

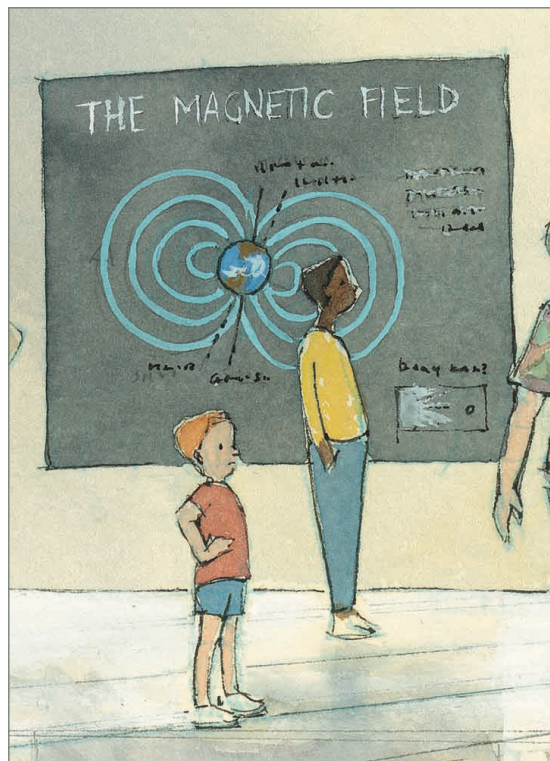
JUST RIGHT: SEARCHING FOR THE GOLDILOCKS PLANET

Mimicking the Magnetosphere

“Earth is big enough that part of its core is still molten, swirling with so much iron that it creates a magnetic field strong enough to protect our atmosphere from the solar wind.”
–Just Right: Searching for the Goldilocks Planet

Magnetosphere

One of the features that enables the Earth to support life is the protection of the magnetic field around the planet. Like a bubble or a force field around the world, the magnetosphere deflects most solar particles and keeps the solar wind from stripping away the ozone layer and the atmosphere. In turn, the ozone layer protects us from harmful ultraviolet radiation. Without the ozone layer, the radiation would be deadly. And without the atmosphere, we would not be able to breathe and the oceans would evaporate.



What does this field look like and where does it come from? Just like other magnetic fields, the magnetosphere is not visible to the naked eye. It is generated by the molten iron deep within the Earth’s outer core. That liquid iron flows around and around the inner core and generates electrical charges, which produce a magnetic field.

Diagrams of the magnetosphere show how the field extends in front of and behind the Earth, with the North and South magnetic poles seeming to act as anchors for the donut-shaped fields of protection.

Explore “NASA Earth's Magnetosphere” at https://www.nasa.gov/mission_pages/sunearth/multimedia/magnetosphere.html

“Our home—the planet Earth—has everything 'just right' for us.”
–Just Right: Searching for the Goldilocks Planet

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Demonstrating Magnetic Fields

To demonstrate a magnetic field, consider using a bar magnet and iron filings. You will need to find a way to contain the filings so they do not scatter loosely, but still allow students to see them react to the magnet. Options for this include:

- Use the lid of a clear lunch or takeout container. Sprinkle the iron filings on whichever side of the lid has a raised edge; this will help contain the filings. Place the magnet under the lid. You may even wish to tape the magnet to the underside of the lid so that you can lift the lid to let students view it from the side or underneath.
- If you would like to have groups of students do this activity on their own, you may provide each group with a bar magnet and a zip-sealed baggie of filings. Have them lay the magnet on the table, then spread the baggie across the top of the magnet.
- Place a cow magnet inside an empty soda bottle (clear, not tinted). Then sprinkle the filings inside the bottle. They will cluster around the magnet creating a 3-D visual representation of the magnetic field.
- You may purchase magnetic field viewing cards that can be held up to a magnet to reveal its poles and the field around it. They are less messy than loose iron filings, since they use a magnetically sensitive film set into a plastic card.
- Science supply businesses also sell premade viewing kits such as a clear plastic cube or cylinder with a magnet suspended in the center and the filings around it, or a clear plastic sealed case with the filings in it that you can use with your own magnet.

Discussing Magnetic Fields

However you choose to stage your demonstration, discuss with students what they observe about the way the filings arrange themselves in relation to the poles. Can they see how the field seems to come out from one pole and curve around to the other pole?

Now look back at the diagram of the magnetosphere around the Earth. Then lead them to predict how that would also mimic the field between the North and South Poles of the Earth. (Do they see the same pattern there?)

The magnetosphere protects us, but what about planets that have no magnetic field? If the planet does not have a metal core capable of producing a magnetic field, then could life exist on that planet's surface?