

# ELECTRO MAGNETS

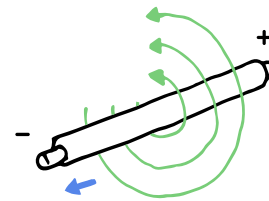


From disk drives to music speakers and even Drax Power Station (the UK's largest), they all rely upon electromagnets! But what are they and why are they so important to us?

## THE SCIENCE

When an electric current flows through a wire, a magnetic field is created around the wire.

Scientists can't agree why this happens but it's really handy it does because we use this effect in gadgets like headphones and computer hard drives! Now let's find out more about magnetism.

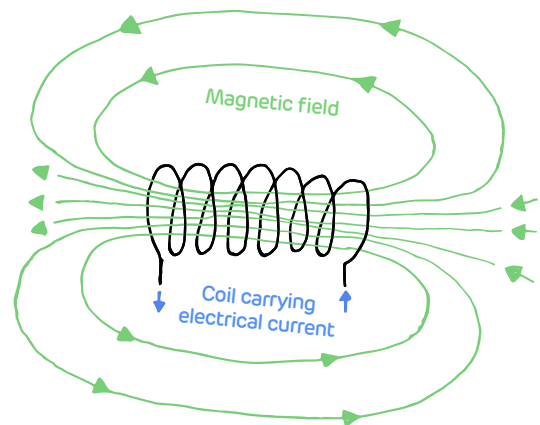


### Key

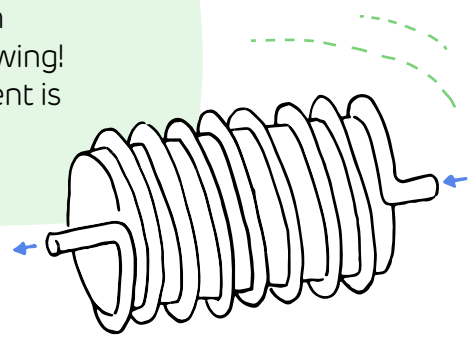
- ← Current flowing
- ← Magnetic field

## THE MAGNETIC FIELD

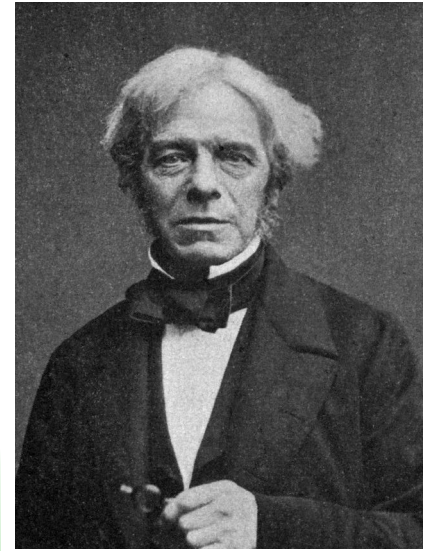
When an electric current flows through a wire, we can make the magnetic field even stronger if we wrap the wires into a coil called a "solenoid" – see right:



If we put a magnetic material - such as an iron cylinder - inside the solenoid, we can turn the whole thing into an even stronger magnet, but only when the current is flowing! A magnet we can create by turning on an electric current is known as – yes, you've guessed it - an electromagnet!



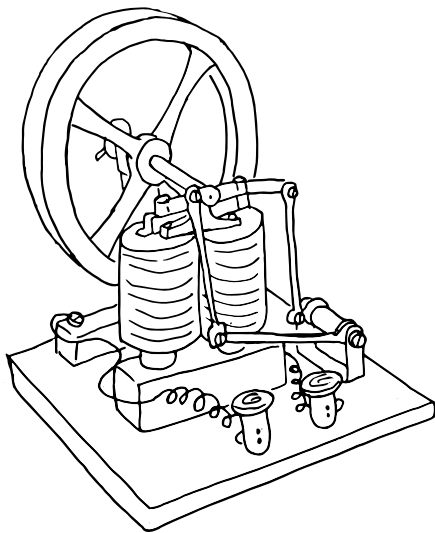
# MICHAEL FARADAY – THE “GRANDDADDY OF ELECTROMAGNETISM”



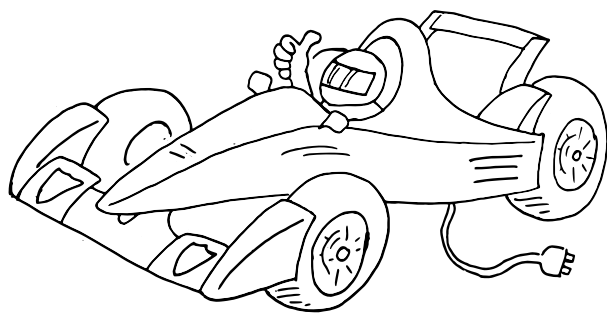
Even though we've nicknamed Faraday "Granddaddy", he wasn't the first person to demonstrate how flowing a current through a wire creates a magnetic field! That honour goes to a Danish scientist called Hans Christian Ørsted.

So, why's Faraday important? It's what he did with Ørsted's discovery that really matters – he used it to build the world's first electric motor! Motors are now used in so many appliances that we almost take them for granted. Mobile phones, electric toothbrushes, fridges, electric bikes and even aeroplanes have them. And most petrol or diesel cars have at least three electric motors!

The electric motor - from this...

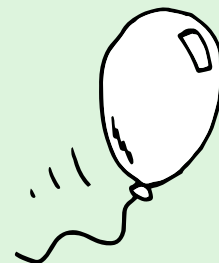


...to this:



## DID YOU KNOW?

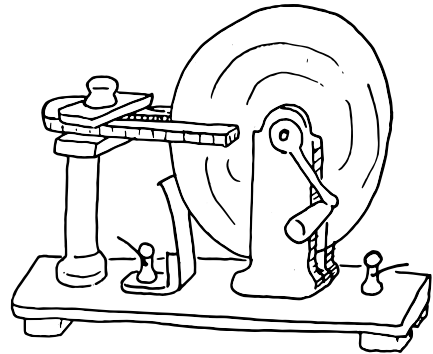
As well as making discoveries about electricity, Faraday also invented the rubber balloon in 1824!



## MORE ABOUT FARADAY...

He later discovered that by moving a conductive material close to a stationary magnet (or a magnet inside a coil of conductive material),  
*an electric current would flow through the wire.*

The machine he built in 1831 to demonstrate this effect is known as the "Faraday Disk" – the world's first electric generator!



## THE FARADAY DISK

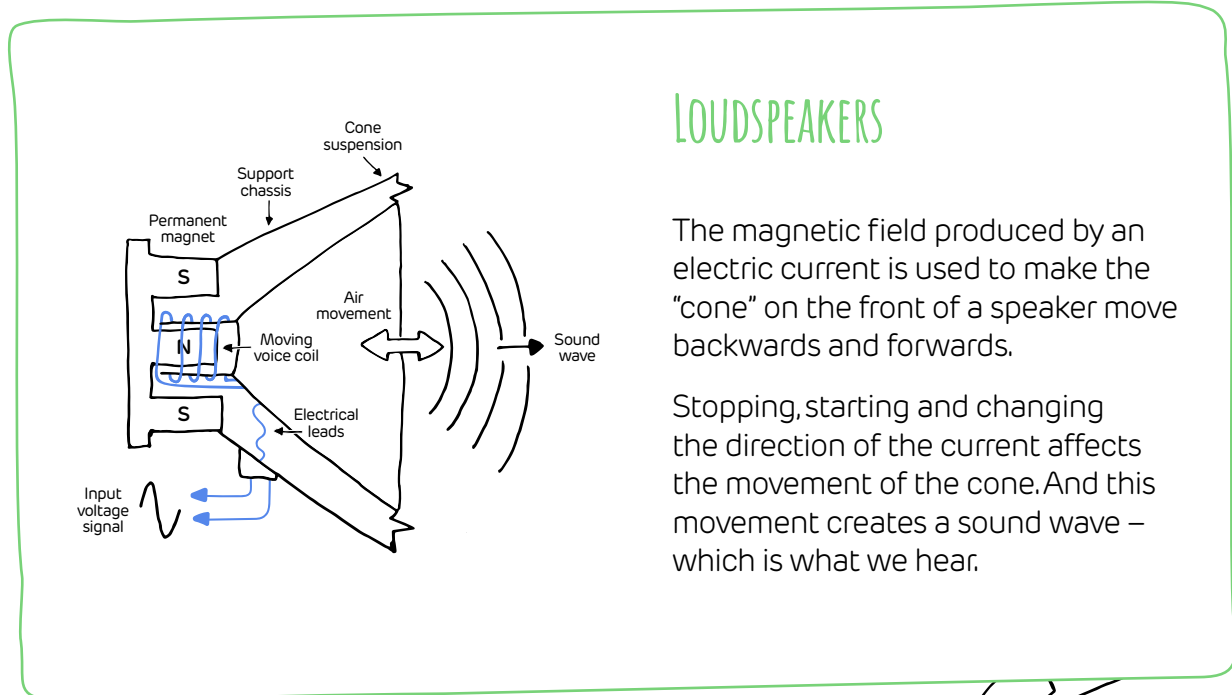
Making electricity this way is known as "induction" and it's how generation plants such as Drax Power Station still do it (although it's on a much bigger scale!).



The turbine hall at Drax Power Station

# ELECTROMAGNETS IN USE

Electromagnets are used in lots of devices – here are just four ...



## LOUDSPEAKERS

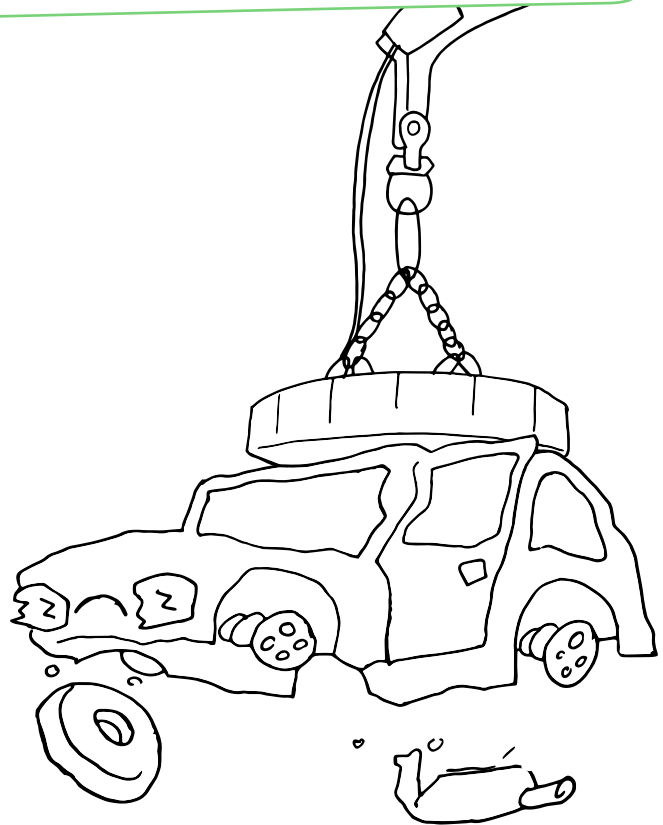
The magnetic field produced by an electric current is used to make the "cone" on the front of a speaker move backwards and forwards.

Stopping, starting and changing the direction of the current affects the movement of the cone. And this movement creates a sound wave – which is what we hear.

## GIANT MAGNETS

These can be used to lift things made from magnetic material, such as old cars in scrap yards.

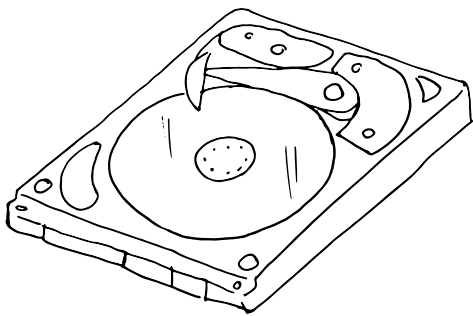
And as well as lifting magnetic materials, electromagnets can be used to sort out materials that are ferrous (containing iron) and non-ferrous.



## ELECTRICITY GENERATION

Power stations like Drax use huge electromagnets in their generators to produce massive amounts of electricity.

Each of the six generators at Drax Power Station produces enough electricity for 1,000,000 people. That's a lot of power!



## HARD DRIVES

Traditional hard drives (i.e. those that aren't solid state drives - SSDs) in electronic devices use magnets in their memory systems.

## DID YOU KNOW?

Drax Power Station is the largest in the UK. It takes up the same amount of space as 1,000 football pitches!