

A Brief History of Stereoscopic 3D Visualization

The beginning of stereoscopy dates back to probably around the 300th year B.C. which is the time the Greek mathematician *Euclid* found out how we humans achieve the depth perception of the world around us. His findings revealed that the depth we perceive is achieved because of the fact that our eyes simultaneously receive two almost exact images, but with a little bit of difference in the perspective and then our brain fuses these two images into one picture with depth.

The first method for stereoscopic visualization was invented by *Sir Charles Wheatstone* in 1838. Stereoscopy is the enhancement of the illusion of depth in a photograph, movie, or other two-dimensional image by presenting a slightly different image to each eye. *Charles Wheatstone* used two drawings with a little bit different perspective and two mirrors to reflect them and position the two images, so that the viewer can simultaneously see them with his eyes and thus the illusion of real depth was being achieved.

In 1850 *Sir William Brewster* invented an inexpensive viewing device for stereographs called the lenticular stereoscope. This device is a closed box that has one or two openings for light. Two lenses are located on the top and enable the viewer to see a 3D image on the floor of the box. He also devised a two-lens camera with which it is possible to take pictures of moving objects.

In America, doctor and writer *Oliver Wendell Holmes* helped to popularize stereographs by inventing a hand viewer in 1861. In addition he promoted the creation of stereograph libraries. Ultimately stereoscopes ranged from small, inexpensive hand-held devices to large pieces of furniture like the so-called Kaiserpanorama constructed by *August Fuhrmann* in 1880.

In 1853 *Wilhelm Rollmann* developed the first method to produce anaglyph images. These images are made up of two color layers, superimposed, but offset with respect to each other to produce a depth effect. Usually the main subject is in the center, while the foreground and background are shifted laterally in opposite directions. The picture contains two differently filtered colored images, one for each eye. When

viewed through the "color coded" "anaglyph glasses", they reveal an integrated stereoscopic picture.

In 1903 *Frederic Eugene Ives* patented the parallax stereogram, the first "no glasses" autostereoscopic 3D display technology. A compound image consisting of fine interlaced vertical slivers of a stereoscopic pair of images was seen in 3D when viewed through a slightly separated fine grid of correctly spaced alternating opaque and transparent vertical lines, now known as a parallax barrier. The grid allowed each eye to see only the slivers of the image intended for it.

The practice of viewing film-based transparencies in stereo via a viewer dates to at least as early as 1931, when *Tru-View* began to market filmstrips that were fed through a handheld device made from Bakelite. In the 1940s, a modified and miniaturized variation of this technology was introduced as the *View-Master*. Pairs of stereo views are printed on translucent film which is then mounted around the edge of a cardboard disk, images of each pair being diametrically opposite. A lever is used to move the disk so as to present the next image pair. A series of seven views can thus be seen on each card when it was inserted into the *View-Master* viewer.

Polarized stereoscopic pictures have been around since 1936, when *Edwin H. Land* first applied it to motion pictures. The so-called "3D movie craze" in the years 1952 through 1955 was almost entirely offered in theaters using polarizing projection and glasses. Only a minute amount of the total 3D films shown in the period used the anaglyph color filter method. Linear polarization was also the standard in the 80s.

Liquid crystal shutter glasses were first invented by *Stephen McAllister* of *Evans and Sutherland Computer Corporation* in the mid-1970s. The prototype had the LCDs mounted to a small cardboard box using duct tape. The glasses were never commercialized due to ghosting, but *E&S* was a very early adopter of third-party glasses such as the *StereoGraphics CrystalEyes* in the mid-1980s.

Today the spectroscopy captured by and by almost all areas of information technology. The success that started in photography and continued in cinema will tomorrow find its way into TV and PC gaming.