Microscopy with 6.003

Phase-Modulated Microscopy

Poster: \( \cos(\omega_x + f(x,y)) \)
Projector: \( \cos(\omega_y) \)
Poster with Projector: \( \cos(\omega_x) \cos(\omega_y + f(x,y)) \)

Modulated illumination enables low-pass system (eyes) to detect high spatial frequencies

Images are 2 dimensional → need 2D Fourier Transform
many frequencies + many orientations = many images

Standing-wave illumination spectrum

Thanks to M. Mermelstein

Experimental apparatus

Stanley S. Hong

Twinkling decoded into sub-pixel image

10 μm

Uniform Illumination  Structured Illumination

Jekwan Ryu