

## Join the TRIP THROUGH OUR SOLAR SYSTEM

Would you like to travel through our solar system and visit the other planets? Before you become a space traveller, you will need to learn a lot about what you will find out there. It will also take a great deal of perseverance, because:

### THE SUN - OUR OWN STAR

Every day we see the Sun rise in the east, travel across the sky and set in the west. For many, many years people thought the Sun travelled around the Earth. Now we know that the Earth travels around the Sun. Because the Earth spins around its own axis every day, it looks as if the Sun is moving across the sky.

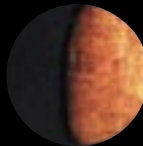
The Sun is a star in a galaxy called the Milky Way. On dark, clear nights you can see the Milky Way glow and stretch over the sky like a band of white milk. It is made up of millions of faraway stars, but they are difficult to pick out as single stars.

The Sun is a ball of gas, more than 100 times bigger than the Earth. It is the centre of our solar system. All nine planets in this system orbit around the Sun, which gives them heat and light. Scientists believe the temperature at the core of the Sun is about 15 million °C. Even the temperature at the surface is extremely hot: 6 000 °C. The Sun's energy waves travel through space at the speed of light, which is 3 million kilometres per second.

### THE PLANETS

We know of nine planets that orbit our Sun. They are all large balls made of gas, metal or rock. All the planets formed at the same time, from the same cloud of gas and dust around the Sun, but they are all very different.

**MERCURY** is the closest to the Sun. It always has one side turned to the Sun, so half is always in daylight and half in the dark. The hot part facing the Sun has a temperature of about 415 °C and on the other side the temperature plunges to -170 °C.



MERCURY



### SEE FOR YOURSELF

You can learn a lot about the Sun by looking at the shadows it makes on Earth.

You will need:

- \* Sheet of poster paper
- \* Sharp pencil
- \* Modelling clay
- \* A watch
- \* Coloured pencil
- \* Ruler



Draw a horizontal and a vertical line across the middle of the poster paper. Write the directions north, south, east and west on the paper as shown.

Use the modelling clay to make the pencil stand up at the spot where the two lines cross. You have now made a Sun tracker. On a sunny day, go out early and find an open space to place your Sun tracker. Ask an adult to help you place your tracker down with the north, south, east and west labels pointing in the right directions.

Can you see the shadow of the pencil on the paper? At exactly 08:00, use your ruler and coloured pencil to draw a line on the paper on this shadow. Measure the length of the shadow in centimetres. Repeat this every hour on the hour until the Sun sets.

You can now use your tracker to tell where the Sun is in the sky at different times of the day. The Sun is always opposite to the direction in which the shadow points. A few weeks later, do the same experiment in exactly the same spot as before. Use a different colour pencil and again mark the shadows. Why do you think the shadows have changed?



## SPACE VOYAGER

In 1977, a space probe called *Voyager II* was launched on a journey to explore and send pictures of the four largest planets of our solar system: Jupiter, Saturn, Uranus and Neptune. It took *Voyager II* almost two years to reach Jupiter and then two more years to reach Saturn. Five and a half years later it flew past Uranus and three and a half years after that it flew past Neptune - right on schedule. It will soon leave our solar system and begin its journey into interstellar space!

## REMEMBER THE PLANETS

The planets are named after ancient Greek and Roman gods. An easy way to remember these names is to remember the sentence:

**"MOTHER VERY ENTHUSIASTICALLY MADE A JELLY SANDWICH UNDER NO PROTEST."**

Beginning with Mercury, the closest to the Sun, and ending with Pluto, the farthest from the Sun, the sentence gives you clues to the order of the planets.

## HOW LONG WILL IT TAKE?

If you start your travels in your very fancy space ship from the Sun when you are 10, and it takes you three months to get to Mercury, you will be 10 years and eight months old when you get to Venus. You will be 11½ when you get to Earth, and over 12 years and four months when you get to Mars. By the time you reach Jupiter, you will be over 18. By Saturn you will be almost 25, and 40 by the time you reach Uranus. You will celebrate your 56th birthday on Neptune, and when you reach Pluto you will be a senior citizen of 70!

For wonderful images and lots of information on the solar system, visit the website:

[www.jpl.nasa.gov/solar\\_system](http://www.jpl.nasa.gov/solar_system)

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**VENUS** has dense clouds of brownish, yellow sulphuric acid, a few high mountains and a few volcanos. It is the hottest of all the planets.

**EARTH** has blue oceans, brown and green continents, and swirling white clouds when seen from space. At the north and south poles are white icecaps. Earth has one moon.

**MARS** has pink sand dunes and pink dust storms. It has the deepest valleys and highest mountains in the solar system. It has icecaps at its two poles, just like Earth. Mars has two tiny moons called Phobos and Deimos. We have learnt a lot about Mars from the spaceship, called Mars Pathfinder, that landed on the planet to collect images and data.

**ASTEROIDS** are found in a belt between Mars and Jupiter. They look like pinpoints of light. Some asteroids have irregular shapes.

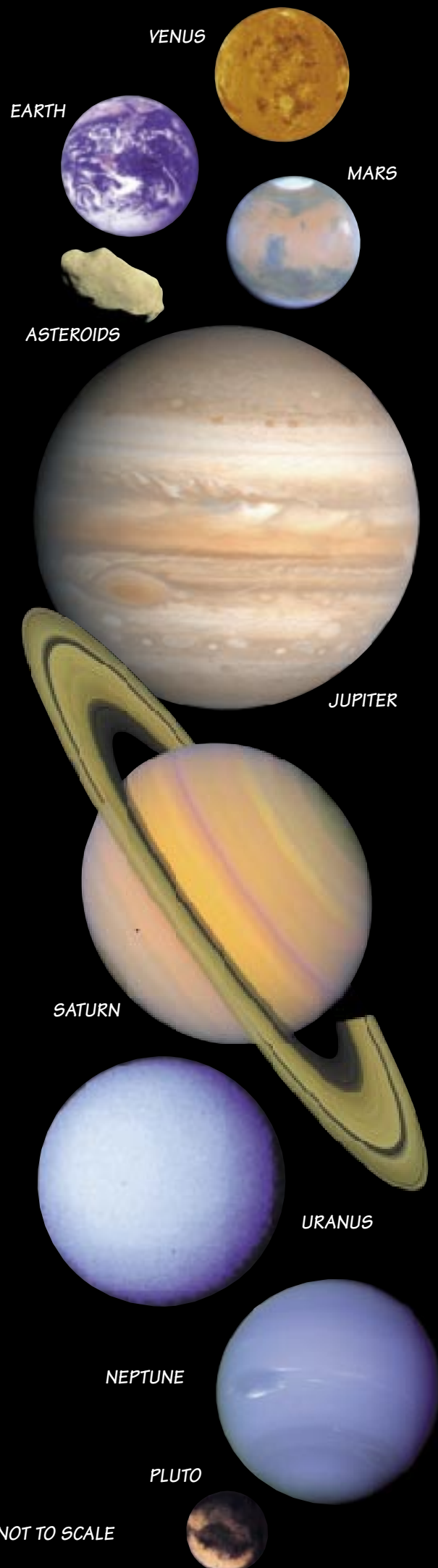
**JUPITER** is the largest planet in our solar system. It is made of gas and liquid and is not quite round, but a little flatter at its poles. It has bright, white clouds and orange and brown belts all around the planet. There is one very clear ring around the planet. Jupiter has 16 moons, one bigger than the planet Mercury.

**SATURN** has multicoloured rings all around it. These rings are made up of billions of grains of all kinds of material, and rocks. Saturn has 18 moons that we know of.

**URANUS** orbits the Sun on its side! It has nine faint, multicoloured rings as well as 15 moons.

**NEPTUNE** has blue skies like Earth and is very, very cold. It takes about 165 years to travel around the Sun. It has one large moon and two small ones.

**PLUTO**, the coldest, smallest planet, was the last to be discovered. It takes 243 years to travel around the Sun. It has one moon, Charon, which is almost as big as Pluto itself. It has a strange orbit that at times brings it closer to the Sun than Neptune.



NOT TO SCALE

# WORLD SPACE WEEK 2003 SOUTH AFRICA

# SOUTHERN SKIES CHALLENGE

**ENTER YOUR ARTWORK**  
**Closing date: 15 December 2003**

## CATEGORIES

Enter in one of the following categories:

### REMEMBERING

Is there a special story about the night sky, the stars you see from where you live, that you have been told by your parents, grandparents or other elders in your village or community? Please share it with us in the form of a story, a story with illustrations, or an illustration/artwork only.

### PREDICTING

#### LIFE ON MARS

During the period August 2003 to January 2004, Mars will be closer to the Earth than it has been in nearly 60 000 years. Mars is the next big destination for Earthlings and some people predict that 40 years from now people will be living on Mars. Do some research about conditions on Mars and write a short essay (with or without illustrations) about: "What it would take to live on Mars." You can also submit a model or website relating to Life on Mars.

### OPEN MIND

The theme of this year's International World Space Week is "Space: Horizon Beyond Earth." What are your impressions of the night sky? Give your imagination free reigns and show or tell us of your own interpretation of this theme. You may write, draw, or paint in any medium.

## WHAT'S IN IT FOR YOU?

The overall winner will receive a computer as well as one for his/her school/institution, donated by Universal Service Agency.

Selected learners will also be taken on a guided visit to the South African Astronomical Observatory in the Karoo where the Southern African Large Telescope is being built!

Cash prizes totalling R30 000 will be awarded to the winner in each subcategory.

Prizes will be awarded in three categories for age groups:

- \* 5 - 9      \* 10 - 14
- \* 15 - 19   \* 20 - 23

### RULES

An independent panel of judges will be appointed by SAASTA. Their decision on all matters relating to the competition is final, and no correspondence will be entered into concerning the competition's judging and organisation. Employees of SAASTA, DoC and DST and their families are not eligible.

The organisers reserve the right to reproduce and exhibit any prize-winning or commended entry without the permission of the entrant or payment of such use. The moral right of the copyright owner will be acknowledged.

Entries will be used to stimulate interest in space science and technology and awareness of our South African starlore heritage.



DEPARTMENT OF SCIENCE AND TECHNOLOGY  
 DEPARTMENT OF TRADE AND INDUSTRY  
 DEPARTMENT OF COMMUNICATIONS  
 DEPARTMENT OF FOREIGN AFFAIRS



## HOW TO ENTER

Get your entry to us by 15 December 2003.

**MAIL IT TO:**  
**Southern Skies Challenge, SAASTA,**  
**P. O. Box 1758**  
**PRETORIA**  
**0001**

## ENTRY FORM

Name and surname: .....

School/technikon/university: ..... Province: .....

How old are/were you on 1 October 2003? .....

Postal address: .....

..... Code: .....

Telephone number where we can reach you: Code: ..... Number: .....

### IN WHICH CATEGORY ARE YOU ENTERING?

- \* Remembering (Starlore)
- \* Predicting (Life on Mars)
- \* Open (Horizon beyond Earth)

### YOU ARE SUBMITTING:

- \* Writing only
- \* Writing with illustrations
- \* Illustration/art only

**More information:**  
[www.space.gov.za/wsw](http://www.space.gov.za/wsw)

or any other artwork (such as a model) or a digital entry (such as a website).



You may use any medium (pencil, watercolour, oil, etc) for drawings or illustrations.

You may submit your entry in any one of South Africa's 11 official languages. **CLOSING DATE: 15 DECEMBER 2003**

Winners will be notified by 31 January 2004. Results will be published on the website: [www.space.gov.za/wsw](http://www.space.gov.za/wsw)



# BIOTECH Discover the secrets of DNA

Nearly all living things, including us humans, are built up from tiny pockets, called cells. Cells are so small that they can only be seen under a microscope.

In the centre of every plant cell – from algae to sunflowers – and in the centre of every animal cell – from snails to you and me – there's a copy of the organism's genetic material. This material, called DNA, carries a complete blueprint of the organism. It's what transfers characteristics from one generation to the next. At the chemical level the cells of all plants and all animals contain DNA in the same shape – the famous "double helix".

## GENETICS

Genetics is about storing and passing on messages. These genetic messages are stored in your DNA, which is inside almost every cell in your body. DNA tells cells what they're supposed to do, when, where and how – to keep your body working well. Our understanding of genetics stems from the discovery of the DNA molecule in every cell, which carries the genetic information.

## CELEBRATING DNA

This year, the world is celebrating the 50th anniversary of the discovery of the DNA structure. In 1953, Francis Crick and James Watson published the first accurate model of the DNA molecule.

## WHAT IS DNA?

DNA is an acid that carries (as genes) all the information which we inherit from our parents. It controls everything about the way you look, from the colour of your eyes to how tall you are to the width of your feet. Your DNA is like your thumbprint. It is yours and yours alone.

Watson and Crick found out that DNA looks like two threads twisted around each other, held together by many bridges between the strands. It almost looks like a

spiral staircase. This shape is called a double helix. The genetic information is stored on the threads.

## WHERE CAN DNA BE FOUND?

In the nucleus of almost every cell in your body is the collection of DNA needed to make you. DNA in the nucleus is grouped into 23 sets of chromosomes that are called your "genome." In each chromosome, the DNA is grouped into "genes." Your genome contains about 35 000 genes. Each gene carries information that tells the cell to make a unique protein that will perform a special function.

How does something as small as a DNA molecule contain all of the instructions to make your whole body and keep it working? Just as a large number of words can be made from only a few letters, so DNA can make lots of different instructions from a few building blocks.

## HOW KNOWLEDGE ABOUT DNA AFFECTS US

Now that scientists understand what DNA is and how it works, they are using this information in many different ways to improve our lives. Foods are being made more healthy and nutritious (such as potatoes that absorb less oil to make chips); better medicines and treatments are being developed for people with illnesses and genetic diseases; vaccines to prevent infectious diseases are being delivered in foods; and micro-organisms that help protect the environment by breaking down poisonous plastics found in water and soil are also being developed.

DNA fingerprinting is also an important tool to help catch criminals, who leave samples of their DNA at crime scenes in the form of hair, blood or other cells from their bodies.



DNA strands tightly coiled into chromosomes.

CELLS

EASY

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PUBLIC UNDERSTANDING OF BIOTECHNOLOGY

## 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](mailto:speakup@pub.ac.za) or fax 012 320 7803 or visit [www.pub.ac.za](http://www.pub.ac.za) for more information.



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