

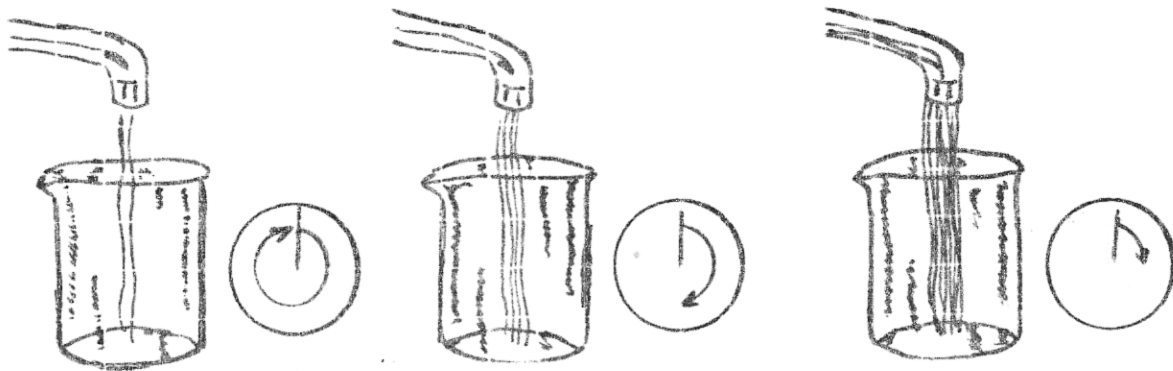
EXPOSURE

Silver halide materials' response to light is negative-acting; the more light that hits them the darker they become. Areas exposed to less light are correspondingly lighter, and areas where no light hit don't change much except for developer fog. This explains why photographic negatives look the way they do; light areas in the subject reflect a lot of light to the film, making their image area on the film very dark, medium tones make a medium change, and dark shadows make a minimal amount of change on the film. The tones are re-reversed in the printing process because the print material is also negative-acting.

Holography captures the interference pattern of reference and object beams which is composed of light and dark fringes. The bright fringes expose the silver halides, darkening them, while the dark fringes don't. The pattern formed on the film is the reverse of the real fringe pattern. How dark the exposed areas become depends on the amount of light that hits them and also on the development. For this discussion, assume that development is constant.

The three components of exposure are film sensitivity, how much light hits the film and the length of time it is exposed. The film's sensitivity is built-in. For a certain film a particular amount of light energy will darken it to a certain degree. This is the statistic given in film instruction sheets under the heading "Energy Requirement", for instance 200 ergs/cm² to produce a density of 1.0. These 200 ergs may be accumulated over a period of time. For a very bright beam, it may take a short time, for a dim beam a longer time.

Exposure is analogous to filling a cup with water. The intensity of light is represented by the flow of water; the energy requirement of the film is the size of the cup. If there is a trickle of water, it will take a long time to fill it. If the water runs twice as fast, then the time to fill it will be



half as long. Doubling the flow again will cut the time down to $\frac{1}{2}$ of what it had originally been. Conversely, less light/water, the time will increase.

As far as relative sensitivity goes, the different speeds of film are analogous to different sized cups. A film with energy requirement of only 25 erga/cm² would be a cup whose volume is only one-eighth that of the 200 ergs/cm²'s cup and then would require only 1/8th the exposure time for the same flow.

In holography, the duration of exposure is a response to the amount of light reaching the film. The light meter is the tool which tells you how much light is reaching the film. The reference beam is metered from the position of the film, and its intensity is compared to a calibrated exposure scale which tells you how long to expose.