Example Misconceptions about Rocks

(**bold** is the underlying critical barriers that cause the misconceptions)

From: Barriers to college students learning how rocks form. K.M. Kortz and D.P. Murray, Journal of Geoscience Education, v. 57, p. 300-315, 2009.

Deep Time A "long time" is at most thousands of years. People play a role in moving sediments and rock. Rocks come to the surface through volcanoes or earthquakes.
Atomic Scale Igneous rocks are not the result of magma crystallizing. Sedimentary rocks form by wet sediments drying. Minerals form separately, then come together to form rocks. Metamorphic rocks melt.
Large Spatial Scale Sedimentary rocks form at or just beneath the Earth's surface. Layers in rocks are the same as layers in the Earth. Volcanism is needed to provide the heat for rock formation. Rocks move down into the Earth through earthquakes, divergent boundaries, cracks, or by burying themselves. Magma and rocks come from the core.
Changing Earth Features on the Earth do not appear or disappear. Rocks pre-exist in magma. Sedimentary rocks are located in the environment in which they are formed. Igneous and metamorphic rocks need exotic conditions to form.
Bedrock A rock forms as a handsample. Pieces purposely gather to form rocks. Granite is made from sediments. The ground is not made of rock.
Materials Magma turns into a black rock and black rocks were magma (i.e. black = igneous). Rocks can change color. Rocks can change into any other rock.
Pressure Pressure to form rocks is caused by things like heat, water, faults, and air.

Table 4: Critical barriers to learning (in **bold**) and example alternative conceptions that result.

Example Misconceptions about Plate Tectonics

From: Alternative Conceptions of Plate Tectonics held by Non-Science Undergraduates. S.K. Clark, J. Libarkin, K.M. Kortz, S. Jordan, Journal of Geoscience Education, 59, 251-262, 2011.

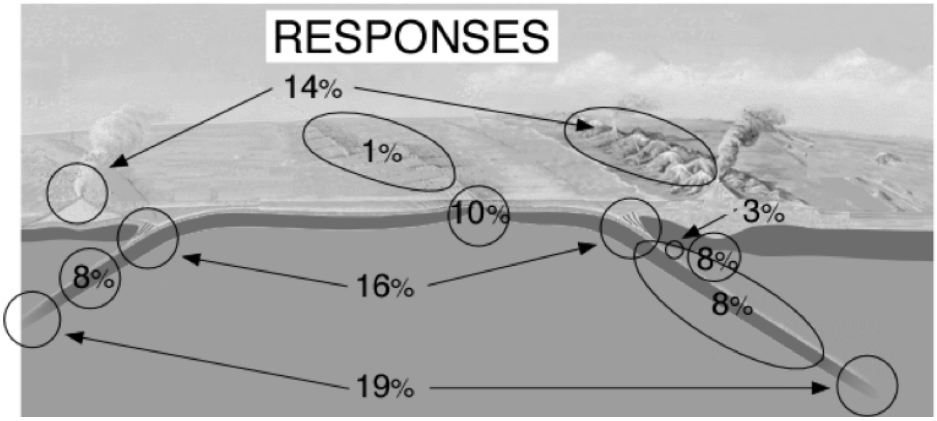

Figure 2. Distribution of responses **where students commonly indicated melting**. Coded areas are symmetric. Scientifically acceptable areas of melting are the circle at the divergent boundary and the circles in the mantle wedge and subducting slab beneath the volcanoes.

Table 3. Responses explaining **why melting occurs** in the subsurface

Response	**Percent**
Temperature / heat	31%
Rocks/plates crashing together/past each other	14%
Pressure	13%
Friction	10%
Magma melts rock	6%
Water	4%
Volcanoes	4%
Rising magma carries heat	4%
Heat from the core	3%
Climate	1%
Ambiguous or didn't know	11%

- Students frequently mix up layers within Earth: crust and mantle vs. lithosphere and asthenosphere.
- 25% of students indicated plates move together at divergent boundaries.

Table 4. Students' interpretation of the **orange colored area of the image**

Response	**Percent**
Magma, melted rock, or liquid	38%
Mantle	28%
Lithosphere	14%
Asthenosphere	7%
Other comments	13%

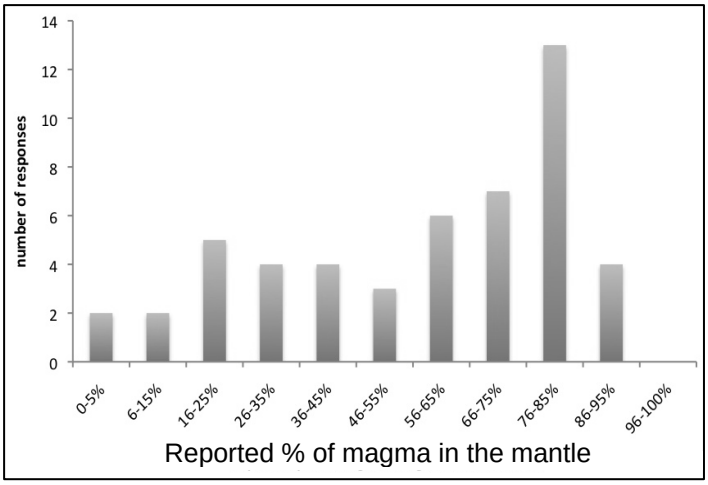

Figure 3. Responses from students that were asked to **estimate the percentage of the mantle that is liquid**.