

Paul Nipkow

Inventor of mechanical television

Paul Gottlieb Nipkow (1860-1940) was a German physicist who pioneered television. Nipkow noticed that the metal Selenium had a special ability: its conductivity depended on light. Perhaps this could be used to convert an image to electricity? December 1883 he found a way to send a moving picture by wire; television was born.

But how did he manage to squeeze images through an electrical cord? Let's take a short look at two inventions that preceded it: telegraph and telephone.

The optical telegraph

Invented in 1794 but had some severe limitations as the optical sensor was the human eye. Thus its speed was not the speed of light, but of human vision.

The electrical equivalent appeared in 1852 as a quite simple yet efficient device. If letters, numbers and other characters are translated to a simpler trinary alphabet (consisting of 'dot', 'line' or 'nothing'), then it is quite easy to transmit a sentence, turning the current on and off repeatedly.

The telegraph is essentially a digital system. Its elements simple but numerous.

The telephone

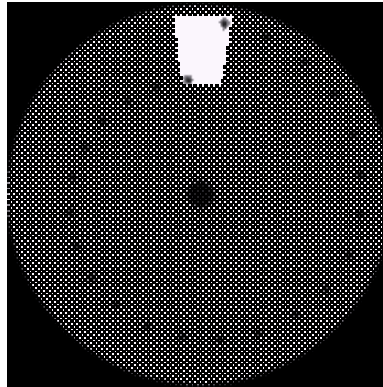
A harder problem, because sound has to be transmitted in realtime. Furthermore sound is a much more complex datatype than text.

Graham Bell solved that problem in 1849 by utilizing an analog device, capable of transmitting the dual aspects of sound (quality and quantity = what kind and how loud).

The telegraph need only concern itself about detecting whether the current is on or off. The telephone needs both amplitude and frequency. It also incorporates the invention of a microphone and a loudspeaker.

Television

Actually a misleading name, since it omits the aspect of sound. A stream of images quickly becomes nonsense without any speech (or at least some text).



Nipkows disc (grey)
Skanned area (white)

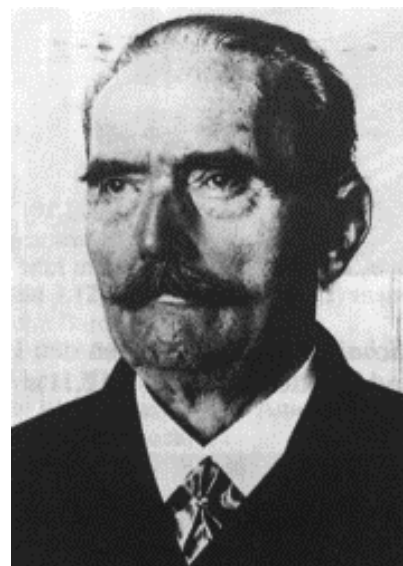
But the omission is understandable. The telephone already existed and only needed to be synchronized with television. But transmitting a live image is much more difficult than text or sound. Sound is a 1 dimensional problem, even though the technical solution faces two aspects.

Any image is 2 dimensional. Add time and we have a 3-dimensional puzzle to solve. (Colours would be nice too, as reality is seldom black/white/grey.)

The challenge

How does an electrical cord with 1 dimension provide a solution to this triple challenge?

Nipkow combined elements from both telegraph and telephone. First the image is broken down in bits (the digital part).



But each bit contains a continuum of values, ranging from pitchdark to bright light (the analog aspect). The ingenious device that did all this was a simple disc (later known as 'Nipkows disc'.)

Nipkows disc

The disc had a spiral of holes cut into it. These holes were positioned so that they could scan every part of an image in turn as the disc spun around. The light coming from each point would then be turned into an electrical current. This electrical signal would light up a second light at the other end of the wire.

The second light would flicker because the amount of current it received would depend on the brightness of the image being scanned. Light from this light bulb passing through a second disc spinning at the same speed, would then project the picture onto a screen.

Later..

Nipkows original system had some severe limitations. It offered only 18 lines of resolution, and it wasn't much sensitive to light. However, he lived to see the modern electronic version (the iconoscope) developed in 1935, so television could be done without Nipkows mechanical disc.

World's first official and regular television started in Berlin 1935. B.B.C. broadcast daily scheduled television programs from 1929 until 1939 when the outbreak of war closed down their transmitter.

1936 first commercial television broadcast by BBC, and the Olympic Games broadcast for the first time in Germany...

Now?

Nipkows disc was long ago abandoned by television, but has recently resurfaced in modern microscopy (in an amplified version). Read more at fx.as.perkinelmer.com/content/livecellimaging/nipkow.asp