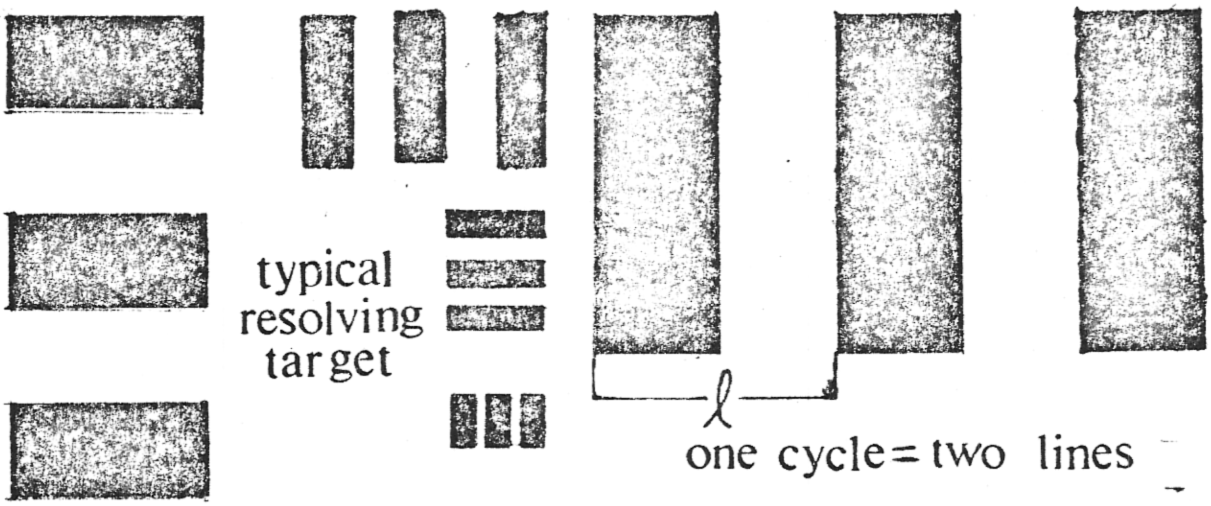
RESOLVING POWER



How fine a detail a photosensitive emulsion can discern is quantified in its resolving power. A test target is photographed through a lens of known resolving power, and the emulsion is developed under stringently controlled conditions. This target is composed of cycles of alternating light and dark bands. When a film reaches the limit of its resolution, then the light and dark bands are not differentiated but blend into a blob. If ℓ is the smallest distance between a cycle of a light and a dark band, then the resolving power, r is given by:

$$r = 1/\ell \text{ lines per mm}$$

For instance, if the smallest spacing observed in the emulsion under a microscope was .02 mm, its resolving power is 1 / .02 = 50 cycles per mm. Since one cycle = 2 lines if the dark and light spaces are equal in size, then the resolving power would be 100 in the more familiar lines per mm. Notice that resolving power is an application of spatial frequency.

What we are capturing on the holographic film are patterns of bright and dark fringes. The range of resolving powers necessary to make holograms start at less than 100 line/mm for diffraction made with red laser light with a small angular separation to over 4000 lines/mm for a reflection hologram made with blue light. Typical camera films resolve at best 200 lines/mm for a fine grain emulsion like Kodak Panatomic-X. Holography films belong to the family of micro-fine grained emulsions.

The classical test for resolving power fails at the high spatial frequencies necessary for holographic recording. Manufacturers of these films will publish statements of estimated resolving powers or will say the film is capable of making reflection holograms with certain colors of laser light.

See the FILM SPEED sheet for a listing of comparative resolving powers for typical holographic emulsions.