Examine the Evidence – Teacher Notes

Trust the evidence … and only the evidence!

These five pebbles have been collected from beaches around the world in the last twenty years. They are about the same size and have about the same degree of roundness. I sprayed the rocks with water to help show more detail.

Basalt pebble found on the Island of Arran in Scotland (Atlantic Ocean).
Sandstone pebble found near Broome WA (Coral Sea)
Granite pebble found near Albany WA (Antarctic Ocean)
Rhyolite pebble found on South Island New Zealand (Antarctic Ocean)
Fossil rich limestone pebble from Latvia (Baltic Sea)

Using evidence from the photograph and your knowledge of rocks, state if each of the following five statements is true or false. Like all good scientists, provide evidence to support your decision.

1. All the pebbles are from modern beaches so the rocks must be the same age.
   False. Pebbles are as old as the source rocks from which they were weathered and eroded. There is no evidence in the photograph that this is so.
   Actually, the granite is about 2 billion years old, the limestone about 460 million years old, the basalt about 300 million years old, the sandstone about 100 million years old and the rhyolite is less than one hundred years old.
   An igneous rock with interlocking crystals usually takes longer to erode than softer sedimentary rocks.

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2. All the pebbles have the same degree of roundness. They must have travelled about the same distance from their source rock.
   False. Rocks are only as hard as the minerals they are made from and the processes that formed them. Igneous rocks such as granite, basalt and rhyolite have interlocking crystals and are difficult to round. Sedimentary rock can be relatively hard if the mineral clasts are quartz and the cement is also quartz. If the cement is calcite the rock will be much softer. The biogenic (made from living things) sedimentary pebble of limestone is so soft that a steel nail can easily scratch it.

3. We can tell which rocks are igneous rocks because their minerals are harder and will be more difficult to wear away. Larger less rounded pebbles come from igneous rocks.

   False. The smallest pebble is from a rhyolite, which is a felsic igneous rock. The sandstone and granite are both about the same size and roundness but granite is igneous and sandstone is sedimentary.

4. This pebble is similar to the others. It is a piece from an intrusive igneous rock. I found it on a beach below a conglomerate cliff. As the waves rolled in and out, you could hear the noise of the pebbles crashing against each other in the sea. Age-dating of radioactive elements in the minerals within this pebble suggest an age of 540 million years. Therefore the conglomerate cliffs were laid down about 540 million years ago?
   False. The date of 540 million years is the date of crystallisation of the original rock.. First, the rocks were uplifted to form a mountain range. This range was later weathered and eroded to form pebbles. The pebble and other sediments were deposited, then compacted and cemented to create the conglomerate cliffs about 360 million years ago. In the last 500 years the conglomerate itself was weathered releasing the pebble into the sea.

5. The coin was placed in the photographs to indicate the price of the pebbles.
   False. The coin is there to indicate scale.

6. Looking at rocks on a beach allows you to make a good guess (hypothesis) on what type of rock they are and what their history may have been.
   True!