Section 3: The EM Spectrum and Infrared Light

Light has a wide range of energies—some light has higher energy than other types of light. Think about looking at the light from a rainbow. The blue light that you see has higher energy than the red light. Our eyes can only detect, or see, a very small portion of the total range of energies of light that comes from the Sun. **Visible light** is the name for this small range of energies that our eyes can see. Other energies are too high or too low for us to see with our eyes. The entire range of energies of light includes visible light and others that may be familiar to you. Your classmates will teach you about some of these other energies of light later. Your responsibility is to learn about infrared light—light you cannot see. The complete range of light energies—the ones we can see and the ones we cannot see—is called the **electromagnetic spectrum**, or **EM spectrum** (figure 2.12). The Sun emits all of these energies of light. So when you say "sunlight," it means much more than just the light we can see!

Light can travel through empty space or through matter like a lens or plastic wrap. Light energy travels from the Sun to Earth by a process called **radiation**. Radiation is the process in which energy travels from a source to another object.

Look at figure 2.12 and see which energies of light you will learn about in this activity. **Infrared radiation**, or IR, has energies that are lower than visible light. This type of radiation has energies that are too low for our eyes to detect—without help. You may have heard of night vision goggles. These goggles help us see infrared radiation by converting the infrared energies to energies that we can see. There is also special film that is sensitive to IR. The goggles and film help us "see" in the dark by detecting infrared radiation coming from objects. The source of the infrared radiation is the thermal energy of bodies, plants, and even buildings. If there is more IR coming from the object, it is warmer and it appears brighter using the special goggles or film (figure 2.16).

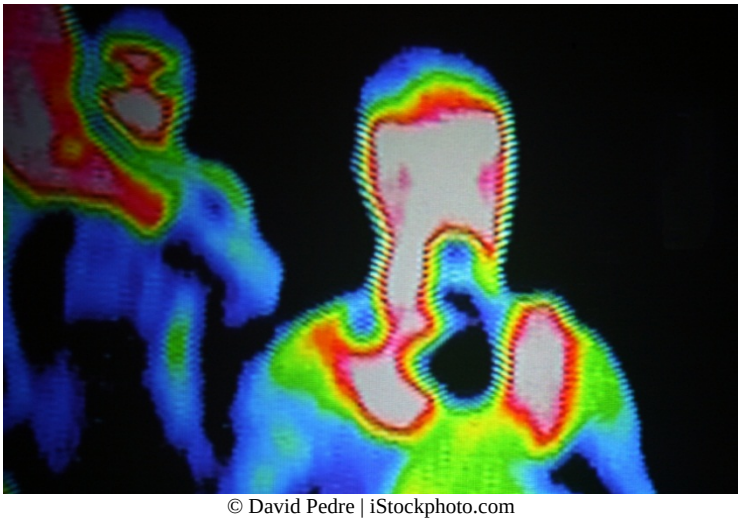

Figure 2.16: Infrared radiation (IR). IR makes the images on this special film. Humans cannot see IR because the energy of this radiation is outside the range that our eyes can detect. Is IR higher or lower energy than visible light?

Being able to “see” at night using specialized goggles is exciting. However, there are organisms that do not need this specialized technology to see IR. While human eyes cannot directly see IR, pit vipers can. They have a specialized organ under their eyes to help them detect IR. This helps snakes like the western diamondback rattlesnake (figure 2.17) locate their prey. They can detect a warm-blooded mouse running through grass because of the difference in temperature between the mouse and the grass. But don’t think only warm objects emit IR. All objects emit IR, just in different amounts. That means you emit IR, and even a snowman emits IR!

Figure 2.17: Western diamondback rattlesnake. These types of snakes (pit vipers) have a small membrane on their heads to detect very small changes in IR. They use this ability to detect predators and prey.