EASY SCIENCE

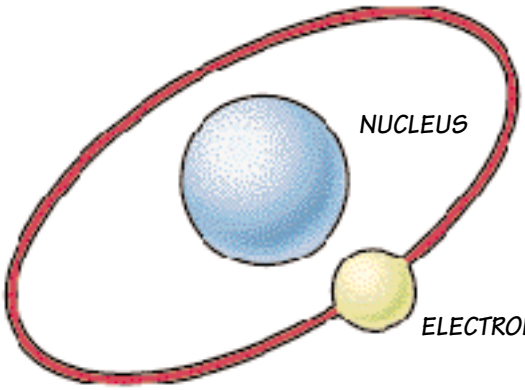
Static Electricity in a flash...

Have you ever felt a shock when you reached for a metal doorknob on a cold winter day? Or seen a bolt of lightning flash across the sky? Or seen little flashes of light when you undress in the dark? These things have a lot in common. They are all examples of a special kind of electricity called *STATIC ELECTRICITY*.

While wearing a pair of hard-soled shoes, try shuffling your feet across a wool or nylon carpet on a cool, dry day. When you do this, tiny particles called **electrons** are rubbed off the carpet and onto you. If you then touch something, especially metal, the electrons will jump from you to the metal. This is the shock that you feel. You may even see a tiny spark and hear a zap!

In most of the following activities you will be rubbing two different kinds of material together. Remember that when you do this, you are rubbing electrons off one material and onto the other. One material will then have a **positive** charge and the other will have a **negative** charge.

REMEMBER: OPPOSITE CHARGES ATTRACT



A HYDROGEN ATOM

All materials contain millions of electrons. Electrons are so small that people cannot see them even with the most powerful microscopes. Along with electrons, all things also contain tiny particles called **protons**. Electrons and protons both have electrical charges. Electrons have a negative charge and protons have a positive charge. Usually, a material has the same number of electrons and protons, so the negative and positive charges balance each other.

Hydrogen has the simplest of all atoms. Its nucleus is formed by one proton, and only one electron orbits around it.

Sometimes when two materials are rubbed together, the electrons from one material are rubbed onto the other. When this happens, both materials become charged with static electricity. The one that gained electrons will have a negative charge and the one that lost electrons will have a positive charge. Two materials that have opposite charges (positive and negative) will move towards each other, or attract. Two materials that have like charges (positive and positive or negative and negative) will move away from each other, or repel.

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EasyScience is produced by the South African Agency for Science and Technology Advancement (SAASTA), an operational unit of the National Research Foundation. SAASTA's mission is to promote the public understanding, appreciation and engagement with science and technology among all South Africans.
Visit the website: www.saasta.ac.za for more information.

SAASTA

MAKE A BALLOON EC-STATIC!

Rubbing balloons with certain materials can cause the balloon and the material to become charged with static electricity.

You will need:

- Two round balloons, inflated and tied
- Two 50 cm pieces of string
- One wool or acrylic sock

Tie string to each of the balloons. Rub one of the balloons for about 15 seconds on your hair. Be sure to rub around the whole balloon. What happens to your hair? What happens when you bring the balloon back close to your hair?

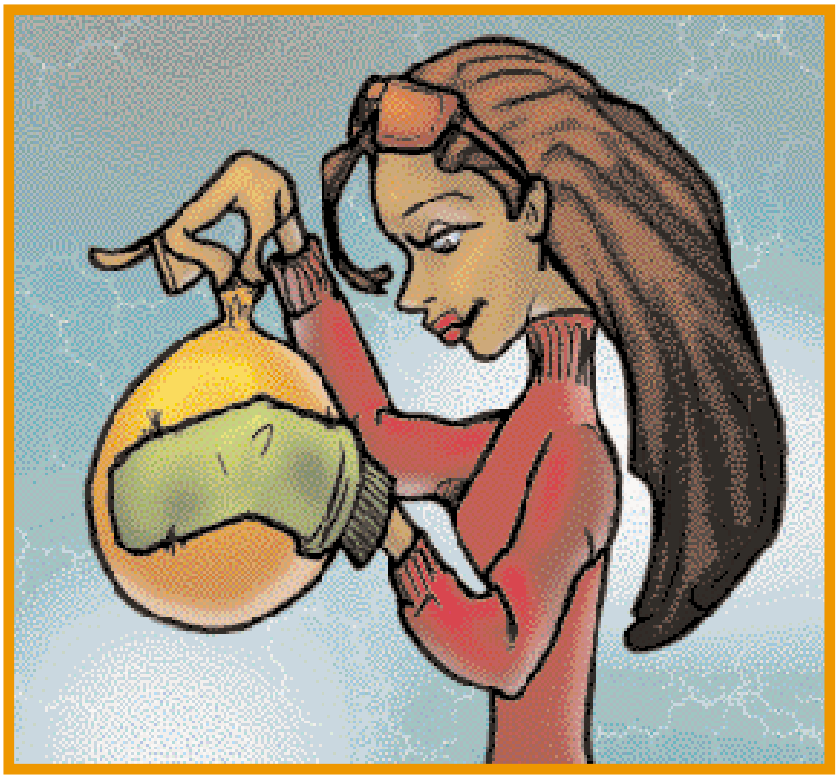
Now rub the balloon on your hair again and have a partner do the same thing with the other balloon. Hold the strings and let the balloons hang freely but don't let them touch each other or anything else.

Slowly move the two balloons towards each other by moving your hand closer to your partner's hand. Don't touch the balloons. What do you see? Do the balloons push away from each other or do they pull together? This happens because you have given the balloons extra electrons by rubbing them against your hair. Both are negatively charged, and we have learnt that negative charges push each other away, or repel. Does this explain what you see?

Place your hand between the hanging balloons and see what happens.

Place a sock over one hand and rub one of the balloons with the sock. Let the balloon hang freely. Bring your sock covered hand near the balloon. What happens now?

What do you think would happen if you rubbed both balloons with the sock and then let them hang near each other? Try it and see!



AN ELECTRON RIP-OFF

You will need:

- Two 30 cm pieces of clear sticky tape

Stick the length of each piece of tape to a smooth, hard top such as a kitchen counter. Allow about 1,5 cm of the tape to hang over the side of the counter.

In each hand, grab the end of one of the pieces of tape. Quickly rip the pieces of tape off the counter.

Allow the pieces of tape to dangle, but do not let them touch anything or each other. Slowly bring the pieces of tape near each other. What happens? Can you explain why? (The name of this activity should give you a clue!)

Try another experiment. Stick one of the pieces of tape to your work surface again. Although the tape is sticky, rub the entire length of the other strip of tape by pulling it between your thumb and index finger.

Now rip the first piece from the counter and let the two pieces hang near each other. What happens now? Do the pieces attract or repel each other? Do you think the pieces of tape have **like** charges or **opposite** charges? What do you think would happen if both pieces were pulled between your fingers and then hung next to each other? Try and see!

EASY SCIENCE

MAKE A MINI LIGHTNING BOLT

You will need:

- A plastic dish
- An aluminium pie dish
- A piece of dowel stick
- Glue
- A drawing pin
- A piece of fur or a piece of woollen or flannel cloth

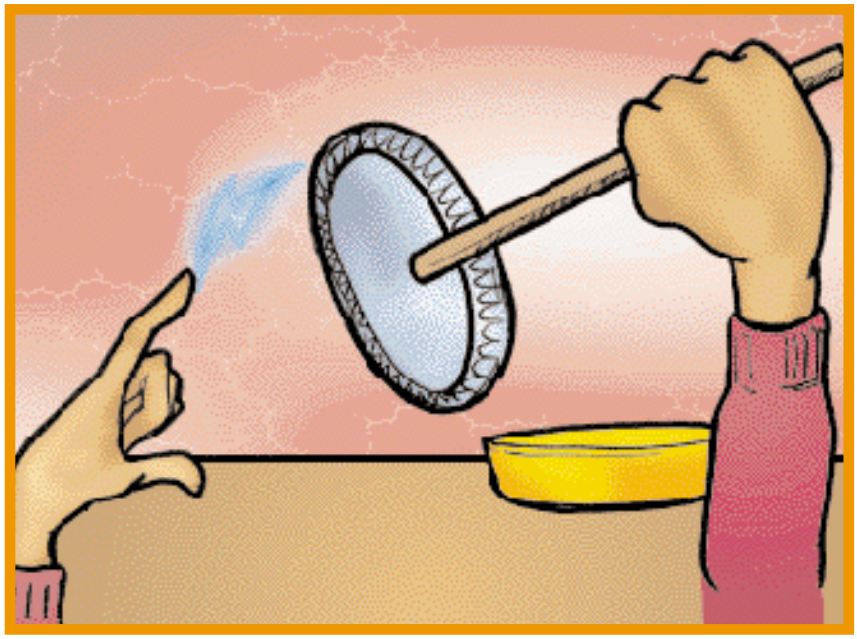
Put some glue on the end of the dowel stick, and then stick the drawing pin through the centre of the aluminium dish from the bottom. Press the dowel onto the pin and allow the glue to dry. You have now fixed a handle to the plate.

Put the plastic dish on the table and rub the inside bottom briskly with the cloth for about half a minute. You have now charged the plastic dish with lots of extra electrons.

Put the aluminium dish inside the plastic one and press it down hard with your fingers. Lift the pie dish out by the dowel handle and slowly bring your finger closer to the metal.

A tiny bolt of lightning will jump between the aluminium dish and your finger. If you do this in the dark, you will see it very clearly.

You can recharge the aluminium dish a number of times by pressing it down onto the bottom of the plastic dish again. When it no longer creates a spark, use the cloth to charge the plastic dish again.



THE MYSTERIOUS MOVING PING-PONG BALL

You will need:

- One unbreakable or rubber comb
- One ping-pong ball
- One tape measure

Place the ping-pong ball on a smooth, flat tabletop. Run a comb through your hair about 10 or 15 times. Now the comb should be charged with static electricity. (If you hair is too short, you can rub the comb with a piece of wool.)

Bring the back of the comb near, but not touching the side of the ping-pong ball. Slowly move the comb away from the ping-pong ball. Can you get the ping-pong ball to follow the comb across the table? Do you think the ball would follow the comb if you had not run the comb through your hair?

See how far you can make the ping-pong ball travel this way. Measure the distance with your tape measure. Have a contest with a friend. Using separate combs, see who can make the ping-pong ball go the farthest! When you say "Go", you and your friend should start combing your hair. Quickly get your ping-pong ball moving! If your ball stops before the finish line, comb your hair again for some extra static electricity and finish the race.

EASY SCIENCE

SCIENCE EXPO FOCUS

Hanri's sheep help her win gold

Sport-crazy, fun-loving Hanri Roeland was a recent winner of a gold medal and the best girl's project in the Eskom Expo for Young Scientists. Hanri did research on alternative ways of treating parasites in sheep.

"When my dad gave me 30 sheep for the experiment I don't think he expected to get any of them back," giggles Hanri who is now in grade 12 at Hoërskool Vrede in the Free State. But her dad nevertheless took his chances, since the parasites – especially hair worm – infesting his sheep had been building up resistance against the chemical dewormers he was using. He was eager for her to find alternative ways of treating the problem.

Hanri decided to go ahead with her research after talking to their local vet, Dr Marietjie Malherbe, about her dad's problem. Apart from finding a solution to the drug resistance of the parasites, Hanri was also hoping to find a cheaper treatment that subsistence farmers could afford.

She sent questionnaires to 28 farmers in the Vrede area, asking them what methods of treatment they used to combat these parasites, how often they dosed their sheep, and if they knew of any traditional medicines, or "boererate", that could cure the sheep. From the farmers' reactions she learnt that they used many different chemical dewormers, but did not always use ones with different active substances. This was the main cause of the build-up of worms' drug resistance. Another problem was that farmers not always checked whether their sheep were actually infested before they dosed them. The unnecessary treatment of healthy sheep also causes resistance of parasites to dewormers.

In her search for cheaper medicines, Hanri experimented with six groups of five healthy sheep each, which she infested with round worm eggs obtained from the University of Pretoria's veterinary faculty at Onderstepoort. One group of sheep was her control group, which did not receive any treatment. The second group was treated with the chemical dewormer most popular among farmers; the third with a dagga brew (she did get police permission to use it!); the fourth with a tobacco brew; the fifth with an aloe dose; and the sixth with a turpentine and linseed-oil mixture.

After some trials and errors, and in the process learning when it was most likely for worm eggs to hatch, Hanri was able to show that while the control group was still pretty sick, the rest showed much lower infestation in the manure samples investigated by her and the vet. "Only the turpentine and linseed-oil mixture was a disappointment, but this maybe just as well, because it is dangerous and sheep can die if they choke on it," says Hanri. Her dad was very glad for the gold medal Hanri won, but was even more relieved to get all his sheep back.

HANRI'S CONCLUSIONS – AND SOME ADVICE TO FARMERS

- Traditional dewormers are not as easy to use as popular chemical dewormers, but they may provide a cheap alternative;
- Farmers should manage the dewormers that still work well; and
- Farmers must use methods of treatment complimentary to chemical dewormers, such as:
  - alternate active substances when dosing sheep,
  - select sheep with better resistance,
  - check whether the sheep are infected before dosing, and
  - let sheep graze with cattle to help prevent infestation.

Profile:

Fave sport: Gymkhana, hockey, life saving (for which she holds a gold medal), biathlon.

Fave movies: Action, true stories and good Westerns.

Fave subject: Maths

Plans for future: I want to study physiotherapy or human movement science next year.

SOME IDEAS FOR SCIENCE EXPO PROJECTS

- Do some kinds of rubber balls bounce better than others?
- What materials are best for soundproofing?
- Which kind of adhesive bandage stays on the longest?
- What container will keep a drink cold for the longest period of time?
- Which colours absorb the sun's heat the most? The least?
- Which kind of vinegar makes the best reaction (loudest, longest, most bubbly) with baking powder?
- Design a soup bowl and spoon that will allow you to finish the last bit of soup without tipping the bowl.
- Do larger batteries (D and C cells) last longer than smaller ones with the same voltage (AA and AAA)?

THE DISCOVERY WEBSITE:
http://school.discovery.com/sciencefaircentral/scifairstudio/ideas.html
also has some good ideas. Do visit this site for many wonderful tips and suggestions – also for teachers and parents – on how to tackle a science project.