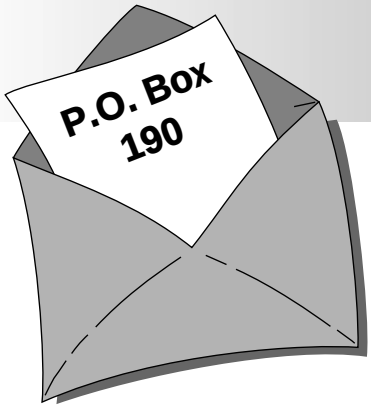

We can only answer questions or remarks of general interest to our readers, concerning projects not older than two years and published in *Elektor Electronics*. In view of the amount of post received, it is not possible to answer all letters, and we are unable to respond to individual wishes and requests for modifications to, or additional information about, *Elektor Electronics* projects.

When Electronics was Young (9)

Dear Editor — in the November 1999 issue of Elektor the above interesting series has a brief note on Guglielmo Marconi that is misleading.

Marconi's early experiments were carried out in Italy not England. He established that communication using electromagnetic waves was possible at the age of 20 experimenting at his parent's estate near Bologna. He moved to England as the Italian government showed no interest in his invention and his English mother felt he would be more likely to achieve success in her mother country. At the time, this country was a leading maritime nation and there was no means of communicating with ships once they were out of sight of land.

It was in England that Marconi filed his patent applications, supported by the chief engineer of the Post office, Sir William Preece.

To call Marconi a 'physicist' is a gross insult. If he had been a physicist, he would be unlikely to have achieved transatlantic communication. The physicists of the day held the view that electromagnetic waves travelled in straight lines and were absorbed by land and water. The curvature of the earth created a 50 mile high mountain of water across the Atlantic Ocean so no waves coild possibly reach the New World. Marconi with no formal education ignored the 'experts' and was successful. Neither the physicists nor Marconi knew about the existence of the ionosphere which conveniently reflected his waves from Poldhu to St. Johns.

Beware of experts!

Guy Selby-Lowndes

Our contributor replies as follows.

"Interpretation of certain aspects of history can be contentious. In the Encyclopaedia Britannica, Marconi's entry reads 'Italian physicist and inventor of successful system of radio telegraphy. Received Nobel Prize for Physics in 1909'. Similarly, Chambers Dictionary of Scientists lists Marconi as 'Marconi, (Marquis), Guglielmo, 1874-1937, Italian physicist and engineer, pioneer of radiotelegraphy'. In line with these two renowned publications, I, too, have called Marconi a physicist."

"Owing to the shortness of the article, I could not include the fact that Marconi had started his experiments in Italy. However, his main experiments were carried out in England. While still a physics student at Leghorn technical school, Marconi in 1894 demonstrated the possibility of sending wireless signals over a distance of a distance of some 150 metres at his father's estate near Bologna. However, since he found nobody in Italy interested in his experiments, he and his Irish mother travelled to England a year later. There, in 1896, he demonstrated a transmission of wireless signals over a distance of three miles between Flatholm Island in the Bristol Channel and Penarth. He filed his first patent application for wireless telegraphy at the London Patent Office on 2nd June 1896. In 1897, he transmitted wireless signals over a distance of eight miles across the Bristol Channel. This experiment drew the attention of Sir William Preece, the chief engineer of the post office, as well as of the Press. In 1899, he transmitted Morse code across the English Channel, which attracted attention from the Admiralty, resulting in the installation of radio wireless equipment on Royal Naval ships. In 1901, he transmitted across the Atlantic from Cornwall to Newfoundland. His pioneering work was rewarded by the award (shared) of the Nobel Prize for Physics in 1909."

"It is a debatable point whether or not Marconi or his fellow physicists and engineers knew about the ionosphere. Michael Faraday's experiments in the 1840s and 1850s demonstrated a clear connection between magnetism and electricity. Faraday's friend and colleague, James Clark Maxwell, confirmed and explained Faraday's experimental results by a mathematical theory. Maxwell's calculations showed that magnetic and electric fields affect each other, and that light is a form of electromagnetic waves. Some traditional physicists adhered to the belief that light was a mechanical phenomenon."

"The conflict caused by Maxwell's hypothesis that electromagnetic waves are propagated at the speed of light lasted for many years, until in 1888 Heinrich Hertz, Professor at the Technical College in Karlsruhe, finally closed the debate on the wave character of light. He demonstrated that the electric sparks produced by him caused electrical vibrations which were propagated into space at the speed of light."

"During a cross-Atlantic trip, Marconi had already noticed that telegraph messages could be received over distances of up to 700 miles by day, but at up to 2000 miles by night. This discovery prompted Oliver Heaviside, an English physicist, and Arthur Edwin Kennelly, an American electrical engineer, independently and simultaneously to publish their prediction of the existence of an electrically conductive layer in the upper atmosphere that allows radio waves to follow the earth's curvature instead of travelling in a straight line as predicted by a number of mathematicians. The predictions of Heaviside and Kennelly were demonstrated in 1925 by Sir Edward Victor Appleton, an English physicist who, in 1947, was awarded the Nobel Prize for Physics for his contribution in the exploration of the ionosphere".

"Today, we know that the ionosphere is a region of the earth's atmosphere at a height of 30-300 miles where short-wave radiation from the sun partly ionizes gas molecules and atoms, leaving them positively charged. The ionized layers reflect short-wavelength radiowaves, which makes long-distance radio communication possible. The ionosphere is layered according to the concentration of free electrons, called D and E layers (also called the Heaviside or Kennelly layers, depending on which side of the Atlantic the term is used), which result from molecular ionization, and the upper layer, termed F layer or Appleton layer, which results from atomic ionization. The thicknesses of the layers vary with latitude, season, time of day, and solar activity".

"Since much of the research into propagation was going on and published while Marconi, Braun, Slaby, and Arco, were conducting their experiments in England and Germany, it is extremely likely that they read about it."