

Our Magnetic Field Is A Shield

Teacher Sheet(s)

Objective: To create a model of the Earth's magnetic field (magnetosphere).

Level: K-4

Subjects(s): Science

Prep Time: Less than 10 minutes

Duration: One class period

Materials Category: Special Requirements

National Education Standards

Science: 3c, 5a, 5c

Math:

Technology (ISTE):

Technology (ITEA):

NGS Geography Standards:

Materials:

- **Per Group**
 - One colored Student Sheet
 - Small plastic salad tray or aluminum tray
 - Steel wool cut in tiny pieces
 - Plastic wrap
 - Tape
 - Straws
 - Bar magnet (strong polarity)
 - Small paper cup
- **Per student**
 - Protective eyewear (goggles)
 - Color pencils, crayons, or markers
 - Unlined paper
 - Student Sheets

Related Links:

Lesson adapted from Northern Lights and Solar Sprites
[Earth-Sun Connection Power Point Presentation 3-5](#)

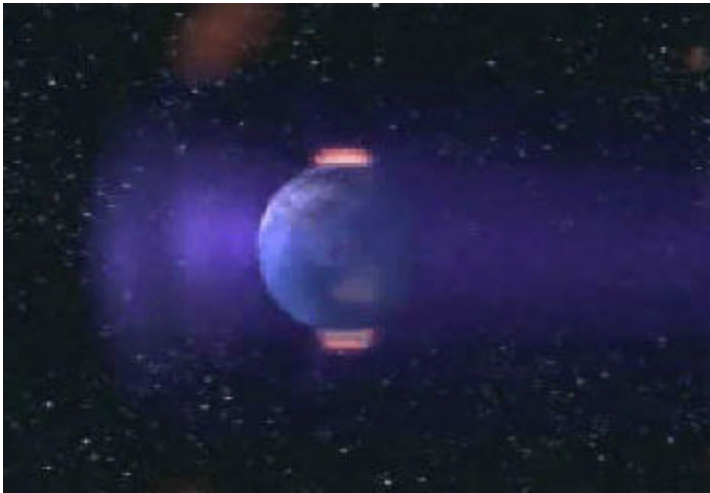
Supporting NASAexplores Article(s):

[Stay Out Of The Sun!](#)

Pre-Lesson Instructions:

- This activity requires students to use small metal pieces of steel wool that could be hazardous to the eyes. **Protective eyewear is highly recommended.**
- Divide class into groups of four students. Assign the students in each group a member number from one through four.
- To keep the bar magnet clean, wrap it in plastic wrap, and secure it with tape.
- Prior to beginning this activity, cut the steel wool into tiny pieces. Place approximately 4 tablespoons of the steel wool pieces into a paper cup. Prepare 1 cup for each group of students.
- Prior to beginning this activity, color a drawing of the Earth (see Student Sheet) for each group to use in the experiment.

Background Information:



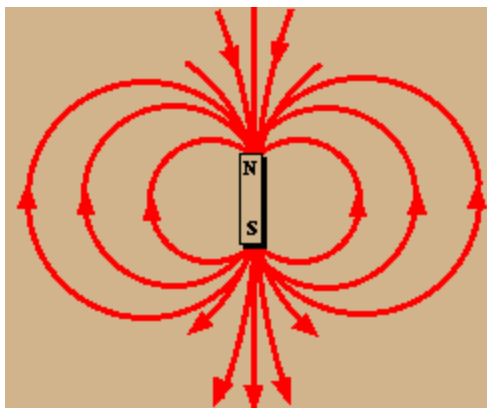
Scientists call the region surrounding the Earth where its magnetic field is located the Magnetosphere. When the solar wind sends its streams of hot gases (plasma) towards the Earth, the magnetosphere deflects most of these gases. You can see the Magnetosphere in the picture to the left.

Each square centimeter of the Sun's surface emits as much light as a 6000-watt lamp. Out of this light the Earth's atmosphere absorbs more than half of the Sun's light, 30% of it is reflected into space, 17% is absorbed by the atmosphere, 22% is scattered to the surface by the clouds, and only 31% arrives at the Earth's surface unaffected.

In this lesson, students will use a hands-on experience to learn about the magnetosphere (the magnetic field surrounding the Earth).

Guidelines:

1. Read orally to the class the K-4 NASAexplores article, "Stay Out Of The Sun!".
2. Hand out the Student Sheet to each student. Have them color the Earth while you pass out the experiment supplies. See the Materials list for each group.
3. Explain to the class that a magnet creates looping lines of force around it. In the same way, the Earth has a magnetic field around it. See the picture below. This is like a big shield that bounces the solar wind away, or deflects it, around the Earth. Scientists think Mars once had oceans and an atmosphere. But, Mars has little or no magnetic field, so the solar wind slowly "blew" the atmosphere and water away. The same thing happened to all the water on Venus, too.



4. Explain to the class the Earth's protective shield or cover is also called the magnetosphere. It works just like your skin does to keep out harmful things.
5. The students are going to observe a model of the magnetosphere using magnets and pieces of steel wool. Read the directions below.
 - o Each student puts on protective eyewear.
 - o Group member number one places the bar magnet in the middle of the plastic salad tray or aluminum tray.
 - o Group member number two places the colored drawing of the Earth that was prepared in advance over the tray. Make sure the Earth is positioned in the middle of the magnet.
 - o Group member number three sprinkles the pieces of steel wool on the top of the page above the Earth from about 10 inches up.
 - o Observe the pattern made by the metal pieces held in place by the forces between the opposite poles of the magnets.
 - o Group member number four blows softly through the straw to move the metal pieces across the drawing of the Earth. This

models the magnetosphere.

- Observe how the magnetic field lines squish on one side of the model.
- Students draw the model of the Earth's magnetosphere on their drawings of the Earth.
- Students label their drawing, "The Earth's Magnetosphere."
- Have students write their names on their papers.

Discussion/Wrap-up:

- Remind the class that the Earth's *magnetosphere* is interesting to study, and it certainly protects all of us. By learning more about it, we understand better how our planet works.
- Display the student's drawings in the class or hall

Extensions:

- Have the students work as a class or in groups with adults to write a story about the magnetosphere and how it protects us. The story can be written on chart paper or made into a book with student illustrations

[Go to the Student Sheet](#)



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