Geoscience

Suggested pacing: 3 lessons per week

Unit	Lesson	Date	Topic	Pages
GEOLOGY	intro	Wed, Jan 21	Introduction and tips for success	
	1	Mon, Jan 26	Continental Drift	4-5
	2	**Wed, Jan 18**	Plate Boundaries	6-7
	3	*Self-paced*	Activity: Map the Ring of Fire	8-11
	4	Mon, Feb 2	Weathering vs Tectonics	12-13
	5	Wed, Feb 4	Faults and Earthquakes	14-15
	6	*Self-paced*	Activity: Earthquake Proofing	16-17
	7	Mon, Feb 9	Rivers - Engines of Erosion	18-19
	8	Wed, Feb 11	Permafrost and the Cryosphere	20-21
	9	*Self-paced*	Activity: Stream Table	22-23
	10	Mon, Feb 16	How old are rocks?	24-25
	11	Wed, Feb 18	Geologic time	26-28
	12	*Self-paced*	Geology Assessment / Study for quiz show	29-31
	13	Mon, Feb 23	Geology Quiz Show	-
WEATHER & ATMOSPHERE	14	Wed, Feb 25	Relative Humidity	32-34
	15	*Self-paced*	Activity: Cloud in a Jar	35
	16	Mon, Mar 2	Heat Index and Windchill	36-37
	17	Wed Mar 4	Air Masses and Fronts	38-39
	18	*Self-paced*	Activity: Humidity Lab	40-41
	19	Mon, Mar 9	Ocean Currents and Thermohaline Circulation	42-43
	20	Wed, Mar 11	El Niño–Southern Oscillation	44-45
	21	*Self-paced*	Activity: Hurricane Tracker	46-49
	March 16-20: SPRING BREAK			
	22	Mon, Mar 23	Global Weather Patterns	50-51
	23	Wed, Mar 25	Past Climates	52-53
	24	*Self-paced*	Activity: Convection Convention	54-55
	25	Mon, Mar 30	Making a Forecast	56-57
	26	Wed, Apr 1	Natural disaster: Hurricanes	58-59
	27	*Self-paced*	Weather & Atmosphere Assessment	60-63
	28	Mon, Apr 6	Weather Quiz Show	
ECOLOGY	29	Wed, Apr 8	Ecosystems	
	30	*Self-paced*	Activity: Build a Food Web	
	31	Mon, Apr 13	Keystone Species	
	32	Wed, Apr 15	Ecological Succession	
	33	*Self-paced*	Activity: Competing Compost Jars	

Unit	Lesson	Date	Topic	Pages
ECOLOGY & HUMAN SYSTEMS	34	Mon, Apr 20	Carbon and Nitrogen Cycles	
	35	Wed, Apr 22	Resilience and Disturbance	
	36	*Self-paced*	Activity: Charting Biodiversity	
	37	Mon, Apr 27	Where We Live and Why	
	38	Wed, Apr 29	Renewable vs Non-Renewable Energy	
	39	*Self-paced*	Activity: Natural Resource Scavenger Hunt	
	40	Mon, May 4	5 Myths About Climate Change	
	41	Wed, May 6	5 Solutions to Climate Change	
	42	*Self-paced*	Capstone Activity: Local climate resilience plan	
	43	Mon, May 11	Final Quiz Show	

SUPPLY LIST:

Lesson 3 - Map the Ring of Fire
- The lesson notes
- Colored pencils or crayons
- Pencil

Lesson 6 - Shake, Rattle, Resilient
- A small box
- Cardboard (at least 3x as long as the small box)
- Cylindrical pencils or markers
- Smart phone
- Various household objects

Lesson 9 - Stream Table Study
- Sand and gravel
- Plastic paint tray or a long bin or storage container
- Drill
- Cups or an empty gallon jug

Lesson 15 - Cloud in a Jar
- 4 glass jars with lids
- Ice
- Water
- Matches
- Paper or tape and pen for making labels

Lesson 18 - Humidity Lab
- A small piece of cloth or gauze
- Fan
- Rubber band
- 2 identical thermometers

Lesson 21 - Hurricane Tracker
- The lesson notes
- Colored pencils or crayons
- Pencil
- Internet connection or book(s) to use for researching a historic hurricane

Lesson 24 - Convection Convention
- 4 identical cups or jars
- Thin flat piece of plastic
- Food coloring
- Water
- Ice cubes
- Salt
- Tray and 1 large clear container
- 2 paper cups
- Scissors
- Matches
- Tea candle

Lesson 30 - Build a Food Web
- Cardboard
- Colored pencils, crayons, or markers
- Yarn
- Tacks or pins
- Scissors
- Gluestick

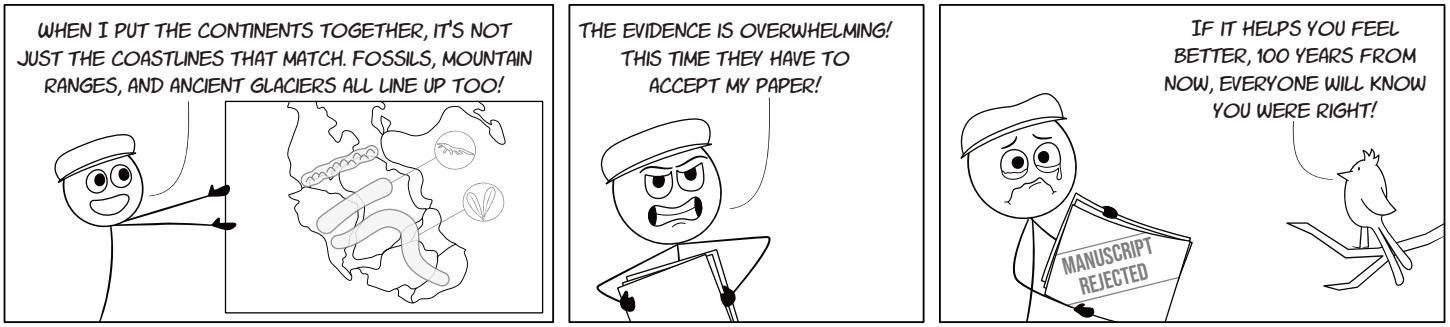
Lesson 30 - Competing Compost Jars
- 2 identical clear containers
- Lids for the containers with ventilation holes OR 2 pieces of cloth and 2 rubber bands
- Newspaper
- Scissors
- Grass clippings or vegetable scraps such as carrot peels, apple cores, or squash rinds etc
- A small sample of soil, if possible, containing invertebrates such as earthworms, millipedes etc

Lesson 36 - Charting Biodiversity
- Cardboard
- Colored pencils, crayons, or markers
- Scissors
- Gluestick

Lesson 39 - Natural Resource Scavenger Hunt
- Pencil and lesson handout

Lesson 35 - Local Climate Resilience Plan
- Internet connection for research or books about local economy, agriculture, and weather
- Posterboard and art supplies

CONTINENTAL DRIFT



Alfred Wegener was the first to propose that Earth's landmasses had once been connected in a supercontinent called Pangea. He called the idea of slowly-shifting land masses "continental drift." It was controversial until more evidence came in: Marie Tharp's mapping of mid-ocean ridges, magnetic striping of the sea floor, and location of earthquake epicenters all added further evidence that continents do move.

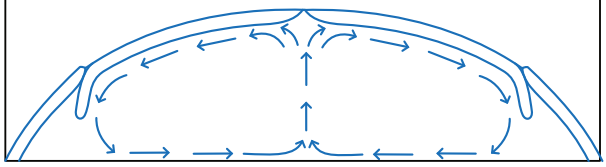
PLATE TECTONICS
THE BEDROCK THEORY OF GEOLOGY

WHAT IT IS

The scientific theory that the outer layer of the Earth (the lithosphere) is made of segments called plates. The movement of these plates causes the major features of Earth's surface and most earthquakes and volcanoes.

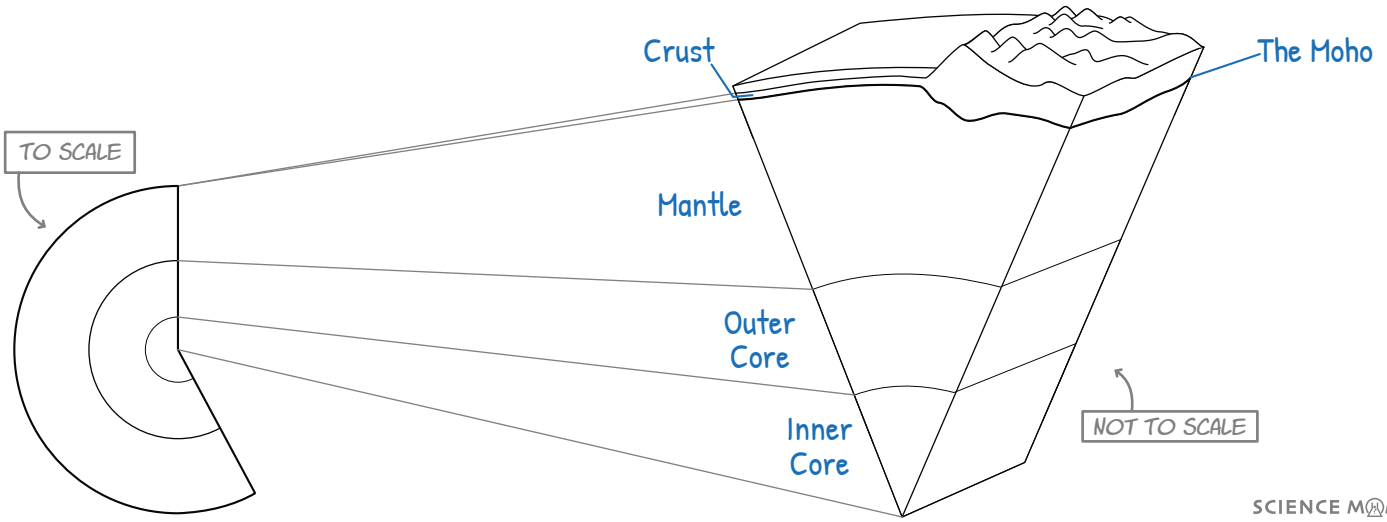
HOW IT WORKS

Convection in the mantle! Hotter mantle rises and cooler mantle sinks back down. The moving mantle moves the plates



Draw lines to match the terms with the correct description, then label each term on the diagram below:

Crust	*The hottest layer of the planet*
Inner core	*Solid silicate rock that is brittle near its surface*
Mantle	*A silicate rock layer that makes up more than 60% of the mass of the Earth*
The "Moho" or Mohorovičić discontinuity	*The boundary between crust and mantle; the depth where earthquake waves speed up as they move from less-dense crust into denser mantle*
Outer core	*A liquid layer mostly made of iron and nickel*



Use the descriptions below to identify and color each of the major tectonic plates:

RED — **Indian Plate**
Smallest major plate; formed the Himalayas

PINK — **North American Plate**
This plate is moving over the Yellowstone hotspot

ORANGE — **South American Plate**
Contains the Amazon rainforest

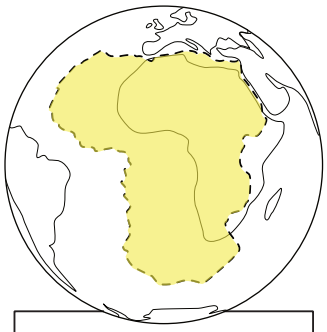
YELLOW — **African Plate**
A plate bordered by rift zones that form deep lakes

GREEN — **Australian Plate**
Fastest moving continental plate; north at 6.9 cm/yr

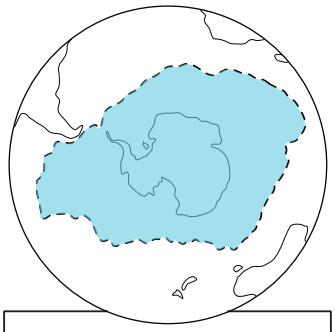
LIGHT BLUE — **Antarctic Plate**
A plate with no human cities, only research stations

BLUE — **Pacific Plate**
Largest tectonic plate; primarily oceanic crust

PURPLE — **Eurasian Plate**
This plate contains most of Europe



African Plate

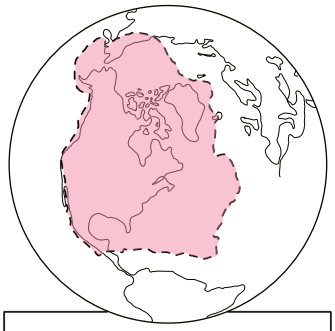


Antarctic Plate

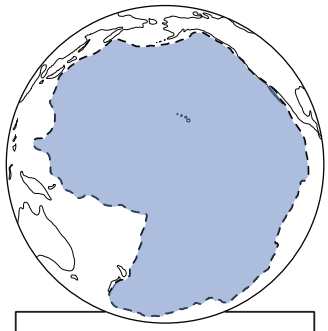
Australian Plate

Eurasian Plate

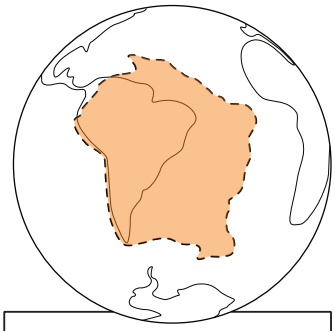
Indian Plate



North American Plate



Pacific Plate



South American Plate

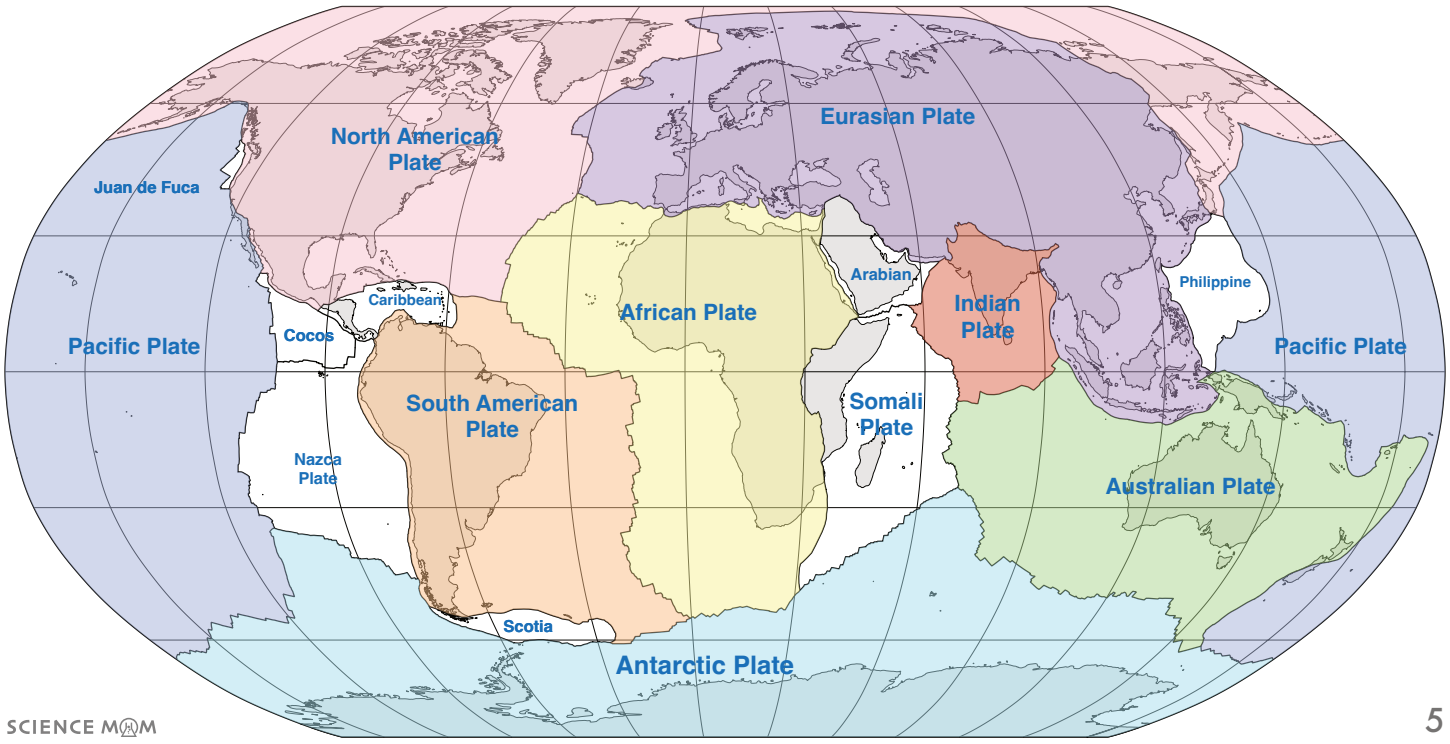
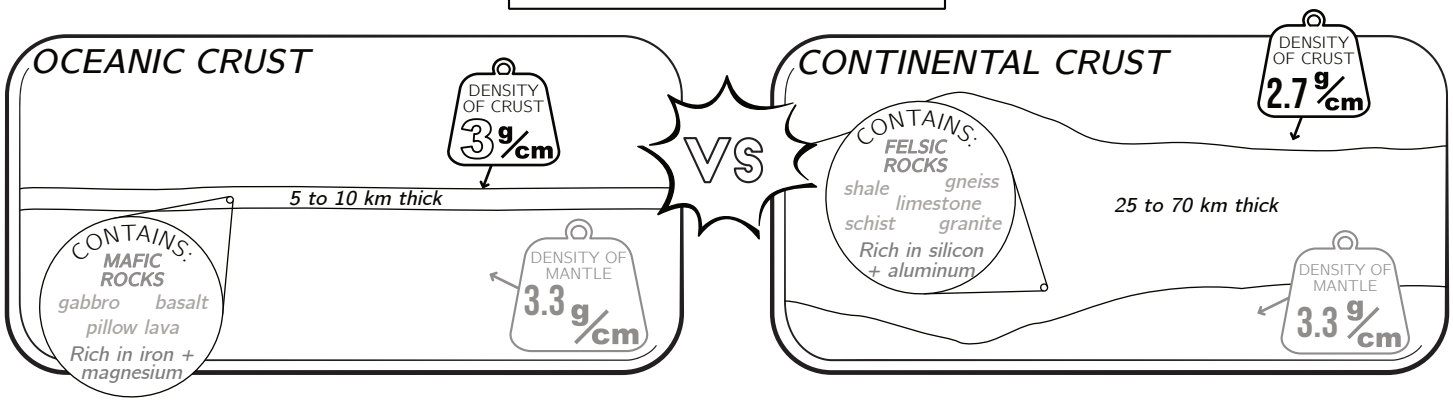


PLATE BOUNDARIES



TYPES OF PLATE BOUNDARIES

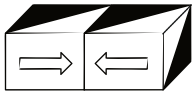
Convergent

Definition: A place where plates move toward each other

Ex:

Subduction zone (when oceanic meets continental plate). Forms volcanic arc, largest tsunamis, and earthquakes.

Collision zone (continental + continental plate) has frequent large earthquakes but little volcanism.



Divergent

Definition: A place where plates move away from each other

Ex:

In continental plates: rift valleys or fault-block mountains.

In oceanic plates: mid ocean ridges

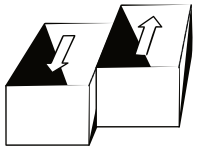
Both can have earthquakes and volcanism

Transform or strike-slip

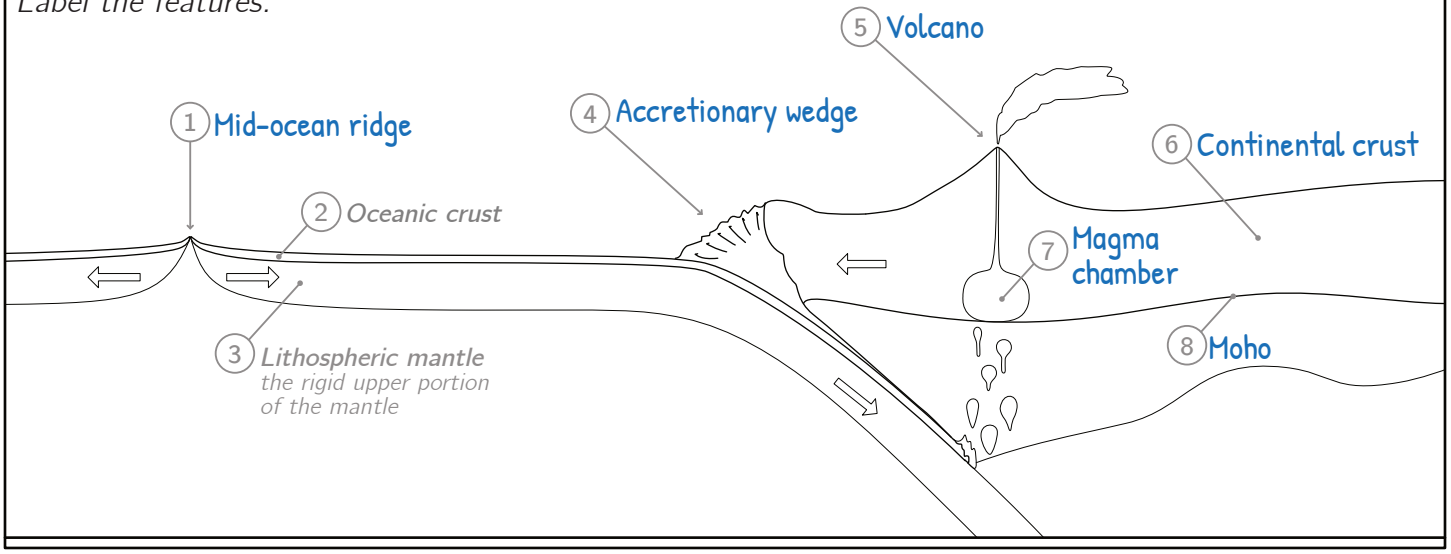
Definition: A place where plates slide past each other, also called transform boundary

Ex:

Form fault lines that often have a lot of earthquakes. Famous examples are San Andreas fault in California, the Northern and Eastern Anatolian Faults in Turkey, and the Alpine Fault in New Zealand



Label the features:



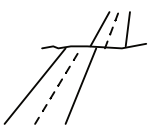
Explain how plate tectonics caused or influenced each event or geologic feature:

COTOPAXI

In 1877, Cotopaxi erupted with a violent explosion that destroyed the town of Latacunga, Ecuador.

The volcano produced enormous pyroclastic flows of hot gas and volcanic material which melted all of the ice cap on the volcano. This caused mudflows or lahars that traveled to the Pacific Ocean, more than 100 km away.

SUBDUCTION ZONE: The Nazca plate is subducting below the South American plate. This subduction zone forms the Andean Volcanic Belt, which has hundreds of volcanoes. This subduction zone has also regularly produced megathrust earthquakes. the strongest Earthquake ever recorded was in 1960 along this zone - the Valdivia earthquake or Great Chilean Earthquake was magnitude 9.5.



2002 DENALI EARTHQUAKE

This magnitude 7.9 quake lasted for almost 3 minutes. It caused thousands of landslides, fractured glaciers, and displaced roads and streams up to 29 feet from their original location. It even caused sloshing in lakes as far away as Louisiana!

STRIKE-SLIP or TRANSFORM FAULT: The Denali quake was caused by movement along the Denali fault. As the Pacific plate slides under the North American Plate, it pushes the Yakutat terrane (a subcontinent smashed into the North American plate) which transmits the pressure or push inland, causing many faults. The Denali fault is a strike-slip fault similar to the San Andreas Fault.

LAKE BAIKAL

Lake Baikal is over 1,600 m deep and contains approximately 20% of Earth's surface water. It is one both the oldest and largest freshwater lake in the world. It is getting larger by approximately 4 mm each year. Deep hydrothermal vents release heated, mineral-rich water into the lake.

RIFT VALLEY: Lake Baikal is the largest basin in the Baikal Rift Zone which stretches more than 2,000 km long. The lake is slowly growing deeper and wider because of the divergent plate boundary. The continental plate to the southwest of Lake Baikal is sometimes labeled the Eurasian plate. Other times, it is called the Amurian microplate.

HAWAIIAN ISLANDS

The Hawaiian-Emperor seamount chain is an enormous chain of volcanic islands, atolls, and seamounts that stretch for 6,200 km across the Pacific Ocean. The Western-most islands contain the most active volcanoes on Earth.

HOTSPOT: The Hawaii plume is a hotspot that is currently powering 4 active volcanoes. 2 dormant volcanoes and over 100 extinct volcanoes show evidence of where the Pacific plate has travelled.