

## Lecture 7-8

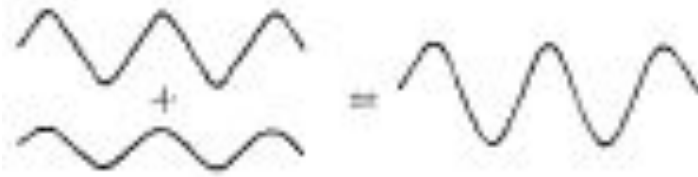
### **physical optics.**

1. Development of ideas of light nature.
2. light interference. some applications of an interference.
3. diffraction of light. diffraction gratings.
4. dispersion of light.
5. emission of light and ranges. types of ranges.
6. polarization of light.
7. X-ray radiation.
8. scales of electromagnetic waves.

# Interference

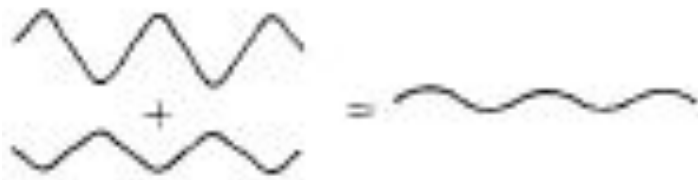
Interference occurs when waves of the same nature from different sources meet at the same place. In constructive interference, the waves are in phase (“in step”) and reinforce each other; in destructive interference, the waves are out of phase and partially or completely cancel

Constructive interference



$$\Delta l = 2k \frac{\lambda}{2}$$

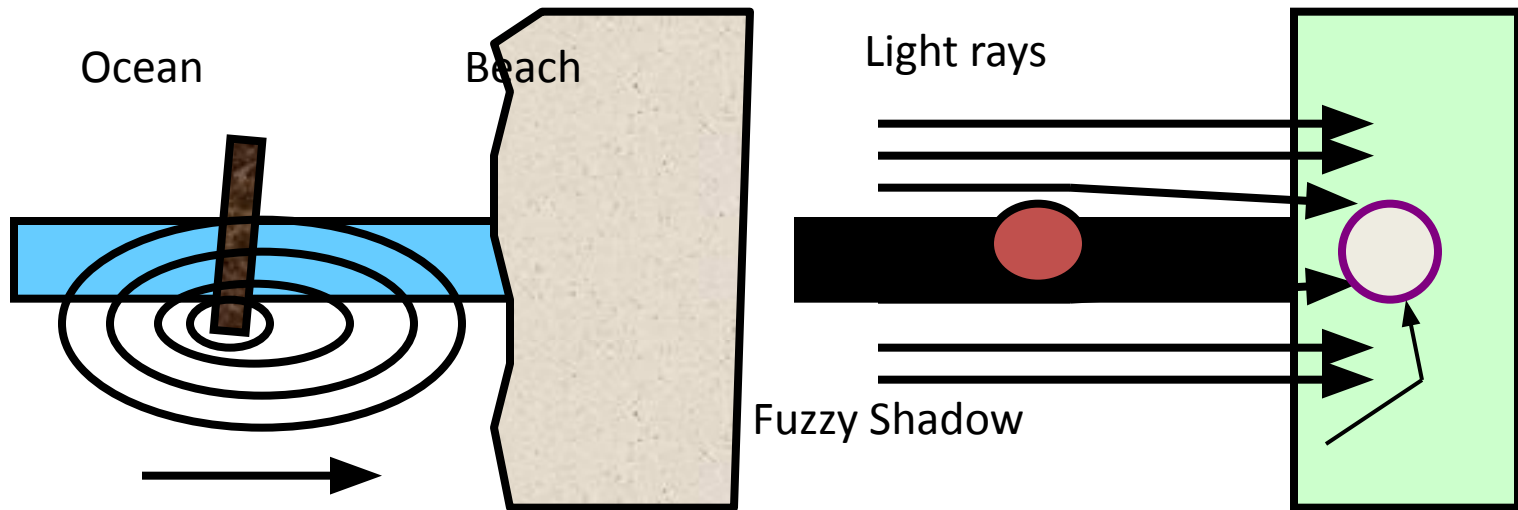
Destructive interference



$$\Delta l = (2k + 1) \frac{\lambda}{2}$$

# Diffraction of Light

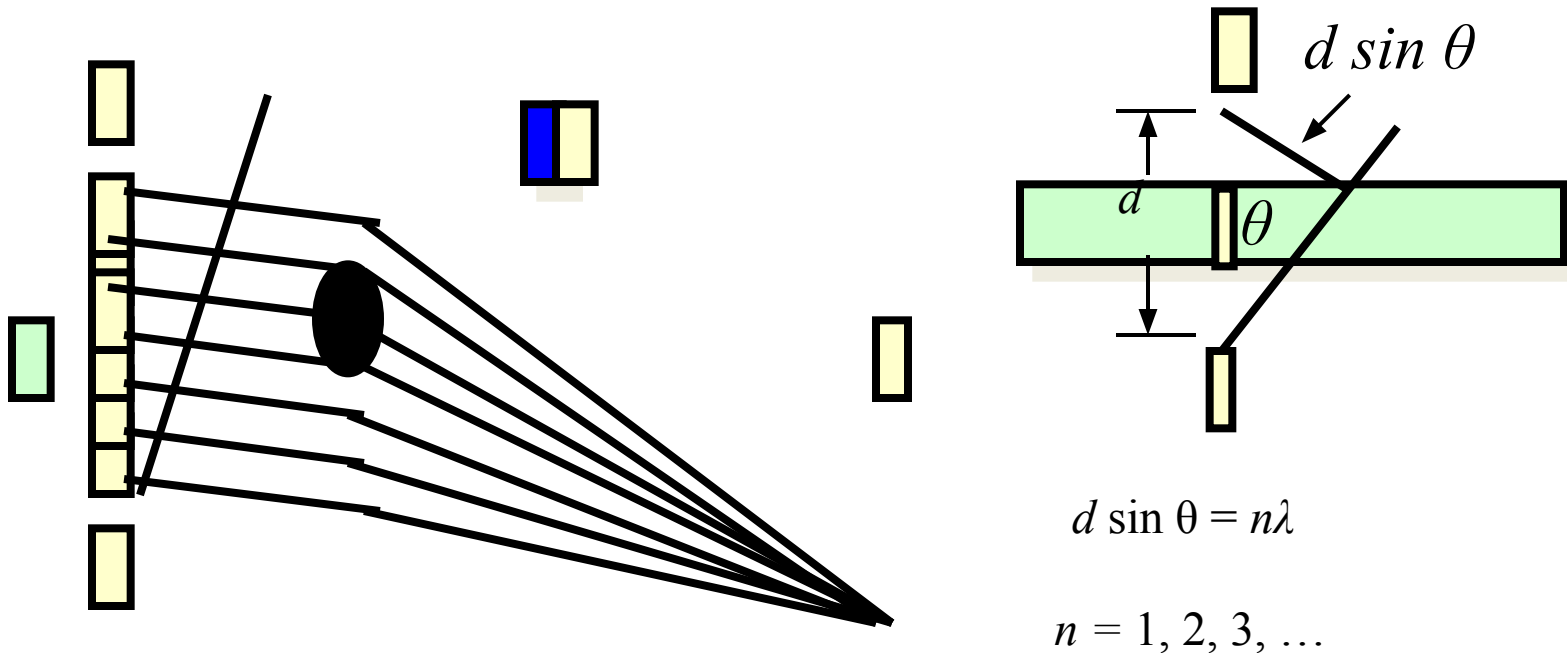
**Diffraction** is the ability of light waves to bend around obstacles placed in their path.



# The Diffraction Grating

## Диффракциялық тор

A **diffraction grating** consists of thousands of parallel slits (қыуыс) etched (бекітілген) on glass so that brighter and sharper patterns can be observed than with Young's experiment. Equation is similar.



# The Grating Equation

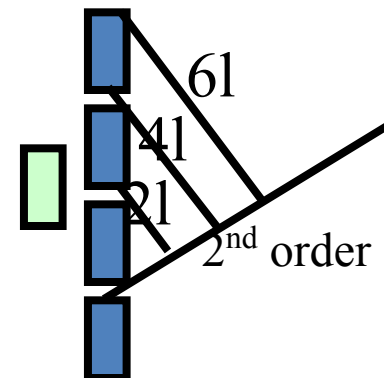
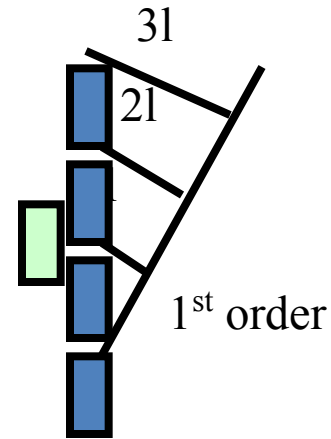
The grating equation:

$$d \sin \theta = n\lambda \quad n = 1, 2, 3, \dots$$

$d$  = slit width (spacing)

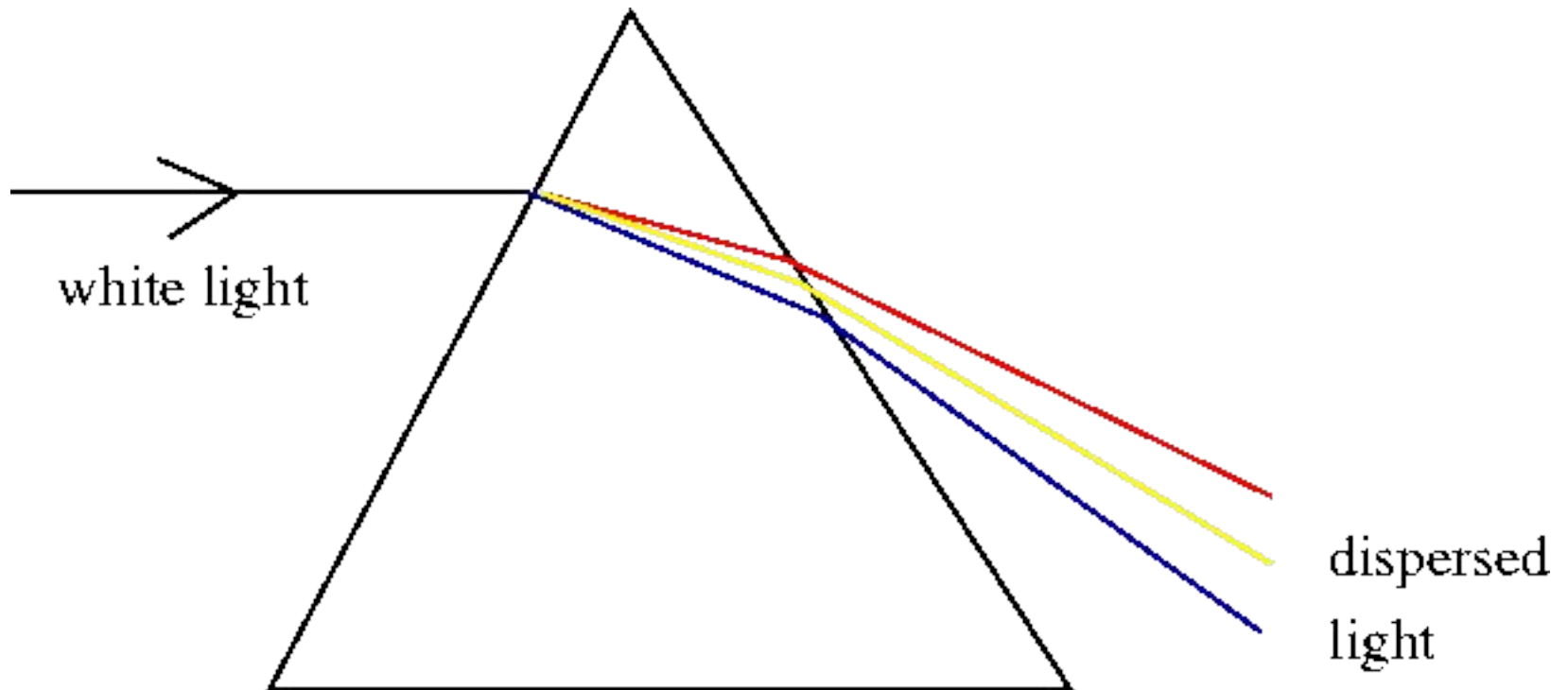
$\lambda$  = wavelength of light

$n$  ( $k$ ) = order of fringe

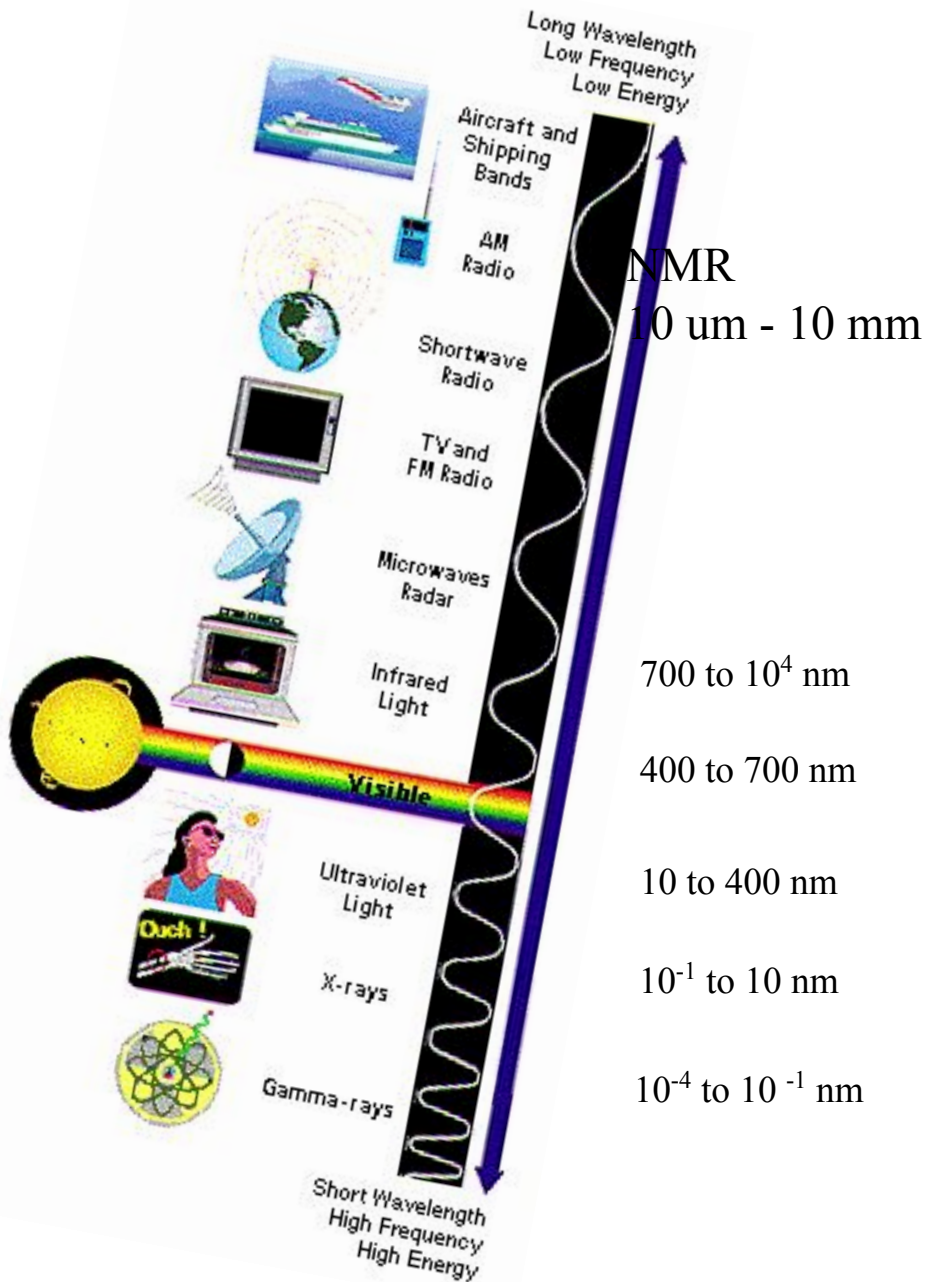


# Dispersion

Another aspect of light that is quite familiar is dispersion. If a beam of white light enters a glass prism, what emerges from the other side is a spread out beam of many colored light. The various colors are refracted through different angles by the glass, and are "dispersed", or spread out.



# Electromagnetic Spectrum



X-ray radiation was discovered by Roentgen in 1895.

X-rays are generated by bombarding electrons on an metallic anode

Emitted X-ray has a characteristic wavelength depending upon which metal is present.

$$E = h\nu$$

$h$  is Planck's constant =  $6,63 \cdot 10^{-34} \text{J*s}$

