

International Year of Light 2015

Sindi Buthelezi

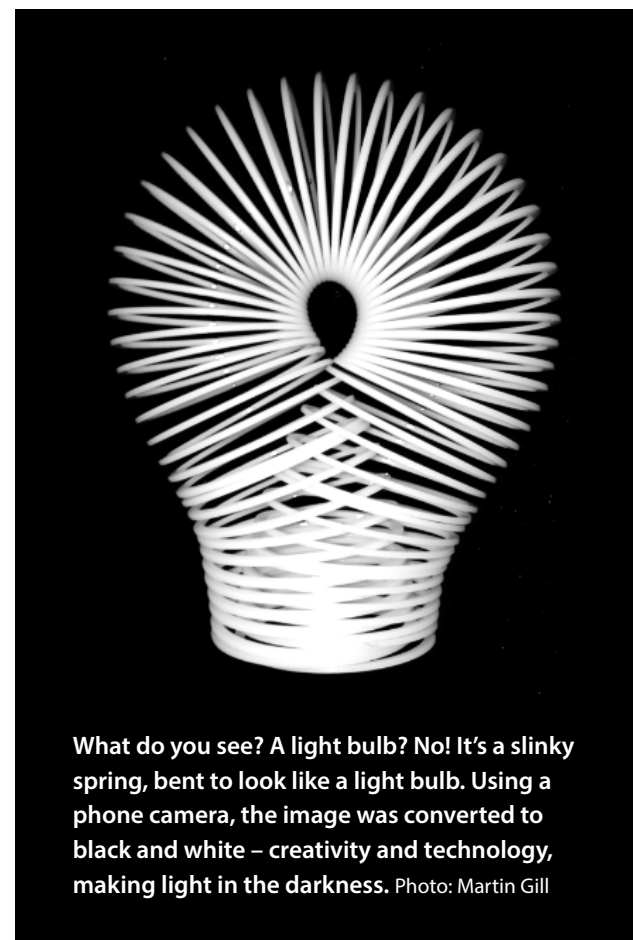
Can you imagine a world with no light? We would be surrounded by darkness, with no lovely sunsets and rainbows, no blue oceans and no extraordinarily colourful plants and animals. It would always be dark and everybody would be afraid. But because of light we are able to see our beautiful world. Light makes life possible and the world deLIGHTful!!!

This year, 2015, has been declared as the International Year of Light (IYL) and Light-based Technologies. Ain't that awesome? This global initiative was proclaimed by the United Nations (UN) General Assembly 68th Session on the 20th of December 2013. IYL 2015 aims to highlight to the peeps of

the world the importance of light and optical technologies in our lives, for our futures and for the development of our society. The IYL is a unique opportunity to inspire, educate, and connect on a global scale. <http://www.light2015.org>

But what is light anyway? And why is it worth celebrating? Light is a form of electromagnetic wave, which our eyes respond to and interpret as colours. But it can also be used in many ways. For example lasers harness the power of light to do thousands of useful tasks including carrying information around the world through the Internet.

There is so much to learn about light! You better stay tuned to Science Spaza this year. **The future is bright when we celebrate LIGHT!**



Science Spaza Hip Hop Competition 2014

Sindi Buthelezi

Let's take a glimpse at 2014 where Hip Hop met Science – a walk down memory lane!

Last year was a fun-filled year for Science Spaza. Full of exciting hands-on activities, loads of sign ups from new clubs and yes of course the launch of our Spaza Space newspaper and first ever Hip Hop Science Spaza Competition.

For the competition you had to take 4 science facts from one of our Science Spaza resources and turn those 4 facts into a rap song. The raps were judged on scientific content, rap lyrics and overall creativity and presentation. We also invited Rooted Souls and iFani to join Science Spaza in Durban for a few days of working with learners on their rap songs. These learners then BATTLED it out for the BEST Rap song of the day. The workshop and competition was aired on SABC 2's Hectic Nine-9, yep I said it... Hectic Nine-9:)

Science Spaza then dashed out with iFani to Bloemfontein for the launch of National Science Week 2014 on the 2nd of August. iFani made the crowd



The Science Spaza Team with iFani in Durban

of about 3000 scholars go crazy and Science Spaza proved to people that science iya-rocka. We also had a mini Hip Hop Science Spaza Competition and the winners won Science Spaza t-shirts and autographed copies of iFani's CD.

The overall winner of the national Hip Hop Science Spaza Competition 2014 was Atomic Combinations from Limpopo (Atomic Scientists from Mountainview Senior Secondary School). Each member walked away

with an iFani CD and they, together with the 3 runners up, will get a chance to record their song for the Hip Hop Science Spaza 2014 CD.

...And that was a Rap!

Modiri Secondary School Trip

Thandile Mdlambuzi

The year 2014 has been the greatest year for Science Spaza, with a great increase in the number of clubs signed up, and the launching of the Hip Hop Science Spaza initiative and this newspaper, Spaza Space!

Also very exciting was the trip that the Science Spaza team took to visit one of the many clubs, the **Mastery Science Club** at Modiri Secondary School in Ga-rankuwa, Gauteng. A team of Scientists from CSIR, lead by Dr Caredee Wright, accompanied the Science Spaza team.



Scientists from CSIR and members of the Science Spaza Team meet with learners from Modiri Secondary School



A club member, Karabo M. Thema, who lead the meeting said: "It's so nice to look back at the wonderful work we have done. I have to say that it was not always easy. Our club aims to improve the level of Mathematics and Science pass in our school, adding on that we strive for scientific excellence.

About two years ago some schoolmates and I took initiative in the Ga-rankuwa community and we wanted to leave something behind for the generations to follow.

We are grateful to Dr C. Wright from CSIR for introducing us to Science Spaza. Science Spaza has been providing us with educational and fun resources. Aside from the resources, Science Spaza has been very helpful. The resources we receive are engaging and they teach us stuff we never knew existed. Really, Science knowledge is Ncah!..."



LIGHT! SOIL! MATHS! WETLANDS! TESTIMONIALS! And Cool and Engaging Activity Sheets! All specially packed for you here in the SciFest edition of Spaza Space.

It is a New Year and it's going to be hip and happening with new celebrations. 2015 is the **International Year of Light**. Read about this and a review of our Science Spaza Hip Hop Competition 2014 on our front page.

Look at page 3 and solve the problems on **Maths and Light** – and boggle your eyes with some tricky images. On page 4 you'll find an interview that focuses on **careers in science**. Move on to see the **2014 winners of the SAASTA National School Debates**, and an invitation to enter in 2015. Page 6 honours **International Year of Soils** and **World Wetlands Day**.

Dash on to page 7 to feast on some cool pictures of the **Hip Hop Competition** and some of the winning rap lyrics. Read more about light, soil and the **Big Circle of Life**. That's not all! What's Spaza Space without news from our fabulous **clubs**? Check what they have to say about Science Spaza on page 8. We wrap up this exciting edition with our famous Science Spaza **Activity Sheets** and this time they are on energy... ENJOY!!!

Science Alight – that's the theme for Scifest Africa this year and this is our Scifest edition.

The Science Spaza Team



Up there, looking down

The South African National Space Agency is harnessing space science and technology to **benefit society** and the planet. Whether through earth observations, space operations, space science or space engineering, there are **boundless opportunities** when you consider a **career in space**.

Visit the **SANSA stand at Scifest Africa** to find out more about our exciting opportunities.

Down here, looking up

However you look at it, there's **SPACE** for you.

www.sansa.org.za
@SANSA7
South African National Space Agency



Light *and* Maths

Have you ever wondered what is happening when you are reading from a book or paper? Did you know that *light waves* are bouncing off the letters on the page and into your eyes? That is why you can see words, how interesting!!!

Thobeka Gumedede

What exactly is light? We see light when a sunbeam angles through a room filled with dust and also after a storm when a rainbow appears. However, these glimpses lead us to more questions about light. Does light travel as a wave, a ray or a stream of particles? What is colour and is light a single colour or many colours mixed together? If it is a wave, does it have a frequency? And what are some of the common properties of light, such as absorption, reflection, refraction and diffraction?

Light usually refers to visible light, which is electromagnetic radiation that can be seen by the human eye.

Objects can be seen by the light they emit, or more often, by the light they reflect.

There is so much maths involved in light. Oh yes I said Maths!!! So many properties of light can be shown by a very simple but important relationship between the speed of light, its frequency and its wavelength. This relationship can be expressed as $c = \lambda f$ where: c = **speed of light**, λ = **the wavelength of light**, usually measured in metres or Ångströms ($1 \text{ \AA} = 10^{-10} \text{ m}$) and f = **the frequency** at which light waves pass by, measured in the number of waves per second (1/s). The speed of light is $3 \times 10^8 \text{ m/s}$. Einstein told us that the speed of light is constant. It does not



Rainbow by Barb Ver Sluis

change. That means if the frequency changes then the wavelength also has to change, but in the opposite

sense. So if the wavelength decreases, frequency increases and vice versa.

Some more interesting things about light: White light is actually made of all of the colours of the rainbow because it contains all wavelengths, and it is described as polychromatic light. Light from a torch or the Sun is a good example of this.

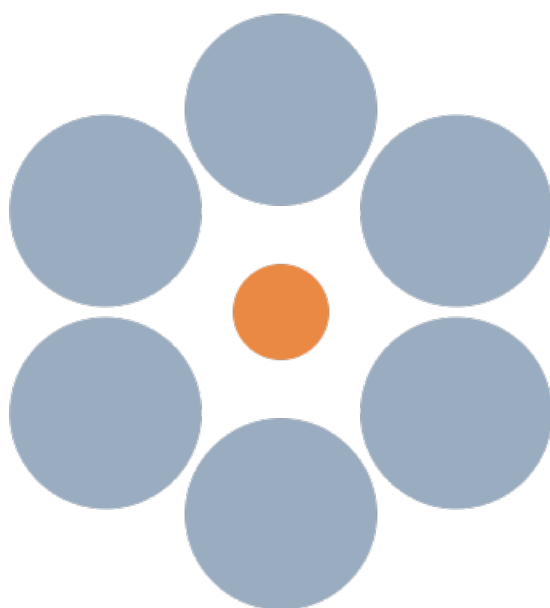
Typical problems

1. If a light's wavelength is increased by a factor of 10, how does its frequency change?
2. If a particular type of light has a wavelength of 6430 Ångströms, what is its frequency?
3. If a particular type of light has a frequency of 1 million /second, what is its wavelength?

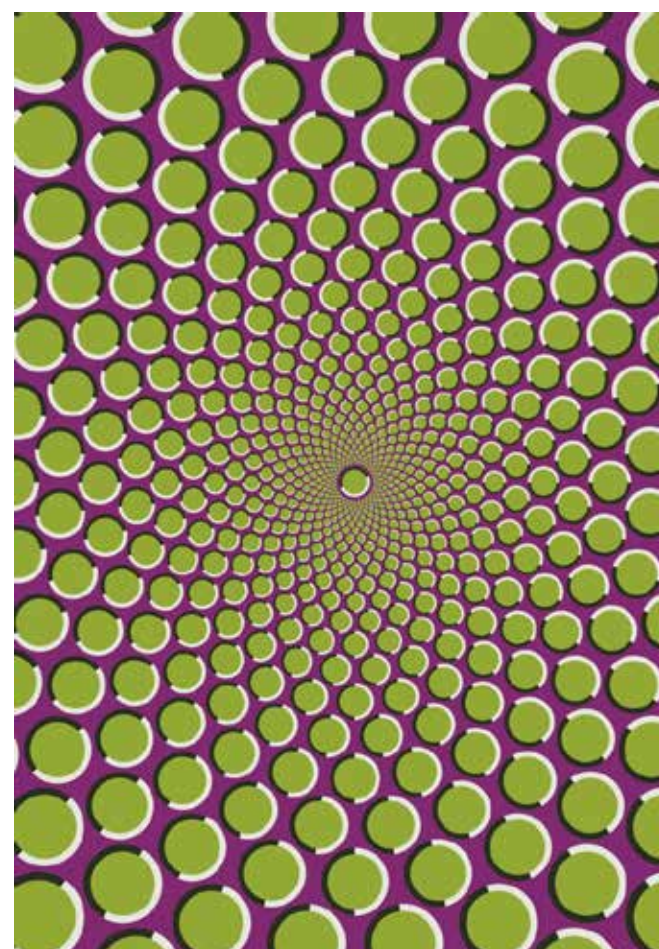
FIND THE ANSWERS
ON PAGE 4.



Things are not always as they appear. For centuries, mathematicians have been fascinated by *optical illusions*. Here are some of the most famous ones. Read the instructions under each one and prepare to be amazed!



Ebbinghaus illusion: the orange circle at the bottom appears smaller than that on the top, but they are in fact the same size. Source: Wikipedia



Motion illusion: contrasting colors create the illusion of motion. Source: Wikipedia; Image: Fiestoforo <http://fiestoforo.cl/>



Interview with Dr Florence Southway-Ajulu

I am honoured to have met the wonderful Dr Florence Southway-Ajulu. Florence is a VERY inspiring woman in science!! Let's hear her story...

Agent Zee: Hi Florence, can you tell me what field of science you are in and what your current job title is and at which institution?

Florence: I specialised in Organometallic Chemistry which I researched at Masters and PhD Levels. I have worked as an academic, lecturing chemistry at DUT and UKZN. Now I work in Academic Planning at Nelson Mandela Metropolitan University.

Agent Zee: Cool! Could you tell me a bit about yourself? What is your life background?

Florence: I was born in Kenya and grew up in the Sugar Belt as my father worked for a sugar company. I completed my primary schooling in the local school. I thrived in this environment because the teachers were very encouraging. At high school in Nairobi the chemistry teacher stood out for me – she was interested in us as students. But what really drew me to



chemistry was her clear explanations, and the “side shows” she took us on to see where chemistry was being applied.

I was good at Mathematics and Science and everyone – parents included – thought I should do medicine. But experience as a hospital volunteer – especially in the surgical ward – put paid to that career.

At the National University of Lesotho I enrolled for a BSc degree. I decided to major in Chemistry and Biological Sciences. I completed my degree and stayed on to work in the laboratory and also with first-year students. This experience made me realise how

important it is to invest time in young people.

A year later I took up an offer to study towards an MSc degree at the University of Sussex in England. There I was introduced to research in Organometallic Chemistry, which is the chemistry of compounds which contain carbon bonded to metals. With supportive academic staff I was able to complete my PhD in four years.

Back in South Africa as a lecturer, I gradually shifted into curriculum development in Chemistry, as I found that many students were not participating to the level that I expected. I tried to prepare my lecturing materials in a way that would help students through more interaction and better stimulation.

Agent Zee: What inspires you most about your career? What gets you up in the morning?

Florence: My job is interesting and I believe that I make a difference in the University environment. There is a “fear” around science, but this could be unlocked through what we do with young minds. If we want improvement in science (or anything), it has to be

deliberate and planned. So questions that go through my head include: “What attributes should our graduates have?” “Are we catering to the students of the 21st century so that they will succeed in their chosen career paths?” Questions like these keep me alert and motivate me to do my best.

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

Florence: We have some really strong scientists so the future of science in South Africa is bright. Universities need to continue providing the grounding which young people need to grow science in South Africa.

Agent Zee: Great! I am sure that will be achieved. What advice would you give to the youth wanting to study science?

Florence: Science has many aspects and therefore there is a wide range of opportunities. Young people should not shy away from science and mathematics. If you have an inclination towards science, give it a go. There is a lot of value in the logic and analytical thought processes of mathematics, so be open to these. The skills that you learn in science are transferable.

Science Spaza
was one of three finalists in the
Mail & Guardian's 2014
Investing in the Future & Drivers
of Change Awards.

Oh Yeah!!!!

We are passionate about young
South Africans gaining enough
knowledge to make excellent decisions
for our futures...



Answers to Typical problems on page 3: 1. frequency must be 10 times smaller; 2. $c = \lambda f \rightarrow f = c/\lambda = 3 \times 10^8 / 6.430 \times 10^{-7} = 4.67 \times 10^{14}$ per second; 3. $\lambda = c/f = 3 \times 10^8 / 10^6 = 300\text{m}$

SAASTA National School Debates champions

Queens College Boys High can proudly say they are the 2014 SAASTA National School Debates champions. They came out on top when competing against other South African provincial finalists in the National Final held in Gauteng on Friday 5 December 2014.

The SAASTA National School Debates Competition aims to encourage young people to address key issues around science and technology that are faced by their communities, through the medium of debate. Conceived and hosted by the South African Agency for Science and Technology Advancement (SAASTA), a business unit of the National Research Foundation, the programme seeks to foster the confidence to speak about science in high school students from Grade 9-11. It also gives participants the opportunity to develop research, critical thinking and information literacy skills, as well as the ability to work as a team to present logical, clear arguments.

“It is well known that the development of science, engineering, technology and innovation has a distinct bearing on overall economic development of any country,” said Dr. Jabu Nukeri, Managing Director of SAASTA. “In order to solve our country’s deep and pressing socio-economic challenges, South Africa needs skills to help the country compete internationally, grow economically and to generally improve the lives of its citizens. SAASTA’s goal is to steer young South African minds towards careers in science, engineering, technology and innovation.”

“Using [debate] to engage scientific issues provides a platform for learners to make scientific information relevant to them, through the understanding of social, cultural, economic and broader implications,” added Nukeri.



1st runner up: St Michaels Girls (Free State)



2nd runner up: Crawford College Pretoria (Gauteng)



Winning Eastern Cape team (Queens College Boys' High) with their teacher, Louise Featherstone, and Dr Nukeri

CALL FOR ENTRY SAASTA National Schools Debates Competition

– ensuring that science becomes part of our everyday dialogue

Attention: Debates and Science educators

We invite all schools with a keen interest in debating – but in this instance from a scientific stance – to enter the 2015 SAASTA National Schools Debates Competition.

The primary objective of the competition is to stimulate interest amongst learners to study towards careers in the fields of science, engineering and technology (SET) by researching and debating high-level topics. It also aims to advance public awareness, appreciation and engagement of science, technology and engineering in South Africa.

Who may enter?

Learners from grades 9 – 11 who are:

- interested in developing their scientific research and information literacy skills;
- critical thinkers; and
- willing to work as a team to present logical, clear arguments.

At least two of the learners must take science-related subjects at school.

How does it work?

The SAASTA Schools Debates structure is not based on proposition/opposition presentations, but allows debaters to engage with one another and move toward a common resolution. Perhaps one of the most interesting features is the mini-imbizos by means of which learners get to interact with one another and share ideas through breakaway discussions and by making use of social media.

Closing date for entries: 20 February 2015

Only 10 schools per province will be chosen.

Provincial workshops for all successful teams: 18 April 2015

Teams will attend workshops in their various provinces before start of competitions.

Provincial competitions: 16, 23 and 30 May 2015

Teams will compete against each other in their provinces.

National Final: 12 September 2015

The selection process

Due to its popularity and the fact that the competition is limited to 10 schools per province, each school has to submit a speech to be judged by external adjudicators. The schools per province participating in the 2015 competition will be shortlisted from these speeches.

Speeches must be submitted in either of the following formats:

- Written (400 words); or
- Voice recording (4 minutes + script of 400 words); or
- Video clip (4 minutes + script of 400 words)

The speech topic is the following: Do you think hydrogen fuel can be a competitive alternative to other traditional fuels?

Guidelines on the video, essay and voice recordings, as well as additional research information, will be provided to interested schools together with an entry form.

After the speeches have been submitted, the external adjudicator team will choose 10 winning entries per province. These schools will then enter the competition by participating in provincial workshops as well as competitions.

Interested?

To receive an entry form and detailed information, please send an email with your name, telephone number, school name and return email address or fax number to suma@mwebbiz.co.za.

Also visit www.saasta.ac.za or check in on our Facebook page – SAASTA Debates – for more information.

Contact details:

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International Year of Soils (IYS) 2015

2015 has been declared the IYS. You heard me right – the International Year of Soils.

Thobeka Gumedede

Maybe you have wondered what **SOIL** is? You may just think of it as something used to build a house on, plant vegetables in or even to build a soccer field on but it is so much more than all that.

Soil is composed of minerals, organic matter, air and water. Soil can be considered essentially as a non-renewable resource as its formation is very slow. Many scientists refer to soil as the mother of life, it brings out life in most organisms. Without soil we wouldn't survive!

Many organisations are working together to implement the IYS 2015. The global soil partnership is working together with the United Nations Convention and December 5th 2014 has also been recognised as the World Soil Day, emphasising the importance of soils.

The whole idea of the IYS 2015 is to increase awareness and understanding of the importance of soil to support food security

and essential ecosystem processes. Hopefully more people will come to understand the importance of soils and appreciate its value in our lives and that of our planet.

And remember, knowledge is the best way to start solving problems. Educate yourself about soils in 2015! Because knowledge is Ncah!

References:

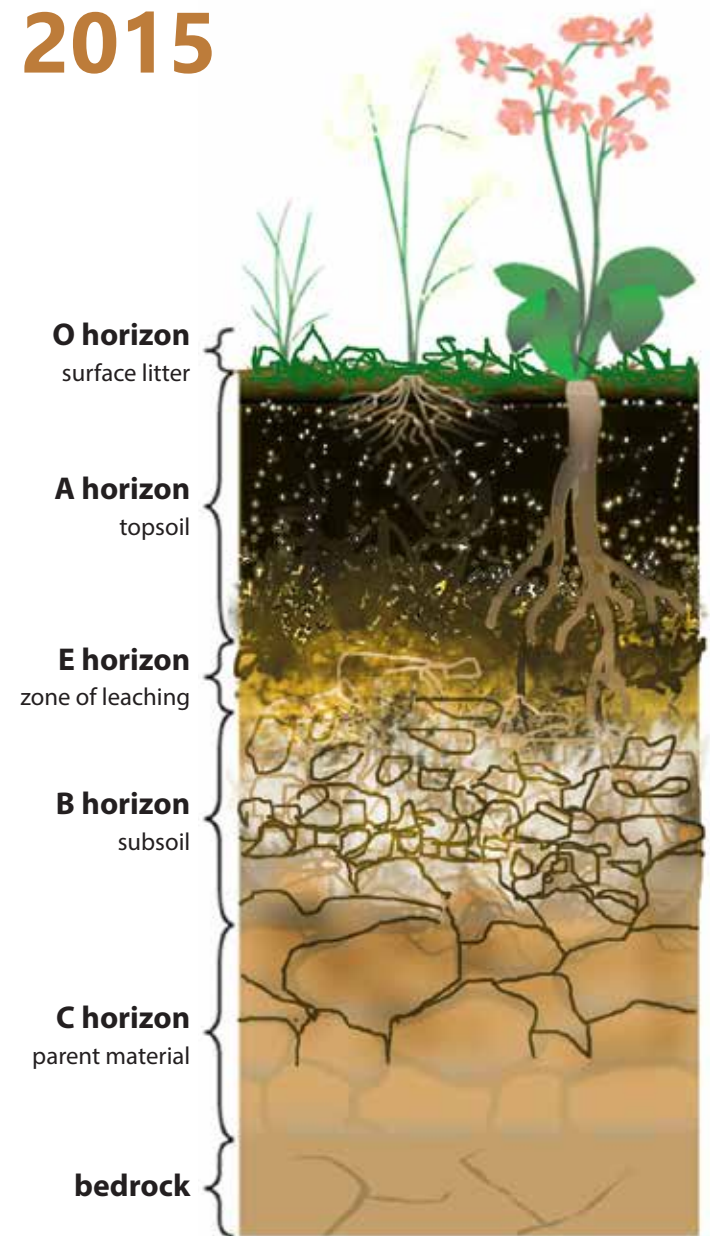
<http://www.fao.org/soils-2015/about/en/>
<http://www.fao.org/globalsoilpartnership/iys-2015/en/>

Definitions:

Biodiversity: the variety of life and natural processes found on our planet.

Food security: having reliable access to enough affordable, nutritious food

Ecosystem services: benefits provided by **ecosystems** that help make life possible and worth living. E.g. Wetlands which catch, store and clean water.



Every year on the 2nd of February we celebrate **World Wetlands Day**. It is a celebration of how wetlands, which are lands saturated by water, help maintain biodiversity on the Earth. The observance of World Wetlands Day began on the 2nd of February 1997.

Sindi Buthelezi

You are probably wondering where wetlands are found, right? Well you can find them near the sea or inland and they can be seasonal – they are water logged only during parts of the year and with some throughout the year. Wetlands play a super important role in the ecosystem – they:

- Absorb water, hence flooding is prevented.
- Ensure that the soil provides a unique breeding ground for vegetation that feeds fish.
- Provide animals with shelter.
- Purify water by removing waste remains.

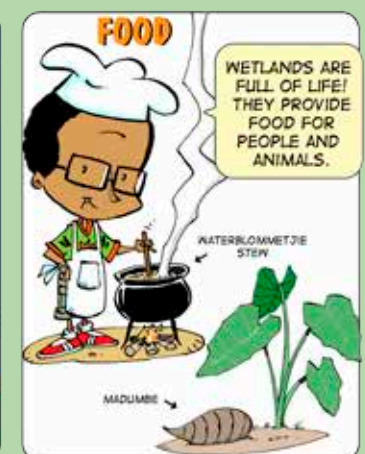
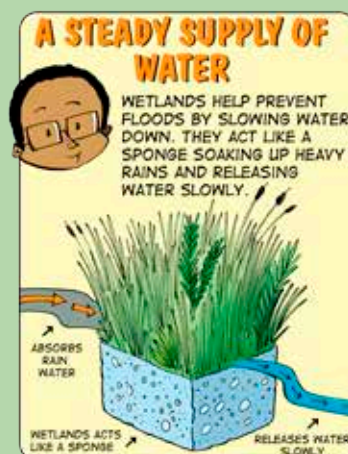
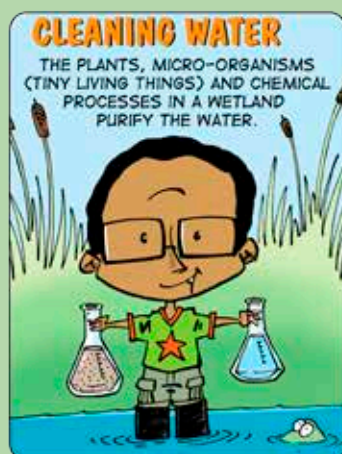
World Wetlands Day gets promoted on radio, TV, in

World Wetlands Day 2 February 2015

newspapers and even via our favourite platform, social media. The whole world, from government to community

groups (and even individuals), celebrates this day with exciting campaigns to highlight the importance of wetlands.

WHAT WILL YOU BE DOING ON THIS SPECIAL DAY? POST ON OUR FACEBOOK PAGE OR TWEET TO US...



Wetlands Poster, <http://www.pub.ac.za> created by Robert Inglis (Science Spaza) and Rico Schacherl

Hip Hop Science Spaza Gallery

National Science Week 2014



Gravity Fours

Science! science! science is a kind of feeling followed by a sense of healing, yeah, yeah!

I've got science in my class, chemistry in my class.

I've got science in my class is a kind of feeling followed by a sense of healing, yeah, yeah!

You're probably sitting there on your own,

You're probably listening to the song, its popping all over the radio

And suddenly you feel a lot of science, science

And suddenly you feel a lot of science, science.

Ionic Bonds

We've been rapping and rapping for Science Spaza now they clapping.

Heads are cracking and cracking and now they feeling headache.

So they need a medicine that has been crystallised and they try to analyse what I was saying.

Atomic Combinations

The energy of bonding's made by distance between nuclei:
The shorter be the bond length, the stronger is your bond.
The longer be the bond length, the weaker is the bond.

Chorus

Atomic combinations, atomic combinations
Electronegativity together with the bonding

Hleketani

Yeah life is a regulatory process, since we develop differently across different backgrounds we are united as one in science, we share the same concepts, same formulae, same units internationally so we also share the same opportunities

The Effect of Light and Soil on Biodiversity and "The Big Circle of Life"

James Ragedi, National Zoological Gardens

From the swimming piranha through to the running cheetah and the flying eagle, all animals are part of "The Big Circle of Life". All unique in their nature and yet connected with the entire whole, one learns to appreciate the variety of life forms that nature has to present. Every organism occupies an important niche in the ecological footprint contributing to a variety of ecosystem services served to humanity, and this life mosaic would not even exist if it weren't for light and soil.

Light has an influence on global climatic patterns that in turn determine soil and vegetation distribution. Well let's look at the rhino as an example. Rhinos are primary consumers utilising nutrients from grass and trees. Light and soil play a critical role in marking the beginning of food chains wherein the light provides energy for photosynthesis in plants while the soil provides nutrients and anchor for the growing plants. Going up the

trophic levels, predators and scavengers then control animal populations below their own trophic levels until those at the top die and decompose, giving nutrients back to the soil for the process to repeat again. It all begins with harnessing the power of light and soil.

This big circle of life is disrupted when species go extinct, creating missing links that threaten other species. This is why humanity needs to work towards conserving nature, because our ultimate survival depends on the survival of the whole.

With various conservation efforts in place to retain this big circle worldwide, The National Zoological Gardens of South Africa in partnership with other organizations plays its part in ensuring the relapse of endangered species from the brink of extinction. The NZG's Conservation Education Department has identified five endangered animals to be the focus of their conservation education programmes. These flagship animals include: Rhinos, the African Penguin, Vultures, the White-Winged Flufftail, and Pangolins.

Did you know?

- In October 2014 only six (6) Northern White rhinos were reported to be remaining in the entire world.
- All penguins are found only in the southern hemisphere and some species ingest soil and stones to assist in the digestion of their meals.
- Vultures are hygienic environment cleaners clearing off germs and pathogens by feeding off dead animals.
- The White-Winged Flufftail is now found in only two wetlands in South Africa and a few in Ethiopia. These birds are highly endangered due to wetland destruction.
- Pangolins are the most trafficked mammals in the world, hunted for bush meat and their scales that are falsely believed to have medicinal value.



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

Atomic Scientists

(winners of the Hip Hop Science Spaza Competition 2014)

We are the 'atomic scientists' (a group of four) coming from a semi-rural area in Polokwane known as Mankweng (which is sometimes called 'Turfloup'). We all study in the same class, grade 11 at Mountainview Senior Secondary School.

As mathematics and science learners, we are very curious about the modern and scientific world and believe that we have the ability to make a difference in the world. We have amazing aspirations in life regarding science that can lead to us taking science (chemistry in particular)



The Atomic Scientists are Maleto Bella, Sebati Jane, Shikwambane Musa, Ragedi Lindokuhle

to a higher level. We believe and see ourselves as inventors.

As much as we have a common passion in science, we all want to follow different career paths in future. Lindokuhle wants to

become a genetic engineer, Musa a medical pathologist, Jane is a born pharmacist and Bella would like to become a physiotherapist.

We are sure that there are other people that have the same dreams

and goals as we do, and that we can meet some through Science Spaza.

Yours faithfully
Atomic Scientists

Pampierstad High School, Northern Cape

We are from Pampierstad High School in the Northern Cape province and our science club is called "Grade 12 A Science club". After coming across Science Spaza's flyers, my friends and I decided to start this science club.

The main reason we started this club is because, we were a group of 6 friends and we were good at different things. Some of us were good at Maths and others in physic, etc. So we decided to start this club so we can help each other where we were lacking. Being part of Science Spaza

is very good. We realize that Science is really "cool" when we are working together.

From Science Spaza we received different activities, which we had to do throughout the year. And these activities required us to think out of the box sometimes. So this sometimes helped us to make logical judgements. Being part of the science club also made us realise that everything around us is science. Our class marks have improved dramatically since we started this club. After we have done a Science Spaza



Thato, Pampierstad High School, Northern Cape.

activity we pass them on to other learners and they were also excited to do them just as we were.

Riebeeckstad High School, Free State

I was motivated to become a member of Science Spaza after you gave us a short visit at school. The guys and I immediately understood the vision, which is to promote science in South Africa and give knowledge and inspiration to the majority of learners like us. Since I joined Science Spaza, I learned a lot about the field of science. I'm also proud to motivate other students to consider joining Science Spaza and grab this information and all at their disposal.



Riebeeckstad High School

I got to know about Science Spaza through my friends at school. I started reading the resource sheets and the Spaza Space. My friend, Innocent, and I decided to start our own science club. We have been receiving these resources and working on them, and they have helped, and improved, our science.

Spaza Space is something I cannot afford to miss out on as it brings science news to us. We also get to know what other clubs are doing. Thank you to Science Spaza for all that you have done for us at Riebeeckstad High School because Science is Ncah!

From
Simiso and Innocent



Vuyani Macala