EASY SCIENCE

Science projects can be fun!

Many of you are probably already doing science projects for expos at your schools or in your regions. Others might still be uncertain what to do. You can learn a lot from doing a science project. You can become an expert on a topic that interests you. It is very satisfying to complete a worthwhile project.

Before you start a project, make sure you know the project guidelines set up by your teacher. Find out:

- The date of the expo
- Safety rules
- Specifications for your display
- Judging criteria

HOW DO YOU PICK A TOPIC?

Here's a good rule of thumb: If you are interested in something, you will be motivated to do a good project. Think about your favourite things to read, watch or do.

Science topics are all around us. Look around your home, school or community. Are there any special natural resources in your area? Are there any ideas for topics at museums, hospitals, veterinary surgeons, airports, zoos, parks, science centres or universities?

Look for ideas in science books in your local library, or read some back copies of EasyScience.

The Scientific Method

The next step is to go to work like a real scientist: you are going to follow the scientific method. It is important to have a good understanding about what the scientific method is before beginning your project.

Sometimes scientists make discoveries by accident, but more often they develop a plan to test a theory or hypothesis they have. This plan is called a procedure. During the procedure, the scientist collects the results or data from the experiments. After thinking a lot about the data, the scientist then makes a conclusion.

Jean Basson & Jaco de Jager (Suiderhof Primary) built a working solar oven.

EASY SCIENCE

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

STEP 1: ASK A QUESTION

You have to think of a specific question about the topic that the project will try to answer. Write it down. "How do we prevent global warming" would not be a good question for an expo experiment on the environment, for example. The question is not specific enough to design an answer that can answer it. A better question would be "How does increasing temperature affect plants that normally grow in cool places?". It would be easier to design an experiment to try to answer this question.

Make sure you don't pick a question that is specific, but too difficult to answer. "Do larger gills allow fish to swim faster?" is a specific question, but getting fish with different gill sizes and measuring how fast they swim would not be easy!

Also make sure your experiment can be finished in time for the expo.

Set up a control group and an experimental group. Remember to change only one variable.

STEP 2: RESEARCH

- Look up information about your topic and your variable.
- Don't forget to write down information for your bibliography.
- Use at least three different sources including books, magazines, Internet, interviews, encyclopedias, etc.

STEP 3: HYPOTHESIS

- Write down what you expect to happen before you try your experiment. This is your hypothesis. Your hypothesis should be very clear so that you can test it.
- Be specific! Make a chart of the numbers that you are predicting and give reasons for your guesses.
- Include other guesses such as height, colour, condition, size, time, etc.

STEP 4: PROCEDURE

- Describe what you plan to do during your experiment.
- List all the materials you will need.
- List each thing you will need to do and number each step.
- Write down everything you will do. Other scientists should be able to repeat your experiment by reading your procedures.

STEP 5: DATA COLLECTION

- As you perform the steps described in the procedure, write down your observations. You can either describe what you see, or make measurements. These are the data.
- Your observations should be honest. Report what you actually see, not what you think you should see.
- You may want to organise your data into a table format.

STEP 6: CONCLUSION

- Look carefully at your data. Decide what your data tells you about your hypothesis. You may decide at this point that you need to revise your hypothesis and think about further experiments. You may also decide to communicate your results with others in a scientific article. This is how scientists let others know of their work.

You will probably also be expected to write a report on your experiment. Your teacher should supply you with specifications for this.

WHAT SHOULD THE DISPLAY LOOK LIKE?

Start by sketching a display on paper. The title should be large and easy to read. Write down clear subtitles such as Topic, Materials, Procedure, Data, Observations, and Conclusion.

Your display should be as neat and attractive as possible. Be accurate – no misspelled words. If you can use a computer to make labels, graphs and charts, that is fine – but not essential. You can also use letter stencils and rulers to make a neat display.

Keep the layout simple. Include only the most useful or interesting photos, illustrations and observations. Use colour to clarify data (graphs, charts, and diagrams).

Make sure the display will fit into the space available for you at the expo. Use safe, durable materials. Let the teacher or expo person know if your display needs electricity or other special arrangements.

Some ideas for topics:

- Which dishwashing liquid is the best degreaser?
- Do some rubber balls bounce higher than others? Why?
- Which kind of adhesive bandage (plaster) stays on the longest?
- Which animals in a zoo are kept in families? Why?
- Which kinds of fabrics are best for keeping you warm?
- Which kind of vinegar makes the best reaction (loudest, longest, most bubbly) with baking soda (bicarbonate of soda)?
- Which paper plates will hold more weight without buckling?
- Are snails attracted to or repelled by light?
- Does fertiliser affect the amount of algae growth in water?
- Design a feeding dish or mechanism which will prevent a large dog from stealing food from a little dog.

There are many useful websites on science expos (or fairs as they are also called) and ideas for topics. One of the best and most comprehensive I could find, was:

http://www.ipl.org/div/kidspace/projectguide/

Amanti Weerasinghe of the Diocesan School for Girls (Namibia) won gold for her research into aluminium.

It's your physics!

Physics is turning out to be great fun all over South Africa as science centres, tertiary institutions and observatories are joining forces to popularise physics as part of the United Nations International Year of Physics 2005.

What's on

- **At Discovery Centre at the University of Pretoria:**
  An optics show and workshop for primary and secondary school learners; an art competition themed *THE EINSTEIN IN ME*.
  Contact: Rudi Horak at telephone 012 420 2865;
  e-mail rudi.horak@up.ac.za
- **Tsebo-Koloing outreach project: Demonstrations and career guidance in science, engineering and technology related careers.**
  Contact: Simon Mateane on telephone 012 318 4493;
  e-mail mateanes@tut.ac.za.
- **The Sci-Bono Discovery Centre in Johannesburg:**
  A project involving 10 libraries in Gauteng. Activities involve taking physics to the public. Some 7 500 Learners from 9 regional libraries in Johannesburg will meet at the centre to showcase their projects and learn about science and career opportunities.
  Contact: Cynthia Xoli Malinga on telephone 011 639 8432 or 082 442 5232; e-mail cynthia.malinga@sci-bono.co.za
- **At the MTN ScienceCentre in Cape Town:**
  A production of *IMAGINING EINSTEIN*, especially produced for the South African celebrations of the International Year of Physics 2005. The one-man production, starring David Muller is targeted at secondary school learners, undergraduate university students and the general public, promoting an awareness of Einstein's discoveries. The play will be performed throughout South Africa at science centres, performing arts theatres, universities, museums and research institutes.
  Contact: Mike Bruton on telephone 021 529 8100 or
  e-mail mike.bruton@mtnsciencentre.org.za
- **The South African Astronomical Observatory:**
  Stars on Wheels via visits to schools and community halls across the Western, Eastern and Northern Cape provinces, entailing practical astronomy workshops for educators, covering activities like designing and building telescopes, sundials and binoculars and nebulae. It will also include the launching of water and paper and balloon rockets. A Southern African Large Telescope space camp will include a visit to the large telescope as well as a Careers in Physics and Astronomy Exhibition.
  Contact: Clifford Nxomani on telephone 021 460 9350;
  e-mail cliff@saao.ac.za
- **The Old Mutual MTN ScienCentre in Durban will host two programmes, a hip musical *ROCK ME EINSTEIN* and a dramatic science show *THE WONDERS OF PHYSICS*, aimed at rural and outlying areas. Performances will start in July.**
  Contact: Michael Peter on telephone 031 566 8040;
  e-mail michaelsc@gatewayworld.co.za
- **The University of Zululand Science Centre:**
  Practical workshops for particularly rural grade 12; and Physics on the Move, a mobile outreach programme to rural schools in northern KwaZulu-Natal. The centre will also host a week's performances of *IMAGINING EINSTEIN* to local rural schools.
  Contact: Derek Fish on telephone 035 797 3204;
  e-mail thefish@iafrica.com

Did you know that physics is a part of your life?

Physics explores the science of matter (everything that occupies space and has mass, whether in liquid, gas, or solid form) and energy, and in particular the relationship between the two. The South African Institute for Physics identifies seven physics sub-groups: applied and industrial, astrophysics and space science, condensed matter and materials science, education, lasers, optics and spectrometry, particle and radiation, and theoretical physics.

Wheels and wings

The faster you ride your bike, the harder you feel the air pushing against you. This is called wind resistance – imagine how hard the air must be pushing against an airplane travelling hundreds of kilometers per hour. Aerodynamics is the study of how air pushes against moving objects and how best to design the object in order to lessen the wind resistance to either keep objects in the air (like airplanes) or keep objects on the ground (like Michael Schumacher's Formula 1 car!).

Playing ball

Motion is an important part of physics. Players that throw or kick a ball so that it moves in a certain way, are actually using physics! When David Beckham curves the ball around a wall of players, he makes use of interesting aerodynamic principles. Even the way players stand when they hit, catch or throw the ball can be explained by physics – e.g. the wider apart their feet are, the broader their support base and the better they can balance.

Soap bubbles

Ever wonder why the bubbles you are blowing are round? Or where the colours come from? The round shape is because the bubble tries to be as small as possible while still holding the air trapped inside. Colours can be seen because the thin, see-through wall of the bubble, which is about 100 times thinner than a strand of hair, causes some of the light that reflects off its inside surface to interfere with some of the light that reflects off its outside surface.

Lubricants

A squeaky hinge, rubbing your hands together and even a wheel rubbing against its axle all have a very important principle in common – friction. Friction causes things to heat up and wear down. Lubricants, like oil, reduce the amount of friction between two surfaces and help to prolong the life of the mechanical parts. That's why your car's engine heats up if you run out of oil.

Fabric

You even wear physics on your skin! The way the threads in fabric are woven, whether it's tight or loose, or whether it can stretch (elasticity), how well it absorbs and how it can be used are all principles explained by physics.

Fizzy drinks

The bubbles you find in soda are caused by a gas called carbon dioxide (CO_2). To make soda, CO_2 is forced into the liquid with a lot of pressure and sealed immediately. Some CO_2 escapes when you open a can or bottle, accounting for the 'pssss' sound you hear.

Cool places

Insulation between the walls of houses and often in the roof of a house, keeps the inside of the house cool in summer and warm in winter. This is because insulators slow down the movement of heat from hot places to cool places. A coffee flask is a good insulator and will keep your coffee hot – but it can also be used to keep your cool drinks cold.

Weather

Meteorology is the study of weather and one of the most common pieces of weather data is temperature. Temperature is a measure of how cold or hot it is. We measure temperature in degrees Celsius (a scale developed by Swedish astronomer Anders Celsius) or degrees Fahrenheit (a scale developed by German physicist Gabriel Fahrenheit).

Music

When an instrument makes a sound, some part of the instrument vibrates very quickly – all sounds humans hear are made by things pulsating at least 20 times per second! The faster it vibrates, the higher the pitch of the sound. In instruments like guitars or violins, the strings vibrate. In 'hollow' instruments like saxophones or flutes; the air inside vibrates and the pitch of the sound it produces depends on the length of the air column.

Rainbows

The rainbow or visible spectrum (the colours we can see) is formed when white light travelling through the air is slowed down by going through a clear substance such as water (rain). The white light from the sun is made up of the colours of the spectrum. When it passes through the rain, red is slowed down the least and violet (a light purple) the most, causing the white light to break up into the colours of the rainbow, which are red, orange, yellow, green, blue, indigo (navy) and violet.

Lenses

The simple spectacles we wear or large telescopes we use actually demonstrate some amazing physics. Depending on their shape, some lenses can make things look bigger while others can make things look smaller. When light passes from air into a lens, it bends according to the shape of the lens. Think about a magnifying glass. If you hold it just right you can focus all the light that falls onto it onto one tiny spot and sometimes even burn a hole through something. We wouldn't have cameras or microscopes or binoculars if it weren't for lenses.

Alet Uys developed a scale to test learner's potential to become pilots. She tested abilities such as perceptual skills, memory and concentration.

Praveer Sooka of St Johns College did research into the resonance coil.

Nontando Cele won gold for her project on The Golden Ratio.