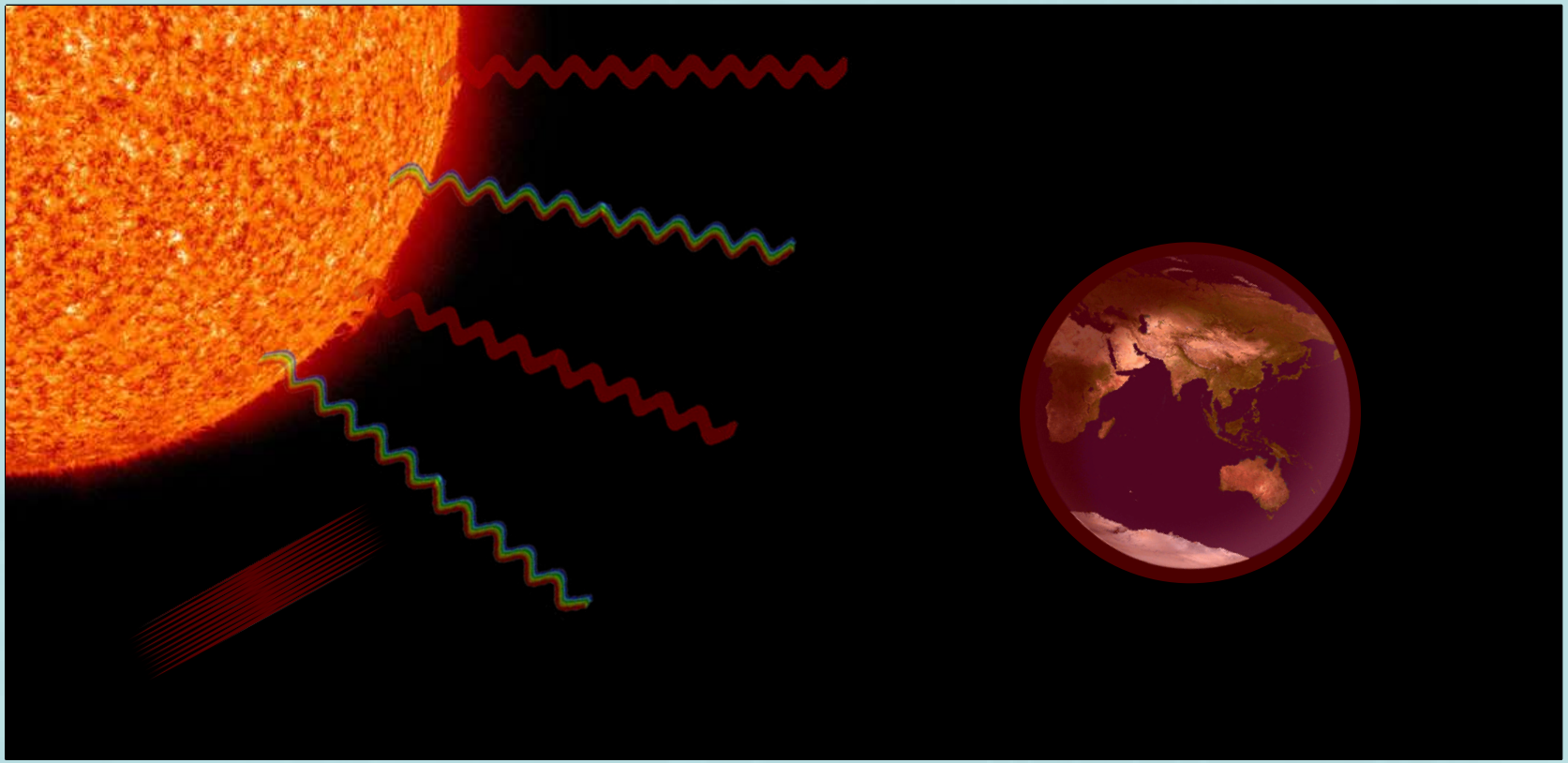
Impact of the Sun's Energy



In this presentation you will:

- explore the impact of the Sun's energy

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Introduction

The Sun is the major source of energy on Earth.

Without heat and light from the Sun, there could be no life on this planet.

As well as supporting life, the Sun also provides energy for wind, ocean currents, and the water cycle.

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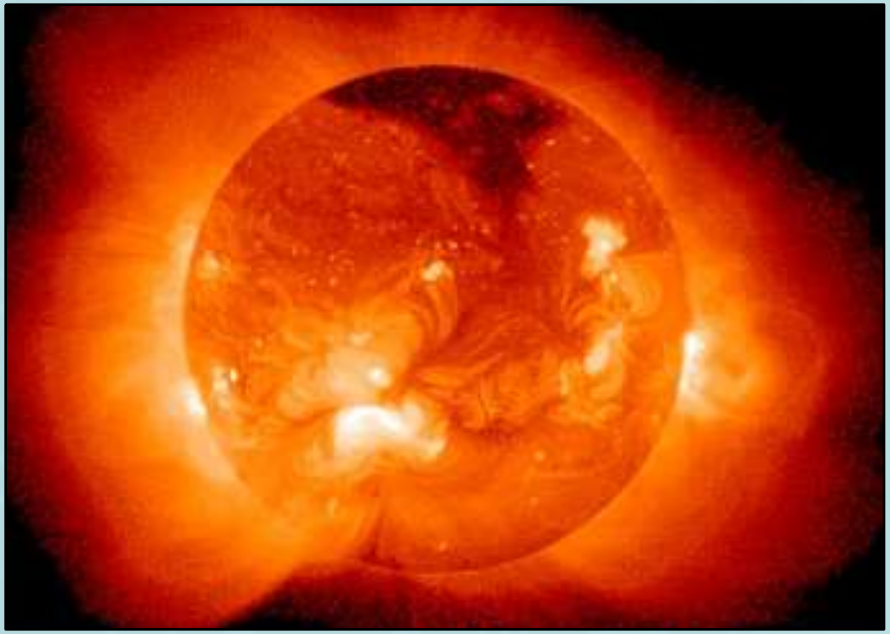
The Sun's Energy

The surface of the Sun has a temperature of around 5,500 °C. The temperature in the Sun's core is around 15,000,000 °C.



The intense heat and light of the Sun comes from hydrogen atoms in the Sun's core fusing together to form new helium atoms.

This process is called nuclear fusion and produces an enormous amount of energy.

In about 5 billion years, the hydrogen that powers the Sun will start to run out.

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Question 1

Where does the Sun's energy come from?

A) Helium atoms fusing together to become hydrogen atoms

B) The nuclear fusion of hydrogen atoms in the Sun's core

C) The breaking up of hydrogen atoms in the Sun

D) The mixing of hydrogen and helium atoms at the Sun’s surface

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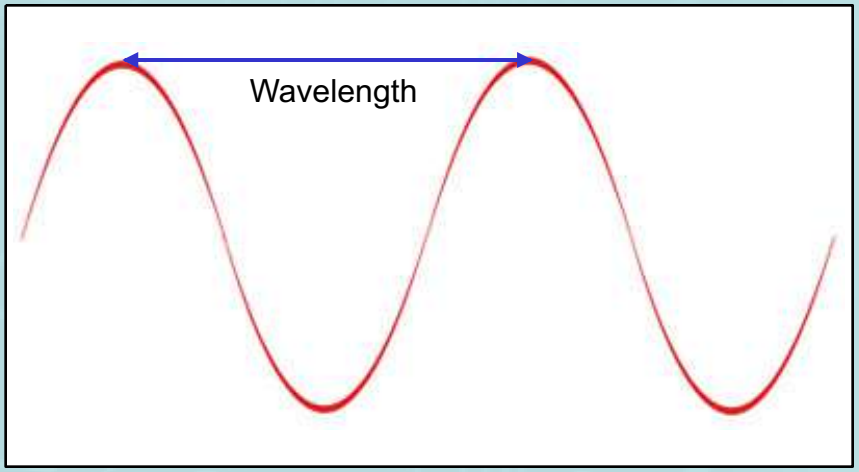
Transfer of Energy

Energy from the Sun travels to Earth in waves.

All waves have a wavelength that is the distance between two identical points of a wave.



The Sun emits energy at different wavelengths. These are grouped into the following ranges:

- Infrared radiation (heat)
- Visible light
- Ultra-violet light

Infrared radiation has a longer wavelength than visible light, which has a longer wavelength than ultra-violet light.

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Transfer of Energy

The Sun loses energy when it transmits light and heat.

There are three ways in which energy could be transmitted:

- Radiation
- Conduction
- Convection

However, energy is only transmitted from the Sun to the Earth by the process of radiation.

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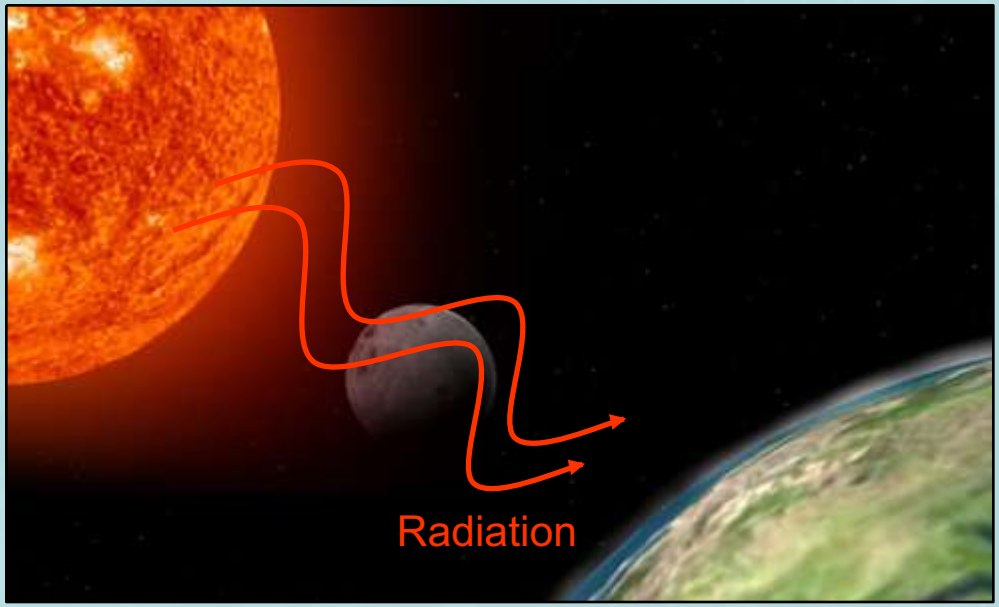
Radiation



Radiation is the mechanism for transfer of energy from the Sun to the Earth because radiation can pass through a vacuum.

Neither conduction nor convection can travel through a vacuum. A vacuum is where no substance exists.

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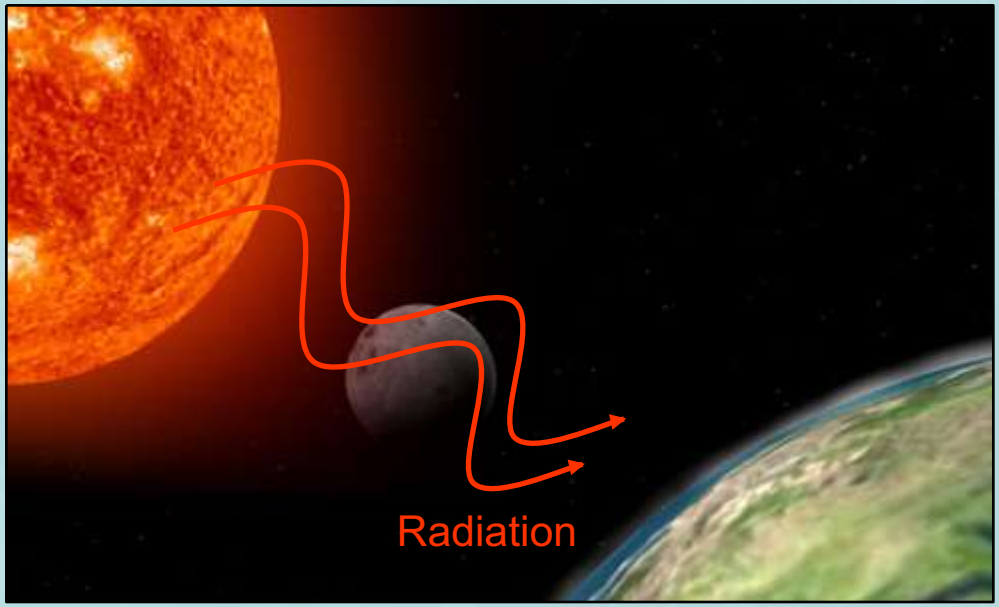
Radiation



All wavelengths of radiation are transferred directly from the Sun to the Earth, traveling through the empty space between the two bodies.

Once the Sun's energy reaches Earth, it travels through different materials by conduction, convection, and radiation. It can be absorbed by any material it passes through, raising its temperature.

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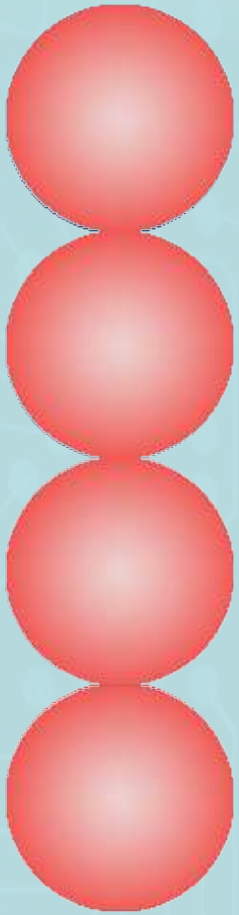
Conduction

Conduction is the transfer of energy through a material. This material is usually a solid, although conduction also occurs in fluids.



The energy increases the vibration of particles and is passed from particle to particle. Other than vibrating, the particles do not have to move to transfer the energy.

Materials that are good at transferring energy are called good conductors. Materials that are poor conductors are called insulators.

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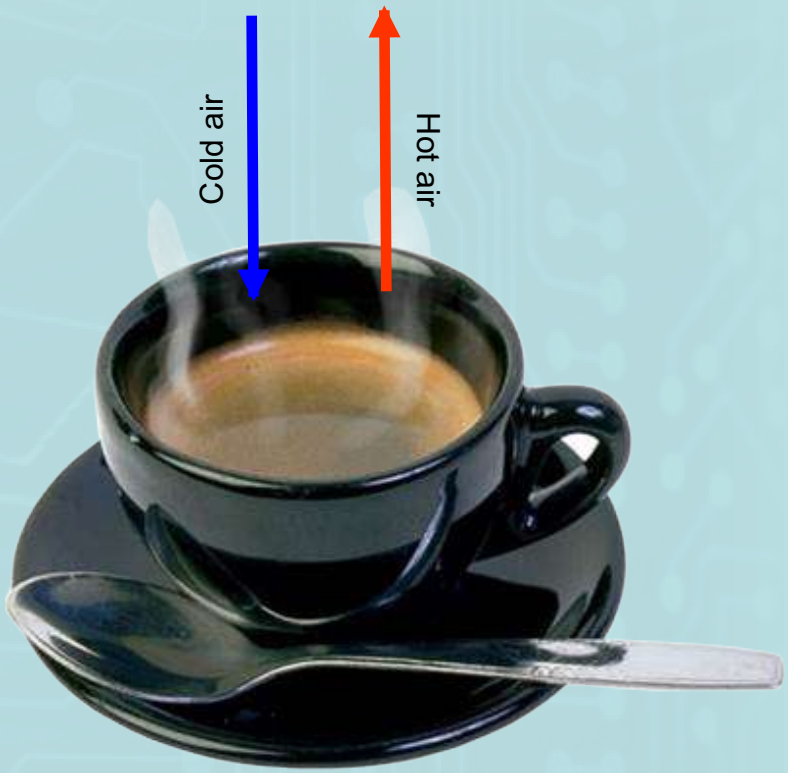
Convection

In a fluid material (a liquid or gas), energy transfers mainly by convection.

Increasing energy causes the density of a fluid to decrease. This in turn causes particles in the fluid to move upward, carrying the energy from one place to another in a convection current.

An example of this is the movement of air in a heated room. The air carries the heat upward while the cold air moves down to replace it. This is why your feet may feel cold even if the rest of the room is warm.



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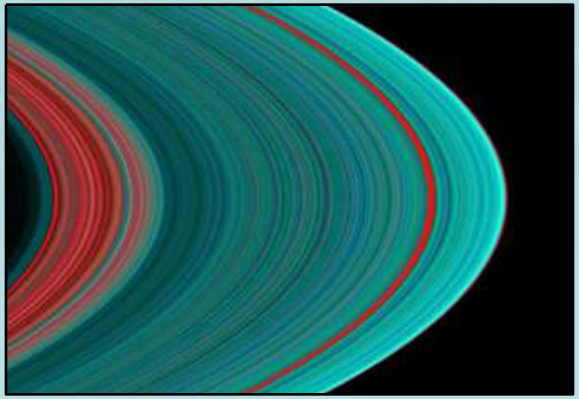
Uses of Radiated Energy

The different types of energy emitted by the Sun have various uses:

- Infrared radiation – all objects emit infrared radiation that can be detected even if there is no visible light
- Visible light – light that can be seen by the human eye
- Ultra-violet – damaging to living things but can be used for sterilization and disinfection



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Question 2

“The Sun loses energy when it transmits light.”

Is this statement true or false?

Next >

Question 2

“The Sun loses energy when it transmits light.”

Is this statement true or false?

True

Next >

Question 3

What is the term that describes the transfer of energy through a material, without the movement of particles from one place to another?

A) Radiation

B) Convection

C) Conduction

Next >

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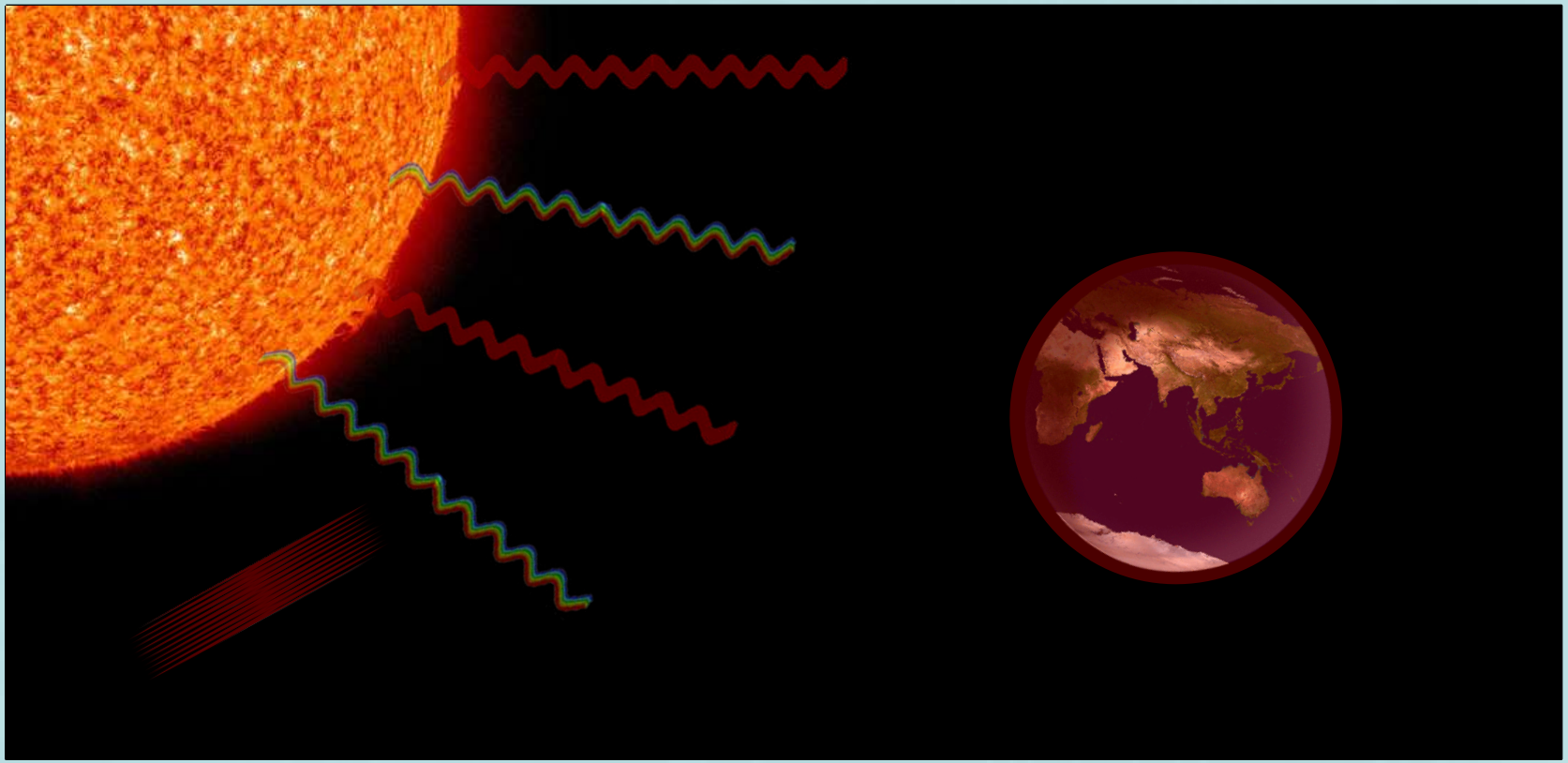
Life on Earth



Energy from the Sun supports almost all life on Earth.

Not only does the Sun heat the Earth to a temperature that enables life, it also provides food for living things.

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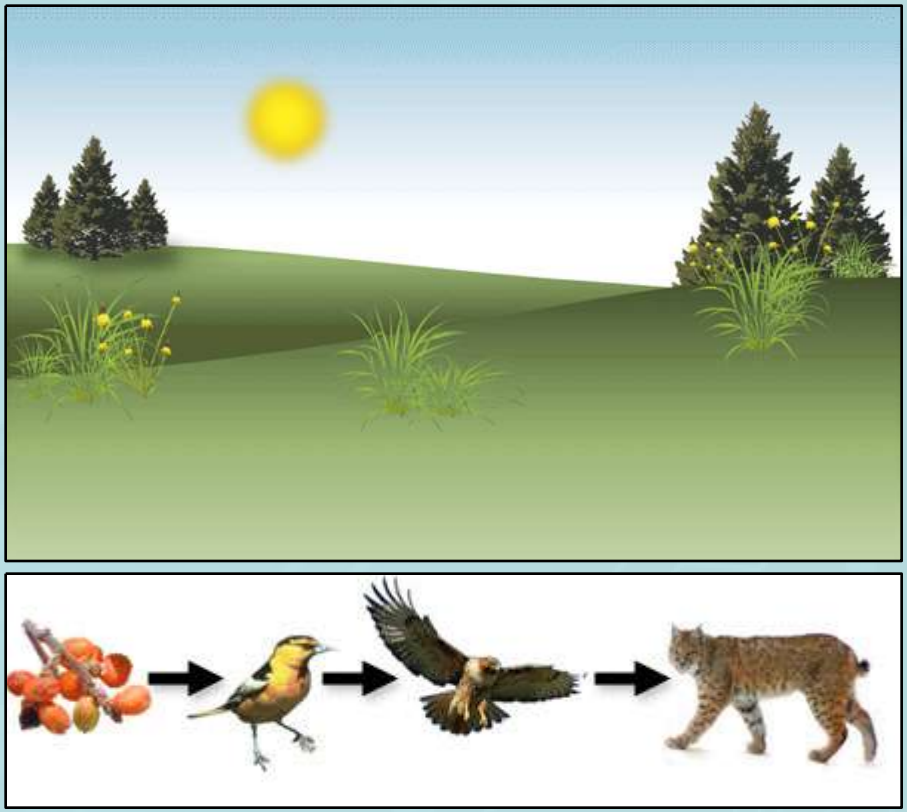
Life on Earth



Plants make their own food by absorbing energy from the Sun (sunlight) through their leaves in a process called photosynthesis.

Part of this energy is passed on to the animals and insects that feed on the plants.

If these animals are then eaten by other animals, the energy is passed on in the same way.

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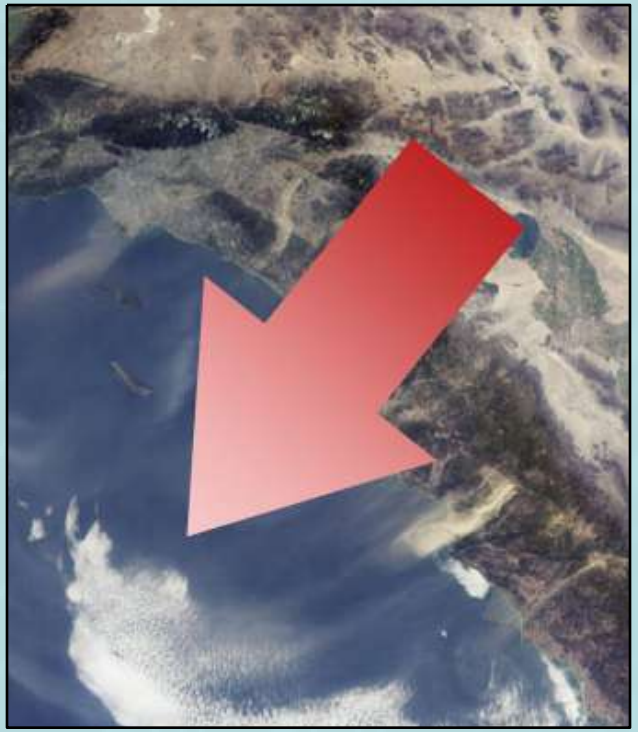
Winds

As we have already seen, the Sun radiates heat to the Earth and different surfaces absorb the heat energy in different ways.



The changing position of the Earth in relation to the Sun means that different parts of the Earth receive more heat energy than others depending on their location, the time of day, and the time of year.

As a result, the Earth's surface is heated unevenly.

The energy produced by this uneven heating is carried through the air by convection currents, causing winds.

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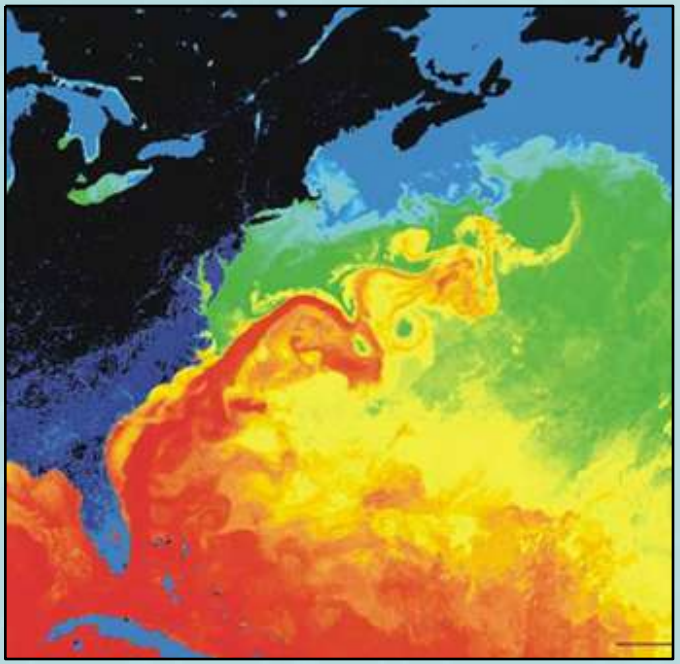
Ocean Currents

In a similar way, radiation from the Sun heats the oceans, creating convection currents in the water.

Warm water from the Equator moves toward the north and south poles, where the water is much colder.

Cold water from the poles moves toward the Equator.

These convection currents create warm and cold ‘streams’ that can affect the climate of the land that they pass by.



Thermal image of the Gulf Stream off the coast of the USA

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The Water Cycle

Water is very important to life on Earth – it makes up about 70% of all living things.

The amount of water on Earth never changes. It goes through a process, known as the water cycle, that moves it around the world.

The Sun provides the energy that keeps the water cycle going.

Water on the Earth can be heated by radiation from the Sun. The water evaporates into the air where it forms clouds, eventually falling back to the surface as rain or snow.

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Question 4

Which of the following is NOT an example of a convection current?

A) Energy transfer from the Sun to the Earth

B) Winds

C) Ocean current

D) Movement of air in a heated room

Next >

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Summary

After completing this presentation you should be able to:

- show knowledge and understanding of the impact of the Sun's energy

End