

SCIENCE SPAZA SPACE



Knowledge is Ncah!



BACK TO SCHOOL EDITION - JANUARY 2019

The future is now!

Get ready for the Fourth Industrial Revolution



Spring Bots

TEAM SOUTH



Who are the Springbots? Read all about them on page 2

Spaza Space is the official publication of the Science Spaza programme, which is an initiative of research communication specialists, Jive Media Africa.

Editorial: For any editorial enquiries, please contact info@sciencespaza.org or call us on +27 (0)33 342 9380.

Sales: For more information about Science Spaza strategic projects or to advertise on any of the Science Spaza channels including print (*Spaza Space*), online and social media, please contact Kezia Rowe on +27 (0)83 645 6894 or kezia@jivemedia.co.za.

Club Management: To sign up a new club please visit www.sciencespaza.org. For any enquiries related to club membership, please contact Laila Hansrod on +27 (0)33 342 9380, email info@sciencespaza.org or WhatsApp Science Spaza on +27 (0)76 173 7130.

We are talking to our future leaders. Are you?

Back to School 2019!

The Science Spaza team is so excited to bring you this back-to-school edition of *Spaza Space*!

We have dedicated this edition to the **Fourth Industrial Revolution** and the technological and social changes that it will bring. But what is an industrial revolution anyway, and why do people say we are going into the fourth one? What were the first three?

We want to prepare all our readers for BRIGHT futures in which you can play a role in shaping a better world. Knowledge is *ncah* – and that's why we are bringing you as much information as we can about science and technology and how they can be used for good – to create a **healthier, fairer, sustainable future** for all of us and our children.

Find out what exactly the Fourth Industrial Revolution (or **IR4**) is, as well as some history on previous revolutions. On page 3, find out how IR4 will **change the way we do things**. Do some fun activities

and get prepared for the school year on pages 2, 5, 6 and 7, and get the latest updates on the launch of South Africa's most advanced nano-satellite.

We hope that all our readers enjoy this edition, and don't forget to send us your pictures to be featured in the next edition of *Spaza Space*.

The Science Spaza Team



Who are the SpringBots?

SpringBots South Africa is a Robotics Team that is focused on growing STEM education (Science, Technology, Engineering and Mathematics) through robotics in South Africa. Roxanne Reddy (Team Manager), Mikhaeel Reddy (Team Captain) and Barbara Moagi (Team Spokesperson) founded the SpringBots in 2017 after they competed in the 2017 FIRST

Global Challenge, where South Africa ranked 77th out of 154 countries. In an effort to get more South African youth involved, the SpringBots team expanded to include six club members comprising of both girls and boys from various schools in Gauteng. Four of the team members were able to travel to Mexico City where they competed in the 2018 FIRST Global Challenge and

ranked sixth in the WORLD for their "Madiba Bot" which is dedicated to Nelson Mandela for his 100th birthday! How awesome are these guys?! This is only the beginning for the SpringBots and we know that they have great things heading their way.

For more information you can follow the SpringBots on Facebook: **Spring Bots SouthAfrica**



"Are you our next Science Whizz?"

So, what is Minquiz™ ?

Minquiz™ is South Africa's Premier National Science Competition.

Minquiz™ combines the rigors of an Olympiad with the excitement of a live on-stage quiz to produce an entertaining competition for Grade 12 learners that promotes excellence in Physical Science and Mathematics.

PROVINCIAL COMPETITION
16 May 2019

NATIONAL COMPETITION
3 & 4 July 2019

(For provincial winners only)

For partnership (sponsorship) and all other queries, contact Dominic.
E-mail: minquiz@mintek.co.za or call (011) 709 4139

Mintek provides bursaries in the following fields:

- Chemistry (Analytical or Geochemistry);
- Chemical Engineering (Minerals Processing or Process Control);
- Electrical Engineering (Process Control Systems or Electronics);
- Extractive Metallurgy (Pyrometallurgy, Hydrometallurgy or Biohydrometallurgy);
- Geology
- Mechanical Engineering;
- Minerals Processing;
- Mechatronics Engineering;
- Mining-Focused Environmental Compliance

PLEASE NOTE: Mintek does not provide bursaries to students studying towards their National Diplomas. Mintek bursaries cover the full payment of registration, tuition and residence fees, and a generous allowance, in return for a commitment to work at Mintek on a year-for-year basis.

The closing date for bursary applications is 31 July for support in the following academic year.
To apply, e-mail bursaries@mintek.co.za or call (011) 709 4139 or visit www.mintek.co.za



200 Malibongwe Drive,
Randburg, South Africa
Private Bag X3015,
Randburg 2125,
South Africa

PHONE:
+27 (011) 709 4111

E-MAIL:
Info@Mintek.co.za

www.mintek.co.za



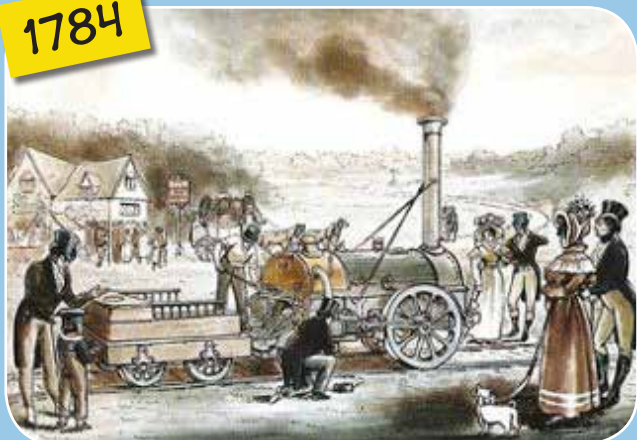
The Fourth Industrial Revolution

Have any of you noticed the way that social media, apps, smart phones and artificial intelligence has changed the way that we interact with each other and relate to each other? It has even changed the way that we do things. In the same way, the worlds of manufacturing, healthcare, agriculture and governance are being impacted by new “smart” technologies. These technologies will change the way our society works and how we relate to one another at many levels.

Let's go back in time...

1784

One of the first locomotives ever built Pic: ThingLink



The first industrial revolution in 1784 allowed for mechanisation to take place because of the invention of the steam engine by James Watt.

1969



Welding robots that are used for hazardous tasks Pic: Phasmatisnox

The third industrial revolution from 1969 made use of electronics and computers to automate many different kinds of processes.

1870

The second industrial revolution began in 1870 and allowed for large scale production using electricity and assembly lines like the ones in Henry Ford's car factories.



Henry Ford's assembly line allows for large scale production of automobiles Pic: AP European History

NOW

Today, the fourth industrial revolution is using technologies such as cloud computing, the 'internet of things' and artificial intelligence to automate and respond to complex systems.



Welding robots that are used for hazardous tasks Pic: Phasmatisnox

A change in the times

New forms of technology can be powerful agents for positive change. The access to information through computers and networks, digital services, and mobile devices as well as changes to

education systems can improve the lives of billions of people even in underdeveloped countries. Social media has also allowed many people around the planet to be able to communicate and

share news with each other daily. Advances in medical sciences will allow people to have a healthier and longer lifespan, whilst advances in the motor industry will increase road safety and decrease the number of road accidents.

Although these advances in our world sound amazing, we need to be aware of the ways in which these advances can change us. When we are building these new technologies we need to remember our values so that we do not build corrupt technology, aiming to only empower people and not machines. People and technology have a deep connection and we have to develop them with care.



Connecting people with technology Pic: Pxhere

TERMS THAT YOU SHOULD KNOW:

Data – ‘information, especially facts or numbers, collected to be examined and considered and used to help decision-making’ – usually this information is in an electronic form that can be stored and used by a computer

The internet of things (IoT) – this refers to the network of physical devices, such as vehicles, home appliances, phones and other everyday items which were previously not connected to the internet, but which are now embedded with electronics, software, sensors and connectivity which allows these things to connect, collect and exchange data with each other.

Digitisation – Converting information into digital format.

What is Artificial Intelligence?

How many of our readers imagine a future with robots? The future is now! Artificial Intelligence (AI) allows machines to learn from their 'experiences' and adjust to new inputs to perform tasks in a human-like fashion. Here are some cool ways that AI is being used today:

Manufacturing: AI analyses data from multiple connected sources to forecast expected demand of certain products – so they are made when they are needed.

Health care: Technology like Apple watch and the Fitbit track user's and act as a lifestyle coaches, reminding you to take your medicine and guiding you to live a healthier life.

Sports: AI is used to analyse sports games and players, providing the coach with a report on how he can organise the game in a better way.



An environmentally friendly 3D printed house *pic: Flickr*



An Apple smart watch *pic: Phxere*



A sports game is being recorded for future reference *pic: Wikimedia Commons*

How will all this new technology affect our environment?

The safety and security of human life has always been linked to the environment. The Earth provides us with natural resources that humans have used to grow industries and economies. But this growth has put our Earth under a lot of stress! New technologies have the potential to create systems to improve the management of the Earth and her resources. Here are a few ways that the Fourth Industrial Revolution can help our environment:

- Buildings will become “smart” and environmentally friendly, by reducing water usage as well as decreasing the use of electricity for lighting, heating and cooling.

- Transport and traffic systems will become more organised, resulting in less carbon emissions and cars that are more environmentally friendly.

- Technology will allow us to monitor the emission of greenhouse gases more efficiently, making sure that we know and learn ways to reduce these emissions.

- Bioengineering will allow crops to grow in larger quantities and at a faster rate, while using less land.



Biotechnology will help us develop better ways to manage pests and weeds.

PUZZLE YOUR MIND

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

ACROSS

2. Buildings will be built to be _____.

3. In agriculture, artificial intelligence will help in the control of _____.

5. The Earth provides us with natural _____.

6. The scientific field that helps produce stronger, faster growing crops.

DOWN

1. New technologies will help monitor _____ gases more efficiently.

4. Environmentally friendly cars will be built that will mean less _____ emissions.

Answers: Across – 2. Smart; 3. Weeds; 5. Resources; 6. Bioengineering; Down – 1. greenhouse; 4. carbon



*This content was sponsored by the
Department of Science and Technology www.dst.gov.za*



Why do scientists use computers?

Source: The Inter-university Institute for Data Intensive Astronomy (IDIA)

How does science happen in universities and in research labs? Mostly using computers. "How so?" you may ask.

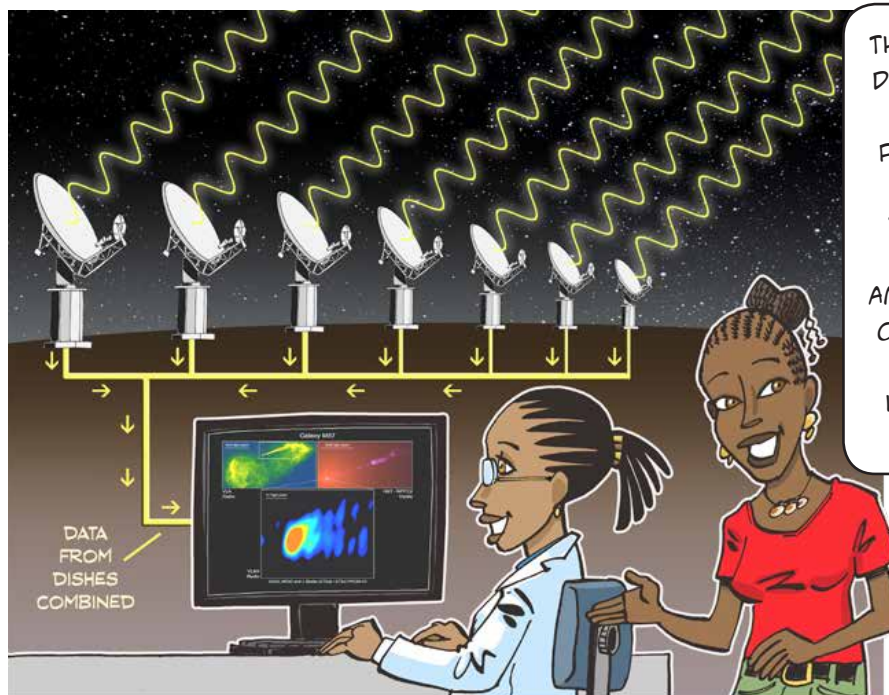
When scientists set up an experiment they usually take measurements. In the past, these would have been recorded on paper – but these days, they are mostly taken by computers. These measurements give scientists the data of the experiment.

Computers are instructed to carry out calculations on these measurements. Scientists use coding to tell computers how to do these calculations. With computers, scientists can take a lot more measurements and make many more calculations than they could by hand.

Computer programmes can also be used to predict what happens in an experiment using the laws of science. This is called a simulation or a model. This means that scientists can do 'experiments' using computers which can be safer, quicker and cheaper than doing the same experiment in the real world.

Computers can also be used to make images that help us make sense of data and gain new knowledge. Computers are used to make the beautiful images from telescopes, for example. This is called data visualisation.

As scientific experiments get bigger and more complicated like the MeerKAT Radio Astronomy Telescope, scientists need



THE SKA TELESCOPES RECEIVE DATA FROM SPACE IN THE FORM OF RADIO WAVES, EMITTED FROM PULSATING STARS. THERE WILL BE HUNDREDS OF SKA TELESCOPE DISHES, AND THEY WILL ALL BE RECEIVING HUGE AMOUNTS OF DATA CONSTANTLY. COMPUTERS ARE USED TO TURN THE INCOMING DATA INTO IMAGES WHICH SCIENTISTS CAN INTERPRET.

more powerful, faster computers and more elaborate programmes to analyse the data. This is one of the ways that science drives the development of new technologies.

The Inter-university Institute for Data Intensive Astronomy (IDIA) exists to grow skills and expertise in data intensive research.

WORD SCRAMBLE

UNSCRAMBLE THESE WORDS TO FIND OUT SOME OF THE THINGS COMPUTERS DO TO HELP SCIENTISTS.

ESUAMER

DEPRICT

TAAD SITLIONSAAVILU

LACLATCUE

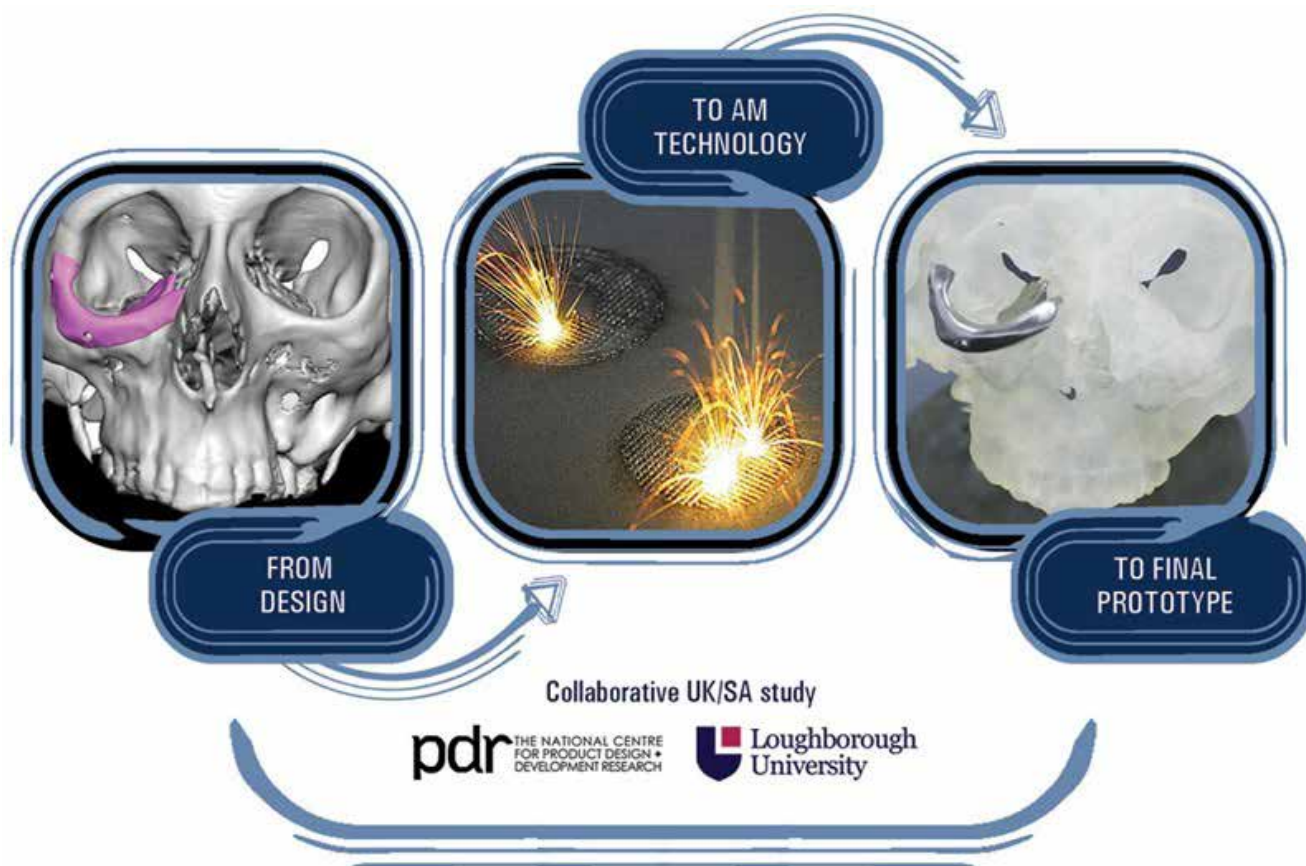
Answers: measure; calculate; predict; data visualisation

Rebuilding bones

Imagine a medical emergency in which a bone is broken so badly that it can't be repaired. Scientists, engineers and medical experts at the Central University of Technology in Bloemfontein have developed a solution to deal with just this problem.

First, using X-ray technology, the broken bone is 3D modelled – meaning that a computerised version of the bone is created. The shape of a “new bone” is designed on a computer to perfectly replace the broken pieces. Then, this new shape (or implant) is manufactured using advanced manufacture techniques.

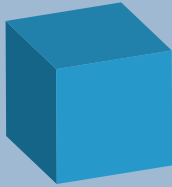
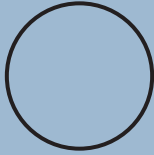

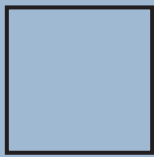
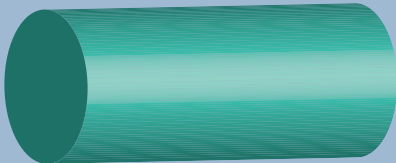


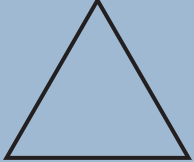
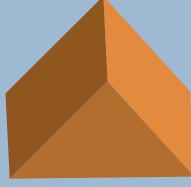

Surgeons can then remove the pieces of broken bone and replace them with an implant that fits perfectly – allowing the body to heal.



Activity: 3D Printing

A 3D printer will build layers of whatever it is printing. So the first layer will be a particular shape and then it will build the next layer on top of that one, and then the next and so on until the whole object is printed.

In the left hand column are some 3D objects that were printed. The second column shows the first layer of each of the shapes that would have been printed. Match up the finished 3D object with its first layer.

| | |
|---|---|
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |



science
& technology

Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

This content was sponsored by the
Department of Science and Technology www.dst.gov.za

A monster underground

Mining is a dangerous job. One of the things that makes it dangerous is the ground falling in. Someone has to check that new tunnels and mines are safe to start working in - but this is dangerous for the people doing the checking!

That is where the newly developed MONSTER robot is going to change things. Instead of sending people down to check the safety, the MONSTER will do it for them.

Loose rocks have more air around them than rocks that are attached tightly to the wall. Because of this the loose rocks will have a lower temperature. The MONSTER uses thermal imaging to find those rocks. Then to confirm that the rocks are really loose, it taps them!

Have you ever tapped on an empty and a full tin with your finger? They give a different sound. Well, the same principle applies when checking the rocks. A different sound is given off from a loose rock than one that is tightly packed into the wall. The MONSTER taps the rock and then “listens” to the sound given off. It can then confirm that the rock is loose and therefore it is an unsafe area to go into.

Such innovations aim to make mining safer and more efficient. They are part of a collaboration called the ‘Mandela Mining Precinct’. The



An infrared camera detects heat waves in a similar way to how your eyes detect light. So infrared camera’s can “see” heat. Thermal imaging uses a computer to create a visible image from the invisible heat waves. *pic: Pixabay/withplex*

South African Minister of Science and Technology, Mmamoloko Kubayi-Ngubane launched the Mandela Mining Precinct in September 2018.



Jobs for the future

These exciting developments have drawbacks. One is that many jobs currently done by people may soon be done by machines – increasing unemployment. The ability to work in the future begins with where you are right now - at school!

The key to employment in the future is lifelong learning. Here are some of the skills that will be in demand for the future:

- the ability to solve complicated problems
- critical thinking
- people skills and people management
- coordinating and multitasking
- the ability to make quick judgements and good decisions
- emotional intelligence
- having a sense of service
- being able to negotiate and to think quickly out of the box and

across multiple disciplines and fields.

It is clear that computers will be used more and more, so continue to develop your maths and science skills and take any opportunity you can to learn about how computers work so that you can be part of solving the complex problems of the future.

REMEMBER THAT A ROBOT WILL NEVER BE CAPABLE OF DOING ALL THE THINGS THAT HUMANS DO. HUMAN EMOTIONS ARE VERY UNIQUE AND ARE ALMOST LIKE OUR SUPERPOWERS!



5-4-3-2-1...lift off!

ZACube-2 takes to the skies

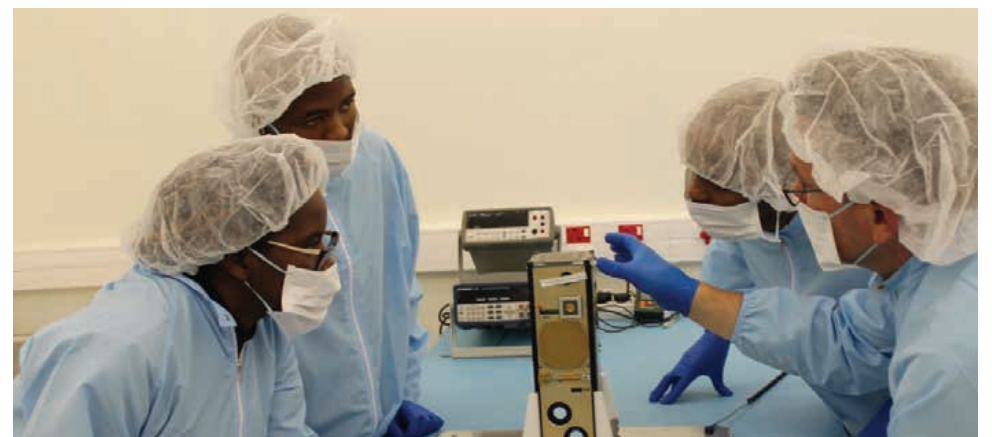
Many of our Spaza Space readers will remember the “name the satellite” competition that we advertised in our October edition. On the 27 December 2018, ZACube-2, South Africa’s most advanced satellite, was launched into space at 04:07am from Russia!



The launch of the ZACube-2 (which will soon be renamed by the competition winner) is a major achievement for South Africa and according to the Minister of Science and Technology, Mmamoloko Kubayi-Ngubane, who said “the team that built it consists of some of the youngest and brightest minds in the country”. The satellite weighs a mere 4 kilograms but will be capable of helping our country to monitor the movement of ships along our coastline and provide real time information about veld fires which will ensure a quick response time from disaster management teams. Can you believe that a small metal box filled with state of the art technology is floating above you right now and will help our

country and continent overcome some of its biggest challenges? Well done to our fellow South Africans! We are proud of your achievements.

This feature is funded by the Department of Science and Technology which has invested over 16.5 million Rand into the development of ZACube-2 at the Cape Peninsula University of Technology.



START YOUR OWN SCIENCE SPAZA



REGISTER NOW TO RECEIVE **FREE** RESOURCES AND SUPPORT. YOU WILL NEED:

1 A GROUP OF FRIENDS WHO ARE EXCITED ABOUT SCIENCE!

2 A PARENT OR TEACHER TO ASSIST YOU

3 A TIME AND PLACE TO MEET

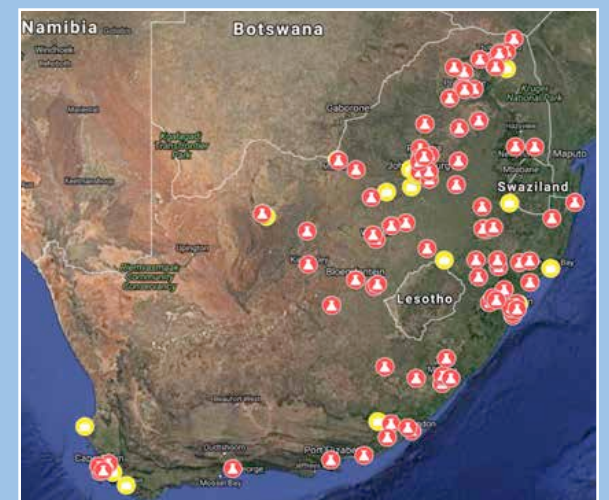
4 SOME **CURIOSITY** AND AN INTEREST IN FINDING OUT MORE ABOUT THE WORLD!



Distribution of Science Spaza clubs in South Africa

There are more than 120 Science Spaza clubs in all provinces that receive Science Spaza products. Science Spaza prints and distributes 10 000 copies of *Spaza Space* quarterly, which includes activity worksheets, the *Spaza Space* newspaper and information about opportunities in science.

These are also sent to more than 30 Science Centres across the country. Science Spaza equips young people with information and skills to solve problems and to take advantage of opportunities in science. Sign up a club now.



SCIENCE SPAZA APPLICATION FORM

Complete the form below and send it to PO Box 22106, Mayor's Walk, 3208, email: info@sciencespaza.org or submit your application online at www.sciencespaza.org

Name of school: _____
 Municipality: _____
 Province: _____
 Name of your science club: _____
 Name of contact person: _____
 Telephone number: _____
 Email address: _____
 Postal address: _____

To be filled in by responsible adult (parent/teacher)
 Name: _____
 Surname: _____
 Position: _____
 ID Number: _____
 Signature (parent/teacher): _____
 Date: _____