John Logie Baird and His Contributions to Television — an overview

By Malcolm Baird

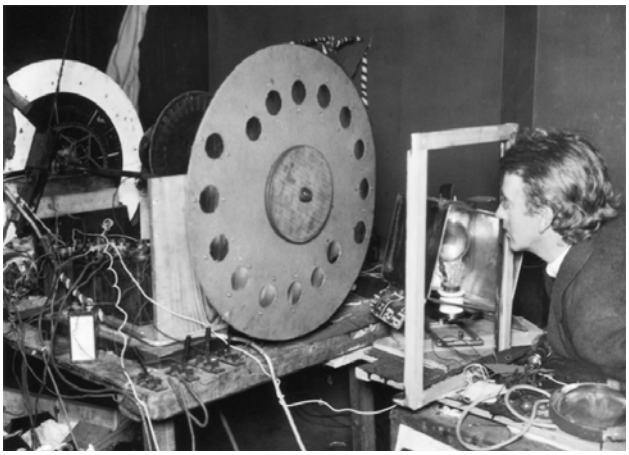
There is an interesting parallel between the history of radio and the history of television; in each case, the earliest achievements were obtained with devices that later became obsolete.

In the case of radio, the invention of the spark gap transmitter by Hertz (1887) and its commercial development by Marconi led to its widespread use in telegraphic communications in the early 20th century. The public imagination was caught by the transmission of the letter "S" across the Atlantic in 1902. The spark gap produced a rapid series of radio impulses which could be interrupted by a key to produce Morse code signals, but the disadvantage was that the signal could not easily be tuned or modulated. This was eventually overcome by the use of high-speed alternators (Alexanderson) and later by vacuum tube oscillators which were made possible by the triode tube (Lee de Forest). By the end of World War I, radio telephony was replacing Morse code and public broadcasting was beginning. A few years later, spark gap transmitters became obsolete and their use became illegal due to the interference that they caused. On a trip a few years ago to a radio museum in Ontario, I witnessed a spark gap transmitter in operation, but the curator could only send for a few seconds for fear of detection!

Television followed the same sort of pattern as radio, displaced in time by about a quarter of century. The early television achievements used mechanical scanning as opposed to electronic imaging which came into use a few years later. Among these achievements were the first demonstration of television (London, January 26 1926) by John Logie Baird. Although the definition and the scanning rate were low (30 lines, 12 ½ frames per second), a recognizable human face was seen. The 90th anniversary of this demonstration was marked by Google in their "doodle" in January 2016. featuring the mechanical television receiver (Televisor) sold by Baird's company in 1930.

January 2016 Google "doodle" featuring the 90th anniversary of the Televisor demonstration.

A Baird Televisor on display at the Early Television Museum. Source EarlyTelevision.org



John Logie Baird working with his scanner,1925.

Soon afterwards, he transmitted television across the Atlantic (London to New York, February 8 1928). The short wave transmitter (40 meters) belonged to his technical assistant, Ben Clapp. Ben Clapp lived on until 1990 and in later years I got to know him well.

A leader in the *New York Times* (February 11 1928) noted the parallel with Marconi's radio transmission 26 years earlier:

> "...[Baird's] success deserves to rank with Marconi's sending of the letter "s" across the Atlantic – the first intelligible signal ever transmitted from shore to shore in the development of transoceanic radio telegraphy. As a communication Marconi's "s" was negligible; as a milestone in the onwards sweep of radio, of epochal importance. And so it is with Baird's first successful effort in transatlantic television. …. Whatever may be the future of television, to Baird belongs the success of having been a leader in its early development."

Biography

John Logie Baird.

John Logie Baird, to whom I shall refer as JLB, was born in the small Scottish town of Helensburgh on August 13 1888, the youngest of 4 children of the minister of the West Parish Church (Presbyterian). At the age of two he had narrowly survived a serious illness and he often missed his school classes due to colds and fevers. He did a lot of reading – above all, the works of H.G. Wells whose scientific stories inspired him. He was also inspired by famous inventors such as Thomas Edison, the Wright brothers and Alexander Graham Bell.

The idea of television came to him in about 1902, soon after he had read the H.G. Wells story *The Sleeper Awakes* which envisioned a table-top television set showing a soap opera. JLB also obtained a technical book by the German physicist Ernst Rühmer on the transmission of speech by a fluctuating light ray using a selenium photocell as a detector. He made a primitive selenium cell (in a kitchen sink experiment) but he soon discovered that it gave a very weak signal. He then moved on to another teenage project, an attempt to fly using a sort of box kite glider. This proved unsuccessful, then he set up a private telephone service for his teenage friends, between his house and their houses nearby.

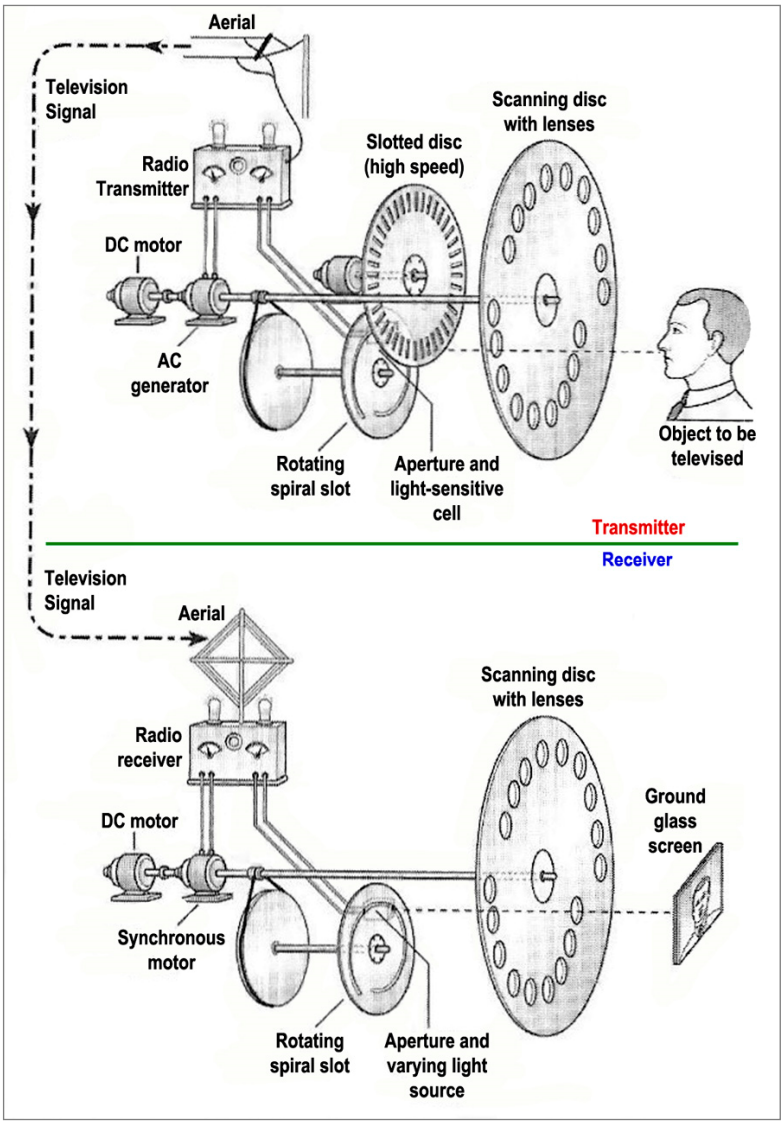
In 1906 he entered the Glasgow and West of Scotland Technical College (which has since evolved into the University of Strathclyde) as a student of electrical engineering. His studies were interrupted by illness and he did not graduate until 1914, shortly before the start of World War I. He volunteered for army service but was immediately rejected on health grounds. After spending a couple of years as an ill-paid junior engineer in a power station, he set out in business, making and selling a water-repellent sock which was advertised as "The Baird Undersock." The venture succeeded, but his health was still a problem in the damp and cold Scottish climate. In November 1919 he moved to Trinidad where he set up a primitive jam factory using local fruit; this was unsuccessful and he returned to the UK with a large shipment of jams and juices which he tried to sell on the London wholesale market. His financial and physical health were not good, but he received help from his family and in particular from his older sister Annie who was a qualified nurse working at one of the big London hospitals.

Early in 1923, JLB moved to the historic town of Hastings, on the south coast of England. His health gradually recovered in the milder and fresher air and his thoughts returned to his early idea of television. The recent development of electronic tube amplifiers enabled him to make use of the weak electrical signals from the photocells. With primitive equipment and some help from local radio enthusiasts, he set up a system of rapid mechanical scanning, using a spirally perforated disc (the Nipkow disc). Despite the *ad hoc* nature of the equipment, he was soon able to transmit moving silhouettes from one room to another and potentially over much longer distances.

The big challenge was picture quality. For television to compete seriously with the movies, it was necessary for the picture to show half-tones as opposed to simple black-and-white silhouettes. JLB's efforts began to attract public attention; more importantly he began to receive help in the form of equipment (donated by companies) and a limited amount of financial backing. In late 1924 he moved from Hastings to London where he set up a laboratory in an attic at 22, Frith Street in the Soho area. Part of the challenge was the geometry of the spirally perforated disk; the perforations had to be quite close to the outer rim of the disc, with the result that the picture was only an inch or so wide,

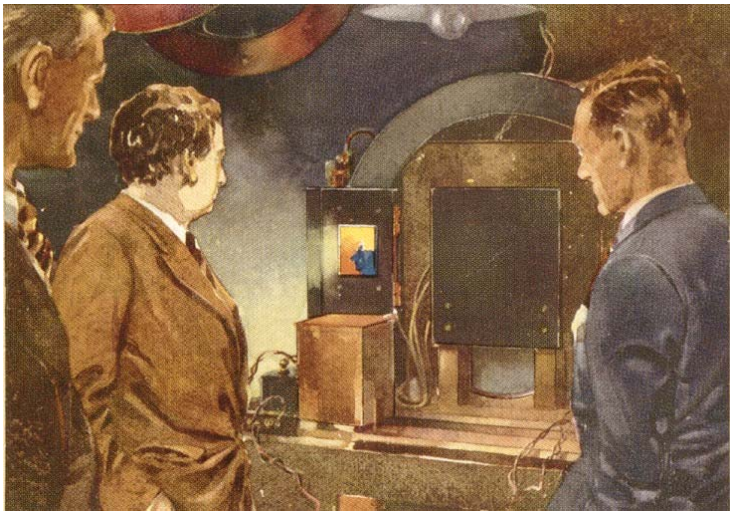
but this could be increased by the use of a viewing lens. Another challenge was to obtain a photocell with adequate sensitivity. The work went on until at last in October 1925, a half-tone television picture was achieved. The first human subject to be "televised" was a young clerk (William Taynton) from an office below his attic laboratory. He had to be bribed with a "half crown" silver coin (about 50c) to stay still under the intense floodlighting. After the public demonstration in January 1926 a company was formed under the simple name of Television Limited, which was later changed to Baird Television Limited. The system operated at first with a 32-line picture scanned at 12 ½ frames per second. This diagram is taken from a lecture that JLB gave to the Physical and Optical Society on January 6 1927, later published in the Journal of Scientific Instruments.

Photograph of Baird's business partner Oliver Hutchinson from the January 1926 demonstration. This is the first photograph ever taken of a television image.



Pictorial of the Baird transmitter and receiver system.

There was no mass market for television and for the next few years JLB focussed on developing his system and demonstrating it to the public. His small company depended very much on public interest and he was joined by the forthright journalist Sydney Moseley. Among the headline-catching events were transmissions from London to Glasgow in May 1927 and from London to New York in February 1928. In July of 1928, color television was demonstrated using an arrangement of color filters over the perforations on the Nipkow discs. The picture on the right is an artist's impression based on an early photograph.



Artist's impression of the use of color filters to demonstrate color images.

The small size of the image (about 1 × 2 inch) was a disadvantage but JLB overcame this by developing a large screen containing 2100 flashlamp bulbs in 30 × 70 array; the bulbs were lit via a commutator which rotated in synchronization with the scanning disc in the camera. In the years 1931 and 1932, mechanical television cameras were set up at the finishing post of the Epsom Derby horse race and pictures were shown to the audience at a London movie theater. In 1932, the scene was viewed by three 30-line cameras and the signals were sent out via three telephone lines and then recombined at the theatre; the picture was projected on the screen by three rotating mirror drums taking the amplified signals from the cameras (see ref.[6], p.219) to show a 90-line image. Despite these achievements, Baird Television was chronically short of money, until 1932 when it was taken over by Gaumont British Pictures, the UK's major movie company.

By this time electronic television was becoming a viable alternative to mechanical television, thanks to the work of two US pioneers: Philo Farnsworth had developed the Image Dissector camera tube which produced an image signal that could be displayed on a cathode ray tube; on September 7 1927 he succeeded in transmitting a moving line of light and this date has been said to mark the birth of electronic television. Farnsworth's main competitor was the Russian-born Dr. Vladimir Zworykin who had studied in Saint Petersburg prior to 1914 under Prof. Boris Rosing who was doing research on cathode ray tube imaging. After 1929 Zworykin received massive support from the Radio Corporation of America (RCA) whose president, David Sarnoff, was also originally from Russia. On the other hand, relations between RCA and Philo Farnsworth were not good. Farnsworth filed suit against RCA for patent infringement and the case was not settled until 1939 – in Farnsworth's favor. As television became a mass medium in the 1950s, RCA's publicity machine ignored Farnsworth and he fell into obscurity. It is only in the last 30 years, after the closure of RCA in 1987, that his contributions to electronic television have been recognized in several books - and a stage play.

Baird Television Ltd was well aware of the developments in electronic television and after 1932 it started to hire talented electronic physicists many of whom were refugees from central Europe, where the political situation was worsening. Baird Television bought one of Farnsworth's cameras for $50,000, for further development. JLB got along well with Farnsworth and entertained him and his wife Elma at our London house in 1936.

Nevertheless, Baird Television was still putting a lot of its resources into the mechanical system. By 1935 the company had developed a "flying spot" or "spotlight" camera that scanned the television studio performers to give a 240 line picture at a rate of 25 frames per second. The rotation speed of the scanning wheel was so high that the aerodynamic drag was a problem, so it was enclosed in a vacuum chamber. The light reflected from the scanning of the performers was picked up by sensitive photocells and it provided the television signal which was transmitted on a wavelength of 6.7 meters. This proved to be the practical upper limit of the mechanical system.

The world's first regular broadcast of high definition television took place on November 2 1936. A small group of formally dressed dignitaries sat rather self-consciously on a platform in the British Broadcasting Corporation (BBC) television studio in Alexandra Palace, a Victorian building located on top of a hill in north London. The dignitaries faced cameras designed by the two rival television companies which were in competition for the BBC contract. This contest was between Baird Television Ltd. and the all-electronic system of Marconi-EMI Ltd. which was mainly based on RCA technology. After a few weeks the BBC decided to adopt the electronic system, because the mechanical camera was large and immovable in the studio compared to the electronic cameras. But according to contemporary accounts, there was not much to choose between the picture quality of the two competing systems.

Alexandra Palace, location of the BBC television studio.

JLB was bitterly disappointed by this result; however Baird Television stayed in business as a leading manufacturer of domestic receivers and in the development of large screen television for showing in movie theaters. There was also some military contract work on the transmission of television from reconnaissance aircraft. JLB's contributions to television were recognised when he was elected to a Fellowship of the Royal Society of Edinburgh; in April 1938 he was invited as guest of honor at the World Radio Convention in Sydney, Australia. My mother accompanied him on the sea voyage and she remembered this as their first and only real holiday together.

Everything changed for the worse in September 1939 with the entry of the UK into World War II. The BBC shut down its television service because its short wave transmitter in London could have acted as a beacon for German bombers. Baird Television Ltd. went into liquidation. My mother and my sister and I were hastily moved to the comparative safety of Cornwall, 200 miles west of London, but JLB continued to do television research at his own expense, in his small laboratory adjoining our London house. Working with one technical assistant (Eddy Anderson), he developed high-definition color and 3D television systems and also a means of sending images rapidly by wire or radio (fast facsimile).

During the war period JLB took out 26 patents. Among his inventions was the world's first color cathode ray display tube which was known as The Telechrome (1944, see picture). It was entirely electronic, with no mechanical moving parts. In its original form it contained a flat screen made of mica with differently colored phosphors (blue-green and orange-red) on each side. Two streams of electrons hit the screen from opposite sides and thereby produced two superimposed pictures which were blended in the eye of the viewer to give color. A later version employed all three primary colors red, blue and green. I can remember as a ten-year old seeing high quality color television in the fall of 1945.

John Logie Baird with his Telechrome color cathode ray tube.

In February 1946 JLB suffered a stroke. After several months of illness he died at the age of 57 on June 14 1946, just one week after the BBC had resumed its television service.

The Aftermath

In 1944, JLB had started a small company called John Logie Baird Limited, to produce and sell television receivers for the post-war consumer market. Although the company was able to pay my mother a small pension, it lacked the resources to continue with JLB's research and his technician Eddy Anderson left to find other employment. My mother suffered a nervous breakdown and my sister Diana and I were taken in by our aunt Annie (JLB's sister) who now owned the family home in Helensburgh. Here, we continued our educations and we later entered Glasgow University; Diana enrolled in the English program, while I studied Applied Chemistry. Some of my technical courses were given at the Technical College where my father had studied half a century earlier.

John Logie Baird's daughter and my sister Diana Richardson with an early televisor.

JLB's reputation was low for many years after World War II. Staff at the BBC remembered their problems with the cumbersome Baird mechanical cameras and their resentment of the high pressure publicity tactics of Baird supporters like Sydney Moseley. Moseley himself in 1952 wrote a biography [2] which was personally sympathetic but largely ignored JLB's advanced work on electronic television. It portrayed him as a romantic failure.

However there were one or two bright spots. In 1957 the BBC showed an episode of "This is Your Life" dedicated to the memory of JLB, with my mother as the guest of honor. In 1959 a public house called "The John Baird" was opened near the original BBC television studio at Alexandra Palace and I was called upon to draw the first pint of beer. The press cameras flashed and I was nervous but fortunately I avoided any serious spillage.

By the time of his centenary in 1988, JLB's reputation had improved. A memorial stained glass window was placed in the West Parish Church in Helensburgh and my mother was subjected to many media interviews. In 1992 she received an honorary degree from the University of Strathclyde, which had evolved from the Technical College where JLB had studied in 1906-1914. She died in 1996 at the age of 89.

JLB's reputation has continued to grow and his contributions are at last being recognized in the USA. On August 26 2014 the Society of Motion Picture and Television Engineers (SMPTE) announced that JLB has been inducted to their Honor Roll. On January 26 2017 the president of the Institute of Electrical and Electronic Engineers (IEEE) unveiled a History Milestone Plaque on the building in London where JLB had first demonstrated television, 91 years earlier.

This overview would not be complete without a bibliography (below) of the major books on JLB, including his own memoirs. Most of these are still easily obtainable but a few have become "rare". Further detail on JLB can be found on the website www.bairdtelevision.com which is updated every few months by my son Iain and myself. I am very grateful to Iain for his help in reviewing the drafts of this article.

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The Author

Malcolm Baird was born in 1935 at Sydenham (S.E.London), not far from the Baird company laboratories and experimental television transmitter at the Crystal Palace. After his father's death in 1946 he attended school and university in Scotland and in 1960 obtained his Ph.D. in chemical engineering at Cambridge. He then joined the research department of Canadian Industries Ltd. and later moved to the University of Edinburgh. From 1967 until his retirement in 2000 he taught and did research at McMaster University in Hamilton, Ontario. Since 2000 his main interest has moved from chemical engineering to television history. More detail can be found in a two-part interview that he gave for the National Academy of Television Arts and Sciences (New York chapter). The interview can be accessed at https://www.nyemmys.org/articles/interview-history-part-1/ and https://www.nyemmys.org/articles/interview-history-part-2/

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