To See or Not to See—It's an Energy Question

For the complete video with media resources, visit:
http://www.nationalgeographic.org/media/infrared-vision/

Program

Energy in the form of light waves travels within and beyond the solar system and makes life on Earth possible. Light waves occur along an electromagnetic spectrum according to their wavelengths and energy. The human eye can only see visible light waves. Infrared light has longer wavelengths and lower energy than visible light and cannot be seen with the human eye. Mosquitoes, vampire bats, bed bugs, and some snake and beetle species, however, can use portions of the infrared spectrum for vision. Sometimes humans can “see” infrared energy in the form of heat. Sitting near a campfire is an example of experiencing visible light as color and infrared light as heat.

Most forms of infrared energy can be seen and measured only with the use of specialized equipment, such as infrared cameras and telescopes or night-vision goggles. These technologies use infrared waves to measure the heat released, or radiated, by an object. As the temperature of an object increases, the movement of its atoms increases and the object radiates more infrared energy. The infrared energy radiated by the object can be detected and then converted into an electronic signal used to produce a visual or thermal image.
Scientists use infrared imaging technologies in a wide range of applications. To name just a few: Earth-observing satellites study changes in land and sea surface temperatures, night-vision cameras monitor nocturnal animal behavior, telescopes detect cooler and more distant objects in the universe, and satellites monitor location and intensity of lava flows and forest fires.

**Fast Facts**

- Infrared light was first discovered during a prism experiment conducted by Sir Frederick William Herschel in 1800.
- Infrared energy is emitted from any object with a temperature above absolute zero (-273.15 degrees Celsius or -459.67 degrees Fahrenheit or 0 degrees Kelvin).
- Radio waves have longer wavelengths and lower energy than infrared waves. Radio waves are used to transmit information through electronic devices including cell phones, radios, and televisions.

**Articles & Profiles**

- [National Geographic Magazine: Power of Light](#)

**Video**

- [National Geographic: Known Universe – Emitting Light](#)

**Websites**

- [Caltech Infrared Processing and Analysis Center: Cool Cosmos – Infrared](#)

**Funder**

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