

Introduction to Light and Color

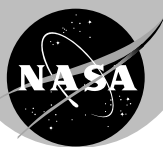
Introduction to Light

Light is a form of radiant energy or energy that travels in waves. Since Greek times, scientists have debated the nature of light. Physicists now recognize that light sometimes behaves like waves and, at other times, like particles. When moving from place to place, light acts like a system of waves. In empty space, light has a fixed speed and the wavelength can be measured. In the past 300 years, scientists have improved the way they measure the speed of light, and they have determined that it travels at nearly 299,792 kilometers, or 186,281 miles, per second.

When we talk about light, we usually mean any radiation that we can see. These wavelengths range from about $16/1,000,000$ of an inch to $32/1,000,000$ of an inch. There are other kinds of radiation such as ultraviolet light and infrared light, but their wavelengths are shorter or longer than the visible light wavelengths.

When light hits some form of matter, it behaves in different ways. When it strikes an opaque object, it makes a shadow, but light does bend around obstacles. The bending of light around edges or around small slits is called diffraction and makes patterns of bands or fringes.

All light can be traced to certain energy sources, like the Sun, an electric bulb, or a match, but most of what hits the eye is reflected light. When light strikes some materials, it is bounced off or reflected. If the material is not opaque, the light goes through it at a slower speed, and it is bent or refracted. Some light is absorbed into the material and changed into other forms of energy, usually heat energy. The light waves make the electrons in the materials vibrate and this kinetic energy or movement energy makes heat. Friction of the moving electrons makes heat.



Introduction to Color

Color is a part of the electromagnetic spectrum and has always existed, but the first explanation of color was provided by Sir Isaac Newton in 1666.

Newton passed a narrow beam of sunlight through a prism located in a dark room. Of course all the visible spectrum (red, orange, yellow, green, blue, indigo, and violet) was displayed on the white screen. People already knew that light passed through a prism would show a rainbow or visible spectrum, but Newton's experiments showed that different colors are bent through different angles. Newton also thought all colors can be found in white light, so he passed the light through a second prism. All the visible colors changed back to white light.

Light is the only source of color. The color of an object is seen because the object merely reflects, absorbs, and transmits one or more colors that make up light. The endless variety of color is caused by the interrelationship of three elements: Light, the source of color; the material and its response to color; and the eye, the perceiver of color.

Colors made by combining blue, yellow, and red light are called additive; and they are formed by adding varying degrees of intensity and amounts of these three colors. These primary colors of light are called cyan (blue-green), yellow, and magenta (blue-red).

Pigment color found in paint, dyes, or ink is formed by pigment molecules present in flowers, trees, and animals. The color is made by absorbing, or subtracting, certain parts of the spectrum and reflecting or transmitting the parts that remain. Each pigment molecule seems to have its own distinct characteristic way of reflecting, absorbing, or transmitting certain wavelengths. Natural and manmade colors all follow the same natural laws.

