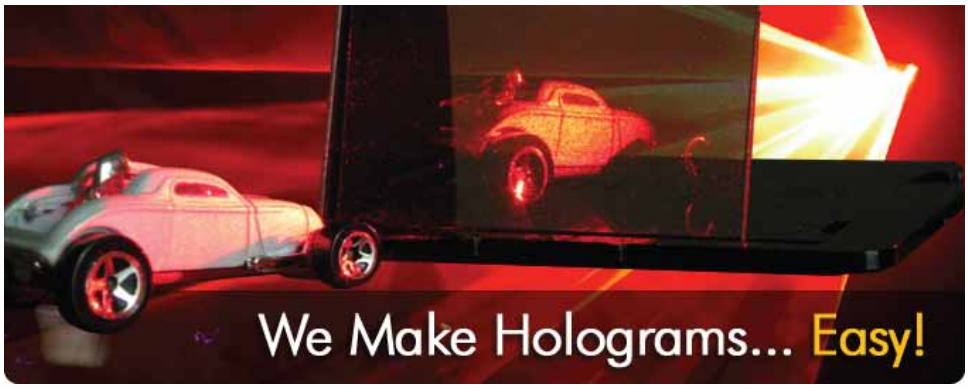
MAKING YOUR OWN HOLOGRAMS

Yes, you can really make your own 3D laser holograms. Holography was only invented in 1947, and the laser was only invented in 1960, so hologram technology is still in its infancy (compare that to photography which is almost 200 years old). But with new advances in laser diodes and "instant hologram" film materials, you can now make 3D holograms right in your own home or classroom. These hologram tips are a great way to get started, and will provide valuable information as you take the first steps toward making your own holograms.



- Litiholo
Home of the Hologram Kit
www.litiholo.com

HOLOGRAPHIC BASIC TRAINING

Vibration is the enemy of holograms.
We're not just talking airplanes passing overhead, or your neighbor's sound system. Holograms are EXTREMELY sensitive to vibrations of even the smallest kind. And they are not like photographs, where motion just causes a blurred image. If there is movement in a hologram, the entire image DISAPPEARS. As an example, you typically cannot make a hologram of a live plant – because it grows too much during the exposure! This is because holograms are made from the interference of light (more on this later), with microscopic details that are 50 times smaller than the thickness of a hair.

So pick a good, solid surface for making your holograms (professional holographers will buy or build their own vibration isolation tables). For the Hologram Kit we recommend using surfaces like a kitchen table, kitchen countertop, bathroom sink, desk, solid floor, etc. Poor surfaces for holograms would be on a bed, directly on a carpet floor, on a wicker chair, or a hammock. When making your hologram, follow these tips: no talking during hologram exposure; do not touch the table or surface during the hologram exposure; do not move around or tap your toes; turn off the air conditioner/heater, the washing machine, and the dish washer.

The "Princess Leia" Question.
If you are interested in holograms, you have probably seen the classic Star Wars scene where R2D2 projects a full-motion holographic image of Princess Leia into the middle of a room for Luke Skywalker to see (or the computer system in Minority Report, or Tony Stark's holographic design tools in Iron Man, or the Holotable visualizations in Avatar). And so, we regularly get the question, "Can you do that thing like in Star Wars where they

project Princess Leia and you can walk all the way around her and she plays a whole message?" (For more on the answer to this question, see our FAQ section at litiholo.com). Unfortunately, almost all of this is still just movie tricks and special effects. At Liti Holographics, we are making some of the most cutting-edge, full-color holograms available, with up to 7 seconds of motion (see our commercial hologram details at litiholographics.com). And we are working on the technology breakthroughs necessary to produce the holograms of the future. But, we also need bright minds with new ideas and knowledge about holograms, which is why we want to help you start making your own holograms.

For your first holograms, you can think of the hologram film as a window that captures a perfect 3D representation of the objects behind the window. When you look through this window, it looks like the objects are really sitting there, but when you look around the window you see nothing. Often, you will have people viewing the hologram try to reach around behind the film to try to touch or grab the objects, only to find a handful of nothing. It's a very cool effect!

Take a look at our Pics & Videos page at litiholo.com to see for yourself.

Interference of the best kind.

Holograms are some of the most pure (and fun) examples of the complex nature of optical interference and diffraction. To make a hologram, you must have two distinct light beams: 1) the "object beam" that bounces off the object and scatters to the film with all of the 3D information of the object's surface, and 2) the "reference beam" that comes directly from the laser to the film. When they meet at the film, the pure and orderly waves of the reference beam interact with waves reflected off the object, and create an INTERFERENCE pattern (sometimes called interference fringes) of light and dark lines that is recorded by the film. It is this interference pattern, with light and dark lines separated by only millionths of an inch, which is able to record both the intensity AND the direction of the light striking the film, thus recording a full 3D scene (two-dimensional pictures only record the intensity of the light striking the film).

Once you develop the hologram film (or if you are using "instant hologram" film, the hologram develops immediately during the exposure, without any chemicals), the light and dark pattern of fringes is re-illuminated with light coming from the same location as the original reference beam. When the light passes through the microscopic fringes, the beam is DIFFRACTED, bending the different parts of the beam to look as if they are coming from the object that was originally recorded in the hologram.

HOLOGRAM FILM, LASERS, AND MORE

The new age of "instant hologram" film.
Well, you may not know it, but making holograms was not always this easy. Usually, after creating your hologram with the laser, you still had one of the hardest parts ahead of you: the developing. For years and years, holograms have typically been made on silver-halide emulsion film, very much like a higher resolution version of the film in traditional cameras. To develop these holograms, you would need to follow a complex process of several different chemical baths, all in the dark, of course. Some other types of holograms were made on DCG, or Dichromate Gelatin, the development for which included you dipping the holograms into boiling alcohol.

But not you! You are now a member of an elite generation that can make holograms instantly. With Litiholo "Instant Hologram" Film, the hologram forms and develops at the same time, allowing your images to be viewed immediately. **No waiting. No chemicals.**

And, we continue to make the film better and better. The new 2.0 "Instant Hologram" Film from Litiholo means brighter holograms with even shorter exposure times. Just like the original "Instant Hologram" Film, there's still no chemicals and no processing required to see your holograms. So you spend all of your time making holograms, not developing them.

You can find the specifications sheet for our new 2.0 "Instant Hologram" Film at www.litiholo.com/hologram_film.htm .

Lasers, lasers everywhere.
Lasers were first invented around 1960, and who would have thought that within 50 years people would be carrying around lasers in their pockets and using them in so many of our consumer electronics products. As a result, there are many more laser possibilities for making your holograms, but not all of them have the right qualities necessary for making holograms.

First, you will need a laser that is the right wavelength (or color) for exposing the film you are using. So red-sensitive hologram films will need a red laser, of course. Second, the laser needs to be able to create interference fringes (see section on "Interference" above), and this typically means a laser that is single-mode (as opposed to multi-mode diodes) and preferably single-frequency (a very narrow range of wavelengths). One great way to test this is to set up a simple Michelson interferometer, which will split the incoming test beam into two parts and then recombine them to produce interference fringes. And third, once you have the right color laser, and with the right quality

capabilities, the laser diode will need to be “stable” during your hologram exposure. Look for a small circuit board that will be attached to the laser diode just behind the metal barrel housing, which helps stabilize the current flow coming to the diode. The temperature of the diode must also be stable, or else the laser will change wavelengths as the temperature changes, and thereby shift the interference pattern that you are trying to capture for the hologram. Sometimes you can better stabilize the laser by attaching a heat sink (metal objects with larger surface area) to the laser housing, and also keeping a stable temperature in the room you are using for making your holograms.

Litiholo is very concerned about safety when it comes to lasers. We have chosen lasers that have a safe power level, yet sufficient to make your holograms. Your natural "blink reflex" is sufficient for protection at these laser powers. Of course, if used improperly, any laser can cause problems. Never place a laser directly up to your eye, or point a raw laser beam into your eye while forcing your eyes open. This would be like staring at the sun. Don't do it!

Holographic objects -- the good, the bad, & the ugly.

Holographic objects are all around you, but not all objects will make good holograms. Remember, making holograms is very sensitive to vibrations and movement, so you will need to pick good solid objects made from hard, solid materials. Die-cast toys and cars (like Hot Wheels cars) are a great choice for your first holograms. Other good objects include pewter objects, ceramic figurines, rings or jewelry, coins, keys, etc. Poor objects include people, plants, paper objects, liquids, and some plastic objects (many toy action figures are made with a softer plastic that continues to flex and move after you put them down). Also remember that if you are using a red laser beam and red-sensitive film then the object needs to reflect red light. So only red, white, or reflective objects will show up well in this case. Objects that are primarily green or blue will absorb the red light instead of reflecting it, making a very poor hologram.

GO FORTH, AND MAKE MORE HOLOGRAMS!

We think that making holograms should be as fun and simple as playing with Legos. And even though our R&D team uses the latest technology, and invents even more technology, our founder always remembers that he first became interested in holography through a 5th grade science project. And that spirit is why we want to help you make more holograms!

Thanks for being a part of the hologram community.

The Litiholo Team

Litiholo
www.litiholo.com