Define the following terms:

land hemisphere	
island	
peninsula	
isthmus	
continental drift	
fault	
subduction	
Ring of Fire	
soil	

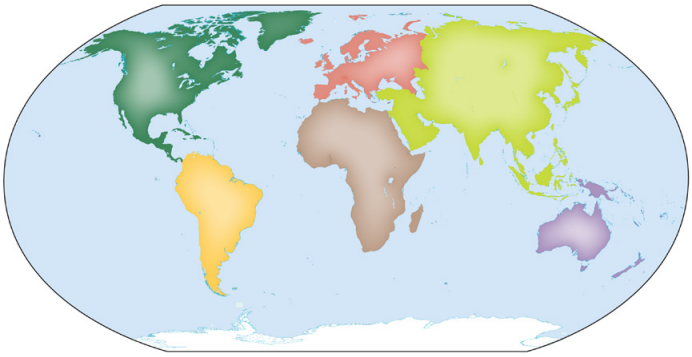
Plate Tectonics

Physical Processes		Distinctive Landforms
convergent plates	→	
divergent plates	→	
transform boundaries	→	
	→	volcanoes
	→	fjords

Land Hemisphere

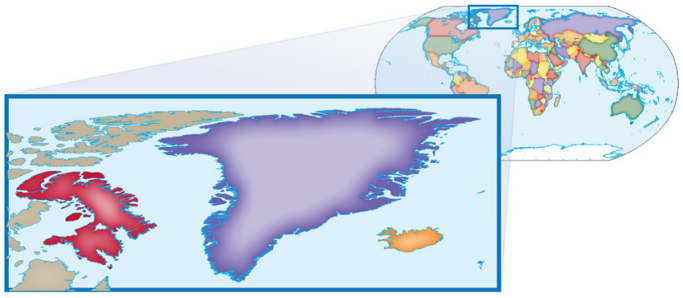
The total surface area of Earth is approximately 510,185,500 square kilometers (317,014,572.40 miles), and that total surface area can be subdivided into what is commonly referred to as the land hemisphere and the water hemisphere.

The **land hemisphere** consists of the seven **continents** and accounts for nearly one-third of the total surface area of Earth, but humans cannot or will not live on all parts of the land. Why is that? Consider some of Earth's unique physical landscapes that would discourage human settlement. Think about extreme places on Earth, places that may be too elevated to sustain life for long periods of time, have the coldest or the hottest temperatures, or receive too much or too little rain. Places like the Himalayan Mountains and the Plateau of Tibet, the sub-Arctic climatic regions, the Sahara Desert, and the Amazon Basin are regions where few permanent settlements have been located, due to extreme terrain or climate conditions.



Looking at this map, can you predict which land areas are the most populated? Why would that be?

There are different landforms throughout the world. In addition to continents, there are islands, isthmuses, and peninsulas. **Islands** are relatively small pieces of land that are surrounded on all sides by water but are not considered to be big enough to be continents. The largest island in the world is Greenland. Australia, almost three times the size of Greenland, and Antarctica, more than 14 times the size of Greenland, are surrounded on all sides by water and are large enough to be considered continents.



What kind of human activities do you think might exist on Greenland? Why do you think that?

Besides Greenland, some of the largest islands in the world include New Guinea, Borneo (Indonesia), Madagascar (Africa), and Baffin (Canada).

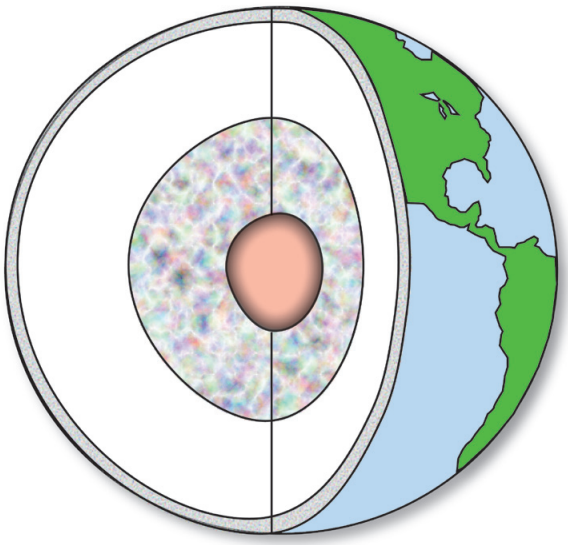
Another landform is a **peninsula**, which is a piece of land that juts out from the mainland and is surrounded by three different bodies of water. A peninsula easily identified in the United States is the state of Florida. The Yucatan and Baja California (Mexico), Italian (Italy), Korean (North Korea and South Korea), and Sinai (a land bridge connecting Africa to Asia) peninsulas are also very identifiable.

This picture of the Sinai Peninsula was taken from space. What physical features can you identify?

A final landform to remember is an **isthmus**, a narrow strip of land connecting two larger pieces of land. The best example of an isthmus would be the country of Panama, which, though geologically a part of North America, is generally regarded as the land that connects North America and South America.

Structure of Earth

Our planet may look like a giant, solid jaw breaker, but it is really composed of many different layers surrounding a solid inner core. The inner core contains mostly iron and nickel. The outer core is a liquid state. Upon the liquid inner core rests the mantle, which is a thick layer of molten or melted rocks, much like hot tar or asphalt. The intense heat from the core of Earth provides energy that keeps the molten rocks moving in a slow current. The outermost layer of Earth is the crust and is the part of Earth on which you walk.

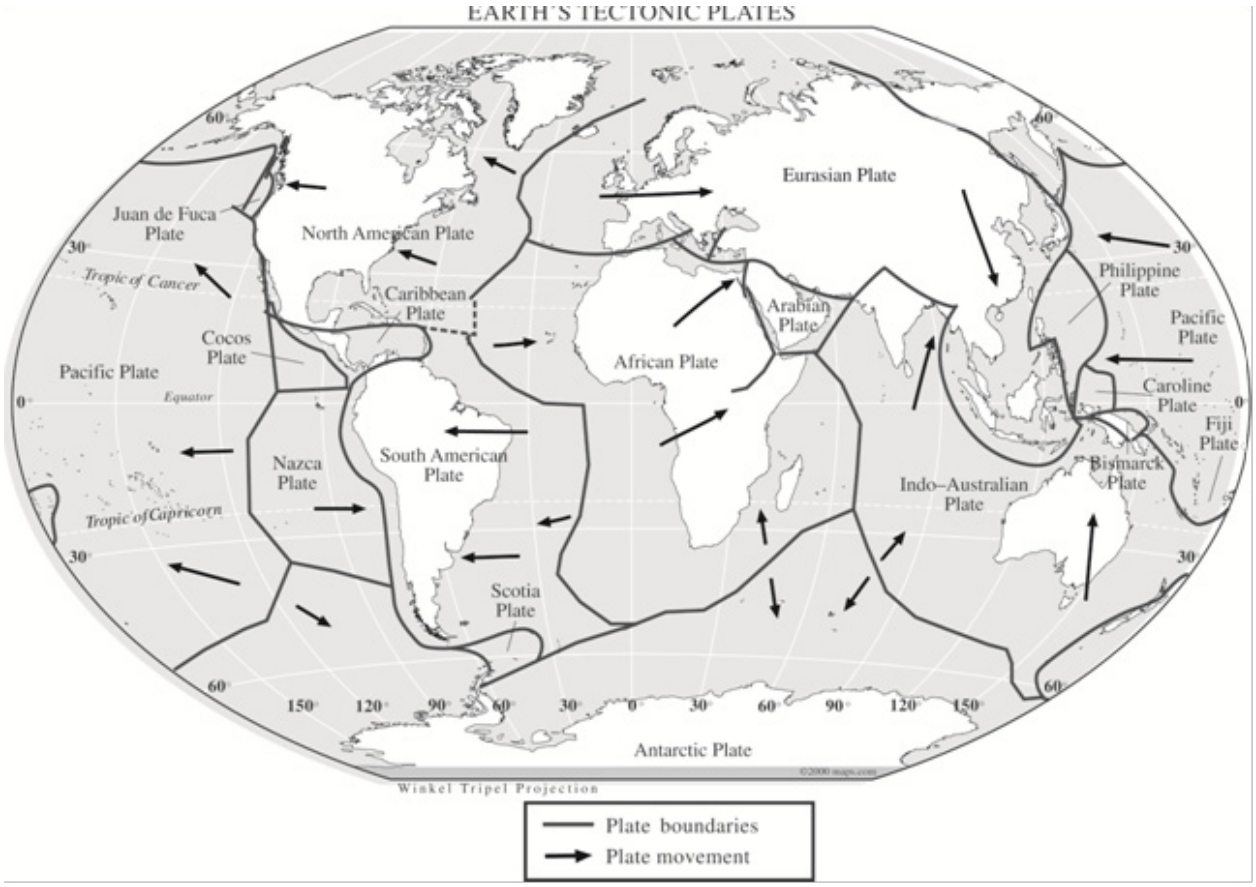


What part of the planet is most affected by human-environment interaction?

Plate Tectonics

Look at a world map and study the seven continents carefully. Does it look like the continents are big puzzle pieces that, if moved and repositioned, could make up one giant landmass? A German geophysicist named Alfred Wegener was the first to write about the possibility of **continental drift** in his book *The Origin of Continents and Oceans* (1915). Wegener said that the crust of Earth is made up of plates that fit together like pieces of a puzzle or a broken eggshell. The plates slowly move around Earth in a process called tectonic plate movement.

The plates float slowly on the moving molten rock and may form convergent, divergent, or transformational boundaries when they collide, move apart, or slide past each other. **Convergent** plates push against each other, which can result in folded mountain ranges that form as the edges of the plates are crumpled, folded, and uplifted to form a mountain range. **Divergent** plates move away from each other, causing hot, molten rock to ooze up through the gap left between the plates. New crust forms as the lava builds up. **Transform boundaries** are those that slide past each other, causing friction between the two landmasses, which may result in an earthquake.



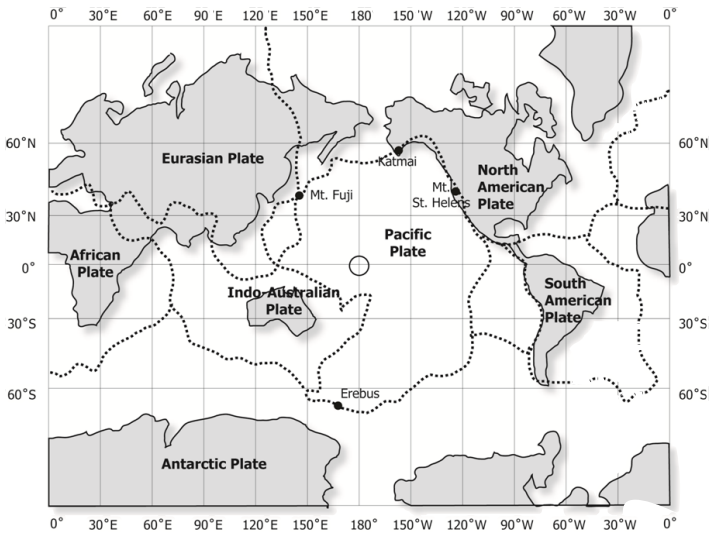
Knowing where you live, what is the risk of you experiencing an earthquake or volcano? Why do you think people would live in areas that are most likely to see earthquakes or volcanoes?

A volcanic eruption can be seen as a destructive event as well as a constructive force. For the inhabitants of Pompeii in 79 AD, the eruption of Mount Vesuvius was a destructive event because the entire city was buried under ash and molten lava. On the positive side, it is important to note that the base of a volcano has mineral-rich and fertile soil as well as breathtaking physical views of the surrounding land. And so, in many places throughout the world, communities located at the base of volcanic mountains, such as Auckland, New Zealand; Naples, Italy; and Mammoth Lakes, California, continue to exist despite the danger volcanoes can pose.

The best example of the destructive side of plate tectonics can be seen in **earthquakes**. If Earth's plates slide against each other in opposite directions, a crack or fracture in Earth's crust occurs, and an earthquake results. The land physically shakes as a result of the energy that is released when the plates slide against each other. The visible sign of a crack in Earth's crust is called a **fault**. One of the most famous fault lines is the San Andreas Fault, which runs approximately 1,300 km (800 miles) from north of San Francisco, California, to southeast, near San Bernardino, California.

Plates can also collide with and slide under other plates in a process called **subduction**. Subduction produces an active area for volcanoes to form when the magma rises to the surface as lava. When two plates, such as the Eurasian Plate and the Pacific Plate, collide with each other, the result is the "pushing up" of mountains, but when the crust of Earth is cracked or broken as a result of the movement, a volcano is the result. Japan is a prime example of the effects of subduction, since nearly 75% of Japan's topography is mountainous, including more than 260 volcanoes, 20 of which are still considered to be active. Japan's most famous physical feature is Mount Fuji, the tallest peak in Japan, which scales 3,776 meters (12,388 feet).

A unique geologic characteristic of Earth is the **Ring of Fire** around the Pacific Ocean. There is an abundance of plate tectonic activity where the Pacific Plate touches other plates (North American Plate, Cocos Plate, Philippine Plate, and Eurasian Plate), resulting in more volcanic and earthquake activity than anywhere else on Earth. Although volcanoes and earthquakes occur in other places, they occur with the greatest frequency around the Pacific Ocean.



What impact on humans is a result from all of the tectonic activity generated near the Ring of Fire?

Erosion and Deposition

Soil may be one of the most important natural resources for humans. It is on the soil that we live and from the soil that we grow the food with which we nourish our bodies. **Soil** is a complex mixture of organic and inorganic materials, air, and water. Soil is dynamic and is responsive to its immediate surroundings— the parent-rock material, age, vegetation, precipitation, temperature, and how human beings use it.

Mature soils have three layers, the A-Horizon, B-Horizon, and C-Horizon. The A-Horizon is also called topsoil. Topsoil contains the nutrients that feed plants. One of the most important factors dictating the fertility of topsoil is the availability of organic material that can be decomposed. If topsoil is not preserved (e.g., crops are not rotated or there is an overuse of chemicals or fertilizers), then crop yields can decrease. If not properly cared for over a long period of time, topsoil can disappear altogether and that parcel of land can become an unproductive wasteland.

The B-Horizon layer is also called subsoil. This comprises mostly inorganic materials such as clay and some large pieces of the parent rock. The C-Horizon soil contains large pieces of bedrock that have been broken down, frozen, and exposed to weathering repeatedly over time. Neither subsoil nor the bedrock contains organic materials, which means that neither of these soil layers can sustain life.

Weathering is the process by which land is broken down into smaller pieces. **Erosion** is the process of moving or transporting the weathering material from one place to another. **Deposition** is the depositing of the weathered material once it has eroded. Both weathering and erosion can be caused by wind, ice, and water. These forces of nature can be accelerated when vegetation disappears due to either changes in the physical environment, such as climate change, or human activities, such as cutting down trees or allowing cattle to overgraze.

As water runs over the surface of land, it loosens pieces of soil and carries those particles downstream. When a stream or river slows down, the particles get deposited. This process typically results in more fertile land, particularly in river valleys, as a result of the nutrient-rich deposits.

Glaciation is one specific form of erosion. Its importance is the relationship between humans and the physical landscape. Glaciation is the process by which an expanded area of ice moves or expands. The results of large sheets of ice moving over the land vary to some degree. Consider the glacier that was formed near the North Pole during the last Ice Age, some 10,000 years ago during the Pleistocene epoch, or Ice Age. As this massive sheet of ice "grew" and moved southward, it acted as a big steam shovel, digging holes in the ground, sometimes cutting through rocks. One effect of this action was the creation of **fjords**, which are long, narrow, deep valleys carved by glaciers. Fjords run almost the entire length of the west coast of Norway.

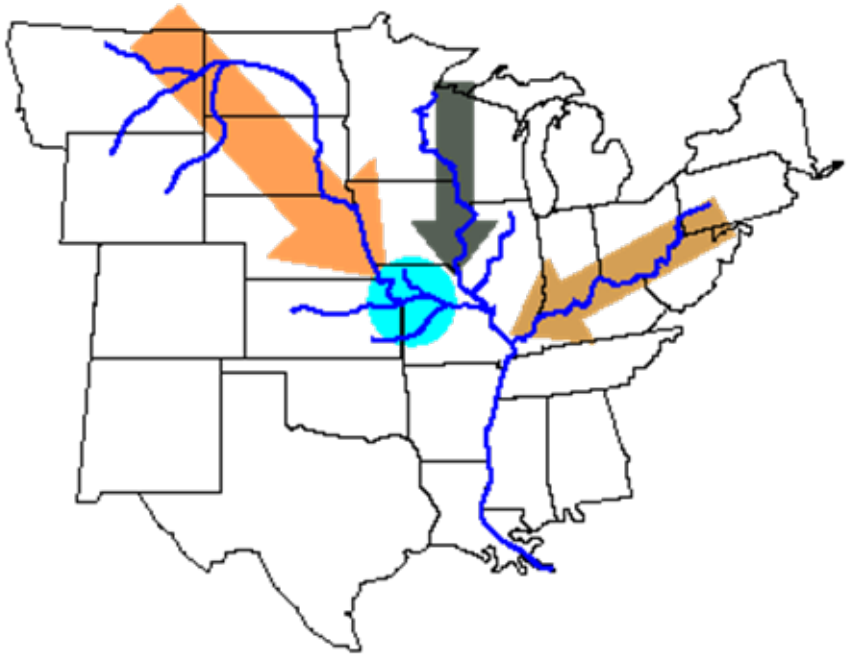
Looking at this map, what regions of the world were most positively and negatively impacted by glaciers in the last ice age?

Humans enjoy taking cruises and other vacations to see the magnificent fjords, which were created by the physical process of glaciation.

As the glaciers moved southward during the Pleistocene epoch, the ice acted like a giant steam shovel and scooped up the topsoil from one region and deposited it elsewhere once the ice started to melt. One of the results of this action was the depressions created by the dense ice sheets and the resulting lakes that were formed. Minnesota is known as "the Land of 10,000 Lakes," and this phenomenon can be seen in Norway as well. Norway has more than 50,000 natural lakes that were created as a result of glaciation. The Great Lakes were also created as a result of glaciation. Each lake was filled with freshwater from the melting ice sheets.

Another important effect of glaciation was the redistribution of topsoil in North America and Europe. As the ice sheet moved across the Scandinavian Peninsula in Europe, most of the topsoil was removed and deposited in what is called the Northern European Plain, the most fertile region in all of Europe. On the other hand, the land known today as Canada was stripped almost entirely of its topsoil.

The furthest extent of glaciation in North America is delineated by the Ohio River and Missouri River valleys. The topsoil that was once in southern Canada was deposited in the United States. **Loess** is silt-size deposits that may have been blown by the wind from Asia during the Pleistocene epoch into North America. The combination of loess deposits and the effects of glaciation have created excellent agricultural land between the Ohio River and Missouri River valleys. This is the most fertile soil found anywhere in the world. Keep in mind that these changes happened more than 10,000 years ago and helped to create one of the most unique characteristics of the United States. In fact, the United States produces more food, in both quantity and variety, than any other country in the world.



Some of the economic advantages of the United States are a result of the physical processes that created the rivers and plains. What economic activities are most successful in the areas highlighted above?

No one person or country could take credit for the natural process of soil deposition. However, there are land-use policies in place today that address the use of pesticides and fertilizers, as well as crop rotation schedules and the types of crops to be grown. However, the natural resource of fertile soil was deposited by glaciers long before political policies were developed to manage the resources.

Positive Reason	Place, Date, and Consequences