

UMnyele weZulu

EDITION 2: 7 AUGUST 2024 XXXII  GENERAL ASSEMBLY CAPE TOWN, SOUTH AFRICA

Preserving the sky for astronomy

The dark and quiet sky is a precious resource - Pg 3

Meet some of Africa's leading astronomers

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(Background) MeerKAT radio telescope array at NRF-SARAO's Carnarvon site. Image: NRF-SARAO



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Upcoming Events

- Cosmic Echoes Art Exhibition
06 to 15 Aug
- Talk by Dr Sian Proctor, the first African American spacecraft pilot
07 Aug
- Centre for the Protection of the Dark and Quiet Sky (CPS)
07 to 08 Aug
- IAUS 389 Plenary Talks:
Gravitational Wave
Astrophysics
07 Aug
- An Invited Discourse featuring
Dr Bernie Fanaroff
08 Aug

Get your
Free Ticket
to see
Sian Proctor,
trailblazing SpaceX
Inspiration4 astronaut,
in person & online
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(Top) MeerKAT antenna Omage: NRF-SARAO. Background) NRF-SAAO's telescope facility in Sutherland. Image: NRF-SAAO



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XXXII IAU GENERAL ASSEMBLY

CAPE TOWN, SOUTH AFRICA, 2024

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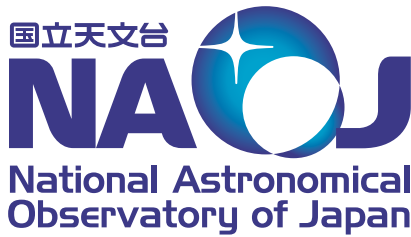


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Preserving the sky for astronomy

Connie Walker & SOC Members of the IAU GA WG6 and CPS Sessions

The pristine starry night is gradually eroding as a result of light pollution



Since the introduction of urban illumination more than a century ago, the visibility of the pristine starry night sky has gradually eroded as a result of light pollution. Observatories and dark-sky advocates worldwide have been working to limit light pollution to ensure the sustainability of ground-based nighttime astronomy and preserve the natural night sky for everyone to enjoy.

With the revolution in LED technology, the low cost of lighting has led to widespread use of bright, white, unshielded outdoor lighting in places where it is not needed or is harmful and counterproductive. A recent report including a citizen science project found light pollution is growing worldwide by 10% per year, far outpacing population growth. Another recent study reports that at the sites of over two thirds of the top ground-based optical astronomical observatories, the night sky brightness has already surpassed the 10% threshold set by the IAU. Turning the tide on this rapid increase in sky brightness will require political advocacy, full consideration of relevant economic forces, and building strong collaborations with environmental conservation, human health, and urban planning groups and organisations.

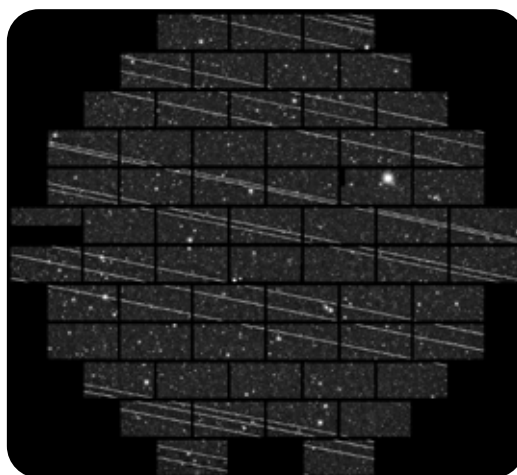
Just as optical telescopes need dark skies to study the cosmos, freedom from radio frequency interference (RFI) is one of the most critical aspects for a radio telescope. Radio telescopes are extremely sensitive to human-made radio signals and therefore are normally constructed in remote places with strict controls on the use of transmitting devices nearby. The most protected places on Earth for radio astronomy are designated nationally as Radio Quiet Zones, geographic areas where the use

of the radio spectrum is specially managed. Despite these protections, RFI from non-astronomical services such as commercial satellite communication, continues to grow, and the competition for narrow slices of radio spectrum is ever stronger. RFI will always be a challenge for radio astronomy, whether it is from satellites, airplanes, ground transmitters or even activities such as maintenance conducted by observatory staff.

Large constellations of low-Earth-orbit (LEO) satellites also pose a new and very serious challenge for ground-based optical astronomy. For optical observatories, the main challenges are the rapidly increasing number of streaks in images and data caused by satellites passing across the field of view; the apparent brightness of the satellites; and the possibility of extensive debris in LEO significantly brightening the night sky.

Two sessions of interest at the IAU GA, WG6 and CPS, hosted by the Executive Committee Working Group on Dark & Quiet Sky Protection and the IAU Centre for the Protection of the Dark & Quiet Sky from Satellite Constellation Interference, respectively, will explore these topics in detail. Commission B7 on site protection is also having a business meeting on August 12 from 1pm to 3pm.

You are invited to join us in building long-term solutions. The sessions offer an overview of the issues, solutions and latest developments in technical approaches to mitigations of light pollution and RFI, engaging diverse stakeholders, and framing effective regulations.



Streaks caused by Starlink satellites on an image taken using the Víctor M. Blanco 4-meter Telescope at the Cerro Tololo Inter-American Observatory (CTIO). Image: CTIO/NOIRLab/NSF/AURA/DECam DELVE Survey

Constance Walker is Head of the Office of Observatory Site Protection at NSF NOIRLab & Chair of the IAU Executive Committee WG Dark and Quiet Sky Protection

Rising Stars PhD Prize Winners at the GA

Naira Azatyan, PhD

Prize-at-large recipient, 2023



I am Naira Azatyan from Byurakan Astrophysical Observatory in Armenia. In 2022, I completed and successfully defended my PhD thesis entitled *Search and Study of Young Infrared Stellar Clusters*.

Knowing about the International Astronomical Union (IAU) PhD Prize, I decided to submit my work. I was overjoyed when the IAU announced that my thesis had won the IAU PhD Thesis at-Large Prize. This recognition is incredibly significant to me as it validates the importance of my research within the astronomical community. The prize acknowledges the scientific direction I have pursued and motivates me to continue contributing to this field.

This year, my participation in the IAU General Assembly is particularly special because I will have the opportunity to present my thesis on 9 August in Division G: Stars and Stellar Physics. During my presentation, I will highlight the methods and results from my research. One of the most important findings in my thesis is that the formation of high-mass stars in star-forming regions requires an external triggering force.

Receiving this prize is a tremendous boost for my career. It inspires me to further develop the scientific path laid out in my thesis. For more details about my work, you can click [HERE](#).

The IAU PhD Prizes are awarded annually to recognise the outstanding work being done by doctoral students in astrophysics around the world. Every year, each IAU Division has the opportunity to award one of these prizes to the candidate it feels has conducted the most remarkable research in the previous year. Additionally, the Divisions can also jointly award one PhD Prize-at-large.

Recipients of these prizes receive registration to attend the GA following their award, where certificates are presented during Division Days.

Question of the Day

Everyone mentions as the most important the very large range of subjects covered, the fact that you can attend many talks completely outside your field. Sharmila Goedhart, working on the science operations of SKA, stresses, "For me it is very important to know which are the current hot topics across different fields so that we see what SKA can provide and contribute". Wendy Williams says "I am giving a talk on Friday and are in general representing SKAO at the GA." Kelvin Wandia from Kenya mentions: "I am very happy to finally have a GA in Africa. I am excited to listen to talks completely outside my research field, which is radio observations of M-dwarfs."

What is your main reason for attending the GA and what makes it different from other meetings you attend?



Sharmila Goedhart, SKAO South Africa, in her lovely self-made shawl, "The GA is the meeting of all meetings"



Wendy Williams, SKAO UK, "I love the scientific diversity of the meeting"



Kelvin Wandia, Manchester University, originally from Kenya, "It's the first time in Africa and that's a big thing"



SKAO

IAU General Assembly Session on the

Centre for the Protection of the Dark and Quiet Sky from Satellite Constellation Interference (CPS)

7–8 August 2024



7 August (10:30 – 17:00)

8 August (8:00 – 9:30)

(South Africa Standard Time = GMT + 2h)

In-person and online

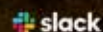


**Cape Town International
Convention Centre**

in Cape Town, South Africa



<https://cps.iau.org/meetings/iauga24cps>



#cps-satcons for the CPS session

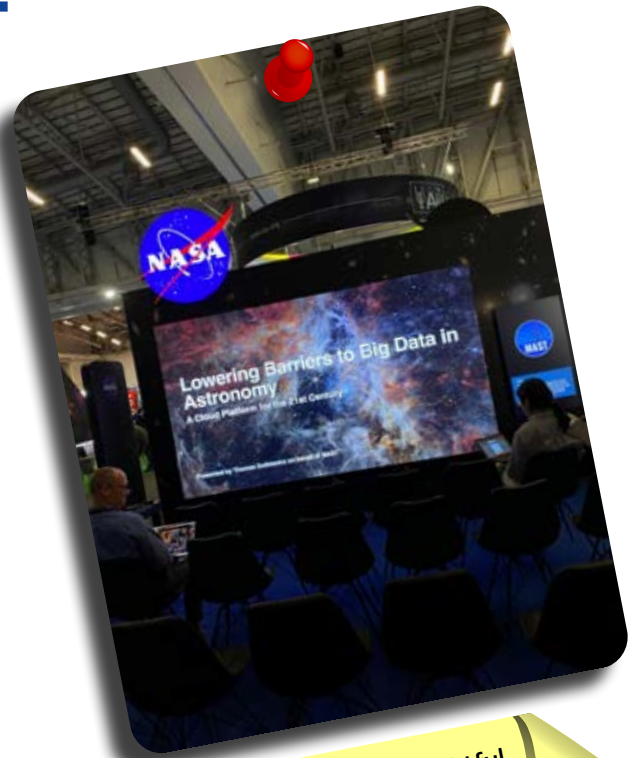
Image Credit: Florian Kriechbläumer

Scenes from Day 1 of the XXXIInd IAU General Assembly

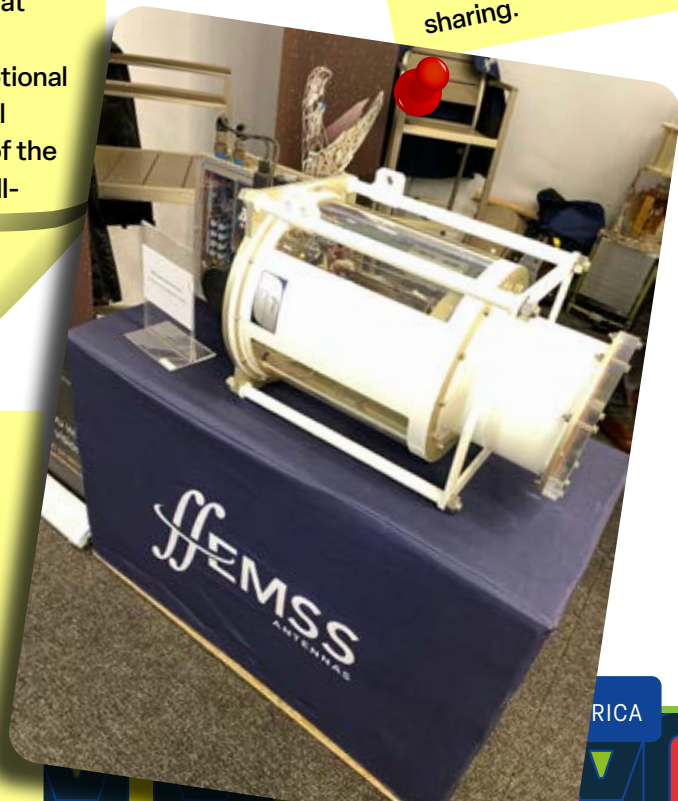
Some of the many goings on in and around this year's GA



The IAU GA 2024 kicked off with a mesmerising performance by a talented iThemba Youth Choir at the Cape Town International Convention Centre. Bringing the rich and vibrant sounds of South Africa to the event, their rendition of melodious South African songs captivated the audience, blending harmonious vocals with energetic rhythms that resonated deeply with attendees. The choir's performance not only showcased their exceptional musical talent but also celebrated the cultural diversity and unity that are core to the spirit of the IAU GA. The young performers received a well-deserved standing ovation, leaving a lasting impression on all who had the privilege to witness their artistry.



MAST delivered an insightful presentation on lowering barriers to big data in astronomy. Emphasizing the importance of accessibility and collaboration, they highlighted innovative strategies and technologies designed to democratize data access for astronomers worldwide. By addressing challenges such as data storage, processing, and sharing.



This cutting-edge instrument is a receiver pivotal in capturing and processing radio signals from space. The Hemss receiver enhances our ability to study celestial phenomena, enabling astronomers to delve deeper into the mysteries of the universe. Its presence at the event underscored the advancements in radio astronomy technology and highlighted the innovative tools that are driving forward our

Historical comet hunt photo plates return to South Africa

Dr. Markus Pössel



Important piece of African astronomical heritage returns

If you have ever watched shooting stars of the annual Leonid meteor shower, visible every year in November, you have seen microscopic bits of the comet 55P/Tempel-Tuttle. That comet, like all of its kind, left behind traces of dust along its orbit, and the Leonids are visible whenever Earth passes through those dusty regions (the “meteoroid stream”). The comet itself proved considerably more elusive than the dust it had left behind: After it had been discovered in 1865/1866 by the Franco-German astronomer Wilhelm Tempel and the US-American astronomer Horace P. Tuttle, it became lost - the orbital elements were not known with sufficient precision to find the comet again. The comet’s relation to the Leonids was pointed out in 1867 by the Italian astronomer Giovanni Schiaparelli (of Mars observation fame).

In 1872, the British astronomer John Russell Hind suggested that 55P/Tempel-Tuttle might be a periodic comet, identical to the comets that had been observed in 868 by European astronomers and by Chinese astronomers in 1366. An analysis by the Japanese astronomer Shigeru Kanda in 1933 strengthened the case for Tempel-Tuttle being the 1366 comet, but dismissed the connection with the observations from 868.

At that time, more definite predictions and orbital reconstructions were not possible. There simply was not enough computing power to trace a cometary orbit and to include all perturbations by the gravitational pull of the various planets. This changed with the advent of electronic computers, and in the mid-1960s, the German astronomer Joachim Schubart, one of the top European experts on celestial mechanics, took up the challenge. Schubart’s institute was (and is) called “Astronomisches Recheninstitut” (ARI). At the time, it was an independent astronomical institute tasked

with the calculations necessary to provide reliable astronomical ephemerides and the data necessary to produce an official calendar; since 2005, it is part of the Center for Astronomy (Zentrum für Astronomie, ZAH) of Heidelberg University. The institute name literally means “institute for astronomical calculations,” and that is what Schubart, together with his colleague Peter Stumpff, undertook for Comet Tempel-Tuttle: They reconstructed the comet’s orbit, varying the orbital period until they were able to match the Chinese observations from 1366. Their reconstruction linked the comet to yet another observation, namely by the German astronomer Gottfried Kirch in 1699.

The astronomers were also able to predict that 55P/Tempel-Tuttle would make its next pass close to the Sun, traditionally the time when comets are most visible, in 1965. But in fact, this prediction came almost too late - by the time the astronomers had obtained their results, the comet should just have reached the point on its orbit closest to the Sun. Due to the relative orientation of the cometary orbit and the Earth, observations that could test the prediction would be hard to obtain from the Northern hemisphere. Schubart asked colleagues in New Zealand, Argentina and South Africa to help, but at first, it seemed as if 55P/Tempel-Tuttle would remain elusive - that it did not show up in any of the observations.

While today, astronomers routinely share data via the Internet, back in the 1960s, standard observations were recorded on photo plates. Some of those plates made their way to Heidelberg, where Schubart then re-examined the material. Several plates were sent to Schubart from Boyden Observatory near Bloemfontein in South Africa. At the time, Boyden Observatory was being operated under what was known as the Boyden Council - in effect, the world’s first international observatory, operated by observatories from the US (Harvard), Ireland, Northern Ireland, Germany, Sweden,

Belgium, and later South Africa.

And lo and behold, on two the Boyden Observatory plates, Schubart was able to make out weak traces of the comet - a few days' worth of travel behind Schubart's original prediction, but well within the uncertainties of the orbital reconstruction. Later, Schubart was also able to identify the comet on copies of plates taken at the Mount Palomar Schmidt camera - the delay being due to the South African plates having travelled to Heidelberg via air mail, while the US-American plates had travelled by sea. With those four data points, which span a time of almost a month, measured by Schubart and his colleague Edward Geyer, the identification was certain: 55P/Tempel-Tuttle had been rediscovered.

Schubart continued to work at ARI long after his retirement, but about 10 years ago he withdrew to a more private mode of life. Emptying out his desk at ARI, he re-discovered the plates, and asked his colleague Ulrich Bastian whether he might help with returning the Boyden plates to South Africa. When the IAU's historic 2024 General Assembly in Cape Town came around, the

first such assembly on the African continent, Bastian asked several of his Heidelberg colleagues: who was attending the General Assembly, and might be able to take the plates along to South Africa? Markus Pössel, senior outreach scientist at the Max Planck Institute for Astronomy and Haus der Astronomie, and the current director of the IAU's Office of Astronomy for Education, agreed to undertake the task. In the course of the General Assembly, Pössel will return the plates to Dawid Van Jaarsveldt of the University of the Free State, closing another small chapter in a cometary discovery voyage that, depending on how you count, has lasted 59 years, or 159 years, or 658 years, and involved astronomers from various countries, continents and generations.

The timing, over this long period, is perfect: Van Jaarsfeldt is currently preparing an exhibition on Boyden Observatory's comets. A total of 13 comets were discovered there, six of them by observer Michiel Bester who is likely to also have been the observer for the Tempel-Tuttle plates.

Invited Discourse Speakers



Dr Bernie Fanaroff (SKA)

*"Innovating at the Periphery:
the Development of SKA and MeerKAT"*

with an additional 10-min talk by Dr Mpathi Ramatsoku
(Rhodes University)



XXXII TAU GENERAL ASSEMBLY

CAPE TOWN, SOUTH AFRICA, 2024

Thursday, 8 August

17:15-18:15

CTICC Audi 1

Meet some of Africa's leading astronomers

IAU GA 2024 NOC

African astronomers are making their mark in science



While South Africans and results from the country's MeerKAT radio telescope and South African Large Telescope feature prominently at the XXXIII IAU General Assembly, more than 225 professional astronomers from 22 other African countries are also presenting their groundbreaking work in astronomy research, communication, education and development.



Dr Meryem Guennoun

Dr Meryem Guennoun is Morocco's first female astronomer and an accomplished astrophysicist at the Oukaïmeden Observatory in the Atlas Mountains of Morocco. This optical observatory is being used

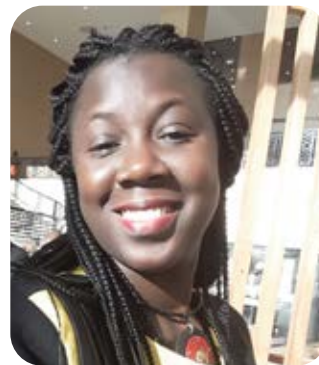
to conduct the Morocco Oukaïmeden Sky Survey, a survey of small solar system bodies through which more than 100 new asteroids have been detected. Meryem specializes in meteor observations and is keenly interested in their parent bodies and their association with asteroids. Meryem will present the methodologies and successes of the Moroccan meteor observation network in accurately pinpointing the origins of meteors and forecasting potential impact zones on Earth.

Dr Pheneas Nkundabakura

Rwanda's Dr Pheneas Nkundabakura is a blazar man. A blazar is a galaxy with an intensely bright centre, containing a supermassive black hole, that emits fast-moving jets of charged particles which happen to be pointing directly at the



observing telescope or viewer. Blazars are some of the hottest and most energetic objects in the universe and emit high-energy gamma rays which are the smallest but most energetic waves in the electromagnetic spectrum. These waves are so small that they can pass through the space within atoms and so cannot be captured and reflected by mirrors. Pheneas will share how he has used data from gamma-ray telescopes, such as NASA's Gamma Ray Space Telescope and its retired Compton Gamma Ray Observatory, to study the nature and behaviour of blazars. Pheneas obtained his Ph.D. in Astrophysics from the University of the Free State in South Africa and returned to Rwanda where he is currently an Associate Professor of Physics at the University of Rwanda in Kigali.



Salma Sylla

At the start of August 2018, 40 NASA scientists headed to Senegal to collaborate with 20 local scientists to exploit a stellar occultation - when a space object is directly lined up with a distant star - to observe the shape of Kuiper Belt object, Arrokoth, set to be observed by NASA's New Horizons probe on 1 January the next year. In July 2024, Senegal launched its first satellite, GaindéSat-1A, an Earth observation satellite that will collect data to help with natural resources and land management, disaster prevention, agriculture, firefighting efforts, flood management, and erosion control.

(Top) A telescope pointed at the skies above Senegal to capture the stellar occultation. Image: François Colas, Observatoire de Paris, Institut de Mécanique Céleste et de Calcul des Ephémérides

Senegal's Salma Sylla, a PhD student at the Université Cheikh Anta Diop in Dakar, is leveraging the excitement of Senegal's increasing role in astronomy and space sciences on the African continent to establish astronomy clubs around the country. She is part of a collaboration called ORION Astro Lab, implemented in collaboration with Madagascar, that aims to create a dynamic, competent and sustainable network of astronomy clubs in Senegal. Salma will share the work of ORION Astro Lab to train 20 astronomy club leaders in Senegal in leadership, project management and astronomy content with support from the IAU's Office for Astronomy Outreach.

Dr Jamal Mimouni

Algeria's Jamal Mimouni, Immediate Past President of the African Astronomical Society (AfAS) and Head of Astrophysics at the University of Constantine I in Constantine, will shed light on the dire challenges faced by academic communities in conflict zones. Using the poignant example of the UNESCO Palestine Chair in Astronomy, Astrophysics and Space Sciences, which has seen its home institution in Gaza destroyed and many of its students become refugees or lose their lives, Jamal will emphasize the critical role played by academic institutions in rebuilding conflict zones and the need to protect research infrastructure during times of conflict.



Astronomy and space enthusiasts can find more stories about astronomy and astronomers in Africa by browsing through the full IAU General Assembly 2024 programme at <https://astronomy2024.org/>. Registration for in-person and full online participation in the meeting is still open and, in another first, the IAU will allow anyone with internet access to watch sessions in pre-recorded or live format on YouTube.

The IAU General Assembly is proudly hosted by the National Research Foundation with strong support from the Department of Science and Innovation and the African Astronomical Society. Key sponsors include the SKAO, Brand South Africa, NAOJ, the American Institute of Physics, ESA, and the Simons Foundation.

Talks by 2024 IAU Prize Winners

Talks will be given by the winners of the IAU Outreach, Development and Education (ODE) Prizes. IAU past president, Ewine van Dishoeck, who established the prizes, will present the session.

Time 12:00PM

Date 7 August

Venue Auditorium 1



Saran Poshyachinda
IAU Astronomy Outreach Prize



Central American-Caribbean Bridge in Astrophysics
(Cenca Bridge) Project

**Yahira Mendoza, Antonio Porras Valverde,
Gloria Fonseca Alvarez, Valeria Hurtado**
IAU Astronomy Development Prize



Bonaventure Okere and Linda Strubbe
IAU Astronomy Education Prize

Cosmic Echoes: A Shared Sky Indigenous Art exhibition

Australian and South African Indigenous artists explore creativity at the intersection of modern science and ancient wisdom



Venue Clivia Conservatory, CTICC I

Days Tuesday 06 to Thursday 15 August

A transformative journey of collaboration between world-renowned artists, local youth, and Elders who have been inspired by the traditional knowledge of ancient cultures and the wonders of modern science.

Cosmic Echoes stems from a vision by the SKAO and its partners, the South African Radio Astronomy Observatory (NRF-SARAO) and CSIRO, Australia's national science agency, to bring together under one sky South African First Nations and Aboriginal Australian artists in a collaborative exhibition, featuring a celebration of humanity's ancient cultural wisdom. This vision embodies the spirit of international science and engineering collaboration that is the SKAO itself, bringing together many nations around two unique and culturally rich sites in Australia and South Africa to study the same sky.

This exhibition reflects the richness of the San and Wajarri understanding of the world; an understanding developed by observing the movements of the night sky since ancient times. Cosmic Echoes explores how this traditional knowledge resonates in the creativity of living artists who are sharing their insights with scientists working to unlock the secrets of the Universe.

About a decade ago, SKAO's first Indigenous art exhibition Shared Sky was developed with the same spirit, and travelled internationally to showcase both communities' cultural heritage. Cosmic Echoes is its successor, highlighting once more the creativity and knowledge of those living since time immemorial where the SKAO's telescopes are being built.

In June 2024, a group of artists worked with local

Indigenous youth and Elders in South Africa to prepare for the Cosmic Echoes exhibition. The workshops in Carnarvon, in the Northern Cape region where the SKA-Mid telescope is being built, produced visual art as well as performance art.

Meanwhile in Western Australia, the SKAO and CSIRO commissioned and briefed a group of Aboriginal visual artists from the Wajarri Yamaji, Traditional Owners and Native Title Holders of the land where the SKA-Low telescope is located.

In addition to featuring mainly established artists, the Cosmic Echoes exhibition curates the youth work in a creative conversation with their professional counterparts. And in turn the artists from Australia and South Africa are 'in conversation' with each other and with the SKAO scientists. Together they achieve an elegant symmetry, echoes of a distant past that speak to a common future.

Cosmic Echoes: a Shared Sky Indigenous Art Exhibition is an SKAO initiative, in collaboration with NRF-SARAO, CSIRO and the Wajarri Yamaji Aboriginal Corporation.

We recognise and acknowledge the Indigenous peoples and cultures that have traditionally lived on the lands on which our facilities are located. In Australia, we acknowledge the Wajarri Yamaji as Traditional Owners and Native Title Holders of Inyarrimanha Ilgari Bundara, the CSIRO Murchison Radio-astronomy Observatory, the site where the SKA-Low telescope is based.

Let the gravitational wave discussions rock your morning in Cape Town!

We look forward to welcoming you to the first plenary of the meeting today, [IAUS 389 Gravitational Wave Astrophysics](#).

Link to the full programme [HERE](#).

First African American Woman Spacecraft Pilot to Speak at XXXII IAU GA

Dr Sian “Leo” Proctor was the mission pilot for the first all-civilian orbital mission, Inspiration4



Dr Sian “Leo” Proctor, mission pilot for the first all-civilian orbital mission, Inspiration4, the first African American woman to pilot a spacecraft and the first African American commercial astronaut, will present a public talk and Q&A at the Cape Town International Convention Center (CTICC) from 7:30 - 9:30 PM on Wednesday, 7 August.

The appearance by Proctor in Cape Town forms part of the International Astronomical Union (IAU) General Assembly (GA) 2024 taking place in the Mother City from 6-15 August.

Inspiration4 launched on a SpaceX Falcon 9 from the NASA Kennedy Space Center’s historic Launch Complex 39A, the embarkation point for NASA’s Apollo and Space Shuttle missions, and travelled across low-Earth orbit on a three-day journey. The crew’s mission was not only to be the first all-civilian orbital mission, but also to raise \$200 million to accelerate research in childhood cancer at the St Judes Children’s Research Hospital in the USA.

Proctor, currently a Professor in Geosciences at the Maricopa Community Colleges in Arizona, USA, is also an analogue astronaut, conducting activities in locations that have physical similarities to extreme space environments. She has completed four missions, including a four-month NASA Mars mission investigating food strategies for long-duration space flights at the Hawai’i Space Exploration Analog and Simulation (HI-SEAS) Habitat in 2013, and the all-female Sensoria mission at HI-SEAS in 2020 which placed women at the leadership and centre of our shared vision for space exploration.

Proctor was born in Guam where her father was working at the NASA tracking station during the Apollo mission and grew up admiring Neil Armstrong’s autograph to her father on his office wall. “For a long time I did not understand why I never saw people who looked like my

dad in the NASA archives from the Apollo period,” says Proctor. She is the founder of The Proctor Foundation which aims to increase diversity in the space industry by exposing black, Indigenous, and/or people of colour majoring in arts and humanities to experiential learning opportunities focused on science, technology, engineering, and math (STEM) and encourages participants to use their knowledge and skills in careers that advance human spaceflight.



(Above) Dr Sian Proctor, mission pilot for the first all-civilian orbital mission, Inspiration4, and the first African American woman to pilot a spacecraft, will present a public talk during the IAU General Assembly on 07 August from 7:30 PM to 9:30 PM. Image credit: Inspiration4

(Top) Image of earth taken by Inspiration4 mission. Image: Inspiration4 / Hayley Arceneaux

Proctor's visit to South Africa forms part of the national Space Tour 2024 hosted by Living Maths, a STEAM-based educational NGO enhancing learning experiences for students through innovative and engaging methods, and Sakhikamva, an NPO involved in aviation awareness and skills development for the youth in the aerospace industry. Tickets for the public talk at the CTICC start at R50 and are available online from Quicket.co.za by searching for Astronaut Dr Sian Proctor.

The IAU General Assembly 2024 will also feature exhibitions by the world's leading astronomical observatories and space agencies including the European Space Agency (ESA), NASA, the National Astronomical Observatory of Japan (NAOJ), the USA's

National Radio Astronomy Observatory, South African Astronomical Observatory, South African National Space Agency, South African Radio Astronomy Observatory, and the Square Kilometer Array Observatory (SKAO).

The IAU General Assembly is proudly hosted by the National Research Foundation with strong support from the Department of Science and Innovation and African Astronomical Society. Key sponsors include the SKAO, Brand South Africa, NAOJ, the American Institute of Physics, ESA, and the Simons Foundation.

Visit <https://astronomy2024.org/> to register and view the full IAU General Assembly 2024 programme, or email info@astronomy2024.org for more information.

Office of Astronomy for Development Astronomy for a Better World!

Astronomy serves as a powerful tool for addressing global challenges, promoting sustainable development across various aspects, including scientific, technological, social, cultural, economic, and environmental domains. Recognizing the deep cultural and historical significance of astronomy, the International Astronomical Union's Office of Astronomy for Development (IAU-OAD) utilizes its versatility to address diverse societal challenges.

The first session of the OAD Institutional Meeting will be chaired by the OAD director, Kevin Govender. This session will begin with a presentation by IAU President Prof. Debra Elmegreen titled: "Astronomy for a Better World: Reflections on the OAD". OAD team members will then follow and present highlights of OAD activities and the flagship programs – Astro tourism, Astronomy for Mental Health, and Hack4dev. A core OAD activity is the Annual Call for Proposals, which strategically funds and coordinates projects worldwide that leverage astronomy to tackle societal issues. Since 2012, the OAD has funded over 200 such projects in more than 100 countries through this call. This session will feature short presentations from some previously funded projects.

The second session, chaired by OAD Deputy Director Dr. Charles Takalana, will be a panel discussion with OAD regional and language offices. To amplify the impact of OAD work, 11 Regional Offices and Language Centers

worldwide, sharing the OAD vision but focusing on specific geographic, cultural, or linguistic regions, were established. The panel will discuss office activities and challenges. Recognising the importance of fundraising and income generation for such initiatives, OAD fellow Genevieve Marshall will give an invited talk titled: "Best Practices in Fundraising and Income Generation" during the session.

At the OAD, we understand the importance of interdisciplinary collaborations. The final session, chaired by OAD Flagship Coordinator Dr. Joyful Mdhuli, will feature talks from various disciplines. Invited speaker Dr. Ashley Cooper, a licensed mental health counselor and full-time Associate Professor, will present "Astronomy and the Reduction of Anxiety: Digestible Astrophysics and Immersive Experiences".

In addition to talks, the OAD will host two poster sessions on August 8th, allowing participants to showcase their work from around the world. Posters will cover a broad range of topics, including OAD-funded projects and work from regional and language offices.

The OAD Institutional Meeting promises a comprehensive program highlighting initiatives aiming to use astronomy for a better world.

OAD-1: Office for Astronomy Development
Meeting Room 1.63 - 1.64
10:30 AM to 12:00 PM
Thursday, 8 August, 2024

Talk by

Astronaut Dr Sian Proctor



7 August 2024



19:30 to 21:30 SAST



CTICC, Cape Town



Book your tickets now

Join Dr. Sian Proctor, pioneering geoscientist, artist, and astronaut, as she shares inspiring stories from her groundbreaking space and art adventures.



XXXII IAU GENERAL ASSEMBLY

CAPE TOWN, SOUTH AFRICA, 2024

Journey into Space with Astronaut Dr. Sian Proctor

Join us for an unforgettable evening as Dr. Sian Proctor, geoscience professor, Afrofuturism artist, and trailblazing astronaut from SpaceX Inspiration4, takes the stage at the Cape Town International Convention Centre during the IAU General Assembly 2024! Discover her groundbreaking journey as the first female, African American commercial astronaut to pilot a spaceship. From her captivating Afrofuturism art to her pioneering work in analog astronaut missions and sustainable space practices, Dr. Proctor inspires a future of diversity and inclusion in space exploration. Don't miss this unique opportunity on Wednesday,

7 August, from 19:30 to 21:30. Be part of this memorable event—reserve your seat today!

Best yet? IAU GA 2024 Participants get free entry!

How to Book Your Free Ticket

1. If you are registered for the GA 2024, we will provide you a promotional code on the IAU GA Slack (more information coming soon)
2. Use your promo code when booking your tickets here.
3. Make sure to show your Quicket ticket when attending the talk on Tuesday 7 August at 19:30
4. Enjoy!

Leading Nasa Scientists at IAU GA 2024

NASA has a number of exciting events planned during the XXXIInd IAU



An Evening with NASA 7 PM - 9 PM, 8 August, NASA Exhibition, CTICC Audi 1

Women's Day Event 11 AM - 2 PM, Friday 9 August, CTICC Audi 1

Live Radio Link with ISS 1:55 PM Friday 9 August, CTICC Audi 1

A delegation of leading scientists from the USA's National Aeronautics and Space Administration, NASA, are in Cape Town for the International Astronomical Union (IAU) General Assembly 2024 at the Cape Town International Convention Centre (CTICC) from 6-15 August.

The IAU General Assembly is the world's largest international meeting of astronomers and National Organising Committee Chair, Kevin Govender, says South Africa's National Research Foundation is ready to welcome more than 2 000 delegates from 82 countries to the historic event which sees the General Assembly being held on the African continent for the first time in the Union's 105-year history.

Astronomy and space enthusiasts can look forward to engaging with NASA scientists during the special "An Evening with NASA" public event at the CTICC from 7-9 PM on 8 August, and at the agency's custom 36m² exhibition in Exhibition Hall 1 of the CTICC which will be open to the public during IAU General Assembly public events. Experts from NASA's Science Mission Directorate will highlight various aspects of the Directorate's work, including progress on the Nancy Grace Roman Space Telescope; missions to discover and study planets outside our solar system; and the agency's strategy to safeguard Earth from potentially hazardous asteroids and comets.

Former NASA astronaut and the first African American

woman in space, Mae Jemison, will make various public appearances during the IAU General Assembly, including a Women's Day Event featuring hands-on activities designed and presented especially for women and girls at the CTICC from 11 AM - 2 PM on 9 August. Jemison, who is fluent in Swahili, is an engineer and physician whose career included serving as an Area Peace Corps Medical Officer in Sierra Leone and Liberia before being selected for NASA's astronaut program in 1988.



Mae Jemison, former NASA astronaut and the first African American woman in space, will make several public appearances during the IAU General Assembly. Image: NASA

Images from NASA's James Webb Space Telescope launched on 25 December 2021, are already allowing astronomers to rewrite the history of the Universe, and research conducted with the space-based infrared telescope will be shared in no fewer than 25



A star is born! Behind the curtain of dust and gas in these “Cosmic Cliffs” of the Carina Nebula are previously hidden baby stars uncovered by NASA’s James Webb Space Telescope. Image: NASA, ESA, Canadian Space Agency, and Space Telescope Science Institute

presentations during the General Assembly. Also, a hot topic at the meeting will be NASA’s proposed Habitable Worlds Observatory, a space-based infrared, optical, and ultraviolet telescope to be designed specifically to search for signs of life on planets beyond our solar system.



Ten lucky Cape Town learners will get to ask NASA astronaut Suni Williams a question during a live radio link to the International Space Station on 9 August. Image: Boeing

The public is also invited to witness a 10-minute live radio link with the International Space Station at 1:55 PM on 9 August during which 10 lucky Cape Town learners can ask NASA astronaut and Boeing Starliner Crew Flight

COSMIC ECHOES

A SHARED SKY INDIGENOUS ART EXHIBITION



5 -15 AUG 2024

CAPE TOWN INTERNATIONAL CONVENTION CENTRE



Test Pilot, Sunitha Williams, a question. The Boeing Starliner is a next generation reusable space capsule designed to transport cargo and crews to and from low-Earth orbit starting with missions to the International Space Station carrying NASA crew members.

Enthusiasts around the world unable to visit Cape Town need not fear missing out, as registrations for full online participation in the meeting are still open and, in another first, the IAU will allow anyone with internet access to watch sessions in pre-recorded or live format on YouTube.

The IAU General Assembly is proudly hosted by the National Research Foundation with strong support from the Department of Science and Innovation and the African Astronomical Society. Key sponsors include the SKAO, Brand South Africa, NAOJ, the American Institute of Physics, ESA, and the Simons Foundation.

Visit <https://astronomy2024.org/> to register and view the full IAU General Assembly 2024 programme, or email info@astronomy2024.org for more information about the event.

astroEDU: Your Gateway to Stellar Educational Experiences

Giulio Mazzolo, Livia Giacomini, Edward Gomez, and Gwen Senderson



Ignite young minds with free and engaging astronomy educational activities

Don't miss out on the astroEDU talk on 7 August at 2:05 PM

Picture this: You're about to join an outreach event with teenagers, but you're stumped on what astronomy activity could captivate them. Or maybe you're a science teacher looking to introduce something fresh and original to spark your students' fascination with the Universe. Or let's say you have developed a fantastic educational activity about astronomy and want to share it with teachers and outreach enthusiasts worldwide, but you're unsure how to go about it. What's the solution? The answer is astroEDU!



Did you ever imagine building the planets of the Solar System as cubic characters with their own, brilliant personalities? With this astroEDU educational activity, you can!

astroEDU is an educational initiative supported by the IAU's Office of Astronomy for Education. Its mission is to provide captivating astronomy educational activities for teachers and outreach practitioners around the world, allowing them to tailor these activities to their needs. The activities cater to all tastes and age groups from 6 to 19 years old, and best of all, they are completely

free and open access, with a new activity released every month.

Now, you might be wondering where these activities come from and how you can trust their quality. The answer lies in astroEDU's approach, which mirrors that

of scientific journals. astroEDU welcomes submissions of new activities from around the globe, which are published on the platform only after undergoing a rigorous double peer-review process – from both educational and scientific perspectives.



Let your students familiarise themselves with orders of magnitude or powers of 10 through this astroEDU card game.

From creating a homemade spectrometer with a matchbox to exploring the Sun's inner structure with a bit of plasticine, or from navigating like a Viking using the Sun to learning about the Solar System's planets as if they were characters

with their own personality, you'll be amazed at the variety and creativity of the 100+ activities already available on the astroEDU portal!

Curious to learn more about astroEDU and its multi-language editions (English, Italian, Spanish, and more to come), and maybe eager to get involved? Visit us at our booth and discover all that astroEDU has to offer. We can't wait to meet you!

Check out the astroEDU website here:

<https://astroedu.iau.org/en/>

Sign up as a volunteer:

<https://astroedu.iau.org/en/volunteer/>

Don't forget to book your tickets for the inspirational [Cosmic Savannah Live Show](#)

14 August, 7:30 PM to 8:30 PM.

Tickets are free but registration is required. It is also streamed online.

Discover the IAU Office of Astronomy for Education (OAE)

Our mission is to bring the wonders of astronomy to primary and secondary schools worldwide



Hello! We're thrilled to introduce you to the **IAU Office of Astronomy for Education (OAE)**, based at Haus der Astronomie (HdA) in Germany, and managed by the Max Planck Institute for Astronomy. Our mission is to bring the wonders of astronomy to primary and secondary schools worldwide – with funding from the IAU, and in our particular case generous support of the Klaus Tschira and Carl Zeiss foundations for the start-up phase of the IAU's youngest office. More formally, we are the IAU's way of reaching Goal 5 in its Strategic Plan 2020–2030: "The IAU stimulates the use of astronomy for teaching and education at school level."

So what's needed to support astronomy in schools world-wide? To start with, good resources! Since it began operations in 2020, the OAE has been curating and developing a diverse array of educational resources, all available under a Creative Commons license. Many resources are available in different languages and can be used by teachers, students, and anyone interested in astronomy education worldwide. We have also created sustainable platforms for earlier IAU projects: the "**Big Ideas in Astronomy**" as a proposed definition of astronomy literacy, and "**astroEDU**," a peer-reviewed collection of classroom activities designed to make learning astronomy fun and engaging.

The OAE also actively supports the community by maintaining a network of National Astronomy Education Coordinator (NAEC) teams. Supported by hundreds of volunteers from over 100 countries and regions, these NAEC teams are dedicated to improving astronomy education worldwide and act as a bridge between their national astronomy education community, the OAE, and the IAU. Learn more about the NAEC Network [here](#).

For us, professionalisation goes both ways: We want to help teachers and educators become more proficient at bringing astronomy content into their classrooms –

astronomy being the ideal gateway science! – and we want to help astronomers become better at supporting teachers. For teachers, we offer workshops as part of our Teacher Training Program (TTP), co-funded by the IAU and other supporters. Our main professionalisation event for both target groups are our annual, world-wide, online **Shaw-IAU Workshops on Astronomy for Education**, generously supported by the Shaw Prize Foundation. This event brings together astronomy education specialists and enthusiasts from around the world. It's a good opportunity to share insights, learn from others, and stay up-to-date with the latest in astronomy education, fully online and free of charge!

Our Global Network

The OAE recognises the importance of networking with individuals and institutions who share the same goals towards fostering astronomy education worldwide.

We're supported by a dynamic network of OAE Centers and Nodes around the world, each leading exciting global and regional projects:

OAE Center China–Nanjing: Hosted by the Beijing Planetarium (BJP)

OAE Center Cyprus: Hosted by the Cyprus Space Exploration Organization (CSEO)

OAE Center Egypt: Hosted by the National Research Institute of Astronomy and Geophysics (NRIAG)

OAE Center India: Hosted by the Inter-University Centre for Astronomy and Astrophysics (IUCAA)

OAE Center Italy: Hosted by the National Institute for Astrophysics (INAF)

OAE Node Republic of Korea: Hosted by the Korean Astronomical Society (KAS)

OAE Node France at CY Cergy Paris: Hosted by CY

Cergy Paris University

OAE Node Nepal: Hosted by the Nepal Astronomical Society (NASO)

For more details, check out our OAE Centers and Nodes.

Get Involved!

Interest in supporting astronomy in schools or, more broadly, supporting science teaching worldwide? There are several ways you can help us make a difference:

- **Connect with NAECs in Your Country or Region:** Find more information [here](#).
- **No NAEC team in your area? Consider forming one yourself!** Join a passionate network of astronomy educators and enthusiasts. Interested? [Apply here](#).
- **Contribute With Illustrations:** We are currently creating a fundamental repository of illustrations for teaching about astronomy. If you have Creative Commons-licensed illustrations (photos, diagrams, etc.), please share them with us to enhance our [Glossary of Astronomical Terms](#). Contact us for details: penteado@astro4edu.org

- **Join the Translation Efforts:** The OAE is dedicated to making all its educational materials available in multiple languages. You can help expand our reach by volunteering with the translation of resources. Please contact us at: deacon@astro4edu.org.
- **Subscribe to Our Mailing List:** Stay updated with the latest news from OAE by subscribing [here](#).
- **Participate in the Shaw-IAU Workshops:** Join the 6th Shaw-IAU Workshop on Astronomy for Education from November 12-14, 2024. It's a fully online event and free of charge! Submit an abstract or register to participate [here](#).
- **Check out our website for more details:** <https://www.astro4edu.org/>

Let's Inspire Together

We're here to support the community in engaging with astronomy education and promoting quality education worldwide. If you're passionate about astronomy and education, join our vibrant community and help us share the wonders of the universe!

Thank you, and we look forward to your involvement!



IAUS 389: Plenary Talks
Gravitational Wave Astrophysics

Results from the LIGO-Virgo-KAGRA O4 run
Dr. Silvia Biscoveanu (NASA Einstein Fellow at Northwestern's CIERA)

Electromagnetic signatures of gravitational wave mergers
Kenta Hotokezaka (Associate Professor: Research Center for the Early Universe, University of Tokyo, Japan)

Results from the Pulsar Timing Arrays
Professor Ryan Shannon (Professor: Researchers from the ARC Centre of Excellence for Gravitational Wave Discovery (OzGrav))

science & Innovation
Department of Science and Innovation
REPUBLIC OF SOUTH AFRICA

NRF
National Research Foundation

AfAS
African Astronomical Society

XXXII IAU GENERAL ASSEMBLY
CAPE TOWN, SOUTH AFRICA, 2024

Wednesday, 7 August
IAUS 389

South African Astronomical Observatory (NRF-SAAO)

A highlight of the National Research Foundation's facility for optical and infrared astronomy



Founded in 1820, the NRF-SAAO is the national centre for optical and infrared astronomy in South Africa. Its primary role is to conduct fundamental research in astronomy and astrophysics by providing a world-class facility to scientists. The NRF-SAAO also promotes astronomy and astrophysics in southern Africa, by sharing research findings and discoveries and participating in outreach activities to enthuse citizens about physics and astronomy.

The SAAO comprises headquarters in the eponymous suburb of Observatory in Cape Town, and a dedicated research and observation station with several working telescopes (including SALT) outside the Karoo town of

Sutherland in the Northern Cape.

All of the current astronomy operations occur in Sutherland to achieve the best possible observing conditions. Historical telescopes in Cape Town are still regularly used for outreach and public events.

On December 21, 2018, the South African Heritage Resources Agency (SAHRA) officially declared the South African Astronomical Observatory's Cape Town site as a National Heritage Site, recognising the incredible achievements and their significance over the past two centuries, and will ensure this heritage is preserved.

The NRF-SAAO will be hosting daily tours and Open Nights for the duration of the IAU GA 2024.

Book your visit at:

<https://www.saa.ac.za/event/ga-saa-day-tours/>

<https://www.saa.ac.za/event/ga-saa-open-nights/>

Highlights of the Opening Ceremony

[CLICK HERE](#)
For more pictures of the Opening Ceremony



Highlights of the Cosmic Echoes art exhibition



All images: SKAO



PROGRAMME WEEK 1

	TUE - Aug 6th		WED - Aug 7th		THU - Aug 8th		FRI - Aug 9th
08:30 – 10:00 Morning plenary	Registration		IAUS 389 plenary		IAUS 390 plenary		IAUS 391 plenary
10:00 – 10:30 Morning e-poster & coffee break	IAUS 389, 390, 391 FM1, FM2, FM3, FM7, OAO		IAUS 389, 390, 391 FM1, FM2, FM5, FM6, CPS, OAE		IAUS 389, 390, 391 FM3, FM7, FM5, FM6, OYA, OAD		Division e-poster
10:30 – 12:00 Morning oral session	S 389-1 S 390-1 S 391-1 OAO-1	FM1-1 FM2-1 FM3-1 FM7-1	S 389-4 S 390-4 S 391-4 CPS-1 OAE-1	FM1-4 FM2-4 FM5-4 FM6-4	S 389-7 S 390-7 S 391-7 OYA-1 OAD-1	FM3-4 FM7-4 FM5-4 FM6-4	Parallel Division Oral Sessions
12:00 – 13:30 Lunch	Shaw Prize		ODE Prize Talks		Gruber Prize		Women in Astronomy
13:30 – 15:00 Afternoon oral session 1	S 389-2 S 390-2 S 391-2 OAO-2/ WG5	FM1-2 FM2-2 FM3-2 FM7-2	S 389-5 S 390-5 S 391-5 CPS-2 OAE-2	FM1-5 FM2-5 FM5-2 FM6-2	S 389-8 S 390-8 S 391-8 OYA-2 OAD-2	FM3-5 FM7-5 FM5-5 FM6-5	Parallel Division Oral Sessions
15:00 – 15:30 Afternoon e-poster & coffee break	IAUS 389, 390, 391 FM1, FM2, FM3, FM7, WG5, OAO		IAUS 389, 390, 391 FM1, FM2, FM5, FM6, CPS, OAE		IAUS 389, 390, 391 FM3, FM7, FM5, FM6, OYA, OAD		Division e-poster
15:30 – 17:00 Afternoon oral session 2	S 389-3 S 390-3 S 391-3 OAO-3	FM1-3 FM2-3 FM3-3 FM7-3	S 389-6 S 390-6 S 391-6 CPS-3 OAE-3	FM1-6 FM2-6 FM5-3 FM6-3	S 389-9 S 390-9 S 391-9 OYA-3 OAD-3	FM3-6 FM7-6 FM5-6 FM6-6	Joint Offices Meeting
17:15 – 18:30 Afternoon plenary	Opening Ceremony		Business 1		Invited Discourse: Dr Bernie Fanaroff		Invited Discourse: Prof Joop Schaye
18:30 – 21:30 Various	Welcome Reception		Public Talk: Astronaut Dr Sian Proctor 19:30 - 21:30		An evening with NASA 19:00 - 21:00		Public Talk: Prof Gerry Gilmore 18:15 - 19:15 Astronomer's Got Other Talent 19:30 - 21:30

Background: Neutral hydrogen in the Large Magellanic Cloud. Image courtesy of CSIRO, L. Staveley-Smith.

PROGRAMME WEEK 2

	MON - Aug 12th	TUE - Aug 13th	WED - Aug 14th	THU - Aug 15th
08:30 – 10:00 Morning plenary	Offices plenary	IAUS 392 plenary	IAUS 393 plenary	IAUS 394 plenary
10:00 – 10:30 Morning e-poster & coffee break	Division e-poster	IAUS 392, 393, 394 FM4, FM8, FM9, FM10, WG1, WG2	IAUS 392, 393, 394 FM4, FM8, FM11, FM12, WG3	IAUS 392, 393, 394 FM9, FM10, FM11, FM12, WG6, WG4
10:30 – 12:00 Morning oral session	Parallel Division Oral Sessions	S 392-1 S 393-1 S 394-1 WG1-1 WG2-1	FM4-1 FM8-1 FM9-1 FM10-1	S 392-4 S 393-4 S 394-4 WG1-4 WG3-2
12:00 – 13:30 Lunch			FM4-4 FM8-4 FM11-1 FM12-1	S 392-7 S 393-7 S 394-7 WG6-1 WG4-1
13:30 – 15:00 Afternoon oral session 1	Parallel Division Oral Sessions	Kavli Prize Talk by David Charbonneau	Young Astronomers	FM9-4 FM10-4 FM11-4 FM12-4
15:00 – 15:30 Afternoon e-poster & coffee break	Division e-poster	S 392-2 S 393-2 S 394-2 WG1-2 WG2-2	FM4-2 FM8-2 FM9-2 FM10-2	S 392-5 S 393-5 S 394-5 WG2-3 WG3-3
15:30 – 17:00 Afternoon oral session 2	9 Parallel Division Oral Sessions	IAUS 392, 393, 394 FM4, FM8, FM9, FM10, WG1, WG2	IAUS 392, 393, 394 FM4, FM8, FM11, FM12, WG3	FM4-5 FM8-5 FM11-2 FM12-2
17:15 – 18:30 Afternoon plenary	Gala Dinner	S 392-3 S 393-3 S 394-3 WG1-3 WG3-1	FM4-3 FM8-3 FM9-3 FM10-3	S 392-8 S 393-8 S 394-8 WG6-2 WG4-2
18:30 – 21:30 Various		Invited Discourse: Prof Natalie Batalha	Business 2	FM9-5 FM10-5 FM11-5 FM12-5
		Public Talk: Prof George Ellis 18:15 - 19:15		IAUS 392, 393, 394 FM9, FM10, FM11, FM12, WG6, WG4
		Cultural Evening 19:30 - 21:30		S 392-6 S 393-6 S 394-6 WG2-4 WG3-4
				FM4-6 FM8-6 FM11-3 FM12-3
				S 392-9 S 393-9 S 394-9 WG6-3 WG4-3
				FM9-6 FM10-6 FM11-6 FM12-6
				Closing Ceremony Handover
				The Cosmic Savannah Guest: Nobel Prize winner Prof Brian Schmidt 19:30 - 21:30

Background: The Milky Way above the ATCA. Image courtesy of E. Lenc.

PUBLIC EVENTS

IN PERSON & ONLINE

#astronomy2024

07 /08 Journey into Space with Astronaut Dr. Sian Proctor

08 /08 Evening With NASA

09 /08 Women in Space Science & Astronomy
The Milky Way with Prof Gerry Gilmore
Astronomers Got Talent!

10 /08 Stargazing at V & A Waterfront

13 /08 Nature of the Universe with
Prof George Ellis

13 /08 #AfricaLookUp Cultural Exchange Evening

14 /08 The Cosmic Savannah Live Show
with Nobel Prize Winner Prof Brian Schmidt.



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XXXII IAU GENERAL ASSEMBLY

CAPE TOWN, SOUTH AFRICA, 2024

The team behind the design, layout, content writing and editing of the XXXIInd IAU GA newsletter includes Patrick Saunders; Guido Schwarz; Laura Hiscott; Maria Stone; Christina Thöne; Shirley Aoko; Gwen Sanderson; Marcelina Kinyumu; Daniel Cunnamo; Susan Caras

Exhibitors



BUSINESS
EVENTS
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XXXII  GENERAL ASSEMBLY

6 - 15 AUGUST 2004

Cape Town, South Africa



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