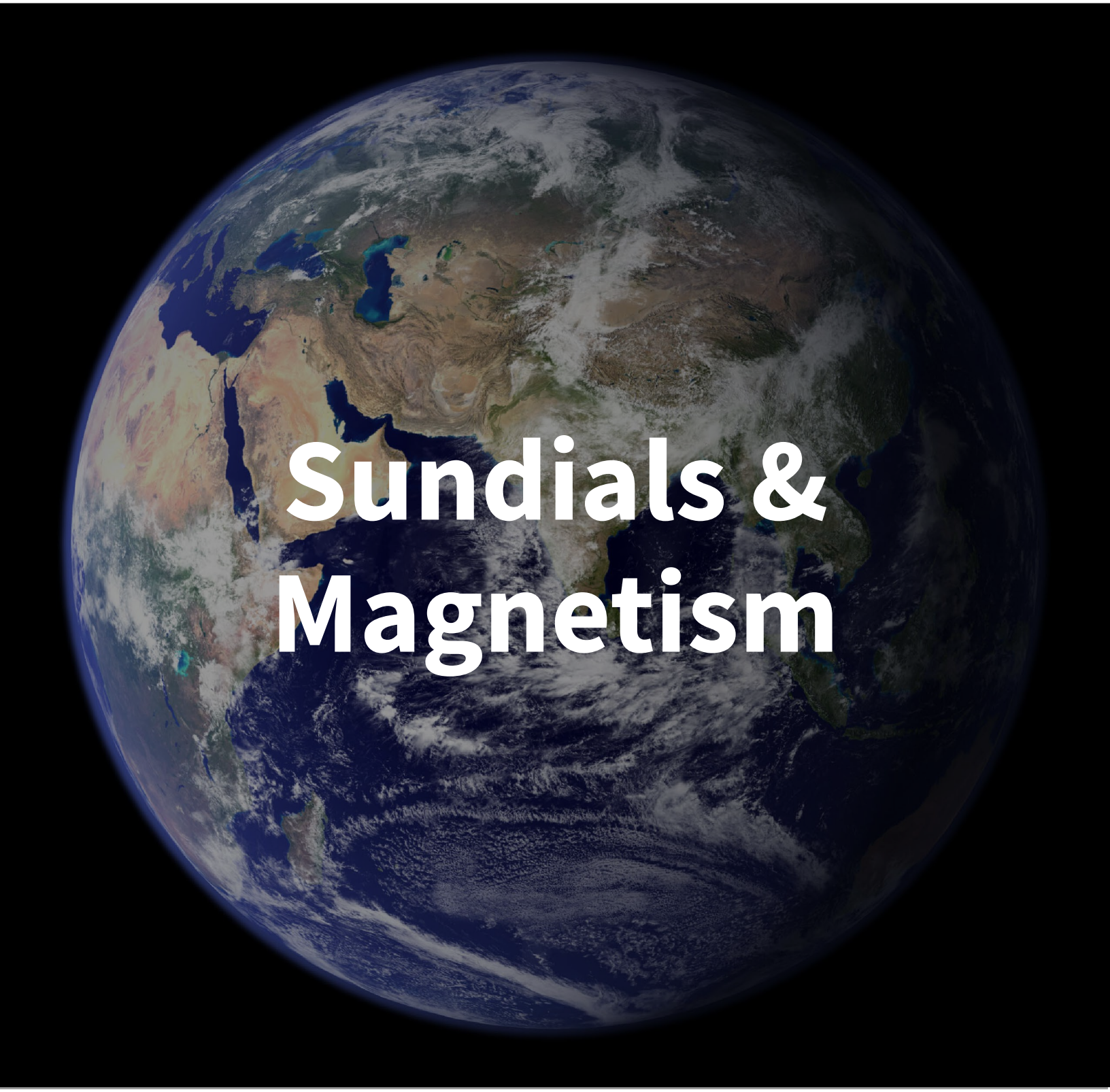


Sundials & Magnetism

Challenger® CENTER

Our Blue Marble: Sundials & Magnetism

Activity 1: DIY Sundial

Objective: Students will construct a paper sundial to learn about Earth's position to the Sun.

Materials Needed:

- ✓ 1 pack of pencils
- ✓ 1 pack of paper plates
- ✓ Markers – These are shared with *Paper Mountains Activity*
- ✓ Scissors – 1 pack of 12
- ✓ Paper circle template – The paper is shared with *Paper Mountains Activity*

Summary of Student Action:

Students will use a paper template to create their own sundial to tell the time on sunny days.

Setup Instructions:

Print out one circle template for each student

Additional Notes:

- The more precise you can be when setting up the gnomon on the sundial and placing your numbers on the face, the more accurate your sundial will be.
- Kids can keep the circle templates if they prefer, they are there to help students find the center of their sundial.
- Students may need help poking holes in the plate to attach their gnomon. Use caution.
- The paper circle template is included to make the activity easier and make the sundial more precise, but it is not necessary for the activity. The included instructions sheet is written for creating the sundial *without* the template. If using the paper templates, replace the instructions with the ones below.
- Template instructions: Cut out one of the circle templates on the table. Fold the circle in half and then in half again. Unfold the paper and look for where the folds meet – this is the center. Line up the template with your plate and poke a hole through the plate where the folds meet. This hole is where the pencil will go.

Our Blue Marble: Sundials & Magnetism

Activity 1: DIY Sundial

Activate Your Knowledge:

Did you know our Earth is part of a larger solar system that is part of an even bigger galaxy? The Sun is the largest object in our solar system. Because of its mass, it exerts gravity on the other bodies, like the Earth, in the solar system. As a result of this gravity, the Earth revolves around the Sun. Since the Sun doesn't shine all the time, we know the Earth is rotating, too. As the Earth rotates, different parts of the Earth receive different amounts of sunlight because it reaches the Earth at different angles. You can use a sundial and the angle of the light to tell time of day.

Materials You Will Need:

- ✓ 1 Paper plate
- ✓ 1 Pencil
- ✓ Markers
- ✓ Scissors

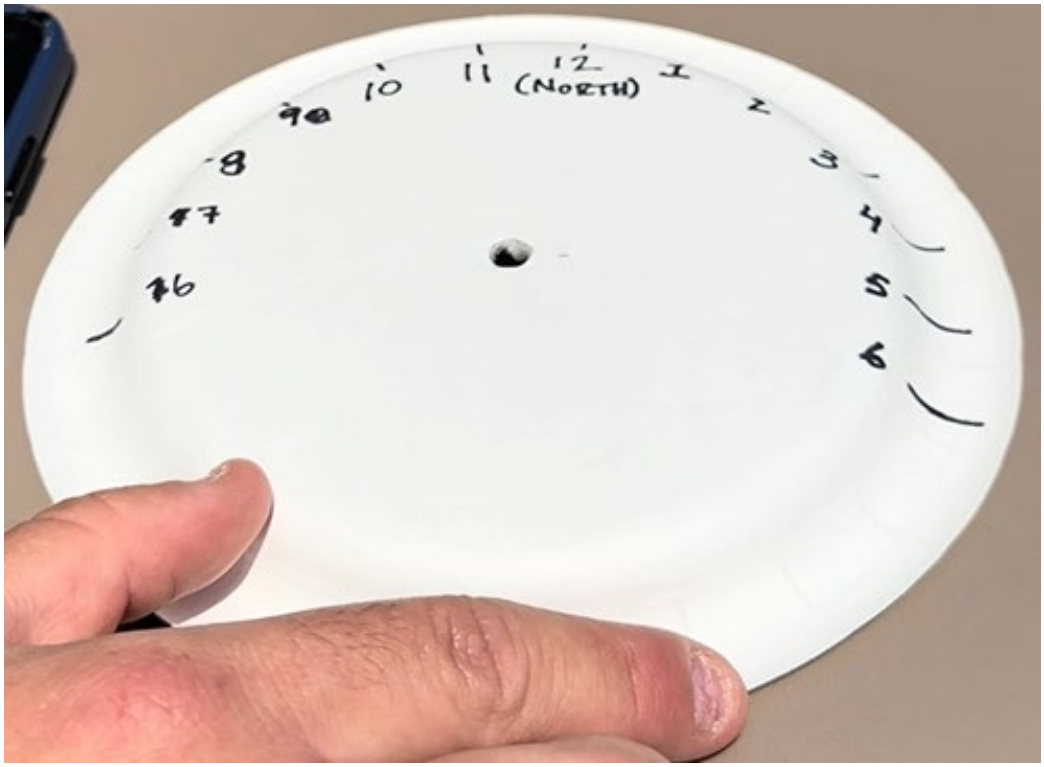
Procedures:

1. First, locate the center of your plate so you can position your pencil. The pencil will serve as your *gnomon*. The *gnomon* is the part of the sundial that casts a shadow on the sundial. The side of the plate where food is typically placed should be facing the ground. At the center of the plate, using a pencil, poke a hole into the center of the plate. This is where the pencil will go.

2. Using a marker, turn your sundial face into a clock face. Write numbers 6-7-8-9-10-11-12-1-2-3-4-5-6 on the plate to match the example image.

3. Attach your gnomon by sticking the pencil in the hole in the middle of the sundial face.

4. When you get home, try taking your sundial outside and setting it up. To set it up, find a bright spot with direct sunlight. Turn the sundial until the shadow of the gnomon is at the appropriate time on your sundial face. Now, you can check back on the sundial later to see if the time is correct!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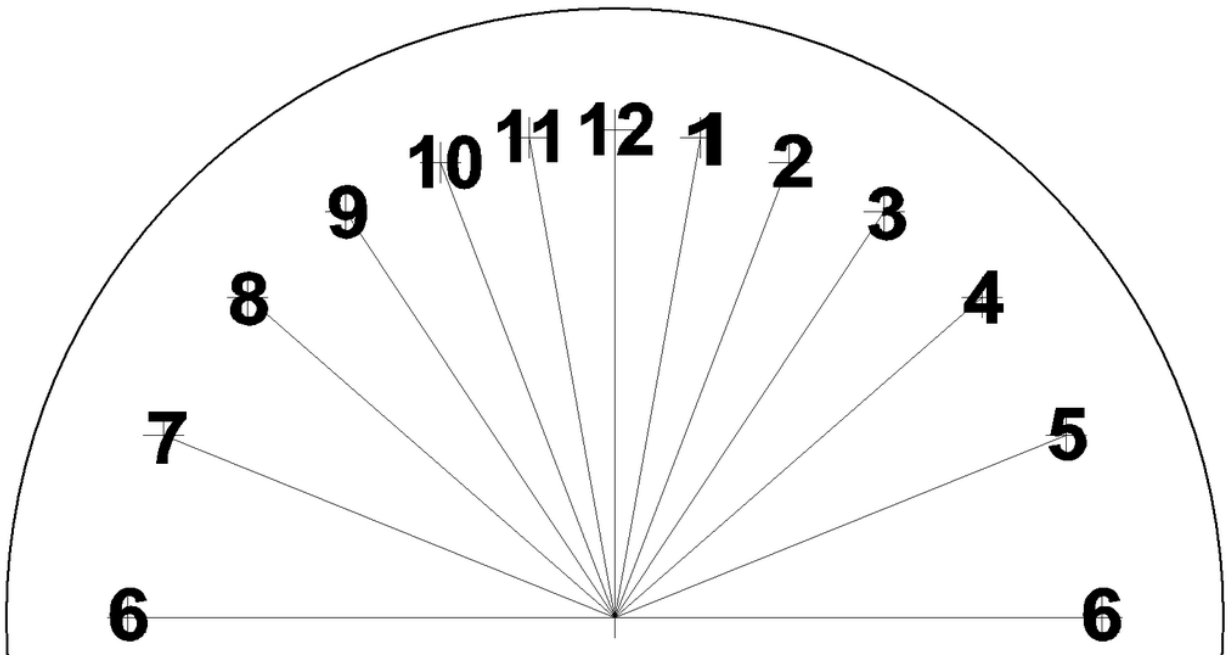
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Our Blue Marble: Sundials & Magnetism

Activity 2: Earth's Magnetism

Objective: Students will perform experiments with magnets to learn more about the Earth's magnetic field.

Materials Needed:

- ✓ 2 Bar magnets
- ✓ 1 Compass
- ✓ Iron filing cases
    - 1 Bottle of iron fillings
    - 1 Packaging tape
    - 1 Sleeve of Petri dishes
- ✓ 1 Box of paperclips

Summary of Student Action:

Students will use the magnets to conduct experiments about how magnetism is generated and why a compass is impacted by a magnet.

Setup Instructions:

For this experiment, you will need to make your own iron filing cases. These will be used to demonstrate the Earth's magnetic field. To create the cases, follow these directions:

- Sprinkle 1-2 tablespoons of the iron filings into 3-5 Petri dishes. Place the lid on the Petri dish. Seal the Petri dish by using the packing tape around the edge. Set out the supplies on the table.
- Place the bar magnets away from the other supplies to keep the bar magnets from affecting the supplies until the students are ready to experiment.

Additional Notes:

Keep an eye on the iron filing cases as they may break or could be opened by students.

Our Blue Marble: Sundials & Magnetism

Activity 2: Earth's Magnetism

Activate Your Knowledge:

Did you know the Sun applies a force on the Earth because of its large mass? Did you know this force is called gravity? Did you know there is also gravity on Earth? The Earth also exerts a force on people and the other things found on Earth because of Earth's own mass. Earth has a core made of metal. The metallic core contributes to gravity and helps the Earth generate a magnetic field around itself. The core is also what makes compasses work. The Northern end of a compass needle is a magnet that is attracted to Earth's magnetic pole located near the North Pole. To better understand compasses and the Earth's magnetic field, let's do some experiments!

Materials You Will Need:

- ✓ 2 Bar magnets
- ✓ 1 Compass
- ✓ 1 Iron filing case
- ✓ 1 Paperclip

Procedures:

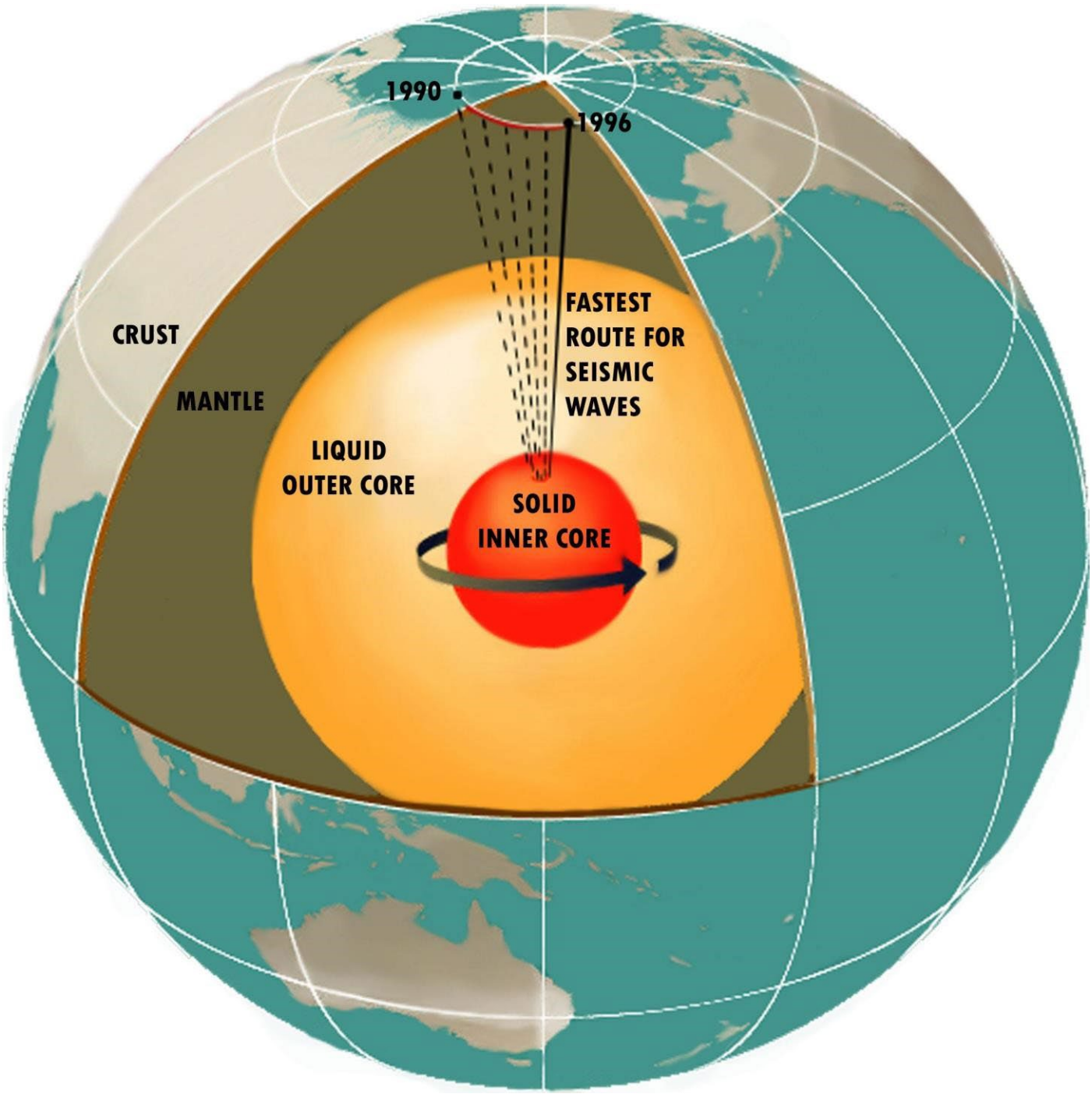
1. Grab two of the bar magnets and hold them near each other. What happens? Do the same ends of the magnet connect to one another?

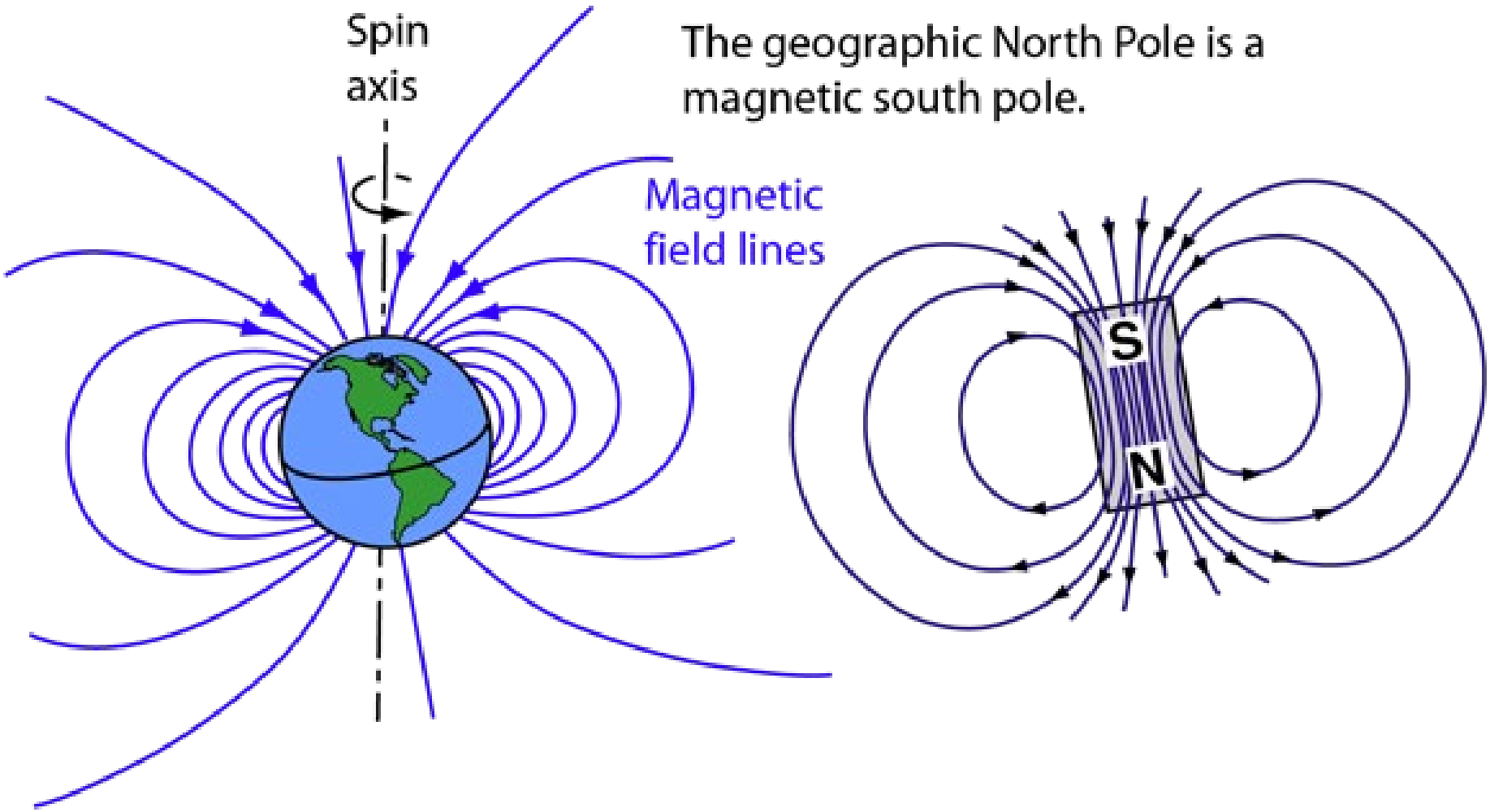
2. Try placing the magnet near the compass. Can you get the arrow to move? How does the arrow move? What does the arrow point toward? What does the compass arrow do when there is not a magnet nearby?

3. Take the iron filling dish – this is the sealed Petri dish filled with iron filings – and gently slide it back and forth on top of the table so that the iron filings are evenly distributed inside the case. Carefully set the case with the iron filings on top of one of the bar magnets. What happens?

4. Try making a magnet. Take one of the bar magnets and drag one end of the magnet across the end of one of the paper clips. Drag the magnet across the paperclip in the same direction 50 times. This will turn the paperclip into a magnetic. Hold the now magnetized paperclip near another paperclip. What happens?

Diagram of the Earth's Core





Earth **Bar Magnet**