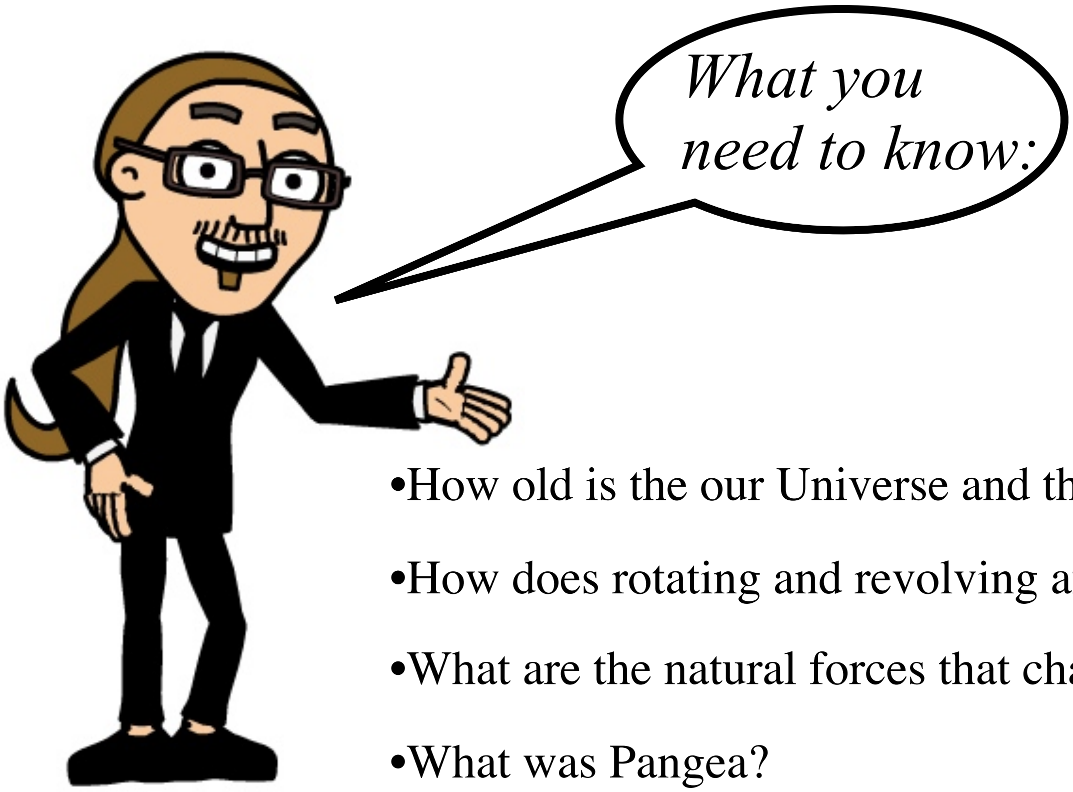
UNIT ONE:

Earth 101

How our world works



- How old is the our Universe and the Earth?
- How does rotating and revolving affect the earth?
- What are the natural forces that change the Earth?
- What was Pangea?
- What are plate tectonics?
- How do the movements of plates effect the earth?

Section one - Age of the Earth

Section two - Active Earth

Section three- Creating Our Continents

Section one

Age of the Earth

Before we begin discussing the people and the places that make up our planet, it is a good idea to get some perspective as to where we fit in the universe. As a species humans and our blue planet are fairly young. But compared to you and me the Earth is old. *Really old*. Over 4 billion years old (4,000,000,000 !!!). Older than most people can wrap their minds around. As you read and explore this section be sure to think about how scientists figured out how old our planet is and how much time has passed between the beginning of the Earth and your time spent in this class.

Questions:

How old is the Universe?

What the early universe like? How did change over time?

How recent is our universe? Our planet? Our species?

How old is the earth? How do we know this (5 ways)?

What is radiometric dating (it’s complicated, read the whole thing before you answer)?

click **answer online**

Cosmic Calendar

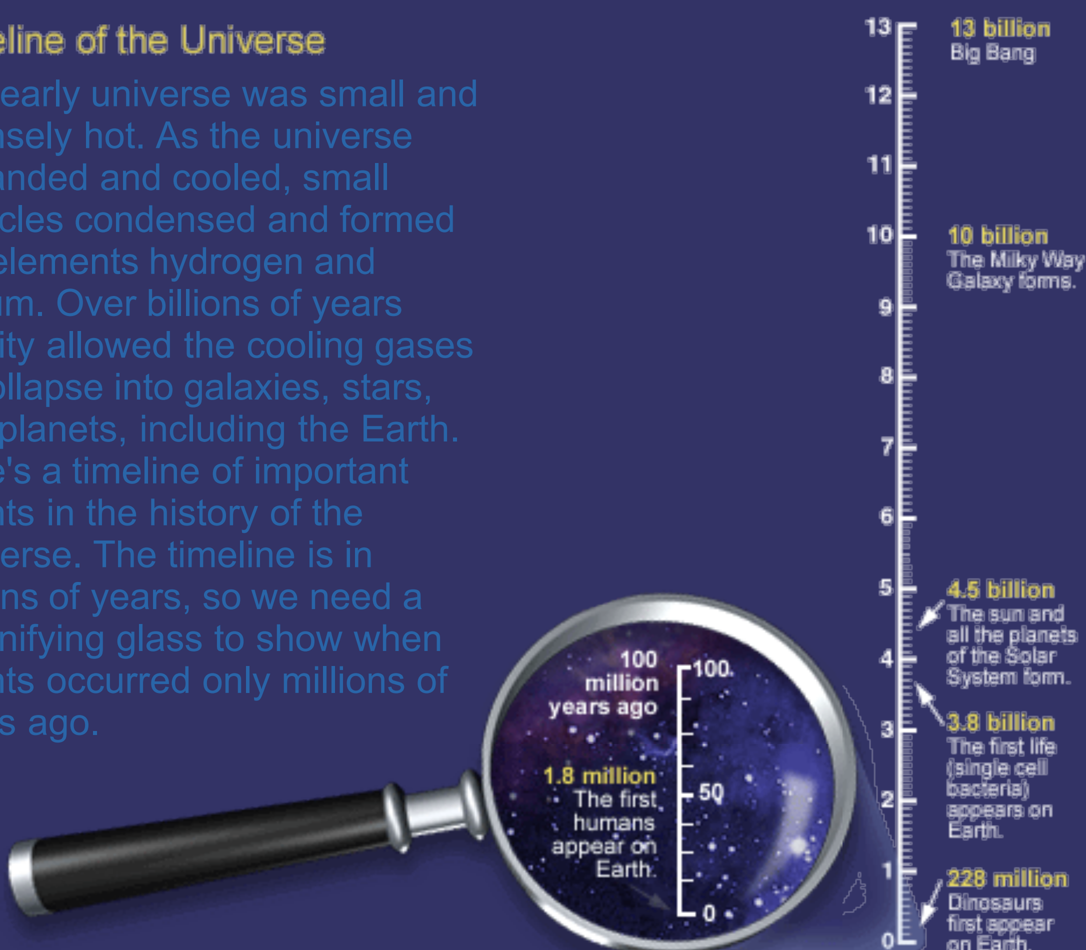
The History of the Universe

If it's hard to grasp the size of the universe, it's equally hard to imagine its age. Astronomers calculate that the universe originated about 13 billion years ago in an explosion of space called the big bang. At that time, all the matter and energy in our observable universe was packed together in a volume smaller than an atom.

No one knows what happened before the big bang or what caused the explosion—our laws of physics can't explain it—but in an instant the energy and matter of our universe poured into existence and expanded with space itself. We still see the evidence of the big bang today, as the superclusters of galaxies continue to fly apart from each other. We also observe the remnant glow of the big bang itself in the form of faint microwave light from all parts of the sky.

Timeline of the Universe

The early universe was small and intensely hot. As the universe expanded and cooled, small particles condensed and formed the elements hydrogen and helium. Over billions of years gravity allowed the cooling gases to collapse into galaxies, stars, and planets, including the Earth. Here's a timeline of important events in the history of the Universe. The timeline is in billions of years, so we need a magnifying glass to show when events occurred only millions of years ago.



The Universe in One Year

Imagine that the history of the universe is compressed into one year—with the big bang occurring in the first seconds of New Year's Day, and all our known history occurring in the final seconds before midnight on December 31. Using this scale of time, each month would equal a little over a billion years. Here's a closer look at when important events would occur when we imagine the universe in one year.

US Geological Survey
National Park Service
Department of the Interior

The Age of the Earth

How do we know the Age of the Earth?
Radiometric dating

Adapted from *The Age of the Earth* , by the Branch of Isotope Geology, United States Geological Survey, Menlo Park, California

How do we know the Age of the Earth?

The Earth is a constantly changing planet. Its crust is continually being created, modified, and destroyed. As a result, rocks that record its earliest history have not been found and probably no longer exist. Nevertheless, there is substantial evidence that the Earth and the other bodies of the Solar System are 4.5-4.6 billion years old, and that the Milky Way Galaxy and the Universe are older still. The principal evidence for the antiquity of Earth and its cosmic surroundings is:

0. **The oldest rocks on Earth, found in western Greenland, have been dated by four independent radiometric dating methods at 3.7-3.8 billion years. Rocks 3.4-3.6 billion years in age have been found in southern Africa, western Australia, and the Great Lakes region of North America. These oldest rocks are metamorphic rocks but they originated as lava flows and sedimentary rocks. The debris from which the sedimentary rocks formed must have come from even older crustal rocks. The oldest dated minerals (4.0-4.2 billion years) are tiny zircon crystals found in sedimentary rocks in western Australia.**
1. **The oldest Moon rocks are from the lunar highlands and were formed when the early lunar crust was partially or entirely molten. These rocks, of which only a few were returned by the Apollo missions, have been dated by two methods at between 4.4-4.5 billion years in age.**
2. **The majority of the 70 well-dated meteorites have ages of 4.4-4.6 billion years. These meteorites, which are fragments of asteroids and represent some of the most primitive material in the solar system, have been dated by 5 independent radiometric dating methods.**

3. **The "best" age for the Earth is based on the time required for the lead isotopes in four very old lead ores (galena) to have evolved from the composition of lead at the time the Solar System formed, as recorded in the Canyon Diablo iron meteorite. This "model lead age" is 4.54 billion years.**
4. **The evidence for the antiquity of the Earth and Solar System is consistent with evidence for an even greater age for the Universe and Milky Way Galaxy. a) The age of the Universe can be estimated from the velocity and distance of galaxies as the universe expands. The estimates range from 7 to 20 billion years, depending on whether the expansion is constant or is slowing due to gravitational attraction. b) The age of the Galaxy is estimated to be 14-18 billion years from the rate of evolution of stars in globular clusters, which are thought to be the oldest stars in the Galaxy. The age of the elements in the Galaxy, based on the production ratios of osmium isotopes in supernovae and the change in that ratio over time due to radioactive decay, is 8.6-15.7 billion years. Theoretical considerations indicate that the Galaxy formed within a billion years of the beginning of the Universe. c) Combining the data from a) and b), the "best, i.e., most consistent, age of the universe is estimated to be 14-17 billion years.**

Radiometric dating

Spontaneous breakdown or decay of atomic nuclei, termed radioactive decay, is the basis for all radiometric dating methods. Radioactivity was discovered in 1896 by French physicist Henri Becquerel. By 1907 study of the decay products of uranium (lead and intermediate radioactive elements that decay to lead) demonstrated to B. B. Boltwood that the lead/uranium ratio in uranium minerals increased with geologic age and might provide a geological dating tool.

As radioactive Parent atoms decay to stable daughter atoms (as uranium decays to lead) each disintegration results in one more atom of the daughter than was initially present and one less atom of the parent. The probability of a parent atom decaying in a fixed period of time is always the same for all atoms of that type regardless of temperature, pressure, or chemical conditions. This probability of decay is the decay constant. The time required for one-half of any original number of parent atoms to decay is the half-life, which is related to the decay constant by a simple mathematical formula.

All rocks and minerals contain long-lived radioactive elements that were incorporated into Earth when the Solar System formed. These radioactive elements constitute independent clocks that allow geologists to determine the age of the rocks in which they occur. The radioactive parent elements used to date rocks and minerals are:

Parent	Daughter	Half-life
Uranium-235	Lead-207	0.704 billion years
Uranium-238	Lead-206	4.47
Potassium-40	Argon-40	1.25
Rubidium-87	Strontium-87	48.8
Samarium- 147	Neodymium 143	106
Thorium-232	Lead-208	14.0
Rhenium- 187	Osmium- 187	43.0
Lutetium- 176	Hafnium- 176	35.9

Radiometric dating using the naturally-occurring radioactive elements is simple in concept even though technically complex. If we know the number of radioactive parent atoms present when a rock formed and the number present now, we can calculate the age of the rock using the decay constant. The number of parent atoms originally present is simply the number present now plus the number of daughter atoms formed by the decay, both of which are quantities that can be measured. Samples for dating are selected carefully to avoid those that are altered, contaminated, or disturbed by later heating or chemical events.

In addition to the ages of Earth, Moon, and meteorites, radiometric dating has been used to determine ages of fossils, including early man, timing of glaciations, ages of mineral deposits, recurrence rates of earthquakes and volcanic eruptions, the history of reversals of Earth's magnetic field, and the age and duration of a wide variety of other geological events and processes.

Section two

Active Earth

No matter how still we sit in our desks our planet is always
1. moving. Our earth spins, rotates, cracks, and shifts all over the
place. Without these actions the earth would be a pretty boring
place. As you read this section be sure to pay attention to the
natural and physical processes of the earth and how they can effect
the people living here.

Questions:

- How does the rotation and revolution of earth effect us?
- What is the difference between climate and weather?
- Why is it cold at the north and south poles?
- In what ways can wind become dangerous and destructive (list them all)?
- What are plate tectonics? How do they effect and change the earth?
- What causes earthquakes? What happens if they occur under water?
- In what ways is the earths surface naturally built up?
- In what ways is the earths surface naturally worn down?

click **answer online**

It All Revolves Around the Sun: Day and Night

The source of all energy on Earth is the sun. Without it, there would be no day and night and no seasons. Life could not exist on this planet without the sun.

A flashlight aimed at a tennis ball sums up the relationship between the sun and the earth. When the light (the sun) shines on one side of the tennis ball (the earth), the other side of the ball is dark. Therefore, half the earth is always illuminated, and half the earth is always in the dark.

The earth constantly rotates, so one side isn't always in the light (or dark); this 24-hour spin causes our day and night cycle.

def•i•ni•tion

Rotation is the spinning of the earth on its axis; a complete rotation occurs once every 24 hours. **Revolution** describes the earth's orbit around the sun; the earth completes a full revolution once every year (365 days, 5 hours, 49 minutes, and 12 seconds to be exact)—except in leap years, which occur every four years to take care of the difference.

As the earth *rotates* (or spins), causing day and night, it also *revolves* (or orbits) around the sun. Because the earth's axis is inclined, or tilted (23½ degrees), sometimes the Northern Hemisphere tilts toward the sun (in June), and sometimes the Southern Hemisphere does (in December).

The hemisphere tilted toward the sun experiences summer, and the hemisphere tilted away from the sun experiences winter. The earth's tilt causes one hemisphere to experience more sunlight or less sunlight at any given time of the year, which causes summer days to be longer and winter days to be shorter. As a result, the North Pole experiences total darkness in December, while the South Pole is in total sunlight; the opposite is true in June.

Considering Climate

Although people usually use the terms weather and climate interchangeably, they mean different things. Weather refers to the here and now; it is the temperature, wind, and moisture of a specific place at a specific time. Weather is localized, it changes, and it can be unpredictable.

Climate refers to the long term, or to average weather conditions over an extended period for a large region of the earth. The world can be divided into many different climatic zones that correspond roughly to their distance from the equator. (Other

factors, such as altitude and proximity to a large body of water, also play a role in determining climate.)

German climatologist Wladimir Köppen (1846–1940) divided the world into five climate zones, each with many subdivisions. (A sixth zone—mountain—was added later.)

- **Tropical, rainy:** Near the equator
- **Dry, desert:** In bands just north and south of the equator
- **Humid, temperate:** Farther to the north and south than the dry, desert areas (the Mediterranean is an important subdivision of this climate zone)
- **Humid, cold:** Mainly north of the northern temperate zone, plus the southern tip of South America
- **Polar:** Toward each pole
- **Mountain:** The upper reaches of the world's great mountain chains: the Rockies, Andes, Alps, Caucasus, Himalayas

Why Is It Hot at the Equator and Cold at the Poles?

The earth is hottest at the point where the sun's rays strike it most directly. At the equator, the sun is always close to being directly overhead. At the North and South poles, the sun is never directly overhead. During the Arctic and Antarctic winter months, the sun does not even appear. Even at the height of polar summer, the sun remains close to the horizon.

The air temperature is caused only indirectly by the sun's rays. The air is actually heated in a process called *reradiation.* As the sun's rays penetrate the earth's atmosphere and strike the earth's surface, the surface absorbs the light energy from the sun and changes it to heat energy that warms the air.

Because some surfaces are more effective than others at absorbing and radiating heat, the earth has varying air temperatures across the globe. The best absorbers of the sun's energy, and hence the warmer areas, are the vast oceans, and the dark surfaces, such as asphalt, soil, and leaves. Smooth and light-colored surfaces, such as ice and snow, are less effective in absorbing energy from the sun and cause cooler air temperatures.

Why Does the Wind Blow?

The wind blows because of differing air pressures at various locations at the same time, which is caused by the differing temperatures and moisture content of air in different places. Because water molecules are less massive than the gas molecules in the air, increased water vapor results in decreased atmospheric pressure. In addition, cold air is more compressed and contains more molecules per cubic inch, so it is heavier than warm air and yields higher atmospheric pressures.

Elevation, or how high you are in the atmosphere, also plays a part in wind formation. At sea level, the weight of the atmosphere is about 14.7 lbs on every square inch. The higher you go from sea level, as in up a mountain, the less pressure is exerted by the atmosphere.

Winds are caused when heavier, high-pressure air pushes into areas of warmer, lighter air. All things in nature seek balance, so the winds are nature's way of equalizing the pressure of the atmosphere. The greater the difference in pressure (and temperature), the faster and stronger the wind blows. Extreme differences in air pressure result in tornadoes and hurricanes.

They Call the Wind Many Things

Twisters, tornadoes, and whirlwinds all refer to isolated points of extreme low pressure (warm, moist air) surrounded by rapidly spinning columns of wind. Although these roaring, funnel-shaped vortexes are not generally more than a couple hundred yards wide, they leave terrible destruction in their path when they touch down on the ground surface. (They may attain a wind speed of 300 mph, but are more commonly in the 110 to 200 mph range.) The most tornado-prone area in the world is the central plains states of the United States, or "Tornado Alley."

Waterspouts and dust devils are miniature and often short-lived versions of tornadoes. Waterspouts are misty columns of spray over bodies of water. Dust devils are similar except that they occur over land. Hurricanes and typhoons are severe tropical storms with sustained winds of 74 mph or higher. These massive, circular- or oval-shaped storms can measure more than 300 miles across. A peculiar characteristic of these storms is their eye, an area of calm (often complete with blue sky) directly in the center of the storm. They are associated with extreme low pressure. Hurricanes are storms that occur in North or Central America; typhoons occur in the western portions of the Pacific Ocean. The intense rains and ocean storm surges associated with these storms can inflict horrific damage, such as that from Hurricane Katrina

and the New Orleans flooding of 2005. "Cyclone" is an umbrella term for all the storms mentioned in this list (except for monsoons). Even low-pressure centers that do not develop into one of these types of severe storms are considered cyclones. The term "tropical cyclone" is also used more specifically to describe the Indian Ocean equivalent of a hurricane or typhoon.

Terra-Trivia

In the Northern Hemisphere, cyclonic winds spin counter-clockwise. In the Southern Hemisphere, cyclonic winds spin in a clockwise direction.

Monsoons differ from other weather phenomena in that they're not a particular type of storm. Instead, the term refers to a seasonal shifting of winds. Although generally associated with Southern Asia, monsoonal climates are also found in Northern Australia, Western Africa, and other parts of the world. Monsoons may be "wet" or "dry." The "wet summer" phase of the Indian Ocean monsoon lasts from June to September and often brings torrential rains. Typical of this phenomenon is the 37.1 inches of rainfall on Mumbai, India, in a single day on July 26, 2005.

The Earth's Moving Surface—It's Not Solid Ground!

Our earth's surface, although it appears to be solid, is really the equivalent of many giant rafts moving and bumping around on an orb of molten material while floating around in space.

Two hundred twenty-five million years ago, all the continents were part of a huge supercontinent called Pangaea (Greek for "all earth"). About 180 million years ago, Pangaea began to split up. Its parts slowly drifted away from, and in some cases toward, each other. The process, called continental drift (a term coined by Alfred Wegener), still continues. The earth's surface, both the land masses and the ocean floor, is made up of giant plates or solid chunks, which is explained in the theory of plate tectonics.

Floating and Colliding Continents

According to the theory of plate tectonics, the earth's outer shell, called the lithosphere, is not continuous, but instead is divided into irregularly shaped rigid plates that float on an underlying molten layer called the asthenosphere. The plates move relative to each other at rates of as much as several inches a year, and they meet in a number of different ways.

At divergent boundaries, adjacent plates are actually forced apart by molten matter rising up from the asthenosphere to form ocean floor ridges. The Mid-Atlantic Ridge, which splits nearly the entire Atlantic Ocean floor in half north to south, is a good example of a divergent plate boundary.

When plates collide at what are called convergent boundaries, the older, heavier plate is forced to sink below the lighter, younger one, often forming deep ocean trenches. This process is known as subduction. If the colliding plates are carrying continents that also bang up against each other, the result is new mountain formation at the edge of the lighter, younger plate. The Himalayas, for example, are the result of the collision between the Eurasian Plate and the Indo-Australian Plate.

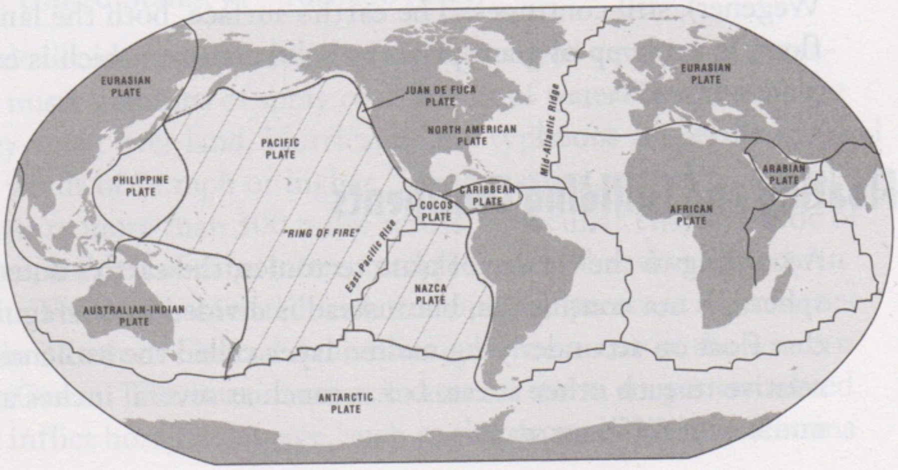
GeoRecord

Some of the world's deepest subduction trenches are in the Pacific. The Mariana Trench in the Western Pacific is the deepest spot on Earth. There, in an abyss called Challenger Deep, the earth's surface plunges to 35,826 feet below sea level.

Tectonic plates also meet at transform boundaries. In this case, the plates don't collide head-to-head, but rather grind sideways against each other, creating lateral faults (such as California's famous San Andreas Fault) and earthquakes.

All of this plate movement generates tremendous amounts of energy, which is released in part through volcanoes and earthquakes. In fact, most of the world's volcanic and seismic (earthquake) activity occurs along plate boundaries and subduction zones. The most volatile of these zones is the perimeter of the Pacific Ocean, the infamous Ring of Fire, where the Pacific Plate is disappearing into deep subduction trenches. More than 75 percent of the world's volcanoes are located here, among them such celebrities as Mount Fuji (Japan), Mount Pinatubo (the Philippines), Kilauea (Hawaii), Mount Saint Helens (Washington State), and Popocatépetl (Mexico).

Tectonic plates and the Ring of Fire.



The Great Shake: Earthquakes and Faults

The activity along plates can cause tremendous pressure to build up. In an earthquake, a sudden release of energy causes the rock on one side of the fault to slip rapidly past the other, with either an up-and-down (vertical) or sideways (lateral) motion.

The wave vibrations generated by an earthquake are measured by a device called a seismograph. There are several ways to express the severity of an earthquake. The most common is the Richter scale, a logarithmic scale in which every whole-number increase represents a tenfold increase in earthquake magnitude. A seven on the Richter scale, for example, represents an earthquake ten times as powerful as a six. An earthquake's destructiveness, in terms of loss of life and property damage, depends on its magnitude and the degree to which the area around the earthquake *epicenter* is populated. By the time an earthquake hits seven or eight on the Richter scale, the damage can be catastrophic. A nine on the scale has never been recorded—an earthquake of that magnitude would result in virtually total destruction.

def•i•ni•tion

The spot on the surface right above the focus is known as the earthquake's **epicenter**.

Tsunami or Tidal Wave?

Earthquakes that occur undersea can generate destructive ocean waves called tsunamis. Although tsunamis are sometimes called tidal waves, this is inaccurate because this type of destructive activity has nothing to do with tides. The tsunami is barely noticeable on the ocean's surface; however, once these fast-moving waves reach the shallow water of the shoreline they build up to enormous heights and can cause extensive coastal damage.

On December 26, 2004, a 9.0-magnitude earthquake off the West Coast of the Indonesian island of Sumatra erupted with a force equivalent to 23,000 Hiroshima-type atomic bombs. This violent undersea quake set water racing with the speed of a jet plane across the Indian Ocean. A wall of destructive water hit 11 countries in Southeast Asia, with 150,000 people killed or missing and many millions homeless.

Building Up the Earth's Surface

The movement of tectonic plates is one of the earth's land-building mechanisms. As the continental plates press against one another, the earth's crust folds, warps, and faults. The process of building up the major features of the earth's surface through the movement and deformation of the crustal plates is called diastrophism.

Another primary land-building force is volcanism, which occurs most commonly along the fractured edges of continental plates. Magma, or molten rock, is forced up through cracks in the earth's crust to emerge at the earth's surface as lava. The buildup of lava and ash forms the familiar volcanic cones that soar majestically on the landscape.

Wearing Down the Earth's Surface

Weathering, erosion, and other gradational forces combine to wear away in time even the highest mountains. Prying plant roots and the freeze-thaw cycle eventually reduce huge rocks to small stones. Acids and oxidation (rust) chemically break down the earth's minerals. The wind sculpts sand dunes, while windborne abrasives rasp away at exposed rock surfaces. But of all the agents of erosion at work in the world, the most powerful by far is water.

Follow the Flowing Water

Water erodes, wears down, and carves into the earth's surface in a variety of ways. Rain, tides, flooding, and even ocean waves lapping against rock cause the breaking down and moving of surface features.

Water also moves around great quantities of material. Streams typically originate in steep highlands and mountain areas. As they flow downward, the quickly moving water is capable of moving stones, sand, and silt (the load of the stream). When fast-moving streams and rivers reach the lower, flatter land, the flow begins to slow. The slower-moving water then spreads out to form floodplains, the wide, level valleys that store excess water when the river floods. As these streams and rivers reach the sea, they deposit their loads to form deltas. Deltas are characterized by rich alluvial (water deposited) soils renewed by the continual deposit of silt carried by the river from the land's interior.

The Crushing Effects of Ice

Water can also carve away effectively at the earth's crust in another form: ice. Many landforms in the Northern Hemisphere are the result of glaciation. During the ice ages, the last of which occurred between 8,000 and 15,000 years ago, huge sheets of ice spread southward from the North Pole. These massive 10,000-foot-thick glaciers scoured the land surface and left glacial lakes and deposits in their wake.

The remnants of these continental glaciers are still found today on the island of Greenland and on the continent of Antarctica. Smaller glaciers, called alpine glaciers, are also found in high mountain areas. Alpine glaciers advance and retreat seasonally, grinding the mountain rock into coarse till and a fine mineral dust called glacial flour that causes the spectacular aqua-blue hues of many high mountain lakes.

The Least You Need to Know

- The earth's rotation on its axis once every 24 hours causes day and night.
- The earth's revolution around the sun once a year and the tilt of the earth's axis cause the changing seasons.
- The earth is hottest at the equator because that's where the sun's rays strike the earth most directly. It is coldest at the earth's poles because these areas receive the least direct light from the sun.
- The earth's crust is composed of slowly moving plates that grind and bump against one another.
- The earth's surface is built up primarily by folding, warping (diastrophism), and volcanism; the surface is worn down primarily by running water and ice.

Section Three

Creating our Continents

Our continents didn't always look the way they do now. It took a long time for the earth to pull them apart and move them around the globe. The idea that continents move at all is a fairly new one and it caused a lot of drama when it was first proposed. Now that you understand a little bit about how the world works, it should make perfect sense that our continents used to be in different places. Read bellow to see who first came up with idea of Continental Drift and how it actually works.

What is Continental drift? Who came up with the idea?

What did the continents used to look like? What were they called?

What evidence is there for continental drift?

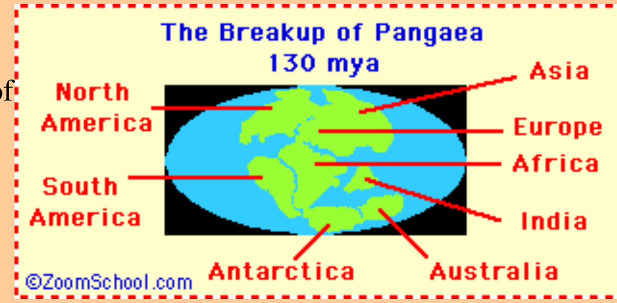
What are the different ways the earth's plates move?

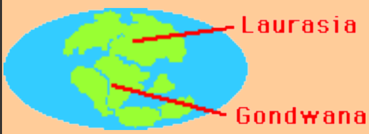
What happens when they move?

click **answer online**

In 1915, the German geologist and meteorologist Alfred Wegener (1880-1930) first proposed the theory of continental drift, which states that parts of the Earth's crust slowly drift atop a liquid core. The fossil record supports and gives credence to the theories of continental drift and plate tectonics.

Wegener hypothesized that there was an original, gigantic supercontinent 200 million years ago, which he named Pangaea, meaning "All-earth". Pangaea was a supercontinent consisting of all of Earth's land masses. It existed from the Permian through Jurassic periods. It began breaking up during the late Triassic period.





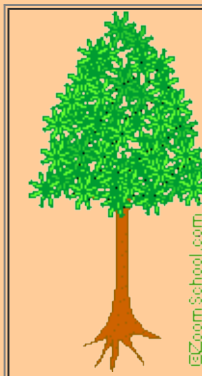
Pangaea started to break up into two smaller supercontinents, called Laurasia and Gondwanaland, during the late Triassic. It formed the continents Gondwanaland and Laurasia, separated by the Tethys Sea. By the end of the Cretaceous period, the continents were separating into land masses that look like our modern-day continents.

Wegener published this theory in his 1915 book, *On the Origin of Continents and Oceans*. In it he also proposed the existence of the supercontinent Pangaea, and named it (Pangaea means "all the land" in Greek).

Fossil Evidence in Support of the Theory

Eduard Suess was an Austrian geologist who first realized that there had once been a land bridge between South America, Africa, India, Australia, and Antarctica. He named this large land mass Gondwanaland (named after a district in India where the fossil plant Glossopteris was found). This was the southern supercontinent formed after Pangaea broke up during the Jurassic period. He based his deductions on the plant Glossopteris, which is found throughout India, South America, southern Africa, Australia, and Antarctica.

Fossils of Mesosaurus (one of the first marine reptiles, even older than the dinosaurs) were found in both South America and South Africa. These finds, plus the study of sedimentation and the fossil plant Glossopteris in these southern continents led Alexander duToit, a South African scientist, to bolster the idea of the past existence of a supercontinent in the southern hemisphere, Eduard Suess's Gondwanaland. This lent further support to A. Wegener's Continental Drift Theory

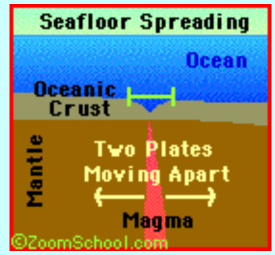


Glossopteris, a tree-like plant from the Permian through the Triassic Period. It had tongue-shaped leaves and was about 12 ft (3.7 m) tall. It was the dominant plant of Gondwana.

TYPES OF PLATE MOVEMENT: Divergence, Convergence, and Lateral Slipping

At the boundaries of the plates, various deformations occur as the plates interact; they separate from one another (seafloor spreading), collide (forming mountain ranges), slip past one another (subduction zones, in which plates undergo destruction and remelting), and slip laterally.

Divergent Plate Movement: Seafloor Spreading

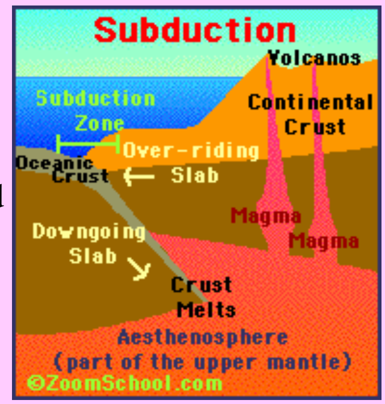


Seafloor spreading is the movement of two oceanic plates away from each other, which results in the formation of new oceanic crust (from magma that comes from within the Earth's mantle) along a a mid-ocean ridge. Where the oceanic plates are moving away from each other is called a zone of divergence. Ocean floor spreading was first suggested by Harry Hess and Robert Dietz in the 1960's.

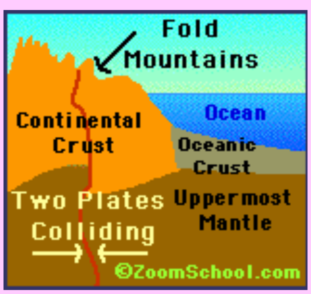
Convergent Plate Movement:

When two plates collide, some crust is destroyed in the impact and the plates become smaller. The results differ, depending upon what types of plates are involved.

Oceanic Plate and Continental Plate - When a thin, dense oceanic plate collides with a relatively light, thick continental plate, the oceanic plate is forced under the continental plate; this phenomenon is called subduction.

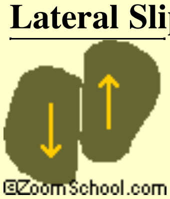


Two Oceanic Plates - When two oceanic plates collide, one may be pushed under the other and magma from the mantle rises, forming volcanoes in the vicinity.



Two Continental Plates - When two continental plates collide, mountain ranges are created as the colliding crust is compressed and pushed upwards.

Lateral Slipping Plate Movement:



When two plates move sideways against each other, there is a tremendous amount of friction which makes the movement jerky. The plates slip, then stick as the friction and pressure build up to incredible levels. When the pressure is released suddenly, and the plates suddenly jerk apart, this is an earthquake.

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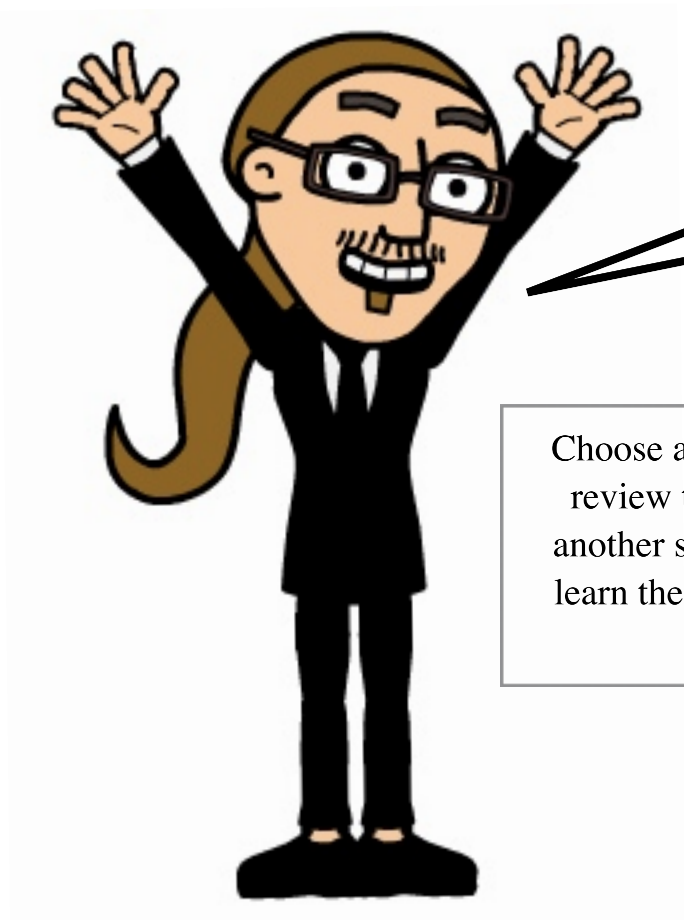

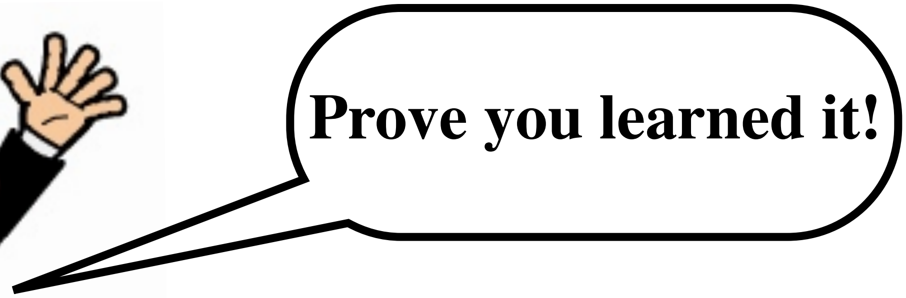

Choose and complete one of the following. Be sure to review the unit and you the internet as you work. If another student couldn't look at what you created and learn the main ideas of the unit then you need need to keep working!!!

Write a journal as the earth

Pretend that you have been around since the Big Bang and the beginning of the Universe. Describe the events that you have witnessed.

Must explain: Age of the universe, Age of the earth, Natural processes of the Earth

Must include at least three images.

Design a dating profile for the earth

The earth is lonely. Design a dating profile to help get the Earth a boyfriend or girlfriend. Be creative. A good dating profile will include a brief and history and things that you are good at and interested in.

Must explain: Age of the universe, Age of the earth, Natural processes of the Earth

Must include at least three images.

Sources

Section one - Age of the Earth

- http://school.discoveryeducation.com/schooladventures/universe/itsawesome/cosmiccalendar/index.html
- http://www.nature.nps.gov/Geology/usgsnps/gtime/ageofearth.html

Section two - Physical Geography basics

- Idiots Guide to Geography Ch. 2
- http://www.enchantedlearning.com/subjects/dinosaurs/glossary/Pangaea.shtml

<table>
<tr><td colspan="4">Advanced Technology Academy
Course Eastern Hemisphere Social Studies
Aligned to Michigan Content Standards for 7th Social Studies</td></tr>
<tr><td colspan="2">Date Range:</td><td>Thematic Unit Name:
peopling of the earth</td><td>Activity</td></tr>
<tr><td>Standard and Benchmark #</td><td>Students will be able to….</td><td>Students will know…..</td><td rowspan="2">None</td></tr>
<tr><td>review of 6th science and social studies</td><td>understand</td><td rowspan="3">Age of the earth and the universe

how contents originated

earths physical processes</td></tr>
<tr><td colspan="2">Essential Questions</td><td>Resources</td></tr>
<tr><td colspan="2">How old is the earth?
How did the contents form?
How does the earth work?</td><td>Section one - Age of the Earth
• http://school.discoveryeducation.com/schooladventures/universe/itsawesome/cosmiccalendar/index.html
• http://www.nature.nps.gov/Geology/usgsnps/gtime/ageofearth.html
Section two - Physical Geography basics
• Idiots Guide to Geography Ch. 2
• http://www.enchantedlearning.com/subjects/dinosaurs/glossary/Pangaea.shtml</td></tr>
</table>

Assessment		Questions/Key Areas I Need to Review
Formative Assessment	**Summative Assessment**	
Section/exit quizzes Journals Reading Guides	**Unit Quiz** **Prove you learned it:** • Write a journal as the earth • Design a dating profile for the earth	