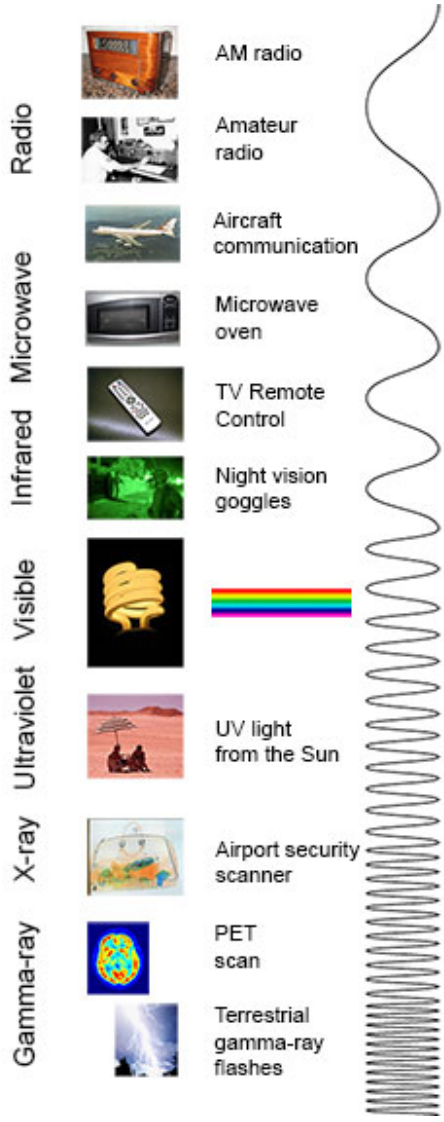
UV Kid!

Facilitator Background Information

Visible light is part of the spectrum of energy — or radiation — our Sun provides. Our Sun also produces other types of energy that we can't see. Radio waves, microwaves, ultraviolet (UV) rays, X-rays, and gamma-rays are all parts of the spectrum of electromagnetic energy — or radiation — from the Sun.

Radio waves, microwaves, visible light, and infrared radiation have relatively long wavelengths and low energy. Ultraviolet rays, X-rays, and gamma-rays have shorter wavelengths and higher energy. These shorter wavelengths are so small that these types of radiation interact with human skin, and cells, and even parts of cells — for good or for bad!

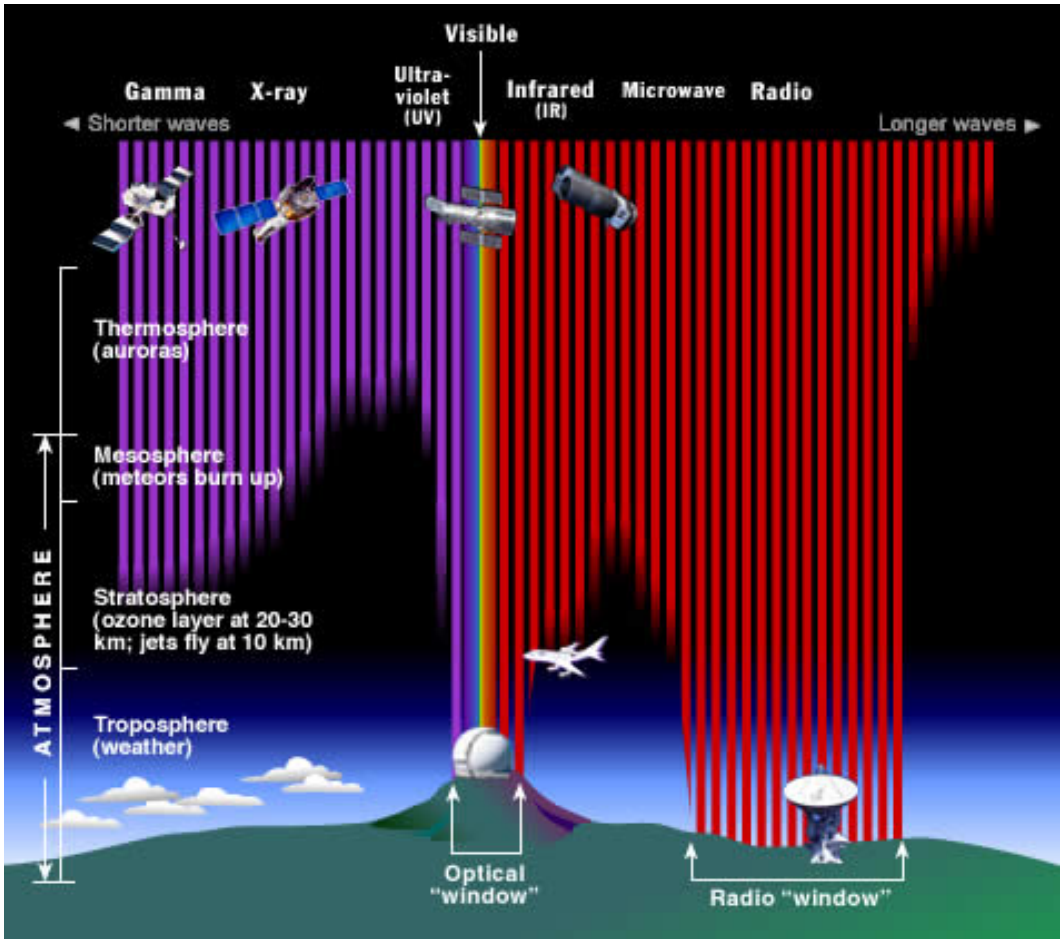
Our Sun also produces cosmic radiation. Cosmic rays are very-high-energy, fast-moving particles (protons, electrons, and neutrinos) that can damage DNA, increasing the risk of cancer and causing other health issues. Cosmic rays have such high energy that it is difficult to design shielding that blocks them. Cosmic rays do not only come from our Sun, but from other places in our galaxy and universe. Earth's magnetic field extends into space beyond the atmosphere, and provides some protection to astronauts aboard the International Space Station from cosmic rays.



From low-energy radio waves (shown at the top) to high-energy X-rays and gamma rays (shown at the bottom), we encounter different parts of the electromagnetic spectrum in our daily lives.

Credit: NASA

Earth's atmosphere protects us from most of the high-energy cosmic, gamma, and X-ray radiation — and much of the UV portion of the spectrum (UVB and UVC). Some UV radiation still gets through the atmosphere (UVA and a bit of UVB). Humans need UV radiation because our skin uses it to manufacture vitamin D, which is vital to maintaining healthy bones. About 10 minutes of Sun each day allows our skin to make the recommended amount of vitamin D. However, too much exposure to UV causes the skin to burn and leads to wrinkled and patchy skin, skin cancer, and eye damage. We can protect ourselves by covering up, limiting our time in the Sun, and using sunscreen.



Earth's atmosphere prevents high-energy gamma and X-rays, as well as much of the UV portion of the spectrum, from reaching the ground. As this illustration shows, only some UV radiation, visible light, and some radio waves reach Earth's surface. Other types of radiation reach various levels of Earth's atmosphere before they are blocked.

Credit: Space Telescope Science Institute/John Hopkins University/NASA

In space there is no atmosphere to protect astronauts from UV radiation — or from X-rays and gamma rays, or cosmic rays. Astronauts have to provide their own protection in the form of space suits and spacecraft. They work in spacecraft that have special shielding, wear special suits when they work outside of the spacecraft, and even have special visors to protect their eyes. NASA tests different materials and coatings for spacecraft and space suits to protect the astronauts. These measures work very well for protecting against UV radiation, but the higher-energy radiation is not completely blocked. Even with protective shielding, astronauts onboard the International Space Station receive a *daily* dosage of radiation equal to about eight chest X-rays! Astronauts wear instruments, called dosimeters, that monitor how much radiation each of them has received. Once they reach certain levels, they do not continue to work in space.