



SCIENCE OVERVIEW

We are a star-powered planet, and our star, the primary source of energy on Earth, is the Sun. Objects on Earth absorb some of that energy, and reflect or radiate away the rest. Light and heat are just two forms of energy or radiation emitted by the Sun. The word “radiation” is just a way to describe how energy is transmitted through space and through air.

Visible light is a form of energy to which our eyes are sensitive. Here on Earth, visible light is usually produced when material is heated so that it glows. For example, in a regular light bulb, electricity flowing through a filament in the bulb heats it up and causes it to glow. As a result, light and heat are produced.

The Sun, too, produces light, but this energy is caused by nuclear reactions deep within the Sun. The Sun is really just a mass of hot gasses that explode in a way similar to a nuclear bomb. However, in the Sun, the explosions have been going on for five billion years and are expected to continue for another five billion!

Visible light is only one kind of solar radiation (energy produced by the Sun). Other forms include gamma, X-rays, ultraviolet (UV), infrared and radio waves. We cannot see these forms of energy (though some animals can see a little infrared), but we have other ways of detecting their presence. For example, if we stay outdoors too long, we might get a sunburn, which is caused by the Sun’s ultraviolet (UV) energy. We can also use instruments to measure the presence of such invisible forms of energy. This lesson will use UV Detection Beads which change color in the presence of UV radiation.

Only some of the Sun’s energy reaches us on the Earth. Much of it is stopped by the Earth’s atmosphere. For example, most UV energy is absorbed by ozone in the upper atmosphere, but some of it still gets through. The UV energy that passes through the Earth’s atmosphere can not only harm us by burning our skin, but it can cause other problems such as skin cancer and damage to our eyes.

The amount of Sun’s energy (including the harmful ultraviolet) arriving at the Earth’s surface depends on several things:

- How many clouds are overhead and how thick and dark they are. How cloudy is it? (though remember that you can get sunburned even if it is cloudy!)
- The altitude. How high up from the sea level are you?
- The amount of humidity. How much water vapor is in the air?
- How much dust and dirt is in the air?

These factors determine how much light there is on the ground for us to see, but also how much invisible energy is present. The question of invisible forms of the Sun’s energy is important especially for spacecraft, because they fly outside of the Earth’s protective atmosphere, and are more subject to their very dangerous effects.

