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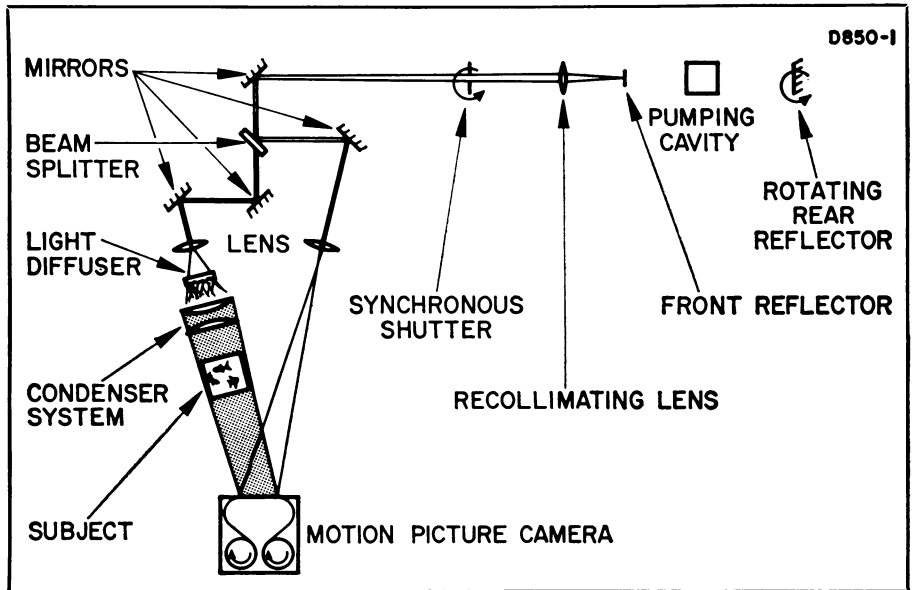
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Photos: Hughes

Combination of camera, mirrors, shutter and lenses produced the movie.

OPTICS

Movies by hologram

A new tool for research has implications for entertainment as well

by Dietrick E. Thomsen

A hologram is a photographic plate that contains information brought to it by two coherent beams of light: one that has been reflected from some object and one that has not. Illuminating the developed plate in similar fashion will produce a three-dimensional image of the object.

Practical holography has been possible only since there have been lasers, because lasers alone can produce coherent beams strong enough to make holograms. Until recently only still images had been made. Now a group at Hughes Research Laboratories in Malibu, Calif., reports success in using pulsed lasers "to produce a true 3-D movie."

Drs. Alexander D. Jacobson, Viktor Evtuhov and James K. Neeland go on to say: "By true we mean a movie in which both subject and film move continuously throughout the filming and in which the imagery is holographic rather than merely stereoscopic."

A **stereoscope** uses two flat images, each conveyed to a different eye, to give an illusion of three dimensionality. A holographic image is actually three dimensional. Walking around it, the

viewer sees the same changing appearance as he would walking around the object photographed. No glasses are needed.

The technique for making motion picture holograms is the same as that for still holograms except that the film moves through the camera at 20 frames per second and the laser's pulsations are cut by a rotating mask from 160 pulses per second to 20 to coincide with the film.

The result is a film strip 100 feet long that contains a succession of holograms of a tank of tropical fish. Played back, the film produces a moving image of the fish. "It is possible to see the fish swimming in space in front of the hologram," say the three scientists.

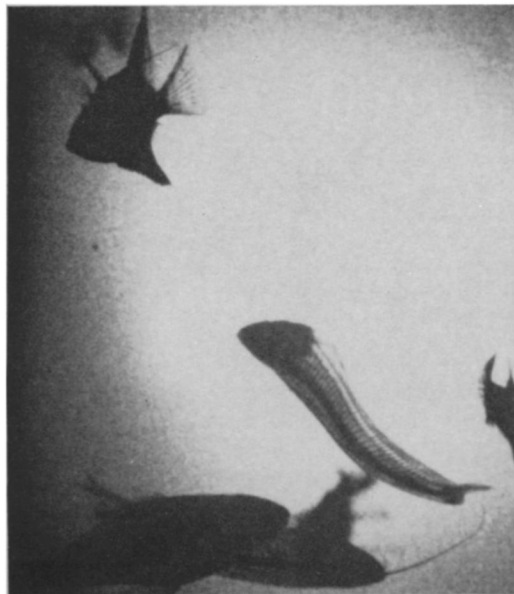
Some suggested applications of the new technique are motion-picture holographic microscopy, time-resolved holographic interferometry and time-resolved studies of the motions of elementary particles in detection chambers.

Time-resolved studies do not necessarily show a continuous motion picture of what is taking place. A series of frames snapped at close intervals show enough to do the trick.





The use of a holographic technique . . .



. . . presented tropical fish in 3-D

Application of holographic techniques to entertainment movies is "possible but remote," says Dr. Jacobson, "but there are people working on the problem." The difficulties, he says, are twofold: The first is how to make holograms of entertainment scenes, especially getting lasers powerful enough to photograph outdoor scenes where the laser has to compete with sunlight. The second is devising a technique for displaying the images to large audiences. Holographic images appear to be in space before or behind the hologram. Designing equipment that would have laser, mirrors and film in the proper orientation to produce the image and would also display it comfortably to a theater audience is "a substantial problem for engineers," says Dr. Jacobson. ◇

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