Guglielmo Marconi

Born:
April 25, 1874,
in Bologna, Italy

Died:
July 20, 1937,
in Rome, Italy

Courtesy Deutsches Museum, München

Telegraphy was the only means of rapid long-distance communication in the 1800s. It went underwater in 1865 when a thin wire connected North America with Europe. That was the year Cyrus Field (1819-1892) completed the first permanent transatlantic telegraph cable. The project required seven attempts before it succeeded. So it is not surprising the telegraph company charged $5 to $10 a word to send messages to Europe. The surprise is that there were plenty of customers.

Werner Siemens (1816-1892) spent many years connecting London, England, to Calcutta, India, by telegraph. (See pages 109-111.) Work on the 6,000-mile distance was finished in 1870. Had wireless communication been available, Field and Siemens might not have tried such huge projects. The first person to send and receive a wireless communication signal was Guglielmo Marconi in Italy. His most high-profile technical triumph occurred in 1901, when he sent the first transatlantic wireless signal from England to Newfoundland.

Marconi was born into a wealthy family that enjoyed all the trappings that money could buy. The Marconis had a townhouse in Bologna and an estate outside the city named Villa Grifone. Marconi's father was a landowner. His mother was the daughter of a whiskey distiller in Dublin, Ireland. Between the ages of three and six, Marconi lived in England with his mother and older brother, Alfonso. When he returned to Italy, he could barely speak his native language. Because he spoke Italian poorly and with an English accent, dressed well, and did not enjoy sports, his classmates picked on him. His father decided to educate him with private tutors.

Marconi's mother was 17 years younger than his father and she enjoyed social activities. She traveled extensively with her sons, sometimes staying for long periods of time in various European cities. Marconi later became a world traveler. His mother had given him the social skills to move easily among different cultures.

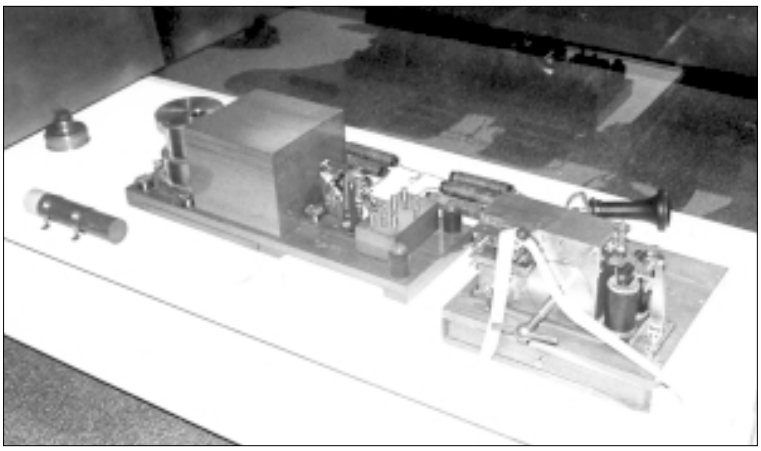
The mother often took her sons to Livorno on the west coast of Italy. When Marconi was 13, he began attending the Technical Institute in that city. He learned that Heinrich Hertz (1857-1894) had recently sent electricity through the air. (See pages 166-168.) Marconi became intrigued by the possibility of wireless telegraphy. He had a weak educational background and failed entrance examinations for the University of Bologna in 1894. His mother asked a neighbor and science professor, Augusto Righi, if her son could unofficially use the university's laboratory facilities. Righi agreed. Marconi's father disapproved and wanted his son to follow a career in the Italian Navy. He gave little encourage-

ment to his son's interest in technical subjects.

Using university resources, Marconi set up a crude laboratory in the attic of the Villa Grifone. Righi cautioned Marconi that he did not have the educational background to succeed at work that had baffled scientists for years. But the young man was undaunted and soon had some success sending signals indoors. He showed his father that he could ring a bell at the opposite end of the house. A wireless signal tripped the bell's relay. His father was so impressed that he gave Marconi $1,000 for additional equipment.

One day in 1895, the Marconi brothers went outside with an oscillator, coherer, meters, switches, antennas, and other pieces of equipment. The oscillator produced sparks that Marconi hoped to receive at a distant point. The receiver included a coherer, a small four-inch glass tube filled with metal filings. The coherer conducted electricity only when it received an electromagnetic signal. The conductivity could be read by the needle of a galvanometer.

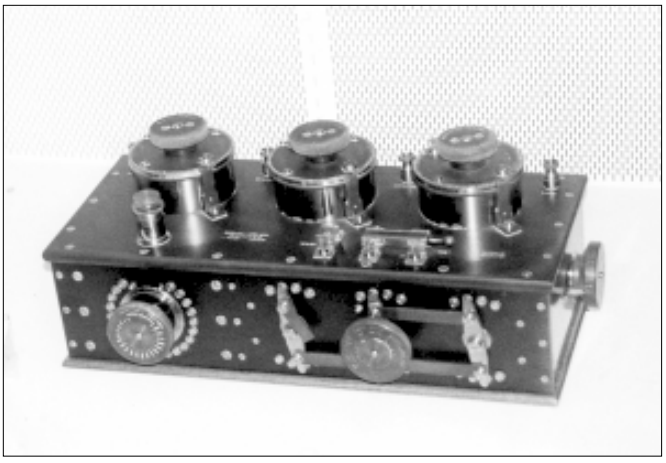
Marconi stayed with the transmitter. Alfonso went a mile and a half away with the receiver and a rifle. He would fire the rifle if the receiver picked up a signal. Marconi closed the switch. Alfonso received the signal and fired the rifle. That experiment is often cited as a first in wireless transmission.



Replica of Marconi's 1901 transatlantic receiver. A kite-borne antenna brought the signal into the receiver and Marconi heard it through a telephone earpiece like the one at right center.

The Italian Ministry of Posts and Telegraph showed no interest in funding more advanced experiments. Like most others, officials there felt wireless telegraphy would only be useful for ship-to-shore, or ship-to-ship communication. They suggested that Marconi try to find assistance in England, the world's most important seafaring nation. Marconi's mother arranged a meeting with William Preece, chief engineer of the Great Britain Post Office. Marconi was an almost unproven 21-year-old. Nonetheless, Preece was impressed and recommend that the British government support his work.

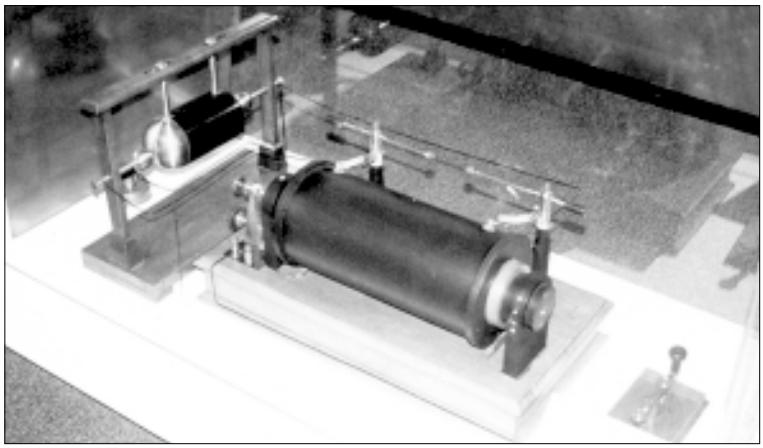
Using government and family money, Marconi established a research organization and surrounded himself with world-class technical experts. One was John Ambrose Fleming (1849-1945), inventor of the 1904 tube-type diode. (See pages 154-156.) Marconi's goal was to send and receive signals at greater distances. He first worked on a tuning circuit. One small region of the country might have many transmitters. If several signals were sent at the same time, the receivers could not separate the transmissions. The effect would be like a roomful of people all talking at once. Marconi patented his tuning circuit in England in 1900. Numbered 7,777, it allowed for transmitting radio waves at specific frequencies. The effect was like a



Marconi's three-circuit multiple tuner. His installations from 1907 to about 1914 used this unit to couple the antenna to the receiver. Its three tuned circuits, loosely coupled together, gave good selectivity for a pre-electronic device. The three cylinders on top are condensers. The front dial at left varies antenna inductance and the unusual front dial with bars at right is for tuning.

person concentrating on a single speaker.

Marconi established the Wireless Telegraph and Signal Company to market his products. His first major sale was to the British government for use in the 1899-1902 Boer War. Partly for the publicity, Marconi used his equipment to transmit nine miles across the Bristol Channel in 1897. Interrupting high-voltage spark signals sent Morse code. Marconi transmitted at about 15 words per minute. He then succeeded in transmitting 28 miles across the English Channel in 1899. But the greatest challenge involved sending electromagnetic waves across the Atlantic Ocean.



Replica of Marconi's 1901 transatlantic transmitter. Closing the key (right) energized the coil (center) and charged the two enclosed brass spheres (left). The spheres discharged through the antenna, sending an electromagnetic wave. The system was powered by a bank of batteries.

An unlimited capacity for work and complete faith in his abilities helped Marconi in his efforts. Assisted by Fleming, he set up a transmitter near Lizard Point, England, in the southwest corner of the country. His receiver was in St. John's, Newfoundland, about 2,100 miles away. The transmitter's antenna consisted of two 150-foot poles, placed about 170-feet apart, and strung with 55 copper wires. But the receiver's antenna was simpler: a piece of wire flown from a kite. Both the transmitter and receiver were far more complex than what Marconi had used in Villa Grifone just a few years earlier. The equipment and expenses brought the experiment's cost to $200,000.

Marconi's lifelong friend Luigi Solari operated the transmitter. Solari sent three dots at specific times, Morse code for the letter "S." In Newfoundland, Marconi listened through a telephone earpiece. At 12:30 P.M. on December 12, 1901, he barely heard three clicks. He passed the earpiece to his assistant George Kemp to verify the reception. When the news broke, Marconi's name was suddenly known throughout the world.

Marconi went on to achieve many other technical accomplishments. They were more and more detailed as the complexity of electronic communication became apparent. His business interests assumed international proportions. Marconi's United States branch became the Radio Corporation of America. From 1919, he lived on a large 220-foot-long yacht named *Elettra*. He bought it from the British government who had obtained it from Austria during World War I. Marconi modified the 730-ton yacht to carry tall wireless antennas and outfitted a complete shipboard laboratory. His work was acknowledged with the highest recognition. Marconi received the 1909 Nobel Prize in physics. He shared it with Karl Braun (1850-1918), German inventor of the cathode-ray oscilloscope.

Marconi married twice. First to Beatrice O'Brien from Ireland and then to Maria Cristina Bezzi-Scali from Italy. He had four children. He enjoyed fishing, horseback riding, and traveling. He was a careful dresser and almost all his photographs show his concern for clothing. An automobile accident took his right eye in 1912 and he had an artificial one fitted. It is all but impossible to detect in photographs of him. Marconi died of a heart attack at 63 while preparing for an evening appointment with Italy's leader Benito Mussolini (1883-1945).

As important as Marconi's contributions were, he did not invent radio. He invented point-to-point wireless telegraphy, not voice transmission. Electronic communication progressed rapidly during Marconi's lifetime. Only 27 years after he sent three barely audible clicks across the Atlantic Ocean, John Logie Baird (1888-1946) sent the first television signal from London to New York City. (See pages 199-201.)

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