P10. Skylights into Infinity
The Some-time Art of Stereography

Stereography is the art of taking photographs so that when viewed either cross-eyed or in a special viewer, an illusion of depth is created within the image. In most forms of stereography, two photos are required, taken simultaneously, by a camera fitted with two lenses spaced 2 ½ inches (6.4 cm) apart. For most purposes, this distance is critical because it is the average distance between the eyes in our faces. Our binocular vision allows us to see a 3-D version of the world because each eye sees things from a slightly different angle and our brains somehow or other merge the two images by creating a sense of depth.

The history of stereoscopy — that is, seeing in stereo — begins to all practical purposes with Charles Wheatstone¹ (1802-75), the English inventor of many things including the concertina, an encryption machine and, best of all, for his improvement to what has become known as the Wheatstone Bridge which is used to measure the resistance of electrical devices. In 1838 he described how binocular vision works and for this received the Royal Medal in 1840. Based on these studies, he constructed a rather complicated stereoscope which used lenses and mirrors to fuse two similar images.

¹ Later Sir Charles Wheatstone, FRS.
In ~1850, the Scottish scientist, Sir David Brewster FRS dispensed with the mirrors and, using commonly available lenses, constructed a much more convenient viewer of which, by 1856, he had sold more than half a million.

(Below) The viewer invented by Oliver Wendell Holmes, 1881.

While Brewster viewers are becoming rare now, another, even less complicated viewer was invented by the American, Oliver Wendell Holmes. This was the most popular viewer in use from 1881, the year of its invention, until 1939.

There were many other varieties of viewers, sometimes called stereoscopes, stereopticons or by a number of commercial names. One such was the folding stereographoscope, usually made from lacquered or polished wood, which was a combination magnifier for CDVs or Cabinet photographs and a stereoscopic viewer.

Stereographoscope, late 19th Century\(^2\)

\(^2\) http://bil douglas.ex.ac.uk/eve/results.asp?item=69041
Another very popular way to view stereographs was in a stereo viewing cabinet, usually called a Beckers-style Cabinet\(^4\). The first of these was patented by Alexander Beckers of 560 Broadway, New York, on April 7, 1857. These cabinets contained a mechanism which held usually 25 or 50 stereographs and which could be revolved by turning a knob on the side of the cabinet while viewing the scene through the eye-pieces. A lid with a mirror on it was used to reflect light back down into the cabinet and illuminate the stereograph. Many also had a frosted glass window in the back which allowed Brewster-type stereotypes on glass to be viewed by transmitted light. A popular variation was the so-called *Sweetheart Viewer* which had a second set of viewing lenses on the back so that two people could view stereographs at the same time. These cabinet viewers were extremely popular in hotel waiting rooms where they served much as TV sets might do today.

Stereoscopy was most popular from 1860 to the later 1920s during which time most homes had at least a hand-held viewer and a few cards showing views of the Holy Land or the Pyramids, or in Britain, the Mogul wonders of India. There was a brief revival of interest when View-Master\(^5\) reels and viewers, originally introduced in 1939, finally hit the popular market in the 1950s. More than a billion reels and 100 million viewers were sold in that time\(^6\). Special cameras and blank reels were available to make your own views, the cameras — such as the *Stereo Microma*\(^7\) — took pairs of photos on 16mm film.

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\(^3\) [http://www.gilai.com/scripts/more/cps253-photography_stereo-Stereoscopy-yes.html](http://www.gilai.com/scripts/more/cps253-photography_stereo-Stereoscopy-yes.html)  
\(^4\) [http://home.centurytel.net/s3dcor/Mvrs/Beckers.htm](http://home.centurytel.net/s3dcor/Mvrs/Beckers.htm)  
\(^6\) [http://stereographer.com/](http://stereographer.com/)  
\(^7\) [http://www.submin.com/16mm/collection/mikroma/introduction.htm](http://www.submin.com/16mm/collection/mikroma/introduction.htm)
Stereo Cameras

Many stereo cameras were developed through the last half of the 19th Century and in the first half of the 20th. Of these, one of the most recent was the Stereo Mikroma already mentioned in relation to the View-Master reels. Manufactured in what was then Czeckoslovakia by the well-known photographic firm of Meopta, these precision miniature cameras were originally made with one lens for 2-D photography, the second lens following later to meet the growing demand for DIY stereography. In their way they were heirs to the "spy cameras" or "detective cameras" of the 19th century.

The earliest cameras were made to take stereo daguerrotypes. The images had to be captured by taking one photograph and then quickly moving the camera 2 ½ inches to the side and exposing for the second time. Given the length of exposures, static subjects were essential! In 1849 Sir David Brewster developed a viewer capable of viewing stereo daguerrotypes. This was exhibited at the Great Exhibition in 1851 and later, a de luxe version of this made by the Parisian optician Louis-Jules Duboscq, plus a collection of stereographs, was presented to Queen Victoria.

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[^8]: See George Eastman House, [http://www.eastman.org/fm/mees/htmlsrc/mP73300001_ful.html#topofimage](http://www.eastman.org/fm/mees/htmlsrc/mP73300001_ful.html#topofimage)
In 1854 the London Stereoscopic Company was founded with the slogan, *No Home without a Stereoscope...* In our day and age this would perhaps not be a great marketing slogan but it worked for George Swan Nottage who, within two years had sold half a million viewers and before the end of the decade, had over 100,000 different subjects in stock.\(^9\)

In the States, those master Daguerreotypists, Southworth & Hawes in Boston, along with the Langenheim brothers and E. & H. T. Anthony both made their own stereographs as well as importing foreign made views for their eager customers. In France, Louis Jules Duboscq and Claude-Marie Ferrier were among the most important stereographers of the day. Stereographs became so popular that Charles Baudelaire, writing about the 1859 Salon commented that there were thousands of avid eyes peering ‘*into the holes of the stereoscope, which were like skylights into infinity*’.  

Of course the advent of the wet collodion process rapidly overtook the much more difficult daguerreotype method and with this came new cameras and a whole range of new subjects for customers to buy. It was Achille Quinet who patented the first double lens — or binocular — camera with which to make stereographs. An improved version was made in Manchester in 1856 by JB Dancer. This could be used for either the wet or dry process — "dry" in this case being an earlier form of the dry collodion plate process which was later to replace wet-plate.

There were many variations and improvements to the design of stereo cameras through the remainder of the 19th Century and early 20th. One of the most attractive of all the wooden stereograph cameras in my opinion is the *Stereo Instantograph* made by J. Lancaster & Son. Originally a spectacle manufacturer, Lancaster became interested in making cameras in the 1870s. In 1882 he introduced three new dry plate cameras, *Le Merveilleux, Le Meritore,* and *The Instantograph.* Stereo versions of each model were also available. These were made of polished mahogany and brass and featured a rising front and swing back (for correcting perspective). Of the three models, the *Instantograph* was the most sophisticated and hence, the most expensive, offering a choice of format: 6 ¾ x 3 ¼ inches or 7 ¼ x 4 ½ inches. A stereo lens shutter seems to have been an optional extra.

\(^9\) [http://www.answers.com/topic/stereoscopic-photography-1](http://www.answers.com/topic/stereoscopic-photography-1)  
\(^10\) [http://www.eastman.org/fm/mees/htmlsrc/mR29000001_ful.html#topofimage](http://www.eastman.org/fm/mees/htmlsrc/mR29000001_ful.html#topofimage)
The introduction of roll film had its effect too on stereography. In 1905, for example, Eastman Kodak Company introduced the Stereo version of No 2 Folding Brownie. This had three shutter speeds — I, B and T — and four aperture settings. It took 125 roll film, produced 2 images each 3 ½ x 2 ½ inches and cost — in 1905 — $12. The Stereo Folding Brownie #2 remained in production until 1910.

Two other cameras made in the 20th century to take advantage of 35mm film and which, of course, could be used with colour film, were the Stereo-Realist and the Wollensak Revere.

The Stereo-Realist was the most popular of the stereo cameras available in the 1950s and, since more than 250,000 of them were sold, probably the most popular stereo camera of all time. Perhaps the most famous owner of one of beautifully engineered cameras was Dwight D. Eisenhower, President of the United States. That stereography should make a come-back in the 1950s was probably due to the release of the immensely popular Kodachrome colour film.

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11George Eastman House - Technology Archive
Stereo-Realist, Model 1041

Although the camera itself had been designed by Seton Rochwite in 1943 during World War II, after the war, from 1947 until 1972, it was manufactured for a public market by David White Co., of Milwaukee. Using 35mm film, colour or black and white, the Stereo-Realist took either 19 pairs of images on a 24 exposure film or 29 pairs on a roll of thirty-six. Several models were made, among which were the 1041 having two f3.5 coated triplet lenses; and the 1042 which was equipped with the famous Tessar f/2.8 lenses used by many other great cameras, such as the Rollieflex, of the era.

The Stereo-Realist was not an easy camera to use, its operation being complicated while weighing in at 820g, it was a heavy camera to carry around in anticipation of getting the perfect shot. The post-war stereo frenzy abated in the 1960s and sales of this now collectable camera dwindled.

The Wollensak Revere stereo camera

The same loss of public interest also affected the other major stereo camera I want to mention, the Wollensak Revere. This was first introduced about 1953 during the surge in interest in stereography, by the Revere Camera Company of Chicago. Also designed for 35mm film, the Wollensak Revere focussed down to 0.91m (3 feet) and weighed slightly less than the Stereo-Realist at 776g. The two lenses were the manufacturer's own lenses, the Wollensak Revere Amaton Anastigmat f3.5. Although not as well known as say, the Tessar on the Stereo-Realist, Revere at that time was one of the major cine camera manufacturers in the world and these were exceptionally good lenses.

13 This and the advertisement below are from the stereoskopie.com website: http://www.stereoskopie.com/Stereokameras/Revere_Stereo_33/body_revere_stereo_33.html
Skylights into Infinity

In an instruction manual called *The Photographic Instructor*¹⁴ published in New York in 1888, Lincoln Adams gave careful and detailed instructions for making your own stereographs. Presumably if you practised what he preached, these directions would ensure that:

*Viewed in the stereoscope, the picture, if properly mounted, will be most charming; the distance, quite perfect.*

Not all stereographs turn out quite so perfect. Those of us who have tried our hand at this fascinating art know that it is not as simple as it seems. Apart from getting exposures and focus right, of course, there are other problems not so evident to ordinary 2-D photographers. One of the most important instructions Mr Adams gave his students was to ensure that there was something to look at in the foreground, middle distance and background. If this instruction was not followed, then almost certainly, when viewed in the stereoscope, the image might be charming but the distance not visible at all. The stereograph relies upon the person viewing it being able to focus on different planes in the photograph.

Of course, among the millions and millions of stereographs made and sold since the craze began in the middle of the 19th Century the majority are not remarkable. Many have grown old and are not as fresh and good looking as they were when young; others have been poorly exposed or the technology of their day unable to handle extremes of contrast, low light levels and the myriad of other problems which beset photographers. Some however, are spectacular and more than 2-D photographs, transport the viewer back in time or to another place in the world—or both—with a special magic of their own.

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¹⁴ LESSON XX. [Pages 134-136.] — *The Photographic Instructor for the Professional and Amateur* being the comprehensive series of practical lessons issued to the students of the Chautauqua School of Photography, Revised and enlarged etc etc, WI Lincoln Adams (Editor), 1888; on-line edition at the site of the Central Pacific Railroad Photographic History Museum, http://cprr.org/Museum/Photography.html
Although stereographs have been made of just about everything on Earth, we will take a look at some examples from among the first war photographs.

**Bringing warfare into the parlour**

Much was said about how TV had brought the VietNam war into the home and thus changed people's attitudes, not only to that particular war but to warfare in general. However, the first time warfare and its horrors were brought into the home was actually during the American Civil War, 1861 to 1865.

Two men were perhaps more responsible than any other Americans for bringing home to the public the poignancy and the horror of that particularly gruesome war. One was the self-styled *adhesive rough*, the iconic American poet Walt Whitman, who, although a conscientious objector, worked as a nurse in the field hospitals in and around Washington DC throughout the war. Reportedly he was a charismatic figure on the wards, many surgeons attributing almost miraculous recoveries to his presence. Whitman himself attributed his healing powers to his love and affections for these sad men.

The other who brought home the tragedy of war was the man who photographed Walt Whitman in the above picture. Matthew B. Brady was originally trained in making daguerreotypes by Samuel B Morse and went on to become one of the greatest of all American photographers. Among the first to see that photography could be used to document history, Brady himself said

> From the first, I regarded myself as under obligation to my country to preserve the faces of its historic men and mothers.

And, with this mission in mind, in 1856 he opened a studio in Washington, DC, in addition to his New York gallery where he had started in 1844 to make his reputation as the greatest photographer in the country.

Once the Civil War had started, Brady commenced to record its progress. He actually photographed little of it himself but instead sent teams of photographers into the field on his behalf. In 1862 Brady posted a sign on the door to his New York gallery which read "The Dead of Antietam" and inside, displayed photographs of the dead on the battlefield. As the New York Times commented, this was the first time that the terrible reality and earnestness of war was brought home to everyone. Of the many stereographs of the battlefield at Antietam, here is a small selection:

A lone grave on the battlefield of Antietam.
Gathered together for burial.

Group of the Louisiana Regiment where they fell

This last, perhaps the most telling of all, shows the newly-made grave of a Federal soldier and beside it, the unburied Confederate man, left where he fell.
Fifty years later, when the world was engulfed by the First World War, stereographers also recorded the carnage and horror of battle, particularly on the Western Front in France and Belgium millions died in the mud of the endless trenches. Many companies produced stereographs of this war but foremost among them were the US companies, Keystone View Company, Underwood and Underwood and WE Troutman Inc., and in England, the Realistic Travels company.

In 1892, B. Lloyd Singley began to operate the Keystone View Company out of his house at Meadville, Pennsylvania. While he was a student, Singley had worked as a salesman for Underwood and Underwood, then probably the leading publisher of stereographic views. In 1905, Keystone became a company and began a series of mergers with other, smaller companies. Finally, in 1921, Underwood and Underwood sold its stereographic library to its former employee, giving keystone the largest collection of stereo views in the world.

Underwood and Underwood itself had been started by two brothers, Elmer and Bert Underwood in 1882. They had been selling stereographs door to door for publishers such as Charles Bierstadt, J.F. Jarvis and the Littleton View Company. Then, in 1891, Bert Underwood learned to take photographs and so the brothers began to publish their own stereo views. By 1901 they were printing 25,000 stereographs every day. Particularly characteristic of Underwood and Underwood were boxed sets of stereo views, organised around themes such as education or religion, a practice they began in 1900.

Underwood & Underwood "The Stereograph as an Educator"

16 http://www.trentu.ca/admin/library/archives/83-1009.htm
After 1910 they virtually ceased publishing stereographs, concentrating instead on news photography. However, the outbreak of the Great War increased the demand for stereographs and the firm responded, particularly with the sets related to "The European War". After the sale of their library to Keystone, the various stock became merged and in catalogues now it is not uncommon to find the same stereograph under the banner of both companies.
The Horrors of War: ghastly glimpse of Belgian wounded, Antwerp Hospital

A listening post waiting in the open for an opportunity to advance
Search as I may, I have been able to find only one stereograph of the landing at ANZAC Cove in 1915. It is not a very good stereograph in that the sense of distance is not pronounced.
Other views

Not all stereographs were intended to record the horrible side of history. There were many which were intended to delight, simply by showing some of the scenic wonders of the earth:

*Victoria Falls makes a 343 foot plunge, Rhodesia, South Africa.*

Or indeed, to make us laugh:

*Reducing the Surplus: "Now Pull hard", TW Ingersoll (St Paul, Minnesota), 1899.*

Sometimes however, because times have changed, the joke falls flat:
To us, 130 years or so later, the humour is lost to us because we realise these little boys must have been the sons of slaves, their parents emancipated by the Civil War but they and their descendents doomed to live in this poverty and oppression for generations yet to come.

Other Ways to View Infinity

Historically, stereographs have been looked at and enjoyed using one of the several viewers on the market. However, there are other ways of showing virtual 3-D in photographic images.

Cross-eyed and Divergent Viewing:

In mounting images for viewing in a stereoscope, the image produced by the left lens on the camera is mounted on the right hand side of the card and the right image on the left. If this cross-over is not done and the stereoscopic pair of images are mounted side by side, — left to left, right to right — many people can actually view them in 3-D without the aid of special glasses or viewer. Anyone who has had orthoptic treatment for accommodation problems will be familiar with these techniques.

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17 For a much fuller discussion, see the Wikipedia article on which the following is based, at http://en.wikipedia.org/wiki/Stereoscope#Stereographic_cards_and_the_stereoscope
To see this yellow car in "distance perfect" to quote Mr Adams, hold your finger in front of your nose, try to focus on it while you move it away from your face. At a certain distance, a third image, the yellow car in 3-D, will seem to appear on top of your finger. Once you can concentrate on this image, your finger can be removed and the car (almost) taken for a spin. One of the advantages of this method is that the images can be much larger than those which have to fit into a viewer because they can be printed or — more commonly these days — viewed on a computer screen. The disadvantage is a certain amount of eye strain.

**Autostereograms and Divergent Viewing**

Another kind of stereogram for which there was a craze some years ago involves printing the image — using a computer program — so that it appears as a pattern of random dots but which, if viewed with the eyes diverging — that is, focussed on infinity — allows the image to emerge as if by magic from the background of random dots. More recently, larger patterns have been used to hide the image rather than camouflaging it in random noise\(^\text{18}\).

\(^{18}\) As an example, see Hiroshi Kunoh & Eiji Takaoki: *3-D Planet – the World as Seen Through Stereograms*, Angus & Robertson, 1994.
A random dot autostereogram in which the image can only be seen with divergent vision.

Two-color anaglyph
Those who saw the original 1953 The House of Wax 3-D movie will remember wearing glasses in which one lens was red, the other a kind of greeny-blue. There have been advances since then but the essential method is to print the two stereo images one over the other but in different colours. Filtering what each eye sees allows the brain to sort out the final impression of a scene in 3-D.

More recently, there has been a move to producing images which can be printed in magazines or viewed on computer screens which look more or less normal but which, when viewed through glasses more sophisticated than the cardboard-and-coloured-cellophane we used for House of Wax, show the image in full colour and dimension.

Anachrome\(^{19}\) glasses (right) needed to view the image below in all its glory.

\(^{19}\) Trademark name for much improved glasses: see http://www.anachrome.com/
There are many other methods, more or less successful, to produce photographs which can give the appearance of three dimensionality, including *Wiggle stereoscopy* (in which the two images are made to appear alternately in rapid succession) and *Lenticular printing* which is popular for post cards, religious images and souvenirs.

One of the problems encountered in stereoscopy since its invention is that unless there are foreground images, the illusion of depth is lost and distant objects, such as mountains etc, appear flat. The "ups and downs" of distant scenery, however, can be enhanced by taking the original images using an extended base line, that is, by having a greater distance than normal between the lenses of the stereo camera or, alternatively, by shifting a single lens camera to a greater distance between shots.
Gilding the Lily

Ever since the first Daguerreotype stereograph appeared, people sought to improve the illusion of reality by hand colouring the images. A good example is the Underwood and Underwood original below which, some years later was re-released by Keystone, somewhat retouched and in a coloured version:

Even more spectacular are the re-creations of 19th and early 20th Century stereographs using the Perfect Chroma\textsuperscript{20} technique. This is a stereograph of a Russian official taken in 1911 by the Tzar's photographer. It has been more

\textsuperscript{20} http://www.anachrome.com/
than "restored" and is literally better than new thanks to modern technology. It can be viewed using the cross-eyed method.