



INTERFERENCE

P47 – Optics: Unit 6

Course Outline

~~Unit 1: Electromagnetic Waves~~

~~Unit 2: Interaction with Matter~~

~~Unit 3: Geometric Optics~~

~~Unit 4: Superposition of Waves~~

~~Unit 5: Polarization~~

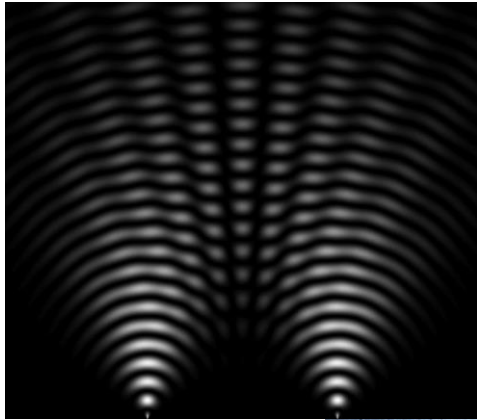
Unit 6: Interference

Unit 7: Diffraction

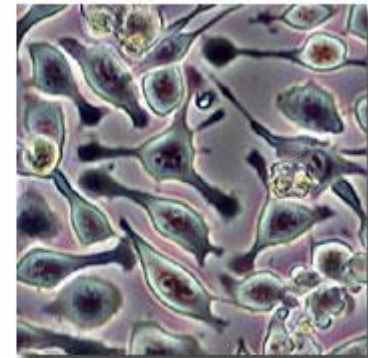
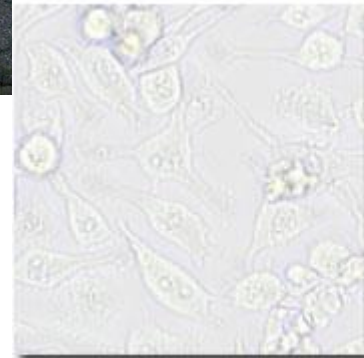
Unit 8: Fourier Optics

Unit 9: Modern Optics

Interference



Living Cells in Brightfield and Phase Contrast

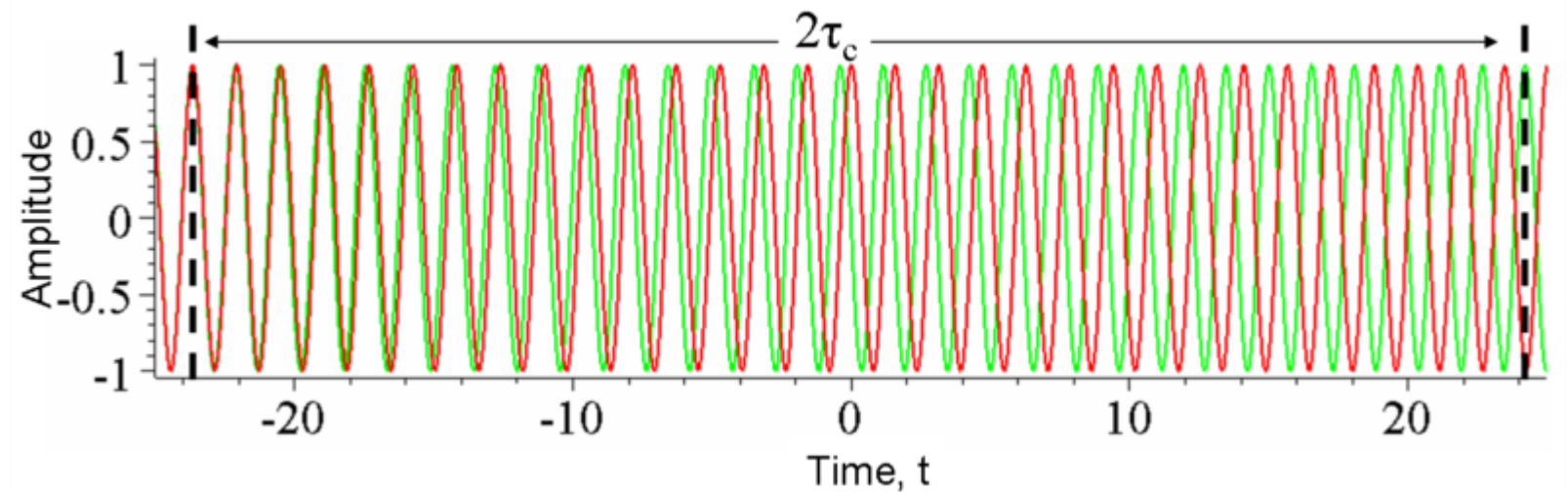
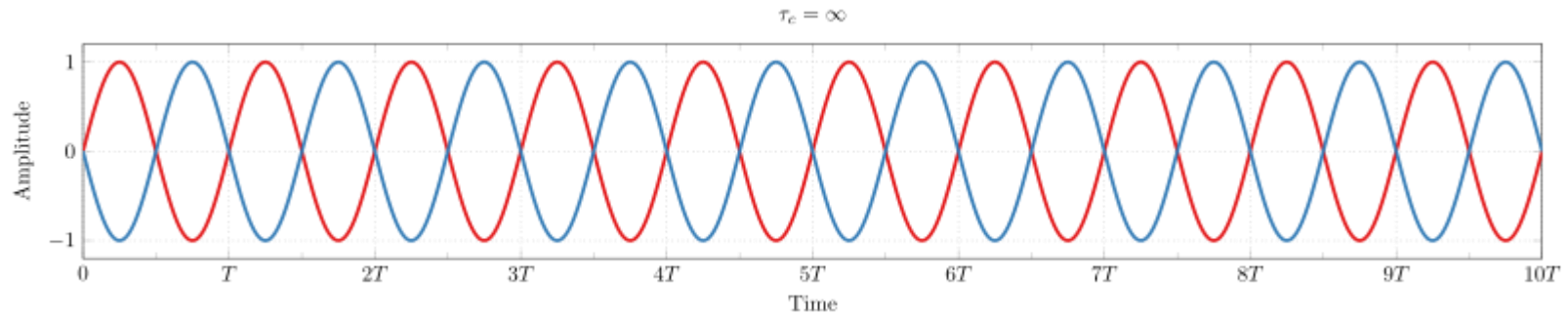


(a)

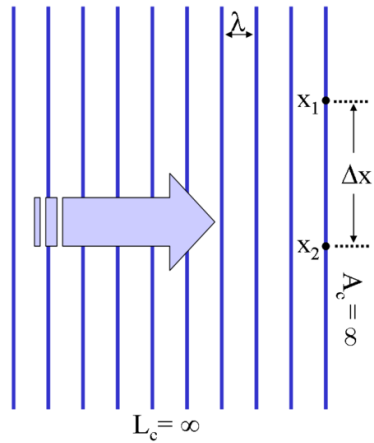
Figure 2

(b)

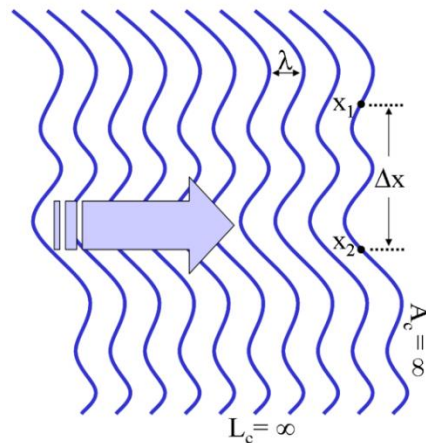
Temporal Coherence



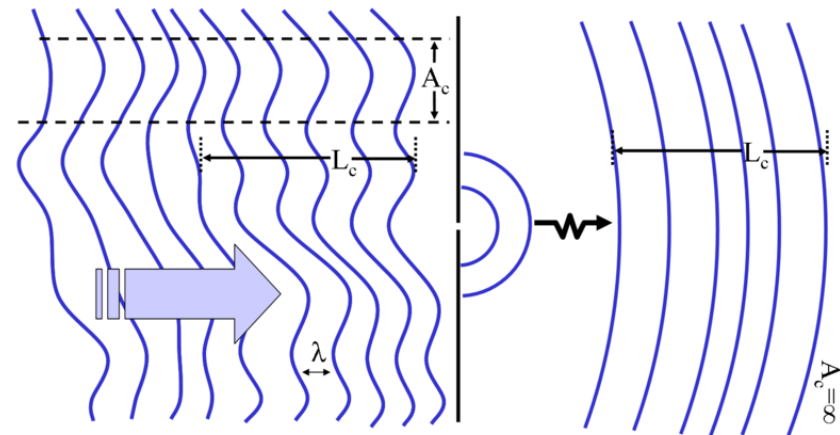
Spatial Coherence



plane wave
infinite temporal coherence

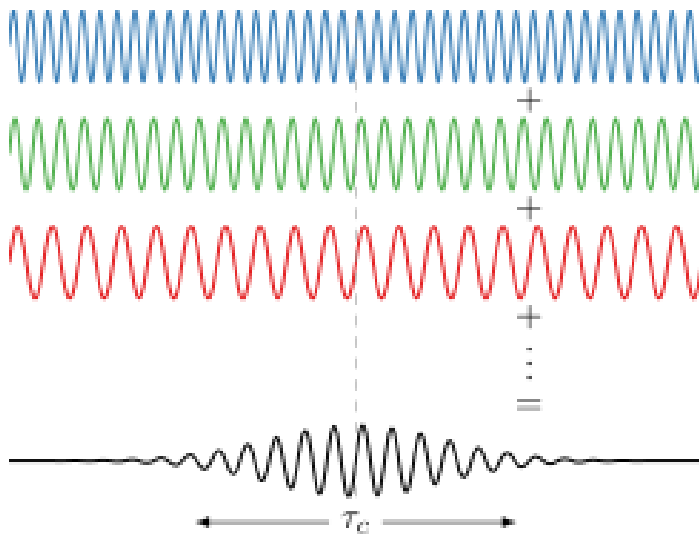


distorted wavefront
infinite temporal coherence

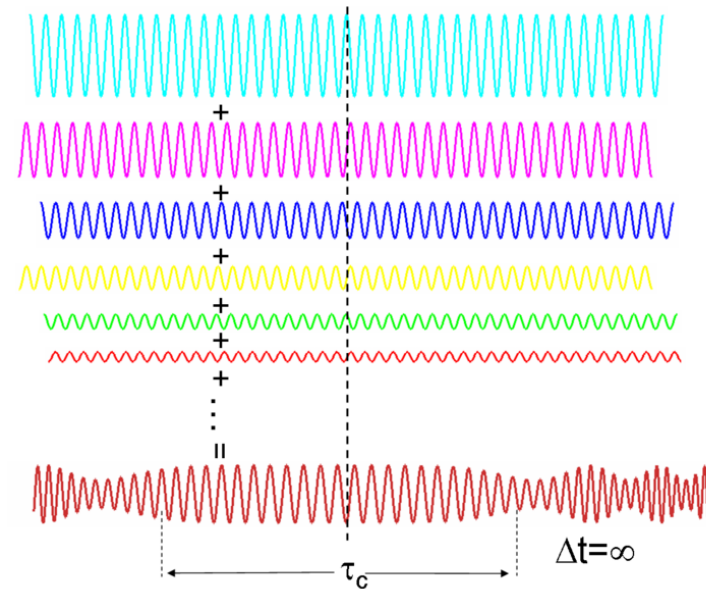


diffracted wavefront
finite temporal coherence
infinite spatial coherence

Spectral Coherence

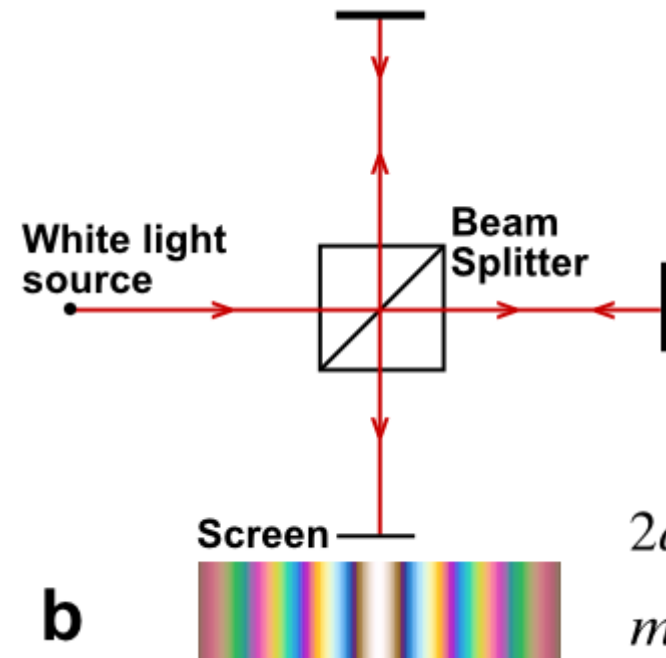
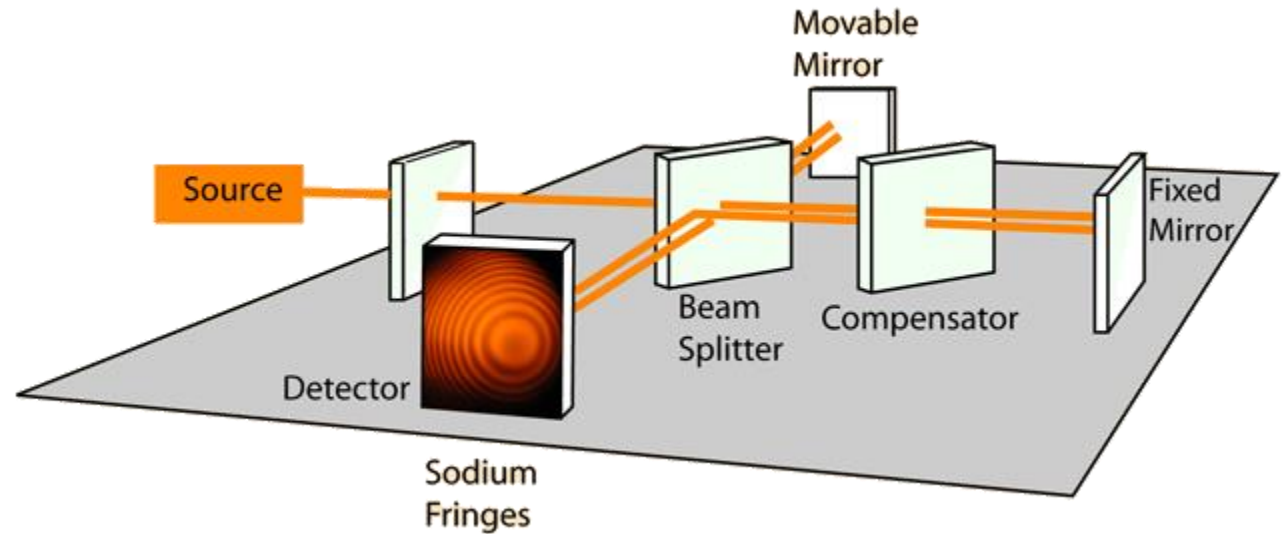


waves of different frequencies
with some fixed phase relationship
→ add coherently



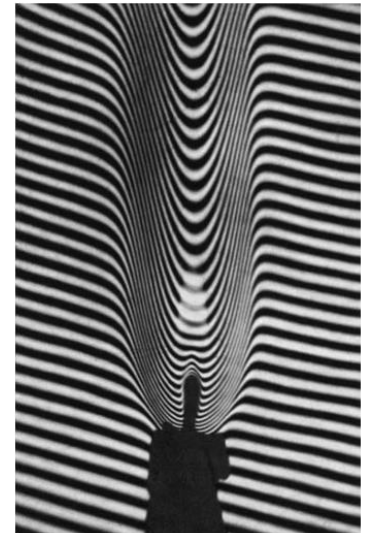
waves of different frequencies
without fixed phase relationship
→ add randomly (natural light)

Michelson Interferometer

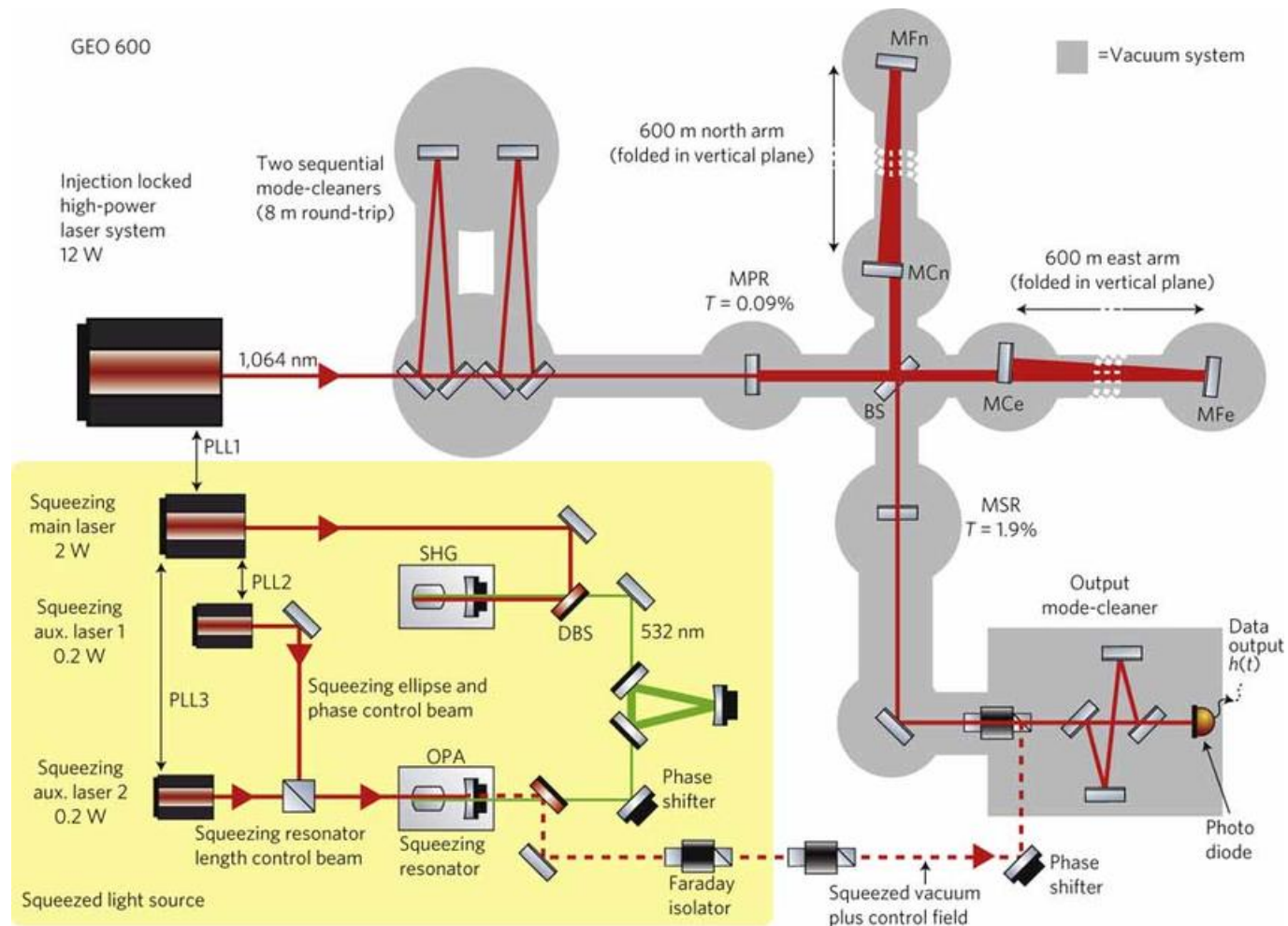


$$2d \cos \theta = m\lambda$$

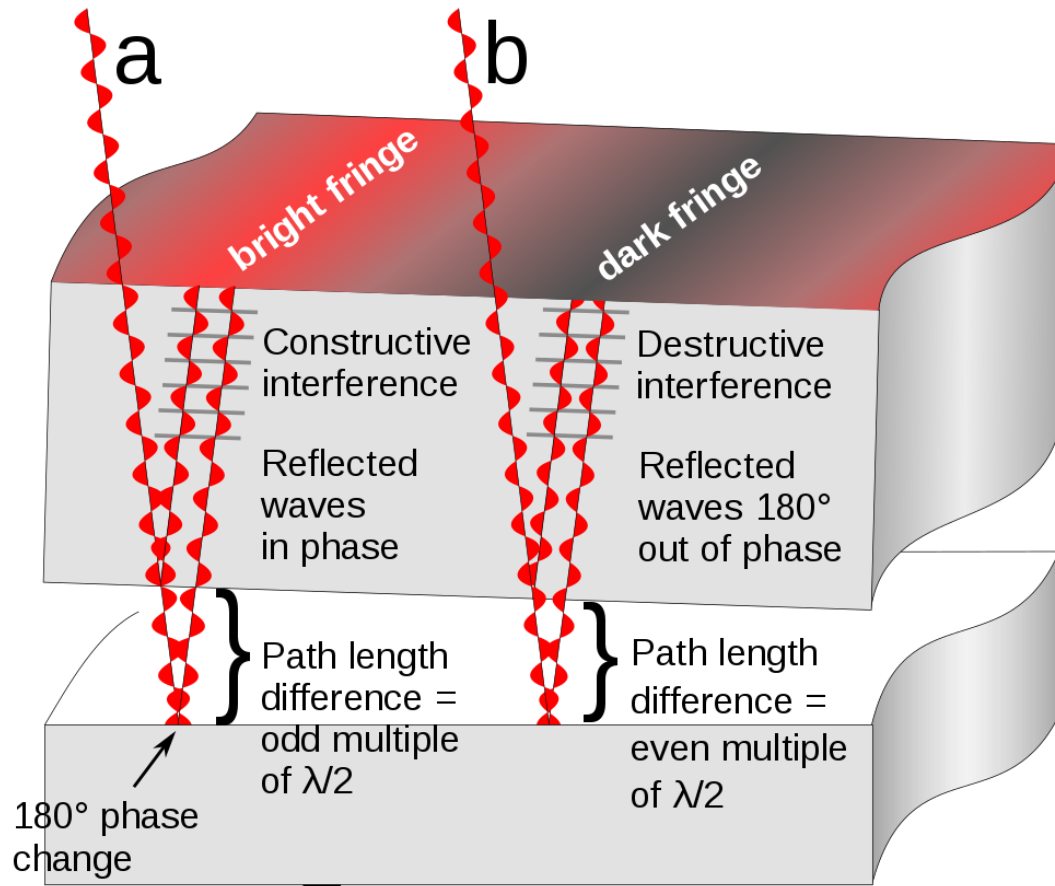
$m = 0, 1, 2, \dots$ dark fringes



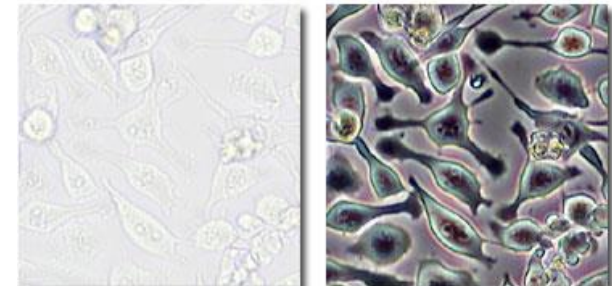
Michelson Interferometer (writ large)



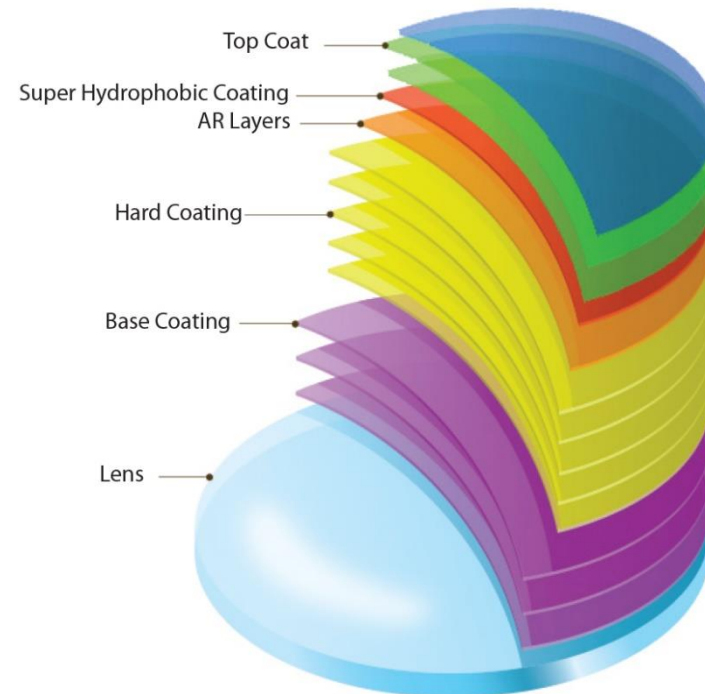
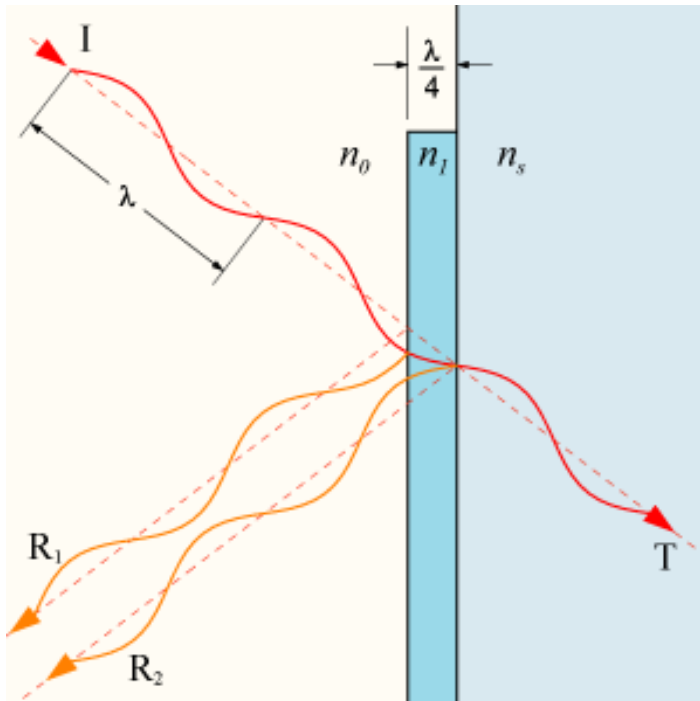
Thin-Film Interference



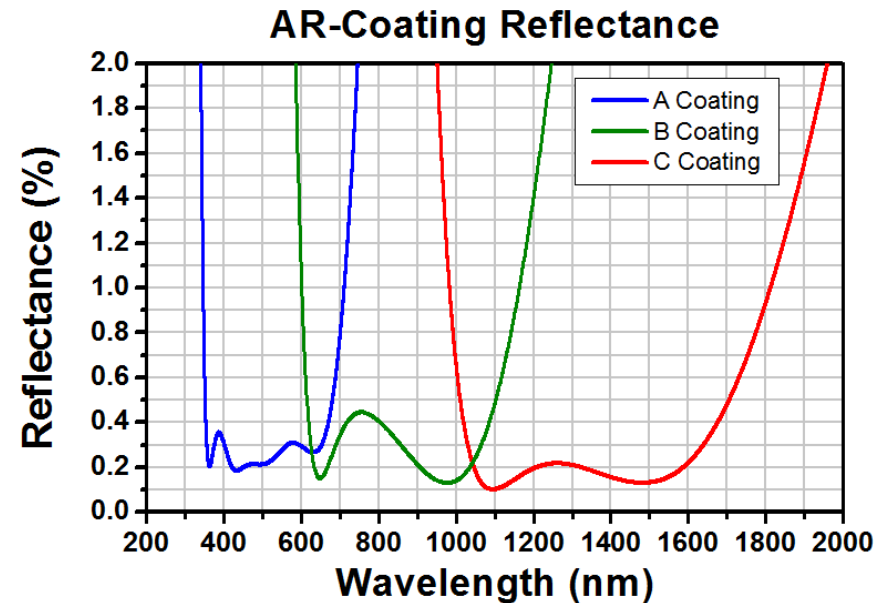
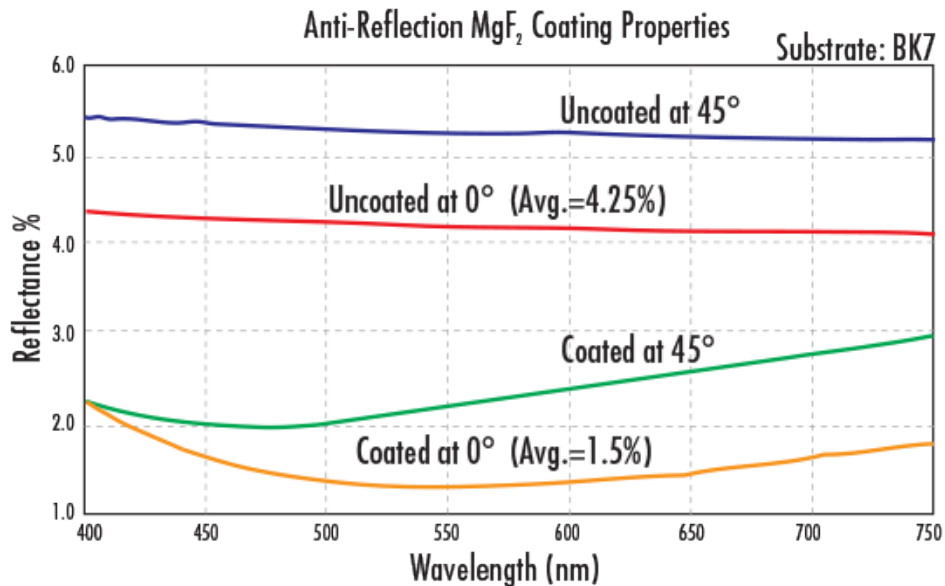
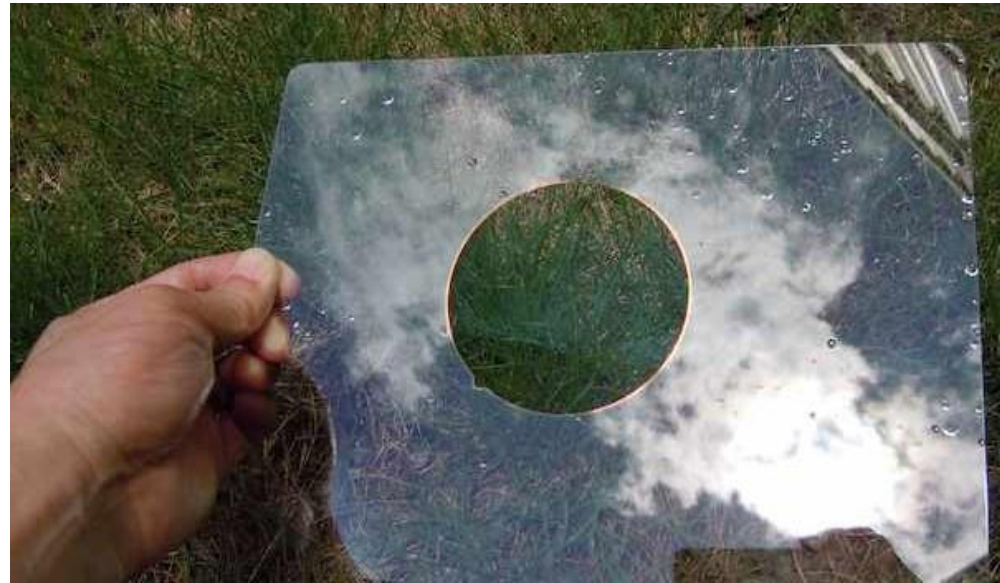
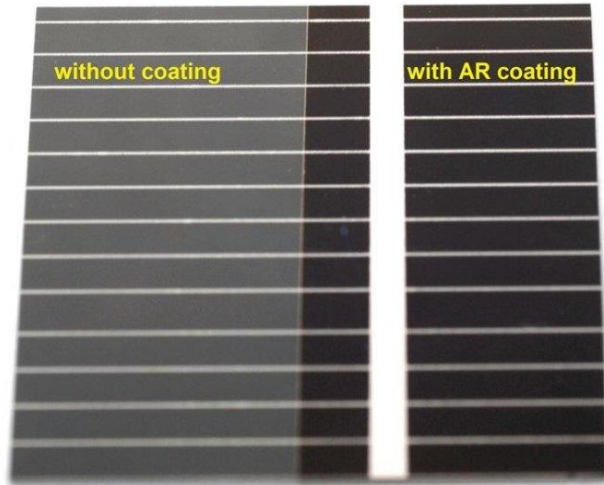
Living Cells in Brightfield and Phase Contrast



Anti-Reflection Coatings



Anti-Reflection Coatings



Multi-Layer Dielectric Mirrors/Filters

