Who's Who in South Africa's Space Zoo?

World Space Week
SOUTH AFRICA

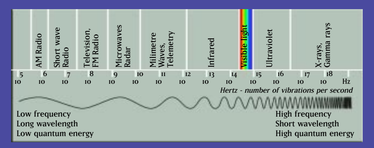
CELEBRATING OUR
Southern Skies

WHAT IS SPACE SCIENCE AND TECHNOLOGY? HOW DOES IT BENEFIT SOUTH AFRICA?

Space science is the study of everything above and beyond the surface of the Earth, from Earth's atmosphere to the very edges of the universe. Space Technology is used by space scientists to study the universe (looking up) and the earth (looking down), or to deliver services to users on the ground.

Information about everything in space can be obtained by means of a form of energy called electromagnetic radiation. Electromagnetic radiation travels through space in the form of waves.

Electromagnetic waves of different frequencies are emitted by different objects in the universe, and so are useful for gathering information.



The diagram above shows the range of frequencies and wavelengths for different kinds of electromagnetic waves. The higher the frequency of the waves the shorter the wavelength and the higher the energy of the electromagnetic radiation.

South Africa has a rich variety of space technology facilities to study the universe or to study Earth from space, or to deliver services from space to users on the ground.

AMATEUR ASTRONOMY IS ADDICTIVE!!

The Astronomical Association of Southern Africa (ASSA) has amateur and professional astronomers as members. Membership is open to everyone interested in space science – you don't need to know anything about astronomy to join – that is how you will learn! ASSA has centres in Bloemfontein, Cape Town, Durban, Knysna, Johannesburg, Pretoria and Pietermaritzburg. Each centre holds a meeting once a month. You can write to ASSA at PO Box 9, Observatory, 7935.

www.saao.ac.za/assa

SOUTH AFRICA'S SPACE PIONEER

In April 2002, a young South African entrepreneur became the first African in space when he joined a team of cosmonauts on the Russian Soyuz capsule on a journey to the International Space Station. Mark Shuttleworth conducted several experiments during his 10-day space flight. One experiment was the very first in the world to assess the impact of zero-gravity on the development of stem cells and embryos; another was to determine the effect of microgravity on the cardiovascular system and muscles; and a third was an attempt to crystallise HIV proteins in weightlessness in the hopes that, when X-rayed, they will give an accurate view of the virus structure. Mark has used his trip as a springboard for an education-outreach programme, which aims to encourage learners to embrace mathematics and science. He has, since his return from the space flight, made substantial investments in science education in South Africa and has fuelled the interest of young people in space science and astronomy. www.africaninspace.com

PLACES WHERE OUR SPACE SCIENTISTS WORK AND WHERE YOU CAN FIND OUT MORE ...

IF YOU WANT TO STUDY SPACE SCIENCE AFTER SCHOOL .....

The National Astronomy and Space Science Programme (run by a consortium of institutions)
UNIVERSITY OF CAPE TOWN
Department of Mathematics and Applied Mathematics, University of Cape Town,
Private Bag Rondebosch 7701,
Tel: (021) 650-2344/650-2334,
Fax: (021) 650-2334, www.star.ac.za

Department of Astronomy, University of Cape Town,
Private Bag Rondebosch 7700,
Tel: (021) 650-3341,
Fax: (021) 650-3342,
http://mensa.ast.uct.ac.za

UNIVERSITY OF THE FREE STATE
Department of Physics, University of the Free State, PO Box 339, Bloemfontein 9300,
Tel: (051) 401-2926/6158,
www.uovs.ac.za

UNIVERSITY OF NATAL, DURBAN
School of Pure and Applied Physics, University of Natal,
Durban 4041,
Tel: (031) 260-2775,
Fax: (031) 261-6550,
www.nu.ac.za

UNIVERSITY OF NATAL, PIETERMARITZBURG School of Chemical and Physical Sciences, University of Natal,
Private Bag X01, Scottsville, 3209,
Tel: (033) 260-5326,
Fax: (033) 260-5009,
http://roger.phy.unp.ac.za

UNIVERSITY OF THE NORTH WEST
Physics Department
University of the North West
Private Bag X 2046 Mmabatho 2745
Tel: (018) 89-2345 Fax: (018) 89-2052
www.uniwest.ac.ca

POTCHEFSTROOM UNIVERSITY
School of Physics, Potchefstroom University for Christian Higher Education, Private Bag X 6001, POTCHEFSTROOM 2520,
Tel: (018) 299-2423, Fax: (018) 299-2421
www.puk.ac.za/physics

RHODES UNIVERSITY
Department of Physics and Electronics, Rhodes University,
PO Box 94, Grahamstown 6140,
Tel: (046) 603-8450, Fax: (046) 622-5049
http://phlinux.ru.ac.za/physics

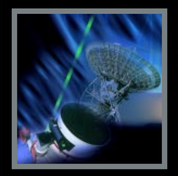
UNIVERSITY OF SOUTH AFRICA
Department of Mathematics, Applied Mathematics and Astronomy,
PO Box 392, UNISA 0003,
Tel: (012) 429-6202, Fax: (012) 429-6064,
www.unisa.ac.za/dept/ws

UNIVERSITY OF STELLENBOSCH
Department of Electrical and Electronic Engineering, University of Stellenbosch,
Private Bag X1, MATIELAND 7602,
Tel: (021) 808-4368, Fax: (021) 808-4981
www.ee.sun.ac.za

UNIVERSITY OF THE WITWATERSRAND
School of Computational and Applied Mathematics,
Private Bag-3, Wits-2050,
Johannesburg, South Africa,
Tel: (011) 717-6138,
Fax : (011) 717-6149, www.cam.wits.ac.za

THE HERMANUS MAGNETIC OBSERVATORY (HMO)

The HMO is part of an international network of magnetic observatories, which monitor and model changes in the Earth's magnetic field. Researchers at the HMO are also involved in studying the magnetosphere, which is the outermost layer of Earth's atmosphere. The HMO runs science awareness programmes for learners and offers presentations on space physics and guided tours of the HMO's facilities. There is also an interactive science centre and magnetometer museum.
Tel: (028) 312-1196 Fax: (028) 312-2039, www.hmo.ac.za



HARTEBEEST-HOEK RADIO ASTRONOMY OBSERVATORY (HARTRAO)

HartRAO operates a telescope 26 metres in diameter that can detect radio waves ranging in wavelength from 2,5 cm to 18 cm. The radio waves are emitted by many different kinds of objects in the sky, from atoms and molecules to neutron stars to galaxies. HartRAO has the largest steerable radio telescope in Africa, and it co-operates with radio telescope facilities on other continents.

HartRAO also has a Space Geodesy programme, which operates global positioning equipment and a satellite laser ranger used to detect the position of satellites. HartRAO organizes workshops for educators to help them present astronomy-related topics in their own classes. Visits to the observatory are also organized for school groups and the public. **Tel: (012) 326-0742, fax: (012) 326-0756, www.hartrao.ac.za**

THE SOUTH AFRICAN ASTRONOMICAL OBSERVATORY (SAAO)

SAAO is the national optical observatory of South Africa, dating back to 1820, when the Royal Observatory was established at the Cape. The headquarters are in Observatory, Cape Town, and the telescopes are at Sutherland in the Northern Cape. At present there are various telescopes with mirrors ranging in diameter from 0,5 metres to 1,9 metres in diameter. The telescopes detect visible light and infrared radiation. A much bigger telescope (SALT) is currently under construction on the site at Sutherland. The SAAO Science Education Initiative offers astronomy workshops for educators. Members of the public can visit the SAAO in Cape Town on the second Saturday of every month at 20:00, **Tel: (021) 447-0025, Fax: (021) 447-3639, www.saao.ac.za**
Visits to the telescopes at Sutherland can be booked through the **Sutherland Tourism Bureau, Tel. (023) 571-1265.**

SOUTHERN AFRICAN LARGE TELESCOPE (SALT)

SALT is currently being built at the SAAO's site at Sutherland, and will be the biggest single optical telescope in the Southern Hemisphere when it is completed in 2005. By putting together 91 small hexagon-shaped mirrors, each 1 metre wide, SALT will have an effective diameter of 11 metres. It will be able to record light from distant stars, galaxies and quasars a billion times too faint to be seen with the unaided eye – as faint as a candle flame on the moon.
www.salt.ac.za

SQUARE KILOMETRE ARRAY (SKA)

South Africa is competing with other countries to host the SKA, a $1 billion international project to create an array of antennas for detecting radio waves that will cover an area of one square kilometer (about the size of 150 soccer fields). This area is 100 times larger than the biggest receiving surface that now exists. If South Africa wins this bid, the main part of the SKA will be built in the Northern Cape, with other parts distributed in Southern Africa. It will bring world class scientists to our country and the region. **www.ska.ac.za**

HIGH ENERGY STEREOSCOPIC SYSTEM (HESS)

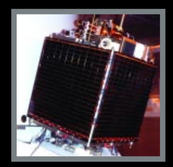
HESS provides an indirect way of detecting gamma rays from the universe. A gamma ray entering Earth's atmosphere interacts with air molecules and causes a shower of secondary particles which emit a faint blue Cerenkov light in the process. HESS consists of an array of four telescopes which can detect the intensity and direction of this light. More telescopes will be added later. HESS is located near the Gamsberg on the Khomas Hoghland, between Windhoek and Walvis Bay, Namibia. HESS is an international collaboration in which South Africa is a partner through Potchefstroom University.
www.mpi-hd.mpg.de/hfm/HESS

SOUTH AFRICAN NATIONAL ANTARCTIC EXPEDITION (SANAE)

Antarctica, the southernmost continent on Earth, does not belong to any country, but several countries have bases there. South Africa has had an Antarctic base since 1962. Data gathered at SANAE are used to study the upper layers of the atmosphere in detail, especially the ionosphere and the magnetosphere.
Information is also gathered about the ozone hole.
http://home.intekom.com/sanae/

THE CSIR SATELLITE APPLICATIONS CENTRE (SAC)

SAC at Hartebeesthoek provides products and services related to the space industry and its applications. It can track and control spacecraft for clients using its antennas or help them set up their own antennas and tracking facilities. It also offers services related to getting, storing and using images of earth obtained from satellites. It has three main groups: Earth Observation; Ground Segment Services; and Information and Communications Technology Applications. **Tel: (012) 334-5000, Fax: (012) 334-5001, www.sac.co.za**



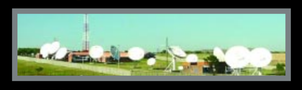
SUN SPACE AND INFORMATION SYSTEMS (PTY) LTD (SUNSPACE)

SunSpace designs and develops small and micro-satellite systems, and related support equipment and ground-based applications. SunSpace has its origins in the SUNSAT satellite programme of the University of Stellenbosch.

SUNSAT, South Africa's first satellite, was developed completely by a local team of engineers, and launched in 1999 by the American space agency NASA. The team who designed and developed SUNSAT forms the core of SunSpace today. **Tel: (021) 880-8100, Fax: (021) 880-1703, www.sunspace.co.za**

INSTITUTE FOR SATELLITE & SOFTWARE APPLICATIONS (ISSA)

ISSA is based at the Houwteq satellite integration facility in Grabouw. It offers post-graduate qualifications in Engineering and Information and Communication Technology. Research conducted at ISSA includes satellite engineering, and excellent facilities are available for designing and testing small satellites.
Tel: (021) 859-7300, Fax: (021) 859-7324, www.issa.org.za



SENTECH

Sentech uses satellites to deliver television and radio programmes to your nearest transmitter station from where it is broadcast to your home TV or radio.
If you live in a remote area where there is no land-based television service, you can receive your SABC and e.tv services directly off Sentech's satellite service with a suitable satellite antenna and Vivid decoder. Sentech also uses its VSAT system to deliver Internet and other data services via satellite directly to schools and other institutions in remote areas of the country.
Tel: (011) 691-7000, www.sentech.co.za

TELKOM

Through its many satellite services (in addition to the undersea cable) Telkom touches the lives of every South African, from connecting us to the world to bringing news and sport to our television screens. Connecting businesses in remote areas, making automatic teller machines work, taking business application into Africa, Europe and the Middle East and fast Internet and telephones to rural South Africa are all part of Telkom SpaceStream product range. **www.telkom.co.za**

CAPE TOWN PLANETARIUM

Inside the domed auditorium of the Planetarium in Cape Town, visitors are transported through the wonders of the universe – the ultimate in armchair travel! Their full monthly menu of shows and activities for all ages, as well as their astronomy courses, are very popular. **Tel: (021) 481-3900, Fax: (021) 481-3990. www.museums.org.za/planetarium**

JOHANNESBURG PLANETARIUM

The Johannesburg Planetarium offers a variety of shows for small children, school groups and the general public, as well as astronomy courses. Special shows can be put together on request, and astronomical birthday parties can be arranged. It also supplies star-charts, telescopes, and other astronomy-related materials. A free e-mail service notifies subscribers of interesting sights in the South African night skies.
Tel: (011) 717-1392, Fax: (011) 339-2926, www.wits.ac.za/planetarium

BOYDEN OBSERVATORY

Boyden Observatory has the third largest optical telescope in Southern Africa, a 1,5 m reflector and various other telescopes for educational purposes, including an excellent solar telescope. An observation platform is ideal for looking at satellites, astro-photography and open-air slide/data projector presentations. Boyden hosts open evenings for school groups and adults.
A Science Centre is now being established at the site. It is located just outside Bloemfontein.
Tel: (051) 401-2924, www.uovs.ac.za/boyden

SOUTHERN AFRICAN AMATEUR RADIO SATELLITE ASSOCIATION (SA AMSAT)

Radio amateurs use two-way radio communication to make contact with other radio amateurs all over the world. They are even able to use satellites and on occasion speak with astronauts. You too can become a radio amateur! Find out more at the web site of the South African Radio League: **www.sarl.org.za**

SPACE SCIENCES AT SCIENCE CENTRES

Space displays are very popular in science centres around the world and several centres in South Africa offer space activities and exhibits. You'll find a list of science centres in South Africa at **www.saastec.co.za**

The MTN ScienCentre in Cape Town features a replica of the Mars Rover; a life-size replica of the Soyuz capsule in which Mark Shuttleworth traveled into space, and some space debris which did not disintegrate upon entering Earth's atmosphere. **Tel: (021) 529 8100, www.mtnsciencentre.org.za**

The Museum of Science and Technology in Pretoria (part of the South African Agency of Science and Technology Advancement) has several interesting pieces of "space junk" that fell from orbit and landed in South Africa. You can also see models of rockets, experimental rocket planes, space stations, satellites and deep space probes. A real-time weather satellite receiver displays cloud cover images of our part of the globe. The Museum also has a traveling STARLAB, an inflatable planetarium which makes it possible to take planetarium visits to rural areas. **Tel: (012) 392-9300, www.saasta.ac.za/museum**

You'll also find a STARLAB at the Unizul Science Centre in Richards Bay, as well as several other space-related displays, including a sundial. **Tel: (035) 797-3204**

SPACE RESOURCE CENTRE

A non-profit organization focusing on research and analysis of the space industry, policy and regulatory instruments in the area of space sciences. It promotes awareness about space science and applications.
Tel: (012) 430-2963/4, Fax: (012) 430-7186.

Design and production: Loretta Steyn Graphic Design Studio - Pretoria
Image of Planet Earth courtesy of Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center.

South Africa is a leader in space science and technology, especially in the southern hemisphere and on the African continent. This poster was developed as an educational resource to promote awareness of South Africa's comprehensive involvement in space sciences, as part of South Africa's involvement in World Space Week 2003. Funding came from the government, via the Department of Science and Technology (www.dst.gov.za) who, together with the other Departments listed, form the National Working Group on Space Science and Technology. The poster was developed by the South African Agency for Science and Technology Advancement – www.saasta.ac.za

SAASTA