# Unit 2 overview

### *Learning objectives*

In this unit, students will

- measure the spreading rate of ocean ridges;
- use evidence to show that plate motions have changed over time; and
- make predictions of how plates will change over time.

In this unit, students explore patterns of seafloor age and calculate the rate of spreading in the Atlantic Ocean. They use their results to understand the history of opening the Atlantic basin and how spreading rates change over time. Next, they compare these rates to the Pacific Ocean to see that spreading rate is not globally uniform. Using plate motion vectors, students predict future trends of plate motion and calculate the time required for the Juan de Fuca plate to be completely subducted. They calculate seafloor spreading rates for the Hawaiian-Emperor chain using hotspot volcanism. Finally, they look at the motion of California along the San Andreas Fault and see that San Francisco and Los Angeles are slowly moving closer to each other.

## *Activity 2.1 – Testing plate tectonics (Engage)*

To begin, students discuss in small groups the kinds of evidence they might look for to determine whether the plate they live on had been previously located in another part of the world.

During the classroom discussion, record all students' ideas on an overhead or large sheet of paper. Encourage them to consider many different factors. Save the list of questions and ideas for later exploration.

## *Activity 2.2 – Investigating seafloor age (Explore)*

In this activity, students examine seafloor ages near spreading ridges as evidence that the plates have been in motion and continue in motion today. They will also discover evidence that suggests the rates of spreading in the ridges have not been constant throughout the ages.

Students who complete this portion of the lesson early should be encouraged to explore some of the questions raised in the Engage discussion.

## *Activity 2.3 – Determining seafloor age (Explain)*

In the reading, students learn how paleomagnetism is used to help determine the ages of seafloor rocks and rates of plate motion. They also learn how ancient features on the sea floor, such as the Hawaiian-Emperor volcanic chains, provide evidence that plates can suddenly change direction. Finally, they learn about whole-rate and half-rate spreading. The section concludes with a discussion of absolute versus relative plate motion and hotspots. Discuss these concepts with students to ensure they have a firm understanding before going on.

### *Activity 2.4 – Investigating plate motion (Elaborate)*

In the final stage of the activity, students apply their understanding of plate motion and rates to several problems. They calculate the absolute motion of the Pacific plate in the vicinity of Hawaii using the hotspot that formed the Hawaiian-Emperor volcanic chains. They compare the Pacific basin's spreading rates to the Atlantic basin's rates and discover that the two ocean ridge systems are producing new oceanic crust at different rates. They examine the Juan de Fuca plate in detail and discover that, at present rates, it will likely be completely subducted in about 80 million years. Finally, students explore how California's geography will change as the Pacific and North American plates continue to slide past each other.

### *Evaluating student comprehension*

This stage is used to provide students with feedback on their understanding of the concepts learned. Example assessments are provided, but you may develop other, more authentic assessments that are better aligned with your students' interests. One approach for assessment would be to have your students resolve any unanswered questions from the Engage portion.