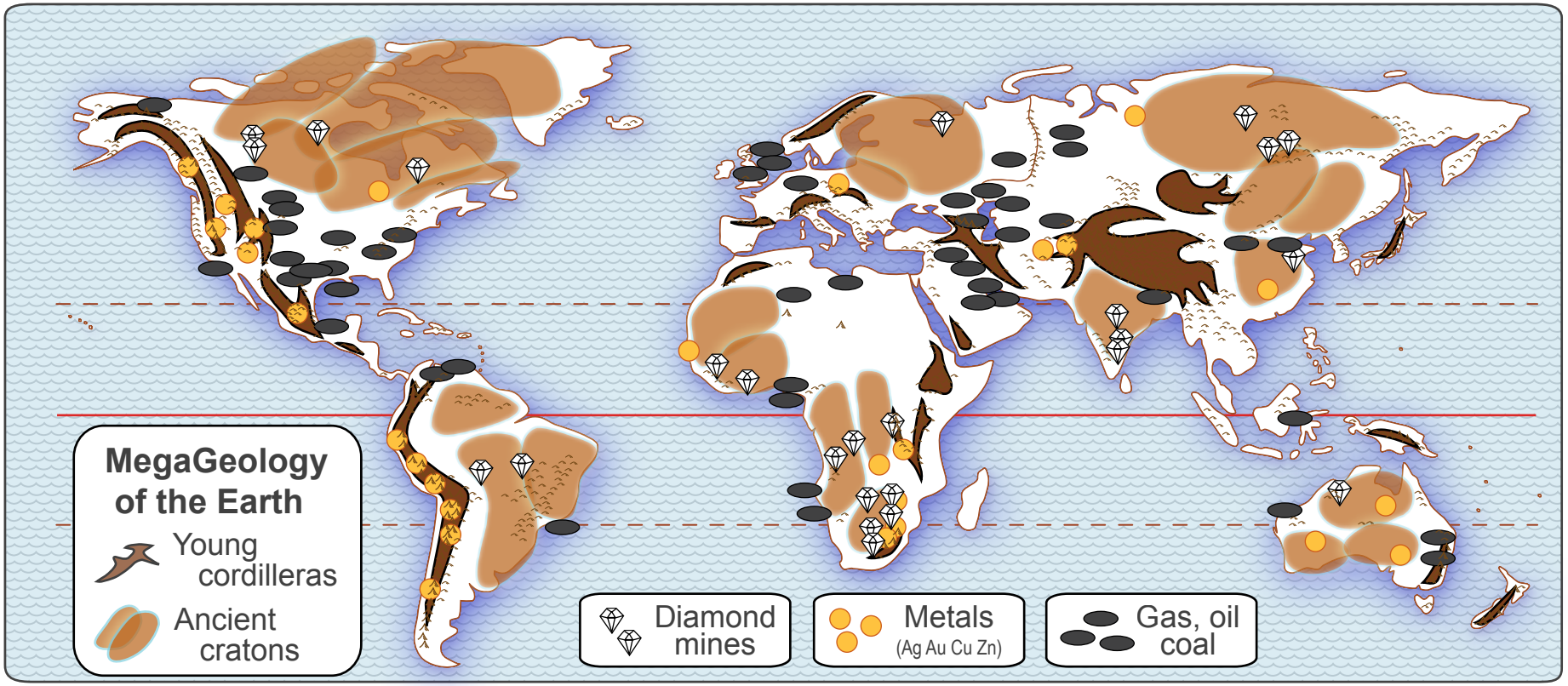
Basic Economic Geology of the World



A **craton** is a large area of ancient rock. Cratons are also called **shields**. They form the "core areas" of continents. Cratons usually are a complex mix of igneous rocks (mostly granite or gabbro) and metamorphic rocks (gneiss, schist, etc).

A **cordillera** is an area of recent (even ongoing) mountain-building. Cordilleras have many earthquakes and active volcanoes.

Areas around ancient cratons and young cordilleras are called **platforms**. They consist mainly of sedimentary rocks. These rocks are formed by deposition of material eroded from high cordilleras and formerly high mountains of cratons.

Many important mineral resources are associated with specific kinds of rocks. By studying the map above (and/or turning individual "layers" of information on and off in the clickable map), gather data to answer these questions:

1. Diamonds are most likely to be found in (circle one): cratons cordilleras sedimentary platforms
2. Fossil fuels (coal, gas, oil) are most likely to be found in (circle one): cratons cordilleras sedimentary platforms
3. Metals (gold, silver, copper, zinc, etc., but <u>not</u> iron or aluminum) are most likely to be found in _____.
4. Discussion question: which areas of the world are likely to make a living by selling minerals to people in other places?

Teacher's Guide: **Basic Economic Geology of the World**

Overview: overlaying maps is a basic geographical skill, because spatial association is a major way of organizing information. Gaining a mental map of basic geology is also useful as background for many topics in economics, world history, and US history. For example, many migrations were started by discoveries of resources such as gold or oil, and many wars were fought over them!	Grade: 4-10 Related Discipline: Economics GLCE: G212, G433-4, E311 Time: 10-20 minutes

Preparation: Duplicate the composite map, or one or more individual maps, if desired. Make sure that you are comfortable using the clickable map, if you want to use it for a post-activity discussion or to do the lesson as a one-computer demonstration.

Setup: Note that resources such as gold or oil were responsible for many economic booms, human migrations, and wars. Tell students that many mineral resources are associated with particular kinds of rock, and those rocks occur in specific places in the world: "You can drill for oil anywhere you want, but you are likely to find it only in places that have particular geologic structures and kinds of rock."

Procedure: The worksheet is self-explanatory, but teachers can use several ways to introduce it and/or provide guidance while students are working.

Answers: This is an excellent topic to emphasize that the world is a big and complicated place, but it also has distinct geographic associations that are easy to remember. The associations are not always one-cause-makes-one-effect – they are usually probabilistic in nature. In practical terms, this means that a given kind of rock does not always yield an economically viable resource. In the classroom, this means that the "answers" may not fit neatly into a simplistic standardized bubble-test, but even a third-grader can make many valid inferences by knowing how to do a careful exploration of a map.

Question 1. One strategy is simply to count features in different parts of a map. For example, this map has 25 diamond symbols. 20 of them are clearly inside ancient cratons. The other five are on the edge of cratons (and map edges at this scale are likely to be a bit uncertain anyway.) The answer is therefore "cratons" – people are <u>not</u> likely to find diamonds in cordilleras or young rocks.

Question 2. Fossil fuels occur in young sedimentary rocks, <u>not</u> in ancient cratons, though some are near edges. They can occur in recent cordilleras, because the forces that make mountains can help create the geologic traps that make rich oil and gas deposits. The third answer is therefore best.

Question 3 is more complex – partly because there are many different kinds of metals. Big producers are in the cordilleras of both Americas, Europe, central Asia, and South Africa. Metal mines also occur in older rocks (cratons) in several parts of the world. (Cratons, of course, <u>were</u> cordilleras in the distant past!). Sedimentary platforms, however, seem to hold few rich deposits of these metals.

Question 4 also has many answers. Some answers are very good, many are just OK, and many are clearly wrong. Students should look for clusters of symbols on the map and then describe their locations – metals in western South America and south Africa, diamonds in India, oil in southwest Asia and central Russia, etc. Give credit for reasonable inferences, but question unreasonable ones.

Debrief: The world is big and complicated, BUT we can make many valid inferences by searching a clickable map (and in fact by carefully looking at a more complex map, in effect turning it into a clickable map in our heads by looking at just a few features at a time).

Vocabulary: cordillera craton igneous sedimentary metal ore fossil fuel resource

Extensions: 1. Look at more detailed mineral maps in texts, atlases, and online sources. Evaluate how well a simple mental map can help them interpret a more complex map. For example, in North America, it's diamonds and nickel in the Canadian craton, metals in the western mountains, coal in the sedimentary rocks of Appalachia, Illinois, and Wyoming, and oil in a long strip that runs from Texas through Oklahoma, Wyoming, North Dakota, Alberta, all the way to northern Alaska.

2. Find instances where mineral or fuel resources were the reason for regional or international conflict.