

# STATIC ELECTRICITY

Static electricity's what causes lightning in thunderstorms, and what can give us an annoying shock when we touch something metal. Maybe you've used this powerful force to attract pieces of paper on to a balloon you've rubbed on your jumper?

But what is static electricity? And, other than using it to pick up paper or create a spooky atmosphere in films, what else can you do with it? Follow the arrows to find out.



## WHAT IS IT?

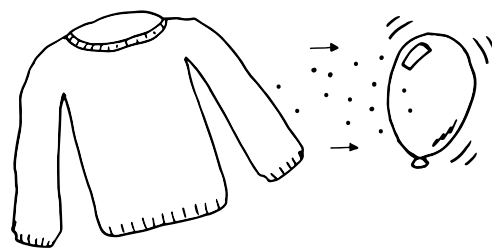
Unlike the current electricity flowing through the wires in our homes, static electricity is all about charges that aren't free to move.

This means they can build up on insulating objects and, when they suddenly come into contact with a conductor (such as your hand), they flow. And that's when you see a spark or get a shock.

## WHAT ARE THE CHARGES?

When electrons transfer from one object to another (because of different materials coming into contact with each other), they create a charge.

Electrons are tiny, negatively charged particles within the atoms that make up all materials. So, for example, when you rub a balloon on a woolly jumper, electrons from the atoms that make up the fibre of the jumper transfer on to the balloon.



The balloon's now negatively charged because it has extra electrons, whereas the jumper now has a positive charge because it has fewer electrons.

## DID YOU KNOW?

The mass of an electron is  $9.1093837015 \times 10^{-31}$  kg

Or, to put it another way:

**0.000,000,000,000,000,000,000,000,000,9109383kg!**

# MORE ABOUT LIGHTNING

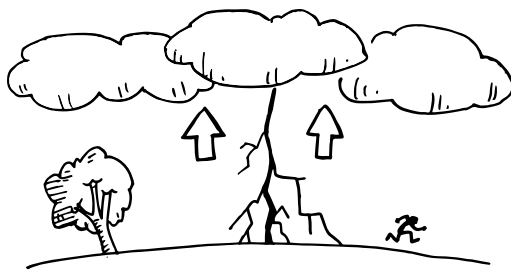
Even though lightning's familiar to us, we're still not sure why it happens!

We think it's caused by the build-up of charges resulting from collisions between tiny ice particles and hail inside the cloud. This causes the top part of the cloud to become positively charged and the bottom part to be negatively charged.

As the cloud passes near the ground, it repels the electrons in the objects on the ground - such as trees and buildings - so their top parts become positively charged. This creates an imbalance between the charges, which nature tries to correct by passing an electric current between them. This is known as a "discharge" and is the big spark you see.



Although it doesn't look like it, the lightning flash we see travels from the ground upwards, NOT from the cloud downwards!



Nearly **1.4 BILLION** lightning strikes hit the Earth every year - that's **more than one every minute!**

## DID YOU KNOW?

In 1752, the American scientist Benjamin Franklin flew a kite in a thunderstorm to prove that lightning is a form of electricity. He was lucky that a lightning bolt didn't kill him - **so do NOT try this yourself!**



# DANGERS OF STATIC ELECTRICITY

Although it might seem fairly harmless, having static electricity in the wrong places can be dangerous.

This is particularly true in environments where flammable materials are stored and handled (e.g. a warehouse full of flammable liquids such as paints or solvents). Anti-static flooring surfaces and storage systems will help to avoid the build-up of static electricity and subsequent discharges.

Similarly, tankers delivering fuel to petrol stations mustn't allow static build-up on their filling hoses by making sure the hose is earthed.

Although static electricity can be dangerous in certain circumstances, it also has its uses!



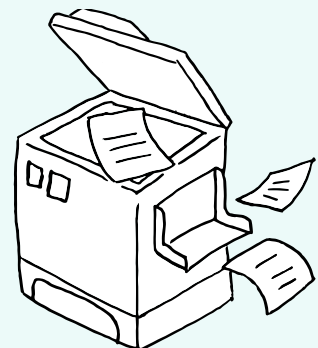
# USES OF STATIC ELECTRICITY

Power stations, such as Drax Power Station, use static electricity in "electrostatic precipitators" to catch the tiny ash particles in the emissions from their boilers. This prevents the ash from going into the air around us.



Electrostatic precipitator units at Drax - view from ground level (left) and above (right)

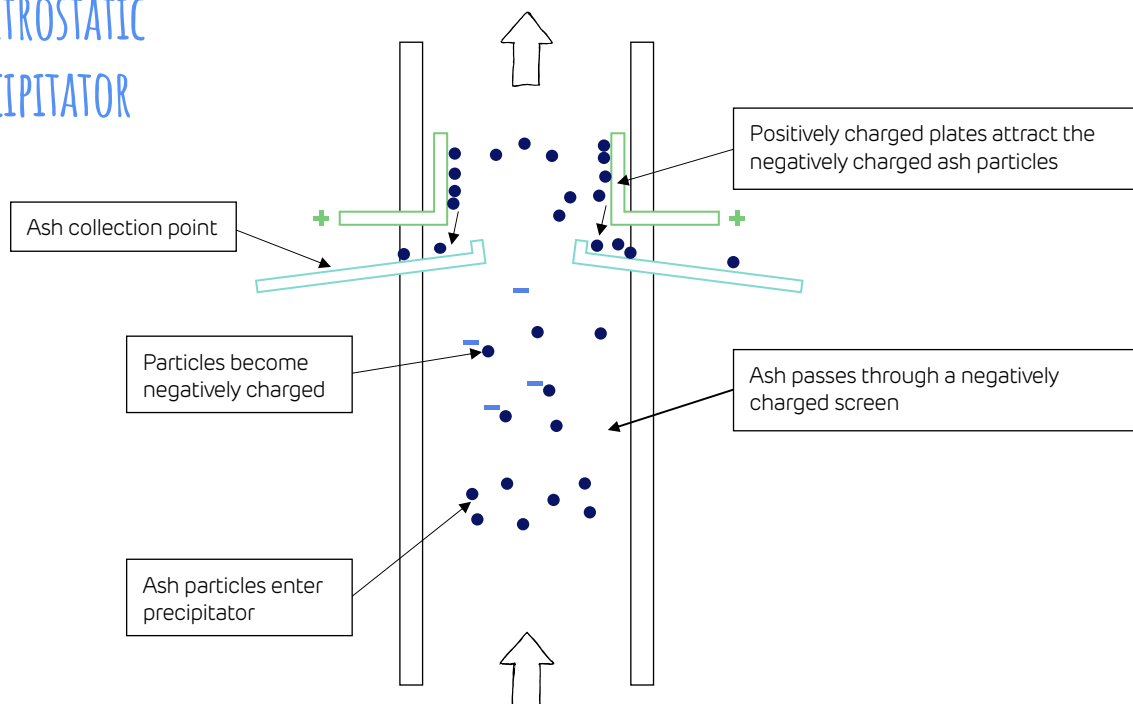
Photocopiers use static electricity to make ink stick onto paper...



# HOW DO THEY WORK?

Emissions from the boiler enter a large chamber and pass through a negatively charged metal grid. This causes the ash particles in the emissions to pick up a negative charge. The negatively charged ash particles are attracted to the positively charged collecting plates and stick to them. As the amount of dust increases on the collecting plates, large mechanical hammers hit them – an action known as rapping – and knock off the dust for collection.

## ELECTROSTATIC PRECIPITATOR



## DID YOU KNOW?

The ash collected from the electrostatic precipitators is used as an ingredient in cement!

