WHERE IS OIL FOUND?

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Level: Grades 2 - 6

Estimated Time Required: 30 minutes

Anticipated Learning Outcomes

Students will learn that crude oil is found in porous rocks (reservoirs) rather than in caves or caverns.

Background

A common misunderstanding of the oil business is what a "reservoir" is. The term "pool of oil" conjures up images of underground caves filled with oil. In fact oil and natural gas are found in the pore spaces surrounding grains comprising sedimentary rocks. In this demonstration students will see what porosity is by observing the filling of pore space by a liquid.

Materials

• 2 large clear glass jars (canning jars are about the right size)
• Bottle of water (1 quart)
• Food coloring
• Marbles, enough to fill one jar completely

Preparation

Fill bottle with water and add several drops of food coloring to tint the water (I use blue food coloring to tint the water dark blue to simulate crude oil). Fill one jar completely with marbles. Keep bottle of colored water hidden until ready to use.

Procedure

1. Introduce the concept of oil reservoirs. Oil is found naturally in porous sedimentary rocks. Porosity is the space around the mineral grains that make up the rock.
2. Hold up the empty jar and ask, "Is this jar full?" The usual response is "no", but some classes will note that it is full of air.
3. Add marbles to fill the jar half full. Stop and ask, "Is this jar full?" Ask, "Can I put any more into it?" (The response should be "yes.")
4. Fill the jar to the top with marbles. Ask, "Is the jar full, now?" The response is usually "yes." Ask, "Can I put anything more into the jar?" If the answer is "yes" follow-up with "What sort of thing?" The class may already have the concept of filling the pore spaces.
5. Bring out the bottle of colored water and slowly pour it into the jar of marbles. Once the jar is filled to the top, stop and repeat, "Is the jar full?" The response should be "yes". Proceed with the analogy that the marbles are like the grains of sand in a sandstone and that crude oil is found within these pore spaces. This is a reservoir.
6. Following the discussion, you could demonstrate that oil is lighter than water by dropping a few drops of cooking oil into a jar with colored water. Shake it up a little, and the oil droplets will rise to the surface.

**Discussion**

Oil was formed from layers of sediments rich in the remains of tiny (microscopic) plants and animals. As the layers were buried deeper and deeper below younger layers of sediment, the plant and animal remains were heated and squeezed, and altered into crude oil. This "high pressure cooking" expelled the oil from the "source rocks", the layers in which the microscopic plants and animals originally were deposited.

Oil floats on water because it is lighter (less dense). The newly formed oil migrates through pores and cracks in surrounding rocks upward toward the surface. The oil will float on the groundwater within porous layers of rock.

The crude oil continues to migrate until it reaches the surface at an "oil seep" (a famous example is La Brea Tar Pits in California). Many times, though, the oil is trapped underground by impermeable layers (such as shales), in which the pores are too fine to allow the crude oil to flow through. It is this trapped oil that explorers seek. Oil wells are drilled into these traps and the oil can then be brought to the surface and transported to an oil refinery for processing. Gasoline and motor oil come from refining crude oil.

**Additional Activities**

- Proceed to the "Why Do We Need Petroleum" activity.

**Acknowledgements**

This activity was inspired by discussions with Linda E. Okland about an ARCO Alaska speakers' kit which included a similar demonstration.