SOUND AND VISION

The story of home entertainment

Just over a century ago all sound was live – and as fleeting as the echo. Now sound can be stored on records or tapes and played back at any time or anywhere, thanks to electricity.

Previous page: Father and daughter enjoying television on a 14in set 1955.

The idea that pressure waves heard as sounds could form patterns occurred to an Irishman, F.L. Scott, living in France in 1857, and he invented a machine he called a *phonautograph*. Mr Scott's machine recorded sounds as scratches on a disc, and it impressed a Frenchman, Charles Clos, who then found a means of playing back the scratches on a machine he called the *paleophone*.

The year was 1877 and, in America, Thomas Edison had already constructed a *phonograph* (from the Greek words for "sound and writer") and he reproduced the first recorded message: "Mary had a little lamb" on a tinfoil cylinder.

Although it was regarded as a miracle, a major drawback was the fact that the cylinder had to be turned by hand. It was difficult to keep it at an even speed so the sound reproduced varied from low rumblings to high pitched squeaks.

Even when Chichester Bell (cousin of Alexander Bell who invented the telephone) patented the *graphophone* in 1886, which substituted wax for tinfoil, the *Musical Times* reported that all that was heard was "grinding from the interior sounds supposed to be a reproduction of most sweet voices".

Then a German, Emil Berliner in 1889, remembered Scott and Clos' idea and designed a disc rather than a cylinder and devised a needle that scored spiral grooves. Sound vibrations were recorded by the needle moving from side to side rather than up and down.

Berliner also invented the method of producing copies of the discs in a shellac/wax mixture from an original. Curiously, though, he saw his idea for the *gramophone* as having no future – except for the construction of talking dolls!

Edison, too, had a limited view of his invention. He saw its principal use as a dictating machine. It was the public, much to his annoyance, who decided to use it for pleasure, recording their favourite songs and performers.

Left to right: Edison's original phonograph (1877); an early horn gramophone (1906) and Berliner's gramophone (1889).

Radio

Edison was more interested in a patent by an Italian, Guglielmo Marconi, for *wireless telegraphy*, taken out in 1896, and one in 1900 which laid the foundations for modern radio reception by explaining how to tune a receiver to a selected transmission. A year later, in 1901, Marconi was to transmit signals from Cornwall to Newfoundland and *"radio-telegraphy"*, or *radio*, for short, had been born.

Radio waves are just part of a vast range of similar types of waves known as the electro-magnetic spectrum. Wherever you are reading this now you are surrounded by radio waves from countless millions of sources (transmitters), some of them far out in the universe; others from a local radio station. Some of these waves carry pictures as well as sound and most of the inventions in this chapter are for collecting, controlling and interpreting them, making them serve our needs for transmitting information and entertainment.

The gramophone became popular as soon as a clockwork spring motor had been developed to turn the discs at a constant speed. Radio was rather slower in gaining popular appeal as loudspeaker models required electricity and, although on 14th November 1922, the British Broadcasting Company started a regular broadcasting service, there were still more than three-quarters of the homes in Britain without an electricity supply. Accumulators (lead acid batteries) in glass containers that could be recharged at the corner shop for a few pennies allowed many to listen to the popular broadcasts but the method was inconvenient and the batteries unreliable. Popular journals carried advertisements from firms willing to do wiring: "No more batteries, electricity for a radio wall plug and electric lighting for your house – £20 or 2s.6d. a week" read one.

By 1930 radio sets had improved from a simple "crystal set" with a long, outside aerial and a pair of earphones, to a receiver capable of picking up radio signals over long distances and all contained inside a piece of furniture that could stand on a table. This was due to the invention and development of the radio valve by an Englishman, an Austrian and an American. Valves looked rather like light bulbs but were designed to pass electric current only one way and step up the power of the radio signal. Ambrose

Left: A five valve radio by Kolster Brandes Ltd of Sidcup, Kent (1935).

Right: Ecko Radio designed by J K White with a plastic case (1931).

Listening to the radio (1934).

Fleming, Robert von Lieben and Lee Forest, all working independently, perfected these valves – the basis of the *amplifier* which led to the production of mains radio.

Today, valves have been replaced by transistors, invented in 1948, and there have been many other technical advances so that the modern "radio" (now usually called a tuner/amplifier, or a receiver or a "tranni" – transistor) is not only smaller and much lighter but needs only a very small amount of electric current to make it work.

The same electrical principles that made radio a success were applied to recording. Instead of the clumsy method of scratching sound waves on wax, new electrical techniques enabled microphones to convert sound into electrical current which could be etched as "patterns" in the wax. In 1925 the first hit of the electrical recording era appeared – 900 voices singing the hymn, "Adeste Fideles – Come All Ye Faithful"!

The first gramophone discs turned at 72 revolutions a minute (rpm) and played for two minutes, but "Adeste Fideles" played at 78 rpm and lasted four minutes. In 1948 came the long playing record which squeezed up to a thousand grooves on a side and, playing at 33⅓ rpm., produced a full half hour of sound.

The sound quality, too, had improved with the development of *stereo*. Since the listener listened with two ears it was thought the best way to reproduce sound was to record it with two "ears" and experiments and trials went on in the Bell Telephone Laboratories in America throughout the 1930s. The first stereophonic disc was patented by Electrical and Musical Industries in 1930, although it was to be a quarter of a century before it appeared in a popular form. The first stereophonic sound film track was used for Walt Disney's cartoon film "Fantasia" in 1941.

The principle of popular stereo is that separate microphone systems pick up and record slightly different strands of the same sound so that the reproduced sounds can be played back from discs by a "stylus" (instead of a needle) capable of vibrating in two directions at once, re-creating the conditions of the original recording.

Tape recording

In 1899 a Danish engineer, Valdemar Poulsen, had the idea of recording sound waves on steel tape. He called his system the *Telegraphone* as it was intended to be used to record telephone messages. The tape kept breaking and so the method was largely ignored until 1932 when Poulsen and a group of Germans each found a method of recording electrical impulses as magnetic patterns on a coated plastic tape. A British invention of this period achieved similar results with recorded speech using fine wire but it needed the arrival of electronic amplifiers and plastic tape before it was a practical invention.

Cassette tapes, smaller and more compact than the reel-to-reel type, arrived in 1953 and have now virtually taken over the popular market, even threatening the future of discs.

Television

Having captured sound reproduction, it remained only to find a means of capturing and transmitting visual signals. The cinema had achieved this with film at the beginning of the century and electricity's contribution was to improve the projected image using tiny light sources and also to add sound.

This was not enough for some inventors who remembered research carried out by an Englishman in 1873. Using an element called selenium, Willoughby Smith had shown that patterns of light could be converted into electric current and passed along a wire to be reproduced in the same form at the other end, using pieces of the same metal.

No application was found for this discovery until a number of inventors in the first quarter of the century tried to use it to transmit pictures, at first with the object of sending newspaper photographs long distances. At this they eventually succeeded, but moving pictures were a problem. Several systems were invented but the best proved to be an electron beam scanning a fluorescent screen from side to side and from top to bottom so fast that its movement registered on the eye as a single image.

The first demonstration of a television system was in 1923 by a Scotsman, John Logie Baird. Using a lamp, a perforated disc and

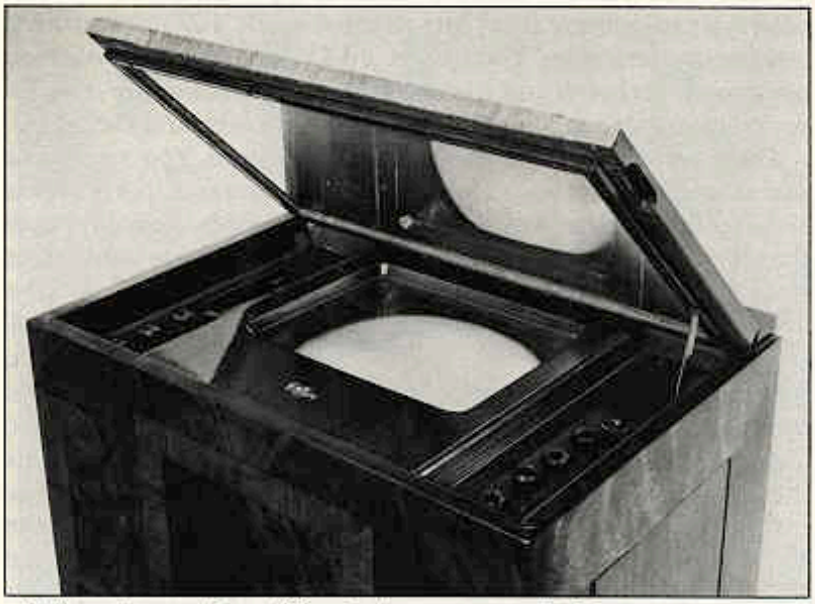
Stereo sound and television pictures from a disc is made possible using laser technology (Philips).

40p worth of equipment in a tiny loft in Hastings, Baird succeeded in transmitting moving pictures and sounds but, beset by chronic ill health, it took him until 1927 to develop his invention. Then in 1929 an experimental television service using his system was started by the BBC. A famous TV broadcast was the Derby in 1931.

There were still many technical problems with the Baird designs and in 1935 a committee of inquiry selected an electron beam system that incorporated Baird's ideas. This system, which used 405 lines instead of 240 lines, was produced by a talented EMI research group led by Isaac Shoenberg. They made a number of improvements including a high vacuum cathode ray tube for the receiver.

The first receivers cost £126 and the picture size measured only 14in (diagonal). The first black and white programmes were news broadcasts and Walt Disney cartoons with an occasional concert and sometimes a film.

It took almost ten years of further research after the war ended to produce a practical TV set and a national TV service. Sales of sets were boosted by the Coronation in 1953 which was televised live. By 1955, 17 in pictures were possible and, the following year,



Though the size of the screen on this 1937 television was only twelve inches, the tube was so long that it had to be mounted vertically and viewed through a mirror in the lid.

a TV receiver with a 23in picture was available.

Research was also going on into presenting colour pictures, developing an idea of Baird's where the basic signal wave was divided into three – one for each of the primary colours. The first sets sold in America in 1954 had problems in keeping the colours in balance and, by 1956 – when the first experimental colour transmissions were tried out by the BBC – they used a system called Phase Alternation Line (PAL for short) with 624 lines. Although based on the American National Television System Committee's (NTSC) method, PAL was able to give better colour reproduction and it was adopted by all other countries, except for France, Russia and their satellites who developed a method of their own called SECAM.

Video recording

Baird had made the first video recording – on disc – in 1928 but the first video tape recorders, developed by Alexander Pontiatoff, a Russian-born engineer working in America, did not arrive until 1956.

Home video tapes – a development of the magnetic sound tapes – arrived in Britain in 1972 and these machines can even

record a programme from one channel while you are watching another on the screen. You can record TV programmes while you are away from home and it is even possible to make your own TV programmes using a small, portable TV camera and recorder.

The video disc (1977) is the latest development. You cannot use discs to record from your TV but films, concerts and sports events are sold in the same way as long playing records. Possibly, with the stereo sound now proposed for the TV set, these video discs may replace the gramophone disc that began it all to give everyone not only "the Sound of Music" but the sight as well!

Nor does the story of TV end there. A library of current information can now be provided from the TV set – the Teletext system, started in 1973. The BBC version of Teletext is called Ceefax and it gives on the screen news and up-to-date information in words and figures. Soon it may be possible to transmit personal visual messages on to the screen, using one of the variations of Teletext and, as well as checking on current prices at the supermarket, you should even be able to order goods from your armchair.

Electronic games and educational puzzles, first seen in 1975, are also making use of the TV set. The TV screen can even be used to display information stored in a computer which can be programmed to operate controls in the home such as heating or can remind you of appointments – its messages appearing even while you are watching a TV programme.

The future

What further changes will come about in the next one hundred years as a result of the application of electricity to mankind's service? Human achievement is based on man's ideas and the fascinating thing about all discoveries and inventions is that we can see how one idea in the mind of one individual at one moment in history can change the course of civilisation. The process is continuous because every discovery and invention is developed by others and, in turn, this inspires further invention.

This, then, is only the beginning. Tomorrow's world will be as different as ours is today when compared with that of a Britain which enjoyed its first public supply of electricity that autumn evening in 1881.


HOUSE TO LET
Silent aids to comfort
ELECTRIC HELPS
THE HOUSE YOU WANT
BRITISH EMPIRE EXHIBITION WEMBLEY, 1924.
ELECTRIC LIGHT
The Beginning of a Perfect Day
THIS WONDERFUL AGE
Electric Cook


UNDERSTANDING
ELECTRICITY
Educational Service
The Electricity Council EC 4010/4.88