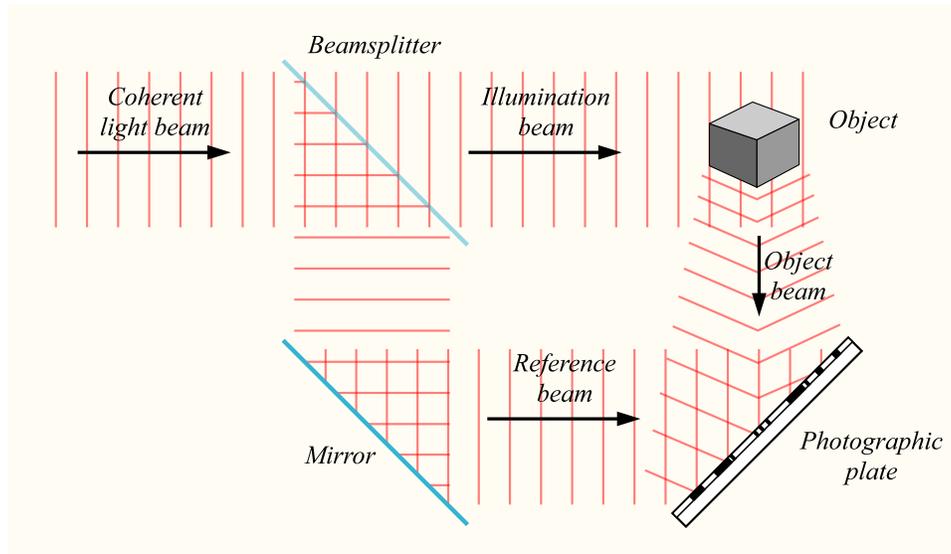


These are Holograms

1 How they are made (5 minute version)



Take a large diameter laser beam, such that it can cover your entire object and film. Split it into two beams with a beam splitter (partially reflective mirror). Shine one of the beams directly onto the film (the reference beam), and reflect the other beam off the subject (the illumination beam) such that the light reflected from the subject also hits the film (the object beam). Where the two beams overlap, they will form an interference pattern.

The red lines represent the peaks of the waves of light, two peaks make a bigger peak, a peak and a trough cancel out. A piece of film (photographic plate) will be exposed at the peaks (black dots), and that is the interference pattern. This diagram is not to scale, for my laser the real light waves (the red lines) are 532nm apart, the pattern on the film is microscopic.

When that piece of film is processed, and then just the reference beam (IE the LED) is shone on the film, the hologram will reproduce the light from the object. It acts like a window into the original scene.

The difference between holography and photography is that photography records the amount of light for each point visible through the camera lens, a single point of view. Holography records the amount of light for each point visible from each point on the film, as if there were a zillion microscopic cameras covering the film. It records the entire wavefront across the piece of film.

Holograms are like a window, there is no image floating in space. The "Princess Leia" hologram in "Star Wars" was unfortunately done with camera tricks. To actually pull it off, one would have to figure out how to get a beam of light to go out a projector, then turn in mid-air towards a viewer to form an image. People are working on it, and have a couple of ideas, but the person who figures it out will get a Nobel Prize.

2 Links for more information

- The diagram above is copyright DrBob of wikipedia, and is covered by the GNU Free Documentation License.
- The holowiki http://holowiki.org/wiki/Main_Page Also has the holography forum.
- The Laser FAQ <http://www.repairfaq.org/sam/laserfaq.htm>