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Holograms: They Seem to Float in Air

PEGGY SEALFON

Though holography—practically a stepchild of photography—is still considered to be in its infancy, it has already shown very definite indications that its growth may well reach gargantuan proportions in the not-too-distant future. Until recently, holography had unfortunately been confined to scientific laboratories because of the need for expensive, specialized equipment, but startling new breakthroughs in the making and viewing of holograms have finally made it possible to bring these mystifying three-dimensional creations out into public view. In fact, not only are there several places around New York City currently displaying holograms, but there is even a school where interested individuals can actually learn how to make their own holograms.

A hologram is a completely three-dimensional picture of a subject recorded photographically. Viewing a hologram, however, is a very different experience than viewing a photograph. If you look at an 8x10 photograph from a distance of say, 20 feet, you can still determine that there is a two-dimensional image to be seen (even though you may not be able to make out exactly what that image is). Not so with a hologram. From 20 feet away, an 8x10 hologram looks like nothing more than a blank sheet of clear plastic.

It isn't until one moves closer to the normal viewing distance of two to three feet that one sees an image on this sheet of plastic (it is actually a sheet of processed photographic film which contains the image). But, unlike a conventional photograph,

this image is: . . . readily rendered in an ethereal, truly three-dimensional form that seems to be projected out in space, either in front of or in back of the emulsion.

Stranger yet, as one moves to the right or left of this almost ghostly floating image, another view of the subject is revealed just as if one were moving around the real subject. For instance, in looking at a hologram of a magnifying glass held in front of a globe, the viewer is actually able to use the magnifying glass so that by moving his head to view the image from varied angles he can actually see different portions of the globe magnified under the glass.

Though it may seem like the work of an eerie supernatural force, holography is a phenomena that can be explained by understanding the nature of light. Technically, a hologram is made by illuminating a subject with a special type of light source, called a coherent light (this is a monochromatic light in a single wavelength in which all waves also are "in step with one another"). The source of coherent light is a laser beam, and by using mirrors and a beam splitter the light is then split into a reference beam and an object beam.

The reference beam is directed onto a photographic film and the object beam is reflected off the subject onto the same film. Where the two beams meet or overlap, a light interference pattern is formed and it is this that is recorded on that photographic film. When the film is processed and a beam of coherent light is passed through the film, a totally

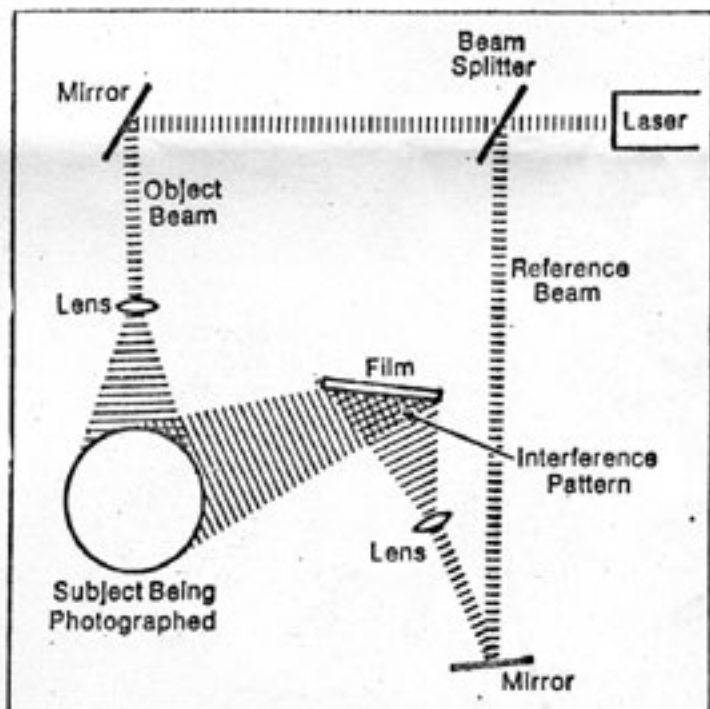


Diagram shows how a hologram is made.

three-dimensional reconstruction of the original subject occurs.

The technique for holography was originally conceived by British scientist Dennis Gabor in 1948, but because the necessary coherent light source was unavailable in abundance at that time, holography underwent an incubation period until 1960 when the laser was developed. Today, just 15 years later, though a laser is still necessary to make a hologram, there are now several types of holograms that do not require a laser for viewing them: these can be seen by properly directing an ordinary incandescent light onto their surfaces from the proper angle.

Suddenly, incredible new applications for holography are being realized . . . and pursued. Stress analysis to

determine structural flaws in material and an efficient data storage system (which may outdate traditional microfilm) are just two possible uses. In addition, mass production methods may eventually put holograms into the hands of the consumer in the form of album or magazine covers, as labels printed right into the plastic on shrink-wrapped packages or stamped right into a record. Ecologically, this could mean tremendous savings of dwindling resources like papers and vinyls, since the need for separate labels or wrappers would be minimized.

Considering these ever-increasing capabilities, it seems hard to deny holography's potential. Yet, some people may dismiss the entire notion of holography as some sort of passing fad that, like the

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hula hoop and the Captain Midnight ring, will have a relatively short life span. For them, the simple idea of a completely three-dimensional, seemingly phantasmagoric, form lurking in space in front of a piece of emulsion sounds too much like some "far out" magical trickery to really give it any credence.

But as proof of holography's merit, the Museum of Holography (MOH) has recently opened its doors in New York City. Director Jody Burns has put an extraordinary amount of energy into coordinating an exciting exhibit of holograms to help educate the public "about the nature of holography as an art medium." The museum's bookstore even offers holograms for sale, as well as pertinent literature. (The ever-expanding Witkin Gallery—one of New York's oldest photography showcases—has recently exhibited a hologram from the museum's collection.)

The MOH, located on the second floor of a loft building at 120 West 20th Street, has a calm, mellow atmosphere. On a typical Saturday it attracts a steady flow of people, young and old, who quizzically examine the exhibit and react with surprise, awe and fascination. They tilt their heads, bend their knees or rise up on their toes to explore each hologram from every vantage point. Some incredulous viewers even wander behind the free-standing holograms—expecting, perhaps, to find a plastic cube housing the image—and are stunned to find only thin air.

The display includes transmission holograms (requiring laser illumination), reflection holograms (which can be

viewed with ordinary light), multiplex (motion) holograms, and other special types. One of the most fascinating works, "Thoughts," created by a young physics instructor, Kenneth Dunkley, is actually a third generation hologram (a hologram of a hologram) and shows a remarkable use of three-dimensional space. To help explain holography, the museum offers a free film program on the subject and on lasers at 1 and 3 P.M. every Saturday.

The New York School of Holography has its offices at the Museum of Holography. It has been in operation since October, 1973 (a San Francisco School of Holography has been alive and well since October, 1971), and has already educated some 300 students in making holograms and constructing inexpensive holographic studios. Affiliated with the International Center for Photography and the School of Visual Arts, the NYSOH has an impressive curriculum of basic and advanced courses as well as an apprenticeship program, designed for individuals who show special talents. Courses assume no technical knowledge or previous experience of any kind and emphasize "hands on" experience. A beginning student can expect to personally create five or six holograms of his/her own composition. The course book, "Practical Holography," by Chris Outwater and Eric van Hamersveld tells how to construct a studio, how to build your own equipment and how to make several different types of holograms. (The book is available from MOH for \$10.)

The setup for making a hologram requires a laser

light (obtainable for as little as \$100) and an absolutely vibration-free table—which can be a simple, but functional and inexpensive, sand-box type similar to the one the New York School of Holography uses. The NYSOH's "optical" table consists of a sand-filled plywood tray or box that rests on top of cinder blocks. The laser beam, beam-splitters, mirrors and subject, which must all be precisely aligned, rest on plastic cylinders that can be easily positioned (and repositioned) by being pressed into the sand. The process uses currently available black-and-white photographic film and processing chemistry.

According to the NYSOH's enthusiastic associate director Abe Rezny, "Holography is probably the greatest invention in photography since the invention of photography itself." For the photographer, Rezny believes that holography offers a good sense of discipline. The ideas for each hologram must be fully thought out before execution and a graphically oriented individual is forced to expand his perception to deal with a totally new concept of space.

As of now it certainly is not quite as easy for an amateur holographer to assemble a portable studio as it is for a photographer to turn his/her kitchen or bathroom into an instant darkroom, but at least the tools for holography are finally within reach, and the original prohibitive expense has been greatly diminished. Naturally, as the medium becomes more and more viable, artists are finding an irresistible attraction to experiment with its rich, untapped resources as a stimulating and innovative

vehicle of expression.

Salvadoro Dali, having made a three-dimension portrait (multiplex hologram) of the strangely spectacular rock star Alice Cooper, is, perhaps, the first internationally known artist to make use of the holographic medium. As a result of Dali's involvement and his influence in the art world, the Knoedler Gallery (21 East 70th Street), an old, established and well-reputed art gallery, has become extremely interested in holography. In fact, the Knoedler is in the process of taking an enormous pioneering step into the realm of the third dimension by presenting an entire exhibit of holograms that is scheduled to open in May.

Most of the holograms this writer has viewed thus far have projected the three-dimension image behind the film viewing plane on the side away from the viewer. Not so with several of the holographic images which will be at the Knoedler. These protrude, almost threateningly, from the film surface into the exhibit room. One in particular, a frightfully realistic image of a woman's delicate hand offering a diamond ring and bracelet, hovers like an eerie disembodied spirit. I later discovered that this hologram had originally been created in 1972 as a commercial display suspended above Cartier's on Fifth Avenue and allegedly provoked one passerby to assail it with her umbrella and declare it to be the "devil's work." The extremely mind-boggling Knoedler exhibit officially opens on May 12 with a champagne gala evening sponsored by UNICEF (tickets \$25 each).