

Earth Movements

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About **Earth Movements**

DeltaScienceModules, THIRD EDITION

Students explore the massive movements that are constantly shaping Earth—volcanoes erupting, trenches creeping open, continental plates colliding and sending mountain ranges skyward. Students learn how rocks provide clues to Earth’s history, structure, and geological activity. They build Earth cross-sections to compare ocean and continental crusts. Students investigate Earth processes that lend support to the theories of continental drift and plate tectonics. They model ocean-floor spreading, plate subduction, magma convection currents, volcanism, and earthquakes at plate boundaries. As a result, students learn to think of the Earth as a geological mosaic, constantly being refitted.

In the Delta Science Reader *Earth Movements*, students read about Earth’s layers and landforms and the forces that shape Earth’s surface. They learn how moving plates, earthquakes, volcanoes, weathering, and erosion change Earth. They also read about seismologists—scientists who study earthquakes—and about Charles Richter, the creator of the Richter scale for ranking the strength of earthquakes. Finally, students learn about the rock cycle.

Overview Chart for Hands-on Activities

Hands-on Activity	Student Objectives
1 Our Earth <i>page 13</i>	<ul style="list-style-type: none"> • examine a hard-boiled egg and relate it to the structure of the Earth • discuss the properties of each layer of the Earth • label a diagram of a cross-section of the Earth
2 The Earth's Crust <i>page 21</i>	<ul style="list-style-type: none"> • compare the thickness of oceanic and continental crust • discuss some of the geographic features found in oceanic and continental crust • label a diagram of the ocean floor • make a model of Earth's crust, including the ocean floor and an adjacent continent
3 Rocks: Clues to the Past <i>page 29</i>	<ul style="list-style-type: none"> • compare different types of rocks • model glacial scratches on rocks • observe fossils in rocks and make a model fossil • infer how rocks provide scientists with clues about the history and structure of the Earth
4 Convection Currents <i>page 39</i>	<ul style="list-style-type: none"> • observe convection currents in air • observe convection currents in water • infer that heat makes gases and liquids rise • conclude that heat in Earth's core causes convection currents in the semiliquid mantle
5 Continents Adrift <i>page 47</i>	<ul style="list-style-type: none"> • observe the behavior of a solid floating on a liquid and relate it to that of Earth's crust floating on the mantle • complete a jigsaw puzzle of the continents and infer that they were once joined • use a flipbook to observe the movement of the continents over time
6 Plates in Motion <i>page 55</i>	<ul style="list-style-type: none"> • observe a model of Earth's crust moving as one solid piece on the mantle • observe a model of crustal plates moving independent of each other on the mantle • predict the consequences of plate movement • compare the models with the actual Earth
7 Ocean-Floor Spreading <i>page 63</i>	<ul style="list-style-type: none"> • model the separation of crustal plates floating on Earth's mantle • observe what happens at the gap where the plates separate • infer how mid-ocean ridges form
8 Subduction <i>page 71</i>	<ul style="list-style-type: none"> • examine samples of granite and basalt • model the collision of oceanic and continental plates • discover how ocean trenches form
9 Building Mountains <i>page 79</i>	<ul style="list-style-type: none"> • make a model of two continental plates and observe what happens when they collide • infer that layers of rock of similar weight will wrinkle and fold when they collide • learn how mountains form at the boundary between two continental plates
10 A Model Volcano <i>page 87</i>	<ul style="list-style-type: none"> • construct a model volcano and observe its eruption • observe the effect of temperature on a gas under pressure • relate the temperature and pressure of magma to the forcefulness of a volcanic eruption • compare the model volcano to a real volcano
11 The Vibrating Earth <i>page 97</i>	<ul style="list-style-type: none"> • learn about a third way in which crustal plates move • model the movement of plates as they slide past each other • demonstrate the movement of vibrations through a solid • observe the destructive effects of vibrations moving through a solid
12 The Ring of Fire <i>page 105</i>	<ul style="list-style-type: none"> • plot the locations of volcanoes and earthquakes on a map of the world • identify the pattern as the Ring of Fire • discuss why volcanoes and earthquakes occur at plate boundaries
Assessment <i>page 111</i>	<ul style="list-style-type: none"> • See page 111.

Earth Movements

Process Skills	Vocabulary	Delta Science Reader
observe; communicate; collect, record, display, or interpret data	continent, crust, inner core, magma, mantle, model, outer core	pages 2–3
compare, make and use models	continental crust, mid-ocean ridge, ocean floor, oceanic crust, trench	pages 2–3, 4–5
compare, make and use models, observe, infer	cast fossil, fossil, glacier, mineral, mold fossil	pages 12–13, 15
observe, infer	convection, convection current, density	pages 6–8
observe, make and use models, infer	continental drift, Pangaea	pages 6–8
observe, predict, compare	plate	pages 6–8
make and use models, observe, infer	ocean-floor spreading	page 8
compare, make and use models, define based on observations	basalt, granite, subduction	page 8
make and use models, observe, infer	plate boundary	page 8
make and use models, observe, compare, hypothesize	bombs, cinders, erupt, lava, magma chamber, volcanic ash, volcanic mountain, volcano	pages 10–11
make and use models, observe	earthquake, fault, vibration	pages 9–10, 14
collect, record, display, or interpret data; communicate	Ring of Fire	page 11

See the following page for the Delta Science Reader Overview Chart.

Overview Chart for Delta Science Reader

Earth Movements

Selections	Vocabulary	Related Activity
Think About...		
What Are Earth's Layers? <i>page 2</i>	continent, core, crust, inner core, mantle, oceans, outer core	Activities 1, 2
What Are Earth's Landforms? <i>page 4</i>	barrier island, canyon, hill, landform, mountain, plain, plateau, valley	Activity 2
What Forces Shape Earth's Surface? <i>page 6</i> <ul style="list-style-type: none"> • Plates in Motion <i>page 6</i> • Earthquakes <i>page 9</i> • Volcanoes <i>page 10</i> • The Ring of Fire <i>page 11</i> • Weathering and Erosion <i>page 12</i> 	continental drift, convection current, fossil, mid-ocean ridge, ocean-floor spreading, Pangaea, plates, subduction, trench earthquake, epicenter, fault, focus, seismic wave, seismograph, seismologist, vibration erupt, lava, magma, magma chamber, vent, volcano deposition, erosion, flood, glacial till, glacier, mass movement, moraine, sediments, weathering	Activities 4, 5, 6, 7, 8, 9 Activity 11 Activity 10 Activity 12 Activity 3
People in Science		
<ul style="list-style-type: none"> • Charles Richter <i>page 14</i> 		Activity 11
Did You Know?		
<ul style="list-style-type: none"> • About the Rock Cycle <i>page 15</i> 	rock cycle	Activity 3

See pages 119–128 for teaching suggestions for the Delta Science Reader.

ACTIVITY SUMMARY

In this Delta Science Module, students are introduced to the internal processes and large-scale movements that change the face of the Earth.

ACTIVITY 1 Students begin the unit with an introduction to the inner structure of the Earth. Using a hard-boiled egg as a model, students identify and discuss the properties of each layer of the Earth.

ACTIVITY 2 Students explore the structure and composition of the Earth's crust. They compare oceanic crust with continental crust and discuss some of the geographic features of each. Then they build a model of the Earth's crust that consists of ocean floor and an adjacent continent.

ACTIVITY 3 Students explore some of the clues that rocks provide about the Earth's past. They compare different types of rocks and discuss how clues from rocks provide scientists with information about the history and structure of the Earth.

ACTIVITY 4 Students learn about convection currents. After observing convection currents in air and water, students infer that heat makes gases and liquids rise. They discuss the composition of the Earth's mantle and conclude that heat in the Earth's core causes convection currents in the mantle.

ACTIVITY 5 Students discover that the Earth's crust floats on the mantle. They observe the behavior of a solid floating on a liquid, then compare this model with the Earth. Next, students complete a jigsaw puzzle of the continents and infer that they were once joined. Using a flipbook, they observe the movement of the continents over time.

ACTIVITY 6 After observing two models of the Earth's crust—as one solid piece and in

sections that move independently—students infer that the crust is broken into pieces. They identify these pieces as plates and predict the effects of their movement.

ACTIVITY 7 Students model ocean-floor spreading—the separation of oceanic plates—and relate their observations to the formation of new crust at mid-ocean ridges.

ACTIVITY 8 Students model subduction and infer what happens to the Earth's crust when oceanic and continental plates collide.

ACTIVITY 9 Students continue to explore plate collision. Using clay models, they demonstrate what happens to the Earth's crust when continental plates collide. They compare their model to the Earth and infer that when plates made up of rock of similar weight collide, the rock will wrinkle and fold, building mountains.

ACTIVITY 10 Students build a model volcano and observe its eruption. To better understand the forces behind volcanic eruptions, they observe the effect of temperature on a gas under pressure, then relate the temperature and pressure of magma to the forcefulness of a volcanic eruption.

ACTIVITY 11 Students are introduced to earthquakes and learn what causes earthquakes. They work in pairs to model the movement of crustal plates. Later, they model the energy waves, or vibrations, that are produced inside the Earth when an earthquake occurs, as well as the destructive potential of such vibrations on the Earth.

ACTIVITY 12 Students plot the locations of volcanoes and earthquakes on a map of the world and identify the pattern that results as the Ring of Fire. Students then relate the location of volcanoes and earthquakes to the boundaries between plates.