HERSCHEL PROJECT

Optics

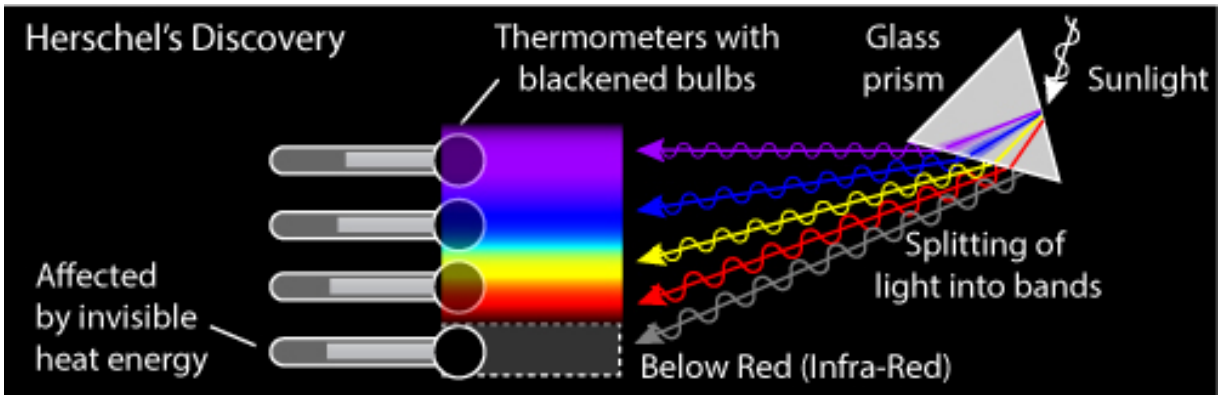
Optics is the branch of physics that studies the behavior and properties of light, including its interactions with matter and the construction of instruments that use or detect it. Optics usually describes the behavior of visible, ultraviolet, and infrared light.

The Optical Theory

Optical theory progressed in the mid-17th century with *treatises* written by philosopher *René Descartes*, which explained a variety of optical phenomena including reflection and refraction by assuming that light was emitted by objects which produced it. This differed substantially from the ancient Greek emission theory. In the late 1660s and early 1670s, Isaac Newton expanded Descartes' ideas into a corpuscle theory of light, famously determining that white light was a mix of colors which can be separated into its component parts with a prism.

The Herschel Experiment

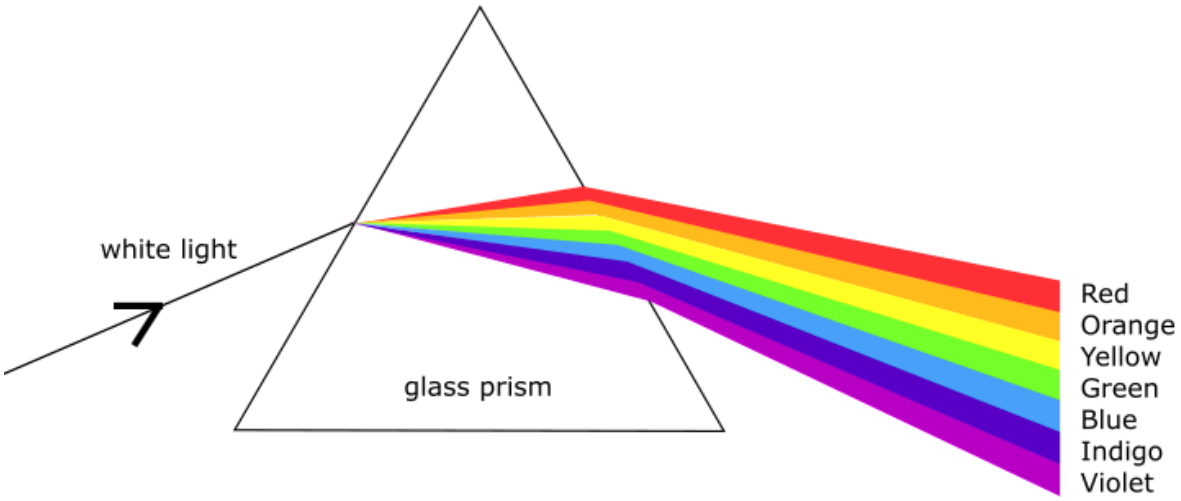
Herschel thought that the colors themselves might be of varying temperatures, so he devised a clever experiment to investigate his hypothesis. He directed sunlight through a glass prism to create a spectrum (the rainbow created when light is divided into its colors) and then measured the temperature of each color.



How the colors are produced

Sunlight is a mixture of many colors of light together. The sunlight seems white to our eyes, however this white light is a mixture of all the colors. The colors can be visualized separately using a prism. When the white light hits the surface of the prism, since the colors of light travel at different speeds, they get bent by different amounts and come out all spread out.

Violet travels the slowest so it is on the bottom and red, which travels the fastest, is on the top. This phenomenon takes place due to what is called **the index of refraction**. Slower moving waves have a relatively higher index of refraction, i.e. they bend more.



Snell's Law