

# Chicago Tribune

Here's graphic example of science on move

## It's not yet picture perfect, but holograph is photo of future

By Katina Alexander

**H**OLOGRAPHY. TO MOST people, that word sounds like a meeting place for androids from outer space. However, in 15 years, predicts Stephen Benton, holography will be a household word. And when that happens, we'll have large, bright, full-color photos that just happen to be in 3-D.

You may have thought you saw a hologram in the film "Star Wars," when R2D2 spewed forth an image of Princess Leia, but that was only special effects from matting the film.

The real thing is even more amazing: We'll sit for family hologram portraits. We'll decorate our windows with hologram plates. We'll view collections of art from around the world and the real artifacts will never leave their country. We'll watch rock concerts, symphony orchestras, and football games floating in space, like theater-in-the-round. And who knows? One day we may answer a knock at the door to a singing hologram.

However, when we reach out to touch these figures, nothing will be there. That, Benton says, is "the holographic joke." But humans aren't the only ones fooled; holograms drive cats crazy—a hologram of a twitching mouse can keep a cat happy for hours.

**THE CONCEPT OF** holography, or the manipulation of light to record images, is as important to communications as the transistor is for electronics.

Atari, an electronic game manufacturer, has acquired

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all patent rights to holograms for games, named "holoptics," and makes a game called Cosmos for home use. Soon, there will be addicts playing Hologram Man, who can be maneuvered not only up and down the screen but through a field of depth where spooks wait in ambush. It'll probably cost more than a quarter to play, though, because holoptics are expensive—a hologram costs a hundred times more than an ordinary black and white photograph.

Holography is a solitary craft that demands extreme precision. A hologram records waves of light down to the nanometer—one millionth of a meter. This capacity puts a microfiche [a sheet of microfilm] to shame, and the memory bank possibilities of holograms are almost infinite. Supermarkets use holograms when they slide products over the glass window at the checkout counter.

**AT THE FINE ARTS** Research and Holographic Center and museum at 1134 W. Washington Blvd., Benton recently showed his holograms to the Society of Photography Scientists and Engineers. On a glass plate was an image of three apples, arranged in a still life composition.

If you sway in front of the plate from side to side, the apples disappear and reappear in bites. If you sway too far over, the image disappears completely. This limited angle of viewing is one of the wrinkles of holography that Benton and 10,000 other holographers in the world are trying to figure out.

At Lake Forest College, Dr. Tung H. Jeong hopes to raise new crops of holographers by instructing summer seminars and graduate students throughout the year. Like Benton, Jeong travels around the world for holography,

comparing and sharing with Russians, Chinese, and Englishmen. The Soviets circulate "reflective holograms" of Kremlin treasures, flat plates that look like glass display cases filled with objects.

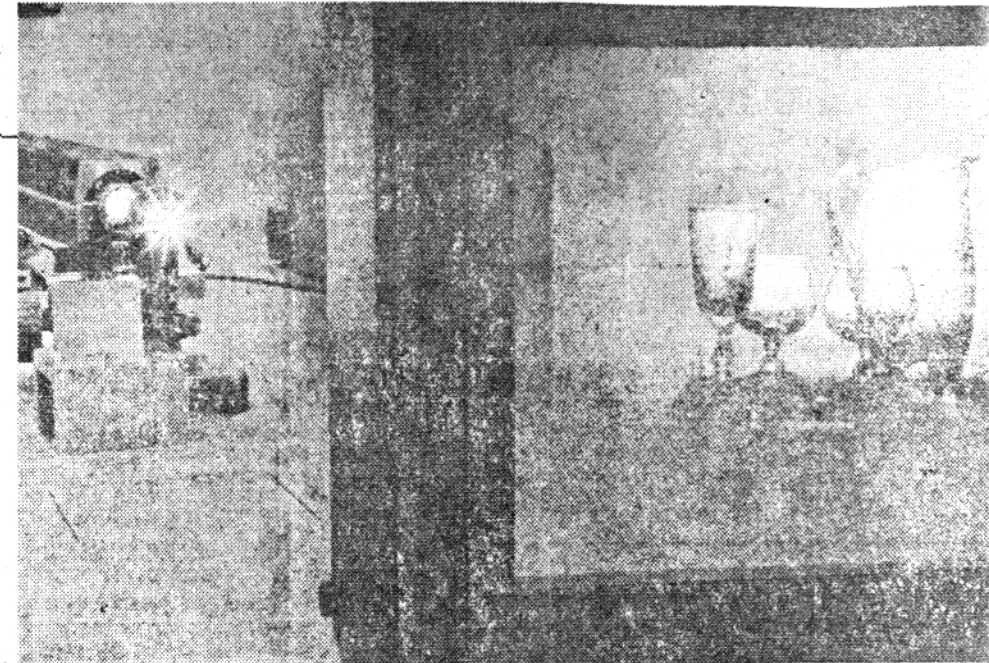
Holography was invented in 1948 by Dennis Gabor, who received the Nobel Prize for physics in 1971. Gabor wrote that holograph, which means "whole message," records on a piece of film "the total information required for reconstructing the object."

**SIMPLY PUT,** it's all done with mirrors, without a lens. Emulsion on a glass plate freezes interfering wave fronts of light—the light from the object [object beam] and the light from the mirror [reference beam]. This is done with the extraordinarily pure light of the laser beam, bouncing off the mirror. When you shine the laser back on the glass, the image reappears in 3-D. Benton calls the plates "delay windows," because light goes in one side and comes out whenever you want it to.

In the past, with laser transmission, all a holographer had to do was shine a laser beam on the plate to see 3-D. But besides cost and clumsy apparatus, there are federal limits on the amount of laser light a person can be exposed to.

Now, via white light transmission, called rainbow holograms, a hologram can be seen with an ordinary light source. So it only takes one holographer to screw in a lightbulb, and the image reappears. They're not as fine in quality as they will be—they resemble the eerie, first daguerrotypes of photography, and they're limited to the colors of the rainbow, as the spectrum is broken up into pure color bands like the laser's.

While working on holographic TV, Benton and his colleagues discovered rainbow holograms by accident. "It seemed trivial at the



A laser beam gives life to a hologram in an Eastman Kodak lab.

time," Benton recalled, "it took a couple of years before we realized it was pretty neat."

**BENTON'S INVENTION,** called the rainbow hologram, enables us to view a hologram with light from a bulb or sunlight instead of the usual laser beam.

Benton sees the future of H. G. Wells, and he is impatient for us to learn it. So he travels the country, researches at Polaroid, and lectures at Massachusetts Institute of Technology and Harvard. "I'm surprised people are so used to 2-D," Benton said with a touch of scorn, describing what we know as photography. "It's so flat . . . it looks so dead."

In Chicago's Holographic Center, the image of a pretty girl combing her hair revolves in space, as does a teeth-gnashing Dracula. These are the works of museum director Loren Billings. Flashing like prisms, laser belt buckles and jewelry seem to encase roses or eyeballs. Phonograph records will become obsolete when a way is discovered to record sound with light waves. Holograms will hang on the walls, and there will be instant holography cameras.

Already RCA is working with holovision, and advertising displays feature hanging brand

names or simulated use of products, such as the arm swinging with a tennis racket shown at one sales convention. More practical uses for holograms are planned for the next space shuttle to record crystal growth, and the government is experimenting with it for military sighting and ranging.

"Most people are reluctant to take holography seriously," Benton said, "Architects and engineers are the biggest customers of holograms—they understand what we're talking about."

**AS AN EDUCATIONAL** aid, holography can be invaluable in teaching spatial understanding and mathematics, as students will see 3-D images of everything from molecules to tepees. Then they can roll up the imprinted Mylar and send it off to the next school.

At the Holographic Center, the scientists were milling about the displays with oohs and aahs. They grouped around to pose for photographs taken with ordinary, old-fashioned cameras. But they replaced the standard comma of "cheese!" for smiles—"Ok, everybody," a photographer said, "Everybody say holography!"