

## *It's all about the light*

I have become an avid amateur photographer. One lesson that is repeated over and over by the professionals is that photography is not about the objects being photographed but it is all about the light. Understanding the science of ozone is also “all about the light.” We will find that one of the features of ozone is its ability to absorb ultraviolet light. We need to understand what is ultraviolet light. To understand about ozone we must first understand the nature of sunlight in general.

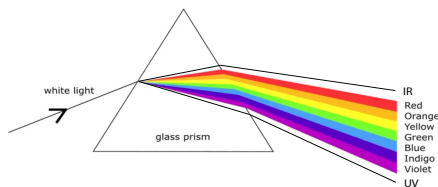


*Newton's Prism Experiment*

A good starting point for the development of the understanding of the makeup of the Sun's radiation is with Isaac Newton in the 17<sup>th</sup> century. He observed that a narrow beam of sunlight hitting a glass prism at an angle resulted in some reflected light and some light passing

through the glass and emerging on the other side. The sunlight emerging from the other side is in bands of differing colors. Newton was the first to use the word “spectrum” for this display of colors in his book entitled *Opticks*. The word spectrum comes from the latin for “appearance” or “apparition”. Newton hypothesized that light was made up of particles of different colors that moved with different speeds through a transparent medium like a prism. Newton's “corpuscular” view of radiation contrasted with the view that light is a wave. It was many years later that we came to see light as having both wave and particle properties.

In the early 19<sup>th</sup> century, the idea of the Sun's spectrum was expanded. The English physicist William Herschel, in 1800, was testing filters to help him to observe sunspots (darker areas on the Sun). By holding a thermometer behind the light passing through a prism, he observed the heat produced by the rays of sunlight falling on the thermometer. With a red filter, he found a lot of heat produced. When he held the thermometer a little beyond the red end of the spectrum, he also found heat to be produced resulting in an even higher temperature as measured by the thermometer. He concluded that there must be an



*Schematic of Newton Experiment Showing Extension into Infrared and Ultraviolet*

invisible form of light beyond the visible spectrum. This light eventually became known as infrared or IR radiation.

In the next year, 1801, a German chemist/physicist/philosopher named Johann Ritter examined the other end of the sunlight spectrum. He detected light of various colors by exposing a plate coated with silver chloride to the separated rays. They turned the silver chloride to metallic silver. When Ritter carried out his experiment he looked beyond the region where the violet struck his plate and discovered that there existed a portion of the Sun's spectrum beyond the violet that became known as the ultraviolet or UV radiation.

It is now clear that "visible" light is simply the radiation for which our human eyes have receptors for detection. The actual spectrum of light reaches far beyond our detection mechanism. We generally refer to the spectrum of light by wavelength; our eyes detect light between about 380 and 700 nanometers (from red to violet).