“Two different times simultaneously equals space” –
3D binocular vision in the work of Alfons Schilling
by Martina Tritthart

Without light, there can be no vision. Since sunlight is essential for life, and is part of normality, its presence in everyday life is hardly scrutinized. Visual artists like Alfons Schilling, however, thematize phenomena of light and perception that go well beyond what is superficially visible and that are concerned with the recipient’s own perceptions. The participation of the observer is the key to the artwork. The activities of the observer in fact constitute the artwork. The perceiver becomes the producer through perception.

From space to vision

Concepts of light and space were and are closely linked with one another.
With the discovery of central perspective in the Renaissance, a change in paradigm took place.
Between 1412 and 1425 the architect and sculptor Filippo Brunelleschi made a drawing of the Florentine Baptistery viewed from the western portal of the cathedral. The viewer looked through the hole on the back of the panel onto a mirror of the same size, which he held in his other hand. The viewer saw the reflection of the drawing and himself viewing this picture. Standing at the same point where Brunnelleschi had created the image, the viewer was able to compare the image with reality.
Two aspects in Brunnelleschi’s experiment are most interesting: firstly, the fact that real space and the image of space or virtual space are put on the same level, and secondly, the observer who sees himself seeing, i.e. sees the pupil of his viewing eye in the image.
The central perspective is a static principle with a fixed point of view, representing the subject in the real world facing the fixed object on the plane behind the frame. In the following centuries this became the dominant principle for vision in the western world, and to quote Erwin Panofsky, it became a very keen abstraction of reality[1].
In the early 17th century the philosopher René Descartes carried out an experiment with an ox’s eye. The picture in La Dioptrique (1637) illustrates his optical analysis: the image is divided into a light part, the outside world, and a dark part, where the viewer is situated. The process of seeing is described geometrically and philosophically: the viewer watching the scene from a distance in a dark room is a metaphor for the immaterial mind perceiving the mechanical stimuli in a kind of sensorium. It represents

[1] Erwin Panofsky, Die Perspektive als „symbolische Form“ in Deutschsprachige Aufsätze/Erwin Panofsky, eds Von Karen Michel and Martin Warnke, Berlin 1998, p 666

the camera obscura as a model of vision, and the duality of inside and outside, subject and object, an either-or position where vision is separated from the physical body of the observer.

Johann Wolfgang von Goethe's book, "Theory of Colours", published in 1810, contains some of the earliest published descriptions of phenomena such as coloured shadows, refraction, chromatic aberration and after-images. In it Goethe describes, among other things, observations of coloured shadows. If an object is illuminated from two sides by a white and a coloured source of light, then two shadows of the object appear, one appears black and one appears in the complementary colour to the coloured light. No instrument can measure the wavelength that would correspond to the shadow perceived as coloured. Today we know that this is not an optical illusion, but a neural process in the human visual apparatus of perception[2]. Goethe explained this phenomenon with the law of the necessary alternation between the colour and its complementary colour.

The experiment shows that the perception of colour does not depend exclusively on the composition of the wavelengths of the light, and that, for perception, it does not make sense to distinguish between an external, objective world and an inner subjective world of perception and experience.

Goethe's theory of colour is of particular interest in this respect, since Isaac Newton's model of light and space, with its purely mathematical explanation, had reached its limits.

In his book "Techniques of the observer", Jonathan Crary describes "how this model [Author's note: the camera obscura model of vision] collapsed in the 1820s and 1830s, when it was displaced by radically different notions of what an observer was and of what constituted vision."[3]

As a result of observational research on after-image in the 19th century, temporality came to be seen as a key to visual perception. From 1820, many optical devices were developed for scientific research but soon became popular with the public.

In 1832 the Belgian physicist Joseph Plateau invented the phenakistoscope, which is also based on the principle of the after-image effect. The phenakistoscope consists of a round disc on which slits are lined up at regular intervals at the edge. The side facing the observer is black, while sequential images are arranged on the back in radial form. The observer holds the disc up to a mirror with a stick and sees, through the slit of the turning disc, a continuous moving sequence of individual pictures, one overlapping the

[2] Cf. Humberto R. Maturana, Rancisco J. Varela: The tree of knowledge: the biological roots of human understanding, Boston, London: Shambhala

[3] Jonathan Crary Techniques of the Observer. Vision and modernity in the nineteenth century, 1990 MIT Press, p 27

next, in the mirror. Plateau was concerned with the duration and quality of after-images, and his calculations confirmed Goethe's premise that temporal sequences were of central importance, not just for the after-images, but also for the whole process of seeing.

It is obvious that instruments such as the phenakistoscope, the zoetrope and the praxinoscope, which were invented in the 19th century, were predecessors of the movies. Furthermore Jonathan Crary emphasizes the historical scientific interest in the subjective act of seeing. The observer himself is spectator and object of empirical research as well as part of the mechanical production. The observer is part of the device.

Besides temporality and motion, there is also the awareness of the constituted vision. The images no longer exist on their own, as the abstract model of the camera obscura explains it.

In the 19th century binocular vision became an important topic in scientific research for the first time. The English scientist Charles Wheatstone first described stereopsis in 1838. For the first time he succeeded in taking measurements of the binocular parallax, the angle between the optic axes of both eyes. In 1838 Wheatstone developed the mirror stereoscope, which made it possible to unify two stereo-images drawn by him, creating an impression of space. In 1849, ten years after Louis Daguerre's production of photographic images on layers of silver had been publicized, the Scottish physicist Sir David Brewster developed the first dioptic stereoscope. Instead of the mirror, lenses were used. This construction made it possible to create an easy-to-handle implement for viewing stereoscopic photographs.

Wheatstone demonstrated that the superposition of two images is necessary for the experience of spatial vision. Depth perception arises from the superposition of two images, which are not identical, being laterally offset (corresponding to the distance between the eyes).

Brewster emphasized the aspect of temporality that arises through the rapid eye movements, the saccades. He spoke of the way pieces of information reaching both eyes in close temporal succession dissolve, creating a spatial image. This is the principle on which, at the beginning of the 21st century, digital 3D technology in 3D cinemas is based, and computer monitors which, with the aid of liquid crystal shutter glasses, provide the right and left eye in turn with stereoscopic half-images, in time with the refresh rate of the computer screen.

The 3D impression is very different to the illusion of depth in a two-dimensional image. Objects in the front, close to the observer, create a plastic impression

while the space in between and at the back appears flat. This 3D realism held a particular fascination for 19th century viewers.
For Jonathan Crary, the real reason for the disappearance of the stereoscope at the beginning of the 20th century was the conscious use of the device for picture viewing, as opposed to illusional effects and trick images, which appeared not to require any apparatus.
In summary Jonathan Crary explains that the shift in perception in the 19th century is on the one hand connected to the inclusion of the subjective user on a psychological and physiological level, but that at the same time developments that deny the body are favoured. This helps to explain the widespread fascination of the cinema in the 20th century, in the sense of an illusion-making machine that integrates the cinemagoer as one of its components.
In the 19th century the era of central perspective gave way, in the terms of the philosopher Jean Gebser (1905 – 1973), to a new aperspective integral system[4] in the 20th century.

The work of Alfons Schilling

Since the 1960s, the Swiss artist Alfons Schilling (* 1934 in Basel, CH) has engaged intensively with binocular perception and the possible ways of representing space and movement in pictures.
In a sense the artist takes up where stereoscopy had fallen from favour around the turn of the 20th century by making three-dimensional vision the focus of his work. The artist invites the recipient to become conscious of his perception and his faculty of knowledge.
Unlike artists working with light kinetics and op art, who also dealt with issues of perception and the role of the viewer, Schilling looks at consciousness and cognitive reactions to the environment. While kinetic art tried out new methods of representation, using light and colour in combination with movement, resulting in a systematic enquiry into the attributes of materials and spatial effects, Alfons Schilling dealt with the mechanisms of perception themselves, examining the perception of movement and space.
The artist constructs experimental compositions with the aid of devices such as photo and film cameras and stereo slide projectors, and also with special three-dimensional imaging techniques such as lenticular prints, random dot stereograms, vectography, and holograms, in which viewers are forced into active

[4] Jean Gebser, The Ever-present origin (Authorized translation by Noel Barstad with Algis Mikunas. Athens, OH: Ohio University Press, 1986)

participation. The work of art does not demand objective viewing, but exists only in the subjective experience of the recipient.

In 1973 Alfons Schilling developed his *Video-Head-Set* for a binocular stereoscopic video system, a theoretical forerunner of the head-mounted display[5]. This was ahead of its time, however, and failed on technological grounds.

Even in the 1950s the artist was looking for new imaging strategies to integrate movement, space and time in the image, leading to the invention of *Rotationsbilder* ('spin paintings', painted circular pictures in motion) in the early 1960s in Paris. The screens are round discs fixed to the wall and set in motion by specially constructed motors. The paint poured on during the rotation process is either visible in detail or blurs together, depending on the speed of rotation. The movement itself is no longer perceptible at high speed. The artist used these pictures to evoke infinity. "How am I supposed to feel "the infinite" in a picture, until the opportunity to see the picture as something finished is taken away from me. Every support must be taken away from the viewer (even if it is only the frame). Only the 'unsupportable'/ the 'untenable' is real painting. The picture must allow no opportunity to begin or end anywhere. These two pieces of information must lie outside it."[6]

For the artist, this insight was the beginning of a creative block as a painter, which led him to New York. There he made films with his brother Niklaus Schilling and was involved, in 1966, in the development phase of the performance series *9 Evenings: Theatre and Engineering*, which he also documented on film. The theatre project, a multi-media show, was initiated by Billy Klüver and Robert Rauschenberg, who later founded the association Experiments in Arts and Technology, E.A.T., still in existence today.

In 1967 Schilling conducted experiments on holograms with the scientist Don White at the Bell Telephone Laboratories in New Jersey. There he was introduced to the visual neuroscientist Béla Julesz, the originator of random dot stereograms.

Before Alfons Schilling started creating his *random-pattern stereogr*ams and his "*free vision" autostereograms*, he made lenticular prints. The lenticular print shows up to 30 different images by changing the angle from which the print is viewed. The picture reveals itself only through the movement of the viewer, and in him. Work and viewer are

[5] Cf. Peter Weibel in Ich/Auge/Welt, The Art of Vision, Wien, New York 1997, p122

[6] "Unendliche" im Bild empfinden können, so lange mir die Chance nicht genommen wird, das Bild als etwas Abgeschlossenes betrachten zu können. Es muss dem Beschauer jeder Halt genommen werden (und sei es nur der Rand). Nur das Unhaltbare ist die wirkliche Malerei. Es darf im Bild keine Möglichkeit aufkommen, irgendwo zu beginnen oder zu enden. Diese beiden Daten müssen außerhalb liegen."Alfons Schilling in Ich/Auge/Welt, The Art of Vision, Wien, New York 1997, p11

interrelated. In terms of content, Schilling is concerned with the disempowerment of the absolute standpoint when viewing a picture by means of the central perspective. Lenticular prints refer to the early chronophotography by Eadweard Muybridge and Etienne-Jules Marey in the 1880s. While Muybridge presented the same snapshot from various different positions in one picture, Marey integrated a series of movement shots in one picture. Alfons Schilling also deals with both aspects, on the one hand showing nine individual images in the lenticular print *Man Standing at Rifle Drill (for Muybridge)* in 1969, and on the other hand making visible the individual image phases of a motion sequence in *The falling man* in 1969.

In the 1970s Schilling put on shows, the so-called *Binocular Performances*, to introduce his studies on perception to the public. One of the performances in New York in 1975 had the title: *Two different times simultaneously equals space*.

Stereo slides were projected simultaneously onto a screen, while rotating shutters disrupted the beam of light. During the performances the artist changed the cues of perception. He used rotating shutters with slits or holes and a stereo slide projector with laterally moveable lenses. He changed the binocular disparity to have an effect on the perception of space and time. Schilling changed the focus in the picture, so that different objects came to the foreground or disappeared. The artist came to the conclusion that motion is crucial not only for motion perception but also for depth perception.

As a result of his research into 3D vision, he built portable vision apparatuses to test stereoscopic vision.

The apparatuses of perception call into question perception, shaped as it is by physical, psychic and cultural elements. With the help of prisms, mirrors, and rotation shutter apertures, Alfons Schilling built devices, which enabled viewers to see in a completely new way.

The *Raumumkehrer* (space reverser) in the work *Das kleine Rad* (the small wheel) (1978) switches foreground and background; far becomes near. The *Augenverschieber* (eye shifter) (1974) changes the parallax und thereby the perception of the size and the distance of the object.

The optic inversion with prisms and mirrors in the apparatus known as *Gazelle* (1993) swaps around all the directions: up becomes down, right becomes left, and back becomes front.

The portable vision apparatuses by Alfons Schilling not only have an artistic-aesthetic component but also a physical one. Because of the size and the weight of the objects they have an influence on the whole body of the viewer and his movements, as in the case of the *Dunkelkammerhut* (1984), a portable camera obscura.

The installation called *Optisches System* (1983), situated in New York with a view of the Hudson River, consists of large mirrors arranged like an oversized space stereoscope. The distance between the eyes is effectively increased to 5 metres. The distance of the view to about 5 km thus changes to a distance of 120 metres, but without zoom-effect. Hence the alternative name for this installation: *Like the gaze of a giant*.

Even more than the spatially perceived images, the vision machines stimulate reflection about the concept of reality. Schilling demonstrates that the physical equipment used in the process of perception determines the perception of space, and that visual perception is therefore overrated. *Optisches System* illustrates the relative perception of size and distance between object and subject, and points to the function of the viewer as part of the equation of perception that is seen as a constant. The environment is perceived and evaluated in relation to the viewer's own body with its specific size and physical apparatus of perception.

Schilling's spatial installation shows how different people's visual experiences must be, even just on the grounds of their varying physical stature.

In the 1980s and 90s the artist Alfons Schilling once again turned intensively to the representation of space in pictures, producing autobinary stereo pictures, which only reveal themselves to the spectator as 3D pictures through a prismatic monocle. When looking at the *autobinary-autostereoscopic* images with both eyes, it is necessary to use the prismatic monocle in order to be able to perceive two parallactically displaced images as a spatial image with corresponding spatial depth.

Both as an artist and as a theorist, Schilling occupies a special position; his work gives no answer to the question about the limits of the visual perception of space, but evokes questions in the viewer about himself and his perception, space and infinity.

Schilling produces spatial images and allows a conscious vision of space without wishing to present a realistic image of the environment; instead he calls into question the mechanisms of perception in the brain that construct the interpretation of reality.

The artist's strategy of disconcerting the viewer makes the latter aware of his role as perceiver and knower. Moreover, Alfons Schilling shows up contradictions in the desire to distinguish between *actual fact* and *factual fact,* between outer reality and inner perception. Connections that had not previously been seen or questioned lose their self-evident nature and become the focus of attention, leading to a wealth of insights and new questions.

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Media:
UNTER 4 AUGEN (1986/87) / BETWEEN FOUR EYES / TÊTE À TÊTE
Alfons Schilling beobachtet von Niklaus Schilling
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