EASY SCIENCE

The attraction of MAGNETS

People in prehistoric times probably discovered that lumps of a certain type of rock can attract (draw to) or repel (push away) each other, depending on which way they are turned. This rock is called LODESTONE and it is naturally magnetic.

The name "magnet" comes from Magnesia, an area near ancient Greece where lodestone was first found.

You will not easily find lodestone in our country, but do yourself a favour and buy a magnet or two. Buy the strongest you can find… it is the stuff magic is made of!

Most common magnets these days are made from the metals iron, cobalt and nickel and some other materials that contain these metals. Magnets are attracted to some types of materials, but not to others. Iron, cobalt and nickel are also the most common materials that can be attracted (drawn to) a magnet, so they are called magnetic materials.

When you have two magnets, you will find out that sometimes they repel each other and other times they attract. This depends on which "poles" are facing each other. Any magnet has two poles: one north and one south. Opposite poles attract (north pulls on south) and similar poles repel (north pushes north away).

Magnets make magnets

You will need:

- Paper clips
- A magnet (a **strong** refrigerator-door magnet will do)

Stick a paper clip to your magnet. Then stick another paper clip to the first one, and then stick a third clip to the second. You have now made a magnet chain. (If you stick the pin to the north pole of the magnet, what type of pole does the part of the clip touching the magnet become?)

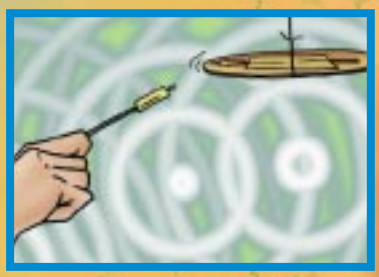
Now very carefully pull the first clip off the magnet and see what happens. The three-clip chain stays together! You have made the clips into little temporary magnets.

How can you make sure that magnets have opposite poles? Try the following activity.

You will need:

- Two paper clips
- Clear plastic tape
- Sewing thread
- Ice-cream stick
- A strong refrigerator door magnet

Straighten out two paper clips (ask an adult to help if you are unsure how to do it) and wrap a small piece of tape around one end of each of these wires.



Slowly rub the magnet down each wire from the taped end to the other end. Do this about 30 times for each wire.

Make sure that you rub the wires only in this one direction each time! (When the magnet reaches the end of the wire, lift it carefully away from the wire, move it away from the wire and repeat the action.)

Your wires should now be magnets and the un-taped ends of the wires should have the same poles, but opposite from the poles of the taped ends.

Tape one of your new magnets onto an ice-cream stick as shown. Tie a piece of thread around the stick so that the stick hangs level when held from the other end of the thread. Ask your partner to hold the thread.

Wait for the stick to stop moving. Take your other wire magnet and bring its taped end near the taped end of t

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SAASTA

he hanging magnet. Did the taped ends of the magnets attract or repel? Does this mean that the taped ends have the same poles or opposite poles?

Let the hanging magnet stop moving again and then bring the un-taped end of your magnet near the un-taped end of the hanging magnet. Did these ends attract or repel? Are the untapped ends the same or opposite poles?

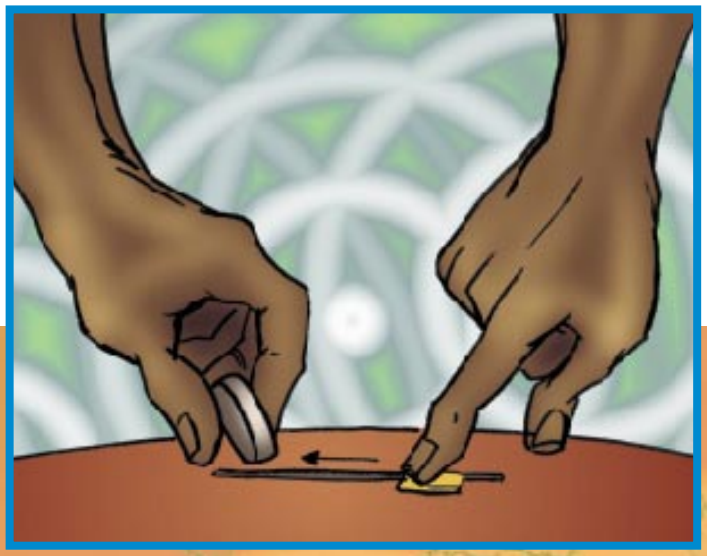
What do you think will happen if you bring the taped end of your magnet near the un-taped end of the hanging magnet? Try it and see! Are these ends the same or opposite poles?

Make your own compass

You will need:

- A styrofoam cup
- A strong refrigerator-door magnet
- A metal paper clip
- A bowl of water
- Clear plastic tape
- Blunt end scissors

Straighten the paper clip as before so that it is a straight piece of wire. Hold one end of the wire down with your finger and slowly stroke your magnet along the wire from your finger to the other end to magnetise the wire as in the previous activity.



Use your scissors to cut the base off the foam cup. Fill the bowl about half full with water. Tape your wire magnet to the cup base and float it in the bowl of water as shown. You have now made a compass with the magnet as your compass needle! See what happens with the needle when you float it in the water.

Use two pieces of tape to mark the opposite sides of the bowl where the two ends of the compass needle point. Turn the needle to another direction in the bowl and let it go. See how it turns to point in the same direction as before.

Ask an adult which end of the needle is pointing north and which end is pointing south. Since your compass needle is a magnet, the end of the needle that points north is the ..... pole of the magnet and the end of the needle that points south is the ..... pole of the magnet.

Take the tape off the bowl and look at something in the room that one end of the needle is pointing at. Carefully pick up the bowl and look down at the needle. **Slowly** turn around in a circle while watching the needle. Does the needle keep pointing at that same thing in the room? Try it again to make sure.

FACT FILE:

Why do we call the two poles of a magnet the NORTH pole and the SOUTH pole?

The Earth itself is like a huge magnet, with poles of its own. One pole of any magnet is attracted to the Earth's magnetic north pole, and the other to the magnetic south pole.

The Earth's geographical north pole is not in the exact same spot as the magnetic north pole. They are a few hundred kilometres apart. What is more, it is really a magnetic south pole! This is why it attracts the north pole of magnets that can turn freely.

FACT FILE: WARNING

Magnets can destroy cassette tapes, video tapes and computer disks. Try this with a cassette tape that you will not use again:

Play the tape to hear what it sounds like. Remove it from the player and rub a magnet all over the cassette. Play it again and listen. What does it sound like?

This happens because recording tape is coated with a thin film containing iron particles. The magnet pulls the iron particles out of position and destroys the recording.

BIOTECH

WHEN DNA IS THE DETECTIVE

By Valerie Corfield, US/MRC Centre for Molecular and Cellular Biology, Faculty of Health Sciences, University of Stellenbosch

Things have come a long way since the days of Sherlock Holmes, when the only tools a detective had were a sharp eye, a magnifying glass and a logical mind. Now police and scientists have many new tricks to help solve mysteries and crimes (forensic science). These include:

- autopsy (examining the dead body for evidence),
- "traditional" fingerprinting
- matching blood types (Are you O, A, B or AB?)
- dental records
- ballistics (study of guns)
- chemical and fibre analysis (clothing etc)
- x-rays
- computer modelling
- forensic entomology (study of insects)
- DNA fingerprinting.

Just like fingerprints, every human has unique DNA. Scientists have found ways to tell one person's DNA from another person's; but unlike fingerprints, which can be changed using surgery, you can't change your DNA. Also, unlike fingerprints, which are only left at a crime scene if a person touches a suitable surface with bare fingers, DNA is tucked away in the centre of every cell in your body. DNA can be extracted from hairs, skin cells, blood, skeletons, bits of bone, teeth and body fluids left after a crime. So when traditional fingerprints are fuzzy and not much help, DNA fingerprints can speak out loud and clear.

DNA can last for a long time, especially when it is protected inside bones and teeth. Scientists have developed ways to extract DNA and to do DNA fingerprinting tests from very small amounts of material, like a dried blood spot or even from cells in saliva left over from a person licking a stamp.

DNA fingerprinting has provided evidence used to convict thousands of criminals. It also enables scientists to look at old cases using stored samples and evidence. This has allowed many prisoners who were found "guilty" to be set free when DNA tests showed that they did not commit the crime. DNA fingerprinting was also indispensable in identifying victims of the September 11, 2001 bombing of the World Trade Centre in the United States, when scientists only had scraps of tissue or shards of bone or teeth to work with.

DNA fingerprinting has also been used to solve long-standing mysteries and identify people who pretended to be someone else (imposter). It can also be used to identify how people are related (parentage), such as in the case of Happy Sindane. In addition, mummies and skeletons that are hundreds and thousands of years old can now "tell us" if they are male or female, healthy or sick, related, even what they had for dinner, helping scientists to reconstruct the details of how these people lived. If only they'd tell us where they hid the treasure...

How DNA fingerprinting works

DNA. It's what makes you unique. It's the stuff that tells each and every one of your body's 10 trillion cells where it's supposed to be and what it's supposed to do. And although your DNA is different from that of every other person in the world (unless you have an identical twin) it's the same in every cell that makes up your body. DNA is unique from person to person, but the same from cell to cell in one person, which is the key in DNA fingerprinting.

From a poster produced by Rapid Phase (Pty) Ltd for the Public Understanding of Biotechnology Programme.

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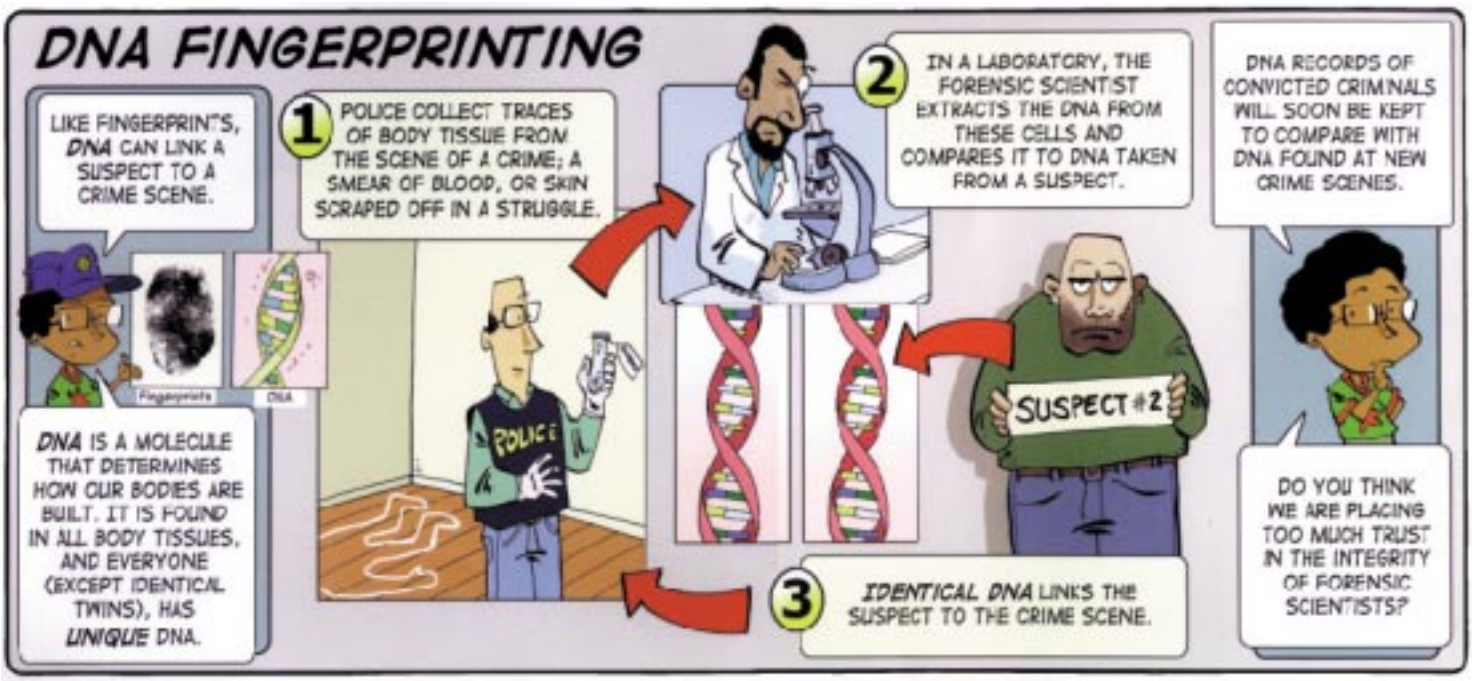


But what exactly is a DNA fingerprint?

A DNA fingerprint looks very different from an inky thumb print on a page. So, what does it look like and how are these DNA fingerprints made?

When police have a suspect, they take a blood sample from that person and take the DNA from the blood cells. The forensic scientists then focus in on specific areas of the DNA that show small differences between two people. The differences between these different parts of the DNA generate a pattern, like a supermarket barcode, that is unique to the person they are investigating. This "barcode" is called a DNA fingerprint. Sometimes at crimes scenes, a very small amount of DNA, such as one hair, is left behind. In cases like these, the target areas of the DNA can be "copied" so scientists then have enough to make a DNA fingerprint.

FACT FILE: What is DNA again?

DNA stands for deoxyribonucleic acid. It is a chemical substance made from building blocks that form long, thin strings called molecules. They are packed very tightly into the nucleus of cells.

FACT FILE: Scientists solving crimes

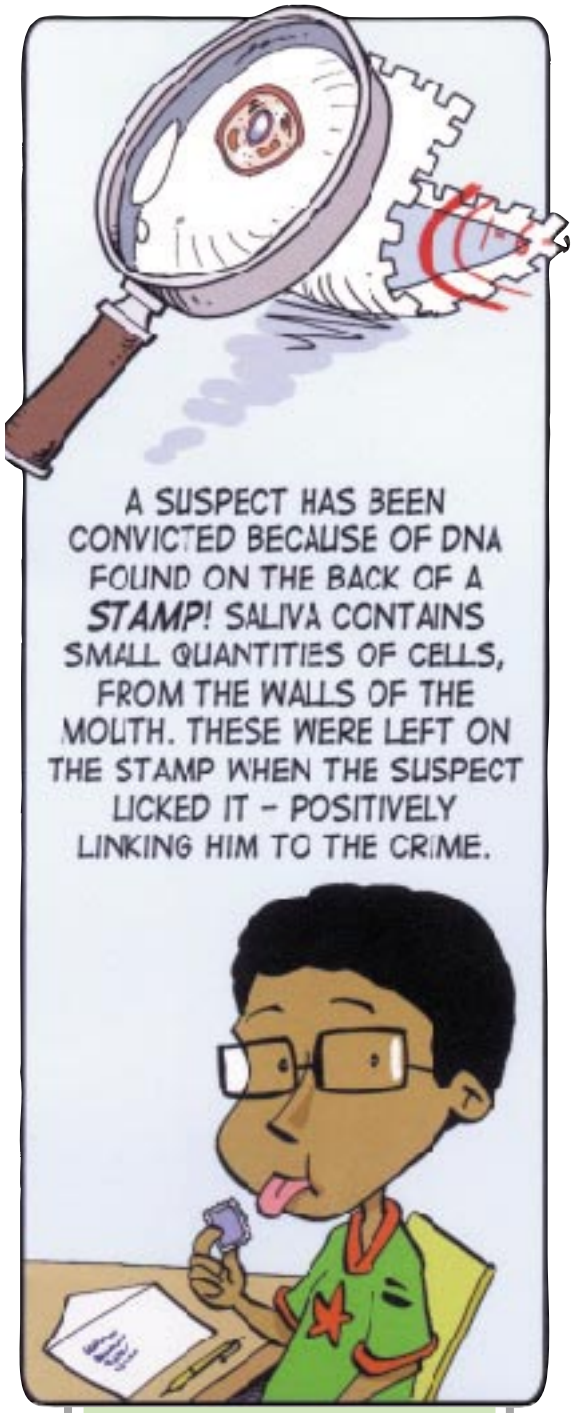
Forensic science is the study of objects that relate to a crime. This evidence is analysed by the forensic scientists, who observe, classify, compare, count, measure, predict, and interpret data.

FACT FILE: How to become a forensic scientist

Forensic scientists work in the laboratory, in the field and in the courtroom. To become a forensic scientist you will need a bachelor's degree in science (chemistry and biology); good speaking skills; good note-taking and writing skills; curiosity and personal integrity.

FACT FILE: Can DNA evidence mislead?

There are lawyers who feel that even if there is physical DNA evidence, motives for a crime cannot be ignored. They argue that DNA is just evidence that can be mishandled or even planted. Also, because the DNA techniques are so sensitive, it is possible that samples can be contaminated by other cells at the crime scene, or even by the police or the forensic scientists investigating the crime. For this reason, there are very strict laboratory rules and in very serious cases, the sample can be sent to two different laboratories for analysis.



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PUBLIC UNDERSTANDING OF BIOTECHNOLOGY

The Department of Science and Technology has launched a Public Understanding of Biotechnology programme to make sure South Africans understand the scientific principles, related issues and potential of biotechnology. Biotechnology is the part of science that uses the DNA building blocks of life to make useful products from living things. If you have opinions, questions or concerns about any area of biotechnology, let's hear from you at speakup@pub.ac.za or fax 012 320 7803 or visit www.pub.ac.za for more information.

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