

## Holography

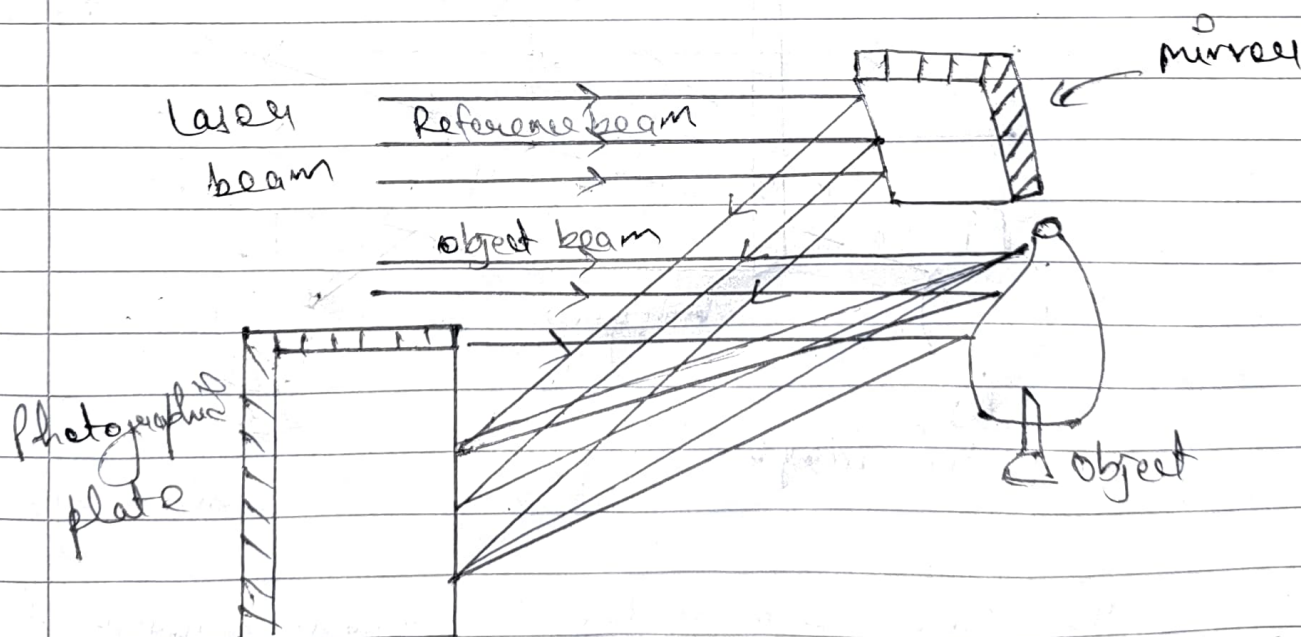
Holo: Hole      graphy: write

It is a technique for recording and re-producing 3-D image of an object. It was discovered by Daniel C. Gabor in 1948. This photography involves two processes:-

1. Recording of Hologram
2. Re-construction of Image

### Recording of Hologram

By using a beam splitter a laser beam is divided into two parts; one is known as reference beam and other is known as object beam. Reference beam goes directly to photographic film and object beam is directed onto the object to be photographed as shown below:-

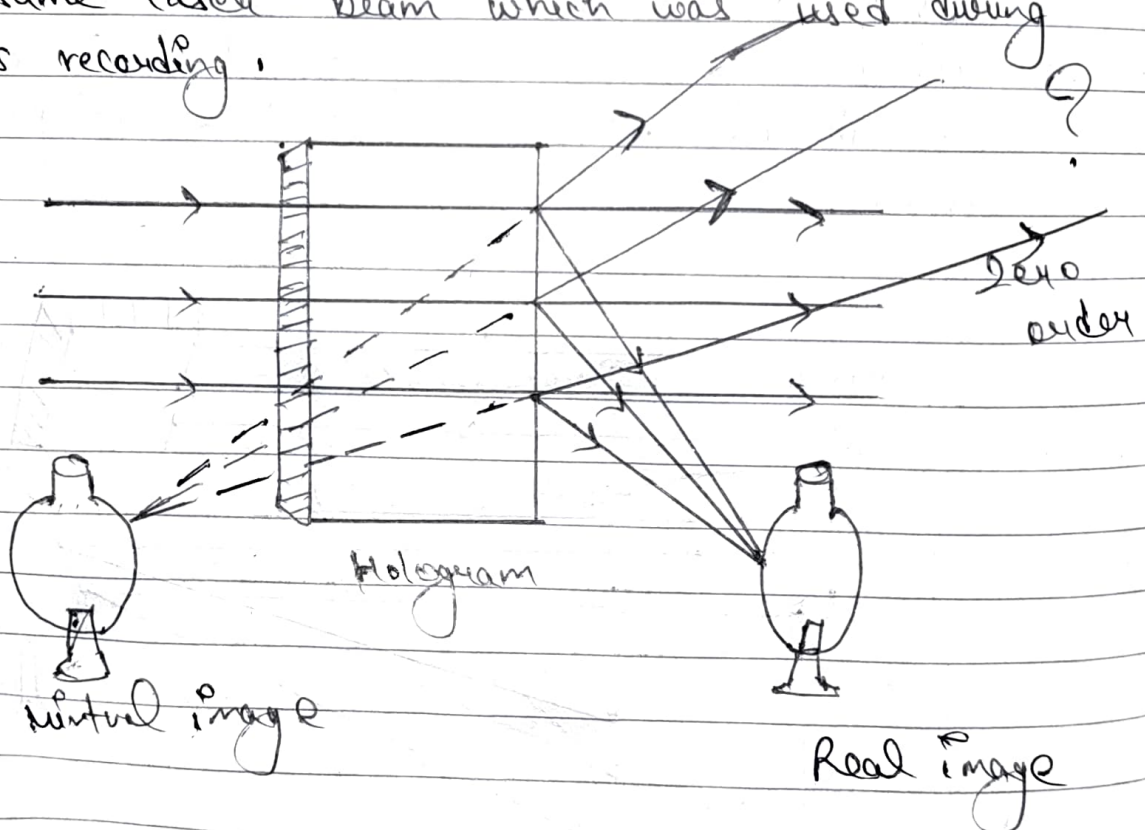


Each part of object acts as source of spherical waves. Part of the light scattered by object travels toward the photographic plate. At the photographic plate the spherical waves from the object combine

with the plane light waves from the reference beam and produce interference fringes. These interference fringes consist of lines, curves & swirls. This process of recording of interference fringes is termed as recording of hologram process. The developed negative of photographic plate is termed as Hologram. Thus, a hologram ~~is~~ ~~just a record of~~ does not contain a distinct image of the object but a record of amplitude and phase.

### Re-construction of Image

When required, hologram is illuminated by the same laser beam which was used during its recording.



The laser beam is passed through hologram has only amplitude variation but no information about phase variation. So, in the direct direction of beam we get zero order giving no information. But, at directions and distance corresponding to these <sup>in</sup> taking



Hologram reconstructed the image in all detail. Thus, the hologram behaves as a window. The important point to note is that a virtual image is also seen at position determined by reflection of real image in the plane of hologram. The virtual image has characteristic of the object like parallax, etc.

The Real image can be photographed just by placing a ~~photo~~<sup>light</sup>sensitive medium there. Thus, hologram acts as a window through which the object is seen. If the observer moves his head side-wise, he can see more of the object originally hidden from view, i.e. a 3-D view is recorded on a 2-D photographic film.

### Types of Hologram

Holograms are of following types :-

- ① Reflection Hologram
- ② Volume Hologram
- ③ White light Hologram
- ④ Rainbow Hologram

### Application of Holography

- ① Holograms are used in the study of structure of material by Hologram Interferometry.
- ② Holograms are used to prevent duplication of a product.
- ③ Holograms are used for security purpose in foreign currency.
- ④ Holograms are used for data storage.
- ⑤ Holograms are used in science fiction.