HOLOGRAM

The dinosaur head you see is an example of holography, a method for recording and projecting seemingly three-dimensional images. Unlike simple photographs, holography utilizes the wave-like properties of light, making use of constructive and destructive interference to record an image. As you move, you observe the dinosaur head from a different angle because the "interference pattern" recorded in the hologram directs different portions of the illuminating light toward your eye through the process of diffraction.

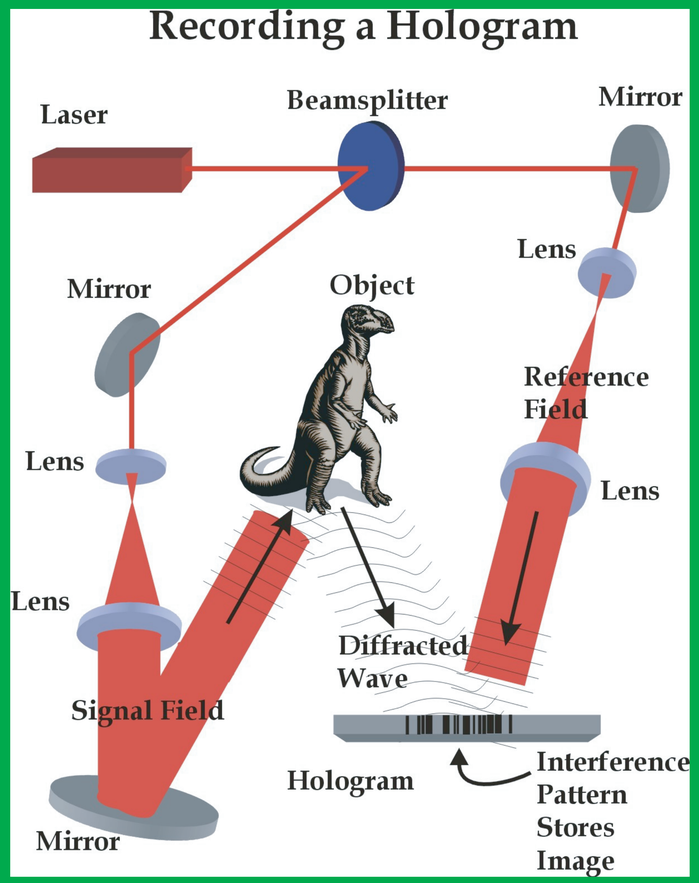

Fig. 1

The holographic recording process is displayed in Figure 1. The object to be recorded is illuminated with a light from the "signal field", typically a highly coherent source (sometimes, a laser is used). A portion of this light, the "reference field" is split off from the laser before hitting the object and is directed toward the recording medium. The light that reflects off the object is also directed toward the recording medium. The signal field and the reference field combine in the recording medium and, since they are waves, interfere with each other to form alternatively bright and dark regions. Because the signal field has scattered off the object, its phase and amplitude carries complete information about the surface of the object. This phase and amplitude, when stored in the medium, accurately depicts the appearance of the object.

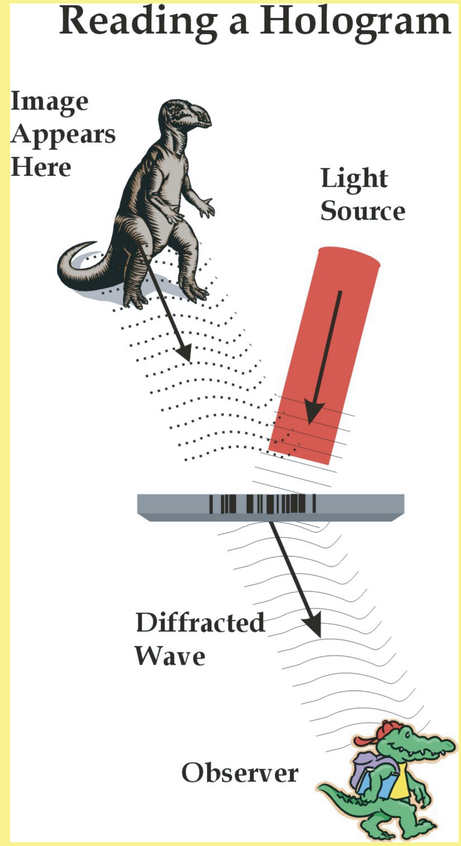

Fig. 2

To project a hologram, one simply illuminates the recording medium with light with coherence properties similar to the reference field (see Figure 2). This light impinges upon the medium and diffracts off the interference pattern in such a way that it "reads out" the amplitude and phase of the signal field.

Figures by Prof. David Reitze, Physics Dept.