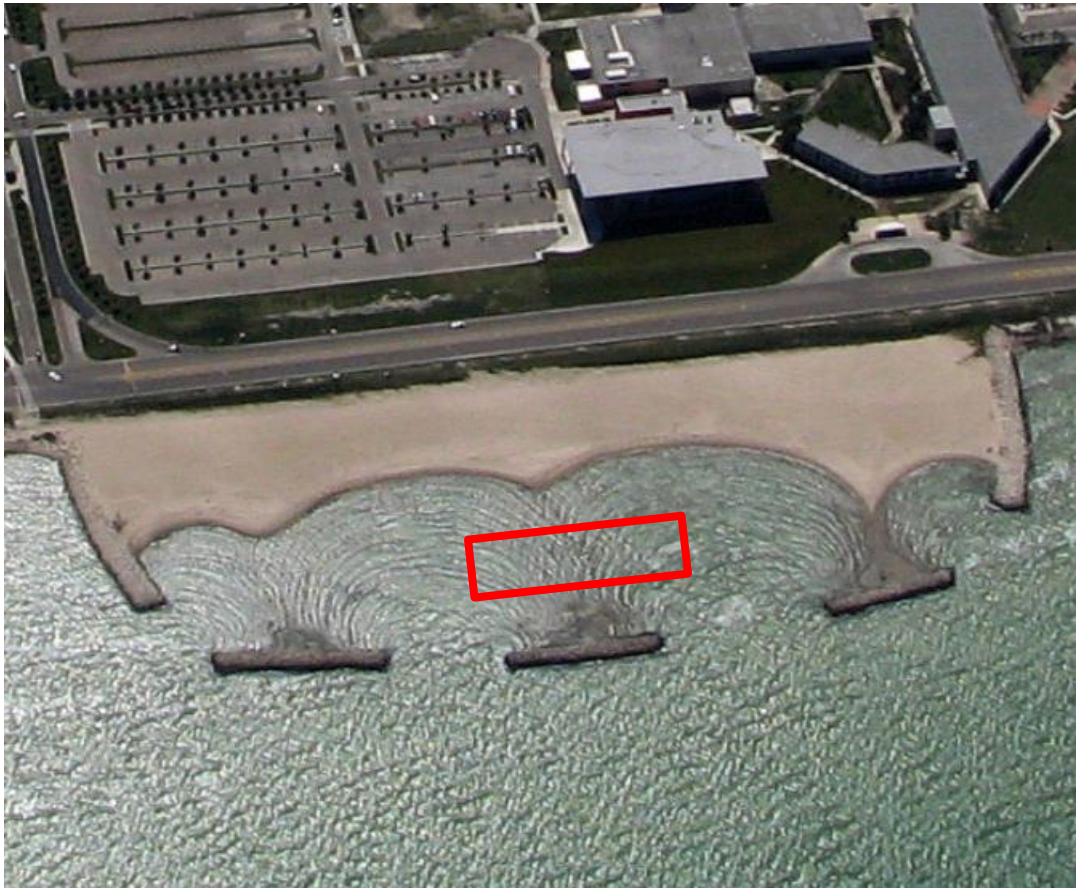
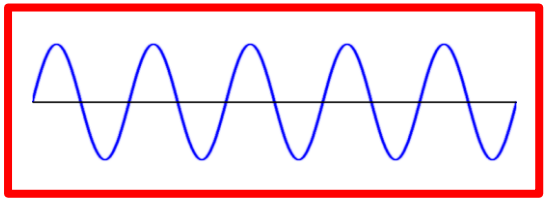
Can we compare light to…

…the waves in the ocean?



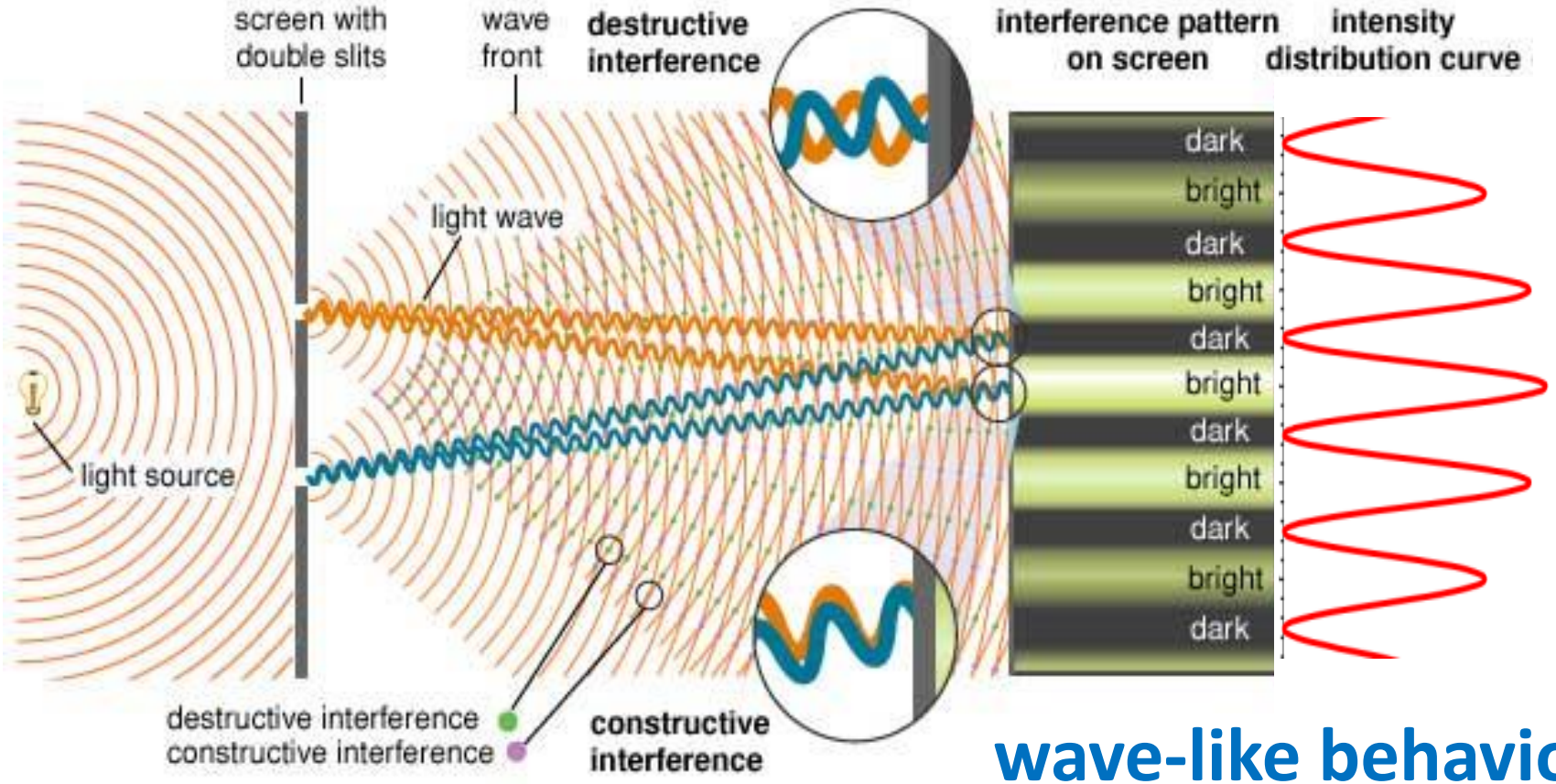
"High-low" pattern behind the obstacle



Double-Slit Experiment

Thomas Young, 1803

Light passing through two parallel slits will <u>interfere</u>, producing a *pattern of bright and dark fringes*.

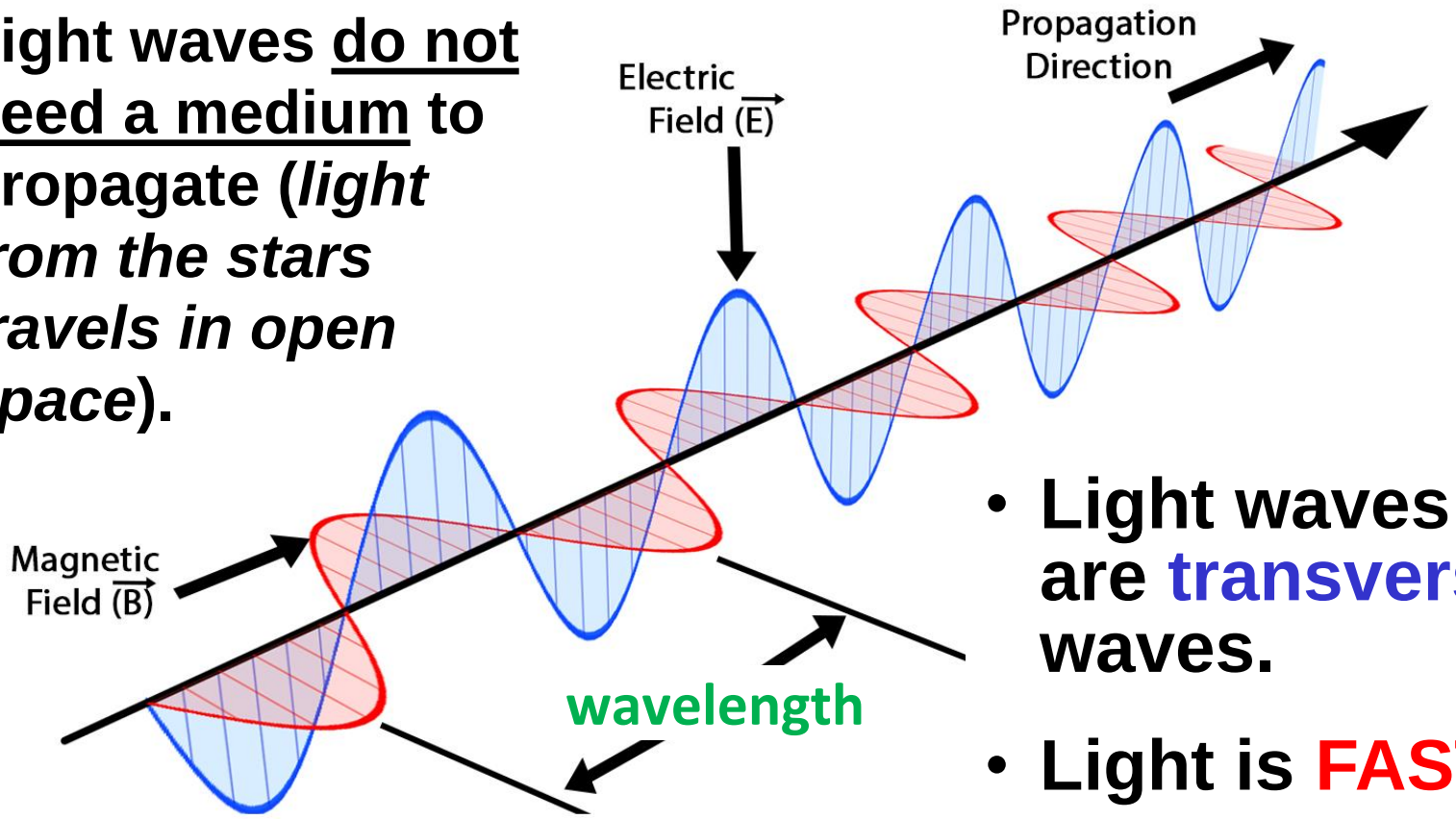


wave-like behavior

Light Waves

Light is an electromagnetic wave made of oscillations of *electric and magnetic field.*

- **Light waves do not need a medium to propagate (*light from the stars travels in open space*).**

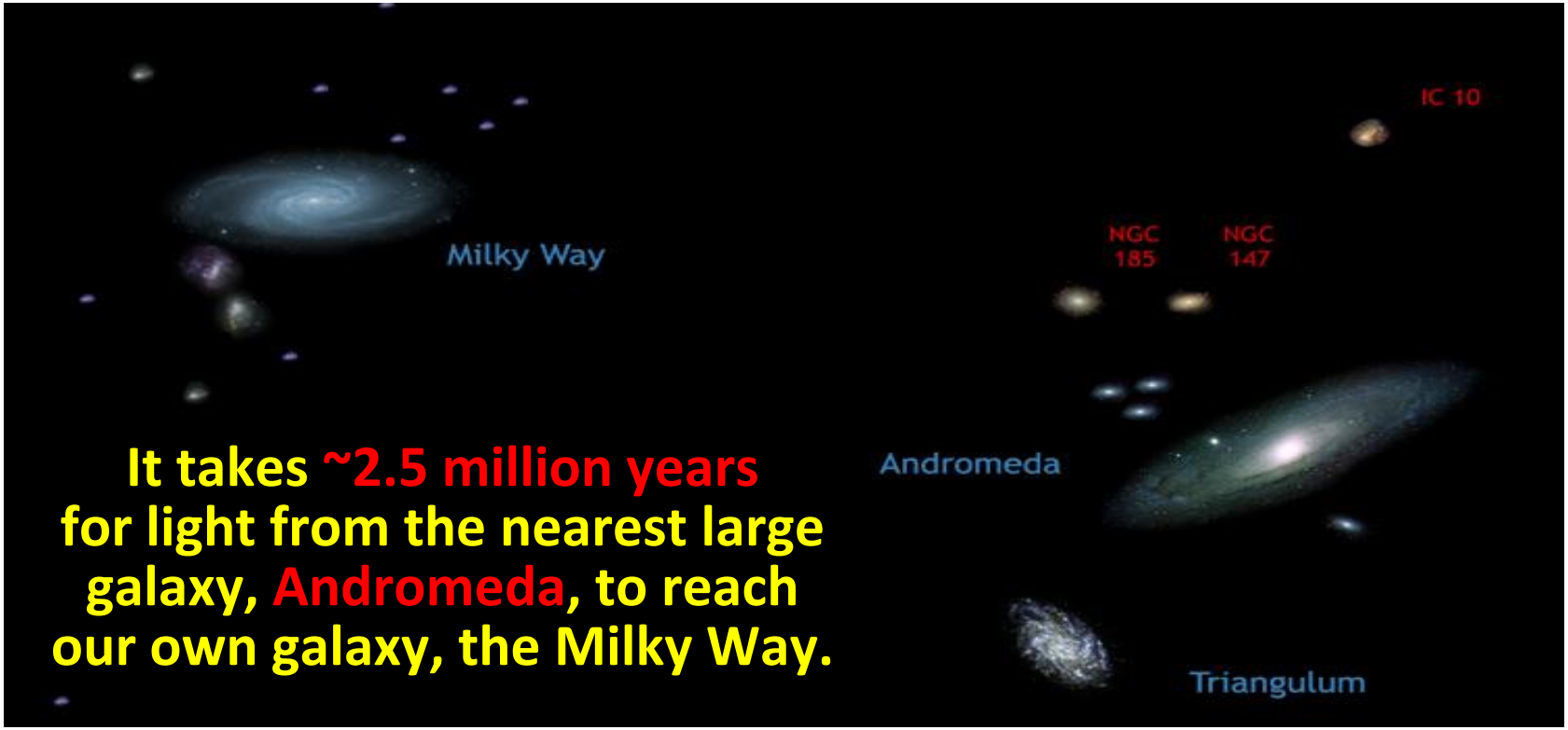


- **Light waves are transverse waves.**
- **Light is FAST!**

c = 299,792,458 m/s

Speed of Light – How Fast?

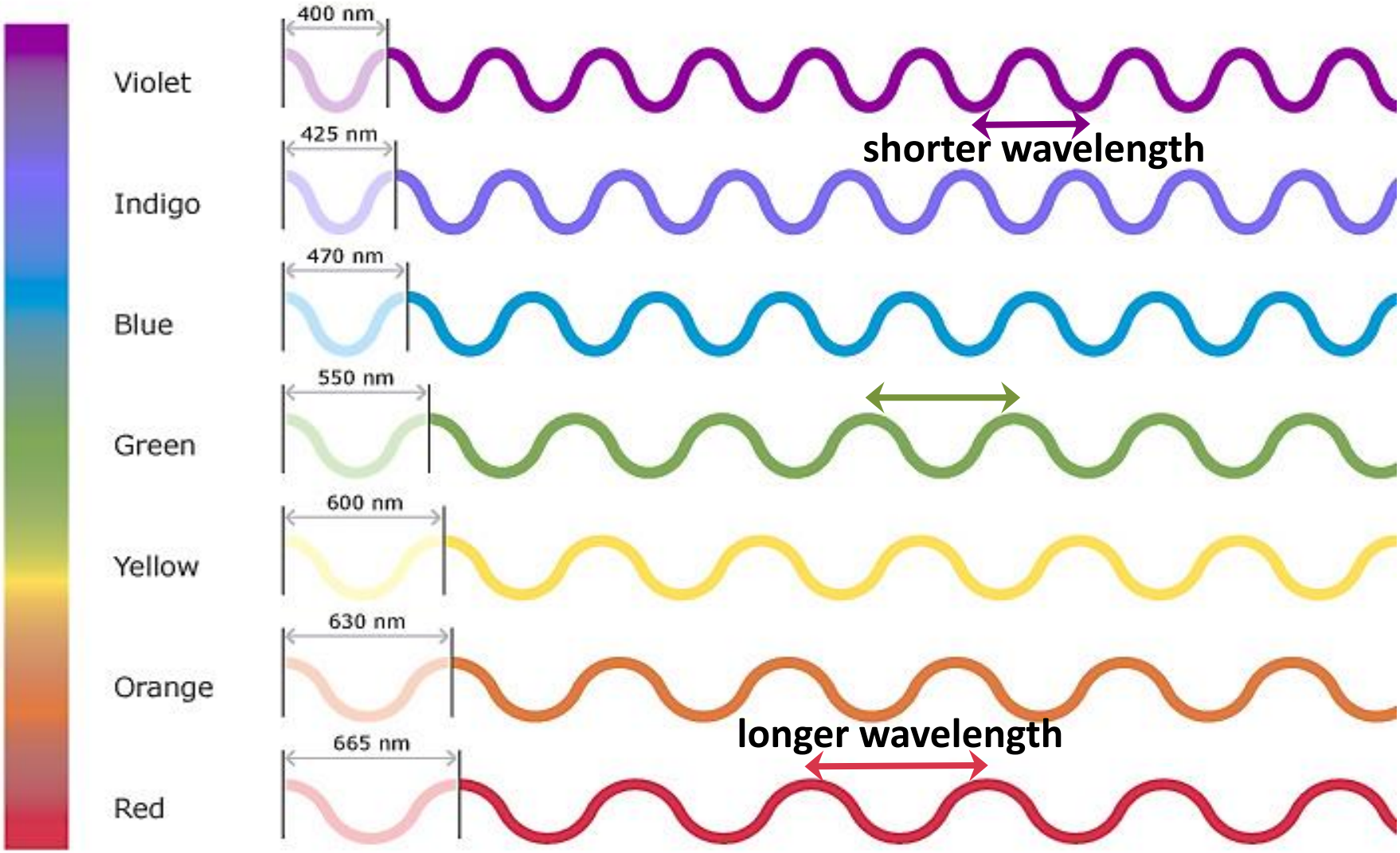
- It takes ~8 minutes for light to travel all the way from the Sun to the Earth.
- It takes ~ 4.4 years for light from the nearest star, Alpha Centauri, to reach the Earth.

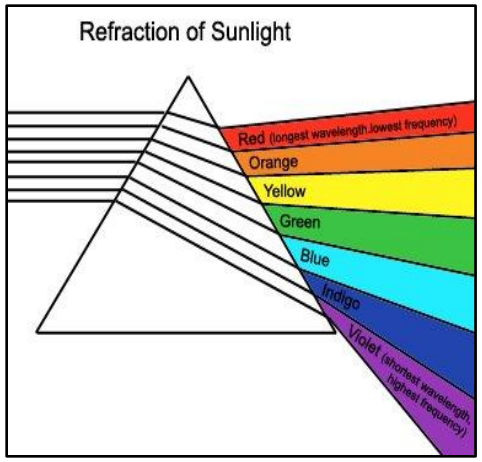


It takes ~2.5 million years for light from the nearest large galaxy, Andromeda, to reach our own galaxy, the Milky Way.

Light Waves: Color

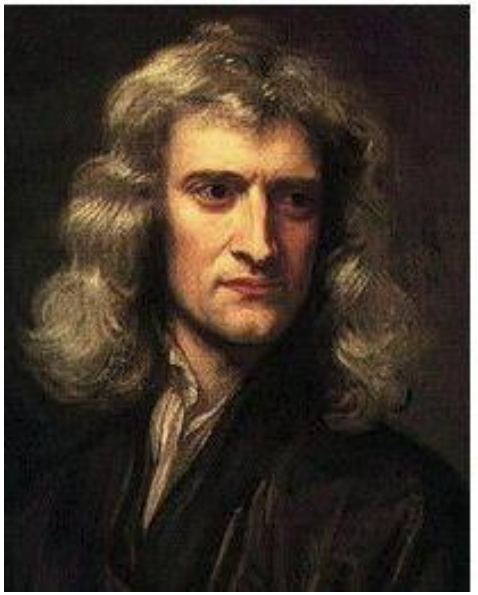
determined by the wavelength(s) of light waves





Decomposition of Sunlight

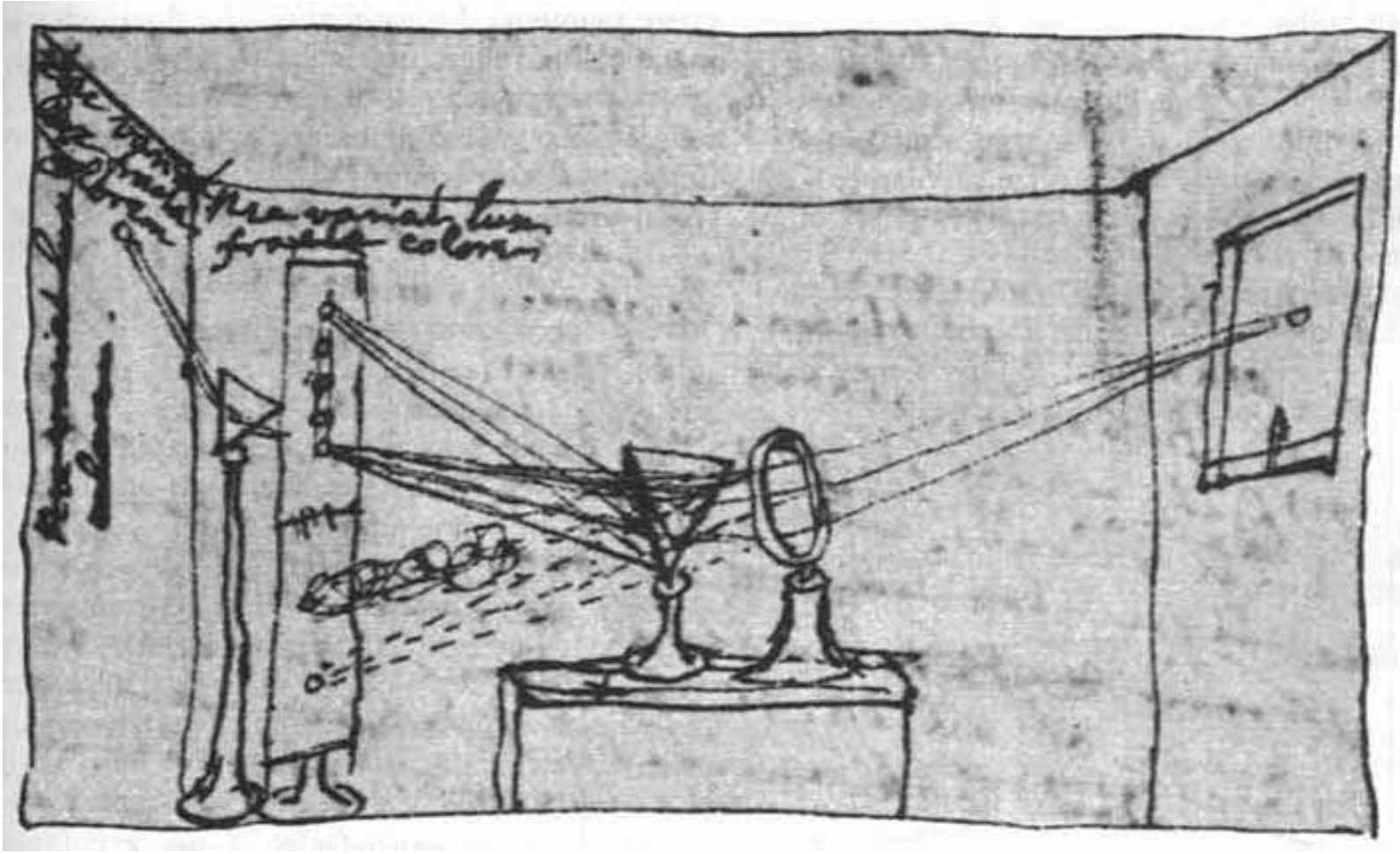
Isaac Newton, 1665



Common (Aristotle) wisdom:
white light is the purest form - colored light must therefore have been altered somehow…

- Newton **shined a beam of sunlight through a glass prism** and showed that it decomposed into a **spectrum** cast on the wall – therefore all the colors were together in the sunlight.
- He thought he then should be able to combine the colors of the spectrum and make the light white again: he placed another prism upside-down in front of the first prism. The band of colors combined again into white sunlight.
- Newton was the first to prove that **white light is made up of all the colors that we can see**.

A drawing 23 years old Isaac Newton made of the prism experiment he conducted in his dorm room in Cambridge.



The Prism Experiment