MOHOLY-NAGY AND DENNIS GABOR: TWO DIFFERENT APPROACHES, THE SAME FASCINATION FOR LIGHT. A POSSIBLE DIALOGUE BETWEEN ART AND SCIENCE BY USING HOLOGRAPHY

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ABSTRACT

Light has been seen as a plastic material since Moholy-Nagy created and presented his work of art "Light-Space-Modulator". When Dennis Gabor discovered Holography new approaches of the use of Light as an Art medium became possible. Nowadays several artists use Artistic Holography as their preferential medium. This paper is a presentation of the research of the author in this field and also a tribute to these two Hungarian men, an artist and a scientist that contributed to the development of a better dialogue between Art and Science in ways that were impossible before their works.

KEY WORDS:

light and space; art and science; artistic holography.

LAZLO MOHOLY-NAGY

Almost every artist has heard about Lazlo Moholy-Nagy (1895-1946), as a professor of the Bauhaus. With the rise of Nazism he fled to the USA as did other professors of Bauhaus. In 1937 he was called to be a director of the New Bauhaus, in Chicago, later called School of Design and now the Institute of Design. He was a multi-faceted artist (painter, sculptor, photographer, editor, film maker experimentalist, designer, etc.). He was influenced by the Russian Constructivism and defended that the industry and technology should be integrated in the design and in the arts. For him, it was important to understand every material to know how to use all of its potentialities. In this context, his work Light-Space-Modulator (Licht-Raum-Modulator) (fig.1) is an important example. "This piece of lighting equipment is a device used for demonstrating both plays of light and manifestations of movement" (Moholy-Nagy: 1931). The piece was driven by electric motors, but for aesthetic purposes only, being one of the early forms of media art works. It is more than the bulbs and the rods that built it, because the shapes designed by the light and shadow and the movement are the real work of art. The experimental concept of the light as a material is really revolutionary for the time and a true inspiration for other artists.

Fig. 1- Light-Space-Modulator, by Lazlo Moholy-Nagy, 1930.

DENNIS GABOR

Dennis Gabór (1900-1979) (fig. 2) was born in Budapest and became a physicist and researcher. He entered the Budapest Technical University when was 18 years old and later moved to Berlin, where he attended the Technical University of Berlin. There he studied with important scientists such as Max Planck or Albert Einstein. Gabor stayed in Germany until the rise of Hitler, and then fled to England where he developed the main part of his work.

Fig. 2- Portrait of Dennis Gabor. Reflection Hologram.

In his research he tried to solve the problem of resolution of pictures in electron microscope, theorized that it would be possible to take a picture containing the complete information of the light. He called it Hologram (total picture) from the Greek holos (all). He was the first to realize the awesome capabilities of the phenomenon of interference of light. In 1948 he published a paper entitled "Image Formation by Reconstructed Wavefronts" (Unterseher; 1982: 15-19). For this discovery he was awarded with several prizes, including the Nobel Prize in Physics in 1971. Gabor's major problem was the inability to find the proper source of light until the discovery of laser in 1960 by Theodore Harold Maiman. The laser provides a coherent source of light that means light with just one wavelength. After this, several other scientists such as Yuri Denisyuk, Emmet Leith, Juris Uptanieks and Steven Benton among others gave a great impulse to the development of holography. Also the artists were seduced by this technique and since the late '60s up to now holography has been a medium for the arts.

WHAT IS A HOLOGRAM?

Many times the kinds of images referred to as holograms "are the result of matt-screening techniques often used in filmmaking. One technique often used is a double parabolic mirror, which makes a real object appear to be located elsewhere" (Unterseher;

1982: 14) for example floating in space.

In fact, a hologram does not speak or make any other interaction with the observer besides those inherent to the conditions of the technique at the moment of recording. But what is really a Hologram after all?

There are several types of holograms (Caufield; 2004). However, the type that is interesting for this work is the hologram of Image. It is a recording of an object, assemblage, scene or person, using a set-up of optical devices organized in a defined geometry on an optical table. The source used in holography is coherent light (laser light with just a wavelength). One part will light up the object and is called the object beam; the other will be the reference beam. Together, they will combine (interfere) making a wave front of light that is a microscopic interference pattern containing all the information of light at the moment of the recording. It lies on a plate or a sheet of film coated with a photographic emulsion of high resolution that is chemically developed. After that the information remains stored until the hologram is reconstructed by illuminating it with a source of light in the same angle of the reference beam of the recording.

It is also possible to generate digital holograms.

LIGHT, PSEUDO-COLOUR AND IMMATERIALITY: RESOURCES IN ARTISTIC HOLOGRAPHY PRACTICES

Artists using holography as an art medium can record all the information contained in light at the moment of recording the object or scene on a light sensitive emulsion which is coating a glass plate or film sheet (the hologram). That information is stored and remains invisible until the moment it is revealed by illuminating the hologram in the right angle by a source of light (white or with the same wavelength of the recording, depending on the type of hologram). In the case of holography the materiality is reduced to the support (plate or film). And no other energy is as immaterial as light itself, which is the essence of the holographic image.

Holographic immateriality is an inherent quality of this technique that allows artists to express some types of subjects impossible to obtain in the other media used in artworks. The real world and the fantastic imagery are possible to mix in ways that are very difficult to achieve in other media and to mix recorded images with real objects in the same conceptual artwork.

The holographic space is also a quality that changes the traditional physicality and volume of the object. It is possible to overlap different holographic images in the same space (Garcia-Robles; 2006: 134-140) (fig. 3, fig. 4 and fig. 5). The orthoscopic space is no more the unique option in holography because the object can be recorded as if it were seen from outside as well as from inside. However, either in 3D or 2D holograms (Oliveira; 2009) (fig. 6) color is another resource for this technique. As it is pure light, the color is the purest (Oliveira; 2000: 113-121). The mixture is made by additive color model. The most common in holography is the use of pseudo-color, although the true color is also possible.

Fig. 3 “Cocoon”, Ana Maria Nicholson

Fig. 4 “Tigirl”, Margaret Benyon

It is also possible to make non-figurative holograms where the object is light (fig.7 and fig. 8). The holograms may invoke the appearance of evanescent space, suggested through lines that recede or visual elements that proceed. The observer is invited to explore them dynamically, by discovering subtle chromatisms and space changes, as he moves before them. Sometimes these holograms reveal new elements not seen at the beginning, which can be simultaneously experienced by various observers. These works confirm the idea that what is unique in holography is the fact that the image is at the same time present and absent (Oliveira; 2010), depending on the position of the observer. Being able to see the work, from the sides and behind, (in the case of transmission holograms) allows the observer to examine and consider all the angles of the image and finally make subtle levels of perception react.

Fig. 5- “Stereoscopic Leaves”, Rosa Maria Oliveira

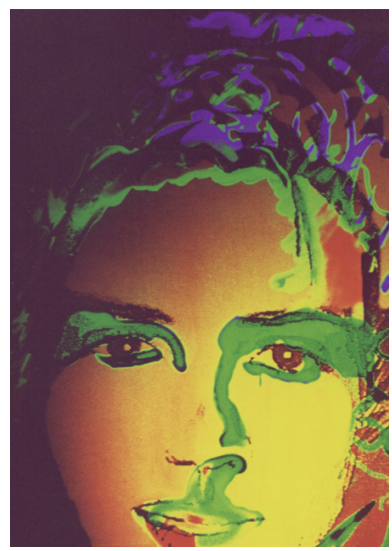


Fig.6- “Irina”, Series Faces, Rosa Maria Oliveira

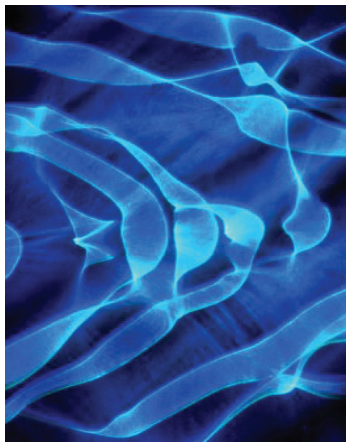


Fig 7- "Study in Light No. 6", Rudie Berkhout

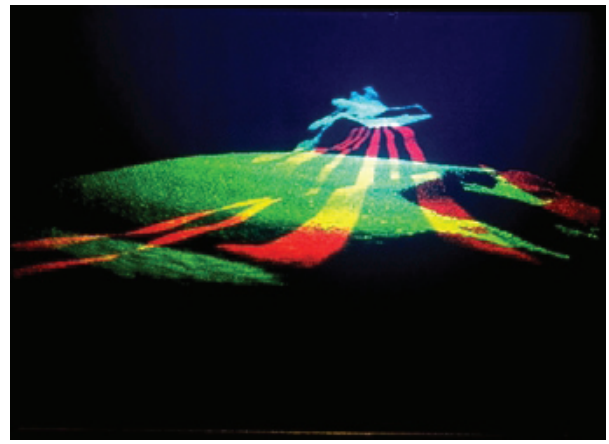


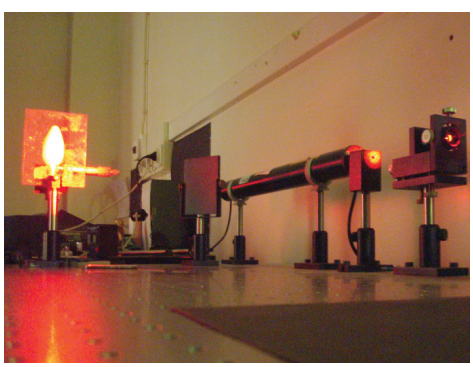
Fig. 8- "Trails", Rudie Berkout

ARTISTIC HOLOGRAPHY IN CLASSES

Holography is a technology that needs a cooperation between the artist and the scientist.

Being such an interesting technology, holography needs some laboratory conditions that are not usually easy to have. These conditions are different for beginners or for advanced holography. In the first case, it is possible to make holograms with few resources; it is necessary to have a darkroom with two different parts: a dry place with a small kit composed by an optical table, some mirrors and lenses, two spatial filters, a beam splitter and a laser (is not necessary to be a very powerful laser) where the recording is made; and a wet place with running water for the chemical development (Pombo; 2000: 231-1238) (Pombo; 2002: 109-114). For advanced artistic holography it is necessary to have a more complex laboratory and another type of equipment. The light sensitive material is bought from different sellers, for instance, Geola.

In the context of a class, there are some dangers to consider in a lab tat require all the teacher's attention. The chemicals used in this technology and the equipment itself need to be handled with care by the students, who must be old and careful enough, not to get hurt.



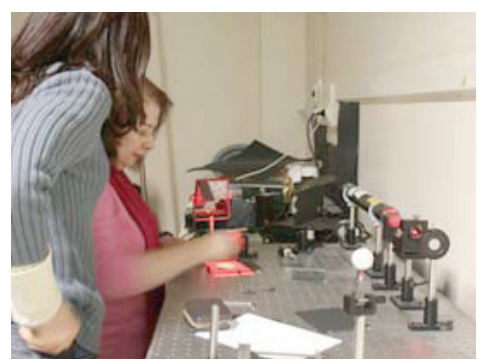


Fig. 9 and 10- Aspects of the Lab for basic holography (recording).

Fig. 11 and 12- Aspects of the Lab for basic holography (development of holograms).

CONCLUSIONS

In conclusion, I would like to pay tribute to these two men, both born in Hungary, both working or studying in Germany and both finishing their lives in the USA and England, leaving their findings and knowledge there.

But I also wish to pay tribute to all male and female artists and scientists who followed their leads to experiment and divulge the new art forms, bridging the gap between art and science, some working in cooperation, some working alone, but all of them applying concepts or technologies that help to build new paths for the knowledge.

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