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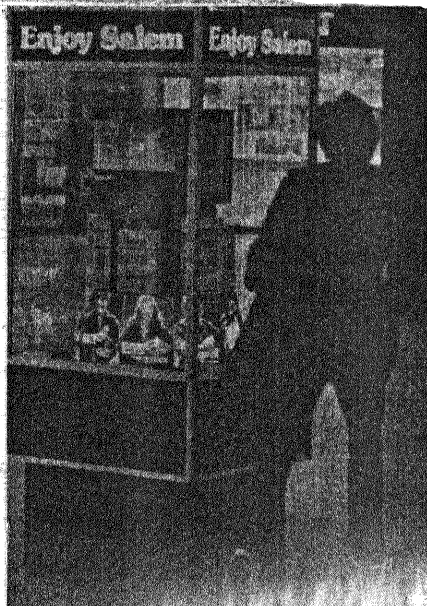
National Advertisers Test Display Holograms Throughout Country

NEW YORK — If it receives high marks on tests being held around the country, integral holography could become the newest consumer advertising medium. Three national advertisers, Procter and Gamble, the McDonald's Corp. and the R. J. Reynolds Tobacco Co., are sponsoring the tests, the first efforts to evaluate the effectiveness of holography in point-of-purchase and out-of-home advertising.

The results, if favorable, could have a considerable financial impact on the display holography industry. Commercial holography thus far has been limited to the use of holograms in trade show displays by a relatively small number of companies. In consumer advertising, however, the potential market is vast. Last year advertisers spent \$3.3 billion on point-of-purchase and out-of-home advertising alone, according to the Point-of-Purchase Advertising Institute.

The most ambitious of the three projects involves the use of 5,000 integral holograms by Procter and Gamble. These "mini" holo-

Holographic display for Salem cigarettes attracts attention of passerby in Penn Station, New York. Researchers from the William Esty advertising agency interviewed many who viewed the display in a recent test program.



grams, showing images about five inches in height, will be part of a national campaign announcing a new detergent, Lee Lacey of the Holographic Arts Co., Chicago, said recently. The need for secrecy prevented him from describing the units fully, he said, but he did mention the units are intended for use only in the initial promotion and then to be discarded.

The approach for the McDonald's holograms, also being produced by Holographic Arts, differs in several ways, Lacey explained. The displays are permanent and permit the insertion of new holograms at heights acceptable to children and adults. The images themselves will be about nine inches high.

"McDonald's feels the interchangeability of holograms is an important feature," Lacey said. "It plans to change them once a month and will cover three different topics, public awareness, product promotion and promotion of their public symbol (Ronald McDonald)."

Now on view at selected McDonald's restaurants in four cities, the displays contain one of three images, Lacey said. They are an appeal not to litter, an adult eating an Egg McMuffin sandwich and Ronald McDonald inviting children to join a club the company sponsors.

The William Esty Co., advertising agency for Reynolds, concluded tests of out-of-home displays containing integral holograms in late September, Bill Eder, account executive for Salem cigarettes, said at Esty recently. To his knowledge it was the first time a national advertiser used holography to reach consumers, he said.

A display containing two holograms of a man smoking a Salem cigarette had been on display here throughout 1977, first at Grand Central Station and later at Penn Station, where passersby were interviewed about their reactions to it, Eder said.

"The attempt was to conduct a careful study to determine if (integral holography) is a viable medium for the advertising industry," he said.

Analysts at Esty will evaluate test results in late October, Eder said. If the evaluation proves favorable, Esty will display approximately 36 holograms promoting Salem and More cigarettes throughout the country, he said.

Also conscious of the educational value of their displays, Esty included a brief explanation of the hologram in it, Patrick Fanelli, creative director, said.

Fanelli fostered the interest of his agency in holography after attending "Holography '75: The First Decade" at the International Center of Photography here in 1975, he said. Shortly after, he explained, he and Eder approached Reynolds about using holograms as a promotional medium. Reynolds agreed to fund a feasibility study.

"It's the first time in my career that two large corporations have subsidized a speculative expedition into a new area like this," Fanelli said, "they have given us their confidence and support. We're really proud of that."

Part of their exploration included studies of pulsed holographic portraits and image plane reflection holograms, Fanelli explained. But a malfunctioning laser stymied their efforts at pulsed portraiture, forcing them to abandon their effort. They rejected reflection holograms because they found them lacking in brightness and difficult to illuminate.

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Variations of Integral Holograms Planned: Cross

SAN FRANCISCO — White light transmission integral holograms may be carrying monochromatic, rather than rainbow, images in the near future, Lloyd Cross, inventor of the method for making them, said recently. His new integral holographic printer, the Mark IV, will provide the capability to accomplish this and other variations on the integral hologram, he said.

The latest model of the printer he devised in 1973, the Mark IV has the flexibility to allow the use of multiple reference beam angles necessary for the production of monochromatic integral holograms, he said. He hopes to produce the first hologram of this kind within a year, he added.

He also mentioned that a true color integral hologram is in the planning stage.

"The Mark IV offers a number of configurations which could be used for true color holography," he said, "over the next year I intend to explore them all."

Cross discussed the system and reviewed the shooting and printing of integral holograms at the Three-Dimensional Imaging Seminar of the 21st International Symposium and Instrument Display held by the Society of Photo-Optical Instrumentation Engineers in San Diego, Calif., during August.

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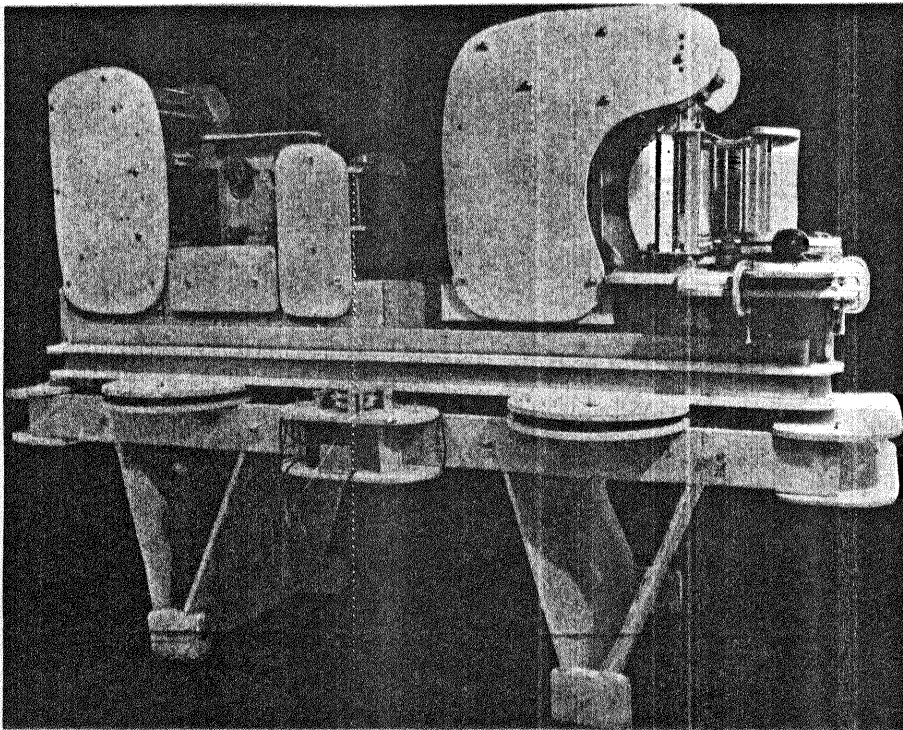


Photo: Sharon McCannack

The Mark IV integral holographic printer, shown from the side. The system contains its own isolation system that can stabilize the printer's components rapidly.

Integral Hologs (Continued from p. 1)

The Mark IV, he explained at the seminar, incorporates design improvements made over the past three years. It is a complete system for integral holography that includes a vibration isolation system within in.

Isolation system

"It provides an interferometrically stable environment for making integral holograms," he said. "in tests conducted in July, the system exhibited a settling time between mechanical motions of six seconds. And we think even that time can be reduced by half."

Three structures form the basic isolation system, he explained. All optical components are clamped securely to a concrete bed. The bed rests on a wooden platform, which floats on a cushion of air contained in a sandwich of wooden discs and inner tubes.

Also contributing significantly to the stability of the system is the method used for mounting optics and other components, Cross said. These mounts, which he calls parallel plate tension structures, are "about 10 times better than anything I've ever seen in terms of ultimate rigidity and stability."

Cross described the construction of a typical mount. Two pieces of material (particle board is used for some structures in the Mark IV), called parallel plates, form the top and bottom of the structure. Two more pieces of material, called compression members, are placed between the plates to form the sides. Then, nuts on threaded rods that pass through the plates are tightened, drawing the plates together. The resulting tension securely holds the compression members in position.

Concerning the optical elements in the Mark IV, Cross said the "total coherent (nature) of the system" requires optics that are "incredibly clean," a quality lacking in most of the conventional optics he had considered.

Oil Lenses

"I haven't been able to use any complex optics or standard optics. They've all got little bubbles (and other flaws) that (are not)

noticed in white light applications," he said.

The search for clean optics led Cross to develop unique lenses in which oil is used as the refractive medium, he explained.

Another consideration came into play as well—cost. Because of the large apertures needed (the aperture of the cylindrical lens used in the Mark IV is 12 inches), he said, the cost of appropriate hard optics of glass or plastic would have been high.

The oil lenses, designed by Cross with the assistance of Michael Kan and others, are virtually flawless. Once the oil has been poured into the lens structure, "any dirt that's in the oil falls to the bottom, any bubbles rise to the top," leaving a clean lens, he said.

To construct an oil lens, Cross uses two plexiglass plates and a vinyl bag, both cut to the appropriate shape. The sides of the bag are sealed and placed between the plates. These elements are mounted in a parallel plate tension structures, and a few gallons of pharmaceutical grade mineral is poured into the bag. By adjusting the tension of the structure, the plexiglass plates can be shaped to the desired curvature.

The resulting lens is not only distortion-free, Cross said, it is also tunable. By apply-

ing torque to the tension structure, the shape of the lens can be altered to meet requirements precisely.

Filming Subjects

Turning to the method of integral holography itself, Cross briefly discussed the shooting of the subject. The subject revolves on a turntable making one revolution in 45 seconds. The camera (Cross uses a standard 35 millimeter Mitchell ciné camera) operates at 24 frames per second, resulting in three frames exposed for each degree of rotation, or 1080 frames for a 360° hologram. The film (Kodak Plus X negative film) is used to produce workprints employed in the printing process.

Although the shooting is similar to conventional ciné filming, certain precautions must be observed, Cross explained. Lighting must eliminate shadows. Since shadows move during rotation, they can produce a three-dimensional blemish in the finished hologram. The camera must be stable, because vibration, unnoticed in conventional films, causes distortion when the hologram is made. Movement by the subject should be slow and gradual to avoid a blurred image in the hologram. The object must be carefully framed in the camera.

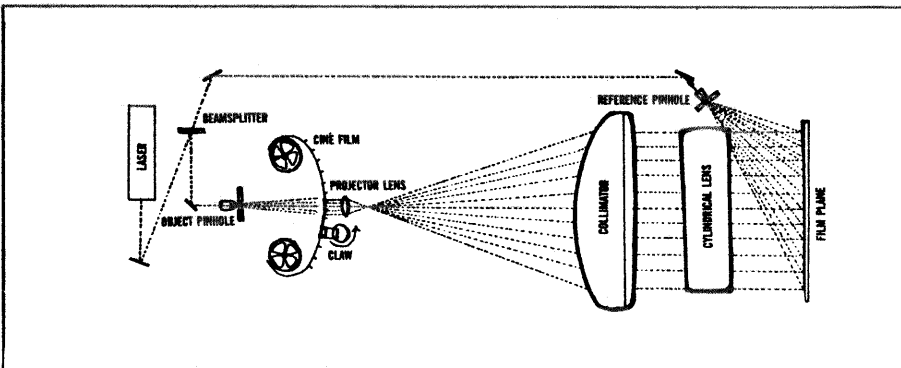
Printing

The printer produces the integral hologram. It exposes holographic film to the ciné footage one frame at a time, forming a line several millimeters wide. After printing and development these holographic lines diffract white light passing through them to reconstruct the image within the curve formed by the film. Since the viewer's eyes scan more than one line at any given moment, the composite image appears to be three-dimensional.

Cross described the path of light through the Mark IV during printing, beginning at the beam splitter. The object beam passes through a spatial filter before reaching the ciné film. After passing through the film, it passes through the projecting lens, which brings the light to a real focus and then expands it. The light then passes through the collimating lens to the cylindrical lens, which focuses it near the film plane.

The location of the focus near the film plane is critical, Cross explained. Since the spherical aberration of a single element with a circular curvature leads to the creation of additional, extraneous focal points, care must be taken to prevent these foci from reaching the film. To achieve this, lens and film are adjusted to permit only the primary focal point to affect the film. The precise location of the focal point varies, Cross said, although it falls a small distance before or behind the film plane.

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The path of light in the Mark IV is shown from the side in the above diagram. Illumination is provided by a helium-neon laser.

Drawing: Sharon McCannack

Number of Galleries Showing Holograms Continues to Grow

The number of galleries across the country displaying holograms continues to grow as public interest in holography quickens. Most include holography in exhibitions with other media. Others deal exclusively with holography, and several offer courses and information as well as displays.

Below are six places where holograms can be viewed, followed by a brief description of the operations. By no means an exhaustive list, it represents only those galleries holosphere reached before press time. We hope readers will pass along to us information about other galleries, museums and public displays containing holograms they may know about.

- **Gallery 1134** — 1134 W. Washington Blvd., Chicago, IL 60607, (312) 226-1007. Hours: 11 a.m. to 6 p.m. daily except Monday. Donation: \$1. Loren Billings, director.

In exhibitions that change every few weeks, 1134 displays transmission, reflection, white light transmission and integral holograms as well as works in other media. Its Fine Arts Research in Holographics Center offers introductory, intermediate and advanced courses. Fees are \$200 for six week courses meeting once weekly and \$250 for intensive weekend classes.

- **Laser Light Concepts, Ltd.**, 57 Grand St., New York, N. Y. 10013, (212) 226-7747. Hours: 1 to 6 p.m., Thursday through Sunday (appointments preferred). Admission free. Abe Reznay, president.

Laser Light Concepts has a changing display of transmission, reflection, white light transmission and integral holograms. It specializes in making commercial holograms. A number of courses in basic and advanced holography are available by appointment. A course in basic holography at \$180 is offered on two successive Sundays. A one-day workshop in integral holography, also held on Sunday, is available at \$125. Advanced courses taught by leading holographers and practitioners are offered periodically. Out-of-town workshops can be arranged.

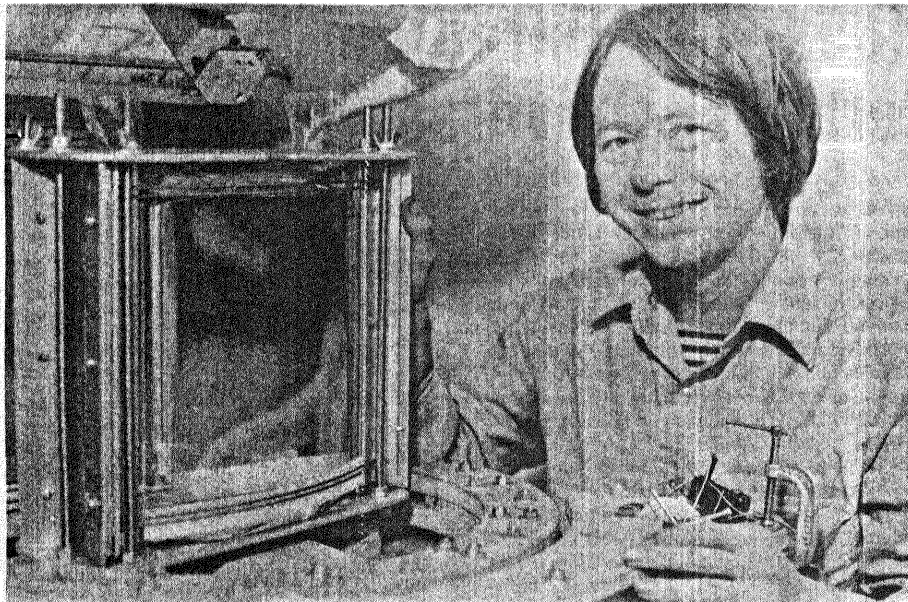
- **Mainhouse Gallery** — 9A Sawmill River Rd., Yonkers, NY, 10701 (914) 476-7317. Hours: 10 a.m. to 6 p.m. weekends. Roger Delano, director.

The gallery includes holography in its exhibitions of contemporary art.

- **Museum of Holography**, 11 Mercer St., New York, NY 10013, (212) 925-0526. Hours: noon to 6 p.m. Wednesdays through Sunday, Thursdays until 9 p.m. Admission: \$1.50, adults; \$.75, senior citizens and children under 12. Rosemary Jackson, director.

The Museum holds three to four major exhibitions per year. It is currently presenting "Holodeon," a collection of more than 40 integral holograms. The Museum also sells holograms and books through its bookstore and can arrange sittings for holographic portraits. It maintains a research library, and a "mini" theatre now showing a documentary video-tape about the making of its "Holofame," a collection of integral holographic portraits of prominent New Yorkers which appears in the exhibition and a general film on holography. Holodeon ends Dec. 31, 1977.

Photo: Sharon McCormack



Lloyd Cross, designer of the Mark IV, is seen with the cylindrical lens used in the printer. The lens comprises a vinyl bag of mineral oil sandwiched between two pieces of clear plexiglass. The collimating lens for the Mark IV is similarly constructed.

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The reference beam, after leaving the beamsplitter, passes through a spatial filter and strikes the plate at a 45° angle, Cross said.

The spatial filter was also specifically designed for the printer by Kan. Cross explained, after it was found that conventional filters and cylindrical lenses could not produce a sufficiently clean beam. It consists of a conventional microscope objective, a second lens and pinhole. Light strikes the objective in an off-axis manner to create two focal points, which, when projected by the second lens, form a narrow line of light. After passing through the pinhole, which cleans it, the beam proceeds to the film plane. The mount allows the pinhole to move in three directions, eliminating the need to align the beam by altering the positions of the lenses.

Cross concluded his presentation at the seminar by pointing out that his experience in building the Mark IV has shown him that, using the same construction techniques, printers could conceivably be built on a much larger scale if desired.

Previous Printers

Cross explained recently that he became actively involved with integral holography in 1972, when he made his first, "Leslie," on a four by five inch plate from about 36 photographic slides. The system that produced it

became known as the Mark I.

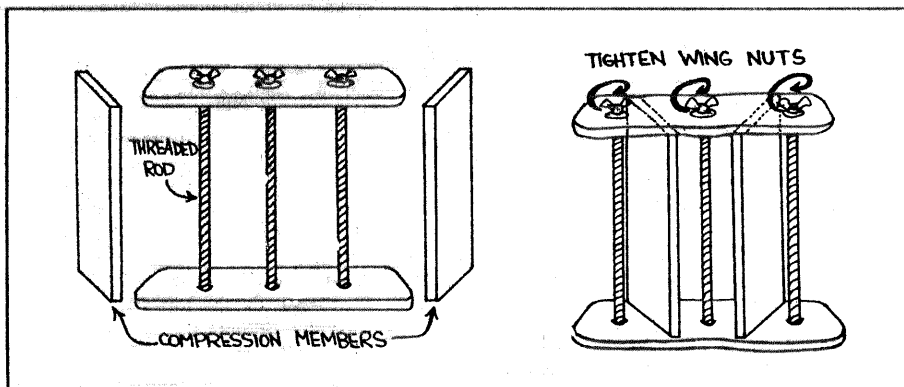
Later that year, holographer Selwyn Lissack showed the hologram to Salvador Dali. Struck by the spatial character of the image, Dali wanted to have a larger one made. To accommodate him, Cross and his associates built the Mark II, the first automatic system, in 1973.

Around this time, Cross encountered one of the first white light transmission holograms produced by Stephen H. Benton of the Polaroid Corp. Realizing that several advantages would result from marrying his process and Benton's, Cross devised a way to do so. The first white light transmission integral hologram, "Lilliana," was made on the Mark II in 1973.

When the commercial market began to develop, the Multiplex Co. was formed by Cross and others to handle the business. By 1974, the Mark III printer had been built. It has printed thousands of integral holograms in the past three years, he said.

Through his work in integral holography, Cross has played a leading role in bringing holography into public view. At the seminar Benton stated its impact succinctly.

"(Integral holograms) are responsible more than anything else . . . for this new wave of interest in holography, because they're available, they're cheap, they're flexible, and they're enchanting."



Drawing: Sharon McCormack

The above diagram shows the format of a typical parallel plate tension structure used in the Mark IV. Two parallel plates connected by threaded rods form a clasp within which two compression members are held. The resulting unit is stable and rigid.

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