

ATLANTA
SCIENCE
FESTIVAL

Lesson Title	Evidence of Plate Tectonics (<i>or evolution</i>)
Grade Band	6 th grade science or 7 th grade evolution (fossils in sedimentary rocks)
Submitted by	Donna Barrett, Metro RESA
Georgia Performance Standards:	
<p>Content – 6th Grade</p> <p>S6E5. Students will investigate the scientific view of how the earth’s surface is formed. e. Recognize that lithospheric plates constantly move and cause major geological events on the earth’s surface. g. Describe how fossils show evidence of the changing surface and climate of the Earth.</p> <p>Content – 7th Grade</p> <p>S7L5 c. Trace evidence that the fossil record found in sedimentary rock provides evidence for the long history of changing life forms.</p> <p>S7L1 b. Classify organisms based on physical characteristics using a dichotomous key of the six kingdom system (archaebacteria, eubacteria, protists, fungi, plants, and animals).</p> <p>Process Standards</p> <p>S6/7C5 b. Identify several different models (such as physical replicas, pictures, and analogies) that could be used to represent the same thing, and evaluate their usefulness, taking into account such things as the model’s purpose and complexity.</p> <p>S6/7C6 c. Organize scientific information using appropriate tables, charts, and graphs, and identify relationships they reveal.</p>	
Safety Considerations:	
Caution with scissors; setting clear guidelines for moving around the classroom	
Materials & Time Required:	
<ul style="list-style-type: none"> • Model cut outs at: http://volcanoes.usgs.gov/about/edu/dynamicplanet/wegener/ • Colored pencils • Variety of fossils (or pictures) such as invertebrates, imprints of ferns, fish, bones, etc (for the engage activity) • Faulty movement: cardboard, construction paper, scissors, ruler, protractor 	

This material is created and submitted by individual authors as recommended lesson plans to incorporate engineering design challenges and to review key science concepts. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the Atlanta Science Festival. For more info about the Atlanta Science Festival, visit <http://AtlantaScienceFestival.org>

Optional: Mystery of the Far Flung Fossils kit, data charts and fossil manual, photographs of the fossils described in the manual

Lesson Logistics (for teacher):

2-4 days suggested

Day 1: Wegener's Puzzle <http://volcanoes.usgs.gov/about/edu/dynamicplanet/wegener/> looking for evidence of continental drift

Day 2: Teaching Engineering: Faulty Movement

Day 3: (extension: Research on the Nature of Science and/or Blue Ridge Mountain Formation

Day 4: Evaluate

Teach Engineering: Faulty Movement (making models of faults)

https://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_natdis/cub_natdis_lesson02_activity3.xml

For 7th grade, this task could be used to support evidence of evolution (fossils in sedimentary rocks)

Optional Activity: Mystery of the Far Flung Fossils is available at Science Kit or other Science Supply company for approximately - \$34.95. Continents need to be laminated and cut out prior to the activity. Student kit includes cut out of small continents.

Mystery of the Far Flung Fossils - Students will be moving around the classroom to visit "continents" during different time periods. It is important to think about the logistics of setting up the classroom with the continents spread across the room. A jigsaw task is appropriate for this task. With students in teams of five, have them divide up with each student visiting a different continent. Once they have recorded the data at their assigned continent, have them bring the data back to share with their group.

The continents are in their natural geographical shape and their sizes are proportional. The blue, top layer, represents modern times, and the pictures of the modern animals you see are native to the continent. The three lower layers depict sedimentary rocks of three past ages:

- Green rock samples—100 million years ago
- Yellow rock samples—200 million years ago
- Red rock samples—300 million years ago

Opening: ENGAGE	<p>ENGAGE: Look at a sample of fossils. What type of organisms do you think these are from? When do you think they lived? Where do you think they were found? What clues might they give about the habitat? What type of rocks might they be found in? How could we find out? What do you wonder?</p> <p>Provide students with examples of fossils that could be found nearby or in the state of Georgia. Find out more about Georgia Fossils at:</p> <p>http://www.georgiasfossils.com/georgia-fossil-map-by-county.html</p>
Work Session: EXPLORE/EXPLAIN	<p>EXPLORE:</p> <p>Wegener’s Evidence: Cut out and color the continents on the student model. See instructions in the activity on the website.</p> <p>EXPLAIN:</p> <p>Discuss the evidence on the continent model. What other evidence did Wegener use to support continental drift? <i>For 7th grade, how can this evidence support theory of evolution (fossils found in sedimentary rock).</i></p>

EXTEND:

Research the Mountains in Georgia: when were they formed? By what processes? The Blue Ridge Mountains are the southernmost part of the Appalachian Mountains. Construct an explanation of the formation of the mountains. Consider the formation of Arabia Mountain and Stone Mountain in your explanation.

Nature of Science Connection: Trace the history of the theory of plate tectonics (or evolution). What/who's ideas lead to the development? Why was Wegener's idea not accepted until a mechanism was found? How does the history of this theory support our ideas of the Nature of Science?

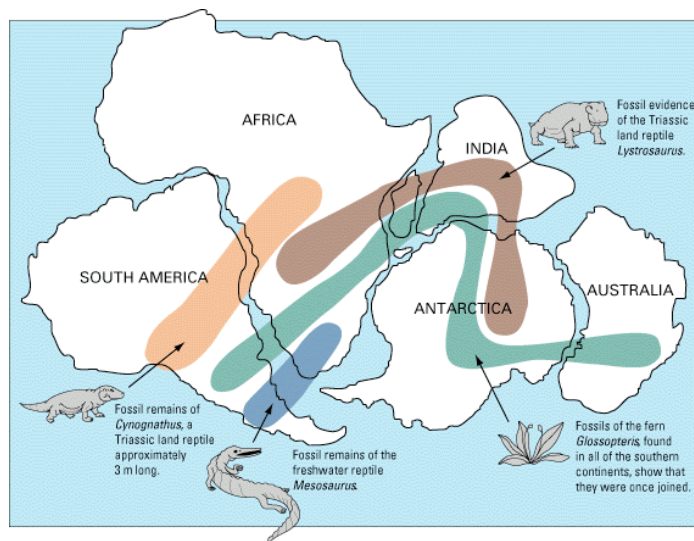
Engineering Application: How do you build a building to withstand earthquakes?
<http://www.exploratorium.edu/faultline/damage/building.html>

7th grade: Research the different climates and living organisms in the different geographic regions of Georgia. Use this as a review of classification and ecosystems.

Recommended: What is a theory? Keeley, Uncovering Student Ideas in Science, Vol 3. What is a model? Keeley, Uncovering Student Ideas in Science, Vol 4.

EVALUATE:

Construct an explanation for how the evidence that the continents shown below were once together. What geologic time period is shown in the diagram? Construct an explanation that explains how the highlighted fossils in the diagram provide evidence for continent drift. What was missing from Wegener's explanation? How was that information obtained and by whom? How did this additional information lead to the theory of plate tectonics?



Source: <http://pubs.usgs.gov/gip/dynamic/dynamic.html>

Documentation of Resources:

Fossil Finders: USGS: This Dynamic Earth
<http://pubs.usgs.gov/gip/dynamic/dynamic.html>

Teaching Companion to This Dynamic Planet
<http://volcanoes.usgs.gov/about/edu/dynamicplanet/>

Georgia Fossils by County: <http://www.georgiasfossils.com/georgia-fossil-map-by-county.html>

The Paleontology Portal: <http://www.paleoportal.org/>

Animation of Plate Movement:
<http://www.scotese.com/>

GSU Hyperphysics:
<http://hyperphysics.phy-astr.gsu.edu/hbase/geophys/platevid.html>

DLSE Teaching Boxes:
<http://www.teachingboxes.org/jsp/teachingboxes/plateTectonics/index.jsp>

UCMP Berkeley: Plate Tectonics -<http://www.ucmp.berkeley.edu/geology/tectonics.html>

UCMP Alfred Wegener:
<http://www.ucmp.berkeley.edu/history/wegener.html>

Additional Resources for Teacher Content Knowledge (may be too detailed for students):
<http://www.storybehindthescience.org/geology.html>