Magnetism – Eddy Currents

Will a magnet fall more slowly when dropped through a metallic tube?

Materials:

- length of copper pipe (about 1 m) (magnet fits inside)
- A non-magnetic object that will fit in the tubes (like a pencil)
- Plastic pipe same length and diameter as the copper pipe.
- Optional 2 thick flats blocks of aluminum 15 cm or longer
- Neodymium (Rare Earth), Ceramic, or (Alnico) cow magnet – these are strong magnets
- cushion

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

- Hold the metal tube vertically over the cushion.
- Hold the magnet outside the tube the same height as the top of the tube and then let it drop. Predict what would happen if you now dropped it inside the tube.
- Repeat the drop only this time dropping the magnet inside the tube. What did you observe?
- Drop a nonmagnetic object, such as a pen or pencil, both outside and then through the tube. Did it's speed change?
- Now try dropping both magnetic and nonmagnetic objects through the PVC tube and observe.

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What's Happening:

The change in the speed at which an object fell was affected by whether or not the tube was metallic. As the magnet falls, the magnetic field around it constantly changes position. As the magnet passes through a portion of the metal tube, this portion of the tube experiences a changing magnetic field, which causes (induces) the flow of circular like eddy currents in an electrical conductor, such as the copper tube. The eddy currents create a magnetic field that exerts a force on the falling magnet. The force opposes the magnet's fall (Lenz's Law). As a result of this magnetic repulsion, the magnet falls much more slowly.

Extension:

Now repeat this experiment using the two blocks of aluminum held just slightly farther apart than the magnet's width. If you aluminum block is long enough you can even demonstrate this effect by propping the block up at an angle and letting the magnet slide down the block. Check out this cool video of examples of eddy currents. Looks like trick videography or science fiction but it is science fact.

http://www.bing.com/videos/search?q=magnetic+eddy+currents&view=detail&mid=A6CA432A9E6EBF1E5ED9A6CA432A9E6EBF1E5ED9&first=21&FORM=NVPFVR

This activity is based on our Magnetism kit. The source for this lab was: http://www.exploratorium.edu/snacks/eddy_currents/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. Please consider volunteering as a classroom guest speaker or allow your business as a field trip location.

Praxis will be hosting Operation Minerva, a conference for grade nine girls, on March 15th. http://praxismedhat.com/services-operation-minerva.

Lorne Cooper, Regional Executive Director

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