MUSEUM OF HOLOGRAPHY / CHICAGO

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MAJOR HOLOGRAPHIC ACHIEVEMENTS

Holography, like many great discoveries, is almost an accident. Searching for methods to improve the resolution of electron microscopy, Dr. Dennis Gabor, a scientist at the Imperial College of London, reasoned that by comparing the light shining through the object with a standard reference light he could record not only the brightness, but also the spatial relationship of one point of light to another. He made what is called a phase comparison. This is the discovery that makes Holography unique as a photographic technique. Using a mercury arc lamp with a green filter, he produced the first 'in line' transmission hologram in 1948. But despite Dr. Gabor's theorizing about the use of 'coherent' light, Holography lay dormant until 1960 when T.A. Mainman, of Hughes Aircraft company, demonstrated his first ruby LASER (Light Amplification by Stimulated Emission of Radiation) which produced an intense spectrally pure light. From then on scientific developments were rapid. Within a year Lloyd Cross sold the first commercially produced LASER, and Russian scientists produced the first white light reflection hologram. In this country, two scientists at the University of Michigan, Emmett Leight and Juris Upatnieks, used the LASER's coherent light to make the first holograms using an off-axis reference beam. The first single shot, single beam 360 degree transmission hologram was produced in 1965. Within several years Steven Benton of the Poloroid corporation had developed the white light transmission, the 'Rainbow' hologram, and Lloyd Cross developed the white light Integral Hologram. To house and encourage this work the Fine Arts Research & Holographic Center was founded in 1976, with its school of Holography opening in the fall of 1977.

WHAT IS A HOLOGRAM?

A Holographic plate and the image that plate produces are both referred to as a Hologram. A Hologram is actually a recording on a light sensitive medium of the light waves that reflect from an object illuminated with laser light, forming in complete and full dimension an image of that original object.

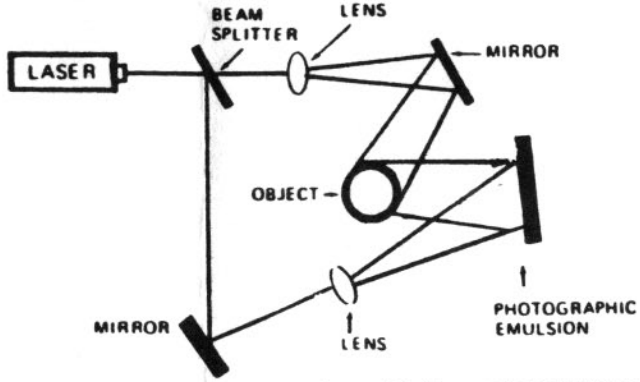
HOLOGRAPHIC PROCESS

Holography is an interference phenomenon dependent upon the wave nature of light. Two separate steps are involved in making and reconstructing a hologram.

In making a hologram, laser light is divided by a beam splitter and sent along separate paths. One beam illuminates the object; the second is made to to interfere with the light reflected from the object.

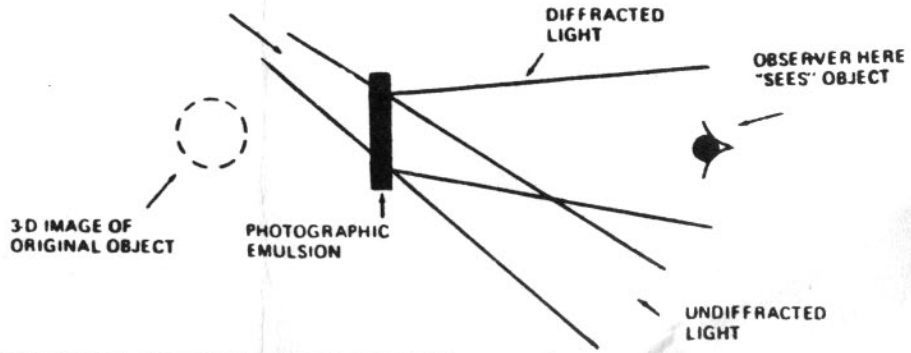
A photographic emulsion is placed at the point where the two beams interfere. The light wave interference pattern recorded on the emulsion forms the hologram. The plate is then developed in an ordinary photographic manner.

For the viewer a hologram is reconstructed by passing light through the plate. The interference pattern causes the light to bend or diffract. The diffracted light is identical to the reflected object light. The hologram reproduces the object as it would be seen from the angle of the reflected light, with full depth and parallex.



In that region of space where the two coherent beams interfere, a photographic emulsion is placed. All this is shown above in the sketch. The emulsion then records the interference pattern of the two beams. The emulsion—a black and white type of very fine grain—is developed in the ordinary way (developer, stop bath, etc.) and the first step is complete.

The second step, reconstruction of the image, is accomplished by passing monochromatic light through the hologram. The interference pattern recorded on the hologram, called a "diffraction pattern," bends part of the light or "diffracts" the light into a new direction. Because the diffraction pattern was formed using light reflected from the object, one would expect the light diffracted by the hologram to be closely related to the light reflected from the object. It turns out that the diffracted light is identical to the reflected object light. Therefore, one "sees" the object via the hologram exactly as one would see the real object via the reflected object light, with full depth and parallex.



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