

A Brief History of Television



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I can still remember as a child, the first television set that we had. It seemed like a huge box with a small screen and a few dials on the side. My job was to be the channel changer. I would get up and switch the dial and for some reason I loved it. The 20th century was a huge leap for this technology. In this article, I will discuss the evolution of television sets available from their birth to the ones we know and love today.

The Invention of Electronic Television

Philo Farnsworth was an American inventor who developed the first television. In the fall of 1927, he invented something called an **image dissector** (Fig.1). Farnsworth's invention, which scanned pictures with a beam of electrons, is the start of modern television. Although mechanical television was invented already, this is still considered the birth of modern television. An image dissector focuses picture onto a layer of photosensitive material, which emits negatively charged "photoelectrons" relative to the intensity of the light hitting the material. Magnetic fields then periodically manipulate the resulting electron image horizontally and vertically before an electron multiplier, or a small aperture leading to a positively charged detector or "*anode*" in the case of the earliest dissector tubes. The electron multiplier or aperture permits only those electrons emanating from a very small area of the electron image, representing a similarly small area of the visual image. The entire image is scanned several times per second to produce an electrical signal suitably representative of a moving visual image¹. This technology is also referred to as Cathode Ray Technology (CRT) (Fig. 2).

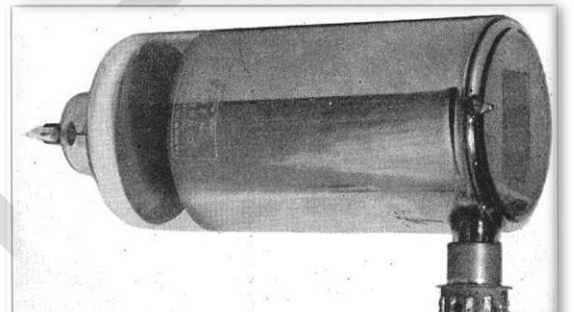


Figure 1 Farnsworth's image dissector
(http://www.radiomuseum.org/forum/unknown_optical_tube.html, n.d.)

This is considered the birth of electronic television because this piece was modified and reengineered to produce different lights and pictures to contribute to the evolution of television. There are numerous other contributors to this and for more information you can visit this link from a Wikipedia article Television History (Wikipedia.com, Television, n.d.).

¹ Wikipedia.com/television

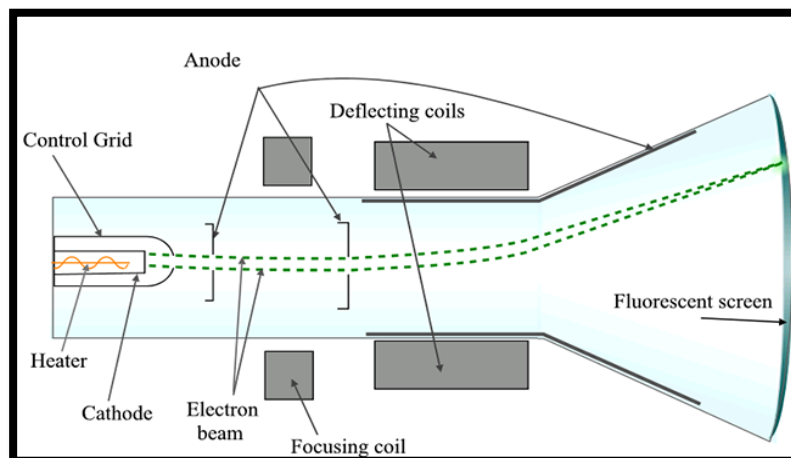


Figure 2 Cathode Ray technology

Early Television Boom

The patent for Farnsworth's "tube" technology (later modified by Russian inventor Vladimir Zworykin) was acquired by the broadcasting company RCA and started to commercially produce television sets. RCA did not start selling consumer television sets until 1933. Even though this was ground breaking technology, it was still considered a niche purchase for homeowners. The general public still needed an explanation of how it worked. The sales of television sets across America skyrocketed when Franklin D. Roosevelt dealt the first ever televised speech during the 1939 New York World's Fair (**Fig. 3**). This had a huge impact on making a Television an ideal part of the household.



Figure 3 Tvhistory.com

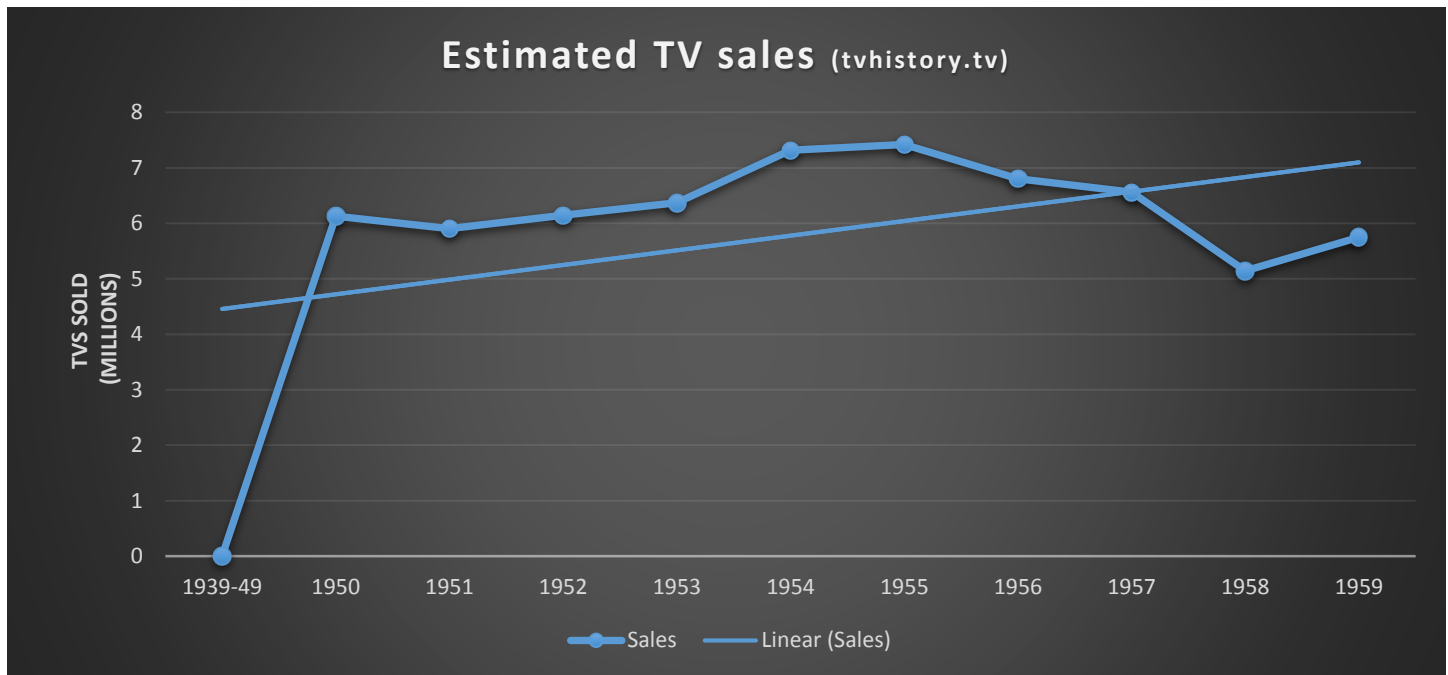
RCA manufactured most of the vacuum tubes in the US. They prided their selves on innovation and produced a number of consecutive products ranging from octal base metal tubes co-developed with General Electric before WWII to the transistor-sized Nuvistor used in the tuners of the New Vista series of TV sets. The Nuvistor tubes were basically the last model produced that featured vacuum tubes, and soon technology shifted to the transistor. Their combined power in the marketplace was so strong that they effectively set the selling prices for vacuum tubes in the US. By 1975, the company had completely switched from tubes to solid-state devices in their television sets, except for the main cathode ray tube (CRT).

RCA first produced TT and TRK models (**Fig. 4**) which were large and expensive for the time period. This was then considered a luxury item and was breakthrough technology that would eventually replace radio entertainment. Families could gather around the television to watch early broadcasts and look on in amazement at the new technology with sound and picture as opposed to just sound from the radio with these new models. The screen size of these models varied from 9" to 12". These sizes seem miniscule compared to the televisions of today.



Figure 4 RCA TRK-9 (tvhistory.tv)

Soon other manufacturers all across the world started to produce televisions. After being held back for so long due to World War II, the television marketplace skyrocketed. There were countless different makes and models of new television sets. Every manufacturer was looking for the newest innovative addition to take their TV to the top. The chart below shows the post-war explosion in sales.



After the war, the ban on production (for consumers) for radio and televisions was lifted and companies were free to explore new innovative opportunities. TV's started to get smaller and dedicating more of their bodies to the screen. Big name networks that are still in operation today were regularly broadcasting our favorite classic sitcoms (i.e. I Love Lucy, Lassie, Gunsmoke). It wasn't until the 1960's that technology took another huge leap.



Figure 5 Tumblr.com

Color TV



Figure 7 ljkrauer.com

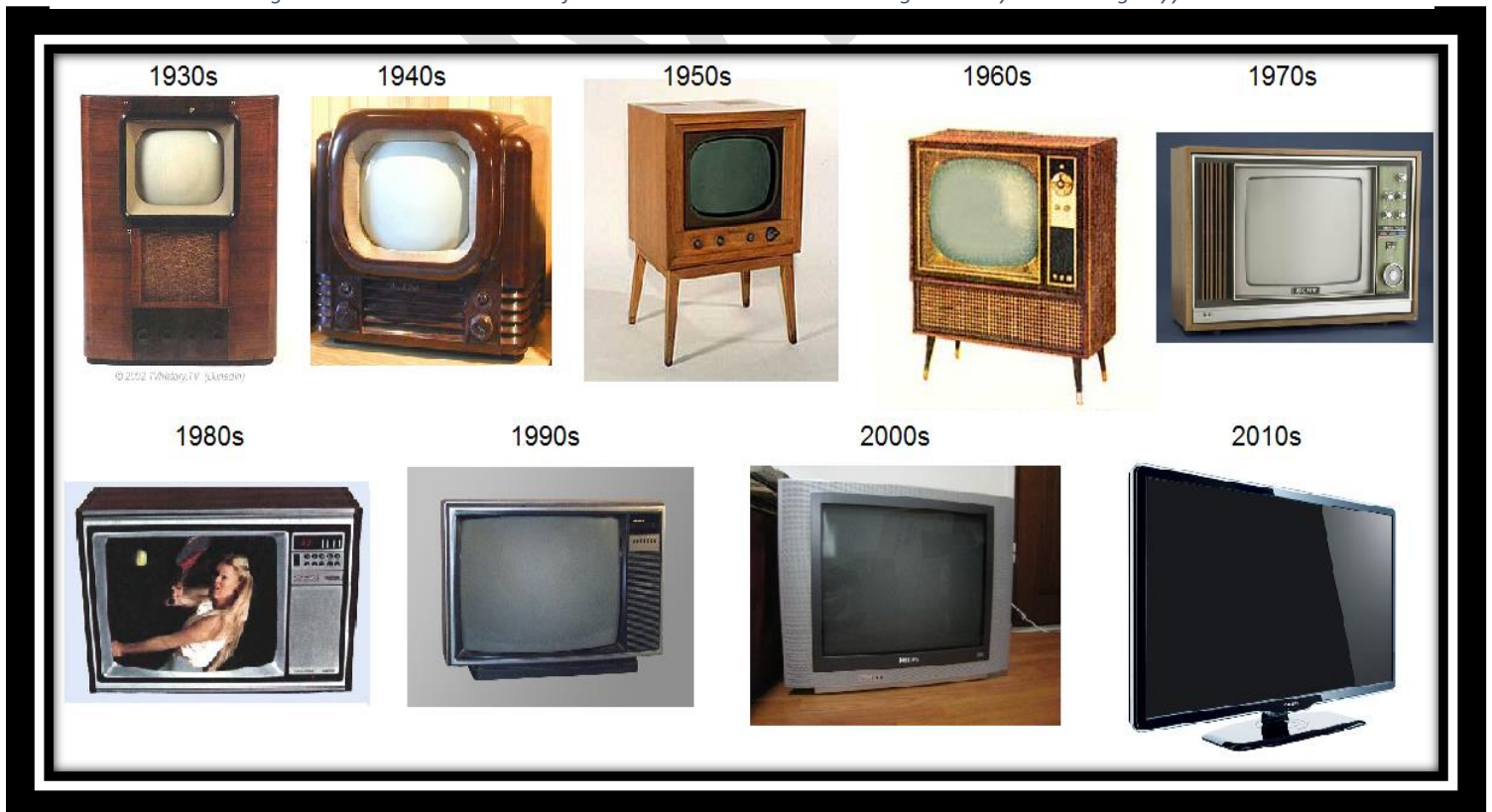
Although inventors had been developing colored television technology before the war, the first practical applications arrived when NBC and CBS started to use color field tests in 1940. Both networks were successful recording programs in color, but due to the war the development was put on hold for consumers until 1953, when the first consumer color television was released.

The first national broadcast in color was in 1954 as NBC broadcasted the Tournament of Roses Parade on New Year's Day. Since the prices of TVs were so high and the lack of programming created problems, color television wasn't regularly broadcasted until 1965. That year, major broadcasters reached an agreement that over half of all prime-time broadcasts would be in color and the first all color broadcasts would occur just one year later. By 1972, all television programming was broadcast in color (makesureof.com, n.d.).



Figure 6 logos.wikia.com

Figure 8 This is various models of TVs as well as the evolution throughout the years. Livedigitalyy.com



Flat-screen Television

Now that we have covered the birth of television let's move forward to post tube televisions of the modern era.

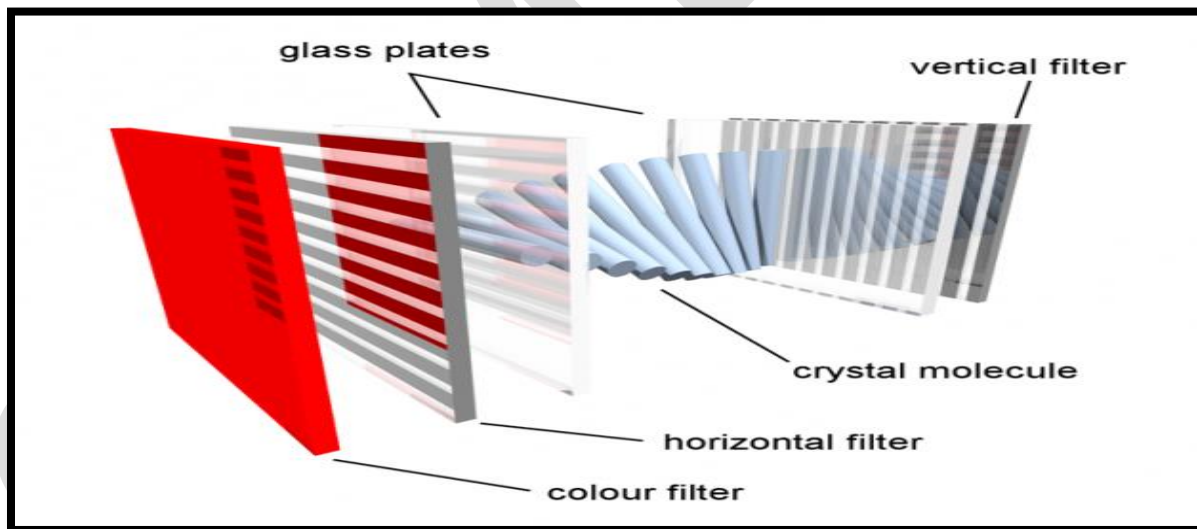
LCD

We can start by looking at LCD (Liquid Crystal Display). LCD TVs all work in the same way. At the back of the screen is a light (Fig. 5), which is on the whole time the TV is powered on, making the light that you see. In front of the backlight are two filters. The first filter is there to block all vertical light waves, the second, rotated 90 degrees, blocks all horizontal light waves. They will then block all of the light coming from the backlight, producing a blank screen.

Obviously that's no use, but this is where the layer of liquid crystals is necessary. A liquid crystal is twisted, changing the orientation of the light. This means that light can pass through the second filter, producing a completely white screen. A voltage is applied to each liquid crystal to manipulate the light. Controlling the voltage controls the twist, and controls the amount of light that contacts the second filter. Using this system and one liquid crystal per pixel, you can create a black and white picture with shades of grey.



Figure 9 LCD Backlight (makeuseof.com)



In order to make a color image, each pixel is actually made up of three sub-pixels. These are located behind a color filter of red, green and blue. Manipulating the light that passes through each of these sub-pixels allows the TV to produce thousands of different colors. The big downside with this technology is that the filters aren't capable of completely blocking all light, so with a permanent backlight there's always a bit of light bleed and, depending on the quality of the set, blacks can look more like dark grey (makesureof.com, n.d.).

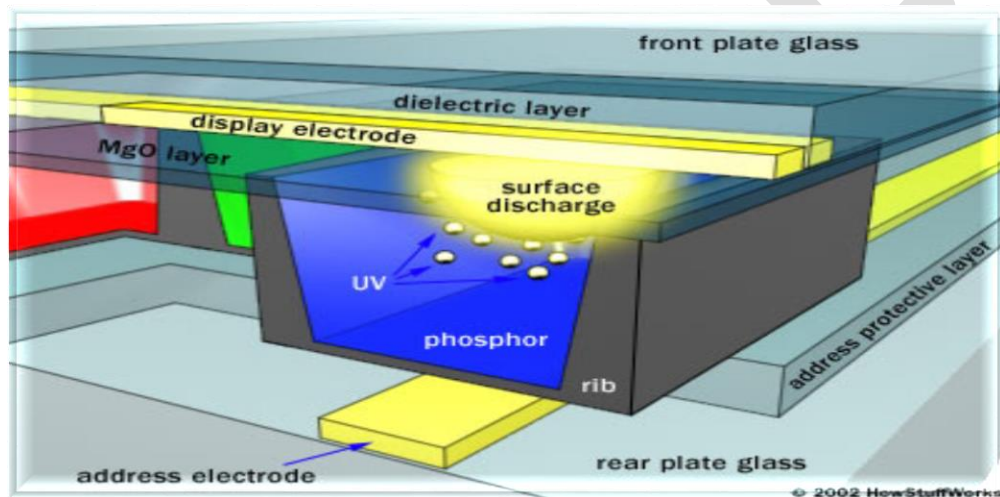
LED

LED screens are essentially the same thing except they are back lit differently. They use Light Emitting Diodes instead of the Cold Cathode Fluorescent Lamp (CCFL) to produce light. LED lighting is 20-30% more efficient than CCFL

lighting and is more cost efficient. Although LCD TVs can come in larger screen sizes, LEDs are thinner and tend to last longer.

Plasma

Just the same as a LCD screen, the picture produced by a plasma television uses a grid of red, green and blue pixels. Each pixel can be turned on or off individually by a grid of horizontally and vertically mounted electrodes. The two electrodes connected to the pixel cell put a high voltage across it, causing it to emit ultraviolet light. The UV light shines through the red phosphor coating on the inside of the pixel cell. The phosphor coating turns the invisible ultraviolet into visible red light, causing the pixel to light up as a single red square.



Plasma TVs have very wide viewing angles. This means that you can sit at almost any angle towards the TV and it won't affect the color or contrast. So to put everything together I've created this table.

Attributes	LCD & LED	Plasma
Contrast Black Level		
Brightness	✓	
Color Accuracy		✓
Viewing Angle		✓
Computer Use	✓	
Fast Moving Video		✓
Screen Glare	✓	
Longevity	✓	✓
Screen Burn-in	✓	
Production Size and Cost		✓
Power Consumption	✓	
Price and Value		✓

New and Upcoming Technology

OLED

Organic light-emitting diode (OLED) technology works using a layer of organic materials positioned between a positive conductive layer of substrate and a negative emissive layer. When connected to a power source, two electrodes – the anode and cathode – ensure the flow of power in the correct direction. When power is flowing properly, the charge produces static electricity that forces electrons to move from the conductive layer, down towards the emissive layer. The changing electrical levels produce radiation that displays as visible light. (makesureof.com, n.d.).

Currently, OLED TVs are taking over technologies like LCD (CCFL) and plasma. In fact, since 2014, there hasn't been a new plasma model made by any manufacturer. LCDs with the CCFL backlight are also coming to an end. OLEDs an impressive amount of less power than plasma or LCD, LED models, making them a good eco-friendly switch.

Not everything about OLEDs is perfect. While technology steadily advances, there are still doubts that the display will last as long as an LCD or even a typical LED television. Apart from that, the organic compound used within an OLED screen is quite susceptible to water damage, more so than any other television tech currently on the market.

Smart TVs

Smart TVs provide the luxury of integrating an internet connection and apps that you would find on your cell phone or tablet straight to your big screen TV. Consolidating these features provides an exceptional entertainment experience. Smart TVs aren't the same as Internet TV, IPTV or with Web TV. Internet TV receives content from the web to the system without the use of apps. Internet Protocol television (IPTV) is one of the emerging Internet television technology standards for use by television broadcasters. Web television is a term used for programs created by a wide variety of companies and individuals for broadcast on Internet TV (Wikipedia.com). In smart TVs, the operating system is preloaded or is available through set-top box. The software applications or apps can be preloaded into the device, or updated or installed on demand via an app store or app marketplace, in a similar manner to how the apps are integrated in modern smartphones (Wikipedia.com).



Figure 10 (gadgetreview.com, n.d.)

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