

# Quick-reference mechanics of making a hologram:

## 1 Outside the Darkroom

1. Select a subject, there are some limitations...
  - It must fit in the apparatus, holographic images are life-size, and the film is 4 by 5 inches. Something about the size of a fist should fit.
  - It must be stable, it can not move more than  $53nm$  during the  $\frac{1}{2}$  second exposure. Plants grow too fast, mammals are right out.
  - It must be reflective, matte white is ideal, black will not show up.

These limitations are why there are so many holograms of skulls, dice, and chess pieces.

2. Give us money. This is the most important step. (-: \$5 for a 4x5. Once the film and chemistry are paid for, the balance will be donated to the FreeBSD Foundation.
3. Sign up for a darkroom time slot.

## 2 In the Darkroom

4. We will get a piece of film, sandwich it between two pieces of glass, and clamp the assembly onto the tilted frame. You then artistically position your objects. Watch the fingerprints.
5. The act of assembling the apparatus causes it to ring like a bell, its really easy to move  $53nm$ . Press return on the computer, it will wait for a minute for everything to settle.
6. The computer will time the exposure, its about 0.5 seconds, to deliver about  $100\mu J$  per  $cm^2$  of energy to the film. The computer will beep before the exposure if you wish to close your eyes.
7. Retrieve your object from the apparatus, we will retrieve your film, and drop it in the pre-wash bath emulsion side up.
8. You then pick up the film, shake most of the water off, and put it in the developer, for 2 minutes. Set the gralab timer by pushing the minute hand clock-wise two clicks. You should see darkness within 15 to 30 seconds.
9. Pick up the film, shake it off, and drop it in the pre-bleach wash.
10. Drop the film in the Bleach, and set the gralab timer for 3 minutes. Watch it until it is clear and then give it 30 seconds more. This should take 1:00 to 1:30.
11. Pick up the film, shake off the bleach, and then drop the film into the wash tray.

## 3 Outside the Darkroom

12. Pick up the film, and carry it out for the last wash tray, and give it 5 minutes or so for all the chemistry to diffuse out.
13. Hold the film up to an LED, and look for rainbows. The interference pattern will not make an image until it is dry, but if its there it will cause diffraction. (This is another sanity check)

14. Blot the hologram to get rid of the big droplets of water, and then holding it by a corner wave it around to dry it. Every once in a while hold it under an LED and look for the image. Note how the image starts out red, and then drifts down to green. That is caused by the wet emulsion shrinking as it dries.
15. Congratulations, you are now a holographer.
16. When it is completely dry put the hologram in a sleeve so it doesn't get dirty. Stick a piece of black vinyl on the back to improve contrast.

## 4 Random hints

- Don't worry, if there is an issue we will assist.
- Its a dark room, NO STRAY LIGHT! Especially light from LCDs, and no we can't just open the door. There is film just sitting out, and it will be fogged.
- Use the tongs in a tray to pick up the film in that tray. Shake it off over that tray, then drop the film in the next tray and return the tongs to the tray they came out of. The goal is to reduce the amount of chemistry carried over into the next tray.
- The chemistry goes left to right: Pre-wash, Developer, Wash, Bleach, Wash.  
The chemistry will stain, when you least expect it. Getting it on your fingers will not burn you, but extended exposure can sensitive you to it, wash it off ASAP. Do not drink the chemistry.
- Set the gralab timer by pushing the minute hand clockwise. One notch per minute.
- If you can't see in the safelight, stop moving before you bump something and tell us. We have a safe-flashlight.

## 5 Links for more information

- The holowiki [http://holowiki.org/wiki/Main\\_Page](http://holowiki.org/wiki/Main_Page) Also has the holography forum.
- The Laser FAQ <http://www.repairfaq.org/sam/laserfaq.htm>