

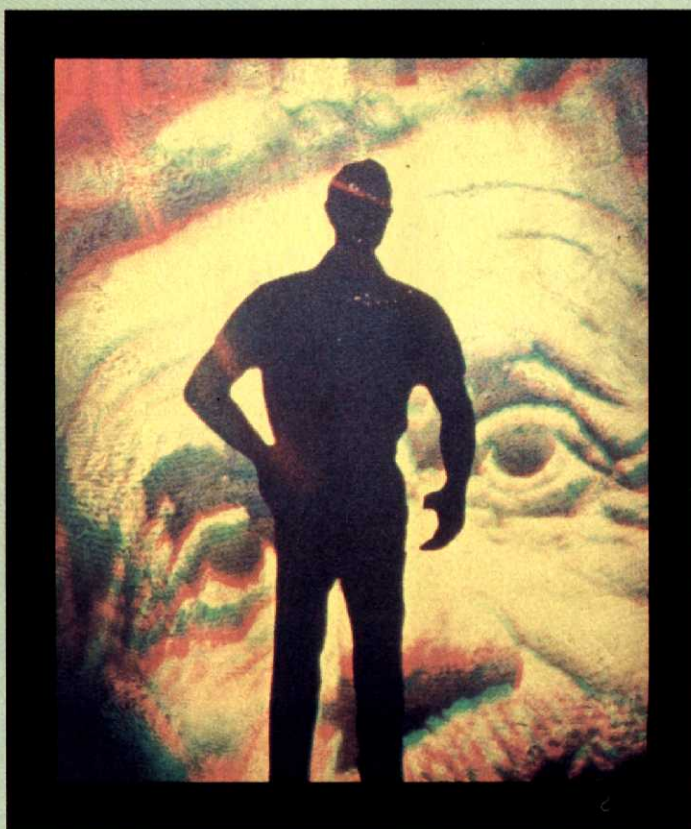
A CONTINUING SERIES

FUTURE FANTASY FUTURE FACT

The woman against the museum wall was looking at me. When I moved, so did she. And then, with a devilish wink, she blew a kiss! What made the woman's actions extraordinary is that she wasn't real. She was a 3-D image in plastic—a hologram. To be more precise, she was the star of the holographic "movie" called *Kiss II*.

Kiss II is one of about two dozen holographic "movies" that can be found at the Museum of Holography in New York. Starring celebrities like Big Bird, William F. Buckley Jr., Andy Warhol and Arthur Ashe, these "movies" showcase the remarkable 3-D qualities of holography. But, holography is more than just an amusing image-making device. Since the museum opened its doors seven years ago, the technology has entered a key develop-

By Josh Martin



ment phase that is just beginning to bear fruit.

Although several game manufacturers (Atari, Coleco, Mattel and Walt Disney among them) have invested in holographic patents and research, few have introduced any. There are no games currently on the market. Games like Sega's *Subroc-3D* use complex optics to create the imagery. Coleco and Atari are working on holographic games, but chances are you won't see one for awhile. Game companies are not sure the public is ready for holographic games yet.

If you're intent on seeing holographic games of the future now, there are a few games in existence. One such game is *Gun-smoke*. Built for and displayed in the Museum of Holography, it costs two bits to take a shot and a score of 38 will win you a free game. No sweat for

Holography

gamers used to rolling a game!

In *Gunsmoke*, you are armed with a rifle and try to out-draw a wild West gunslinger who stands inside the swinging doors of a saloon. If you win the draw, the 3-D gunslinger falls into the dust; if you lose, he stands triumphant with his six-shooter still smoking. What is remarkable, technically speaking, is that both alternatives are contained in the 3-D action of the hologram. Sophisticated video game players might find the action primitive, but the holographic movie action is impressive.

Kansai Saiki Seisasukusho Corp. (Kasco), the Japanese company that makes *Gunsmoke*, has sold over 6,000 of them, but there are only 750 in the United States. Kasco also markets two other holographic games, *Samurai* and *Bank Robber*. And naturally, the first X-rated holographic game has already been developed. It was built by Peter Claudius.

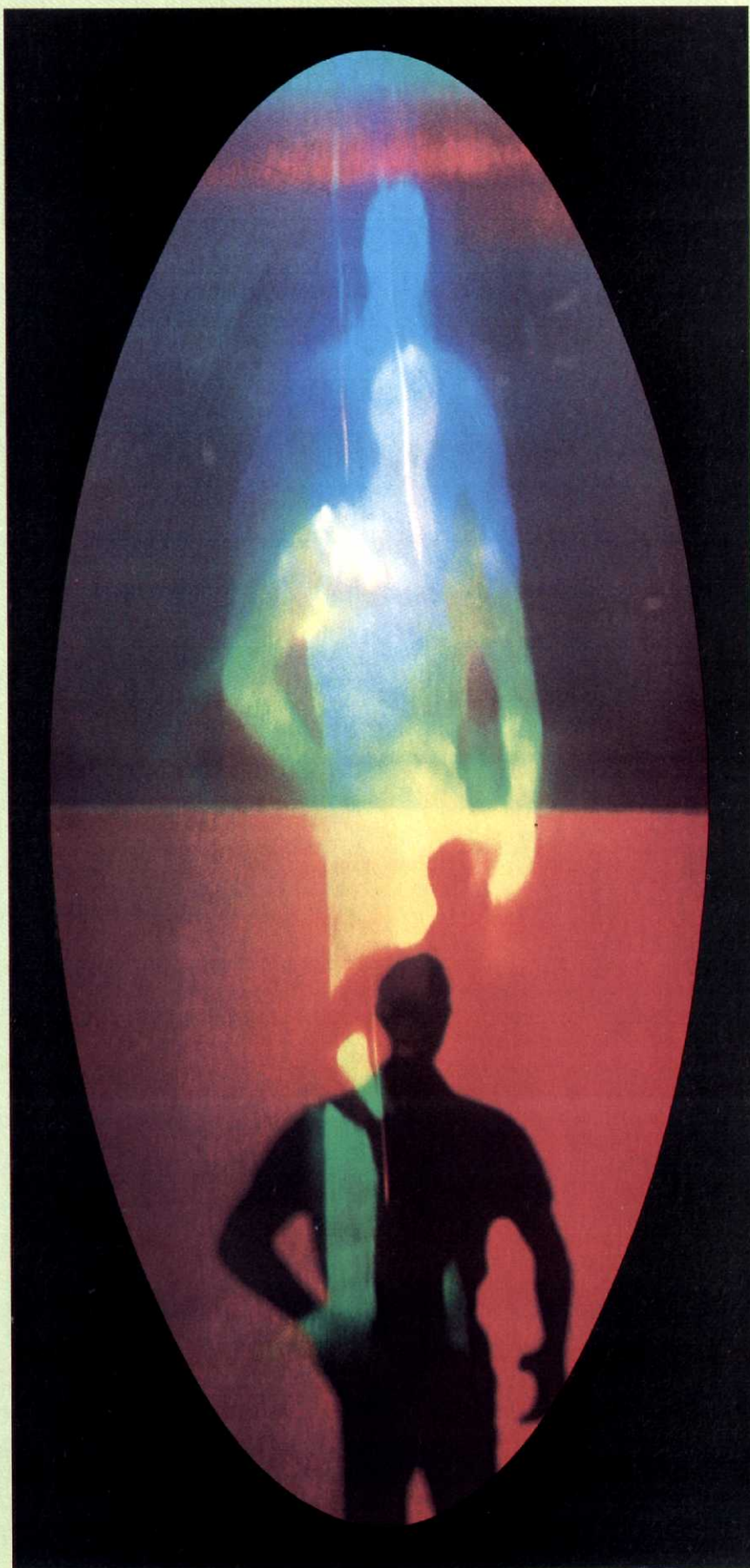
Secretive

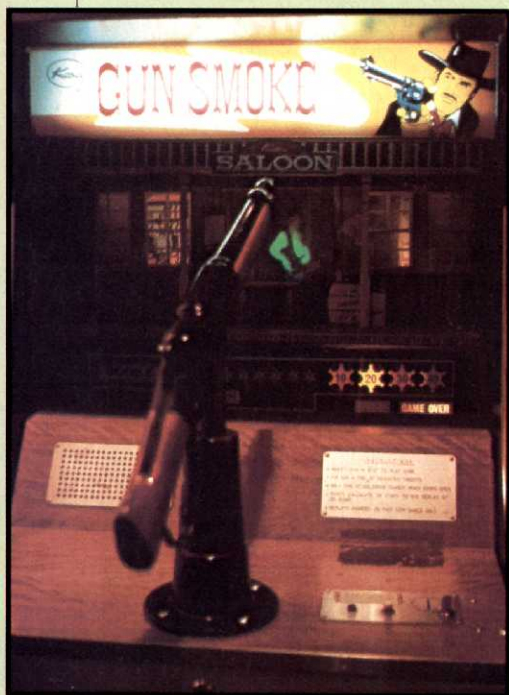
Until the late 1960s, it was assumed that you had to have millions of dollars to make a hologram. Then, an ex-research scientist named Lloyd Cross discovered that holograms could be made on a shoestring budget and could be as good—or better—than those made in large government labs. Working with a team of artists and using only scrap materials, Cross built a lab which he says is superior to others costing several times as much.

Most companies and individuals now working on holography are secretive about their work. And many video game manufacturers feel the idea hasn't matured enough for public acceptance. They realize, however, that the potential of the technology is enormous and that those who are able to develop the right applications and hold the necessary patents stand to make a fortune.

One of the few people in this area willing to talk about developments is Eugene Dolgoff, whose Long Island-based company, Dolgoff Holophase Inc. (DHI), has been

Holography is a form of laser technology. The word comes from the Greek "holos" and "gram" meaning "whole message."





One of the first holographic games, **GUNSMOKE**, pits you against a 3-D gunslinger complete with smoking six-shooter.

working with holography for the past 10 years. Dolgoff is somewhat amused by all the secrecy:

"Everybody thinks they have something but almost no one has anything. You can spend a lot of money and not get anywhere."

DHI has a development program which aims at incorporating holography into a number of existing products including games. The company has already produced holographic business cards, stick-on holograms (for stationery or decal use) and novelties. It is about to enter the game field with a holographic jigsaw puzzle which is slated to hit the market in mid-1983. What makes the puzzle unique, says Dolgoff, is that two people can be sitting at the same table, viewing the same puzzle pieces, yet be working at assembling two separate images. Dolgoff expects non-electronic holographic video games to be available as early as 1984.

What exactly is holography? Well, the technology whose name comes from the Greek words *holos*

and *gram* meaning "whole message," is a technique using lasers to create 3-D images. According to the *Holography Handbook* (Ross Books, Berkeley CA), a hologram is "an interference pattern formed as a result of reference light encountering light scattered by an object and stored as such on a light sensitive emulsion." That's not too clear. The Museum of Holography offers another definition: "Holography represents the space in front of and behind the plane of traditional visual recording. It is the cube rather than the square."

Holograms are created by optically splitting a laser beam into two rays. The object beam illuminates an object, while the reference beam illuminates a film plate onto which the hologram will be recorded. When the object beam reflects from the object to the film plate, an interference pattern is formed by colliding light waves. (During the process of making a hologram, the objects appear grainy when bombarded by the laser light. This creates the illusion that the object is only an image.) When the interference pattern captured on film is illuminated, this pattern reconstructs a 3-D image of the object.

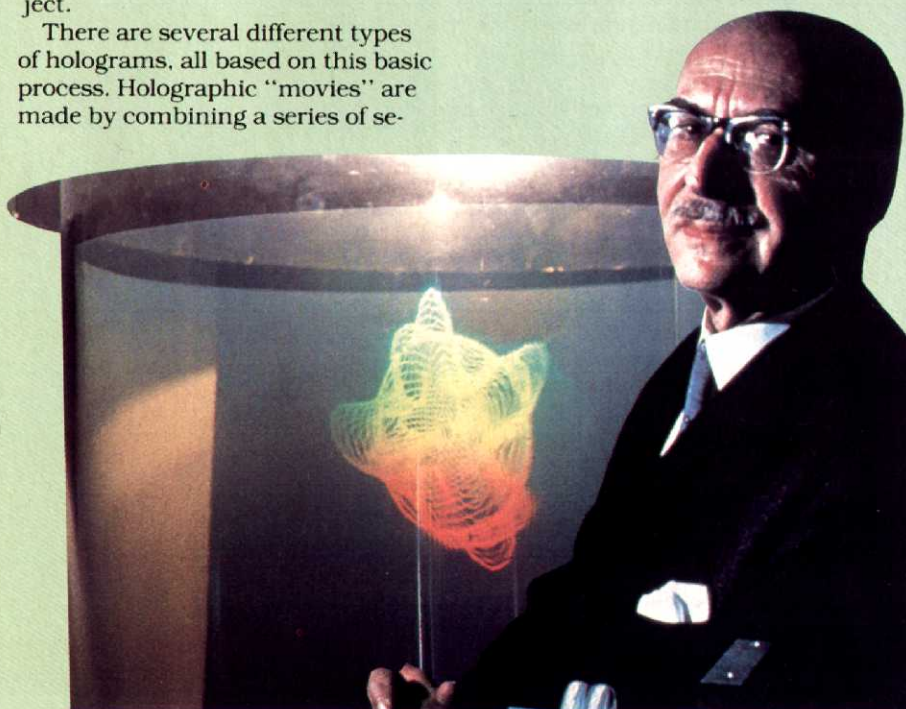
There are several different types of holograms, all based on this basic process. Holographic "movies" are made by combining a series of se-

quential holograms. Most contain between 360 and 800 successive movie frames, covering 7 to 15 seconds of real time action. Reflection holograms are illuminated and viewed from the front of the holographic plate (unlike the "movies," which need a special wall mount and lighting arrangement). The most recent type of display is printed holograms, which are stamped onto a mylar surface. Printing allows for mass production.

Holographic Problems

According to Edward Bush, editor of the museum's magazine, *Hologosphere*, the main problem with efforts to bring out a holographic video game is that holography is "not compatible with other imaging technologies." He explains: "It would take 256 days to transmit a hologram on standard television bands. Television is 525 lines to the inch, whereas a holographic image is 10,000 lines to the inch." This, of course, would make the development of a holographic cartridge for a standard TV hook-up videogame system—such as the Atari—a very difficult and perhaps unfeasible process.

Nevertheless, holography, television and photography are linked, if





only because all of them are visual technologies. The differences that have blocked the combination of these technologies are rooted in history. Photography was developed and used as an alternative to painting. In a flash, light passes through a lens to leave an entire image simultaneously on film. Television was developed as a means to transmit visual information by breaking the image into segments and transmitting the segments to a receiver for reassembly. And holography?

In the creation process, holography is similar to photography, and many people in the field compare their work to that of the pioneering photographers. Indeed, it has been said that those photographic pioneers had enough technology on hand to develop holography 80 years ago. But they

Left, Dr. Dennis Gabor, who conceived of and produced the first hologram. Gabor invented holography in 1948 and won the Nobel prize in 1971.



Holograms For Sale

Holograms are priced to fit every budget—from under \$20 to over \$2,000. You can purchase a work of fine art for \$1,000, or you can select from a variety of subjects and objects (people, plants, pins and belt buckles) ranging in price from \$12.50 to \$135. Custom jewelers offer gold or silver holograms at prices ranging from \$125 to \$800. And if you want to really make your wedding day memorable, purchase a holographic portrait of the event

for \$2,500.

Both the Museum of Holography and Hammacher-Schlemmer, the eccentric New York City-based department store, offer holographic "movies." One of the best known "movies", KISS II, features a young woman blowing a kiss, as you move around the image, mounted between two sheets of clear plexiglass curved 120° in front of a black metal frame, she gives you a kiss and a playful wink.

While many department stores and jewelry shops carry some holographic items, two of the best places to shop are:

The Museum of Holography
11 Mercer Street
New York, NY 10013
(212) 925-0526

Holos Gallery
1792 Haight Street
San Francisco, CA 94117
(415) 668-4656

didn't.

Holography was originally developed as a way to improve magnification images of the electron microscope. The first holograms were produced in 1947 by Dr. Dennis Gabor, a researcher at the Imperial College in London, England. They were crude images produced using X-rays and other short wave forms of light and completely lacked the three-dimensional qualities we are now familiar with.

The problem was the light waves, which are the key to holography. The better the light, the more accurate the image created by light waves bouncing off an object. With the invention of the laser in 1960, holography took a quantum leap forward. Lasers produce a very pure, uniform light source and scientists like Y.N. Denisyuk in the Soviet Union and Emmett Leith in the U.S. were able to apply laser technology and new optical techniques to produce 3-D holograms.

State-of-the-Art

Because of the potential health hazards of high-powered lasers, it was difficult to let the public in on these developments. But with the creation of white light holograms—holograms which could be displayed with ordinary room lights—holography could be safely exhibited.

In 1976, the Museum of Holography opened its doors in New York City, providing educational information and displaying state-of-the-art holography as well as a number of historic exhibits. Its 800-work collection includes Dr. Gabor's first hologram, the first color hologram, and the first laser hologram.

It is hard to say where holography will go from here. Recent developments may lead to new uses such as the mass production of holograms on vinyl, improving and controlling the colors in the images and the development of black-and-white holographic images. (A traditional holographic image doesn't come out black-and-white because, not unlike a prism, it focuses all colors, creating a blur.) Another advance is the production of a color-



The bottom of the glass is real. The top is a hologram. You can put your finger right through it. This is on display at the Museum of Holography.

less hologram—that is, a hologram that does not have the color of the laser—red or green or whatever—included in the image. The colorless hologram is seen as a significant step toward the goal of an accurate, full-color 3-D image.

Soon we'll see a number of holographic forms of entertainment, games and novelties on the market. But practical applications are in their infancy.

Mass production and color control could lead to the introduction of some curious consumer items, like holographic wallpaper, mobiles and even wall tiles. Polaroid has been refining and clarifying holograms for people to hang in their homes, like family portraits.

High Fashion

There have even been signs of a fashion trend for holographic jewelry (see sidebar), according to *The Wall Street Journal*. The Museum of Holography has sold over \$200,000 worth of holographic items. One company, Light Impressions, produced 250,000 holograms last year.

Most people agree that the boom



hasn't occurred yet. As one holographer put it, "It isn't going to make the Fortune 500 list this year." However, holography is ready for widespread consumer production and the technology is such that almost anybody can get involved. The industry just needs people with open minds and pioneer spirits to get the "whole message" across to the public. Will video game manufacturers be among them? □



These otherworldly holograms only hint at the enormous potential for tomorrow's holographic games.



Make a \$500 Hologram

While costs of building a laboratory can run into millions of dollars, you can assemble the necessary equipment to make holographic images 2 $\frac{2}{3}$ " square for about \$500. Here are the basic ingredients:

- * **A quiet, vibration-free table:** This is a must, because you use sensitive optical components to make a hologram and noise vibrations can upset the settings.
- * **A laser:** the most expensive of the items is also the most necessary. The price of a laser is determined by its power.
- * **Film:** Special plates are needed to record the holographic image in an emulsion, not unlike the plates used in portrait cameras.
- * **Chemicals:** A hologram is not a photograph, but the process of developing the image is similar.
- * **Lenses and mirrors:** These manipulate the laser beams, creating the holographic effect.
- * **A darkroom:** This is needed both to create a hologram and to develop the plates. (A bathroom can be turned into a darkroom, so, unless you don't have indoor plumbing, this is a low cost item.)

There are many how-to books and supply houses that can help. Those listed below are recommended by experts in the field.

A Guide to Practical Holography, by C. Outwater and E. Van Hammersveld. (1974) \$12.50 A beginner's manual.

Homegrown Holography, by G. Dowbenko. (1977) \$8.95 Gives practical information about lab construction and optics for the beginner.

Holography Handbook, by Unterseher, Hansen and Schlesinger. (1982) \$16.95 An excellent manual offering beginner and advanced techniques, in

clear step-by-step chapters. Lists equipment vendors. Equipment can be purchased from:

Edmund Scientific Co.
101 East Gloucester Pike
Barrington, NJ 08007
(609) 547-8900

Melles Griot
1770 Kettering St.
Irvine, CA 92714
(714) 556-8200

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