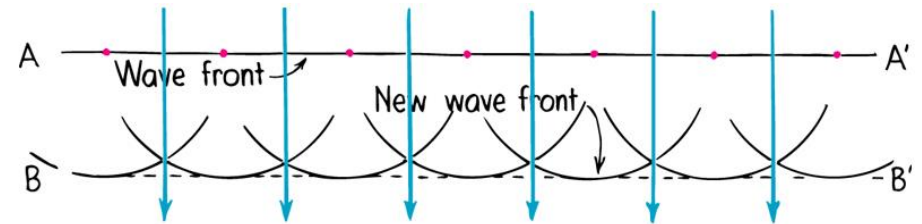
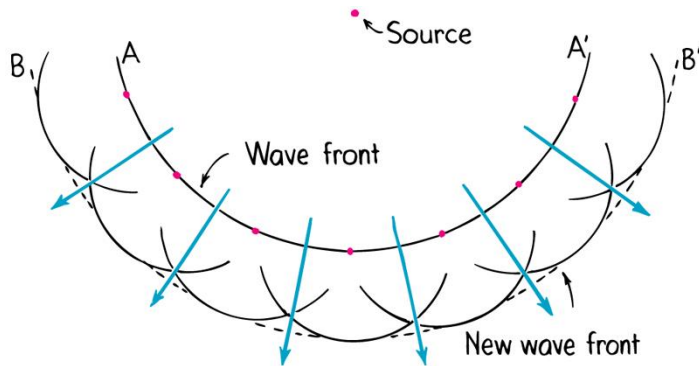


Chapter 29

Light Waves

Huygen's Principle

Every point on a wave front may be considered the source of secondary wavelets that spread out in all directions with a speed equal to the speed of the propagation of the waves.

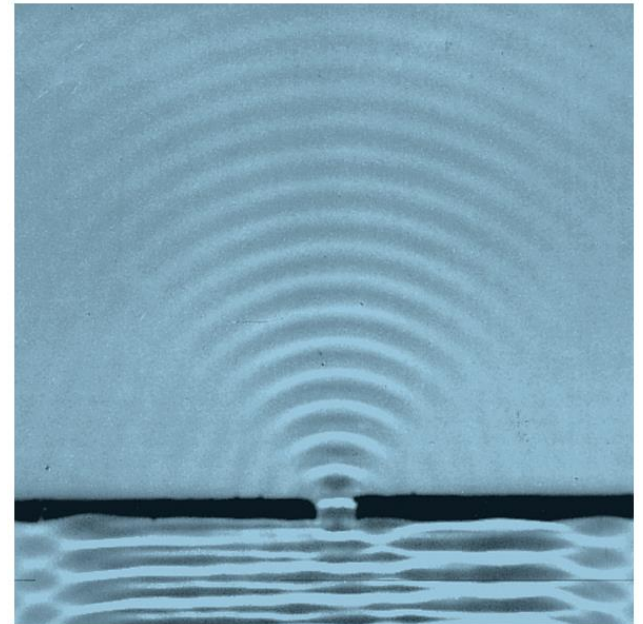


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Diffraction

The bending of light around obstacles is called *diffraction*. The greater the wavelength, the greater the diffraction for a given obstacle or aperture.

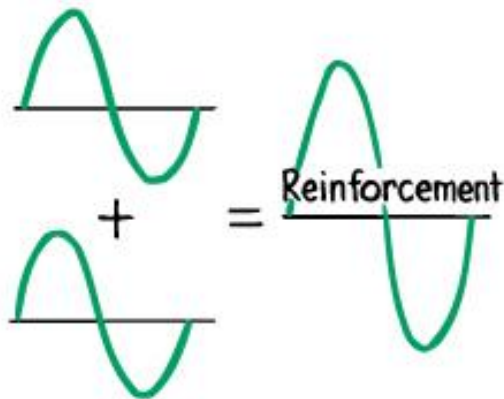
- Puts a limit on how well object can be resolved.
- The greater the wavelength, the greater the diffraction for a given obstacle or aperture.



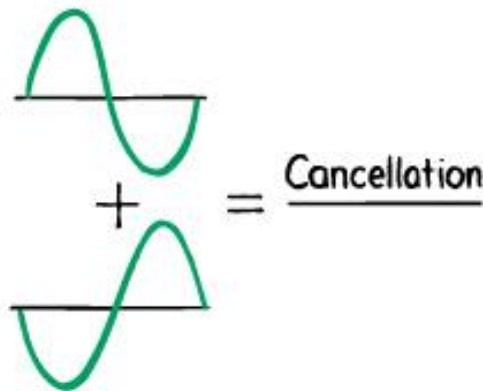
Interference

Recall the concept of *interference* from Ch. 19, that when two waves interact, the amplitude of the resulting wave is the sum of the two individual waves.

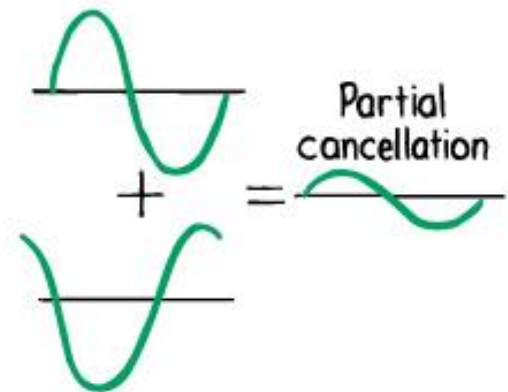
- If the amplitude is greater than that of the individual waves, the interference is *constructive*.
- If the amplitude is less, the interference is *destructive*.



a



b

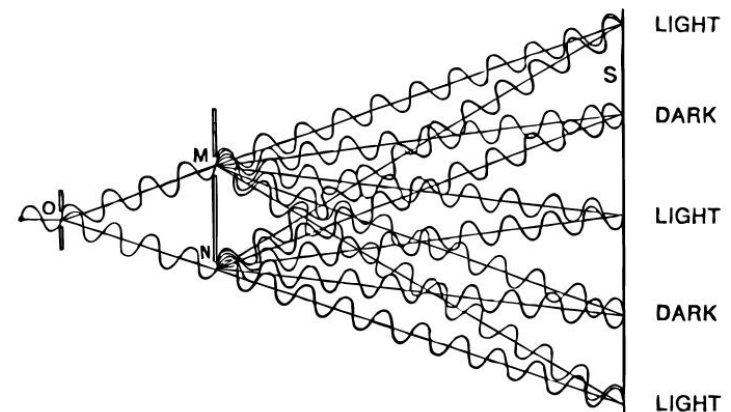
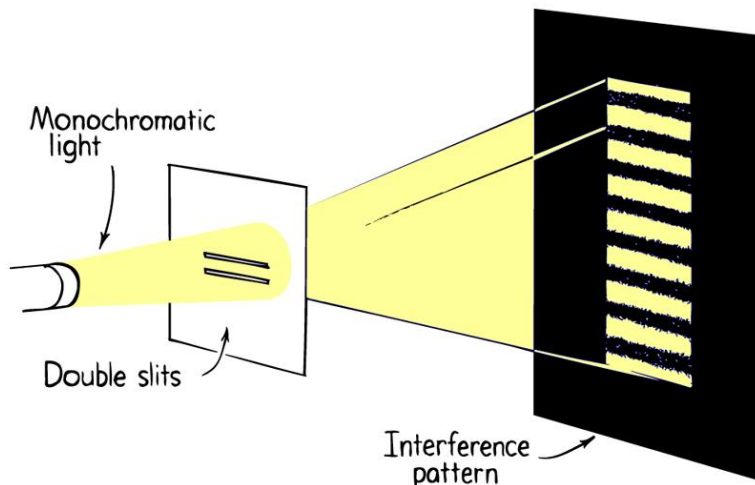


c

Two-Slit Interference

In 1801, Thomas Young convincingly demonstrated the wave nature of light in his famous “two-slit experiment:

- Monochromatic light (light of a single wavelength) is passed through two small slits onto a distant screen.
- Each slit acts as a single source (Huygen’s principle).
- If the waves from the two slits arrive “in phase” a bright fringe appears on the screen. If the waves arrive “out of phase” a dark fringe appears.

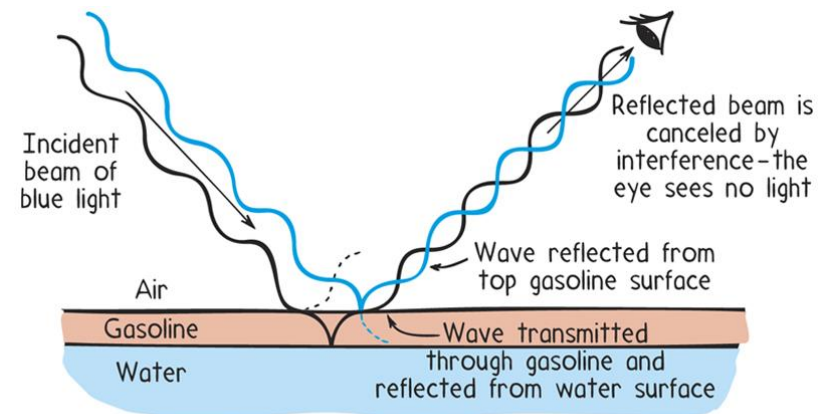
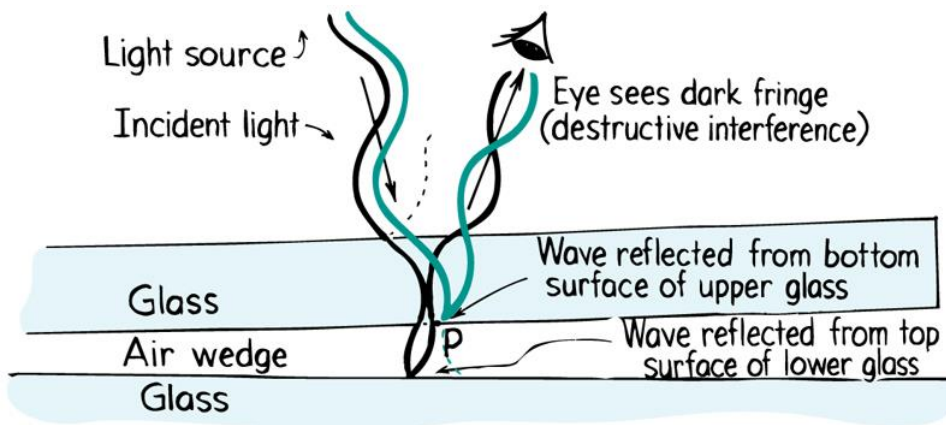


Hewitt, Conceptual Physics, Ninth Edition.
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Thin Film Interference

When light reflects off very thin films, vivid colors can be seen. (Examples include the shimmering colors seen on a soap bubble or off a puddle in a parking lot that has some oil/gasoline floating on it.)

These are caused by the constructive interference of the light reflect off the top and bottom surfaces of the film.



Polarization

The electric field of the light waves is made to vibrate in a particular direction.

Mechanical Analogy: Think of shaking a rope through a picket fence.

If the pickets are vertical, then only vertical vibrations can get through.

The horizontal vibrations are blocked.

