MAY 11-15, 2020
TOPIC: LIGHT: DISPERSION, INFERENCE, SPEED OF LIGHT

Prism
- A narrow beam of white light enters a triangular glass block.

Spectrum
- The beam of light splits into different range of colors.

Dispersion
- The process by which light is separated into colors due to difference in degrees of refraction.

Sir Isaac Newton
- His experiments using prism showed that light travelled in straight line until it is reflected, refracted, diffracted or disturbed in some other ways.
- He was credited with the discovery of white light as consisting a spectrum of colors.

Rene Descartes
- He showed that sunlight becomes focused into a circular arc when it bounces off raindrops
- The production of colors requires the presence of both aperture and refraction.
- The normal state of light corresponds to white while the deviation from the norm corresponds to color.

Descartes' illustration of the formation of the rainbow; rays such as ABCDE form the primary bow, and FGHIKE the secondary one.
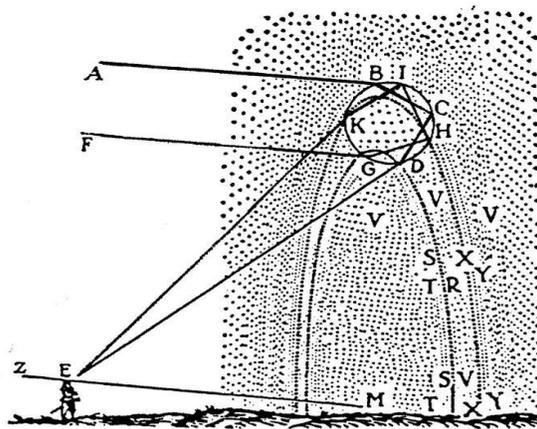
Inference

Thomas Young
- Performed an experiment demonstrating the wave nature of light that Christian Huygens had proposed earlier.
- He allowed monochromatic light, or light with a single color, to pass through two closely spaced narrow slits.
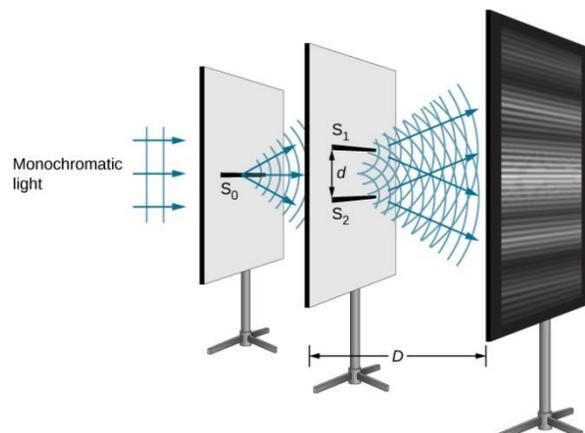
This image shows the inference of light waves as observed by Young.

- The light emanating from S0 is incident on two other narrow slits S_1 and S_2 that are equidistant to S_0
- When the light reaches the screen, an interesting pattern of bright and dark bands known as fringes in screen.

Constructive Inference
- Bright fringes lines
- Where waves from two slits arrive in phase and reinforce each other.

Destructive inference
- Dark fringes lines
- Where the waves cancel each other out.

Young's double-slit experiment it does not only demonstrated the wave nature of light but also allowed him to measure its wavelength.

Rayleigh Scattering
- As light moves through the atmosphere, it bumps into bits of solid particles or gas molecules and becomes scattered in all directions.
- Was named and described after the English physicist Lord john Rayleigh
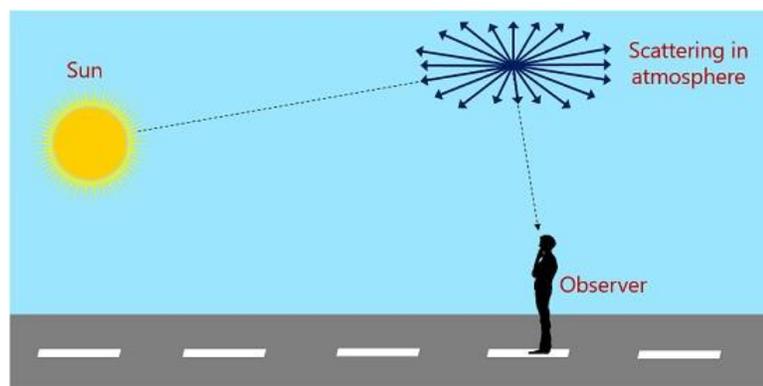
Rayleigh scattering from air molecules

Circuit Globe

Speed of Light
- Light behaves like a wave.

Characteristics of Wave
- Wavelength – the distance between peaks of wave
- Frequency – the number of peaks that will travel past a point in one second.

The speed of wave can be found by multiplying the two units together. The wave's speed is measured in units of length (distance) per second.

$$Wavelength \times Frequency = speed$$

With the use of the SI units for wavelength (λ), frequency (f) and speed of light (c), we can derive some simple equations relating to wavelength, frequency and speed of light:

$$\lambda = c/f \text{ of } f = c/\lambda$$

the speed of light was believed to be infinite by people hundred years ago who observed that light travels faster than sound.

Kepler
– the speed of light is infinite because vacuum of space din not slow the speed down.

Rene Descartes –
- He concluded that the speed of light was infinite during a lunar eclipse, the sun, earth and moon are still aligned.
- He argued that if the speed of light were finite, the sun, earth, and moon will be out of alignment during a lunar eclipse.
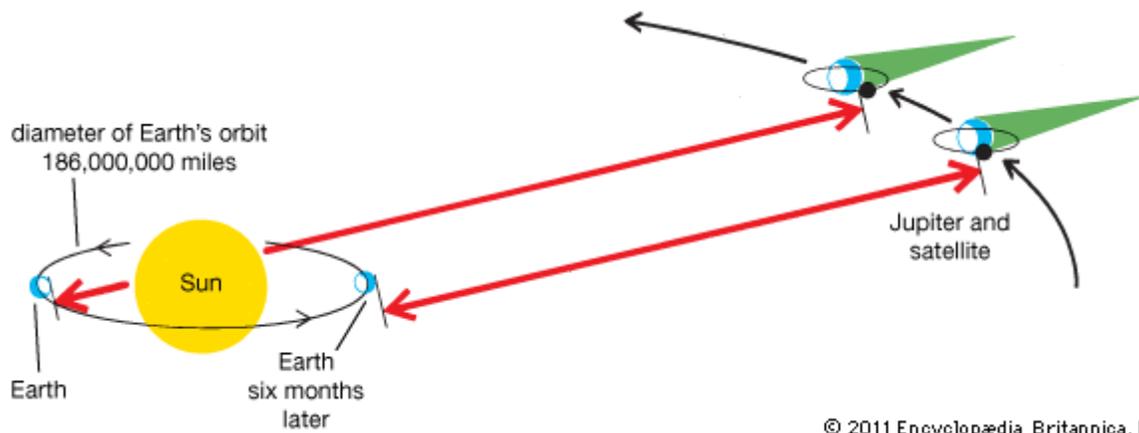
Galileo
- The first recorded experiment on measuring the speed of light (failed measurement).
- The experiment made use of lanterns, telescopes and shutters

Olaus Roemer
- Made very careful observations of the period of revolution of Jupiter's innermost moon, Io.
- He was able to predict when Io hid or eclipsed behind Jupiter's shadow.

- His prediction for the exact time when Io's eclipse would occur was about 22 minutes late when he observed it six months later.
- He attributed this time lag to the fact that Earth move farther from Jupiter in the few months and that light had taken longer to reach Earth.

diameter of Earth's orbit
186,000,000 miles

Sun

Earth

Earth
six months
later

Jupiter and
satellite

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To Do List

I.   Answer the following briefly.
1. How is reflection explained by the wave model and particle model of light?

2. How can light be separated into different colors?

3. What will happen
        a. To the wavelength of light if the frequency is doubled?
        b. To the frequency of light if the wavelength is reduced to one half?