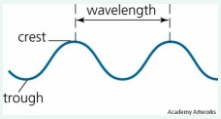
Hands On Learning
with Reading Museum Service

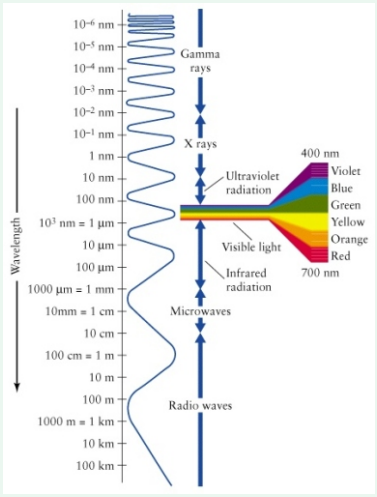
CRYSTAL WIRELESS SET H12/B

Background

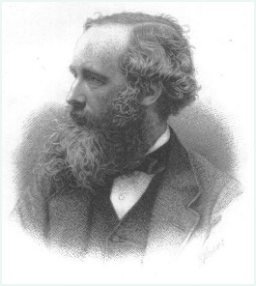
Our eyes are sensitive to light. Light is a form of electromagnetic wave. In the late nineteenth century it was realised that there were all sorts of other electromagnetic waves that our bodies are unable to detect. X-rays are electromagentic waves. Radio waves are another kind of electromagnetic wave.

Electromagnetic waves are measured by their wavelength (right). Some electronic waves have a short wavelength and others have a long wavelength. The diagram on the left shows the range of electromagnetic waves that exist. At one end (short wavelength) there are gamma-rays, at the other end are radio waves (long wavelength). As the diagram also illustrates, the range of electromagnetic waves which our eyes can detect represent only a tiny fraction of the possible electromagnetic radiation.





In the 1860s a brilliant Scotch scientist called John Clerk Maxwell (right) produced some mathematical calculations which predicted the existence of electromagnetic waves outside the range of human sensitivity. However it wasn't until the late 1880s that the German scientist Heinrich Herz devised machinery that proved these waves really did exist.



Herz said that his experiment 'proves Maestro Maxwell was right - we just have these mysterious electromagnetic waves that we cannot see with the naked eye. But they are there.' However, when asked what practical purposes his discovery might have, commented - 'Nothing, I guess.'

If Herz could not see the use to which electromagnetic waves could be put, others most certainly could. Perhaps the most famous was Gugleilmo Marconi. Marconi patented and made a number of radio transmitters. For the first time human beings were able to send messages over long distances without using sight or sound, or needing electrical cables. Early radios were quickly adapted for use at sea. The Titanic, for example, could send and receive radio messages - although this couldn't prevent it sinking on its maiden voyage in 1912.

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Speech or music broadcasts, rather than simple Morse code, needed amplification to be heard by general listeners. This was made possible by the development in Britain in 1904 of the thermionic valve (right) by J. A. Fleming. In 1907 an American, Lee de Forest, produced a modification that turned these valves, or 'tubes', into devices capable of amplification (left). For 50 years valves were a fundamental component in all radio equipment until they were replaced by the transistor.



The introduction of valve technology was slow, but by about 1920 it was ready to be exploited on a wider scale. The radio equipment manufacturers realised that there was potentially a huge new market for the sale of radio receivers if entertainment programmes were allowed to be broadcast.



In Britain the government allowed the Marconi Company one experimental evening of broadcasting a week, but public response and pressure from industry led to further trials. In 1922 a consortium of manufacturers set up the British Broadcasting Company (BBC). Its first broadcast came from the ex-Marconi station 2LO in London on 14 November 1922; other British towns and cities soon followed.The photograph on the left shows the cover of the *Radio Times* for Christmas 1923.

This company continued until its licence expired at the end of 1926. It then became the British Broadcasting Corporation, a non-commercial organisation. Its governors are appointed by the government but they did not answer to it.



Unfortunately, the first valve receivers with loudspeakers were too expensive for most people. Consequently many people listened in on cheaply made crystal sets with headphones such as the one in this box. The heyday of crystal sets was the 1920s. By the 1930s the price of radio sets (right) had started to drop and soon listening to the wireless in the living room at home was a familiar experience for millions.

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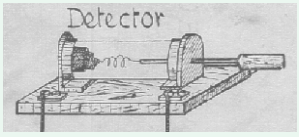
A crystal radio is a very simple kind of radio receiver. It needs no battery or power source except the power received from radio waves themselves.

Radio transmitters send out enormous amounts of energy (tens of thousands of watts). However, because transmitters are usually far away, by the time they reach the receiver they are much weaker. Each crystal radio had a long wire aerial to pick up this signal, although the amount of energy received by a crystal radio set is measured in fractions of a watt. The aerial wire is missing from this example.



The tiny amount of energy from the radio wave that is picked up by the aerial is taken to a coil of wire. The length of the coil of wire decides the frequency of the signal that is being received. There are, in fact, two coils of wire in this example, but they are both hidden inside the wooden case. An example of a typical coil can be seen on the right.





Fine tuning was done by means of a 'cat's whisker' detector. The detector is broken on this example, but an idea of what another typical example looked like can be seen from the illustrations on the left. A crystal, often a small piece of galena (lead sulphide), was enclosed in a glass tube to exclude dust. The end of a very fine wire - the cat's whisker - was dragged across the surface of the crystal until the best resonance was found. As the crystals were quite soft regular replacements were essential (below).

The weak signal was heard using headphones. Listening to radio on a crystal set was a solitary experience!





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The crystal radio set in this box was made by British Thomson-Houston, an engineering company, based at Rugby, Warwickshire. The firm was founded in 1896.

The model in this box is called 'Bijou'. It was made in about 1923. The control panel has terminals for Aerial and Earth on the left-hand side. On the right there are two connectors marked 'Telephones' - that is, the head phones were plugged in here (left). In this case the headphones are made by Ericsson's of Beeston, Nottingham.



In this particular model there are two coils, one of which is fixed and the other could be moved towards it. Tuning involved varying the distance between the two of them. Clear instructions for tuning can be seen inside the lid.

In some ways British Thomson-Houston was ahead of the game. It was the first UK company to offer a valve receiver to the public. As there was no public broadcasting at this time it was suggested that the receiver could be used for picking up time signals! These receivers and the crystal sets that they manufactured were marketed under the trade name Radiola. An example from 1922 can be seen on the right.

The BBC insignia on the front of the wooden box indicates that it complies with the standards set by the BBC. Other variants of this mark can be seen below.

