

Hip Hop Science Spaza and iFani do it AGAIN for National Science Week 2015!

Sthabile Mazubane

We are so amped for National Science Week (1-8 August 2015)! Science Spaza has partnered with the Department of Science and Technology and SABC's Hectic Nine-9 to bring you *enlightening* Hip Hop songs from iFani and Edendale Technical High School in celebration of the International Year of Light.

We're exploring the exciting science around light and how it affects our daily lives, through Reflection, Refraction and Scattering of light. Dr Sandile Ngcobo from CSIR talks to us about lasers and Mr Sphesihle Makhathini from SKA talks about the Square Kilometre Array and the galaxies it explores. Lungelo, an awesome beat-boxer from Pietermaritzburg, does wonders

with his mouth – he sounds like a 4-piece percussion band!

Community radio stations will feature our interviews with local artists about their specific interest in Science and Hip Hop, so don't touch that radio dial – stay listening!

AND watch Hectic Nine-9 during National Science Week.

Please see page 6 & 7 for more...



Photographs: Kavo R Photography

Hip Hop Health Kicks Off

30th May 2015 at Olwazini Discovery Centre

Njabulo Mbedu

Three Science Spaza Clubs from uMgungundlovu District Municipality are becoming experts in water and health by participating in a research literacy project, Hip Hop Health: Research, Rhythm and Rhyme for Healthy Communities, supported by The Wellcome Trust.



Members of Science Spaza Clubs from three uMgungundlovu District schools are participating in the Hip Hop Health Research project. They attended a learning workshop at the Olwazini Discovery Centre in Pietermaritzburg.

Sixty members from Science Spaza Clubs at Sobantu Secondary School, Mehlokazulu Senior Secondary School and Emzameni High school have begun working closely with experts in health research and

water to identify water-related diseases in their respective communities.

The clubs will run research projects to learn more about these issues and their findings

will be turned into rap songs which they'll perform for their local communities and have recorded on a CD. The CD and research activities will be shared with all the Science Spaza Clubs in South Africa in 2016.

Photography *and* Light

Mbali Shabalala

Did you know that the word *photography* means ‘drawing with light’?

A camera’s job is actually just to capture light – in the form of a photograph! The camera records whatever’s in front of it, just like our eyes. However, cameras aren’t able to capture the brightness of light as well as the human eye. Too much light means that your photograph will just be white; and not enough light means your photo will be too dark to see the objects in it clearly, even though your eyes can see them. Nature definitely wins!

But there are some things that cameras can do that our eyes can’t, like adjusting the image distance by moving the lens. Our eyes can’t zoom in and out – we have to get up and move closer to the object if we want to see it better! Also, cameras can help us capture a moment of light and keep it forever.

Next time you’re taking a photograph, remember the science behind it. You’re doing something quite magical – you’re painting a picture with light!



Photographers get together to capture midwinter light in Antarctica. Find out more on pages 10 & 11... Photograph: Robert Inglis

Medicine *and* Light

Noluthando Lebitsa

Big words are cool, so here’s a new one! *Spectrophotometry* (told you it was big!) is the study of electromagnetic radiation and how it interacts with stuff. Basically, it’s used to measure how much a substance absorbs or transmits light. Sounds like fun? Well, it might just save your life!

A device called a spectrophotometer (yay – more big words!) is used in medicine to test blood or other body tissue so that a doctor can diagnose your illness! Simply put, it measures how much UV or Infrared light is absorbed by your tissue as it passes through, and this information can help tell the doctors

important facts about what’s happening in your body.

This same science is used to make medicines. When you have a headache or flu, the doctor usually gives you something called paracetamol, which is a compound found in medicines like Panado. When the scientists are making the pills, they have to be super careful how much paracetamol they put into the medicine. Too much of it can kill you! So a spectrophotometer is used to get the measurements right. Paracetamol absorbs certain colours, so the spectrophotometer shines light through the sample of medicine, and measures how much of those certain colours were absorbed. Fancy, hey?

Who knew? Light could save your life!

It’s the *International Year of Light and Light Based Technologies!*

But there’s nothing **light** about this edition of Spaza Space – it’s packed from cover to cover with exciting and interesting things to know and do – all relating to light and its impact on our lives. There is great science going on in South Africa and you’ll find out about it here.

We kick off with a roundup of two **Hip Hop Science Spaza** events. Hip Hop Science Spaza is all about using music to shed **light** on science. Don’t forget to watch Hectic Nine-9 on SABC 2 or listen to community radio stations (page 7) during National Science Week to hear the beats of Hip Hop Science Spaza and meet iFani and two star scientists – Sphesihle Makhathini from the Square Kilometre Array and Dr Sandile Ngcobo from the National Laser Centre. Make sure you enter the Hip Hop Science Spaza competition this year – details are inside and on www.sciencespaza.org.

Agent Zee catches up with some inspiring scientists who are doing **enlightening** work with lasers – all women from the CSIR. Remember to celebrate **Women in Science** on Women’s Day, August 9th.

Spot some **cool maths** patterns on page 3. And find out what’s going on around the country in National Science Week on pages 4 & 5. **The South African National Space Agency** (SANSA) is offering goodies to one lucky winner who answers their question correctly. Find out all about the Sun and catch the Space Weather report – or at least find out what causes *Aurora Australis*, the beautiful Southern Lights that light up Antarctica. You can also hear from an Antarctic explorer who tells us about 24-hour days and how they affect your sleep.

Finally – there’s the **News from the Clubs**. This is your space to share what you’ve been doing and inspire other clubs. So let’s hear from you!

Keep shining!

The Science Spaza Team

PS – here’s a little traditional knowledge to **reflect** on... “Turn your face to the sun, and the shadows fall behind you.”

– *Maori Proverb*

(Health tip – just never look directly at the Sun – it can damage your eyes forever).



Do Mathematics and Gain More!!

Supplied by South African Maths Foundation (SAMF)

The week of the 3rd to the 8th of August 2015 is National Science Week and the theme is “The International Year of Light and Light Based Technologies”. The South African Mathematics Foundation (SAMF) will be showcasing mathematics activities that highlight the importance of mathematics in science and how it affects the lives of learners. Mathematics opens a lot of possibilities in life.

Mathematics helps us to understand the world around us! Just a few examples are: dialling a number on a telephone; managing money; travelling; games, and many more.

You can think of mathematics as the recognition of patterns. This involves observing relationships between things, using patterns to represent relationships, and using those patterns to predict what you cannot yet see. This helps to improve your thinking skills and logical reasoning.

These photographs show a few examples of patterns that we can see in nature and art: the arrangement of leaves on a spiral aloe; hexagons in honeycomb; and geometric patterns decorating an Ndebele house. Can you think of some other interesting patterns in nature?

There are also many patterns that we can find in numbers. Look at these multiples of 11:

$$11 \times 1 = 11; 11 \times 2 = 22; 11 \times 3 = 33 \dots\dots; \\ 11 \times 11 = 121; \dots\dots; 11 \times 22 = 242$$

Can you find 11×111 and 11×33 without a calculator? (Answers: 1221 and 363). Can you think of any other number patterns?

These are just a few examples of where we can see mathematics at work in our daily life. Do a brainstorm and see how many more situations you can think of where mathematics helps us to understand things.

Doing mathematics can give you a wider choice of careers: Engineering, Technological Studies like Computer Science, Social Sciences like Anthropology, Communications, Economics, Business and Commerce, Actuarial Science (used by insurance companies).



Photograph: John Inglis





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2015 National Science Week

Mathematics Activities hosted by the South African Mathematics Foundation (SAMF). Learners, teachers, parents and the general public are all encouraged to visit the SAMF activities and exhibitions from the 3rd till the 8th of August 2015.

Hosted at: University of Pretoria, Mamelodi Campus.
Entrance is free but booking for certain sessions is required.

Mathematical games
Quizzes and Maths Relay
Motivational talks
Career Guidance Session

Activities:

Casio Calculator Workshop
Problem Solving Course for Educators
Exhibitions on mathematics

The National Science Week is proudly sponsored by the Department of Science and Technology (DST) and is managed by the South African Agency for Science and Technology Advancement (SAASTA). The above activities are organised by the South African Mathematics Foundation (SAMF).

Enquiries: David Ramaboka > SAMF: Tel : 012 392 9324 Email : ramabokad@samf.ac.za





National Science Week 2015 Events Guide

National Science Week celebrates the International Year of Light and Light Based Technologies from 1st – 8th August 2015. Find out what's happening near you!

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Wordwise Media – Sink, Splash or Swim Quiz

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Ditsong National Museum

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Kenhlalsi

Dr Princess Cele
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National Zoological Gardens

Mr Ulrich Oberprieler
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P Stem Foundation

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Rural Education Festival

Mr Griezelle Raphahlelo
011 056 5534

Sci-Bono Discovery Centre

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Sci-Enza

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South African Mathematics Foundation

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South African National Space Agency

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Funzani Education and Training Centre

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Isibusiso Esihle Science Discovery Centre

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Garden Route Botanical Gardens Trust

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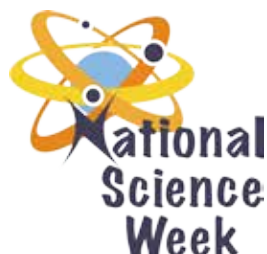
National Science Week is an initiative of the Department of Science and Technology implemented by the South African Agency for Science and Technology Advancement (SAASTA) a business unit of the National Research Foundation.

For more information and to find out more about what's happening near you visit www.saasta.ac.za and www.dst.gov.za



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SAASTA
South African Agency for Science
and Technology Advancement



... this is the rhythm of the Light

SAMA award winning Hip Hop artist iFani jetted in to KZN to collaborate with star scientists and learners from Edendale Technical High School to kick off Hip Hop Science Spaza 2015.

Learners, who had been preparing and practicing their songs on light, met up with leading SA scientists from the National Laser Centre and the International Square Kilometre Array project before putting their songs under the spotlight.

Hip Hop Science Spaza is celebrating the International Year of Light and Light Based Technologies – raising awareness of the importance of light in our lives – including its role in scientific discovery and numerous applications which affect our lives from data transmission to health diagnostics.

Also featured were the “Ionic Bonds”, Durban based science learners and runners-up in the 2014 Hip Hop Science Spaza competition along with beatboxer Lungelo. iFani was accompanied by up-and-coming Hip Hop artist, KZN’s Lex LaFoy who reflected on the role of the social sciences and the power of Hip Hop to change lives.



The event will be featured on Hectic Nine-9 (SABC2) between 16h00 and 17h00 during National Science Week. You can pick up the interviews and recordings on community radio stations nationally or online every day during National Science Week.



YOU
can enter the
**Hip Hop Science
Spaza 2015**
competition now!!

Details and T&Cs at
www.sciencespaza.org
and on the *Science Spaza*
Facebook page



Clockwise from left:
Lungelo, an awesome beat-boxer from Msunduzi;
SAMA Award Winner iFani; Ms Tebogo Gule and Ms Koki Selepi from the Department of Science and Technology;
Thozama from Hectic Nine-9 with learners from Edendale Technical High School

Bright minds light up SA's scientific future

Two brilliant young scientists attended the Hip Hop Science Spaza event in Pietermaritzburg on 6 July, and inspired the learners to believe in themselves and work hard to excel in science.

Sthabile Mazubane caught up with Sphesihle Makhathini, whose passion for science was sparked by South Africa's success in being chosen to host the International Square Kilometre Array project (SKA).

Sthabile: What field of science are you in?

Sphesihle Makhathini: My field is Radio Astronomy. I'm currently a PhD candidate at Rhodes University, and I'm funded by SKA South Africa.

Sthabile: Could you tell me a bit about yourself and your interests?

Sphesihle Makhathini: I'm from e-Mnambithi in KZN. Besides physics, I'm very interested in music, poetry and literature about periods of struggle, especially the black man's protracted quest for self-determination.

Sthabile: What prompted you to study Radio Astronomy?

Sphesihle Makhathini: When I heard that we had won the bid to host the SKA, I knew I had to be involved in this project.

Sthabile: What REALLY inspires you in your career?

Sphesihle Makhathini: We're building the biggest radio telescope in the world! That is motivation enough for me.



Sthabile: What are the current challenges in this field?

Sphesihle Makhathini: Some of the technology that will make the SKA possible has not been invented yet ... in particular, technologies that can handle the computing demands of the SKA. That's what I'm working on.

Sthabile: What are your thoughts on the future of science in SA?

Sphesihle Makhathini: It is not as bright as it should be. Too many of our schools do not have the right resources to enable pupils to realise their full potential.

Mbali Shabalala talked to Dr Sandile Ngcobo about how he got to be a senior laser researcher at the CSIR, and a member of the team that invented the world's first digital laser.

Mbali: You are involved in cutting-edge research. Can you tell me how it all started?

Dr Sandile Ngcobo: I was born in KZN where I attended school in Eshowe and Pietermaritzburg, and then did a BSc and got my Honours in Science at the University of KwaZulu-Natal (UKZN).

During my Honours year I was employed by HartRAO, and that is when I got introduced to lasers because I registered with the University of Stellenbosch for a Master's degree in Laser Physics. From HartRAO I moved to the Council for Scientific and Industrial Research (CSIR) as a fulltime researcher, developing diode-pumped solid state lasers. During this time I also completed a PhD degree through UKZN.

Mbali: What prompted you to enter the field of lasers?

Dr Sandile Ngcobo: At HartRAO they were using Satellite Laser Ranging (SLR) to measure the position of satellites by using lasers. HartRAO wanted to develop a laser powerful enough to measure the distance to the Moon. I was one of the team who were tasked with developing that laser.

Mbali: What REALLY excites you about your career?

Dr Sandile Ngcobo: I am excited by having to come up with new ideas. The real challenge is applying those ideas in real-life situations, because ideas often do not work the way you expect them to in real life. You need a problem solving approach to come up with solutions that work.

Pictured above from left:

Sphesihle Makhathini (SKA), Sthabile Mazubane (Science Spaza), Dr Sandile Ngcobo (CSIR)

Listen to *Hip Hop Science Spaza* on these community radio stations...



Vaal community radio
www.906fmstereo.com



East Rand Stereo
www.939.co.za



Phalaborwa community
www.phalaborwafm.co.za



Radio today
www.1485.org.za



Wild Coast FM
www.wildcoastfm.co.za



Emalahleni fm
www.emalahlenifm.org.za



Waterberg stereo
www.waterbergstereo.co.za



Aganang FM
www.aganangfm.org.za



Mogale FM
www.mogalefm.com



Teemaneng FM
www.rtsfm.co.za



Vaaltar FM
vaaltarf.co.za



Siyathuthuka
siyathuthukafm976.co.za



Radio KC
www.radiokc.org.za



Whale coast fm
whalecoastfm.co.za



Zululand FM
zululandfm.org.za



Radio NFM
www.radiionfm.co.za

The **Hip Hop Science Spaza Project** is a national collaboration between popular music artists and learners in science clubs around South Africa to make science accessible to the general public. See www.sciencespaza.org. Science Spaza is an initiative of Jive Media Africa. National Science Week is an initiative of the Department of Science and Technology managed through the South African Agency for Science and Technology Advancement (SAASTA). Find out more at www.saasta.ac.za



Space is not as empty as you think



Photograph and caption supplied by SANSA

While the name suggests that space is empty, that is far from true.

Particles released by our sun and space weather events fill the space between our planet and surrounding bodies. It is known as *space plasma*. Plasma particles are the fourth state of matter (the other three are solids, liquids and gases) and have an effect on how radio waves travel through space. It is important for scientists to understand how plasma affects data transmissions.

Antarctica is often referred to as a “window into geospace”. The Earth’s magnetic field lines converge (come together) at the North and South Poles, acting as a funnel for space plasma to travel close to the Earth’s surface, where it interacts with the gases of the atmosphere. That makes Antarctica the ideal location for space science research.



Photographs: Robert Inglis

Aurora

Noluthando Lebitsa

The Aurora is a spectacular display of natural light in the Antarctic and Arctic regions. At sunrise, the Earth’s magnetic field interacts with solar winds up to 320km above the ground. That’s almost as high as seventy thousand giraffes all on top of each other!

Atoms coming from the sun collide with gases in the Earth’s atmosphere in oval regions around the Earth’s magnetic poles. These collisions cause the gases to emit light which paints the sky with different colours, usually pale pink and green, and sometimes blue, yellow and violet. The colours depend on the electrical state of the gas molecules and the solar wind particles they collide with. Greens and reds appear when oxygen atoms are involved, and violet is from an interaction with nitrogen ions. Sometimes, the Aurora is simply white, from a mixture of all the colours in the spectrum!

In different parts of the world, the Aurora looks a little different, and has different scientific names. *Aurora Australis* appears in the Southern Hemisphere, and looks like a shimmering curtain. *Aurora Borealis* appears in the Northern Hemisphere, and is also called the Northern Lights. The *Aurora Australis* is best between March and September, and lasts between 15 and 40 minutes if you’re lucky enough to see it.



Sunlight

Sthabile Mazubane

The sun is literally shining all the time – even when we can't see it!

One of the most important jobs that the sun has is to provide light. When we think of the sun, our first thought is often of heat, but actually we would have no life on Earth if it wasn't for the light energy we get from the sun.

Our galaxy is super big! Light from the sun takes about eight minutes to reach Earth. Even though it's so far away, this light is so powerful that it's dangerous to look directly at the sun without protective glasses! And it's only getting brighter, too. Billions of years from now, the sun will be almost 40% brighter than it is now. It will be so strong that the oceans will evaporate into space! All life as we know it will be gone.

Sunlight also gives us our food. Photosynthesis is a process in which plants use energy from sunlight to convert carbon dioxide and water into food. Like plants, human beings also need sunlight to stay healthy. Too much sun isn't so great, especially for your skin! But in moderation, sunlight can prevent diseases, improve sleeping habits, increase mental performance and even boost energy levels.

Without the sun, you wouldn't be around to read this!

Fun Sun Facts

Age: 4.6 billion years

Diameter: 1,392,684 km

Mass: 1,989,100,000,000,000,000 billion kg (that's like 333,060 Earths!)

Surface Temperature: 5 500°C (that's more than 100 times as hot as a summer day in the Earth's hottest deserts)

Did you know light from the Sun takes eight minutes to reach Earth and is the main source of energy we need to live?

Our Sun is an average sized star known as a Yellow Dwarf and produces more yellow light than any other colour because its surface temperature is about 5,500°C. Sometimes the Sun produces large explosions of energy called solar flares. These explosions cause space weather which can affect our technology on Earth and in space.

SANSA's Space Weather Centre keeps a close eye on the Sun and provides early warnings on extreme space weather.

One lucky Science Spaza Club Member will win a SANSA hamper!

Answer this easy question: How long does it take light from the Sun to reach Earth?

SMS or WhatsApp your answer to 076 173 7130

Like us on Facebook and follow us on Twitter

www.sansa.org.za



SANSA provides early warnings and forecasts on space weather activity, playing a vital role in protecting satellite technology, communication and navigation systems.



Light in Antarctica



Top: An Antarctic researcher takes a stroll in the half-light of an Antarctic midday in winter. The sun never rises above the horizon but the sky still lights up in blue and violet.

Left: South of the Antarctic Circle the sun never sets at midsummer. Travelling southwards through sheets of sea ice we witness the midnight sun as it dips close to the horizon.

Below: A storm during the long winter. Windspeeds of over 200 kilometres per hour blow snow and ice under the South African Research station SANAE IV.

Next page – top: The South African flag is ripped by high winds on SANAE IV, the South African research station in Antarctica. The sun lies just below the horizon and creates the appearance of dusk for hours every day.

Next page – inset: Robert Inglis was the mechanical engineer on the 40th South African Expedition to Antarctica. This photo was taken on the morning that the team set sail to return to South Africa.

Next page – middle: An iceberg floats in sea ice off the coast of Antarctica.



All photographs: Robert Inglis

Interview with an Antarctica survivor

Sindi Buthelezi

A little birdie told us that Mr Robert Inglis, from Science Spaza, travelled to Antarctica in the year 2000 and returned in 2002. Just in case you did not know, Antarctica is known as the highest, driest, windiest, emptiest, coldest place on earth. We had the great opportunity to hear from him first hand!

Science Spaza: Why Antarctica?

Robert: Untouched, wilderness, adventure, escape and beauty!

Science Spaza: Antarctica is...? (one adjective)

Robert: Peaceful

Science Spaza: A typical winter day?

Robert: Looks like you are stuck inside a milk bottle... except when it is dark, which is most of the time.

Science Spaza: When summer came?

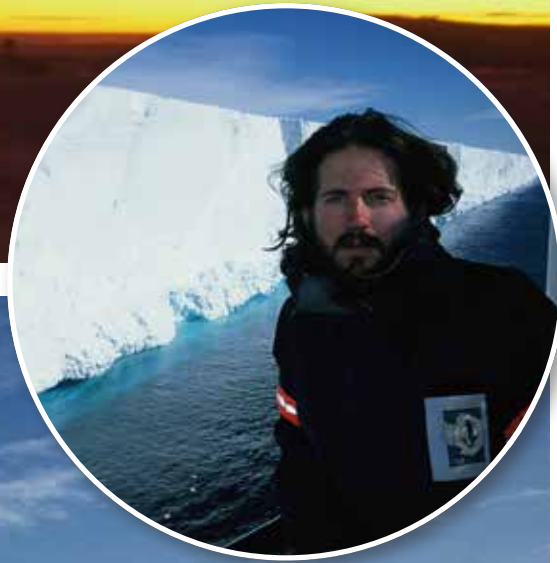
Robert: In winter the sun never rises. At midsummer it never sets. 24 hours of sunshine a day gave me a really good tan.

Science Spaza: The effects on my body were...?

Robert: In summer I never felt like going to bed and in winter I never felt like getting up. I also experienced short term memory loss.

Tjoo! A whole day with no light?

That was sure boring. Thanks for your time Robert! Now we know we must appreciate light.... #NCAH man.



Midnight sun

Ruby Gill

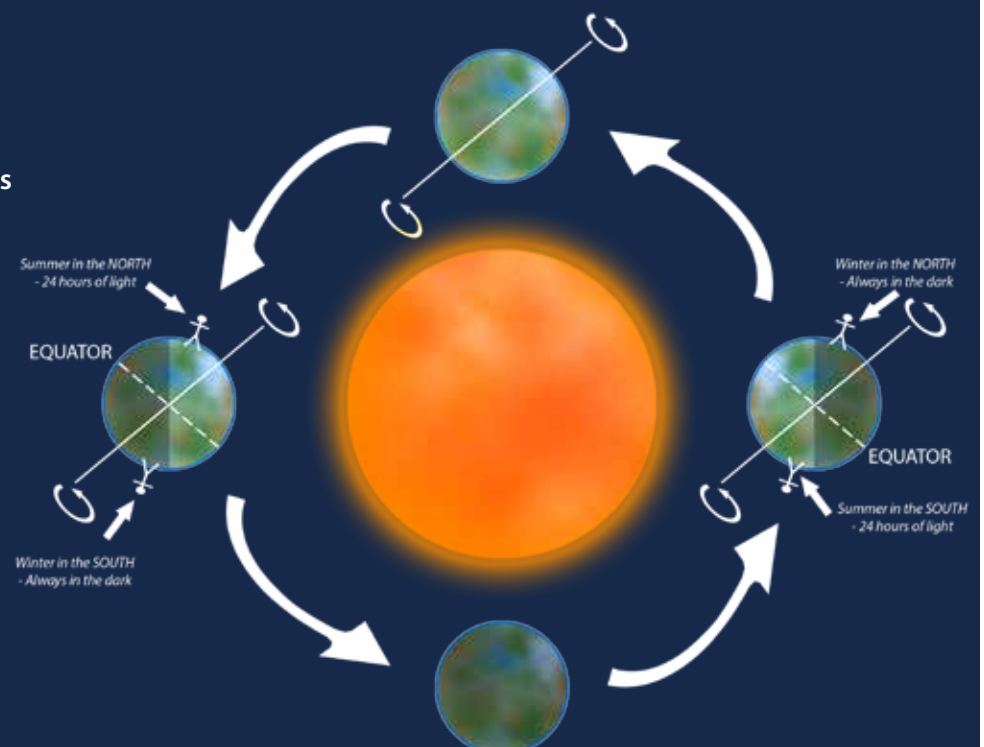
I'm sure you have days sometimes that go sooooo sloooooowly that it feels like they'll never end! Well in Antarctica during the summer, they never do!

That's right. In summer, between September and March, the sun never sets. And in winter, it's the opposite. It's dark all day, every day, like one super long night!

Sounds crazy, right? It's all got to do with the tilt of the Earth's axis. During summer in the Southern Hemisphere, the bottom of the Earth is tilted towards the sun, even when the earth rotates. This means you can see the sun from the South Pole all the time! During winter, the bottom of the Earth is pointing away from the sun. The sun never rises because it's always on the other side of the Earth.

These super long days and nights make life in Antarctica very different to life at home. During summer, people can work all day because it's always light! Sleeping is difficult because you don't really know when night is. During winter, people often get grumpy and slow, and they just want to sleep all the time.

So next time you're having a very long day, remember: it could be worse.



NEWS FROM THE CLUBS

This is where you, the members of the Science Spaza clubs, get to share your news and have your say about science issues

Beat that Anxiety! from the Science Spaza Team

What's the scariest thing about Anxiety? You never see it coming. Nobody has complete control over it – that's just how the body works!

Feeling anxious often comes from fearing the worst in any situation. When you're writing an exam you're scared of failing; when you have a public speaking competition you're scared of tripping on stage, or forgetting your lines! The good news is that these fears can keep you on your feet. You end up studying much harder, or learning your lines better, because you are more afraid of failure.

But too much anxiety can be very harmful. It's super important that we learn how to manage it. Here are some quick ways to deal with the nerves:

- **Take a deep breath:** Your brain needs oxygen to function properly! When you're under pressure, taking deep breaths helps you calm down.
- **Be optimistic:** Seeing that the glass is half empty will definitely make you panic. Rather look at the glass as half full and focus on the positive things!
- **Surround yourself with things that make you happy:** People say that laughter is the best medicine, and they're right! Laugh (and cry) as much as you need to. Don't take everything too seriously!
- **Talk to someone:** Talking really helps! Find someone who you're comfortable with and talk to them about your fears.

At the end of the day, remember that time is your friend – this too shall pass!



Members of The Physicians

Kaalfontein School

We are the Kaalfontein School from the Gauteng Province and the name of our club is **The Physicians**. Our career goal is to become Engineers (to take part in any field of engineering). To become scientists is our dream and we believe that through hard work, patience and love we can actually achieve that. Our environment is very poor and for our

Kaalfontein School, we believe working together we can achieve a better and cleaner environment – because our school started in 2010, and we are still learning inside the shack. However that doesn't demotivate us. We keep ambitious – towards achieving our dreams and helping to change the environment.



Ntando Makhathini

Mehlokazulu Senior Secondary School

I am Ntando Makhathini, a Grade 11 learner from Mehlokazulu Senior Secondary School. I am a science learner who is motivated and enjoys partaking in science-related activities.

After my matric I wish to do Chemical Engineering at the University of Johannesburg. Having done the Simple Sand Filtration System with my school mates, it has encouraged me to pursue this course. I believe

this has helped me familiarise myself with some activities that are conducted in the real science world.

People from our communities are not aware of the importance of our environment, therefore I was grateful to hear that I was going to be part of the Science Spaza project where we will be doing research on water pollution and diseases caused through the use of polluted water.

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Get in touch – we'd love
to hear from you!

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AGENT ZEE

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AgentZee

Shining Stars in the International Year of Light

Celebrating Women in Science in National Science Week as well as Women's Month in the International Year of Light and Light Based Technologies!

The National Laser Centre at the Council for Scientific and Industrial Research (CSIR) is doing cutting-edge research and technology development using lasers. Lasers produce light, which can be used in many different ways to improve people's lives. We've caught up with some shining lights in African Science!

Light Amplification by Stimulated Emission of Radiation – if that sounds a bit complicated, don't worry – just refer to the technology by its better-known acronym LASER.

"But what is a laser?"

Wow. I thought you'd never ask! Lasers are devices that control the way in which atoms release photons of light. Put another way – lasers

produce light with very special properties by energising atoms. When the atoms get excited some of their electrons get an energy boost – when they return to their original energy state they release photons of light.

As a result, lasers are usually monochromatic (*mono* – one and *chroma* – colour), meaning that each laser produces a single specific colour of light (depending on which atoms are used to release the electrons). They are also highly ordered, with all the light waves moving together. This makes a laser a very powerful tool with fascinating properties.

And with new properties, come new possibilities. I've been talking to some great scientists who are exploring the world of lasers.

Dr Patience Mthunzi

Dr Patience Mthunzi is the research leader in the Biophotonics research group within the National Laser Centre at the Council for Scientific and Industrial Research (CSIR). She recently received one of the country's highest awards, the Order of Mapungubwe, for her contribution in the field of Biophotonics. Dr Mthunzi uses lasers in HIV research. She is truly a remarkable DIVA. Here's what she had to say.

Agent Zee: Could you please tell me a little about your life background?

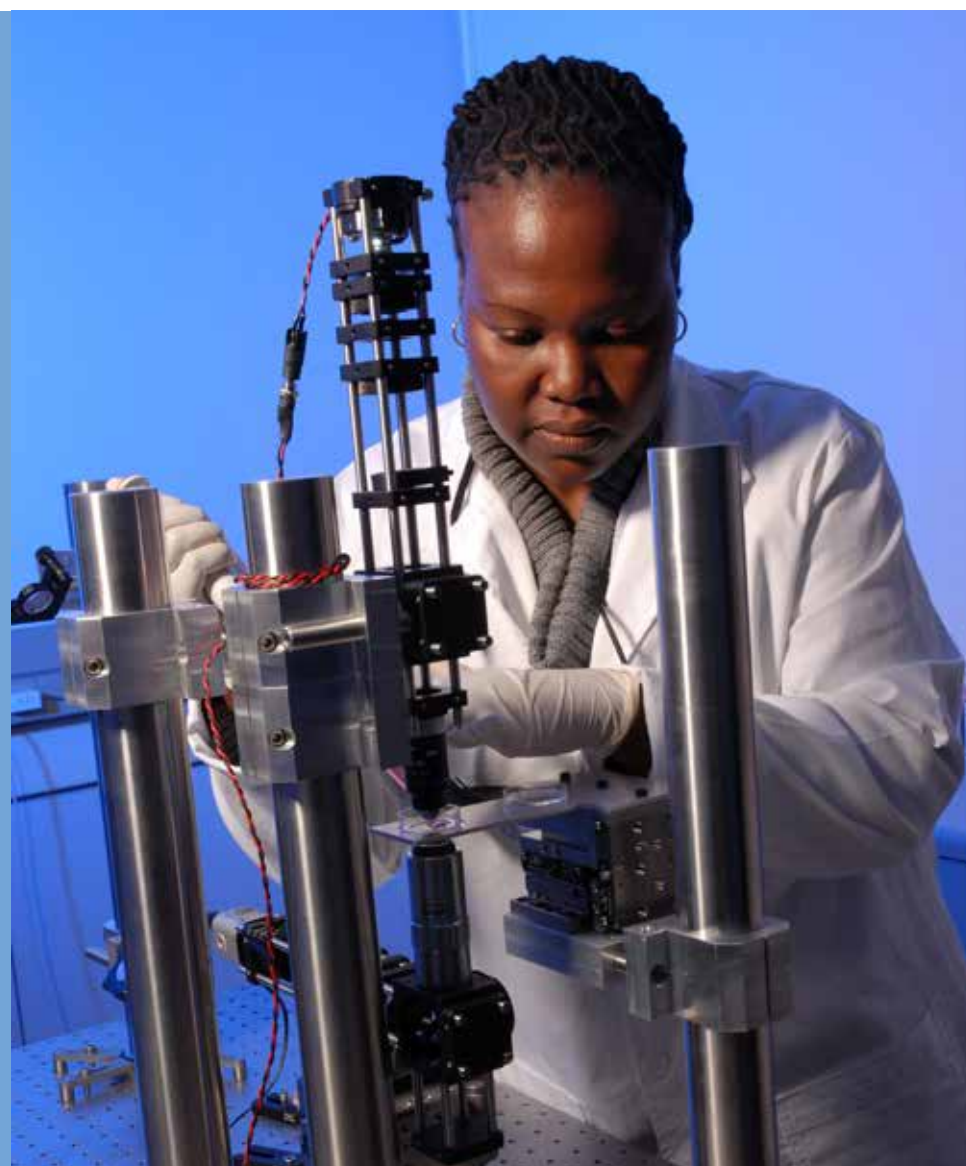
Patience: I was born in Orlando West, Soweto. After matriculating from Reasoma Secondary School in 1994, I enrolled for a degree in Psychology at the University of South Africa. However, during 1996 my deep love for science deflected my attention to a BSc degree (Biological Sciences) followed by Honours (1999) and Masters (2002) degrees both in Biochemistry, at the University of Johannesburg (former Rand Afrikaans University).

Between 2003 February and 2004 September, I worked as a research assistant at the National Institute for Communicable Diseases (NICD) in their HIV vaccine unit.

My highest qualification is a PhD (2010) in Physics (Biophotonics – Optical Tweezers Area) from the University of St. Andrews, Scotland, UK. This fairly new aspect of medical research focuses on the use of laser light for micro-manipulating biological materials to carefully study their intricate processes.

I started full-time employment with the National Laser Centre (NLC) in the Council for Scientific and Industrial Research (CSIR) in the Biophotonics group in October 2004. During November 2005 to April 2006 I set up a fully functional cell culture facility at the NLC before commencing my PhD (May 2006) in the UK.

continued overleaf ...



Ann Singh

Ann Singh is a researcher at The National Laser Centre in the field of laser physics. Singh's work focuses on building new lasers and exploring laser applications, for example in security and health. Singh says: "Spiritually, many cultures and religions point to believing in the curative effects of light; and scientific studies have shown that light at specific wavelengths has healing effects". I asked her a little more about her experiences.

Agent Zee: Can you tell me what field of science you are in and what your current job title is and at which organization?

Ann: I am a physicist and am currently a researcher at the National Laser Centre, CSIR.

Agent Zee: What is your particular scientific interest?

Ann: My interests are in Biophotonics and the application of lasers for everyday problems such as health, manufacturing, security.

Agent Zee: Could you tell me a bit about yourself and your life background?

Ann: I come from a rural lifestyle in Thornville, Kwazulu-Natal and grew up without many of the readily available facilities that we have today like electricity and indoor conveniences with many safety concerns. However my family placed a huge emphasis on education and the benefits that go with that, such as being able to take care of yourself without stepping on other people. That mindset had enabled me to study what I wanted to and to be able to travel from home and gain new experiences as well as build a positive life for myself.

Agent Zee: What prompted you to enter this field and why?

Ann: Science is exciting and helps you explain so much of what happens around you from the motion of

blood circulation to understanding stock markets. It is an inherent part of everyday life. While science can be divided into many subjects such as Physics, Chemistry, Biochemistry, etc., they are all interlinked.

Agent Zee: What REALLY excites or inspires you about your career? What gets you up in the morning?

Ann: I think for me it is the hope that what I am doing can someday make life better or easier for someone else. A lot of the work we do is about eventually having safer cost effective products that can be used by the South African market.

Agent Zee: What are current issues or challenges in this field?

Ann: Science is ever-changing so one needs to be continually aware of these changes. And the wealth of info can be a challenge; however, that is a positive challenge. The more difficult challenge for science in general is being able to attract sufficient funds.

Agent Zee: What are your thoughts on the future of science in SA?

Ann: Many more people now have greater exposure to the details of science through science shows, expos, school visits, etc., so there is a greater base from which to build future scientists. The earlier children learn about science, the more their thirst for and understanding of the subject will grow and that is the key



– understanding the subject so that it can be put into practice. There is also a greater focus in many areas on looking at local problems that science can solve, which is important.

Agent Zee: What advice would you give to the youth wanting to study science?

Ann: It is an exciting field to be in, one that does require hard work and a real understanding of maths and science subjects at school. The earlier you start to explore the subject the better. You

need to use science to explain all that happens around you.

Agent Zee: 2015 is the International Year of Light. What do you find exciting about working with light?

Ann: Light, and more especially laser light, can be applied to so many fields – cutting, building of motor parts, killing cancer cells, and identifying people, to name a few. This diversity allows one to be constantly engaged in different fields.

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Agent Zee: Wow, OK, so when did you first get inspired to study Science?

Patience: From high school level, in Grade 10 (then standard 8) I was doing science subjects like Mathematics, Physics, Chemistry and Biology.

Agent Zee: Mmm... I am sure there have been obstacles along the way for you. Would you mind mentioning a few?

Patience: Life is full of challenges. I tend to use these as stepping stones rather than obstacles. Some of my examples are listed:

1. Before I started getting bursaries during my first degree, my studies were funded via a student loan (then called TEFSA loans, I think now these are called NFSAS) which I settled after I started working for CSIR.
2. Sometimes having people doubt your abilities can be very discouraging; in those cases I listen to the little voice from within and then know exactly what to do.
3. Fear of the unknown can also prevent us from achieving to our maximum potential. To overcome this I convince myself of the fact that life wouldn't be



possible without taking risks, whether calculated or not.

Agent Zee: What REALLY excites you about your chosen career? What gets you out of bed in the morning?

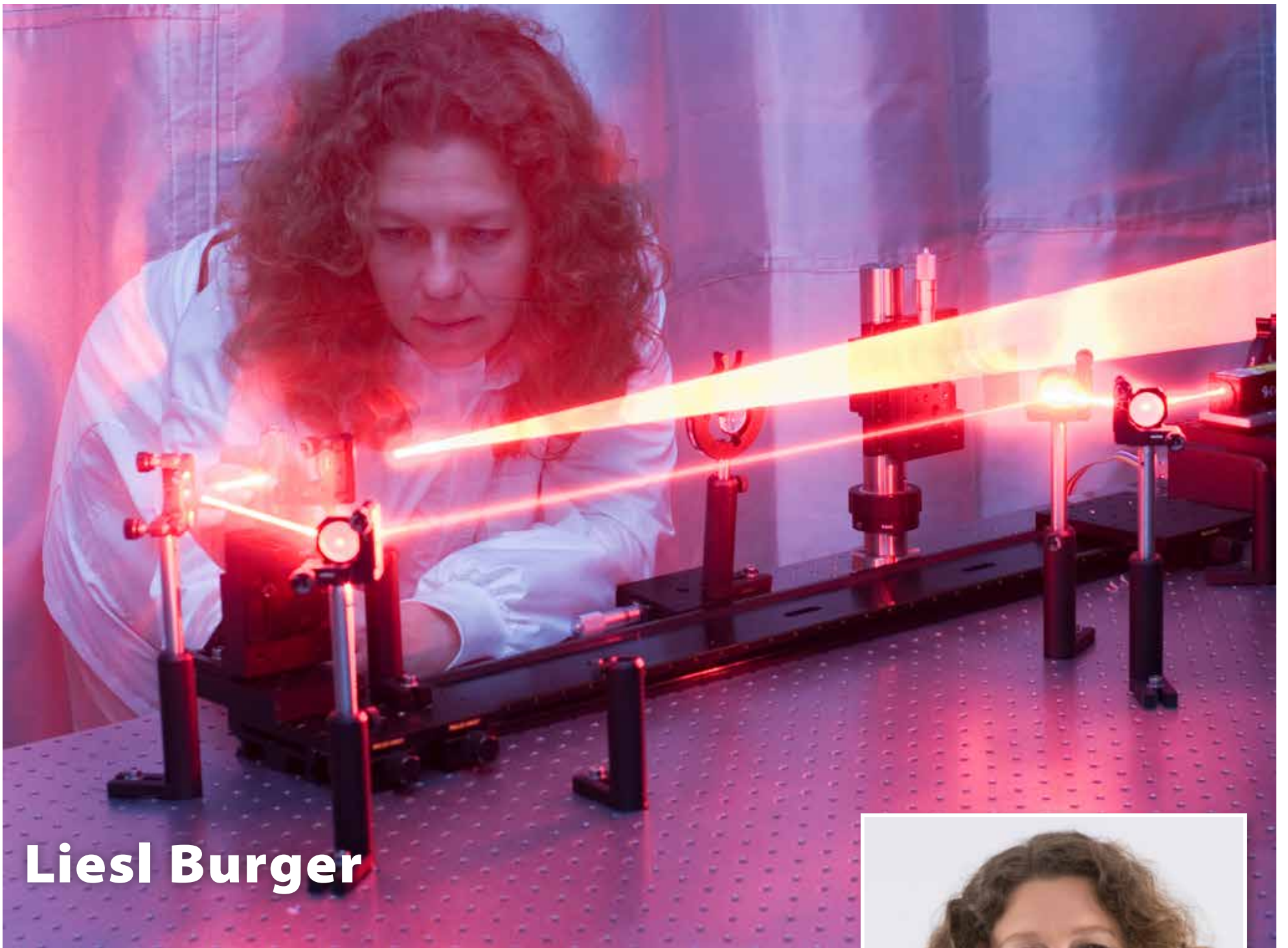
Patience: I discover new things on a daily basis. The more I dig the more informed I get. I love being both mentally stimulated and challenged and my job does precisely that.

What gets me out of bed in the morning is the love of life. I celebrate the fact that I'm able and am a firm believer in counting my blessings.

Agent Zee: Where do you see yourself in the next 5 years?

Patience: It will definitely be somewhere quite senior. However, only time will specifically reveal where that will be. My life has been full of good surprises.

Agent Zee: You are truly an inspiration and a great role model to young women in South Africa. Thank you for your time and all the best for the future...



Liesl Burger

Liesl Burger is working towards her PhD in laser physics. She was part of the team at the National Laser Centre which developed a world first – a laser beam, the shape of which can be altered digitally. The new technology has potential applications in health care, manufacturing, communications and other industries.

Agent Zee: Can you tell me what field of science you are in and what your current job title is and at which organization?

Liesl: I am a researcher in the field of laser physics, and I work at the National Laser Centre, which is part of the Council for Scientific and Industrial Research (CSIR) in Pretoria.

Agent Zee: What is your particular scientific interest?

Liesl: My particular field of interest is how to shape the energy in a laser beam. This is how we make a laser beam useful for applications like data transfer, micro-manipulation, or 3D printing.

Agent Zee: Could you tell me a bit about yourself and your life background?

Liesl: I grew up in Zimbabwe and later Johannesburg, and then attended WITS University on a CSIR bursary. When I graduated I went to work at the CSIR, where I have been for over 25 years. I am married, and have 2 children.

Agent Zee: What prompted you to enter this field and why?

Liesl: I have always been good at maths and science, and found everything scientific to be interesting. In Grade 10 a group of us visited the CSIR, and I was fascinated by the really cool stuff that was being studied there.

Agent Zee: What REALLY excites or inspires you about your career? What gets you up in the morning?

Liesl: Research is fun! Every day brings new problems to solve, and you get to contribute to solving the technological challenges of South Africa.

Agent Zee: What are current issues or challenges in this field?

Liesl: The science community is relatively small in SA. We need more scientists and engineers, but also entrepreneurs who understand science and technology and can take innovative ideas to the marketplace.

Agent Zee: What are your thoughts on the future of science in SA?

Liesl: SA has some world-class scientists and engineers, but we need many more in order to establish a technology-based industry in SA.

Agent Zee: What advice would you give to the youth wanting to study science?

Liesl: I would encourage learners to use the wealth of information on the internet to check whether the things that people tell you are true, and to find out about things that interest you. There are free textbooks, interesting articles, educational videos, and also people on forums who are happy to share their knowledge. Keep reading, keep asking, keep learning.



Agent Zee: 2015 is the International Year of Light . What do you find exiting about working with light?

Liesl: When lasers were first built in 1960, they were certainly interesting, but not very useful and became known as “a solution in search of a problem”. Since that time lasers have been used in every aspect of modern life, from barcode scanners in supermarkets and in DVD players, to 3D printers, surgery and military weapons. And new applications are constantly being discovered.

CSIR
our future through science

Masixole Lugongolo

Masixole Lugongolo is currently doing her PhD in Biophotonics at the Council for Scientific and Industrial Research (CSIR) through UNISA. Her research focus is on the interaction between lasers and biological systems – specifically with regard to HIV. Biophotonics is the application of lasers in biosciences, and promises very important applications in health treatment. She had this to say:

Agent Zee: Hi Masixole! Can you tell me what field of science you are in and what your current job title is and at which organization?

Masixole: I recently joined the field of Biophotonics (simply the application of laser technology in biological sciences) at the National Laser Centre in CSIR, where I am doing my PhD research project.

Agent Zee: What is your particular scientific interest?

Masixole: HIV research.

Agent Zee: Cool, so could you tell me a bit about yourself and your life background?

Masixole: I am from Eastern Cape in Mount Frere, Mpoza Location. I spent most of my childhood years under my maternal late grandmother's care. After completing Matric in 1995, I then did a National Diploma in Biotechnology at Technikon Natal (now Durban Institute of Technology). My aunt and her late husband sponsored my education as my mother was not working. At completion, I moved to Johannesburg to look for a job. I stayed in Rockville with my late cousin sister's family. Unfortunately, getting a job was not easy. While waiting for that door to open I had to make some money. At some point I sold vegetables and fruit, collected waste for recycling, babysat and worked in a butchery. After that I worked as a volunteer lab technician at Wits Technikon (now University of Johannesburg). During this time, I still had no income so I had to raise money for transport; and achieved that by doing our neighbours' laundry and ironing. One of the lecturers that I worked closely with encouraged me to do a BTech. At first I was not interested, but I eventually gave in and he assisted me with getting a Technikon bursary that paid for my tuition fees. While doing the BTech he told me that he had an interesting Master's project on HIV and he would like me to do that project when I completed the BTech. I did not hesitate to say yes to that proposal, as I had always dreamt of doing work on HIV. My Master's journey was challenging as it took way longer than it was supposed to – there were just too many obstacles – but by the grace of God I finally graduated. I worked at NICD as a Research Assistant in the AIDS unit. In April this year I joined the CSIR National Laser Centre on a PhD studentship.

Agent Zee: Wow! From zero to hero, hey! So tell me, what prompted you to enter this field and why?

Masixole: I would simply say it was by chance. However, when I went to Senior Secondary School and had to choose between the two streams that my school offered, I knew I had to choose Maths and Physics – not because I like them or was good at them, but mainly because I did not like history, even



though I was stronger at it than in Maths and Physics. I actually wanted to be a Social Worker, but my uncle discouraged me and I did not know what else to do. I then asked the lady who was our neighbour, who had just started at tertiary, what she was studying towards, and she said she was doing Medical Technology and explained what that was. I then applied for that, but I did not meet the requirements at ML Sultan Tech where I had applied, but I was accepted for Biotechnology at Natal Tech.

Agent Zee: What REALLY excites or inspires you about your career? What gets you up in the morning?

Masixole: The impact it has in the medical field is what excites me the most. If it were not for the science research people would still be dying in large number due to HIV/AIDS and other medical conditions. I get up in the morning because I believe God brought me to planet earth for a purpose and my desire is to live a life that is aligned to that purpose and also contributing to a bigger community.

Agent Zee: Indeed, Masixole! What are your thoughts on the future of science in SA?

Masixole: I think it has a potential mainly because I see so much enthusiasm and drive in young people. I am not talking about those who do suffer from this 21st century condition of feeling entitled, but of those who believe in "uvuke uzenzele" – those who have dreams and are not willing to allow obstacles to stand in the way of reaching their goals. But if there is no intervention at the school level to improve the education system, it might not have a future. And I saw this as a challenge for my field and for our country at large.



Agent Zee: Great! So what advice would you give to the youth wanting to study science?

Masixole: You need passion, determination and you must be your own motivator.

Agent Zee: Very true! So, 2015 is the International Year of Light. What do you find exciting about working with light?

Masixole: There is a lot that can be achieved with light, but what excites me the most about light is the potential and the impact it has in the medical field. Lasers are already being used to improve medical conditions, like the use of lasers in treating skin conditions. Scientists are also looking at the impact it might have in HIV treatment, and I have hope.

Agent Zee: Nice one, hey! Thank you so much for your time Masixole, it was really interesting hearing from you!



Agent Zee is an initiative of Jive Media Africa – a window on news, opportunities and role-models in African Science. Do you have scientists who would like to talk to Agent Zee? Write to zee@agentzee.org to arrange an interview or to profile your work.

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