

STUDYING SPACE SCIENCE

South Africa is buzzing with space science activities. To follow a career in space science you will need to do well in school subjects such as mathematics and physical science. This will allow you to enrol for courses in mathematics, physics or engineering at university.

Many South African universities offer post-graduate courses in space science and remote sensing at their science and engineering faculties.

The National Astronomy and Space Science Programme

University of Cape Town
www.star.ac.za

University of Cape Town
Department of Astronomy
<http://mensa.ast.uct.ac.za>

University of the Free State
Department of Physics
www.uovs.ac.za

University of KwaZulu-Natal
School of Physics
www.ukzn.ac.za

North-West University
Physics Department
www.nwu.ac.za

Rhodes University
Department of Physics and Electronics
<http://jansky.ru.ac.za/physics>

University of South Africa
Department of Mathematics, Applied Mathematics
and Astronomy
www.unisa.ac.za

University of Stellenbosch
Department of Electrical and Electronic Engineering
www.ee.sun.ac.za

University of the Witwatersrand
School of Computational and Applied Mathematics
www.cam.wits.ac.za

University of Johannesburg
Faculties of Science and Engineering
www.uj.ac.za

University of Fort Hare
School of Science and Technology
www.ufh.ac.za

University of Venda for Science and Technology
Faculty of Natural and Applied Sciences
www.univen.ac.za

Nelson Mandela Metropolitan University
Faculties of Science and Engineering
www.nmmu.ac.za

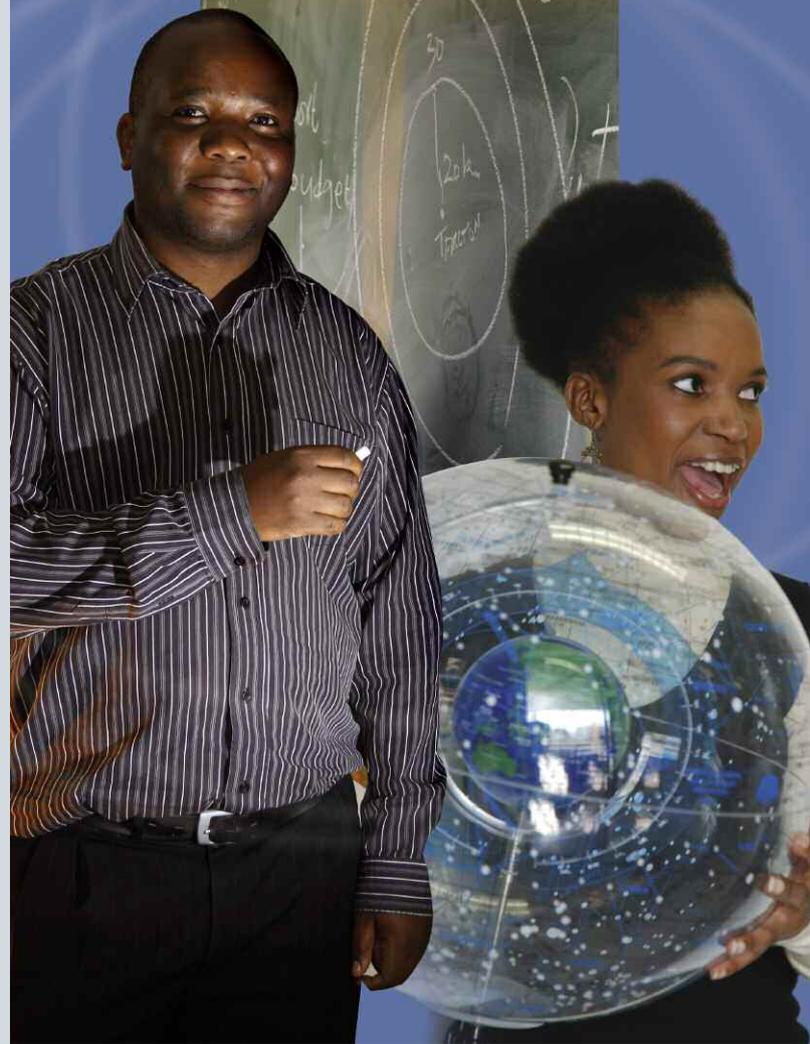
University of Limpopo
Faculty of Science, Health and Agriculture
www.ul.ac.za

University of Pretoria
Faculties of Engineering, Natural and Agricultural Sciences
www.up.ac.za

Loretta Steyn Graphic Design Studio – Pretoria

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CAREERS IN SPACE SCIENCE & TECHNOLOGY



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The fully integrated Soyuz Rocket, carrying SumbandilaSat as secondary payload, ready to be railed out onto the launch pad.

The Fregat Upper Stage of the Soyuz Rocket with all satellite payloads fully integrated onto it. SumbandilaSat (centre left) was a secondary payload of the rocket.

CAREERS IN SPACE SCIENCE & TECHNOLOGY

Space science is a rapidly emerging field in South Africa. The government has established the South African Space Agency and a unique micro satellite, SumbandilaSat, has been launched.

SumbandilaSat is taking pictures of Southern Africa to help with research, planning and management in areas such as agriculture, the fishing industry, water resources, urban planning, and losses caused by disasters such as fires and oil spills.

Space science is the study or utilisation of everything above and beyond the surface of the Earth, from the atmosphere to the very edges of the universe, e.g. astronomy, space physics and geodesy.

Space technology is the technology in satellites and ground systems that is used to study the universe (looking up) and the Earth (looking down). Space technology is also used to deliver services to users on the ground, i.e. images of the Earth and of weather patterns, navigation, and communication.

Space technology helps us to manage our natural resources better by helping us improve agricultural output, and by providing valuable information for disaster relief and peace-keeping operations.

Space systems have become an important part of the modern information society, touching many aspects of our daily lives, i.e. cell phone calls, the Internet, ATMs, and satellite TV broadcasts.

South Africa's space engineers, scientists and technologists can help find solutions to many of the problems facing Africa such as drought, famine, and urbanisation. That is why South Africa needs more young people trained in space science, engineering and technology and remote sensing!

SUMBANDILASAT

SumbandilaSat, South Africa's Earth observation microsatellite, was launched by the Russian space agency Roscosmos on 17 September 2009.

The launch was the result of the Department of Science and Technology's three-year, R26 million integrated capacity-building and satellite development project. SumbandilaSat means 'showing the way' in Tshivenda. The name, chosen via a national competition for high school learners, identifies the satellite as a South African project and brands the satellite as a major South African space technology.

The key players in the construction of the satellite were the University of Stellenbosch, specialist South African microsatellite company SunSpace Information Systems in Stellenbosch, and the CSIR (Council for Scientific and Industrial Research). The CSIR is responsible for mission control and the CSIR's Satellite Applications Centre at Hartebeesthoek is responsible for operations, telemetry, tracking, control and data capturing.

The main payload of the 81 kg satellite is a 6,25 m multispectral imager – that is, the imager has a resolution of 6,25 m x 6,25 m. Spaceborne sensors yield valuable data which are combined with measurements taken on the ground and then processed and modelled. The satellite orbits 500 km above the Earth and is used for among other things to provide authorities with information on coastal activities such as smuggling and illegal fishing, to help in disaster management, and to monitor droughts, desertification and agricultural crops. It also facilitates communications for amateur radio.

Images in the optical, infrared and radar wavelengths from Earth observation satellites such as SumbandilaSat offer a wealth of information on South Africa's natural environment to policy-makers and scientists. The global coverage and long-term monitoring capabilities of satellites allow them to be used to study global climate change and the effects of human activity, such as ozone depletion or the loss of wetlands. The SumbandilaSat project has already had important spin-offs in the form of several educational opportunities at various levels, from school learners to post-graduate university students, including satellite engineers at Stellenbosch University.



ANDISWA MLISA – the geoinformatics specialist

Andiswa is one of the Directors at Umvoto Africa, a water resource development consultancy, where she leads the Geoinformatics Division (Geographical Information Systems (GIS) and Remote Sensing (RS)). The company focuses on hydrogeology and mining exploration.

What Andiswa does

Andiswa combines her knowledge of geology and technology to interpret various data. She spends a lot of time capturing data and collating information and imagery. She then pre-processes the data for analysis and classification. A large part of her job involves problem solving and providing the information to natural scientists in her organisation and clients. She sometimes visits sites that Umvoto is doing investigation on for field verification. Andiswa uses RS and GIS technology to tackle projects such as finding diamond-bearing kimberlites in Angola and Brazil, and water resource development and management. She also mentors young undergraduates and post-graduate students, and serves on various national and international committees.

The future of geoinformatics as a career in South Africa?

The time is ripe to choose space science as a career. The political and leadership structures are being put in place. We now have a Space Bill, the South African Space Agency is being formed and South Africa has launched its own satellite. These initiatives will support the growth of space science in the country. The fields of application are increasing all the time, and more people are becoming aware of the benefits of space science to service delivery.

Advice to prospective space scientists

Develop above-average computer skills to keep up with developing technology. Make sure your communication and interpersonal skills are highly developed, as your job is to bridge the gap between technology and applications. The space science field is wide, so keep your mind open to developments in other fields, as the methodologies and technologies can be applied across different fields. For example, GPS technology is used mainly for surveying and navigation but also for detecting surface deformation.

What does one need to become a geoinformatics specialist?

School subjects: Maths, science and geography.

University subjects: Geomatics, earth science, geology, GIS/RS and computer science, depending on your field of interest.



"We have the skills and resources to achieve our dreams in space science."

ASHEER BACHOO

ASHEER BACHOO – the image processing researcher

Asheer works in the field of Optronic Sensor Systems (OSS) as an image processing researcher in the Signal Processing Research Group at the Council for Scientific and Industrial Research (CSIR).

What Asheer does

Asheer's research involves reading a lot of technical papers and extracting important bits of information in order to come up with new ideas. If an image processing problem has to be solved, he begins the development and testing of software. Being a researcher means that he can sometimes define his own work, although there are deadlines to meet and objectives to achieve. The most exciting part is the research and applying a solution to a problem involving image enhancement and real-time processing.

What are the challenges of your job?

You have to manage your projects effectively and keep a healthy balance of theories and applications to ensure success. Algorithm development and implementation is a challenge due to the exponential growth in recent years in data requiring high-performance computation – some computations can take several weeks. It is a challenge to find new, efficient ways to process images.

What is your advice to prospective space scientists?

You must have a passion for your job. It must not be something you dread or despise. Scientific endeavour is the result of passion and the need to learn and conquer every day. Keep fighting the small battles and in the end you will be the winner.

What does one need to become an image processing researcher?

School subjects: Maths, computer studies and physics.
University subjects: Computer science, maths, applied maths and statistics.



ABEL RAMOELO

ABEL RAMOELO
– the remote sensing and GIS researcher

Abel is a Remote Sensing (RS) and Geographical Information System (GIS) Researcher at the Council for Scientific and Industrial Research (CSIR) in Pretoria.

What Abel does

Abel develops algorithms to extract information on Earth observation data (satellite or space-borne, airborne and field-based data) for various applications such as water resources (pollution assessment), land degradation mapping, detecting changes in land cover, pasture assessment (quality and quantity) and bush encroachment.

Abel's inspiration

When Abel was studying for his BSc Env. Sc. (Hons) degree at the University of Venda, he attended an inspiring presentation on the use of Earth observation data for land cover mapping by a CSIR staff member. Abel's research involved analysing the suitability of landfill sites using space-borne sensors, and he then decided to further his research interests by joining the CSIR.

What are the challenges of your job?

In most cases we use our ingenuity to come up with novel techniques for extracting information from airborne or satellite imagery. It is sometimes stressful when things do not go the way we planned. Nonetheless, we are successful in most cases as we have partnerships with overseas researchers who may have been involved in similar fields and can assist us.

The future of space science in South Africa?

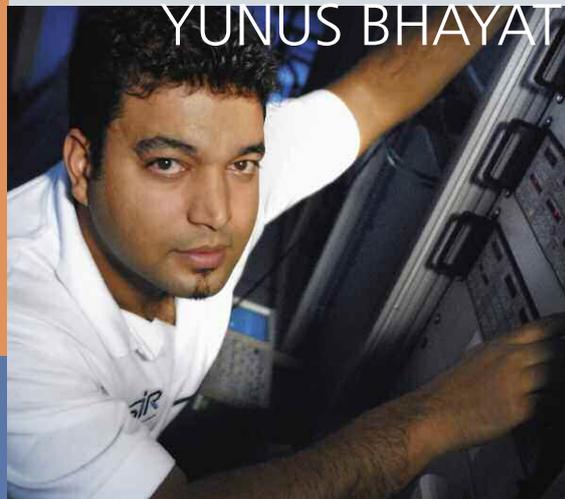
The South African Government's recent initiatives, such as establishing the South African Space Agency, will ensure the future of space science in South Africa. The launch of SumbandilaSat, South Africa's own Earth observation satellite, is another initiative that will help to provide ways to tackle several environmental problems at a regional and national level.

Advice to prospective space scientists

In South Africa we have very few space scientists, so this skill shortage has created a lot of opportunities for young scientists. Space science is a vast domain which incorporates design and building of satellites, processing of Earth observation and remote sensing data and also astronomy.

What does one need to become a RS/GIS researcher?

School subjects: Geography, physical science, agricultural sciences, maths. **University degree:** Ecology, environmental sciences, geoinformatics, GIS and remote sensing, resource management, nature conservation, etc.



YUNUS BHAYAT

YUNUS BHAYAT
– the electronic technologist / engineer

Yunus manages the telemetry, tracking and command (TT&C) operations at the CSIR Satellite Applications Centre (CSIR SAC). CSIR SAC receives, archives and distributes data received from satellites and provides support to international space agencies. The team operates and performs preventative maintenance to satellite tracking equipment.

What Yunus does

Yunus oversees a team that tracks satellites and receives images and other data from these satellites. The data are then archived and distributed to users. They work around the clock, seven days a week, with a high workload in the mornings between 08:00 and 11:00 and relatively quiet periods at night.

The team routinely provides satellite "housekeeping" or life-cycle support and monitors satellites from the ground for international space agencies or satellite operators. As part of TT&C networks, they at times also provide special services such as tracking satellites just after they have been launched and testing satellites in orbit.

Yunus' inspiration

He is inspired by the way space science and technology are serving people in areas like education and human capital development. Satellite technology drives and is at the forefront of technologies such as Earth sciences, remote sensing, telecommunications, and many more. It is allowing us to make many informed decisions on how to sustain and improve life on Earth.

Advice to prospective space scientists

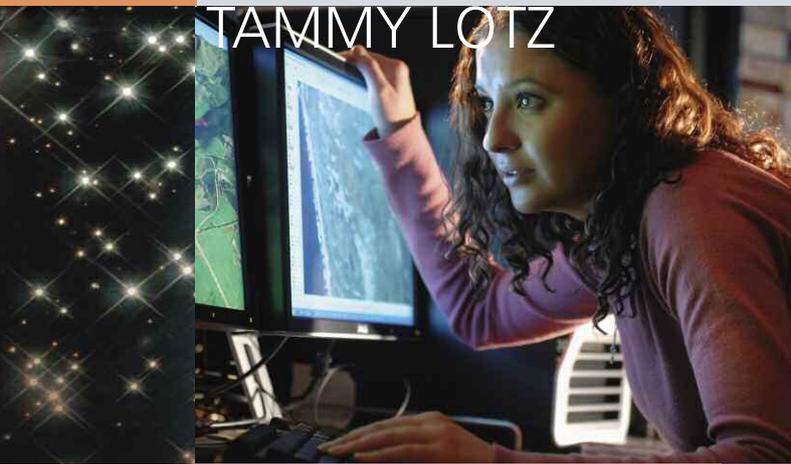
"The field is vast and, to a large extent, unexplored by South Africans. Exploit the opportunity! Work hard and don't lose sight of your aspirations. Find out what the entrance criteria are for your intended field of study long before you write matric and work relentlessly toward achieving your goals."

What does one need to do Yunus' job ?

Characteristics: Have a real passion for space sciences and satellite technology. Strive for excellence in everything you do. Be tenacious, persevere and believe in yourself.

School subjects: Mathematics and science are mandatory subjects, preferably on higher grade level (C symbol at least) for engineering and science related fields of study.

Tertiary qualifications: Nat Dip or BTech in EEng, BEng or BSc EEng.



TAMMY LOTZ
– the remote sensing researcher

Tammy works at the CSIR Satellite Applications Centre (CSIR SAC) where she is training as a remote sensing researcher. CSIR SAC receives, hosts and distributes data received from satellites and provides support to satellites of international space agencies. It also maintains and manages satellite tracking equipment.

What Tammy does

She works with the images that are received from satellites. The images are processed to develop maps, showing specific details, depending on what they will be used for i.e. agricultural fields need to be monitored and mapped. For example, all wheat fields are mapped in the whole country so that the Agricultural Research Council knows where they are. Another example is when the National Biodiversity Institute wants to link all remaining natural areas, but before they can do that they need to know exactly where they are and what exists in between them, such as other farms or urban areas.

Inspiration

Tammy had always loved geographical sciences and decided to do a course in remote sensing during her honours year at university. She enjoyed it so much that she decided to continue with a masters degree and pursue it as a career.

Advice to prospective space scientists

“Keep your options broad. Study a variety of subjects at university. You might find a particular field that you enjoy more than the others, so then do postgraduate studies in that field. Study what interests you most and take it from there. There is no use doing subjects you don’t enjoy, since you have to do this for the rest of your life. Be sure to pursue other activities outside of the academic world too to help keep you focused.”

What does one need to be a remote sensing researcher?

Characteristics: A sound and grounded mind with determination in your heart.

School subjects: Science, maths, geography and computer studies.

Tertiary qualifications: A BSc degree in natural sciences, majoring in geography, geographical information systems, and any other subject you find interesting, i.e. forestry or geology.

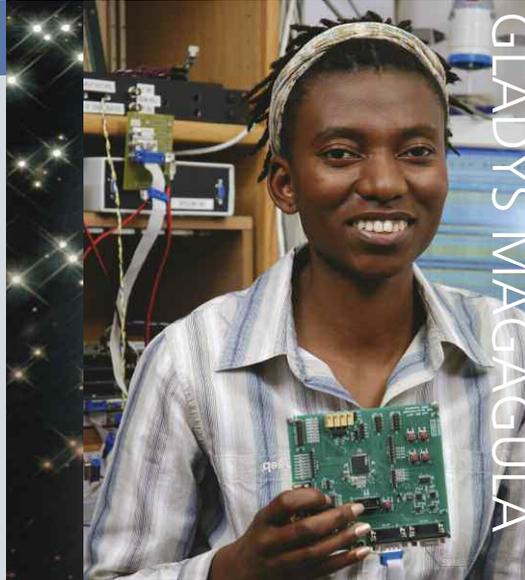
GLADYS MAGAGULA
– the software engineer

Gladys is a software engineer at SunSpace and Information Systems Ltd., a private company that builds high-performance small- and medium-sized satellites and related systems for the local and international aerospace market.

What Gladys does

She is a member of the team that writes the software that instructs all the different mechanical parts of the satellite to work together. A satellite is not made from only one component, so her team has to work with engineers who

design and manufacture all the other parts of the satellite. If one part of the satellite does not work correctly, it can cause the whole satellite system to fail.



Remove from your vocabulary the phrase ‘the sky is the limit’

Gladys’s inspiration

One of the courses in her postgraduate studies was satellite systems. She loved it and wanted to learn more about satellites.

Why space science?

She would like to be the main developer of the software that runs on all the SA satellites that are still to come.

The future of space science in South Africa?

The future of space science is very bright, especially since space science covers such a broad field. Apart from satellite engineering there are also many other opportunities in space science, such as jobs that involve analysing the information received from a satellite. Much research and development still need to be done, since the technologies space scientists use are constantly changing and improving.

Advice to potential space scientists

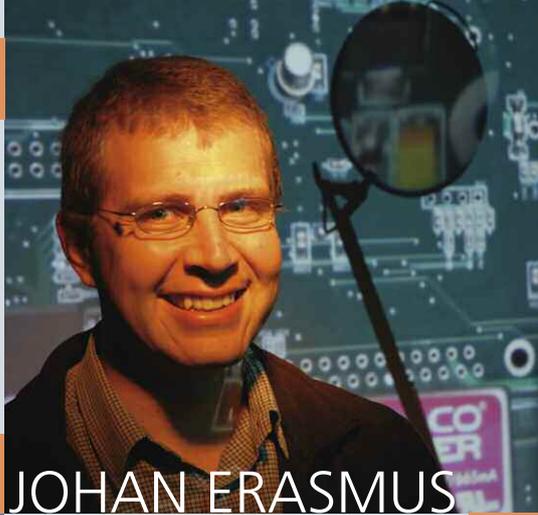
“I am living proof that there are opportunities in the space science field. Remove from your vocabulary the phrase ‘the sky is the limit’.”

What does one need to become a space engineer?

Characteristics: Insight into problems, team worker.

School subjects: Maths, geography, science and computer studies.

Qualifications: Depending on what combination of subjects are offered in the school of engineering at your university of choice, you could start by doing a degree in mechanical or electronic engineering.



JOHAN ERASMUS

JOHAN ERASMUS
– the electronic engineer

Johan is head of the assembly, integration and testing team at SunSpace and Information Systems Ltd., a private company that builds high-performance small- and medium-sized satellites and related systems for the local and international aerospace market.

What Johan does

Johan’s work involves measuring and testing of electronics, writing and testing of software, and putting together the boxes filled with the satellite hardware into a satellite frame. His team combines smaller systems they receive from the various other teams in their company into a working satellite. They also test it thoroughly before the launch. The team is involved in the first operations of the satellite in space.

Why space science?

Satellites provide a different view of everyday problems like nutrition, communication, planning of cities and housing. The proper use of satellites makes barriers in our physical world, like mountains, disappear! Many pieces of everyday technology would not have been developed had they not been needed for space science. Satellites involve many different engineering disciplines, which make them an ideal tool for developing engineering excellence and to make young people excited about science and engineering.

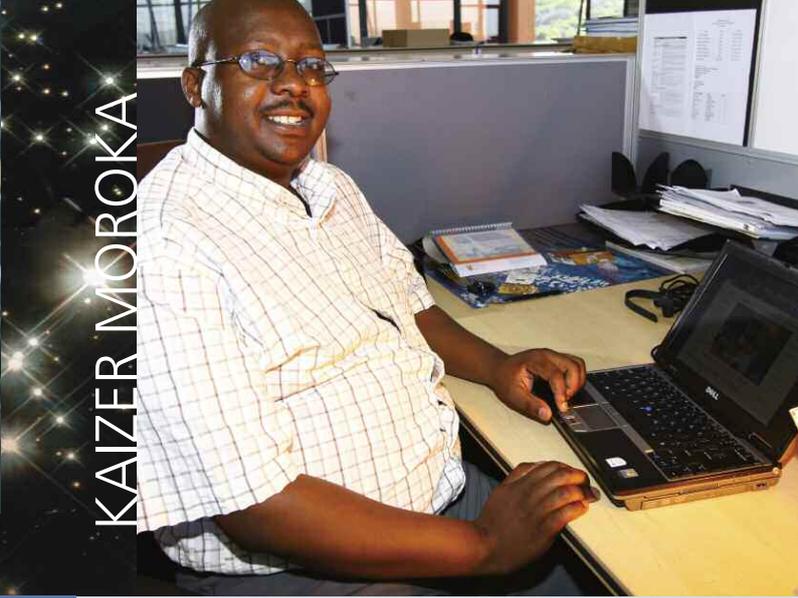
The future of space science in South Africa?

South Africa has to compete with other countries with much more experience in the field of space science. We need to provide solutions that help solve Africa’s own problems. An advantage is that we do not ourselves have to learn all the lessons learnt by others who have been building satellites for many years and can do things in new and clever ways. We know a lot about space technology and have proved that we can do almost anything if we try hard enough.

What does one need to do Johan’s job?

Characteristics: Determination, curiosity and an innovative mind to help you find new solutions for old problems.

Qualifications: A degree or diploma in mechanical or electronic engineering.



KAIZER MOROKA

KAIZER MOROKA
the space science facilitator

Kaizer is a Deputy Director in the Research, Development and Innovation programme at the South African Department of Science and Technology (DST).

What Kaizer does

With his broad knowledge of the field of space science and technology, he is responsible for ensuring that existing space-related projects communicate and interact with each other to improve their services in the fields of satellite engineering and satellite applications. He is also involved in getting new space science and technology projects off the ground. Another part of Kaizer’s job is to help make the public aware of space science and technology activities in this country which means helping to organise and present workshops, symposiums and conferences in the space field, as well as running public awareness campaigns.

What challenges do we face in this field?

South Africa has a shortage of appropriate skills in design and development, for example in software development. We need to undertake more research and development in the space science sector and encourage our industry (private sector) to appreciate R&D and have support structure for R&D in their business model, particularly the space sector. At present the school curriculum and insufficient career guidance are holding back the number of students choosing to study in this field.

We need private-public partnership and commitment to disentangle the challenges.

The future of space science as a career in this country?

The future looks bright with the current developments in the country. Cabinet’s approval of the Space Bill and Space Strategy in December 2008 will enable South Africa to become a key contributor to global space science and technology, with our own National Space Agency, a growing satellite industry and a range of innovations in the space sciences.

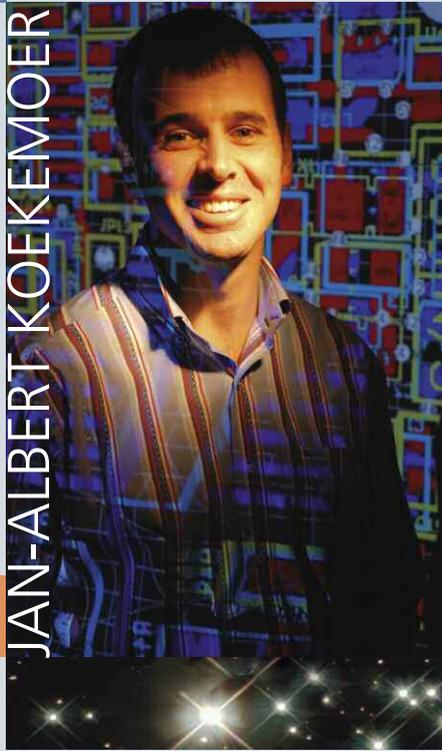
Advice to prospective space scientists

Space science & technology and its applications are no longer a “nice-to-have” but a necessity in many fields: to manage the country’s resources; to plan better for both South Africa and the whole of the African continent; and to fight crime, disease and poverty.

JAN-ALBERT KOEKEMOER – the satellite systems engineer

Jan-Albert is the chief systems engineer at SunSpace and Information Systems Ltd., a private company that builds high-performance small- and medium-sized satellites and related systems for the local and international aerospace market.

JAN-ALBERT KOEKEMOER



What Jan-Albert does

He manages the design, development, manufacturing, and testing of satellite systems from a technical point of view. He has to make sure that the chances of something going wrong technically with the project are as small as possible. He has to keep track of technical developments in many different engineering disciplines. As the systems engineer, he has to ensure the satellite system works well technically and is reliable under extremely harsh conditions in space.

“Both engineering and science can provide unique and equally important contributions to space research.”

Advice to prospective space scientists

“Both engineering and science can provide unique and equally important contributions to space research. Study areas to consider are astronomy, engineering science, aerospace engineering and applied physics. Make sure you fully research and understand each career path before making a final decision. The careers directly related to space and space applications include satellite and satellite payload design and development; operating the satellite; processing and applying the data received from satellites, and astronomy.”

What does one need to become a satellite systems engineer?

Characteristics: Dedication and commitment – since space programmes usually have a long-term aim; vision – in order to stay ahead of the competition in a market; and hope – to keep you going in an environment where unexpected and uncontrolled failures can and do occur.

Qualifications: A masters degree in electronic engineering. Jan-Albert also completed a course offered by the International Space University. Some local universities are now offering postgraduate courses in systems engineering, but one cannot enrol at any local university for the exclusive purpose of becoming a systems engineer.



LUFUNO VHENGANI

LUFUNO VHENGANI – the remote sensing and GIS researcher

Lufuno is a researcher in Remote Sensing (RS) and Geographic Information Systems (GIS) at the Council for Scientific and Industrial Research (CSIR).

What Lufuno does

A typical day at work consists of searching for technical papers related to the study he is involved in and reading and extracting the information he needs. He uses the information he finds for the project that he is doing or to start a new project. He spends some time doing fieldwork and some time processing the data he has collected and writing reports. He also gets to travel and meet people who are interested in sharing ideas.

Inspiration

Lufuno was always inspired by science and maths. He was introduced to satellite remote sensing after completing his Honours degree in physics. The Institute of Satellite and Software Application gave him the opportunity to study for a post-graduate diploma in satellite engineering at Stellenbosch University and a Master's degree in Satellite Remote Sensing at the GDTA, the French Aerospace Remote Sensing Development Group, in Toulouse.

What are the challenges of your job?

In GIS and RS there are new things to learn almost every week, and one must keep studying to keep abreast of new developments in the technology.

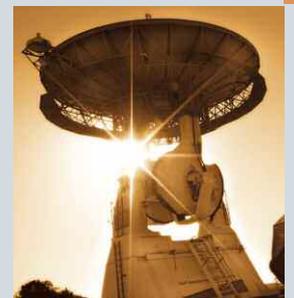
How do you see the future of space science as a career in South Africa?

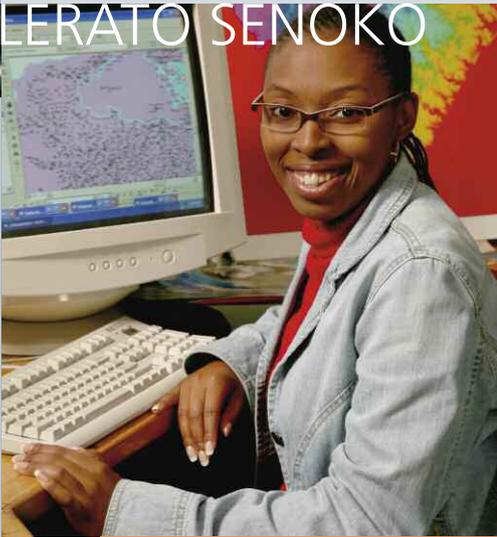
Many opportunities are opening up. South Africa requires skills to design, build and operate its own satellites, and the skills to interpret and derive useful information from satellite data. There are other disciplines such as astronomy, and with the development of the Square Kilometre Array (SKA) radio telescope, the future looks bright for this field.

What does one need to become a space scientist?

School subjects: Maths and physical science.

University: A degree in Engineering (Electrical) or a BSc degree with a major in physics. Space science is a broad field and requires skills from a range of disciplines, but physical science and maths are the most basic requirements.





“There is room for improving existing technologies and putting them to good use in South Africa.”

LERATO SENOKO – the remote sensing / geographic information systems analyst

Lerato works at the Institute for Satellite and Software Applications (ISSA), an initiative of the Department of Communications which develops high level information and communication technology (ICT) applications for South Africa and the rest of Africa.

What Lerato does

She analyses information that comes in a form of layers that she gets from satellite images and aerial photographs. This information is used to help the Department of Communications to take important decisions, such as where ICTs are needed most in South Africa.

Lerato’s inspiration

Remote sensing/geographic information systems can be used in South Africa to help solve problems such as the effect of global warming, where houses should be built, and improving our food production by studying the type of soil and plants in South Africa, without actually being in contact with them on the ground.

The future of space science in South Africa?

“The future is bright and the opportunities are great. There is room for improving existing technologies and putting them to good use in South Africa. Space is not the limit, we can do anything!”

Advice to prospective space scientists

“Be creative, innovative and imaginative. Have the will to be different and surprise yourself by being the best amongst the rest. South Africa is waiting for you.”

What does one need to do Lerato’s job?

School subjects: Science, maths and geography.

Qualifications: A degree in remote sensing or geoinformatics.

JAPIE ENGELBRECHT
– the control systems engineer

Japie is senior control systems engineer of the satellite attitude and orbit determination and control group at SunSpace and Information Systems Ltd., a private company that builds high-performance small- and medium-sized satellites and related systems for the local and international aerospace market.

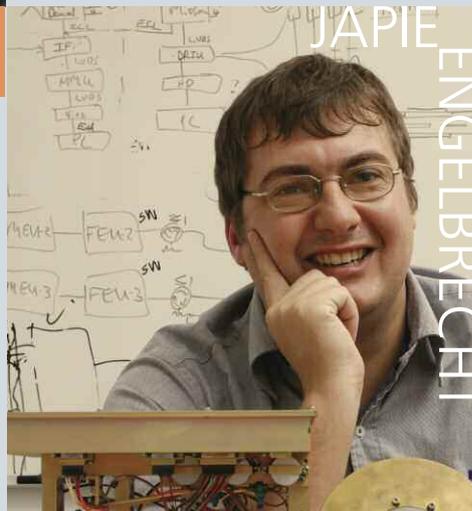
What Japie does

Japie and his team provide the computer system, with sensors and maneuvering devices, which controls the direction in which a satellite in space points and the way it moves after it has been launched. Once launched and in space, a satellite is released and tumbles randomly. Japie and his team steady it and ensure that its solar panels are pointed towards the Sun and its video cameras and the main imager (“camera”) are pointed towards the Earth.

The satellite’s cameras and imager are normally controlled to point towards specific targets on the ground.

Inspiration

As a young engineer, Japie was part of the team that tested the performance of SunSat, South Africa’s first satellite in space.



The thrill of operating a real satellite in space inspired him to continue working in this field.

“When you command the satellite to perform attitude manoeuvres and see the video images point at specific ground targets, it’s like driving your very own spaceship!”

Challenges of the job

Problem solving, keeping up with the latest technology and developing electronics that can survive the launch vibrations and the harsh environment of space, that are compact, light-weight and use little power.

Advice to prospective space scientists

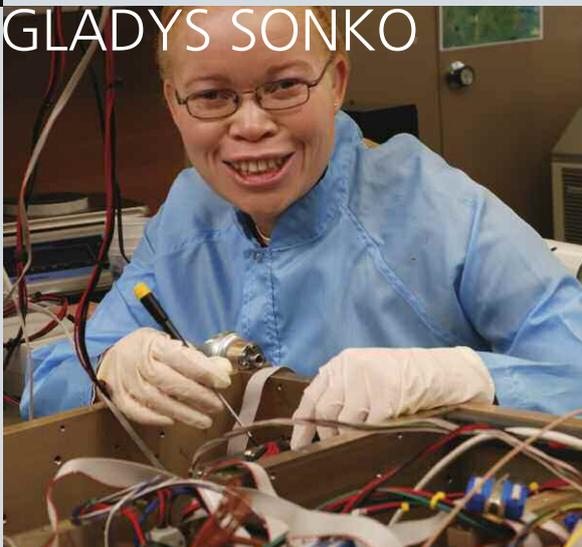
“Pursue a tertiary education in science and/or engineering, and preferably get a postgraduate qualification. Apply for holiday work at space companies. During your postgraduate studies, join a research group that specialises in space sciences or technologies. If you have the opportunity to study overseas, join a research group with ties to an established national space programme.”

What does one need to become a control systems engineer?

Characteristics: The ability to troubleshoot and solve problems, the motivation for hard work which sometimes requires long hours, and a keen interest in space and technology.

Qualifications: Masters degree in electronic engineering.

GLADYS SONKO



GLADYS SONKO – the electrical engineer

Gladys Sonko recently completed her studies as electrical engineer. She is working at CSIR Defence, Peace, Safety and Security. This unit contributes to an improved understanding of crime, violence and conflict.

What Gladys does

While working as an engineer in training at SunSpace, she got hands-on experience in designing components of a satellite, building the satellite in a laboratory, and testing and operating it once it orbits the Earth. Gladys' team simulated the thorough testing procedure (commissioning) that will be followed for SumbandilaSat.

Gladys' inspiration

She has always been curious to find out how gadgets work and that led her to study engineering.

Space science as a career in South Africa

The space industry is still very small in South Africa, but the establishment of a South African Space Agency is hopefully going to fast track its growth. With projects such as SumbandilaSat and the radio telescope project KAT (and hopefully SKA), the future looks bright indeed!

Goals for the future

Gladys wants to be a good engineer, make a success of the training programme, and use the opportunities that may arise from it. "In the long term I want to retire young and tour the world!"

Advice to potential space scientists

"Follow your passion and work hard to make your dreams come true for although you will get a lot of help along the way, you are the driver. It is good to seek advice from wiser people before making big decisions. At university, it is important to get guidance so that you end up with the right qualification."

What does one need to become a space engineer?

Characteristics: Perseverance, a technical mind.

School subjects: Maths, science.

Qualifications: A degree in mechanical or electronic engineering.

RAVI NAIDOO – the mechanical engineer

Ravi Naidoo is leader of the production team at SunSpace and Information Systems Ltd., a private company that builds high-performance small- and medium-sized satellites and related systems for the local and international aerospace market.

What Ravi does

Ravi assembles electronic circuit boards that are used to control the functioning of the satellite. His team has to work to high levels of quality and international standards and he has to ensure that these standards are met. If a circuit board is not built according to the set standards the satellite will be less reliable and will not operate well, which his company cannot afford to happen.



RAVI NAIDOO

Ravi enjoys being around professional people from whom he can learn. He gets to do hands-on work like spray painting, satellite assembly, vacuum simulation testing of the satellite, and he also travels overseas for commissioning of satellite project phases. He enjoys identifying problems, working with people, sharing his knowledge and motivating others.

Ravi's inspiration

He found opening toys and radios to see how they work very exciting while he was growing up. He studied mechanical engineering at the Cape Technikon, now the Cape Peninsula University of Technology. He had no idea that 10 years later he would be involved with the building of hi-tech space satellites.

Advice to prospective space scientists

"Take a keen interest in science and technology by doing subjects such as maths, physics and computer studies. Read books about space, planets, and machines; do the experiments. Question everything around you, like why is the sky blue, where do clouds come from, what makes the waves crash against the seashore, then you will become fascinated with the answers. The space science industry is very rewarding, not only work-wise but also as far as salaries are concerned. Take up the challenge!"

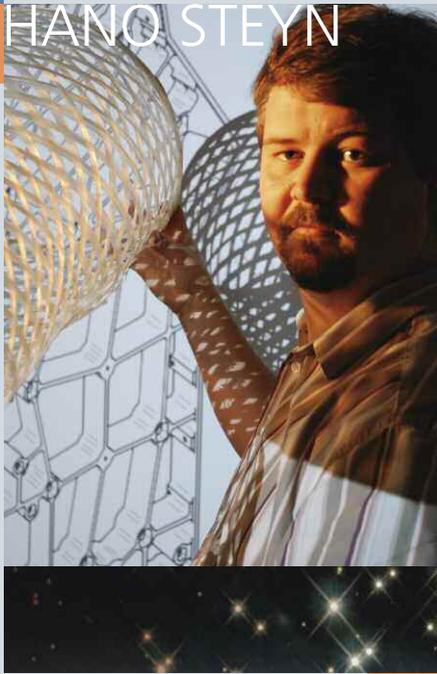
What does one need to become a satellite production team leader?

Characteristics: An interest in the fields of maths, physics, computers, general science and technology; open-mindedness; be a continuous learner; disciplined; and have a passion for the space industry.

School subjects: Maths and scienc.

Qualifications: BTech degree in mechanical engineering.

HANO STEYN



HANO STEYN – the mechanical engineer

Hano is leader of the mechanical team at SunSpace and Information Systems Ltd., a private company that builds high-performance small- and medium-sized satellites and related systems for the local and international aerospace market.

What Hano does

Hano's team designs and builds models of satellites, manufactures and tests the hardware of the satellites, and finds solutions to failures during testing. The team builds the structures of these tested satellites, which are like very sophisticated "computers" that can take high resolution images and videos. They then put this "computer" on a rocket, which is launched into space to take and send back images and videos of the Earth. Once in space, it must be able to withstand the conditions and send back those images with no chance of ever being fixed if it stops working! Space is a harsh environment with temperatures varying between -80 °C to 120 °C and particles from the Sun constantly bombarding the satellite.

Hano's inspiration

He has always been fascinated with space, the stars and the planets, but his career in space science was sparked by Neil Armstrong's walk on the Moon.

Why space science?

Our people and our country's infrastructure can gain much from developing our own satellites. Satellites can be used for, among others, monitoring our coast, tracking fires and preventing their spread, and monitoring the status of crops. Even emails and voice message communication to really remote areas depend on satellites.

What does one need to become a space engineer?

Characteristics: The urge to solve difficult and challenging problems; the ability to work under pressure, within short timescales and no margin for error.

School subjects: Maths and science.

Qualifications: A masters degree in mechanical engineering.

RICHARD TSWAI – the remote sensing researcher

Richard is a remote sensing researcher at the Agricultural Research Council (ARC)'s Institute for Soil, Climate and Water.

What Richard does

Richard processes and analyses multispectral data from satellite sensors and spectral data from a spectrometer instrument for various applications. The work entails the daily management of projects, drafting proposals for new projects, analysing data, compiling scientific reports, planning and giving presentations at workshops, and attending conferences.

Inspiration

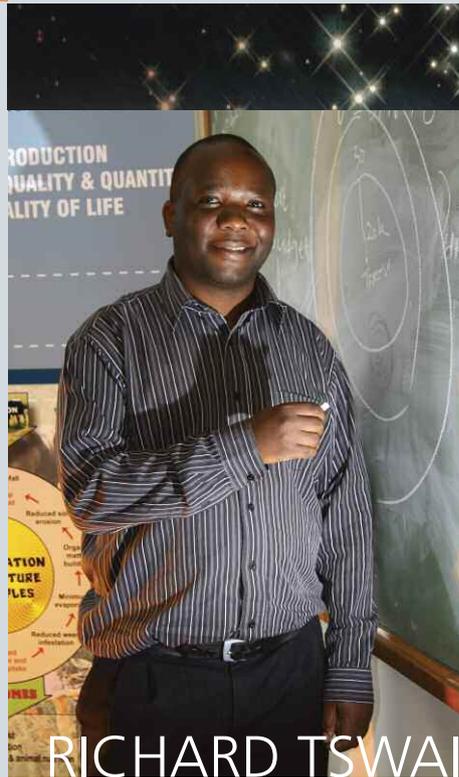
While studying for his BSc degree, Richard attended a demonstration on rocket launching given by the South African Astronomical Observatory, which sparked his interest in space science. He later studied for a post-graduate diploma in satellite systems offered by the Institute for Satellite and Software Application (ISSA) in collaboration with the University of Stellenbosch. Staff at ISSA introduced the students to remote sensing technology, and the GDTA, the French Aerospace Remote Sensing Development Group, also inspired his interest in remote sensing.

Where can one find a job like yours?

Remote sensing is a cross-cutting technology, and work opportunities can be found in the engineering, agricultural, communications, military, academic and research sectors, to mention just a few.

What are your goals for the future?

My goal is to be a specialist scientist in remote sensing. I plan to explore microwave remote sensing technologies and how they can be used in agricultural research.



RICHARD TSWAI

Advice to prospective space scientists

Young people should work hard at maths and science at school as these subjects will open opportunities for careers in space science and engineering. Space engineering involves the design of satellite systems and sensors for acquiring data. Space science deals with the use of satellite data to solve a diverse range of problems associated with, e.g. urbanisation, town and regional planning, the environment and food production.

What does one need to become a space scientist?

Maths, physical science and geography at school are needed to study for space-related degrees. A number of South African universities offer space-related courses.