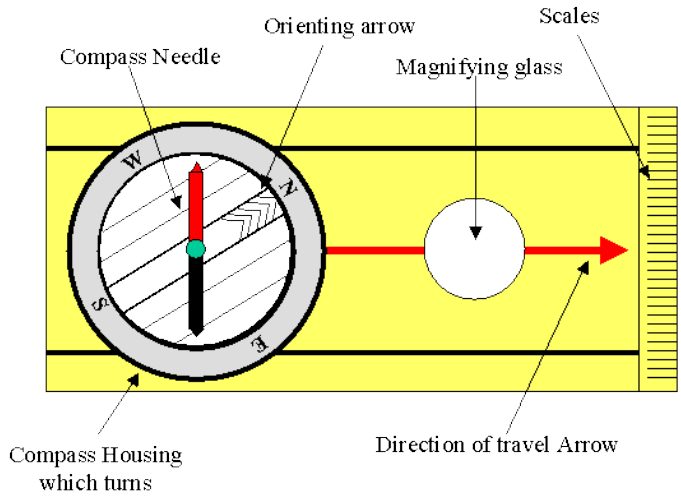
Activity 5 - Navigating the Earth with a Compass

TEACHER'S GUIDE

For centuries, navigators at sea relied on compass bearings to guide them safely back to port after long ocean journeys. A slight change in these bearings, even by a degree, could result in hundreds of extra miles added to a voyage, or deadly encounters with coral reefs and shoals under foggy conditions. Compasses are oriented to the Earth's magnetic field. In 1600, the English scientist Gilbert wrote a book called **De Magnete** that described why Earth is like a magnet. Since then, the idea that Earth is a giant magnet has been pretty well taken for granted, and used to great advantage by merchants, hikers and scientists!

GOALS

1) Students will learn how to use a compass to take simple bearings on landmarks around their school.
2) Students will appreciate that slight differences in bearings can lead to dramatic changes in where you are planning to travel.



MATERIALS

- Compasses. May be found at:
  http://www.rei.com
  http://www.ebrasingtons.com

PROCEDURE

To use a compass, one holds the compass level (horizontally) so the needle is free to move. You face the object or direction of travel so that the "direction of travel" arrow points to it. You rotate the compass housing so that the orienting arrow is on top of the red section of the compass needle, which points to the magnetic pole in the Northern Hemisphere. Then you read out the degree number along the red line of the arrow. Students can treat this as a game. First, a student takes a bearing of an object outside the schoolroom. Other students then guess the object, based on the bearing degrees the first student gives them. The student should only give this one clue. Note: If you do not know how to use a compass, you may want to briefly review the excellent orienteering page at http://www.learn-orienteering.org/old/

Next is an inquiry lesson where students work together in teams to come up with a way to determine if a magnetic storm is in progress by using their compass. The students should test out their idea over several days when there is a magnetic storm to see if it worked. See the storm dial on this webpage to determine whether or not a magnetic storm is occurring: http://sprg.ssl.berkeley.edu/dst_index/. The students then write up their results in a paper or share with the class what they discovered.

Student Name _____ *Date* _____

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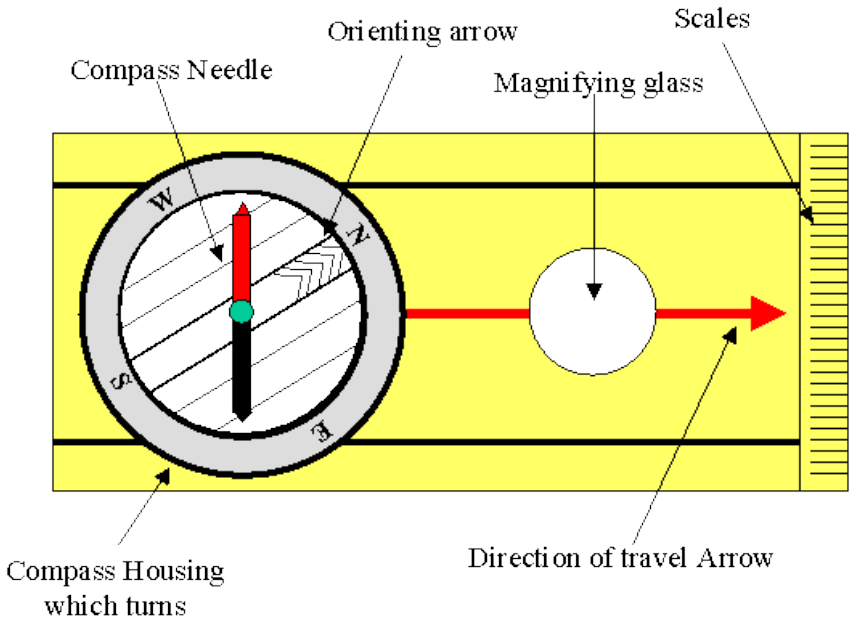

A compass, like the one sketched above, is one of the oldest pieces of human technology that is based on measuring something 'invisible' – Earth's magnetic field. Navigators have used compasses for centuries, and learned quite a lot about how they work and what Earth's magnetic field looks like. This activity will get you acquainted with Earth's magnetism in a very direct way. Your teacher will review with you the basic use of a compass. Use the above figure of a typical compass to "get your bearings."

Part A: In your school yard, and without letting anyone see you, take a bearing on a particular object (tree, building, car, etc.) located a few hundred yards away. Note the bearing in "degrees," and write the answer in the box below:

Hand this paper to your classmate and have them stand in the same spot you did, and use the bearing to figure out the object at which you were looking. Don't make it easy for them by selecting an isolated object!

Part B: During a "magnetic storm," bearings can suddenly change by up to 5 degrees. Work with a partner to develop a way to determine if a magnetic storm is occuring by using a compass. Write up your idea. Test it over several days by comparing your results with the magnetic storm dial on the following website: http://sprg.ssl.berkeley.edu/dst_index/. Write up a description of whether or not your idea worked.