WHAT IS LIGHT?

Light is easy to see but difficult to describe. It is a form of energy called electromagnetic (EM) radiation, which consists of ripples, or waves, of electricity and magnetism combined. As well as light, there are many other types of electromagnetic radiation, including radio waves, microwaves, infrared waves, ultraviolet rays, X rays and gamma rays. Together, they form the electromagnetic spectrum. All the waves in the spectrum travel in the same way and at the same speed. But they differ in their wavelengths and frequencies, from long, low-frequency radio waves to incredibly short, high-frequency gamma rays.

Light for our world

Our main light source is the Sun, a vast, glowing, 5-billion-year-old ball of burning hydrogen and helium gas 150 million kilometers (93 million miles) away. Sunlight is vital to life on Earth. Without it, there would be no plant life, because plants fuel their growth by capturing the energy of sunlight in a process called photosynthesis. And without plants, there would be no animal life, because all animals feed either on plants or on other animals that are plant-eaters.

Nuclear reactions at the center of the Sun produce vast amounts of gamma-ray energy. By the time this energy reaches the surface, it has mostly changed to heat and light, which travels out into space. Some of it reaches the Earth.

A lighthouse beam flashes on and off to warn ships and boats about rocks, cliffs, and dangerous waters.

Light production

The production of light by hot objects—such as the Sun’s surface, a burning candle or a glowing wire—is called incandescence. Some substances absorb light or other energy briefly and then give it out again as light without getting hot. This is called fluorescence. Fluorescent chemicals are used in detergents to make clothes look brighter. Other substances, such as glow-in-the-dark paints, absorb light or other energy and gradually release it as light over a longer period. This is called phosphorescence.

Animal light

Some animals are bioluminescent, which means that they can produce their own light. These creatures include deep-sea fish, such as anglerfish, lantern fish, and flashlight fish, and certain sponges, shrimps, jellyfish, and coral animals. On land there are fireflies, cave insects, even shining slugs. The light is usually used to attract mates or to lure prey. There are also types of fungi that glow, such as foxfire.

FACT FILE

POLARIZED LIGHT

In ordinary light, the waves vibrate in many different directions, but in polarized light, all the waves vibrate in the same direction. A polarization filter makes unpolarized light into polarized light by allowing waves that vibrate in only one direction to pass through it. Polarizing filters are used in sunglasses to reduce glare.

The polarizing filter stops all waves of light except those vibrating in a certain direction.

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HISTORY FILE

LIGHTING OUR WAY

- c. 500,000 BC: people first tamed fire for light, warmth, and cooking.
- c. 13,000 BC: oil lamps were first used.
- c. 1000 BC: wax candles lit Greek and Roman dwellings.
- c. AD 1800: lamps fueled by natural gas were used to light city streets.
- 1808: arc lights, which use electric sparks to make an intense light, were invented.
- 1879: the electric filament bulb, which heats a wire so it glows, was developed by Thomas Edison (1847–1931) in the U.S. and Joseph Swan (1828–1914) in England.
- 1930s: the fluorescent tube, developed in the 1890s by French physicist Antoine Henri Becquerel (1852–1908), became widespread. It produces light by passing electricity through a gas.
- 1950s: bright colored neon lights for advertising became common. Like fluorescent tubes, they use electricity to make a gas glow with light.
- 1980s: compact fluorescent bulbs, which use less electricity than filament bulbs, became available as low-cost electric lights.

Fireflies, actually types of beetles, show as faint green streaks of light.

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