Do Astronauts Get SUNBURNED?

With no protection, an astronaut in space would be sunburned in just seconds.

Imagine standing on a beach watching the waves come in to shore. Step into the water and you can feel each wave hit your legs. While you stand there, other waves are hitting you, too. They are waves that come from the sun and they are called electromagnetic waves. Like all waves, electromagnetic waves carry energy. While water waves can only travel through matter, electromagnetic waves can also travel through a vacuum, or a place without matter. Much of space is a vacuum.

When astronauts go into space, they must wear space suits, complete with gloves and helmets, to survive in the vacuum. Inside their space suits they have oxygen to breathe. Space suits also protect them from the energy of the sun's electromagnetic waves.

Before You Read

FEEL THE BURN Have you ever been sunburned? Where were you? Do you remember what the weather was like? What time of year was it? What time of day? Do you remember what you were wearing? Write about your experience.

Read

What would happen if an astronaut took off a glove during a space walk? Here's how physics professor Philip Plait answered that question.

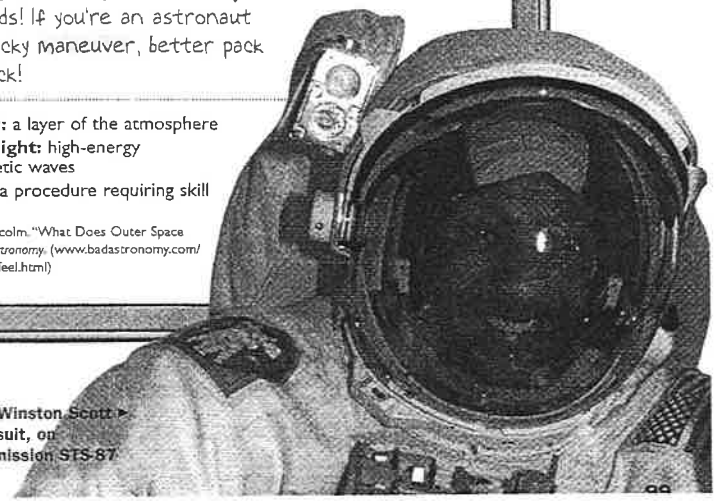
WHAT DOES OUTER SPACE FEEL LIKE?

Space doesn't feel like anything, because there is nothing to feel! Space is a vacuum (or near enough). It's a common question to ask how hot space is (or how cold), but space itself has no temperature. However, the Sun is hot, and [it gives off that energy in the form of electromagnetic waves]. You [or any other object] absorb [some of] that [energy] and feel heat. Near the Earth, a person floating in space would...not receive enough [heat energy] to keep from freezing! You yourself would radiate away your heat, and that's why spacesuits have heaters in them...

Surprisingly, the worst thing that might happen [if you took off your glove] is that you'd get a bad sunburn. Without the Earth's protective ozone layer between you and the raw sunlight, the ultraviolet light from the Sun could give you a nasty sunburn in just a few seconds! If you're an astronaut doing a tricky maneuver, better pack the sunblock!

ozone layer: a layer of the atmosphere
ultraviolet light: high-energy electromagnetic waves
maneuver: a procedure requiring skill

From: Guess, Malcolm. "What Does Outer Space Feel Like?" *Bad Astronomy*. (www.badastronomy.com/mad/1999/space_feel.html)



Astronaut Winston Scott ▶ in a spacesuit, on Columbia mission STS-87

NOTEZONE

Underline the type of electromagnetic waves that can give you a sunburn.

Circle what protects you from electromagnetic waves when you are on Earth.

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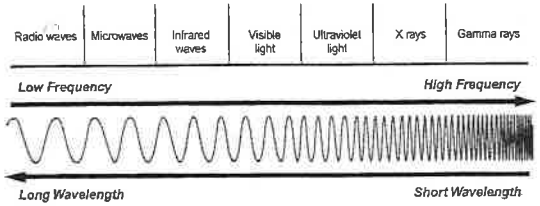
INTERPRET A DIAGRAM The diagram shows all the types of electromagnetic waves given off by the sun. The waves are in the order of their frequencies, starting with the lower frequencies at the left. Remember, frequency is the measure of how many waves pass by a point each second.



The higher the frequency of the waves, the more energy they carry. The more energy a wave carries, the more dangerous it is to living things. Luckily, the atmosphere protects Earth from most high-energy waves. You read that a layer of ozone in the atmosphere protects us from most of the ultraviolet light from the sun. But some ultraviolet light still gets through.

► ***Why might ultraviolet light waves cause sunburn when visible light waves do not?***

WHICH WAVES ARE SAFE? All the electromagnetic waves shown in the diagram above are given off by sources other than the sun as well. Radios and microwave ovens are common household objects. Infrared heat lamps are used in restaurants to keep food warm. Every room at home has at least one light bulb that gives off visible light. Ultraviolet lamps are sometimes used at amusement parks to give a Day-Glo effect. Other types of electromagnetic waves are used only by trained professionals. X rays are used by doctors to create pictures of the body. Gamma rays are used in hospitals to sterilize medical equipment.

► ***Mark each type of electromagnetic wave shown on the diagram above. Use an "E" to label the types that can be used by everyone. Use an "S" to label the types that require special training.***

► ***How are the frequencies of the waves related to who can use them? Why do you think this is?***

Propose Explanations

ULTRAVIOLET WAVES AND SKIN Scientists have discovered a direct connection between exposure to ultraviolet light and certain kinds of skin damage. Scientists don't know exactly how ultraviolet light damages skin. What they do know is that the energy of these waves causes chemical reactions inside skin cells. These reactions probably release substances that damage the cell. The result of too much ultraviolet light is sunburn, deep wrinkles, thickened skin, brown spots, and possibly skin cancer. In addition to damaging skin, ultraviolet light can cause damage to the eyes.

One way to protect yourself from sunburn is to use sunblock or sunscreen. These contain substances that either absorb or reflect ultraviolet wavelengths. Either action prevents most (but not all) of the damaging waves from reaching your skin.

► ***Professor Plait suggests that an astronaut's skin could be protected from sunburn by a sunblock. Why might sunblock not be enough to prevent sunburn out in space?***

► ***What jobs here on Earth might expose people to more skin and eye damage than usual? (Hint: Damage is not only caused by lack of protection, but by spending long periods of time in bright sunlight.)***