviation, were moving ahead. By August 1903, Langley finally was ready for his first manned flight. But when the aircraft took off, a simple snag tore its frame apart and the plane collapsed. The press was in "triumphant ecstasy" over the failure, but Langley never recovered. Four months later, the Wright brothers flew successfully at Kitty Hawk. They kept their ideas secret from the world while negotiating for the most lucrative

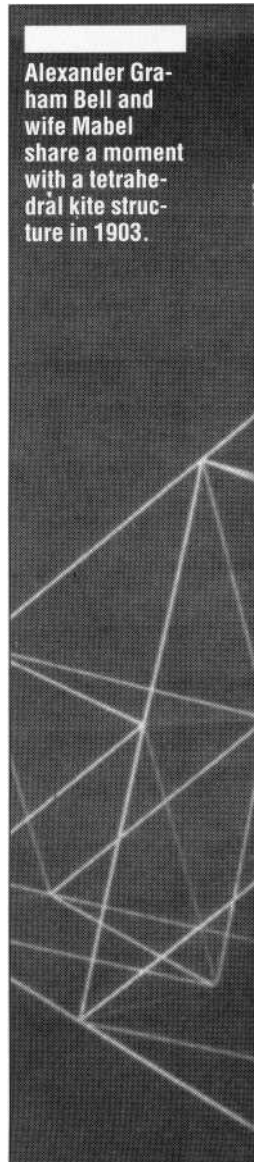


Bell colleague Glenn Curtiss pilots June Bug in the first public one-kilometer flight in 1908.



Bell and his colleagues tested a "hydrofoil" (top photo) that for years was the fastest boat in the world. He and grandson Melville Grosvenor, the author's father, (lower photo) experimented with launching a propeller from a twirling wooden shaft.

Alexander Graham Bell and wife Mabel share a moment with a tetrahedral kite structure in 1903.



arrangement to develop their invention.

In 1906 Mabel Bell encouraged her husband to hire promising young engineers to bring new life to his aviation experiments. In 1907, the Bells and four young engineers formed the Aerial Experimentation Association (AEA) and began at once to develop a heavier-than-air flying machine. After the first crashed for want of proper control, Bell recommended adjustable flaps on the wingtips. After the success of their next plane, called White Wing, the AEA obtained a patent for the aileron and the three-wheeled undercarriage, neither of which had been used by the Wright brothers. In June 1908, their third craft, JuneBug, won the prestigious Scientific American trophy for the first public U.S. flight of more than a kilometer, and that winter their Silver Dart flew on the ice in Nova Scotia, the first manned flight anywhere in the British empire.

After Silver Dart's success, Bell and his two Canadian engineers formed the Canadian Aerodrome Co. to produce airplanes for the Canadian military. But after trials near Ottawa, generals told them they could see no use for airplanes since they couldn't take off from rough artillery fields. Within a year, the generals were buying non-Canadian airplanes, as they have until today, while Bell and his colleagues watched from the sidelines. Even more discouraging, AEA engineer

Glenn Curtiss formed his own company to exploit AEA patents.

FIRST MONTESSORIAN

Education was probably the single most dominant theme of Bell's life, from the time he taught his first class at age 15 in 1863 to his death in 1922. Long concerned about the deaf, Bell pioneered teaching lipreading and speech therapy, opposing the use of sign language that limited integrating hearing-impaired individuals in the world.

Bell exhibited remarkable insights on parenting and child psychology. When his 5-year-old daughter Elsie broke her doll's porcelain head in 1883, he wrote his wife that it would be a mistake to simply buy her a new one. "A doll should be to a child what a child is to us," and such a relationship should not be easily replaced. He felt parents could use dolls to teach their children responsibility, caring and even recovery from grief. Sigmund Freud, in writings published nearly 40 years later, is generally credited with realizing the importance of such play to children.

Bell fought traditional teaching's reliance on memorizing. So it wasn't surprising that he became the most prominent American supporter of Italian educator Maria Montessori, who like Bell advocated enabling children to discover things themselves. The Bells financed one of the first Montessori schools in the United States and launched the Montessori Educational Association. Mabel became its first president.

KEEP ON FIGHTING

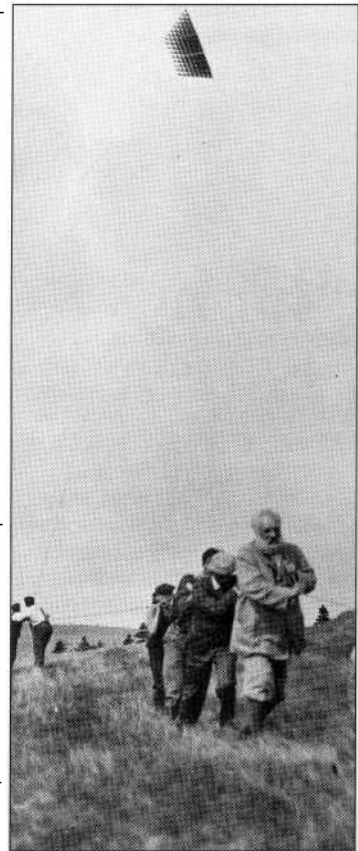
Alexander Graham Bell's life of achievement and innovation resulted from his willingness to try anything. The telephone, flying machines, a device to record sound—all seemed preposterous to most people.

Bell understood the value of man giving fancy free rein and learning from failure. "In scientific researches," he wrote in 1915, "there are no unsuccessful experiments; every experiment contains a lesson. If we don't get the results anticipated and stop right there, it is the man that is unsuccessful, not the experiment."

In 1901 Mabel wrote to Bell, "I do so appreciate the quiet, persistent courage with which you have gone on after one failure after another ... nothing has been able to shake your faith, to stop you in your work." One day she pinned up a jingle in his lab she found in a newspaper. It became Bell's motto:

If things seem a little blue,
Keep on fighting.
Stay it out and see it through,
Keep on fighting.

-Edwin S. Grosvenor



Bell helps haul down a version of a tetrahedral kite, which in 1907 lifted a man 168 feet into the air.

