CHAPTER 8—SKILL SHEET 1: PLATE DYNAMICS

Level of Difficulty: Moderate
Content: Important
Level of Interest: Good
Preparations: None
Materials: Earth Science Reference Tables
Time: About 20 minutes

Suggestions for the Teacher

This is a good time to explain that most scientists perform experiments to discover results. However, geologists often look at the results (the world around us) and try to hypothesize the experiment (natural events) that produced what we observe today.

Extensions

1. Some teachers have their students cut out tectonic plates printed on paper or hand students a set of tectonic plate shapes and ask students to recreate Pangaea by assembling the pieces for the best fit. You can use outlines of the continental shelves, which are more realistic than the shoreline shapes. This activity can be found at many sources on the Internet. This site also shows a way to model the creation of new crust at an ocean rift.

   http://volcano.und.nodak.edu/vwdocs/vwlessons/activities/p number6.html

   or www.tufts.edu/as/wright center/lessons/pdf/docs/activities/back and beyond.pdf (Activity #3)

   or http://www.ontariogeoscience.net/lessonplans/jigsawpuzzle.html

2. Students can view this “reconstructing Pangaea” as an on-line United States Geological Survey exercise for students.

   http://atlas.geo.cornell.edu/education/student/continental puzzle.html

3. Students can make a flipbook animation at Larry and Sheryl Braile’s Purdue University web site. Voyage Through Time—A Plate Tectonics Flipbook

   http://www.eas.purdue.edu/~braile/edumod/flipbook/flipbook.htm

4. Consider reproducing the convection demonstration(s) in the Preparation section of Geophysical Investigations.
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The regions where Earth’s plates meet form belts of active geologic change, which includes earthquakes, volcanic eruptions, and tectonic mountain building. The relative motion of these plates can be as much as 15 cm/year. However, most plates shift more slowly: about as fast as your fingernails grow. Geologists have identified four types of plate boundaries.

• Divergent rift boundaries occur where two plates pull apart as new crust is created. The mid-ocean ridges are divergent rift zones.
• Convergent subduction zones occur where plates collide and one plate (usually an oceanic plate) dives beneath another. In the oceans, subduction zones are usually found at the deep ocean trenches. As one landmass collides with another, the collision can pile up great mountain ranges.
• At transform boundaries, one plate slides past another.
• Inactive interfaces are places where there seems to be little or no relative motion of the plates.

Actually, most plate boundaries show a mixture of these relative motions: separation, convergence, and slippage. Figure 8-2 is a profile of a diverging rift and a nearby converging subduction zone. Where geologists can locate ancient plate boundaries, they often find associated mineral deposits, such as the copper ores of the American West or emery deposits in Westchester County, New York. (Emery is used as an abrasive.)

On page 9 of the Earth Science Reference Tables are diagrams that show the slow motion of the continents over the past 458 million years. Use this diagram to answer the following three questions.

1. In what general direction has the North American landmass moved?
   North or northwest

2. The names above the small world maps are geologic time periods. The Atlantic Ocean opened between which two periods?
   Triassic and Cretaceous

3. Approximately how long ago was New York State located at the equator?
   362 million years. (Devonian and Mississippian time)

4. What is the most likely composition of crust created at an ocean rift zone?
   Basaltic or mafic
5. Label each of the lettered plate boundaries shown in Figure 8-3 according to the relative motion that is occurring there: Divergent, Convergent, Transform, or Inactive.
   A. Convergent (subduction)
   B. Transform
   C. Divergent (rift)
   D. Divergent (rift)
   E. Inactive Divergent (rift)
   F. Transform
   G. Convergent

6. India is a part of what tectonic plate?
   Indian-Australian Plate

7. Where is the only significant land surface on which new crust is being created by rifting?
   Iceland

8. According to this map, why are earthquakes relatively uncommon in New York State?
   New York is not located near a plate boundary.

9. At which kind of plate boundary is part of the crust destroyed?
   Convergent (or subduction)

10. What kind of plate or part of a plate is most like to descend into the interior at subduction zone?
    Oceanic crust

11. Which type of boundary has many earthquakes, but neither creates nor destroys a significant amount of Earth’s crust?
    Transform

12. Label the major oceans and continents on Figure 8-3.