



Herschel Discovers Infrared Light



Sir Frederick William Herschel (1738-1822) was born in Hanover, Germany and became well known as both a musician and as an astronomer. He moved to England in 1757 and, with his sister Caroline, constructed telescopes to survey the night sky. Their work resulted in several catalogs of double stars and nebulae. Herschel is famous for his discovery of the planet Uranus in 1781, the first new planet found since antiquity.

Herschel made another dramatic discovery in 1800. He wanted to know how much heat was passed through the different colored filters he used to observe sunlight. He noted that filters of different colors seemed to pass different amounts of heat. 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. Herschel used three thermometers with blackened bulbs (to better absorb heat) and, for each color of the spectrum, placed one bulb in a visible color while the other two were placed beyond the spectrum as control samples. As he measured the individual temperatures of the violet, blue, green, yellow, orange, and red light, he noticed that all of the colors had temperatures higher than the controls. Moreover, he found that the temperatures of the colors increased from the violet to the red part of the spectrum. After noticing this pattern Herschel decided to measure the temperature just *beyond* the red portion of the spectrum in a region where no sunlight was visible. To his surprise, he found that this region had the highest temperature of all.

Herschel performed additional experiments on what he called "calorific rays" (derived from the Latin word for *heat*) beyond the red portion of the spectrum. He found that they were reflected, refracted, absorbed and transmitted in a manner similar to visible light. What Herschel had discovered was a form of light (or radiation) beyond red light, now known as infrared radiation. [The prefix *infra* means below.] Herschel's experiment was important because it marked the first time that someone demonstrated that there were types of light that we cannot see with our eyes.