Now Showing in 3D

**Purpose**
To observe a magnetic field in 3D

**Teacher Note**
Cow magnets work well with this experiment. Cow magnets are very strong magnets that you can purchase at a feed store or from scientific catalogs. If cow magnets are not available, substitute four or five donut magnets stacked upon each other or a very strong bar magnet.

**Teacher Prep**
For each group, either spray paint one side of a small plastic bottle or place a plain white label on one side. The white paint or label will help the students see the fibers better. Fill each bottle with baby oil almost to the top, leaving only a small space to add the fibers. Secure the cap of each bottle before dispensing to the groups.

**Procedure**
1. Wear goggles to protect your eyes from the steel wool pieces.
2. Unroll one end of the steel wool.
3. To trim evenly, use scissors to cut across the unrolled end of the steel wool. Discard the frayed fibers.
4. Cut across the steel wool, making very narrow cuts (2–3 mm wide).
5. Continue cutting until you have a little more than a teaspoon of fibers.
6. Gently wad the fibers (do not pack too tightly) and drop them into the bottle of baby oil.
7. Securely place the cap on the bottle and shake the bottle until the fibers are spread evenly throughout the oil.
8. While the fibers are still mixed in the oil, hold a magnet about 2–3 cm from one side of the bottle and observe the tiny fibers. It helps to hold the bottle in bright light to better see the fibers against the white portion of the bottle.
9. If the fibers start to settle to the bottom, just shake the bottle again. If the fibers clump against the magnet, you are holding the magnet too close to the bottle.
10. Vary the position of the magnet. For example, hold the magnet up and down, sideways, or with just one pole near the bottle.
11. Record your observations and illustrate each.

**Materials**
magnet
eextra-fine steel wool
small plastic bottle filled with baby oil
scissors
goggles
Conclusion

1. Explain in your own words why the iron filings lined up the way that they did.
2. Describe how the magnetic fields changed as you varied the position of the magnet.
3. What do you think creates a magnetic field?
4. What do you think the Earth’s magnetic field looks like? Draw a picture.

Extension

Fill a small plastic soda bottle (remove label) about one-fifth full of iron filings. Place a cow magnet in a plastic test tube. The test tube should be about 75% full as long as the bottle is tall. To enlarge the size of the top of the test tube so it won’t fall into the soda bottle, wrap the outer top rim of the test tube with masking tape. Also wrap masking tape over the top opening of the test tube. Place the test tube into the soda bottle, making sure it fits snugly. Add tape if needed. Put the bottle cap back onto the top of the bottle. Turn the bottle on its side and rotate. Watch what happens to the iron filings.