

Magnetism – Strange Attraction

The attraction and repulsion of magnets produces entrancing, unpredictable motion. Patterns of order can be found in apparently disordered systems.



Materials:

- Stand or something to hang the magnetic pendulum from
- String
- Felt Pen or tape
- Ruler
- 4 to 6 Neodymium (Rare Earth), Ceramic, or cow (Alnico) magnets

Procedure: (Remember to have your parent's permission and have them watch and help you.)

- Put all the magnets together in a stack so that they stick together. By doing this, you orient the magnets so that all of the north poles point in one direction and all of the south poles point in the other.
- Mark the top of each magnet with felt pen or tape. This identifies the matching poles.
- Use the string to hang one magnet from the stand so that it is a free-swinging pendulum.
- Arrange the other magnets below the pendulum in a triangle shape (about 5 cm on a side). Position the magnets so that they all have the same pole up.
- Adjust the length of the pendulum so that the free-swinging magnet will come as close as possible to the other magnets without touching them.
- Give the pendulum magnet a push, and observe.
- Vary the location and poles of the magnets and observe.

What's Happening:

Did you notice that a tiny change in the location of one of the fixed magnets or in the starting position of the pendulum caused the pendulum to develop a different pattern of swinging? The force of gravity and the pushes and pulls of the magnets act together to influence the swinging pendulum in complex ways. It is difficult to predict where the pendulum is going next. This sort of unpredictable motion is called chaotic motion.

Extension:

Chaos theory is unveiling hidden relationships in nature from such diverse things as the patterns in Saturn's rings to measles outbreaks. Often, a system that is predictable in the long run shows chaotic variations in the short term. Weather is often unpredictable yet the climate pattern is known. Small changes can have big effects. Scientists recognize this characteristic of chaos when they argue over the "butterfly effect." That is, can a butterfly flapping its wings in China drastically alter the weather in Medicine Hat?

This activity is based on our Magnetism kit. The source for this lab was: http://www.exploratorium.edu/snacks/strange_attractor/index.html. Our teaching kits (described on our website) are loaned out FREE to provide classroom teachers and parents of home schooled children an opportunity to explore Science in interesting ways. Visit the Praxis display at SEATAC. Please consider volunteering as a classroom guest speaker or allow your business as a field trip location.

Lorne Cooper, Regional Executive Director

PRAXIS, "Making Science Fun". Contact Praxis at praxis@praxismh.ca, www.praxismh.ca, Tweet or follow us @PraxisMedHat, or friend us on Facebook. Address: c/o 200 7th Street S.W., Medicine Hat, AB, T1A 4K1 Phone: 403-527-5365, Fax: 403-527-6570.