Build your own Levitron

A simple device made from magnets and copper bars from the Belgium Science on Stage team.

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You will need....

About 8 neodymium cylindrical magnets (1 x 20 mm diameter 7 x 8 mm approx.)
2 bars of copper 50 mm wide x 75 mm long x 15 mm thick
4 rubber corks 25 mm long
Some spacers; e.g. plastic boxes small sponge etc.

Background:

Levitation is very topical at present. We have all seen demonstrations of levitation using magnets on superconducting cooled materials and know of the trains in Japan etc. but how can we show something like this in class? Patrick Walravens from Belgium demonstrated this at Science on Stage 2. Here is an attempt to reproduce his experiment.

Follow these steps:

1. Arrange the blocks and magnets as shown.
2. Place the large neodymium magnet overhead with about six smaller ones as a handle.
3. Place one small neodymium magnet on bottom block so as to be attracted to the large magnet overhead
4. Place about 25 mm thickness of spacers on top copper block (e.g. plastic boxes, Pringles lid, pH paper box and sponge from microsope cover slips box in use here) Ideally include something which can be compressed.
5. Try various levels of spacing and finally compress down to the lowest level possible.
6. You will notice that the lower magnet lifts off, floats and levitates. It will slowly move up to the top copper block
7. You can, with fine adjustment, find a position where the magnet levitates about 2- 3 mm above the lower block even when the strong magnet overhead is still.

So what happened?

The magnet appeared to levitate about 2 mm above the bottom copper block, lifting slowly towards the overhead copper block. There is a gravity force acting downwards on the magnet and an almost equal magnetic force acting upwards. The balancing force can be explained by the generation of eddy currents according to Lenz's Law i.e. creating magnetic fields to oppose the motion of the magnet.

What is more difficult to explain is why it levitates at about 2 mm when the large magnet overhead is static.

What next?

Place a paper underneath and verify that you can remove it easily showing no contact between the magnet and block. You can also spin the levitating magnet. I have tried other metals but with little success. It would probably work better with thicker copper or gold bars!

Copper blocks are available from Miko Metals Cork. See catalogue at **www.miko.ie**
Neodymium magnets are available from **Briglec Limited, Sandyford Industrial Estate, Dublin 18**, as well as usual school science suppliers. Total cost about forty euros.