

MOVE ATOMS TO MAKE MAGNETS

You can't see atoms with your naked eye, but you can move them around to change a material's performance dramatically. Find out how in two different experiments!

What you'll need:

- 1 fridge magnet
- 1 iron nail
- A handful of paperclips
- 1 shallow, non-metal bowl holding about 2.5 cm of water
- 1 large sewing needle or a straightened paperclip
- 1 permanent magnet with north and south poles marked
- 1 piece of Styrofoam or cork
- Masking tape

Experiment 1 – Make a magnet

Check that the nail hasn't already been magnetized by seeing if it will pick up a paperclip.

Magnetize the nail by stroking it in one direction with one end (pole) of the magnet. Be sure to lift the magnet off the nail after each stroke. Going back and forth will not work.

Experiment with how many strokes it takes before the nail will pick up one, then several paperclips.

What's happening?

Iron contains tiny groups of atoms called domains. These domains are like mini magnets, each with its own North and South pole. When iron is non-magnetized, as your nail was pre-experiment, the directions of the domains are all jumbled up.

Stroking the nail with a strong magnet causes the atom domains to arrange themselves in a neat pattern of straight rows with the north and south poles oriented in the same direction—and that's what makes the magnet!

Experiment 2 – Construct a compass

Magnetize your sewing needle by stroking it about 100 times with the North pole of the magnet. Stroke the needle in one direction only, from the thick end to the pointy end of the needle.

Stick the needle through the foam and float it in the bowl. If you're using cork, use masking tape to attach the needle.

Watch! Does your compass needle move?

What's happening?

When the magnetized needle can float freely in water, it naturally swings around and points north. Your homemade compass works by aligning itself with the Earth's magnetic field.

