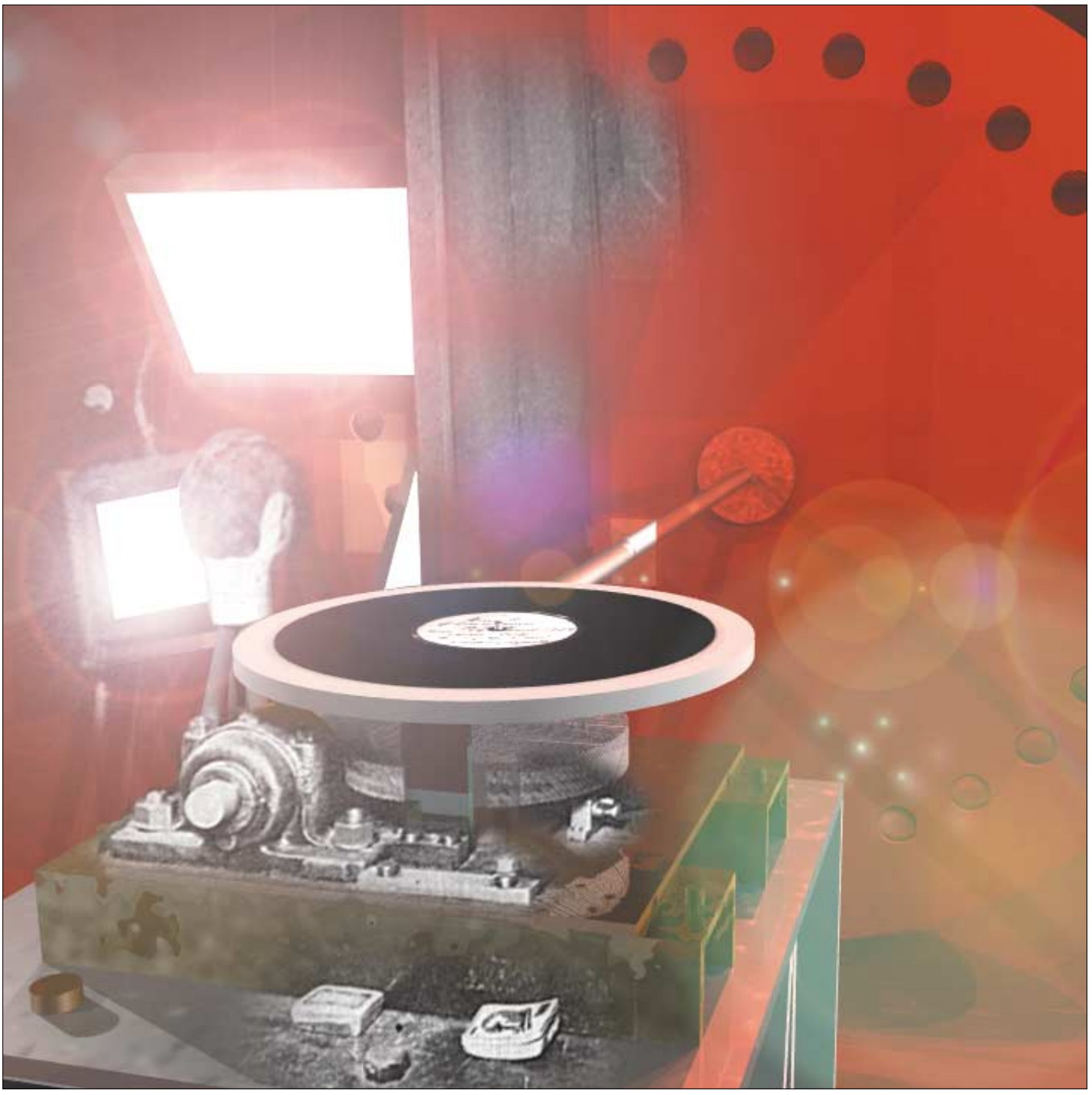
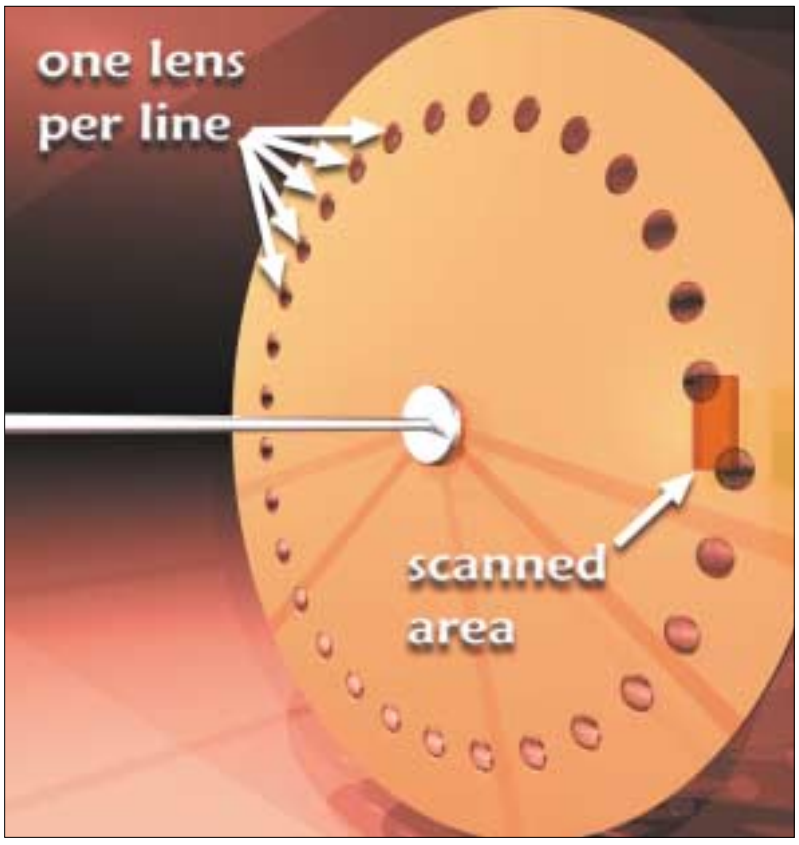
Restoring Baird's image

The rediscovery of a video recording system developed by John Logie Baird more than 70 years ago has shed new light on the early days of television, writes **Donald F. McLean**



It was just over 100 years ago, in August 1900, that Constantin Perskyi presented a paper entitled 'Television', making him the first person to use today's well-worn word to describe the age-old dream of 'seeing at a distance'. In October this year, it will be 75 years since the first successful attempt to televise a live subject in light and shade. Coinciding with these anniversary commemorations, the IEE is publishing a new book – 'Restoring Baird's Image' – which looks at the early history of television and video recording in the light of some fascinating recent discoveries. Those discoveries come from analysing and restoring gramophone videodisc recordings made between 1927 and 1935, 25 years before the first practical videotape recorder and nearly 50 years before the domestic videodisc player.

Over a period of many decades, the re-telling of the history of how television came to be has created both staleness and an evolution of the facts. The first days of television in the 1920s and early 1930s form part of an era confused by the use of unusual technologies and poorly understood by all but a handful of experts. The events in those earliest days have been played down predominantly by the outstanding achievements of electronic television in the late 1930s, by the lack of hard evidence from those early days and by outright technological arrogance from the 1950s and 1960s.



1 The Nipkow disc configured as a single spiral camera. The area being scanned is highlighted [Courtesy of the author]

Television's dawn

Spurred on by the discovery of the light sensitivity of selenium in 1873, the early pioneers of 'seeing at a distance' demonstrated transmission and reception of still pictures over cable in the late 19th century without the advantage of electronics. Fleming's thermionic diode valve in 1904 and de Forest's triode valve and amplifier of 1912 started the electronic revolution, essential for long distance imaging. By the early 1920s, news picture 'facsimiles', some even using digital coding[1], spanned thousands of miles.

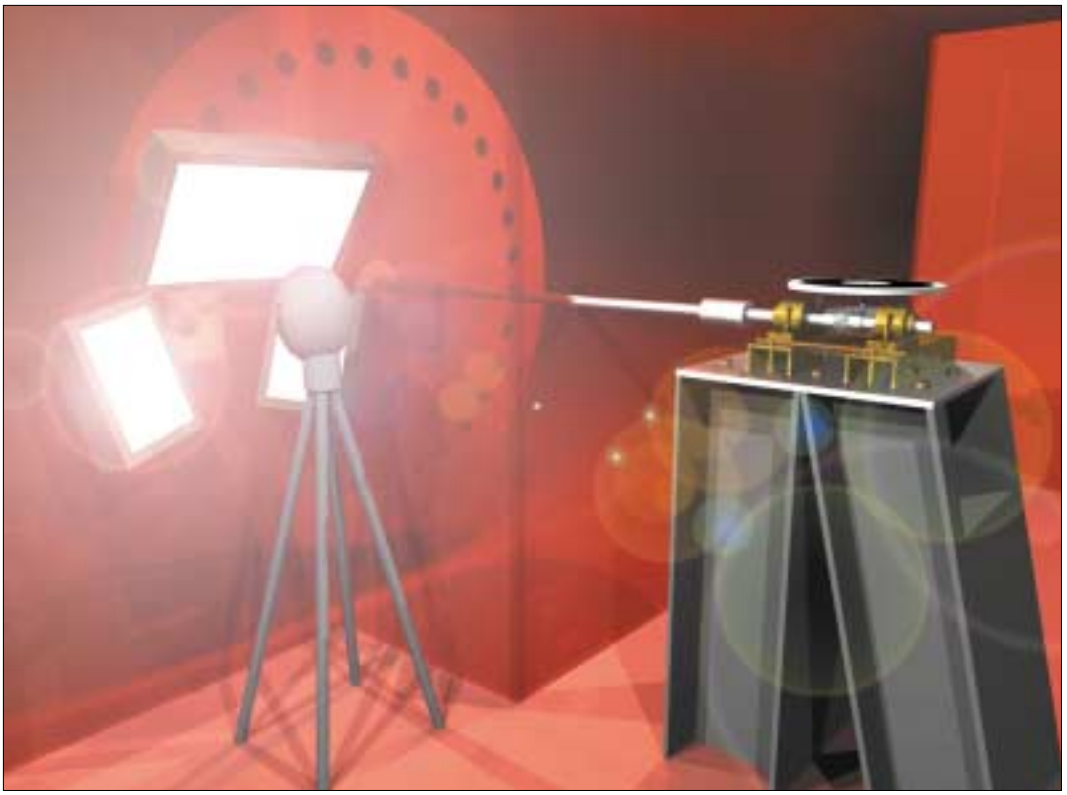
In contrast to these slow, yet high-quality transmissions, television required several pictures per second to give the perception of motion. The advantages offered by electron tubes for television camera and display were recognised (1908[2], 1911[3]) well before their practicality. The electron tube display first appeared in the 1920s and the electronic camera – a major technological challenge in itself – in the 1930s.

Several mostly independent pioneers around the world, including Baird in the UK and Jenkins in the USA, focused on the achievement of a practical television system by adapting what already existed to their purpose. They used the only method of scanning the scene available – mechanical scanning. Of the many methods developed for scanning, the Nipkow disc[4] became the most popular, supporting the development of the first practical television systems for a period of almost half a century after its patent.

As shown in Figure 1, the Nipkow disc was normally one spiral of holes or apertures spread equally around the outer part of a flat disc. The path each aperture swept out (through the angle between apertures) corresponded to a line in the image. The radial distance of each successive aperture changed in equal steps so that, in one revolution, all the apertures swept out the area of one TV frame. By masking off that area and placing a photocell behind it, we have a television camera. By placing a variable light source, (usually a neon), behind a similar disc, we have a television display. With synchronisation of camera with display, we have the vision channel for television.

Practical television

John Logie Baird first achieved scanning and remote display of moving pictures in reflected light (regarded as 'true' television) on 2 October 1925. He followed this up with what is globally considered as the first demonstration of television to members of the Royal Institution



2 Simulation of Baird's laboratory deduced from photographs and the features of the Phonovision discs. A dummy head stands in front of floodlighting and faces the scanning aperture.The most likely position for the drive motor is between the scanning disc and the turntable [Courtesy of the author]

on 26 January 1926. Baird developed his system further over the next few years. The Baird Company commenced experimental broadcasting in 1929 then supported the BBC's first Television Service from 1932. The transmitted standard of 1929-1935 was 30 lines per picture refreshing 12·5 times per second. Line scanning was vertical, from bottom to top with picture scanning from right to left. Baird chose an aspect ratio of 3:7 – a vertical letterbox, optimised for televising individuals from close-up portrait to long shots.

The mechanical nature of systems based on Nipkow discs, and the sensitivity and bandwidth of photocell amplifiers initially constrained the television image to mere tens of lines rather than the hundreds of lines of the electronic systems emerging in the thirties. However, this low definition turned out to offer a distinct advantage. In Baird's case, the highest vision frequency was so low that it was in the audio spectrum. Both this narrow bandwidth and the ease of creating different scanning arrangements were the main reasons why Baird was able to achieve so many 'firsts', years before they were repeated in electronic television.

Inventions

Spurred on financially and technically by his early demonstrations, from 1926 to 1928 Baird patented and developed a series of innovations that covered almost every engineering aspect of television. He demonstrated colour television, stereoscopic television, (near) infra-red, and long-distance transmission. In early 1928, he demonstrated reception of pictures across the Atlantic in East Coast USA from transmissions in Surrey. In the months leading up to that event, he not only transmitted live images, but also used his latest experiment, videodisc recordings[5]. These and other demonstrations served to establish Baird in the public's eye and to raise general awareness of a television revolution.

Today, little evidence remains of these early achievements. This makes it difficult to be factual about Baird's contribution to television – especially in his most publicised creative era of the late 1920s. Various interpretations of his works have both over- and understated Baird's importance. However, the significance of one of his achievements from that period has only recently been recognised. This is his recording of television – the first in the world.

Phonovision and the 'Phonovisor'

In 1926, Baird applied for the first of a few patents on ideas for recording a television signal[6]. He called the process 'Phonovision'. What made Phonovision unique was its mechanical coupling of the camera mechanism to the record platter (Figure 2). The same linkage on playback would have ensured a rock-steady picture from the disc. In one simple concept, Baird eliminated the effect of speed variation during recording and playback.

3 A promotional mock-up of the 'Phonovisor'. The image would appear in the aperture to the left of the turntable. A single pickup arm would playback video and audio together in a manner patented by Baird several years before Alan Blumlein's 1931 stereo patent [Courtesy of the author]

A subsequent patent[7] described the 'Phonovisor' (Figure 3). This was to be a simple domestic machine used for playing back and showing pictures from the Phonovision discs. The Phonovisor would have looked like a conventional gramophone. However, mounted coaxially with the disc platter was a horizontal Nipkow disc with the apertures on the rim outside the disc platter.

Although highly innovative in its simplicity and inherently cheap, neither Phonovision discs nor the Phonovisor ever appeared commercially.

4 Phonovision equipment at Baird's laboratories at Long Acre in London in early 1928. The floodlights have been blacked out by ebonite sheets for Baird's television experiments in the near infra-red, which he called 'Noctovision' [Courtesy of the Royal Television Society, RTS36-60]

Unlike Baird's other experiments, the reproduction of pictures from the Phonovision discs, though undoubtedly attempted in the laboratory (Figure 4), was never publicly demonstrated. From his own comments, it would seem that Baird was never sufficiently satisfied with the picture quality to give such a demonstration. Baird moved on to other ideas and abandoned Phonovision. He passed a few of the discs to museums[8] and to his friends and employees. Over the subsequent years, many people attempted reproduction of images from the Phonovision discs[9]. Their efforts yielded only distorted and unrecognisable patterns.

What Baird could not have realised is that more than sixty years later the faults during recording could be corrected in a personal computer[10,11,] restoring the latent image on his discs to a recognisable form. Those images give a remarkable insight into those pioneering days of television. The images though are only part of the discoveries made. Studying the details of the video signal tells us the camera type and even how well it was built. In addition, analysing the faults on the recordings gives a unique and in-depth understanding of the difficulties Baird encountered[12]. From previously being mere curiosities, the discs have today become one of Baird's most historical legacies.

In the Phonovisor, Baird was attempting to build a domestic videodisc player and display system. Phonovisor development can be placed 25 years before the first practical videotape recorders. However, the first videotape recorders had a different purpose: they were used initially to time-shift broadcast programme transmission. It was not until the 1970s that the first domestic videodisc and videotape machines became available that shared the original purpose as thought out by Baird in 1926.

The 30-line broadcast

In September 1929, after much lobbying, the Baird Television Development Company started a series of experimental transmissions through the BBC transmitters. For nearly three years, for no less than five times a week, the Baird Company produced its own programmes from its laboratories in Long Acre. In August 1932, the BBC took over full control and started the first BBC Television Service with regular programming from studio BB in the basement of Broadcasting House.

It now seems that a few of the enthusiasts watching the television programmes on their Baird 'Televisor' displays were moved to use their domestic audio recorders to record the

vision signal for subsequent playback. Although the quality of the result would have seriously disappointed them, they very fortunately kept the discs safe rather than destroying them.

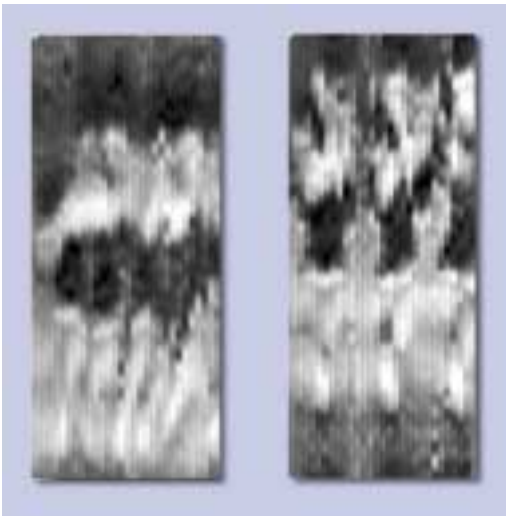
The off-air recordings

In 1996, a privately recorded aluminium disc, with just the cryptic words 'Television 1933' written on the label, was discovered to contain the earliest-known recording of a television broadcast - in fact, a television special (Figure 5). Featuring the Paramount Astoria Girls, the recorded fragment was discovered by the author to be from the first television revue broadcast on 21 April 1933, just eight months after the start of the BBC Television Service. The non-stop action on the disc overturns the established views on the 30-line BBC programmes of staid amateurish performances. The camera technique, lighting technique and production features are all unusual, unique and professional. The rapid pace of the performance is stunning and provides us today with a true measure of Britain's heritage of television programme making.

In early 1998, another discovery was made. A set of unmarked privately recorded aluminium discs has been revealed to contain high quality original 30-line vision recordings from the BBC's 30-line service. One of the singers on the discs is almost certainly Betty Bolton (Figure 6), a well-known contralto, who performed over a dozen times in front of the 30-line cameras. Her vision-only performance on disc is exceptional.

After 1500 programmes, the BBC 30-line service closed on 11 September 1935. In November 1936, the BBC re-opened its Television Service with high-definition television. The massive technology leap that television had made left recording technology far behind. It would be nearly 20 years before direct video recording could catch up.

Whilst the new high-definition systems were under development, Baird continued to develop television, focusing on colour and projection television for cinema. Throughout the war, Baird worked largely on his own, eventually giving the world's first demonstration of a fully electronic colour television display in August 1944. Some critics think of Baird as having 'lost his way'. However, his concepts for television, and in particular his pursuit of the domestic videodisc player, colour television and video projection show that his thinking was, if not an accurate vision of television's future, at least along the same lines that both the market needs and engineering developments have since driven television.



5 The Paramount Astoria Girls perform their high-kicking routine in long shot on an amateur recording made on 21 April 1933. Two dancers can be made out on the left and almost three on the right. Contemporary documents show that the producer, Eustace Robb, vetoed an idea of having the dancers wear white swimming costumes. We can now see why [Courtesy of the author]

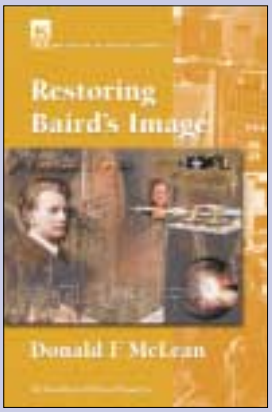
Conclusion

Through an approach reminiscent of an archaeological dig, television pictures have been recovered and restored from the pioneering days of both John Logie Baird in the late 1920s and of the fledgling BBC Television Service in the early 1930s. Accompanying these historic images, there is now a new and far deeper understanding of Baird's experimental efforts and for what broadcast television was really like.

From the investigation into the faults on the Phonovision recordings, we can see the progression of Baird's attempts to solve the mechanical problems that thwarted the production of the world's first videodisc recorder and player. The imaging results alone from Baird's Phonovision and the recording fragments of BBC programmes have been hailed as one of the greatest finds in television's engineering history. What makes this story so fascinating is that the material comes from such a dynamic and important period in the history of technology.

6 Betty Bolton, star of vaudeville, theatre, dance bands, records, movies and radio, was the first performer to appear on the BBC's 30-line television service on 22 August 1932. She appears on two of the eleven fragments recorded by an amateur in the 1930s [Courtesy of Betty Bolton and the author]

In the early 1980s, Don McLean sought out and restored the surviving discs from Baird's experiments with Phonovision. Using computer-based techniques in an investigation reminiscent of an archaeological dig, he not only revealed the images on the discs but also uncovered details of how the recordings were made. The story of Phonovision, the restoration project, and how McLean's subsequent work on amateur 'off-air' recordings of the BBC's 30-line Television Service has overturned established views on mechanically scanned television, is told in the new IEE book 'Restoring Baird's Image'. Heavily illustrated with previously unpublished or rarely seen historic photographs, the book helps to explain a poorly understood and complex period in television's history, as well as shedding light on the achievements of Baird, the development of video recording and the definition and invention of television itself. 'Restoring Baird's Image' is available directly from the IEE and through leading bookshops priced at £29 (ISBN 0 85296 795 0).



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Donald F. McLean CEng FIEE is European Director of a consulting practice in a multinational professional services company. Much of his spare time is spent pursuing his interest in restoring the earliest known recordings of television. The results, including sound and video clips from all the restored Phonovision discs, can be found on the Web at www.dfm.dircon.co.uk