

AFRICAN SCIENCE STARS



ISSUE 2



SAVE THE DATE

Annual Conference
and General Assembly of the
African Astronomical Society
14-18 March 2022
(AfAS-2022GA)

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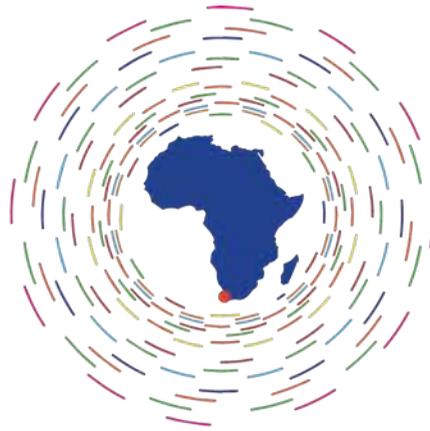
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XXXII IAU GENERAL ASSEMBLY
CAPE TOWN, SOUTH AFRICA, 2024



IN PREPARATION FOR THE 2024 GENERAL ASSEMBLY OF
THE INTERNATIONAL ASTRONOMICAL UNION

Forum on Astronomy in Africa



XXXII  GENERAL ASSEMBLY

CAPE TOWN, SOUTH AFRICA, 2024
www.astronomy2024.org



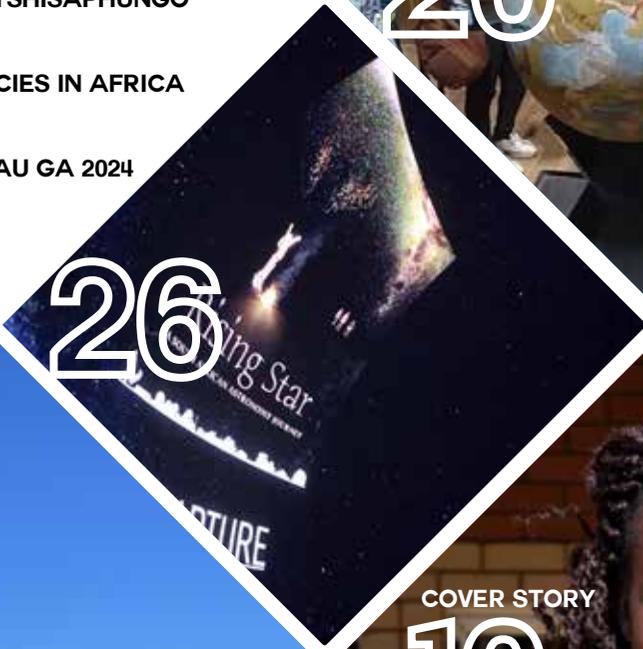
Find out more about the Africa Forum and
preparations for the 2024 IAU General Assembly:

www.astronomy2024.org

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// LETTER FROM THE EDITOR



A rather strange question came hurtling my way during the course of producing this edition of *African Science Stars* you hold in your hands. I don't know how to rephrase it but it went something along the lines of "What exactly is the point of astronauts? We have satellites up there, so are they just being paid to travel to space?"

It got me thinking, really. Besides their primary role being mission control and general observation during such trips, what stops us from replacing astronauts with robots? I am obviously downplaying their role and would like you to sit and examine the individual roles of each and every single person who works in the field of Astronomy.

In this issue, we outline a few career options as well as list some of the best African universities you can pursue these at. We even explore new gadgets and trends. Just going back to the matter of astronauts; I am sure you have already seen Sir Richard Branson jet off to space in his Virgin Galactic "spaceship" and there was also the super-rich Jeff Bizos following suit in his Blue Origin "spaceship". There is also South African-born Elon Musk with his Space X... Space is going to get really crowded pretty soon!

As early as next year people will be able to fly out to space for a whopping \$300 000 (US Dollars) per person. It will get cheaper. At present, its a trip no longer than two hours in which you go high enough to experience what it feels like to not feel gravity.

Beyond all these travel developments we also have to ensure that we, in the sciences, are thinking ahead when it comes to this. What does this sudden influx to space mean for us and Space Scientists in general?

It means opportunities. We are going to have to really think out of the box when it comes to what is next in our various fields. Think space tourism, think about how to open a business in space, think how to have space experience training centres right here on earth ... There is a lot.

As *African Science Stars*, we are all about Africa; if a future really exists out there in Space and one day we might have the opportunity to run this magazine from Space, we would like the whole of Africa to come along. Read about our recent visit to Botswana and how women in science are making some serious strides towards gender equality within the sciences. In visiting African countries regularly we also seek to find out what each country can contribute towards future space innovation? To do this we must also dig in to that particular country's history with Astronomy.

In this issue, we also go to Egypt where Dr Saad leads us into the world of Astronomy in Egypt. In the next edition, we'll cover another country so keep reading!

We hope that you will enjoy this edition and do feel free to write directly to me on unathi@sciencestars.co.za.

Unathi Kondife
Editor, African Science Stars



ASTRONOMY IN AFRICA IS ON THE RISE

Astronomy is on a very good growth path in Africa and this is providing several career opportunities for young students interested in the sciences and engineering.

You should be seeing more scholarship opportunities advertised on several platforms. The African Astronomical Society (AfAS) is progressing very well as a pan-African body that is advancing the interests of the African astronomy community and is embarking on several initiatives to take astronomy forward in the continent in partnership with the International Astronomical Union Office of Astronomy for Development (IAU-OAD) and the African Planetarium Association (APA). The Forum on Astronomy in Africa was successfully held from 27–29 October 2021 and the outcome is an audacious African vision document that will ensure better coordination of activities and legacy projects as Africa prepares to host the 2024 IAU General Assembly in Cape Town.

Here, in South Africa, we are currently working on the development of a national astro-tourism strategy that will guide us on how to maximise the benefits of the investments made in this sector to create more job opportunities and services. This will also create more awareness in the public about preserving the dark skies we have across the country so that future generations can also enjoy the beauty of the night. The MeerKAT telescope in the Karoo is undertaking great scientific discoveries and will continue to do so until it is fully integrated into the

SKA in the next 5–10 years. Infrastructure work is underway to prepare to expand the current 64-dish MeerKAT telescope with more dishes through a joint partnership between South Africa, Germany and Italy.

On 15 October 2021, the SKA Observatory signed hosting agreements with the governments of Australia and South Africa to host its telescopes and associated infrastructures. The agreement includes details on the incorporation of the 64-dish MeerKAT radio telescope into the SKA-Mid array, which will form an in-kind contribution by South Africa to the Observatory. On the rural development front, the Department of Science and Innovation (DSI) – led by South Africa’s minister of Higher Education, Science and Innovation Dr Blade Nzimande – launched the state-of-the-art green science centre in Cofimvaba in the Eastern Cape Province, known as the Albertina Sisulu Science Centre. This centre has a planetarium that will expose young learners in the region to the world of astronomy. This Science Centre is an educational facility that will house interactive exhibits and will use a hands-on approach to enable people of Cofimvaba and surrounding villages to experiment and engage with science. Science is being taken to the people!

Going back to the event I mentioned earlier, this is something I would encourage young researchers and those interested in Astronomy in Africa to diarise and follow closely – it is going to showcase African astronomy as well encourage active participation by African astronomers and those interested in the field. As we build up to this General Assembly, I am certain that *African Science Stars* magazine will keep you informed all the way. The magazine you hold in your hands is a very informative publication on recent developments in both astronomy and space science in Africa. I, personally, would like to see it growing to become a one-stop resource for public engagement on science matters.

Also, keep an eye on the 2021 Science Forum that takes place from 1–3 December 2021. The theme for this year is “Igniting conversations for World Science Forum 2022” and I particularly look forward to the African astronomy session on the programme. I could go on, but I am certain this edition of *African Science Stars* will give you more extensive news, insights, profiles and updates on some of the African Astronomy advances that are taking place.

Takalani Nemaungani

Acting Chief-Director for Astronomy,
South African Department of Science and Innovation

TRENDING IN THE WORLD OF SCIENCE ACROSS AFRICA

By: Zakiyah Ebrahim



Here are some of the latest developments and discoveries from multiple areas of science across Africa.

CUTTING-EDGE COMPANY USES DRONES TO DELIVER COVID-19 VACCINES IN GHANA

A cutting-edge company, Zipline, has made it possible for Ghana to become one of the first countries in the world to have Covid-19 vaccines delivered to hundreds of health centres in its most remote areas. *France24* explained that each drone can carry enough doses to vaccinate 2 000 people in each location. The drones use precise GPS coordinates of the place of delivery. It takes, on average, 30-40 minutes for the trip from the warehouse to the health centre. The programme is financed by Ghana's government.

Sources: France24, Africa News

EGYPT PLANS TO LAUNCH FOUR SATELLITES BY 2022

Egypt will launch four CubeSat satellites by 2022, the Egyptian Space Agency (EgSA)'s CEO Mohamed al-Koosy announced in August. The country plans to use it for scientific research purposes and is part of their strategy to develop the peaceful use of space sciences and technology. One of them weighs about 1.3kg and is equipped with a camera to take pictures.

Sources: Egypt Independent, Daily News Egypt

SA RESEARCHERS MAY SLOW DOWN RHINO-POACHING

African rhinos are one of the continent's greatest natural treasures, but they are critically endangered due to illegal poaching. Thanks to researchers from Wits University and its partners, a new project

using harmless radioactive isotopes injected in a rhino's horn may stop poaching attacks. The project is headed by Professor James Larkin, who explained that small numbers of this radioactive material will make the horns detectable through thousands of monitors installed at airports, ports and harbors around the world.

Source: Wits University

SCIENTISTS FIND THAT ASTEROID THAT HIT BOTSWANA IN 2018 WAS 22 MILLION YEARS OLD

On 2 June 2018, a small asteroid hit the Kalahari Desert of Botswana, and now, more than three years later, scientists have finally discovered its origin. Named 2018 LA, the team of scientists suspect that the space rock originated from Vesta, the second largest asteroid in the solar system. It originally measured about 1.5 metres in diameter and had been moving around in space for around 22 million years before crash-landing on Earth, the team said.

Source: Australian National University

A STARTUP APP IS IMPROVING HEALTHCARE IN EASTERN DRC

An application created by Bienvenue Zigabe is improving healthcare services in Goma, in the eastern Democratic Republic of the Congo (DRC), by allowing people to have quicker access to medical services. Named WiiQare, it helps patients pay for treatment and medication, such as for malaria, using their savings or on credit. It is already used by several residents and has positive reviews. Such an app is important in countries like the DRC where access to healthcare is often delayed due to a lack of money, which, sadly, leads to many cases of death or serious injury.

Sources: Healthcare Africa, Africa News

AFRICAN SCIENCE STARS TREKS TO SUTHERLAND

We're up bright-eyed and bushy-tailed on a Wednesday morning in Sutherland, in the Namakwa District of the Northern Cape.

By: Lusanda Tamesi

Our first stop is the South African Astronomical Observatory (SAAO). We have to get there before all dignitaries do. We set up our camera and choose the best seats to ensure we capture it all for this *African Science Stars* Astronomy edition.

What a sight to marvel. This is home to the biggest optical telescope in the Southern hemisphere, the Southern African Large Telescope (SALT). While waiting, we learn that the Observatory has initiated direct and indirect opportunities for the community, some of which include 200 bursaries that will cater to the youth of Sutherland who want to study mathematics- and physics-related courses at tertiary institutions.

The dignitaries arrive. We see the Premier of the Northern Cape, Dr Zamani Saul. There is also Dr Clifford Nxomani (the Deputy CEO of the National Research Foundation), Takalani Nemaungani (Acting Chief Director of Astronomy) and Doreen Februarie, an Independent Public Participation Consultant commissioned by the University of Cape Town.

With the Astronomical research in South Africa celebrating 200 years of existence and astro-tourism, the South African Astronomical Observatory (SAAO) expanded on its community initiatives.

"We are grateful to the officials of the South African Astronomical Observatory as well as the National Research Foundation for hosting us on what has been a very insightful visit," said Dr Saul, who went on to appreciate the professionalism of the "energetic and intellectually agile SALT SA Project Engineers and Scientists that are creating a name for us worldwide in the field of astronomy!"

In having SALT in the Northern Cape, there is also the guarantee that the province's name will forever appear in scientific journals. "We will continue with collaborations with the SAAO and SALT for the benefit of the community, especially the youth," added the Premier. It was a day filled with much applause and excitement for the Sutherland community. It truly was a case of a large-scale project filtering down to benefit the surrounding community. In so doing, we are certain that the residents will also value and protect the SALT area. It is after all theirs and will soon benefit 200 of their brightest minds.

The next day was off to a busy start. Little did we know it would be quite an emotional experience for all participants. Activities

commenced with a visit to the local computer centre. It was more to showcase what the community has at its disposal.

We then witnessed a meeting between Dr Saul and the descendants of nine individuals who were unethically removed from their graves in the Sutherland district and provided to the University of Cape Town for research purposes in the 1920s. "Culturally, when a person endures hardships, the only way to connect with your ancestors spiritually is to visit their gravesites," said Dr Saul, as he listened to the painful story of graves being removed.

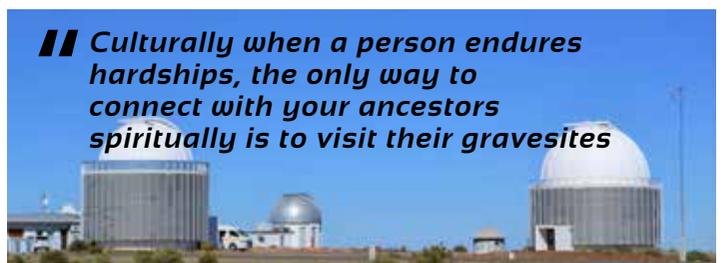
We met Alfred Stuurman (58), a descendant of one of the families whose graves had been removed. He shared with us his wish to visit his forefather's grave, Dawid Stuurman. Before this day that dream seemed quite impossible for him. But upon learning about plans to rebury their family members, there was much excitement. The process of repatriation has been set in motion.

"I know the history of Dawid Stuurman now! And I have hope that one day I can be able to walk to the graveyards without hesitation," said Stuurman.

Plans for the re-burial were planned for much earlier in 2021 but were delayed by the Covid-19 pandemic. Dr Saul apologised to the families present for the delay and reiterated the government's continued commitment to this process to ensure that the Abraham and Stuurman families, and the community at large, find closure.



// Culturally when a person endures hardships, the only way to connect with your ancestors spiritually is to visit their gravesites



MEET MOLLY

Molly Kgobathe is a science whiz who has achieved a lot at the University of Botswana and is a member of the Astronomical Society of Botswana.

By: Unathi Kondile

“I found that by studying the cosmos beyond our own planet, we can understand where we came from, where we are going, and how physics works under conditions which are impossible to recreate on Earth. I remember thinking how GREAT and beautiful is the Universe,” says an excited Kgobathe, who is an academic assistant at the University of Botswana’s Computer Science Department. She is also the Events Secretary for the Astronomical Society of Botswana (ASB) and the International Astronomical Union’s National Outreach Coordinator for Botswana.

Molly Nkamogelang Kgobathe has gone as far as enrolling for her Masters in Computer Information Systems at the University of Botswana (UB). Before that she completed a Bachelor of Information Systems and then did a Professional Graduate Diploma in Education (PGDE) in Computer Studies, all at UB.

Kgobathe was born in 1985 in Maun and her family moved to Qangwa. She started primary school in Nokaneng in the north western region of Botswana. She later transferred to Orapa, where she completed her primary education and completed her Junior Secondary School. For senior school she went back to her birthplace Maun where she attended boarding school for Senior Secondary School and completed her Botswana General Certificate of Secondary Education (BGCSE).

Whilst studying at the University of Botswana, Kgobathe was introduced to the Astronomical Society of Botswana (ASB) and immediately fell in love with astronomy. There was no turning back.

We, at *African Science Stars*, have heard quite a lot about this scientist who also lectures at UB. We would like to introduce you to some of her work and key thinking around STEM, data science, astronomy, women in science, travels abroad, personal awards and her tips for first year students at University.

Unathi Kondile (UK): *What you are currently doing? Tell us a bit about your research work?*



“Our only limit is our imagination”

Molly Kgobathe (MK): After many years of being fascinated by the data science and the love of big data analytics, I have just completed my dissertation titled “Integrating Personal Identification Systems: A Data Warehouse solution for Botswana” – for my MSc in Computer Information Systems. It only seems like the right thing to do to be part of the teams driving scientific mandates of educational engagement on the STEM and research projects collaborating Astronomy and Computer Science in Botswana. Through the ASB we have been working on a couple of astronomy outreach projects and astronomy curriculum development for grassroots level.

UK: *Beyond data science and analytics, what fascinates you?*

MK: I have always been fascinated by the stars and the data collected beyond the clear skies. I love data science ... and the collaboration between the two areas of interest drove me to engage more on the Astronomical science. We, at the ASB, are currently working on several projects to increase knowledge and awareness of Astronomy among the youth. The aim is to get youth interested.

UK: *Why get youth interested?*

MK: Understanding how things work, conducting research and problem solving are what drive me. As a young girl, I got in trouble for breaking things apart to try to understand what makes them tick.

I am always identifying a problem and wanting to know what the best solution is. Is it applicable? How do we apply it? That's what has always driven me to do research. My involvement in the astronomical sciences was influenced by my involvement in the high performance computing (HPC) systems. In all my engagements of Data Science relations, I got to realise that most of the simulation of astronomy are run on the HPC facility.

It is at some international conferences that my childhood dream of one day visiting Mars was inflamed; the child in me was awakened. I was taken back to my childhood where we watched thought-provoking movies about extraterrestrials, went on school trips where we used to lie around the fire at night reading the stars and watching Mars mission documentaries. I found the science and technology behind these accomplishments nothing short of magic; testament that, indeed, man is without bounds. Our only limit is our imagination. The moment I got to understand Astronomy, I wanted to do outreach on it – it's exposure that every child needs.

UK: *You have spent most of your tertiary years at the University of Botswana. What advice would you give a young person or a first-year student?*

MK: For a first year student, my advice would be to develop a healthy appetite for learning; an enthusiasm for their chosen area of study and get excited. Once one gets to the University Science Block at the University of Botswana, or whichever university, it is useful to pick a winning team that encourages good academic performance because moving with the wrong crowd can kill one's dreams. Also one should not be afraid to approach academic staff to seek assistance. As for study methods, one should just stick to what works for them – after all it has brought most of us thus far. Lastly, keep the faith and stay disciplined.

UK: *In 2019 you were awarded the ISC Travel grant. Tell us a bit more about how you got the grant and what the actual prize entailed?*

MK: It was an open opportunity advertised internationally. I had volunteered in the UB computer science HPC team and we were doing the HPC server administration. I also had subscribed to the SADC HPC ecosystem, did a couple of HPC MOOCs.

Then, along the way, myself and a colleague managed to rope in a few ladies to start the Women in HPC Chapter for Botswana. We went around government schools doing outreach about the HPC technology to our younger generation in schools. So when I saw the opportunity advertised I simply tried my luck by sending in an application. All credit goes to our number-one mentor Dr Motshegwa, who is always pledging for his students to be given exposure to international conferences. I would also like to give thanks to the computer science department and the University of Botswana for allowing us to be exposed to such.

UK: *What would you say was new to you in your travels? What stood out or what is that one thing you never knew that you would say you now know and are enlightened about in your field of work?*

MK: I was excited to visit the Germans, as their dedication to technology and engineering is something I admire most. Since it was my first time in Germany I was not aware that most of the citizens there knew less English than I thought. There was a language barrier

every time I tried to ask for assistance. The conference was very well organised. They invited many speakers – from the keynote speakers, workshop facilitators and the MC, everyone knew their content and they were very articulate. Every event started on time daily.

In a nutshell, it was all beneficial to me and the other travel grant recipients, my university and my nation at large and the ISC sponsor. The incentives that came with the ISC travel grant was for travel, accommodation and food at the conference. I also had access to the conference itself and almost all workshops. I was also given a few mentors to assist me around the conference and with giving advice on directing my career path based on their lived experiences. It was such an honor to be a part of the ISC. I was very excited and happy about the opportunity.

UK: *What is your overall experience as a woman in the sciences? Please share your personal positive and negative experiences.*

MK: In my experience, it's not easy being a woman in the sciences. Most of the organisations give more implementable and paying opportunities to men, while females are given more volunteering opportunities (and not those that pay well) so they could prove themselves first. As women, we also need to be trusted with good opportunities and careers in the science field. Women are the pillar of the nation.

UK: *What is your ultimate career goal? Where do you see yourself in the next 20 years?*

MK: My long-term goal is to be an expert in computer sciences cyber security and astronomical sciences. I aspire to secure admission to pursue PhD combining the three areas innovatively. I hope to be engaged in the national and international research programmes and projects that could assist the society in feeling the impact of ICT on global issues.

I hope to be engaged in drafting policies and curriculum to suit the present ICT life-related solutions in Botswana and internationally, which will build onto capacity building and outreach more on the latest technologies which need to be engaged.

UK: *Lastly, just as an afterthought, is there anything you would like to dispel about the sciences or studying towards a science degree?*

MK: I believe everything is difficult only if you have never been taught or exposed to it earlier. The only thing difficult about science is that most of the streams are only met at university level within our country. If only international science could be introduced at grassroots level with all resources availed equally between rural and urban areas, such that it prepares all students, even those from rural areas, well enough for the current scientific trends. If we could get this right, we wouldn't be talking of science as difficult.

UK: *Last question (really now). Is there anything else you would like to add about the work that you are currently doing?*

MK: Astronomy supports the well-being of many STEM professions including the computer science professions. So I would recommend any computer scientist to venture into Astronomical Science. To a child with dreams, just engage in anything you're passionate about so you do not regret your experiences. Volunteerism opens doors for many opportunities so since STEM is broad, find what you enjoy and do it effortlessly. Like most researchers I am on the research gate. That's where you will find me.

“As women, we also need to be trusted with good opportunities and careers in the science”

TOP 10 ASTRONOMY UNIVERSITIES IN AFRICA

By: Lusanda Tamesi

Have you ever wondered how universities are ranked? What is a university ranking? How are they judged? And how can you use these rankings to help you choose a university?

These rankings try to answer questions like: Is the university licensed? Are they accredited by the appropriate organisation for higher education?

The way you choose a university should not be shaped by its results or pass rates alone. Statistics do not always show you the full picture of the university's courses or how students live on campus.

University rankings are based on many factors, some of which are teaching quality, research performance, citations (researchers influence on society), international outlook, industry income and alumni employment rates.

Among the 19 African universities listed by EduRank based on the quality of their research in Astrophysics and Astronomy, we have decided to give you the Top 10 Universities.

1. University of Cape Town (UCT)

#1 in Africa
#1 in South Africa
#83 in the World

UCT is a multicultural, public research university located in Cape Town, South Africa. It was founded in 1829 as the South African College, and is now rated as the number one for Astrophysics and Astronomy research. UCT is the highest ranked university in the QS World University Rankings, the Times Higher Education World University Rankings, EduRank and Academic Ranking of World Universities.



2. North-West University (NWU)

#2 in Africa
#2 in South Africa
#1001 – 1200 Global World Rankings

NWU is a public research university founded in 2004 in Potchefstroom. It is ranked number two in Africa and South Africa for Astrophysics and astronomy. This university is home to the MAT telescope located on its Mahikeng Campus.

3. University of the Western Cape (UWC)

#3 in Africa
#3 in South Africa
#293 in the World

UWC was founded in 1959 as an institution of higher learning for black people in South Africa. It aims to inspire equality through teaching and research. UWC has a wealth of alumni, including Professor Emmanuel Iwuoha who conducts research on smart materials. In cooperation with MeerKat, UWC researchers are involved in developing several large galaxy surveys.

4. Pedagogical University (The Maputo University)

#4 in Africa
#1 in Mozambique
#298 in the World

Pedagogical University is in Maputo, Mozambique. Maputo University (UniMaputo) was founded in 1985 as a Higher pedagogical Institute (ISP). Maputo University majors in physics and chemistry.

5. University of KwaZulu-Natal (UKZN)

#5 in Africa
#4 in South Africa
#404 in the World

UKZN was formed in 2004 and, according to The World University Rankings, ranks between 351 – 404 on the World University Rankings category with a 58:42 student ratio of females compared to males.

6. University of Witwatersrand (WITS)

#6 in Africa
#5 in South Africa
#457 in the World

The university is renowned for its global humanitarian efforts and focus on innovation for the Fourth Industrial Revolution. This is the oldest South African university and was first named South African School of Mines when it was established in 1896. WITS houses 28 South African Research Initiative (SARChI) Chairs and six DST-NRF Centres of Excellence.

7. Rhodes University (RU)

#7 in Africa
#6 in South Africa
#801 – 1000 Global World Rankings 2022

This university was founded in 1904 and is located in Makhanda, South Africa. Rhodes University is one of the top public universities. Rhodes has a considerably long legacy in astronomy education.

8. University of the Free State (UFS)

#8 in Africa
#7 in South Africa
#590 in Global rankings

A public higher-education institution, UFS was established in 1904 and is located in the urban setting of the midsize city of Bloemfontein. Besides its observatory and planetarium, the university is the only institution with access to two observatory projects in South Africa: The Boyden Observatory and Science Centre and Old Lamont-Hussey Observatory.

9. University of Nigeria

#9 in Africa
#1 in Nigeria
#616 in Global Rankings

The University of Nigeria Nsukka is a federal university in Enugu State, known as UNN. It was founded in 1955 and has a teaching programme for astronomy and research in astrophysics. The university has a Space Science Research Centre at the Department of Physics and astronomy.

10. University of Johannesburg (UJ)

#10 in Africa
#8 in South Africa
#401 – 450 in Global rankings

This is the largest residential university in South Africa. UJ was established in 2005. It has ranked 61st in the 2019 QS BRICS World-Class University Rankings.

NAVIGATING THE TYPES OF TELESCOPES

By: Lusanda Tamesi



Under the clear skies on a rocky arid outcrop, far away from the clustered town with light pollution, I needed some "time off" from everything. To my surprise, something shiny in the sky caught my attention. How can I get a clear and closer view? Why are those shiny objects forming a box?

"You need a telescope for a clearer view," said a passerby.

But, which telescope would be best?

It all comes down to how much money you are willing to spend on a telescope. Which telescope do you think would be ideal for you? Are you driven by brand names? What exactly do you want to look at with this telescope? Are you looking to search for fuzzy or faint celestial objects? And then there is size. What size would work best for you?

In the family of telescopes we have radio telescopes, x-ray telescopes, gamma-ray telescopes and optical telescopes. There are different types of telescopes – big, small, professional astronomy ones and those for amateur astronomers. Our focus will be on optical telescopes that you can even use at home – in your backyard.

Refracting telescopes

Also known as dioptric telescopes, these are optical telescopes used by professional astronomers. They are often big and expensive. They are convex in the eye and concave in the end. Their main categories are Achromatic and Apochromatic.

Pros:

- Easy to use since adults can use it while sitting and kids can use it with ease as the eyepiece is placed at the bottom instead of on top
- It's sturdy, made of harder material
- Easy to maintain
- Lenses do not require much maintenance

Cons:

- Chromatic aberration (achromatic refractors suffer from chromatic aberration, can produce an inexact series of colours thus affecting image quality that is solved by apochromatic refractors)
- Pricing depends on how big the lenses are – the bigger the



refractor, the more expensive the cost of an aperture - The weight can be a challenge – some of these are longer and heavier thus making it difficult to transport.

Compound telescopes

The "topdog" of telescopes – catadioptric or compound telescopes are hybrid telescopes that mix refractor and reflector elements in their design. They are named after German astronomer Bernard Schmidt, who made the first compound telescope.

Pros:

- Compact size (light, and easy to carry)
- Great optics

Cons:

- High price
- Collimation and maintenance



(Image credit: Meade instrument)

An observer with a bubbly personality that pinpoints star images giving off detailed planetary observations. Meade ETX90 Observer is good for traveling, observing terrestrial life and astrophotography. This darling cannot rest as it gives off close-up views of planets and star clusters and audio that is over four hours; educating you on what you are observing with its AudioStar GoTo system built-in speaker. The Meade can make observations exciting, whether from your backyard or on the go.

Optical design: Maksutov-Cassegrain
Mount type: Motorized fork mount
Aperture: 3.54" (90mm)
Focal length: 49.21" (1250mm)
Viewfinder: Red Dot
Weight: 18.96lbs (8.60kg)



TELESCOPES IN AFRICA

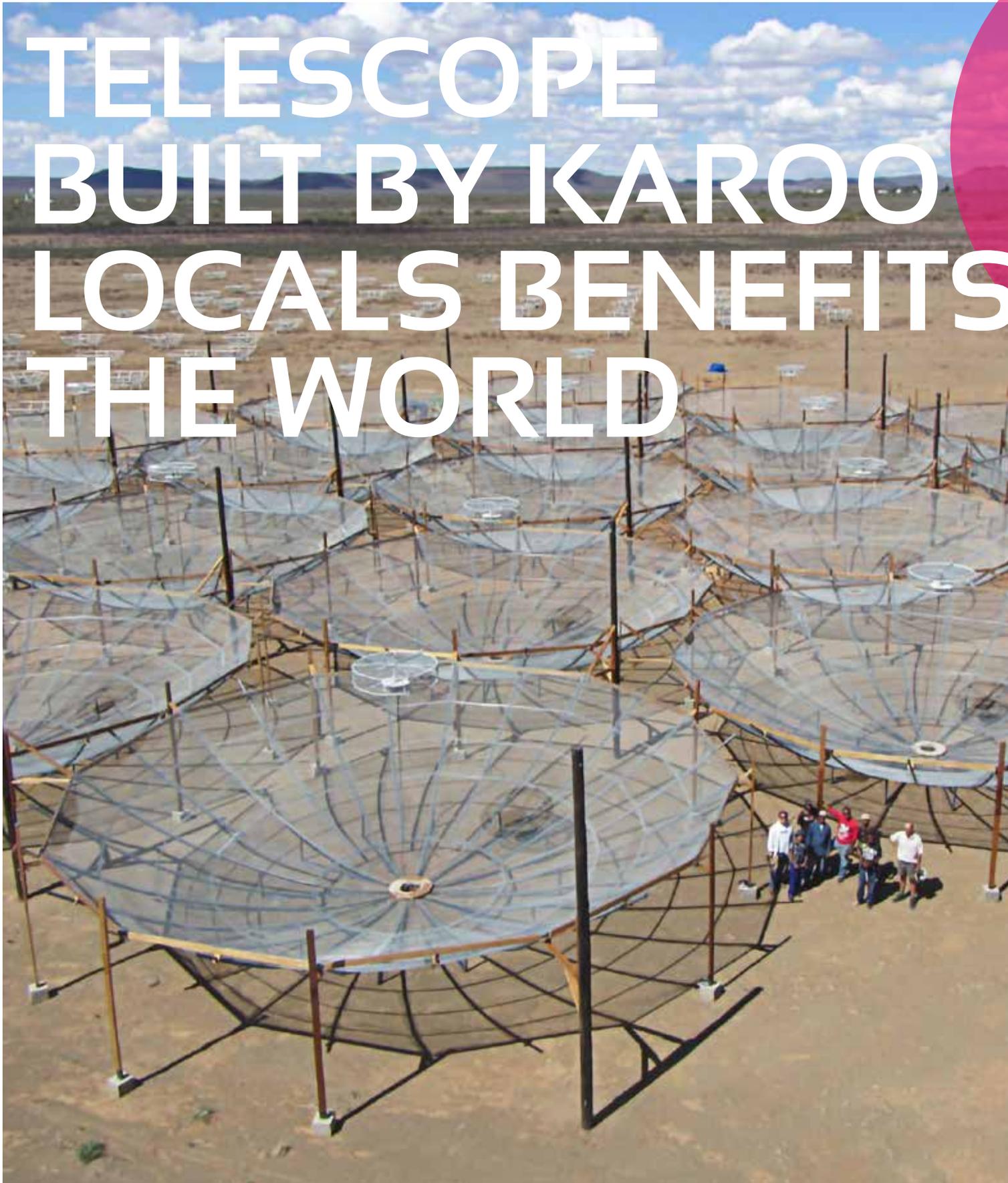
- * Southern African Large Telescope (SALT) in SA
- * The Telescope of Kottamia Observatory in the Middle East
- * Hess Optical Telescope in Namibia
- * Marly Telescopes in Burkina Faso
- * MOSS in Morocco
- * Nigeria Radio Telescope
- * Ghana Radio Telescope in Accra

What to avoid when working with telescopes

- * Avoid looking directly at the sun (unless you have a solar filter) with the naked eye or an optic. This may result in permanent or irreversible eye damage.
- * Avoid directing your optics towards the sun.
- * Keep your optics supervised at all times.
- * Make sure an adult is with at all times, especially if there are children present.



TELESCOPE BUILT BY KAROO LOCALS BENEFITS THE WORLD



The Hydrogen Epoch of Reionisation Array (HERA) radio telescope is an array of 350 antennas situated next to MeerKAT in the Northern Cape province of South Africa.

The HERA telescope has now released its first set of observations to the world, giving a glimpse of what the Universe looked like about 13 billion years ago.

A team of four Carnarvon-based artisans began construction of the HERA telescope in early 2015. The team was supervised by Cape Town-based Kathryn Rosie – HERA Project Engineer at the time, and Matthys Maree (Carnarvon) – at the time filling in as construction supervisor. “Construction of the array is phased in such a way that, as antennas are completed, they are hooked into the telescope data correlation system. This enables observations and early science to be carried out while construction continues,” says Rosie. After the initial construction, Phase I observations were carried out in 2017-2018 throughout the Southern Summer using about 50 dishes.

HERA is an array of 14-meter diameter dishes, packed closely together and pointing straight up at the sky. The telescope detects radio frequencies from outer space similar to the ones used in our FM car radios. It is built using wooden poles, a PVC-pipe structure and wire mesh, but this deceptively simple set-up hides a state-of-the-art technology that makes it possible for astronomers to peer into the universe deeper than ever before.

A US-led project, HERA is a large international collaboration, with a strong South African participation, from construction to science. The goal of HERA is to observe how the first structures formed in the very early stages of the Universe, as the first stars and galaxies lit up space.

The South African Radio Astronomy Observatory (SARAO), the hosting organisation and contributing partner in the broader HERA collaboration, is responsible for providing the necessary construction management, systems engineering, location, power and fibre networks needed to operate the HERA instrument. The original building team in Phase I grew from four artisans to over 20 people with, at most, a matric qualification but a lot of excellent experience, all from the local town of Carnarvon.

Currently for Phase II, the building team comprises 10 artisans.

Astronomers are eager to understand how the universe reached conditions for the very first stars and galaxies to form and HERA will help them understand how it happened. “Even the most powerful optical and infra-red space telescopes like the Hubble Space Telescope or its upcoming successor, the James Webb Space Telescope won’t be able to look that far back in time. That is one of the reasons why radio astronomy is so important,” says Prof. Mario Santos, currently representing SARAO on the HERA board.

Accompanying the Phase I data release, a few scientific journal articles were co-authored by scientists from the University of the Western Cape, Rhodes University, and the University of KwaZulu-Natal along with the international team. One of the papers presents the most sensitive upper limits to date on the strength of the signal we can detect from the Universe at around 66 million years after the Big Bang.

The lead scientist behind this paper, Dr Nicholas Kern, currently a postdoctoral fellow at MIT, says “this analysis is a big step in demonstrating HERA’s unprecedented sensitivity going forward as construction is completed: with only a couple of weeks of data from the array at fractional capacity we are already producing world-leading limits”. A second paper further elaborates on the implications of those upper limits for models of early universe star and galaxy formation.

Nearly six years after construction began, the array stands at a total of 332 dishes with the remainder planned to be completed in the coming weeks. “Commissioning and construction activities are progressing well, we are currently conducting a logistic and support analysis to ensure smooth operations for the coming seasons in order to facilitate future discoveries,” adds current project engineer Ziyaad Halday. “The upcoming observations with the enhanced HERA array should allow us to observe the lighting up of the very first stars after the Big Bang,” says Dr David DeBoer, HERA Project Manager, from the University of California, Berkeley.

With this data release begins a new adventure of unveiling the mysteries of the early universe, thanks to the skilled hands of Carnarvon artisans.



TECH IT TO THE TOP WITH THESE TOOLS AND GADGETS THAT ARE TOO COOL TO RESIST!

We've rounded up some of the most intriguing tools and gadgets, suited for different budgets and interests.

By: Zakiyah Ebrahim

Nintendo's Game & Watch – Super Mario Bros. Edition

The original Game & Watch system was first released in Japan in 1980. It was the very first handheld gaming console created by Nintendo. Now, you can get your hands on this fantastic piece of history. The limited-edition product was released for the 35th anniversary of Super Mario, and is only available until stocks last in 2021. It's literally three prior Nintendo games and includes a digital clock! Retails for R1 299 on Takealot.



Smart beanie with built-in bluetooth headphones

Can you imagine having a beanie that keeps you warm while allowing you to rock to your choice of music? The stylish knit-beanie with built-in bluetooth headphones brings you all these benefits, with practicality. It's perfect for use while you're on the bus or when going for a walk. With up to six hours of playtime and removable speakers that makes it washable, we can totally understand the hype around this product! Retails for R450 on Takealot.



Snap Circuits mechanical coding robot

Are you curious about the fundamentals of coding and engineering in a fun and enjoyable way? Look no further than this hands-on robot. The Mech-5 is a one-of-a-kind, entry-level Mechanical Coding Robot. According to its description, it's designed to inspire young engineers to learn about mechanical engineering principles and coding basics. This STEM gadget is constructed in a way that it can throw, lift, kick, draw and more! Available on Amazon for \$34.99 (around R500, excluding shipping fees to South Africa).



Doodling robot

If you're keen to build your own creative robot with mechanical and scientific powers, you might want to check out the doodling robot. It incorporates vibration and spin – generated by its motor – to create cool works of art. You can adjust the angle and height of the robot's coloured pens and observe it do its magic. The kit comes with the parts and pens, and is a fun-filled activity for users both young and old. Retails for R499 on Takealot.



Echo Dot

The Echo Dot device is definitely one to keep on your radar! The popular accessory is the perfect addition to any teen and young adult's nightstand. It has an LED display that shows you the time, temperature and even has a countdown timer. Even better, it is equipped with bluetooth and Wi-Fi connectivity, comes with an incredible speaker and is Amazon-Alexa-enabled with multiple voice control features. Fill your room with music, set timers, ask questions, add items to lists, create calendar events, check the weather, play the news, access thousands of Alexa skills like Headspace or Sleep Sounds, and so much more – all with just your voice. Retails for R1 086 on Takealot (Amazon).



SPACE AND ASTRONOMY **FULL DOME** DIGITAL THEATER



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Sutherland Planetarium is located in the centre of Sutherland en route to the Southern African Large Telescope. It is the latest and only privately owned Digital Planetarium in South Africa.

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South Africa


SUTHERLAND
PLANETARIUM

ASTRONOMY IN EGYPT



Dr. Somaya Saad

All you need to know, from the history and latest developments to the country's best universities and more.

The history of astronomy in Egypt dates all the way back to 7 000 years ago, since the ancient Egyptians built temples and pyramids on scientific bases and full knowledge of the original directions.

The major applications of early Egyptian astronomy are clearly seen in the orientation of sacred buildings towards the true north, which was identified using the night sky stars. Sirius heliacal rising is another phenomena that was noticed and connected to the flooding of the Nile and was used by ancient Egyptians to know the beginning of the year.

The phenomenon of the sun orthogonality on the face of Ramses II in Abu Simbel temple in southern Egypt in specific two dates of each year indicates the ability of the ancients to follow the movement of the sun and measure its height on the horizon throughout the year and to distinguish the seasons, including the appropriate times for cultivation. They recorded this on the wall of the temples and passed it down for generations.

In the modern era, it can be said that the Egyptians considered astronomy a comprehensive science, and they were interested in building the observatories. The 30-inch telescope still attests to that period, it is affiliated with the National Research Institute of Astronomical and Geophysical (NRIAG) in Helwan, Cairo.

The institute is one of the oldest research institutes in Egypt, the Arab world and North Africa, as it was established in 1903. It is considered as the largest expert house in the fields of astronomical and geophysical sciences.

Due to the urban sprawl in the city of Helwan, an optical telescope with mirror diameter of 74 inches has been built at Kottamia mountain ~ 450 m above the sea level in the eastern desert, 80km from Cairo, and began its function in 1964, the telescope has 3 foci



and is used for imaging the clusters and galaxies and perform the / spectroscopic observations of variable stars.

In 1995 the telescope was upgraded and became fully automated. An upgrade stage included a new optical system, mirror and 2kx2k CCD Camera and a computer controlling both the telescope and dome NRIAG has a number of astronomical observatories such as solar observatory, solar spectrum stations, solar radiation, solar energy, a satellite monitoring and tracking station.

Since its establishment, the Institute has also participated in many scientific programs and international research activities in cooperation with a number of international centers and institutes. The Education of astronomy before the university stage are not

common and it starts at university level. Each of the Departments of Astronomy, Faculty of Science at Cairo University, Al-Azhar University, the Space Weather Department, Faculty of Science at Helwan University, along with the departments of Astronomy at the German and American universities as well as Zewail University are the most concerned with teaching astronomy in Egypt.

The Institute issues a scientific journal in the fields of astronomy and geophysics and also issues the astronomical guide and the Hijri calendar, which includes the times of astronomical phenomena, the beginnings of the Hijri months, prayer times, seasons and religious holidays.

The Institute also hosts the Arab Association for Astronomy and Space Sciences, which is one of the scientific associations affiliated with the Arab Science Councils, which operates under the supervision of the League of Arab States. It supports scientific activities in the fields of astronomy and space sciences. Egypt was one of the first countries to join the International Astronomical Union in 1925.

Egypt hosted the International School for Young Astronomers in 1980, 1994 and recently in 2018. It also cooperates with neighbouring countries in organising workshops and scientific schools for the post-graduate level.

During the next decade, Egypt is seeking with great strides to build a new telescope with a diameter of about 6 meters, and for this, we now seek to find a good site suitable for building the new telescope.

Due to the apparent passion for knowing the universe and the celestial bodies, many astronomical clubs and societies are spreading in the republic, this is besides some of the initiatives aiming to increase the astronomical awareness. Specialists and some amateurs contribute to teaching through many organised activities. There is a planetarium that offers suitable shows for all ages and raises the level of awareness among children and youth. There are many entities that communicate with the public and amateurs, such as amateur astronomical associations, exploration centers, cosmic villages, which contains museums with models of astronomical instruments, telescopes and exhibitions.

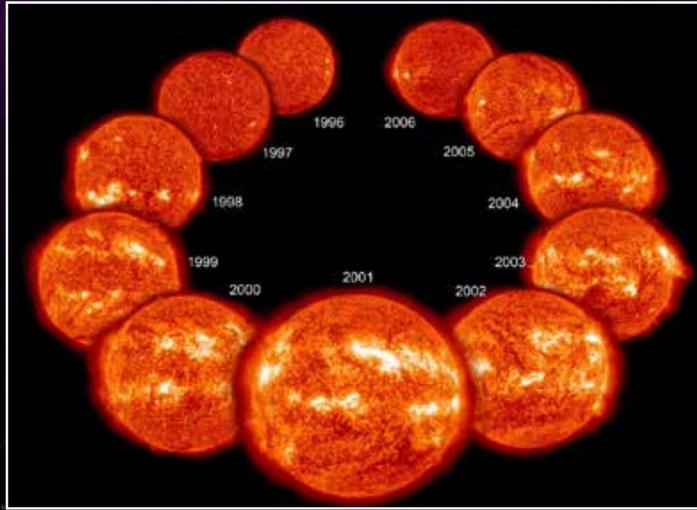
* Dr Somaya Saad, is full Professor at Astronomy Dept., National Research Institute of Astronomy and Geophysics (NRIAG). She is the chair of the Egyptian National Committee of Astronomy and Space Science. Dr Saad received her Ph.D. in Astrophysics from Cairo University. Her research interest is related to the physics of hot stars and stellar variability.



“Cairo University, Al-Azhar University, the Space Weather Department, Faculty of Science at Helwan University and Zewail University lead in Astronomy in Egypt

The Sun & its Solar Cycle

Our local star, the Sun, is a huge ball of boiling gas with a very strong magnetic field that rotates with a differential rotation on its axis with different velocities at the poles. This differential rotation twists the magnetic field and causes a variety of solar features. In order to see the different structures, the Sun is observed in a variety of wavelengths, ranging from hard X-rays to radio.



The Sun has an 11-year cycle of solar activity known as the solar cycle.

The magnitude of the magnetic flux that rises to the surface of the Sun, follows 11-year cycles of activity known as the solar cycle or sunspot cycle. During this cycle the Sun reaches periods of maximum and minimum solar activity. Solar minimum refers to a period when the number of sunspots is small, resulting in less solar activity. Solar maximum is the period when the number of sunspots is high, resulting in more frequent solar activity.

Solar winds travel at speeds of up to 800 km/s

Coronal Holes

These are large holes in the Sun's corona that are caused by the Sun's magnetic field. They are less dense and cooler than surrounding areas.

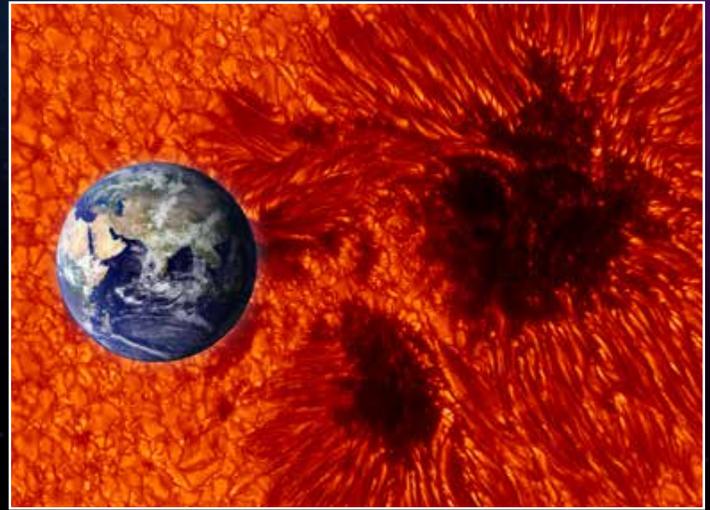
High-speed solar wind streams flow from coronal holes into space at speeds of up to 800 km per second. If conditions are right and these streams reach the Earth, geomagnetic storms may occur.

Solar Wind

The solar wind is a stream of charged particles constantly flowing from the upper atmosphere of the Sun. It consists mostly of electrons and protons and varies in temperature and speed over time.

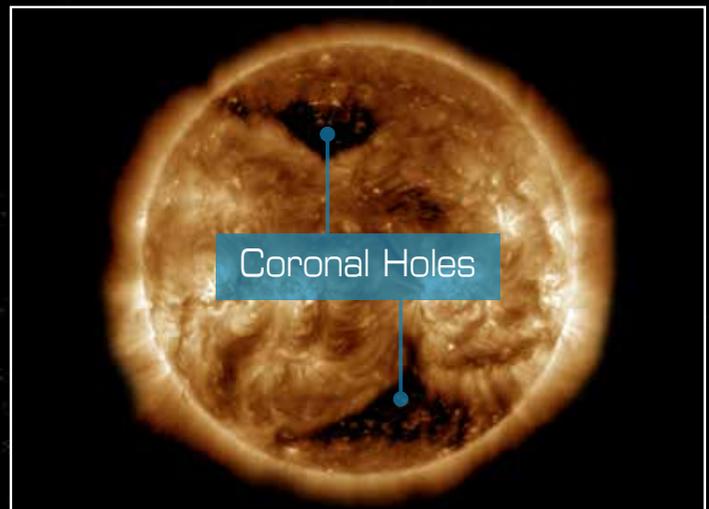
Main Solar Features

Sunspots and Solar Active Regions - Sunspots are dark features that appear on the surface of the Sun. They vary in size, shape and lifetime. Sunspots appear in areas where the magnetic field is very strong. They appear to be darker than the gas surrounding them, because they are several thousand degrees cooler.



A small sized sunspot is about the size of the Earth.

However, when sunspots are observed by means of ultraviolet or X-ray filters, there appears to be high emission activity in the corona. That emission is produced by the plasma that travels on the powerful magnetic fields emerging from the sunspots. We refer to the whole view as solar active regions. Active regions may produce coronal mass ejections which may result in solar superstorms.



High-speed solar wind streams from coronal holes may cause geomagnetic storms on Earth.

Find out more about space weather at SANSA

Email: spaceweather@sansa.org.za | Tel: +27 (0)28 312 1196 ext 2764 | Website: <http://spaceweather.sansa.org.za>

SANSA Space Science, Hospital Road, Hermanus 7200, South Africa

sansa

SPACE SCIENCE

The Impact of Space Weather

What is Space Weather?

Due to societies increasing dependence on modern technology space weather has become a hot topic around the world. Space weather refers to a collection of physical processes, beginning at the Sun and ultimately affecting technology on Earth and in space. The Sun emits energy by means of electromagnetic radiation, coronal mass ejections (CMEs) which release high-energy charged particles, and plasma streams.

The charged particles from the Sun travel outwards in the solar wind, carrying parts of the Sun's magnetic field. The electromagnetic radiation travels at the speed of light and takes about 8 minutes to move from the Sun to Earth, whereas the charged particles travel slower, taking a few hours to several days to complete the same journey. The radiation and particles interact with the Earth's magnetic field and outer atmosphere in complex ways which may cause disturbances to technological systems in space and on Earth.

Space weather poses a risk to society, the economy and national security.

What are the effects of space weather?

An extreme space weather event or solar superstorm is a potentially high-impact, low-probability natural hazard. Due to a growing awareness of the potential consequences of extreme space weather, governments in numerous countries now consider this as an element of national risk assessment.

Superstorms may have detrimental effects to the power grid, satellites, avionics, and aircraft over polar regions, High Frequency (HF) radio communication, mobile telephones and GPS systems, to name a few. Solar superstorms have consequently been identified as a risk to the world economy and society.

Magnetic disturbances induce electric currents in long conductors such as power lines and pipelines. This may cause power outages or excessive pipeline corrosion. Magnetic disturbances also directly affect operations that use the magnetic field, such as magnetic surveys, directional drilling and the use of compasses. Radio waves, which are used for satellite communication and GPS navigation, may be affected leading to disruption of communication and/or navigation systems. Satellites may also suffer damage to electronics due to radiation.



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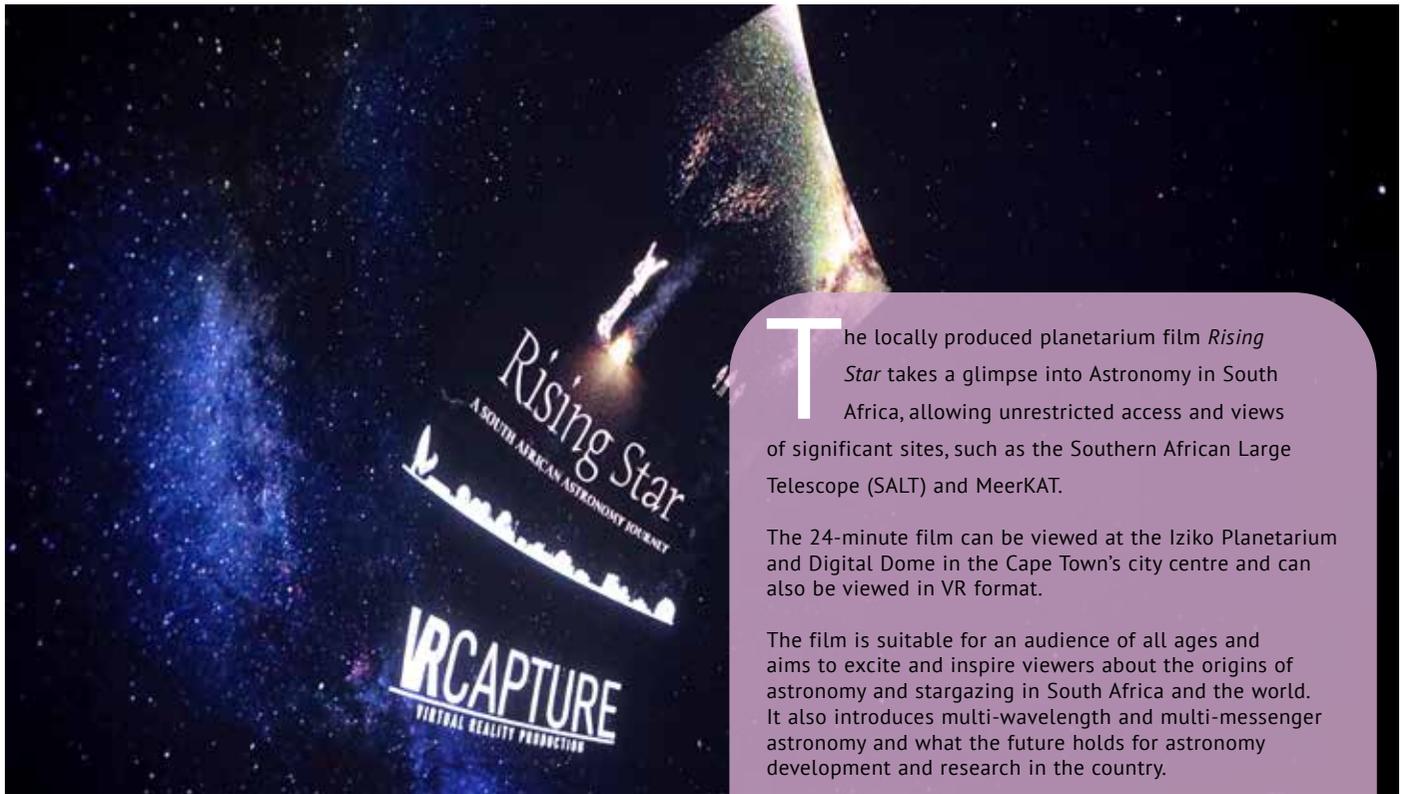
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In Service of Humanity









A LOOK AT A RISING STAR

A fully immersive astronomy experience is now showing at the Iziko Planetarium in Cape Town.

By: Nadine Sims



The locally produced planetarium film *Rising Star* takes a glimpse into Astronomy in South Africa, allowing unrestricted access and views of significant sites, such as the Southern African Large Telescope (SALT) and MeerKAT.

The 24-minute film can be viewed at the Iziko Planetarium and Digital Dome in the Cape Town's city centre and can also be viewed in VR format.

The film is suitable for an audience of all ages and aims to excite and inspire viewers about the origins of astronomy and stargazing in South Africa and the world. It also introduces multi-wavelength and multi-messenger astronomy and what the future holds for astronomy development and research in the country.

The film was produced by the company VR Capture, with support coming from the South African Astronomical Observatory (SAAO) and the South African Radio Astronomy Observatory (SARAO), and is the brainchild of astronomer Daniel Cunnama.

"I just hope that it inspires people to find out more about the astronomy we are doing here and be proud of our achievements as South Africans, and hopefully visit Sutherland and Carnarvon to take some of it in," says Cunnama.

The Iziko Planetarium was established in 1987 and in 2017 the digital dome underwent an 8K digital upgrade, making it one of the most advanced on the continent and one of four major planetaria in South Africa.

Before the Covid-19 pandemic, the 15.2m digital dome catered to around 100 000 people annually. Not only does it host public showings but is also able to be utilised by scientists and astronomers for research purposes, by using the facility to better visualise their data.

South Africa has a rich history of astronomy, with telescopes like SALT and MeerKAT. SALT is the largest optical telescope in the Southern Hemisphere – so powerful, it is able to detect stars that are dimmer than the faintest star visible to the naked eye. And MeerKAT, with its 64 antennas, is the most sensitive radio telescope of its kind.

Virtual reality tours of the Sutherland facility are available, through which the different telescopes can be explored. Visit salt.ac.za for more information on these tours.

For more information or to make a booking, visit the Iziko Planetarium website or call 021 481 3800.



Our Editor, Mr Unathi Kondile, with Mr Gihan Ilangakoon who is the Secretary of the Astronomical Society of Botswana.

AFRICAN SCIENCE STARS TOURS BOTSWANA JUST IN TIME FOR ITS UPCOMING SATELLITE PROGRAMME!

At the end of 2020 Botswana's President, Mokgweetsi Masisi, launched what has been dubbed "an ambitious satellite project." He promised that over the next three years there will be a concerted effort at ensuring that Botswana gets its own satellite project called "Botswana Sat-1 Project" that will aid and assist in various sectors across the country.

After this announcement, *Science Stars* magazine took a giant leap into Africa by launching its special *African Science Stars* edition which is now distributed across all Southern African Development Community (SADC) countries that include Botswana. You are holding the second edition in your hands right now.

The first issue was launched in May 2021, and it is edited by former University of Cape Town media lecturer and publisher, Unathi Kondile, who spent most of June this year traversing Botswana – introducing the magazine to various stakeholders.

"With the looming advent of the Botswana satellite project, we thought it wise to also bring *African Science Stars* into the country," an ebullient Kondile said.

"This is a magazine that primarily targets high school learners and youth in general. The aim is to simplify science. We sit down with astronomers, geoscientists, physicists, aeronautical engineers and various other scientists and we get them to break down some of the most complex concepts that they work with on a daily basis. We also delve deep into science career options," Kondile added.

In the case of President Masisi's space programme, Botswana International University of Science and Technology (BIUST) will host this programme that will see the country launch its own earth observation 3U nanosatellite into space. The role of a magazine like *African Science Stars* would then be to come in and say: Now we want young people to understand clearly what a satellite programme is, and we further want them to be informed on what career opportunities accompany what President Masisi has launched.

"We must demystify this myth that sciences are only reserved for bright sparks. Clear, jargon-free explanations can make science accessible. It can lead to the young African child dreaming of one day going to space."

Botswana should be excited by the upcoming Satellite programme, which Kondile explained as follows: "For our young reader, our magazine clarifies what satellites are. Satellites are like our own eyes in the sky. The satellite, however, is much stronger than the eye. It can take images of about 60 x 60 km squared in one shot. A satellite has an aerial view of your field.

"So think about the many opportunities that exist for Botswana by just having this mirror in space. This will help in agriculture, town planning and is applicable in almost every single government department that works with data."

Speaking on 18 of December 2020, President Masisi said the project will be demanding as this will be the first time the country will be launching a satellite into space. "However, we can capitalise on the data and apply it in various industries such as our current focus that is agriculture, it will contribute towards the growth and development of the nation," Masisi said, adding that the space project is aligned to Botswana Vision 2036.

African Science Stars is therefore the catalyst that will ensure more young bright minds will take up an interest on such space developments in the country. The magazine is currently distributed at BIUST, University of Botswana, Astronomical Society of Botswana and in various selected high schools. Kondile said the aim is to open up a fully-fledged *African Science Stars* office in Gaborone and to have the magazine produced by Botswana-based journalists.

"I will be back in Botswana to conduct science journalism workshops in February 2022. We would like to work with local journalists, the Department of Higher Education and various science and technology organisations throughout Botswana to pique the interest of the youth around the sciences." Kondile, together with the founder of the magazine, Madambi Rambuda, went on a road show across the country; from Gaborone to Francistown to Palapye.

They met with Tumo Kedumele who is the founder and lead director at Women in STEM currently based at BIUST. Kedumele will be working closely with the magazine and oversee its distribution in the country. Gihan Ilangakoon, who is the Secretary of the Astronomical Society of Botswana, was also excited to welcome the new magazine into the country and promised to get society members to contribute in each quarterly edition.

At the University of Botswana, the *African Science Stars* team met with Molly Kgobathe who is the International Astronomical Union's Office for Astronomy Outreach based in Botswana. Readers can expect to read on astronomical developments from her desk.

This article first appeared in Botswana The Midweek Sun newspaper.



SISTER- TO- SISTER CALLS FOR RESEARCH AND MENTORSHIP FUNDING

By: Keletso Thobega

A number of research articles published in Botswana have explored the disparities in gender in Science, Technology, Engineering and Mathematics (STEM). It is found that women and girls often fall behind in STEM. While education research shows that girls tend to excel in their academics, particularly STEM in school, many of them struggle to find their feet at post-graduate level at tertiary institutions.

It against this backdrop that medical laboratory scientist Monkgomotsi Maseng established the Sister-to-Sister initiative with the intention to improve outreach programmes and ensure that women and girls excel in STEM.

Maseng is a medical laboratory scientist currently working with the School of Allied Health Profession, Faculty of Health Sciences, University of Botswana, Gaborone. She is also a research fellow with Botswana Harvard AIDS Partnership Institute and holds a Bachelor of Applied Science degree in Laboratory Medicine from RMIT University, Melbourne, Australia (2009). And a Diploma in Medical Laboratory Technology from Institute of Health Sciences, Gaborone (2000).

"I majored in Medical Microbiology, Medical Genetics & Diagnostics and Clinical Immunology & Transplantation, and started working as a medical laboratory technician from 2000 to 2004 at KSDA Hospital and Diagnofirm Medical laboratories."

"I then joined academia in 2005 at Molepolole Institute of Health Sciences as an assistant microbiology lecturer to nursing students and was upgraded to the position of lecturer in 2010," says Maseng, who later joined the University of Botswana Clinic in 2014. In 2016 she moved to focused more on the academic side of her work.

Maseng realises that stereotypes and disparities around gender and science can be frustrating and demoralising when you grow up in a small diamond town of Orapa in Botswana.

Having done her primary schooling in Orapa she moved to Letlhakane Senior Secondary School. In a sense, she grew up like many other children in our communities but was able to zone into her interests and excel.

Maseng established the Sister-to-Sister initiative, which she explains as follows: "The mandate of Sister-Sister is to mentor and support women in

STEM and aspiring female students at elementary, middle, high and tertiary schools. Sister-Sister aims to build strong-minded, passionate and confident female scientists and aspiring ones by breaking barriers and stereotypes surrounding females in the Sciences in Botswana. Our aim is to visit schools at primary and secondary schools to promote science and encourage especially females to pursue science and maths subjects!"

Sister-Sister was established in 2020 and its objectives include mentoring and supporting women in STEM, as well as aspiring female students in middle, high and tertiary schools. Maseng said the initiative was also a response to the Sub-Saharan African Network for TB/ HIV Excellence (SANTHE) call on Gender Equity Diversity and Inclusion Awards and also the SANTHE Super-scientists initiative that tackles gender narratives in science.

Maseng said investments in STEM education and mentorship is a great step towards breaking barriers around STEM and demystifying the notion that STEM subjects are difficult.

"Educators need to be supported with resources, funding and investment in their professional development so that they are able to inspire students and produce quality work. STEM brings concepts coupled with real life lessons with applications in context that connect schools, work, community and the global enterprise and the ability to compete in the new economy."

Maseng said gender equity is close to her heart and it goes without saying that it forms part of the mandate of Sister-to-sister.

"The bottom-up system hampers females in STEM from making their way to senior positions. There is a 'leak' in the STEM pipe that chokes female scientists. This 'leaky-pipe' may be

attributed to gender-specific biases and stereotypes that create a confidence gap between men and women," Maseng said.

Maseng noted there is lack of funding, attractive remunerations, recognition and collaboration in the country. She also noted that there is lack of research collaboration across STEM disciplines, weakening skill development and robbing the country of valuable benefits it could gain.

"Currently, we depend a lot on research findings done outside the country. "We need to start investing in research and form research networks to develop new products geared towards the social and economic growth of the country."



Maseng and her team are currently working on creating a website and already have a Facebook page called *Sister Sister – Advocating for Women in Science*. Check it out, follow and take part!



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Living with Space Weather

What is space weather?

There is no greater influence on the Earth and its space environment than that of our local star, the Sun. Did you know, just like Earth, space has weather too? Snowstorms and thunderstorms occur on Earth while in space they are known as “solar storms” and like their counterparts on Earth they too may cause problems for us humans, especially because we are so dependent on satellite technology.

Can space weather affect life on Earth?

Although space weather can pose a health risk for astronauts in space, it will not harm humans and other life forms on Earth as we are protected by the Earth’s magnetic field. However, space weather can cause a geomagnetic storm, which can result in disturbances to technological systems such as GPS, radio communications, internet, cell phones, DStv and our electrical power grids.





How do you monitor events on the Sun?

The South Africa National Space Agency (SANSA) is host to the only Space Weather Centre in Africa which provides an important service to the nation by monitoring the Sun and its activity. SANSA space weather forecasters utilise a variety of ground and space-based sensors and imaging systems to view activity at various depths in the solar atmosphere. With this information the Centre is able to form a picture of the environment from the Sun to the Earth providing forecasts and alerts to anyone affected by space weather.

What causes space weather?

Space weather is caused by four main components: solar flares, coronal mass ejections, high speed solar wind and solar energetic particles and refers to the effects that the Sun has on the Earth and the planets of the solar system.

Solar flares

The Sun is a huge ball of boiling gas with loop-like structures on the solar surface. When one of these loops becomes unstable, it breaks off from the Sun and creates a solar flare.



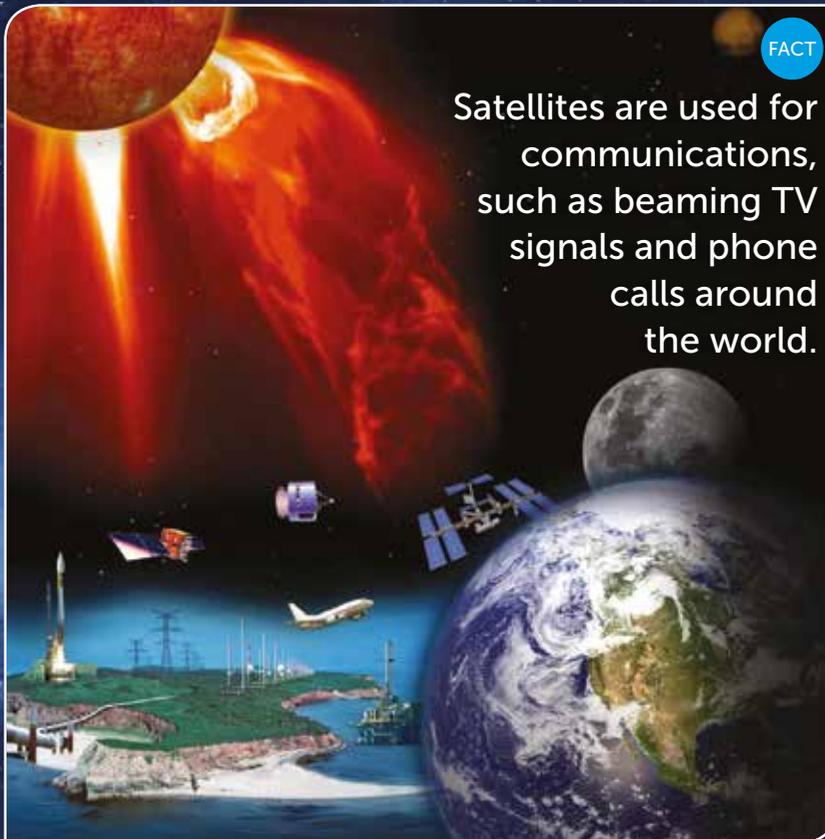
FACT

The biggest flares can be hundreds of times the size of the Earth.

← Approximate size of the Earth

What is a Satellite?

A satellite is a moon, planet or machine that orbits a planet or star. Earth and the moon are examples of natural satellites. Usually, the word "satellite" refers to a machine that is launched into space and moves around Earth or another body in space.

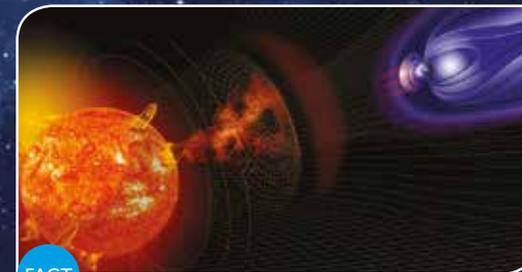


FACT

Satellites are used for communications, such as beaming TV signals and phone calls around the world.

Coronal mass ejections

A coronal mass ejection (CME) is a massive cloud of hydrogen ions which erupt from the surface of the Sun when stored energy is suddenly released. The impact of a CME causes a disturbance to the Earth's magnetic field and can interrupt communication and navigation systems.



FACT

CME's travel at supersonic speeds of up to 2 000 km per second. That speed would get you from Johannesburg to Cape Town in less than one second.

For more info on SANSA

See our website: www.sansa.org.za

South African National Space Agency | @sansa7

Tel: 028 312-1196 | Fax: 028 312-2039 | E-mail: spacesci-info@sansa.org.za





WHAT IS SPACE WEATHER?

Visiting the regional Space Weather Warning Centre in Hermanus.

By: Nadine Sims

Have you ever sat and wondered what the weather must be like out there in Space? Does it rain? Get windy? Hot? Well, much like Earth, the weather exists out there in Space too and it can get quite turbulent out there.

In space, weather events have many names but generally they are called "solar events". The word "solar" is derived from the latin word "sol" which means sun. Solar storms can cause quite a lot of disruptions that could be dangerous. That is why there are Space Weather Warning Centres, to help predict and prepare for catastrophic events.

The South African National Space Agency (SANSa) Space Weather Warning Centre in Hermanus is decked out with a huge wall of TV monitors that have various images of the sun and this is where the experts are able to look at the Sun and the supply warnings, alerts and forecasts of any space weather events.

This centre in Hermanus is one out of 17 international space weather warning centres and it is the only one of its kind in Africa. Monitoring space weather events is not only important to scientists but it should be important for everyone that uses modern technology, as it has the potential to disrupt and impact systems such as satellites, power grids and radio communication. This can also have

a negative effect on the aviation industry which requires its GPS and navigation systems to run smoothly on all aircrafts, especially during bad weather.

A solar superstorm also has the potential to have bad effects on communication systems like mobile phones and could have severe effects on the world economy and society at large. Therefore, it is vital to monitor the sun and its daily activities and hopefully pre-empt any space weather events.

Space Weather Event example:

An example of a big space weather event that disrupted everyday life is the Carrington Event of 1859 where the digital telegraph (some say that it was the internet of its day) was affected by the largest geomagnetic storm ever recorded.

If something similar were to happen today, it would cripple society and potentially affect GPS systems, internet-based technology, power or electricity and transport. Therefore, it is important to be able to forecast any solar weather events.

WORLD SPACE WEEK!

World Space Week (WSW) kicked off on 4 October this year with thousands of events globally. It went on until the 10 October. This year's theme was "Women in Space" which sought to celebrate women who significantly contributed to the space sector around the world.

There were quite a number of key events driven by some aerospace companies, such as:

Lockheed Martin and Airbus

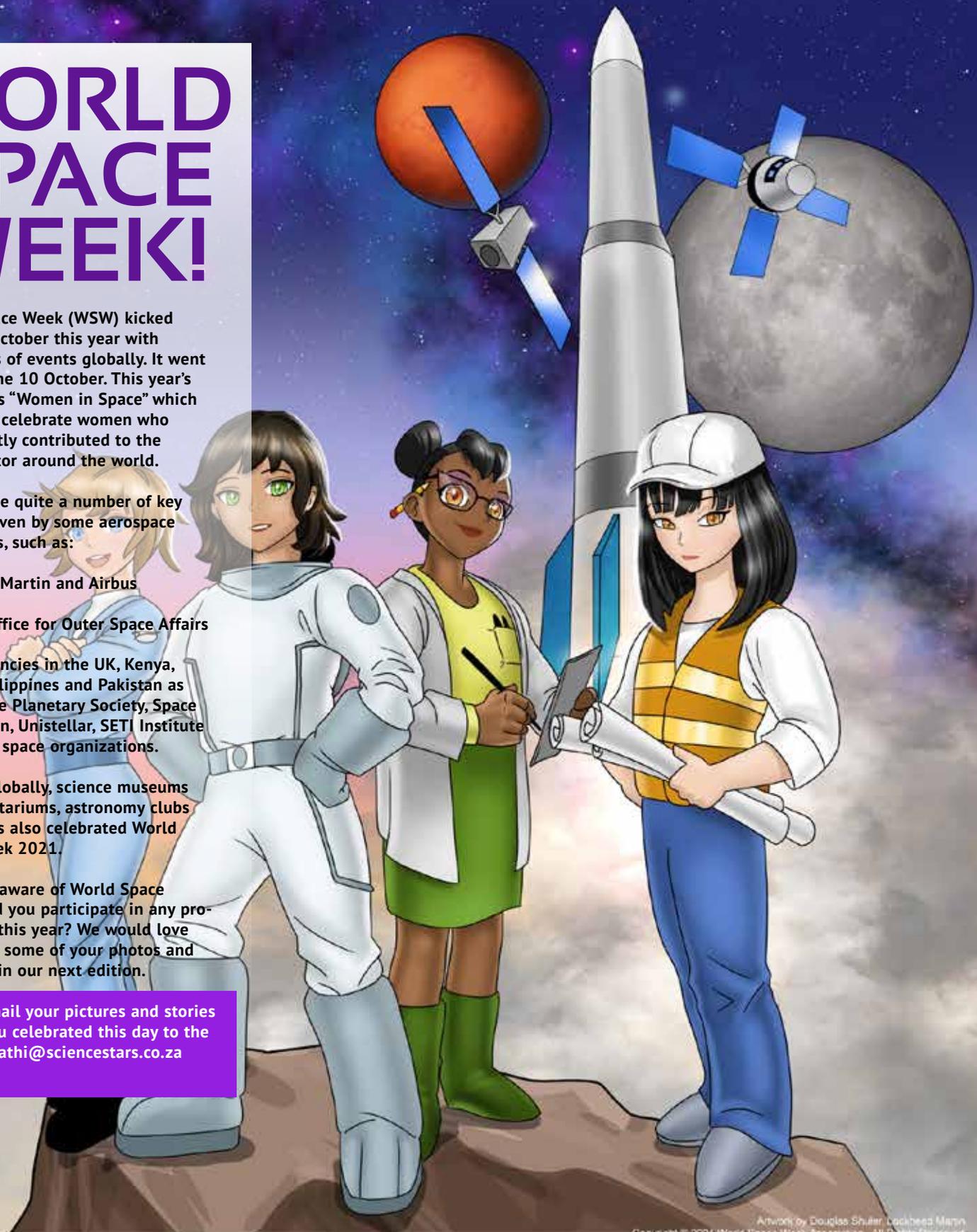
The UN Office for Outer Space Affairs

Space agencies in the UK, Kenya, Israel, Philippines and Pakistan as well as the Planetary Society, Space Foundation, Unistellar, SETI Institute and other space organizations.

Schools globally, science museums and planetariums, astronomy clubs and others also celebrated World Space Week 2021.

Were you aware of World Space Week? Did you participate in any programmes this year? We would love to feature some of your photos and activities in our next edition.

Please email your pictures and stories of how you celebrated this day to the editor: unathi@sciencestars.co.za



Artwork by Douglas Shuler, Lockheed Martin
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World Space Week 2021 Celebrates WOMEN IN SPACE

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THE WEATHER WOMAN OF THE MOMENT

Meet Mpho Tshisaphungo, the first female to head the Space Weather Centre at SANSA.

By: Chireez Fredericks

In her role at the South African National Space Agency (SANSA) in Hermanus, Mpho Tshisaphungo is responsible for coordinating and managing the Space Weather Centre – a position that’s surely the end goal for many in her field. What’s even more impressive is that she’s the first woman in SANSA’s history to take the lead.

Tshisaphungo and her team monitor space weather conditions in real-time. These documented conditions are then further analysed to prepare forecasts, warnings and alerts for government and private industry users.

She enjoys organising space weather courses, as well as training programmes in space weather forecasting. “We are also developing the training material for users in the aviation sector, this information has to be customised for their use.”

Tshisaphungo says she enjoys working at SANSA and that her team feels “like a family” to her. She emphasises the joy she finds in being a part of something much bigger than herself and encourages young people to find their talents. “Identify your strengths and focus on what you are good at,” she says to those who are trying to find their feet in a new career or in a new workplace.

When she is not immersing herself in her career or furthering her education, she enjoys dancing and spending time with her family – and she says she hasn’t strayed much from what was important to her in her younger years.

Growing up in Limpopo, Tshisaphungo notes that education has always been an important part of her life. “I never wanted to miss school, even when I was sick,” she recalls, and her fascination with numbers saw her excel in mathematics. Her passion for mathematics was one her parents supported.

Although Tshisaphungo’s mother never completed her own education, she was always a good support system to her children, encouraging them to take pride in their schoolwork and ensuring they were well fed and equipped to do that.

As a child, Tshisaphungo wanted to work in chemistry as spending time in a lab and experimenting was what made her happiest. After high school, she applied to as many universities as she could and although she was accepted at Cape Peninsula University of Technology (CPUT) for a degree in Chemistry, she did not have the required funding to enroll. She then applied for the Bachelor of Computer Science with Mathematics and Physics at the University of Venda in Limpopo.

But noting the lack of resources during her course, Tshisaphungo then decided that computer science was not for her and chose to follow her passion by completing her Bachelor of Sciences in Mathematics and Physics, despite not knowing what career prospects she would have.

After her third year, Tshisaphungo was looking for any opportunity to further her education, when she spotted a poster advertising the winter school in Hermanus. At that time, she had no idea what Space Weather was but she was intrigued and decided to apply anyway. She was accepted into the programme and by June 2006, she was on her way to the Western Cape. “During the winter school, I spent a lot of time with the SANSA researchers who recognised my potential and offered me an opportunity to continue my studies.”

Determined to pursue her interest, Tshisaphungo accepted SANSA’S offer to intern at the centre for six months. By December of that year, she applied for her honours degree in The National Astrophysics and Space Science Programme (NASSP) at the Universe of Cape Town. Once completing her honours, she was given the opportunity to become a space weather assistant and her career evolved from there.



TOP 10 SPACE AGENCIES

- *Currently, African space programs focus primarily on improving the socio-economic and environmental benefits of space applications.*
- *Observing the sun and its activities; the space agencies provide reasoning to pictures that we cannot read but our scientists can.*

Humans have been venturing into space since the 1950s when the Union of Soviet Socialist Republics (USSR) launched Sputnik – the first artificial satellite to orbit Earth. According to War on the rocks; over the past decade 11 African countries (Algeria, Angola, Egypt, Ethiopia, Ghana, Kenya, Morocco, Nigeria, Rwanda, South Africa, and Sudan) have launched 38 unilateral and three multilateral satellites into orbit. The first African satellite “Sunsat-1” was launched to space by South Africa in 1999.

To date: Investigations surrounding such questions have advanced from telescopes to satellites and space rovers with recent spacecraft. We have also watched humans set foot on the moon, land rovers on Mars, and also showed us the life beyond but scientists realised that studying that life and sending signals back to earth would take years thus the establishment of space agencies (power-house of our information signals) made things easier, which brings us to the core of this feature – finding out which are leading Space Agencies in Africa. They are:

1/ SOUTH AFRICA (A SPACE WEATHER REGIONAL WARNING CENTRE FOR AFRICA)

SANSA (South African National Space Agency) is South Africa’s government space agency that is responsible for the development and promotion of aeronautics and aerospace research. As of today, it is the only space program in Sub-Saharan Africa with an astronaut program and it was established on 9 December 2010 by the National Space Agency. SANSA uses satellite and other data acquisition to contribute to socio-economic development, environmental conservation, and natural resource management. Besides housing a state-of-the-art facility in Hartebeesthoek, it also operates a 24-hour regional space weather centre in Hermanus.

2/ NIGERIA (HAS LAUNCHED FIVE SATELLITES)

The National Space Research and Development Agency (NASRDA), a research institution that is under the supervision of the Federal Ministry of Science and Technology of Nigeria was established on 5 May 1999. With the main objective to promote and support the

use of space technology within and outside Nigeria. The agency has the highest number of employees (approximately 3 500) in the continent and has been operating for 22 years. Nigeria, Africa, and the entire world are to be benefited from the centre’s foundational research, studies and development within Space Science.

3/ EGYPT (HOST COUNTRY FOR THE HEADQUARTERS OF SPACE AGENCIES)

Egyptian Space Agency (EgSA) is home to a multi-million dollar space observatory and research centre. It has limited experience in the field of satellites as it dates back to 1998. The Egyptian Space Agency owns six satellites, some of which are out of service, and others are still operating efficiently. It is the first awardee of the United Nations Office for Outer Space Affairs (UNOOSA)’s Access to space. Egypt’s first earth remote sensing satellite was EgyptSat 1 or MIRSAT-1.

4/ ANGOLA

The National Space Program Management Office (GGPEN) is an Angolan government space agency that was established in 2003. GGPEN is responsible for conducting technical studies and promoting space exploration. In addition to ensuring human competencies, it creates national technology within the space domain.

5/ALGERIA (THE ALGERIAN SPACE AGENCY)

The Algerian Space Agency (ASAL) derived from Arabic was established in 2002. Algerian Space Agency is responsible for the country’s space program, undertaking five satellite missions in communication, earth observation and research. Algeria has successfully launched into orbit two satellites. It participates effectively in promoting space activities in Africa within a project called ARMC (African Resource Management satellite Constellation), a project that was initiated by Algeria, Kenya and South Africa for the management of African resources and the environment.

6/ ETHIOPIA

Ethiopian Space Science Society (ESSS) was established in 2004, with 47 founding members as a citizen’s association. Ethiopia was

Report findings

The number of space agencies on the African continent has grown rapidly over the years, despite the fact that the continent lags behind wealthier continents in space programs. The African Space Industry Annual Report 2021 indicates that 125 new satellites will be developed in 23 African countries by 2025.

Space weather may have a negative impact on our day-to-day operations. When space weather happens you can go a day or more without communication; astronauts cannot jump up and down in space as this would have a bad effect. Space weather agencies would also be affected. The entire universe would be in turmoil, but nature on its own would be releasing beautiful features because when all the jumbles happen a rainbow of colors or magnetism would be produced but would not be recorded which is why it is important for space agencies to monitor the movement of the sun and the gases released.

the only African country that managed to launch a satellite in 2020 – satellite ET-SMART-RSS, a small satellite built and launched with support from China. It is a home to multimillion-dollar space observatory and research center. This agency is mandated to carry out research and training in space science and encourage development in aerospace and infrastructure in Ethiopia.

7/ GHANA

In Ghana, the Ghana Space Science and Technology Institute (GSSTI) is a national agency for space affairs. It is managed by the Ministry of Environment, Science, Technology and Innovation. The space agency was established in 2012 for space science, space exploration, astronomy, and technology space agency. It is the youngest space program in Africa that coordinates space research across the country.

8/ KENYA (FIRST AWARDEE OF THE UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS ACCESS TO SPACE)

Kenya is one of the leading space leaders in Africa and has a long history in the space science and technology arena. It's an equatorial state making it ideal for a spaceport. A satellite, Uhuru, was launched from Kenyan soil in 1970 to study celestial X-ray astronomy. It hosts the Luigi Broglio Space Centre in Malindi at the coast. Rockets were launched from the centre, the last being in 1988.

9/ MOROCCO (ONE OF THE LEADING EMERGING SPACE ACTORS IN NORTH AFRICA)

Established in December 1989, The Royal Centre for Remote Sensing (CRTS) of Morocco is tasked with promoting the exploitation and development of remote sensing applications in the country. CRTS coordinates the Moroccan remote sensing program in cooperation with government departments, private operators, and Moroccan universities. Furthermore, it provides training opportunities in space technology and maintains partnerships with universities and other institutions for research activities.

10/ LIBYA

The Libyan Centre for Remote Sensing and Space Science (LCRSSS) is a governmental research organisation dedicated to the research in remote sensing, space and earthquake sciences that was established in 1989. LCRSSS has more than five research stations.

Quiz answers:

- 1.C
- 2.C
- 3.A
- 4.B
- 5.A
- 6.C
- 7.B
- 8.D
- 9.C
- 10.C
- 11.D
- 12.C
- 13.B
- 14.C
- 15.B

INTERESTED IN A CELESTIAL CAREER PATH?

This is your guide to a successful career in space.

When one thinks about careers in Space Science it is easier to think of engineers and astronauts first, but there are other fields within Space Science where you can study planets, the solar system and other aspects of the universe.

When it comes to careers these are usually the top daunting everyday questions:

What can I study?

Where can I study?

Who can fund my studies?

Let's start with the studying part. What are the most popular universities to pursue a career in space in Africa?

According to uniRank university rankings 2021, these universities are part of the top 200 universities in Africa to help you start your celestial research on the go:

- Addis Ababa University
- University of Cape Town
- University of Nairobi
- University of Nigeria Nsukka
- Copperbelt University (Zambia)
- Cairo University
- University of KwaZulu-Natal
- Ghana Space Science and Technology Institute (GSSTI)
- Kwame Nkrumah University of Science and Technology
- BIUST
- Pan-African School for Emerging Astronomers (PASEA)
- The University of Yaounde II
- The Kenyatta University
- The Abou Bekr Belkoid University of Tlemcen (Algeria)
- NorthWest University
- The University of Ibadan (Nigeria)

After reviewing African universities, which careers can I choose from?

- Electrical engineering
- Satellite systems engineer
- Remote sensing and GIS researcher
- Geographic information systems analyst
- Control systems engineer
- Mechanical engineer
- Geoinformatics specialist
- Image processing researcher
- Electronic technologist

Who can fund my studies and what is needed?

1/ SAWISE Angus Scholarship

- Must be female
- Must have achieved 70% year-mark and above
- Only for studies at Honours level
- In any field of science and engineering
- For more information type in this URL:
sawise.uct.ac.za/sawise/scholarships/angus

2/ United States International University-Africa (USIU-Africa)

3/ Cyprus West University's Tomorrow Leaders Scholarships

- For undergraduates only
- This scholarship is eligible to international students as well
- How to Apply: Apply for Tomorrow Leaders Scholarship

4/ Iso Lomso fellowships 2022 for Early Career African Researchers (fully funded)

- You must be from any African country
- Have a doctoral degree
- This funding is open across various disciplines
- **Deadline: 15 February 2022**

PLACEMENT

(Space agencies)

- * South African National Space Agency (SANSA)
- * SumbandilaSat
- * The Algerian Space Agency (ASAL)
- * Ghana space science and technology centre (GSSTC)
- * Libya Center for Remote Sensing and Space Science (LCRSSS)
- * Agence Gabonaise d'Etudes et d'Observations Spatiales (AGEOS)

1/ GEOINFORMATICS SPECIALIST

Geographic information systems (GIS) are computer-based tools that allow people to map and analyze the world around them. The technology is used to integrate queries and statistical analysis. The word is not foreign to anyone as it is commonly used.

GIS specialists build and maintain GIS databases, and use GIS software to analyse the spatial and non-spatial information in them. They may work under a wide variety of job titles, including GIS Analyst, GIS Technician and Cartographer.

Universities where you can study:

University of Nairobi School of Engineering, Nairobi

- Doctor of Philosophy in GIS
- Must be a holder of a Master's degree from the University of Nairobi or an equivalent academic qualification of another institution recognised by the University of Nairobi.

Deadan Kimathi, University of Technology (DKUT), Nyeri

- BSc in GIS and Remote Sensing
- 4-year course; 65 entry points needed
- Includes training in Geospatial information systems, surveying and remote sensing.

The University of Ghana

- MS in Geoinformation Science

University of Stellenbosch

- MSc in Geoinformatics

The University of Pretoria

- MSc in Geoinformatics

Indian Institute of Remote Sensing

- MSc in Geo-information and Earth Science

SPOTLIGHT ON: THREE SPACE SCIENCE CAREERS

What do Geoinformatics specialists do?

Text or spreadsheet files of latitude and longitude coordinates, Tabular data, Aerial or satellite imagery, Manual digitising of paper maps or map images.

Relevant experience

The following are examples of where to gain experience:

- Undertaking data capture for a local council
- Internship with a GIS company
- Placement year with a GIS provider/developer
- If you are studying postgraduate studies, your university may have links with companies that offer internships or work experience. Make sure to speak to your careers advisor about how you can get involved.

2/ IMAGE PROCESSING RESEARCHER

First, let's define what Image Processing entails. It involves the process of converting an image into a digital form and applying certain functions to it in order to improve it or extract useful information from it.

Image processing is a type of signal time when the input is an image, such as a video frame or image, and output can be an image or features associated with that image. Usually the Image Processing system includes treating images as two equal symbols while using the set methods used. Image processing is a way by which an individual can enhance the quality of an image or gather alerting insights from an image and feed it to an algorithm to predict the later things.

Duties of an Image processing researcher

- Importing an image with an optical scanner or digital photography
- Analysis and image management including data compression and image enhancement and visual detection patterns such as satellite imagery
- Write reports
- Create visual interpretations of data
- Be skilled in Python, MATLAB or similar high tools
- Importing an image with image detection tools
- Exploring and manipulating the image

How can I become an Image Processing Researcher?

- MSc Computer science
- A master's degree in Computer Science
- Be skilled in non-image processing
- Have a scientific mindset

You can study in India's Indian Institute of Remote Sensing or the PSC College of Technology.

For jobs go to: [indeed.com](https://www.indeed.com)

3/ SPACE SCIENCE FACILITATOR

Space Science facilitators offer short and informal lessons relating to space science to visitors either families, school children, or adult visitors.

Must be good in:

- Adaptability
- Collaboration

- Written and verbal communication
- Critical thinking

How to become a space science facilitator?

- For high scholars, consider taking courses in physics, maths and chemistry.
- Bachelor's degree in Engineering
- Bachelor's degree in Computer science or mathematics
- A Master's degree or Ph.D. in Engineering

Responsibilities

- Ensuring that existing space-related projects communicate and interact with each other to improve their services in the fields of satellite engineering and satellite applications;
- Getting new space science and technology projects off the ground;
- Excellent communication skills and ability to interact with people;
- A background and interest in science/astronomy and the ability to relay scientific information to a variety of audiences.

PEOPLE HAVE BEEN DISCOVERING THAT THERE IS A GREAT DEAL OF INNOVATION THAT CAN TAKE PLACE WHEN THEY APPLY WHAT THEY HAVE LEARNED FROM SPACE TO EARTH AND VICE VERSA.

BRAIN POWER

These questions are based on basic astronomy, history of astronomy, cultural astronomy and modern astronomical developments in Africa. Go on, test your knowledge!

- 1 **What is the nearest star to Earth?**
A. Alpha Centuari
B. Proxima Centuari
C. The Sun
D. Beta Centauri
- 2 **How hot is the core of the Sun?**
A. About 5 500°C
B. About 800 000°C
C. About 16 million°C
D. About 30 million°C
- 3 **On which planet can you have a birthday more than once in a day?**
A. Mercury
B. Venus
C. Mars
D. Jupiter
- 4 **Which is the hottest planet in the solar system?**
A. Mercury
B. Venus
C. Earth
D. Mars
- 5 **Which is the largest rocky planet in the solar system?**
A. Earth
B. Venus
C. Jupiter
D. Saturn
- 6 **Which planet has the shortest day?**
A. Mercury
B. Venus
C. Jupiter
D. Uranus
- 7 **Who discovered the four big moons of Jupiter?**
A. Isaac Newton
B. Galileo Galilei
C. William Herschel
D. John Herschel
- 8 **Which was the first asteroid to be discovered?**
A. Vesta
B. Juno
C. Pallas
D. Ceres
- 9 **How many hexagonal mirrors does SALT main mirror consist of?**
A. 1
B. 52
C. 91
D. 101
- 10 **In which country is the HESS telescope located?**
A. Ghana
B. South Africa
C. Namibia
D. Kenya
- 11 **Who was the first South African to travel to space?**
A. Elon Musk
B. Tim Noakes
C. Thebe Medupe
D. Mark Shuttleworth
- 12 **Who was the first human on the Moon?**
A. Buzz Aldrin
B. James Lovell
C. Neil Armstrong
D. Michael Collins
- 13 **What we usually refer to as shooting stars are actually?**
A. Meteoroids
B. Meteors
C. Meteorites
D. Asteroid
- 14 **Which Observatory in Africa celebrated its 200th anniversary in 2020?**
A. Boyden Observatory
B. Union Observatory
C. South African Astronomical Observatory
D. Lesedi (Sutherland)
- 15 **In which year was Algeria's first earth observation satellite launched into space?**
A. 1992
B. 1998
C. 2002
D. 2008
- 16 **Oukaimeiden Observatory which hosts the MOSS and TRAPPIST North telescope is located in?**
A. Mali
B. Ethiopia
C. Morocco
D. Tunisia

Quiz answers on page 37



STAND A CHANCE TO WIN A TELESCOPE!

ALL YOU HAVE TO DO IS TELL US ABOUT
STAR GAZING IN YOUR COUNTRY. IT CAN BE
ABOUT YOUR OWN PERSONAL ACCOUNT OF
STAR GAZING OR PROFESSIONAL
INSTRUMENTS IN YOUR REGION.

YOUR ENTRY SHOULD INCLUDE A BIT
ABOUT YOURSELF, WHERE YOU ARE
FROM AND HOW OLD YOU ARE.

ENTRY INFO:

Email your entry to:
info@sciencestars.co.za

For extra entries:
Like our Facebook page
Like the pinned post and tag a friend
Competition ends February 28th 2022

The winner will be contacted and will be announced
in the next edition of African Science Stars.
Terms and conditions apply

FORUM ON ASTRONOMY IN AFRICA: MAPPING THE PATH TOWARDS THE IAU GA 2024

By: The Organising Committee of the 2024 IAU General Assembly



THE IAU GENERAL ASSEMBLY 2024

The International Astronomical Union (IAU), which has been in existence for over 100 years, is the world's largest body of professional astronomers. It holds a General Assembly every three years, bringing together many thousands of astronomers from around the world. This meeting will take place for the first time on the African continent in 2024. Cape Town has been selected to host the meeting, and the National Research Foundation (NRF) of South Africa is the official host organisation.

Other key organisations involved in the event include the African Astronomical Society, the Academy of Science of South Africa, the IAU Office of Astronomy for Development and the South African Astronomical Observatory. While being hosted by South Africa, we are determined to make this a General Assembly for the whole continent, and ensure that the legacy of this meeting will further develop astronomy in Africa in the coming decades.

ABOUT THE FORUM

In preparation for this historic event in 2024, it is essential to bring together the African astronomical community to discuss how

the continent can maximally benefit from the unique opportunity, as well as how best to facilitate participation by countries in Africa. After initial conversations among the various stakeholders, it was decided that a discussion forum would be an effective way of promoting this goal.

The main purpose of such a forum would be to engage the African Astronomy community, including professional astronomers, amateur astronomers, and the education and outreach community, to obtain commitment on participation and potentially identify country ambassadors. Due to the pandemic, it was decided that the format of this forum would be virtual, with the event taking place entirely on Zoom from 27 to 29 October 2021. The event was also broadcast live on YouTube to make it as accessible as possible. Full recordings are still available; links are provided at the end of the article.

A call for contributions was issued, especially to the African astronomical community, but was also open to anyone anywhere in the world interested in astronomy in Africa. Participants were invited to make contributions in the form of short recorded

talks about ideas or initiatives related to the IAU GA 2024. Then, during the forum, real-time proposals for discussion could be made in the "unconference" session. The spirit of the forum was based on the principle of shared ownership. It was a spirit where different stakeholder groups (astronomers, amateurs, science centres, outreach professionals, etc.) could choose to drive activities agreed upon at the forum.

Participants included astronomers, amateur astronomers, the astronomy education and outreach community – basically anyone with an interest in astronomy research, infrastructures, education, outreach, development, amateur astronomy, astrotourism, astronomy arts and culture. In particular, those interested in proposing an IAU Symposium or Focus meeting at the 2024 GA were encouraged to express their interest during the Science session on Day 3.

GENERAL SESSIONS

There were essentially two parts of the general plenary sessions. The first was a series of short pre-recorded talks (all of which are still available on the forum webpage) which aimed to provide a snapshot of the astronomy landscape in Africa, and the second was open discussion, guided both by a common Vision Document and topics suggested by participants in real time through an "unconference session". The Vision Document was shared with all 430 registered participants prior to the forum. It formed the core of the discussions at the Forum and included actions needed to achieve the common vision. On Day 2 the discussions were in the form of an "unconference" – which meant that the topics of discussion were based on the interests of the participants themselves. Most popular topics were given a time slot for discussion. All topics of discussion are still available on the forum webpage, as well as the full recordings of the discussions.

SUMMARY OF SCIENCE SESSION

One of the main focuses of the Science Sub-Committee (SSC) is to facilitate the strong involvement and leadership of African researchers in scientific events at the IAU GA2024. This includes symposia and focus meetings. The path to hosting and leading symposia formally begins more than two years prior to the GA itself, and involves the development of a compelling programme focused around contemporary science topics and the involvement of a strong and scientifically competent organising committee. The aim of the parallel session for the SSC, was to bring experienced campaigners together with prospective proposers to share and exchange information. In the first half of the session, the experiences of successful symposia chairs and leaders in the IAU were leveraged to

provide an insider's view to proposing for and hosting symposia. In the second half, prospective proposers pitched their ideas for symposia and focus meetings, with the aim of consolidating the interests of the community under one umbrella and to assess the level of engagement amongst their African colleagues.

SUMMARY OF COMMUNICATIONS, EDUCATION AND OUTREACH (CEO) SESSION

It was highlighted as a strength of African astronomy that we focus on outreach and education as much as we do on scientific research. When developing a field, the growth of research is not enough; a pipeline of young talent also needs to be nurtured, and astronomy has been seen to be a part of our culture and social activities. The General Assembly of the International Astronomical Union was seen as an opportunity to expose different audiences to more traditional education and public outreach efforts, including making efforts towards inclusivity and accessibility. The conversation followed several topics, each led by a member of the CEO sub-committee.

Planetaria: The high cost of producing one's own recorded shows was highlighted, along with the costs of translating them into various African languages. However, it was also pointed out that conducting live sky shows inside the dome would have great value, and can be done with no additional cost for the planetaria. There is also a pressing need to build capacity to enable people to construct their own low cost mobile planetaria across Africa. Ensuring inclusivity and accessibility of planetarium shows was also discussed.

Science Centres: There is a very strong network of science centres across South Africa as well as across Africa. These networks have developed a platform for science centre staff and their collaborators to share programs and activities that they have created, and establish new collaborations. The take home message was that science centres are always on the lookout for new activities to offer and would make great partners for the IAU General Assembly CEO portfolio.

Amateur astronomers: The main point that was discussed was how to grow amateur astronomy communities across the African continent. ASSA, the South African association, is well established and can help other budding associations. The African Network of Amateur Astronomy Associations compiled by the AfAS Outreach Committee was highlighted, and many of the well established associations have already indicated to AfAS their willingness to mentor newer astronomy clubs, especially in schools.

Wild ideas: This was a space to think outside the box as well as to remind us of great ideas that may not be new, but are very effective. Pan-African projects were given special attention due to the continental scale of the 2024 event. Many "wild ideas" were brought up and will be followed up on by the CEO sub-committee and AfAS.

Lastly, this IAU GA belongs to all of us. We want to hear your ideas on what we can do, so email them to us!

SCIENCE FLAGSHIP

The science flagship concepts within the SSC are under active development, with the broad aim of facilitating skills development for the astronomy community across the continent (especially as it relates to topics in Big Data) and supporting the AfAS flagship projects, such as the African Integrated Observation System (AIOS). At the forum, ideas were discussed for facilitating skills development workshops by bringing into focus various existing frameworks for funding and collaboration. This involves leveraging involvement in initiatives such as the IAU Hands On Initiative (I-HOW), partnerships with DARA and various initiatives hosted by the NRF and SARAQ, for example. The Science parallel session aimed at creating visibility and support for the AIOS.

EDUCATION AND OUTREACH FLAGSHIP PROJECT

This flagship proposes to develop a continent-wide model of the solar system. By placing the Sun on Cape Town, the venue of the 2024 General Assembly of the International Astronomical Union, and scaling orbits of solar system planets and other objects, every country on the continent has at least one object traversing it, along which it can set up a centre of astronomical activities, from outreach to research to infrastructure. The flagship project was presented and an invitation was extended to African partners to link their astronomy activities to the model. This gave rise to a flurry of ideas, especially in conjunction with the broader Astronomy Hubs discussion. The diversity of astronomy status and of means of African countries was recognised. It was agreed that both timelines and scales of the elements along the solar system model would be flexible, ensuring that each country owns their particular orbit and object. The celebration of a solar system object along its orbit could even possibly take place at certain times. The broadcasting/ interactive sharing of the GA events to other African countries through structures representing solar system bodies was discussed.

THE WAY FORWARD

The main outcome of the forum was an updated version of the vision document, containing input from all the discussions during the three day event. This document attempts to capture the spirit of unity in astronomy across Africa, and to consolidate that spirit into a vision for 2024 that we can strive towards as a united astronomical community. It is a working document which serves as both a brainstorming exercise and a planning document for the African astronomy community. It is intended to be shaped by the community in order to capture big picture aspirations for 2024. The content is sometimes broader than only the actual IAU General Assembly but it serves to motivate supporters and funders with a vision of where we would like to be by 2024. Participants were given an opportunity before, during and after the forum, to add their comments and suggestions to the document. The document is now an open work in progress belonging to the African astronomy community, and most importantly has specific actions listed which we can each take ownership of in the path towards 2024 and beyond.

Contact details

Website: astronomy2024.org

Email: IAUGA2024@afasociety.org

Twitter and Instagram: @astronomy2024



CAPTION: A representative to-scale map of the orbits of the planets through Africa, with the Sun at Cape Town.

AfAS 2022 Seed Research Grant

APPLICATION INSTRUCTION GUIDELINES

Application Deadline: 31 January 2022

The African Astronomical Society (AfAS) is the primary pan-African professional society representing astronomers from across the continent. AfAS aims to create and support a globally competitive and collaborative astronomy community in Africa and to be the voice of astronomy in Africa while contributing to addressing the challenges faced by Africa through the promotion and advancement of astronomy.

The AfAS Seed Research Grant

Launched in 2021 by the AfAS Early-Career Researcher Working Group, AfAS Seed Research Grant supports research projects in Astronomy (including Astrophysics and Space Science) conducted by postgraduate students and/or early career researchers that are based in Africa. Three (3) grants of up to €1 200 each will be awarded to outstanding applicants in 2022. The seed funding may be used for international/domestic travel, lodging, computer equipment and other research-related expenses.

Eligibility

- Applicants can be citizens of any country provided they are based in Africa during the 2021-2022 academic year.
- Applicants are currently conducting research in Astronomy (including Astrophysics and Space Science) at an academic or scientific research institute in Africa.
- Applicants must be enrolled in a postgraduate level or they must have received their PhD degree within the past three years (i.e. between November 2018 – November 2021).

Application Procedure

Applicants should submit the following documents combined in one single PDF to Dr Charles Takalana (charles.takalana@afasociety.org) by 31 January 2022:

- A detailed curriculum vitae including a full list of academic publications and contact details of two academic referees;
- A research proposal (maximum 3 pages), including (but not limited to) the research title and abstract, the scientific rationale and an introductory background, the methodology and expected results, as well as the proposed timeline and a budget breakdown;
- A motivation letter addressed to the AfAS Seed Research Grant Committee;
- Proof of registration (for postgraduate students) or a proof of employment (for early career researchers) at an academic or scientific research institute.

Applicants should also arrange for signed recommendation letters from two academic referees to be sent directly to Dr Charles Takalana by 31 January 2022. At least one letter must be from a senior scientist

(e.g. the advisor) familiar with the applicant's research work.

Incomplete applications or files received after the deadline, as well as applications which do not meet the conditions of eligibility will not be taken into consideration.

If you are submitting any supporting documents in your local language, you must attach at least an informal translation into English.

Selection Criteria

Applications will be reviewed and ranked by the AfAS Seed Research Grant Committee which is composed of senior astronomers and members from the AfAS Science Committee. Applicants will be evaluated by the jury based on the following criteria:

- Quality of the research proposal (e.g. significance of the research statement);
- Publication track record, commensurate with the applicant's career stage;
- Excellence of the overall academic performance and achievements;
- Potential impact on growing research collaborations in Africa.

AfAS reserves the right not to accept any application in part or in whole.

Grant Awards Agreement

No funds will be released until AfAS has received the grant agreement signed by the successful applicants. The selected recipients are also required to submit a report including research updates and a financial report with expenses and scanned receipts of major expenses in the year following the award of the seed grant.

Estimated Timeline

- Opening of the call - 15 November 2021
- Closing of the call - 31 January 2022
- Application review process - during February 2022
- Notification of successful applicants - by mid-March 2022

Enquiries

Dr. Zara Randriamanakoto

Early Career Representative Officer, African Astronomical Society

Email: zara@saa.ac.za

Dr. Charles Takalana

Head of Secretariat & Assistant General Secretary, African Astronomical Society

Email: charles.takalana@afasociety.org

For more details on AfAS please visit: www.afasociety.org

NEW SPACE AGENCY APPROVED FOR AFRICA

COMING SOON: AN EXCITING FLAGSHIP SPACE AGENCY IS SET TO LAUNCH IN 2022.

By: Nadine Sims

The African Union Executive Council has confirmed their plans to build an African Space Agency (AfSA) as part of the flagship programmes of the African Union Agenda 2063.

In Addis Ababa (in 2016), the Heads of State and Government adopted a policy and strategy for the African Space Agency, as well as an African Outer Space Programme.

The headquarters of the African Space Agency will be located in Egypt and would include the human resources that are necessary to run the operations of the AfSA.

The workforce and leadership of the Agency is still being appointed and as soon as that is done, the Agency is then expected to be fully operational and functioning in 2022.

The African Union says that Africa needs to develop a well-structured space policy and strategy that could guide the continent, enabling it to become globally competitive, while also using science and innovation for socio-economic transformation on the continent.

One of the main objectives of the Agency is to, "Harness the potential benefits of

space science, technology, innovation and applications in addressing Africa's socio-economic opportunities and challenges."

The African Union says that it hopes to achieve this goal and will commit itself to help countries across the continent by training scientists in earth observation, satellite communication, navigation and position, and astronomy.

This will hopefully be aided by the Pan African University Institute of Space Science and Technology, located in South Africa.

The facilitator of the space-focused programme is the Cape Peninsula University of Technology and it will be one of six other South African Universities working and training in varied fields of space science.

The establishment of both the Pan African University Institute of Space Science and the African Space Agency, is in line with the African Union's objective to "drive to grow indigenous capacity in space science and technology in line with the African Space Policy and Strategy."

The Agency will be overseen by the African Space Council, which will have the authority over the plans, budgets and policies. The council will meet once a year, to discuss key issues and their progress.



CONFERENCES NOT TO BE MISSED

BELOW IS A LIST OF EVENTS IN THE ASTRONOMICAL SOCIETY TO WATCH OUT FOR.

By: Lusanda Tamesi

The 2nd Life in the Universe Conference

This conference is about in-depth research on understanding and gaining knowledge about evolution of life in the universe. It takes place from 22-24 November as a virtual event.

Proceedings of the first conference are available on YouTube at "Life in the Universe Symposium 2020".

The 2nd Life in the Universe Conference is sponsored by the Breakthrough Initiatives, the Palaeontological Scientific Trust and the South African Radio Astronomy Observatory.

Register on: Litu2021.org

Science Forum South Africa

Science Forum South Africa (SfSA) will take place for the 7th time at the CSIR International Convention Centre Pretoria, South Africa. Conversations will be under the theme: "Igniting conversations for World Science Forum".

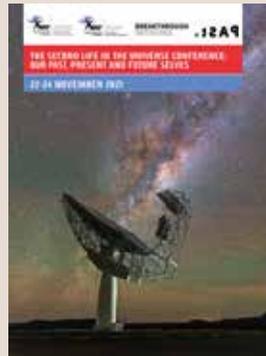
This three-day event takes place from 1-3 December virtually and in-person, in preparation of the World Science Forum (WSF) in 2022 which will take place in Cape Town from 5-9 December 2022.

The theme for the WSF 2022 is "Science for Social Justice".

Register on: esastap.org.za/sfsa2021/#

The Annual AFAS Conference: AFAS 2022

A hybrid, in-person and virtual, conference that will be a second of many to come from 14-18 March 2022. This conference will be in line with AFAS objectives – sharing astronomy research from all

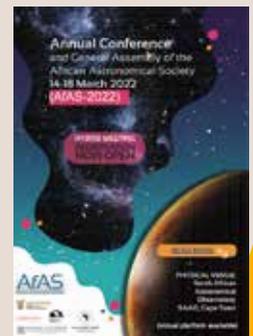


over Africa and stimulating discussions about future research topics.

In addition to discussing how African countries and the rest of the world can enhance their collaboration, the conference will focus on outreach, communication and education initiatives associated with Astronomy in Africa.

This conference will be led by AFAS committee and organisers, African Planetarium Association (APA), African-European Radio Astronomy Platform (AERAP) and *African Science Stars*.

Register on: africanastronomicalsociety.org/afas2022-ga-registration-form/



2024 International Astronomical Union (IAU) General Assembly

"It will be the first time this assembly is held on African soil in what will be the 105th year of existence of this prestigious global association of professional astronomers," says a statement by the Department of Science and Innovation (DSI).

This event will be hosted in Cape Town, South Africa, as it is home to Southern Africa's largest telescope, SKA.

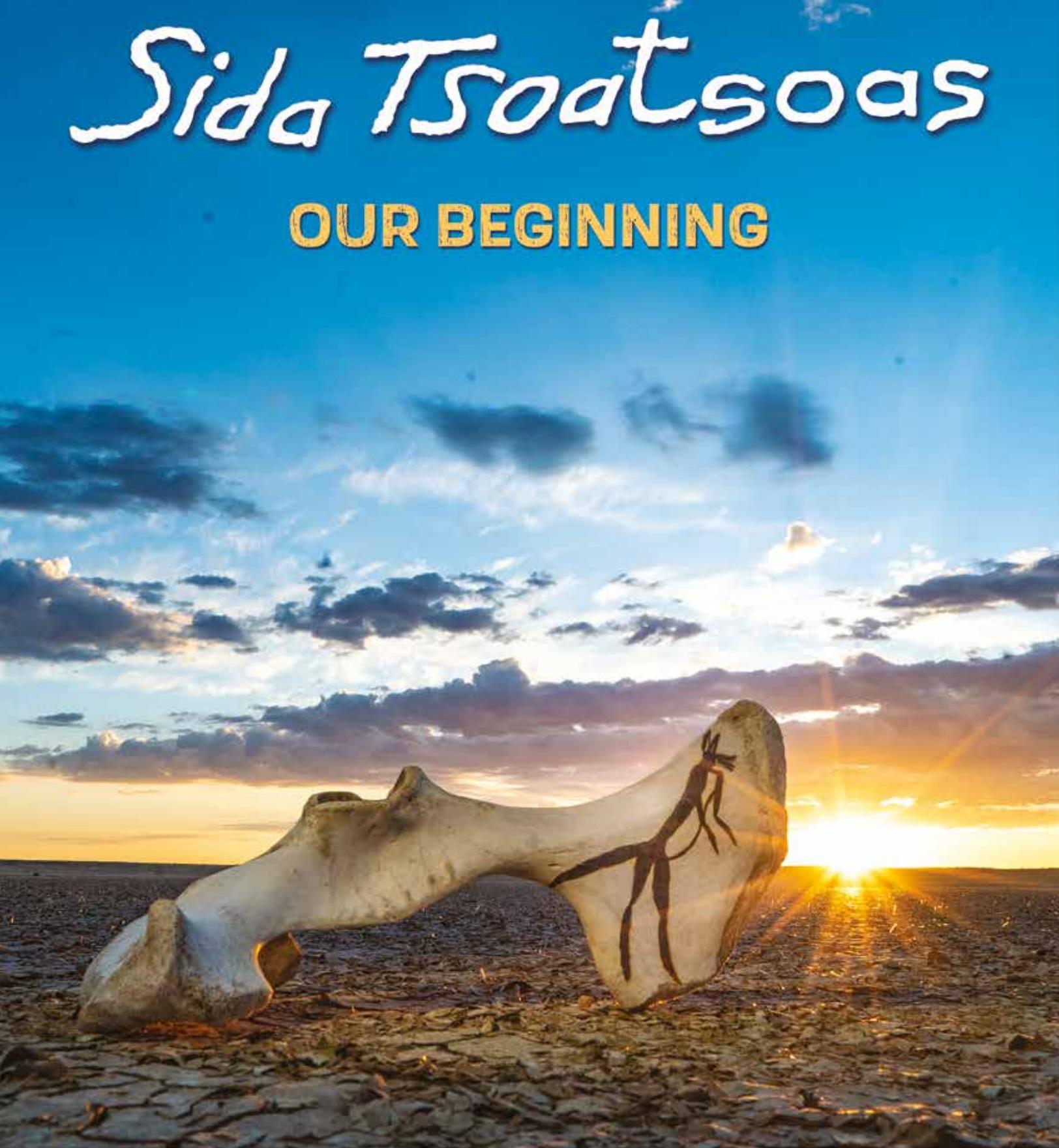
By putting together a global audience in Africa to bring attention to science, attract funding, develop programmes and create jobs (whilst putting other African countries on the map), this event is not only an educational injection but also an economic one.

Become an ambassador and register here: astronomy2024capetown.org



Sida Tsoatsoas

OUR BEGINNING



National Arts Council **NAC**
an Agency of the Department of Sport, Arts & Culture

AFAS
African Artistic Forum



POST AGE.



national film and video foundation
SOUTH AFRICA

an agency of the
Department of Arts and Culture