Review plate interactions

• What are the different ways that plates can interact?
Focus question

• What happens to Earth’s crust during plate interactions?
Demonstrate model A

Teacher master FF, *Plate Vocabulary*
Demonstrate model A

a. Place the plates on a flat surface before moving them.

b. Slowly move the plates in the direction described in the second step (push together). The plates must always be in contact with each other (as there are no gaps in Earth’s crust).

c. Follow the instructions on the sheet in the zip bag to test divergent and transform interactions.
Locate boundaries

Notebook sheet 41, *Plate-Interaction Map*
Begin working with models

The foam and cardboard pieces represent Earth’s lithospheric plates.

Foam = continental lithosphere
Cardboard = oceanic lithosphere
“Convergent Boundary,” “Divergent Boundary,” “Transform Boundary,” and “Folding”
Discuss models

Notebook sheet 41, *Plate-Interaction Map*
Convergent boundary

1. What did you observe as the two pieces pushed together, forming a convergent boundary?
2. Where do you see a plate boundary with pieces of continental crust converging on Earth?
3. What landform do you see on Earth there?
When we see a piece of the crust rise up like this, some parts of the crust may break and wrinkle or become deformed into mountains. At other places, the whole crust may rise up without breaking or deforming, which is called uplift.
Divergent boundary

1. As the two pieces are pulled apart at a divergent boundary, what happens between them?

2. Where do you see two continental plates pulling apart like this on Earth?
Divergent boundary

3. There are no gaps in Earth’s crust. So what do you think happens in the space between the two plates?
1. What did you observe as the two pieces moved past each other?

2. Was it difficult or easy to slide the two pieces when they were touching each other?

3. Where do you see two plates moving past each other like this on Earth?
Transform boundary

Faults are breaks in Earth’s crust either within a plate or between plates.
Transform boundary

- Why do you think the San Andreas Fault zone is an important area to know about?
Introduce trench

- Why would a model showing two oceanic crust plates converging be difficult to create with the materials we have here?
Introduce trench

• Where do you see a boundary with oceanic crust converging?
**Introduce trench**

**Trenches** are deep areas where the oceanic plates are converging and sinking.
Introduce subduction

When one plate sinks under another plate, such as in model A or B, that process is called subduction.
Introduce subduction

1. What would happen to the rocks as they begin to subduct?
2. What is the limitation of this model?
Model B and divergent plates

1. As the two plates are pulled apart, what happens between them?

2. Where do you see two oceanic plates pulling apart like this on Earth?

3. There are no gaps in Earth’s crust. So what do you think happens in the space between the two plates?
Discuss volcanism

• What do you know about volcanoes that might explain why there is no empty space between the plates at the Mid-Atlantic Ridge?
Discuss volcanism

- Where do you see two plates moving past each other like this on Earth?
Discuss model C

1. What happens when foam and cardboard push together?
2. What happens to the cardboard as you push it into the foam piece?
Discuss model C

3. Where do you see a plate boundary with continental crust (represented by foam) and oceanic crust (represented by cardboard) pushing together on Earth?

4. What landform do you see on Earth there?
Discuss model C

- Where on the map do you see a plate boundary with continental and oceanic crust pulling apart from each other?
Discuss model C

• Where do you see two plates moving past each other like this on Earth?
Discuss model D

1. What did you observe happening to the foam as you pushed the sides together?

2. What would you call the landform that was created if this happened in Earth’s crust?
Discuss model D

3. Looking at the *Plate-Interactions Map*, where do you think landforms like this might occur?
Review vocabulary

Spend a few minutes reviewing the vocabulary for this part. Update the vocabulary index and table of contents in your notebook.
Answer the focus question

• What happens to Earth’s crust during plate interactions?
Let’s look at the Kaibab Formation in the Grand Canyon. In that formation, we find fossils of animals that once lived in a tropical sea. Yet the Kaibab Formation is more than 2,430 m above sea level.
Revisit Colorado Plateau

It seems there are two general explanations for these observations.

• The sea used to be more than 2,430 m higher than it is today. The Kaibab Formation was once under water.
Revisit Colorado Plateau

• The sediments that formed the Kaibab were 2,430 m lower and below sea level some 245 mya when they settled. Something happened to push the formation up.
Have a sense-making discussion

1. Where did the rock layers of the Grand Canyon originally form?
2. Where are the rock layers found now?
3. Which of the plate interactions you modeled might have caused the rock layers to lift up so high?
Movement of plates can cause sections of the crust to rise, lower, buckle, or fold.

The rock layers that formed in a basin later were uplifted due to plate tectonics (e.g., as an oceanic plate subducted under a continental plate in a convergent boundary, it pushed the continental plate upward).
This plate movement raised the rocks to the elevation at which we find them today. It made them more susceptible to the forces of erosion because the flow of water starts high above sea level.
Read “Earth’s Dynamic Systems” on page 81.

Earth’s Dynamic Systems
Earth’s surface is constantly changing. Weathering and erosion breaks down mountains and deposits sediments in basins.

- After billions of years, why isn’t Earth’s surface smooth? How do volcanoes and earthquakes change the surface? How do plate motions move continents?
- Sometimes describe Earth in terms of four interacting systems. The geosphere is the solid rocky surface and the interior of the planet. The hydrosphere is Earth’s water, both in the oceans and on the land. The atmosphere is the air that surrounds us. The biosphere is all the living things on Earth. Let’s take a closer look at the geosphere.
Think about information from the reading and consider the specific constructive and destructive processes that formed the Colorado Plateau and the Grand Canyon.

Add additional information to your previous answers.
Introduce mountain types

Notebook sheet 42, Mountain Types
Mountain Types
### Summarize mountain types

<table>
<thead>
<tr>
<th>Type</th>
<th>How it forms</th>
<th>Drawing</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fold</td>
<td>Slow compression caused by converging plates.</td>
<td><img src="image1.png" alt="Drawing" /></td>
<td>Central Appalachian Mountains</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Little Stony Man, Shenandoah</td>
</tr>
<tr>
<td>Fault block</td>
<td>Breaking of the crust either by compression or pulling apart (tension). The movement happens fast enough to break, rather than fold, the crust.</td>
<td><img src="image2.png" alt="Drawing" /></td>
<td>Grand Tetons, WY</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sierra Nevada</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Basin and Range Province, CA, NV, UT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tioga Pass, Yosemite NP</td>
</tr>
<tr>
<td>Dome</td>
<td>Magma pushing up from below uplifts the rocks. Erosion can expose the hardened magma dome.</td>
<td><img src="image3.png" alt="Drawing" /></td>
<td>Half Dome, Yosemite NP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Henry Mountains, UT</td>
</tr>
<tr>
<td>Volcano</td>
<td>Volcanic eruption</td>
<td><img src="image4.png" alt="Drawing" /></td>
<td>Mt. Hood, OR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mount St. Helens</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Axial Seamount on the Juan de Fuca Ridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mauna Kea</td>
</tr>
<tr>
<td>Plateau</td>
<td>Uplift of a relatively flat area next to a mountain that is being created by folding.</td>
<td><img src="image5.png" alt="Drawing" /></td>
<td>Colorado Plateau</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Himalayan Plateau</td>
</tr>
</tbody>
</table>
It takes a lot of force and a lot of time to raise a mountain. Most mountains, including fold mountains, fault-block mountains, domes, and plateaus, are formed because forces have pushed up, or uplifted, the rocks they are made of.
How could the idea that the plates were broken apart in different ways over Earth’s history explain why some mountains are not located near plate boundaries today?
Review vocabulary

Spend a few minutes reviewing the vocabulary for this part. Update the vocabulary index and table of contents in your notebook.

- dome
- fault
- fault block
- fold
- plateau
- subduction
- trench
- uplift
Answer the focus question

• What happens to Earth’s crust during plate interactions?
Homework

Access mountain cards on FOSSweb. Identify a local mountain, or a prominent mountain somewhere in the world that is of interest.

Create a mountain card in the same format as the digital cards.
Wrap-Up/Warm-Up

Share your mountain cards with the class.

• Do mountains get shorter over time? If not, why not?