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monthly notes of the astronomical society of southern africa

Volume 81 Nos 11-12 **December 2022**

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Higher Education, Science and Innovation Minister Dr Blade Nzimande and SKAO Council chair, Dr Catherine Cesarsky, unveiling the plaque to signal the commencement of construction of the SKA project in the Karoo. See P. 233.

The **Astronomical Society of Southern Africa** (ASSA) was formed in 1922 by the amalgamation of the Cape Astronomical Association (founded 1912) and the Johannesburg Astronomical Association (founded 1918). It is a body consisting of both amateur and professional astronomers.

Publications: The Society publishes its electronic journal, the *Monthly Notes of the Astronomical Society of Southern Africa (MNASSA)* bi-monthly, the annual *Sky Guide Africa South* and *Nightfall*.

Membership: Membership of the Society is open to all. Potential members should consult the Society's web page : http://assa.saao.ac.za for details. Joining is possible via one of the local Centres or as a Country Member.

Local Centres: Local Centres of the Society exist at Bloemfontein, Cape Town, Durban, Hermanus, Johannesburg, Pretoria and the Garden Route Centre; membership of any of these Centres automatically confers membership of the Society.

Internet contact details: email: assa@saao.ac.za Home Page: http://assa.saao.ac.za

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Astronomical Society of Southern Africa
ASSA
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Vol 81 Nos 11-12 **December 2022**

News Note: SKA Observatory celebrates start of telescope construction in Australia and South Africa

In ceremonies at both sites in Australia and South Africa, the SKA Observatory celebrated the start of construction of its world-leading radio telescopes and announced €300 million worth of construction contracts.

The SKAO's Director-General, Prof. Philip Diamond, travelled to Western Australia to represent the Observatory at the site of the future SKA-Low telescope. Council Chair Dr Catherine Cesarsky attended the event in South Africa's Northern Cape province where the SKA-Mid telescope will be located.
In her address, Dr Cesarsky said that the SKA project has been many years in the making. Today, we gather here to mark another important chapter in this 30-year journey that we've been on together. A journey to deliver the world's largest scientific instrument. After 18 months of intense activities around the world, we are starting construction of the SKA telescopes.

Over the past 18 months, over 40 contracts worth more than €150 million have been entered into by the observatory. On Monday, major new construction contracts worth over €300 million were announced at the ceremonies.

Minister Ed Husic from Australia and South Africa's Dr Blade Nzimande announced more than €200 million for Australian and South African companies to deliver some of the extensive infrastructure required for the telescopes.

The SKAO also announced the major contracts – worth €100 million – to manufacture the antennas for both telescopes, bringing the total amount of construction funds allocated so far by the observatory to close to €500 million.

Higher Education, Science and Innovation Minister Dr Blade Nzimande and SKAO Council chair, Dr Catherine Cesarsky, unveiling the plaque to signal the commencement of construction of the SKA project in the Karoo

Representatives of the communities surrounding the telescope sites had pride of place in both ceremonies. In Australia, guests received a traditional Welcome to Country from members of the Wajarri community, the SKA-Low site's native title holders and Traditional Owners. Across the Indian Ocean, attendees witnessed a special "meerkat" version of the ancient riel dance around a newly-cast SKA dish foundation.

The construction commencement ceremonies took place 18 months after the SKAO's Council approved the building of its two telescopes. Initial procurement concentrated on developing software, contracting professional services firms to help oversee construction, and bulk-buying components such as programmable circuit boards currently in short supply worldwide.

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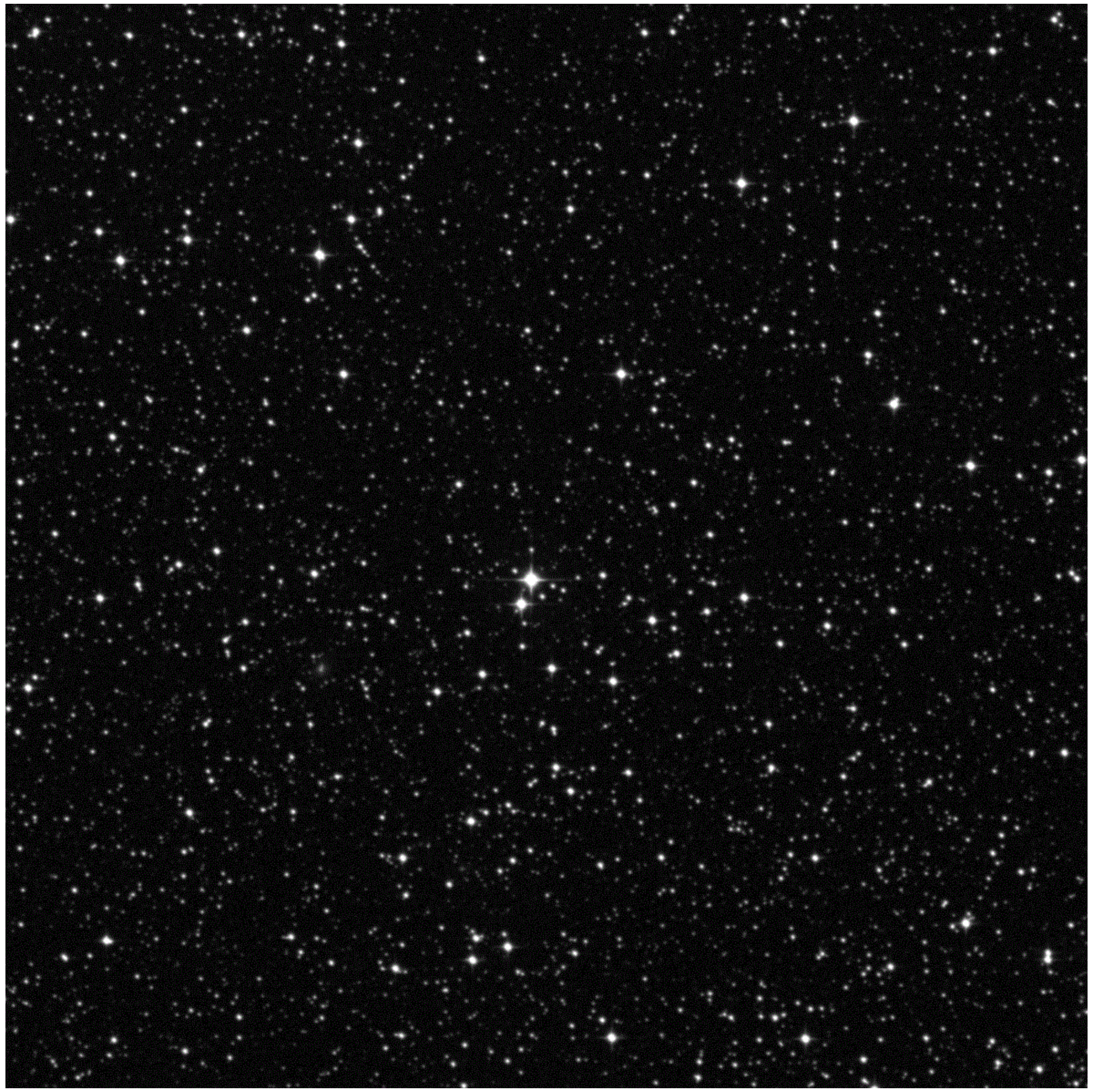
ASSA Matters

News Notes

STREICHER 100 – DSH J1021.5-6940 Carina

Less than a degree from omega Carinae four more or less similar magnitude stars forms a tight knot and even displays a similar yellowish colour. A few stars in a bare starfield could be at times quite outstanding and striking that draws attention to please the eye.

OBJECT	TYPE	RA	DEC	MAG	SIZE
STREICHER 100 DSH J1021.5-6940	Asterism	10h21m.30	-69°40'.24	9	2'



These 40 or so contracts paved the way for construction to start on site. In South Africa, this phase will eventually see 133 SKA dishes added to the existing 64 of the SKA-precursor telescope MeerKAT to form a mid-frequency instrument. Australia will host a low-frequency array of 131 072 antennas shaped like Christmas trees, allowing the two telescopes to cover a wide swath of radio frequencies.

The telescopes require vast infrastructure. Listed company Ventia will put up site-wide power and fibre infrastructure in the SKA-Low telescope's core and spiral arms and fabricate and commission the central and remote processing facilities. In South Africa, the Power Adenco joint venture will construct gravel access roads, cast dish foundations, lay on power and optical fibre networks, erect security fencing, and more.

Competitive tendering also took place to procure the telescopes' lead components: the antennas and dishes themselves. On Friday 2 December, the SKAO finalised the two contracts for these critical hardwares.

Italian company SIRIO will build the low-frequency antennas for the SKA-Low telescope in Western Australia, with important participation from the UK. In China, one of the Observatory's long-term partners, CETC54, will manufacture the SKA-Mid telescope's dish structure. Parts will be produced in several countries, including Italy, Spain, and South Africa.

In their announcements, the science ministers elaborated on the contractual conditions that the SKAO placed on infrastructure providers to include local communities.

In South Africa, the lead infrastructure contractor is required to spend a proportionate amount locally by providing a range of sub-contract opportunities to local SMMEs, on employing, training and transferring skills locally and on other community development initiatives.

In Australia, the aim is to create nearly 100 new roles for the Wajarri Yamaji and locals in the Mid West region of Western Australia.

The Indigenous Land Use Agreement recently signed between the Wajarri Yamaji and the Australian federal and Western Australian governments as well as CSIRO, expanded Inyarrimanha Ilgari Bundara, the CSIRO Murchison Radio-astronomy Observatory to enable construction of the SKA telescope there.

The agreement ensures that Wajarri Yamaji cultural heritage will stay protected and that they will receive sustainable and intergenerational benefits in areas such as enterprise and training and education. About 400 km of ground was surveyed to map areas of cultural significance, and the layout of the SKA telescope array was amended to avoid significant Wajarri heritage sites.

In recognition of the agreement, the Wajarri gifted the site the traditional name – Inyarrimanha Ilgari Bundara, meaning “sharing the sky and stars”.

“Prof. Diamond said that they wanted to be good neighbours to all of the local stakeholders where our infrastructure is located. It’s important that SKAO play a part in supporting the local economy as well as the national one, and we’re doing our small part to ensure this is the case. For example, we’ve instructed infrastructure contractors to ensure local businesses are engaged and benefit from those contracts as well.

With its large infrastructure and telescope component contracts in place, the SKAO is on track to reach its next milestone: ensuring that the first four SKA-Mid dishes and six SKA-Low stations (of 256 antennas each) work together as a telescope.

The first two antenna stations are due to be completed by May 2023, while the first dish is set to be installed in April 2024, followed by three to four dishes each month.

Procuring mass-produced dishes and antennas represents a step-change for radio astronomy. Instead of bespoke and one-off components, manufacturers can develop new techniques to produce such elements, potentially offering new product lines.

Thanks to the telescopes’ design as interferometers – where the signals of multiple telescopes are combined to act as one giant telescope – the first notable scientific results can be expected before the telescopes are completed at the end of the decade.

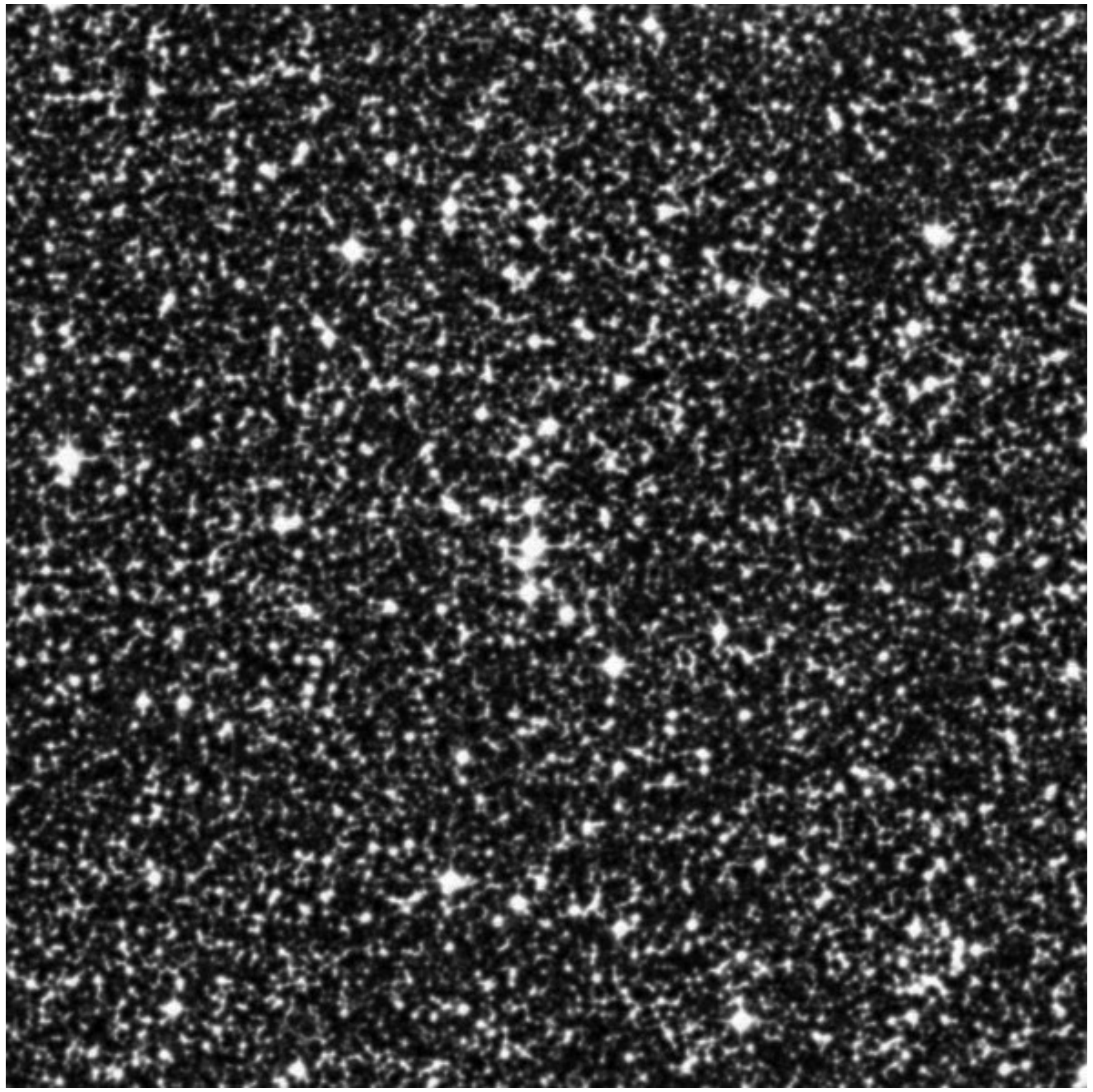
The SKA telescopes will be managed from the SKAO’s Global Headquarters at Jodrell Bank near Manchester in the United Kingdom. Scientists will use the two arrays over the course of their expected 50-year lifespan to answer crucial questions about the earliest epochs of the universe, and unravel some of the most profound mysteries in astrophysics.

Dr Cesarsky concluded that the SKA telescopes will truly revolutionise our understanding of the universe; they will allow us to study its evolution and some of its most mysterious phenomena in unprecedented detail, and that’s really exciting for the scientific community.

STREICHER 99 – J1843.8-1049 Scutum

This part of the Milky Way in Scutum is densely packed, with multiple faint stars, which makes it extremely hard to untangle the indicated compact faint string. The starry sky is dotted with multiple forms of star chains and strings literally scattered to please the eye. This hide and seek dainty string was by no means an easy find, but still brings me a feeling of joy and delight.

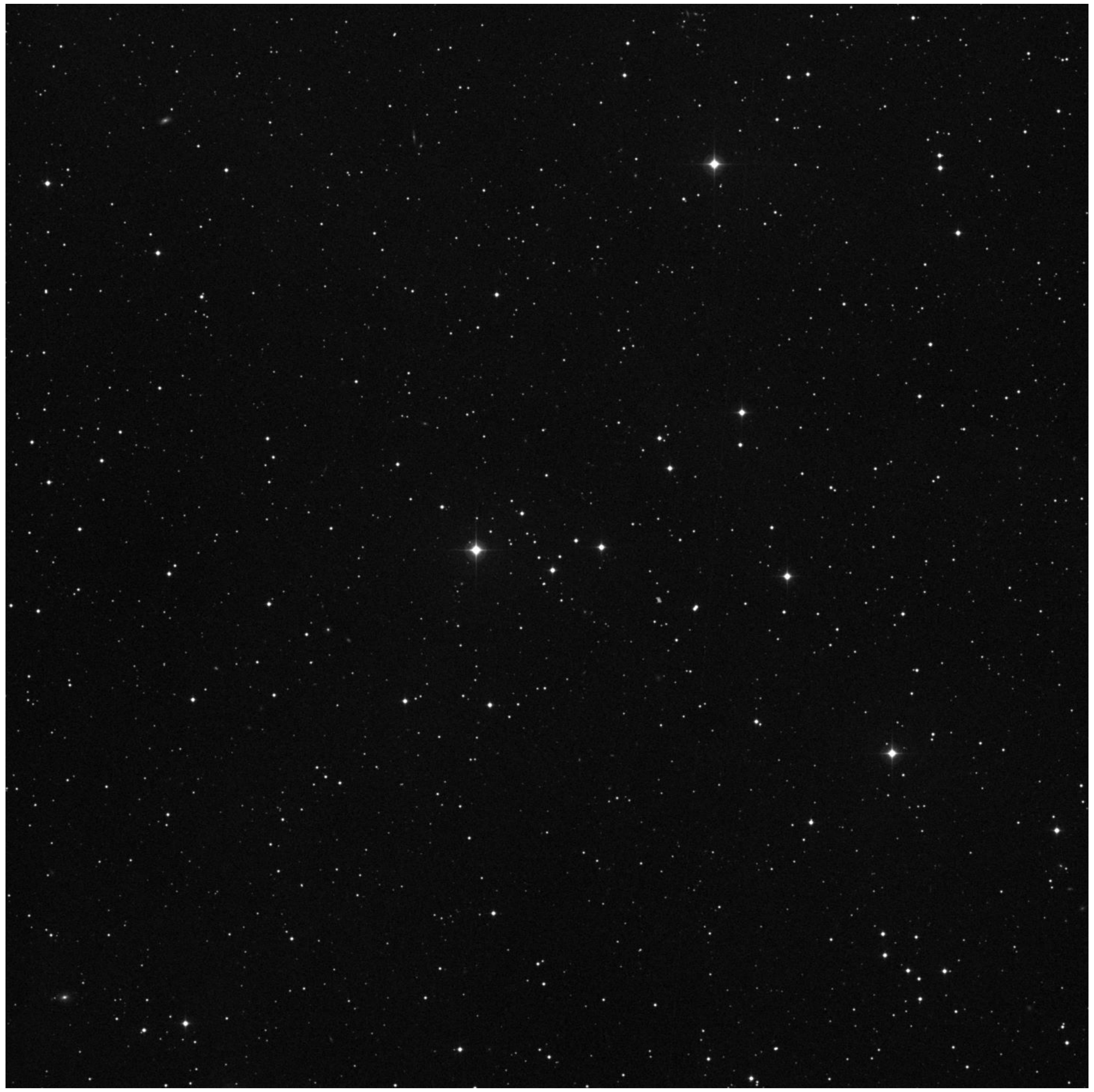
OBJECT	TYPE	RA	DEC	MAG	SIZE
STREICHER 99 DSH J1843.8-1049	Asterism	18h43m.51	-10°49’.35	12	2.8’



STREICHER 98 – J1713.1+8757 Ursa Minor

Star string formations can be unique and a find like this one is more than rewarding, and one of my top favourites. A closer look at the surrounding star field brings up quite a number of fainter star strings, a truly special observing.

OBJECT	TYPE	RA	DEC	MAG	SIZE
STREICHER 98 DSH J1713.1+8757	Asterism	17h13m.06	+87°57′.18	11.8	4′



News Note: "Breakthrough Listen" has begun observations of a million nearby stars with the MeerKAT Array

Breakthrough Listen – the initiative to find signs of intelligent life in the universe – announced today, at a conference organized by the South African Radio Astronomy Observatory (SARAO), the start of observations using a powerful new instrument deployed to the MeerKAT radio telescope in the remote Karoo region of South Africa. The new search for techno-signatures – indicators of technology developed by extra-terrestrial intelligence – expands the number of targets searched by a factor of 1 000.

Artist's impression of the MeerKAT telescope in South Africa, and the Breakthrough Listen compute cluster, scanning the sky for possible signals (represented as binary codes) from extra-terrestrial intelligence. One of the first targets to be observed by the new instrument will be the Alpha Centauri system, represented as the three stars towards the top right of the image. Cr: Danielle Futselaar / Breakthrough Listen / SARAO

The astronomers and engineers on the Breakthrough Listen team have spent the last three years developing and installing the most powerful digital instrumentation ever deployed in the search for techno- signatures, and integrating the equipment with the MeerKAT control and monitoring systems in cooperation with SARAO engineers. The new hardware complements Listen's ongoing searches using the Green Bank Telescope in the USA, the Parkes Telescope in Australia, and other telescopes around the world. But while Listen's programs at the GBT and Parkes involve moving these thousand-ton-plus dishes to point at targets all over the sky, the program on MeerKAT usually won't mechanically move the antennas.

Breakthrough Listen Principal Investigator Dr Andrew Siemion explained that MeerKAT consists of 64 dishes, which can see an area of the sky 50 times bigger than the GBT can view at once, such a large field of view typically contains many stars that are interesting techno-signature targets. Our new supercomputer enables us to combine signals from the 64 dishes to get high resolution scans of these targets with excellent sensitivity, all without impacting the research of other astronomers who are using the array.

By operating in this "commensal" mode, Breakthrough Listen gains access to one of the world's most capable and sensitive radio telescopes almost 24 hours a day, 7 days a week. The ability to scan 64 targets at a time within the main field of view also improves Listen's ability to reject interfering signals from human technology such as Earth-orbiting satellites. The Listen team had to develop sophisticated targeting and scheduling software to ensure the survey goals could be met in the desired timeframe. They have also developed an automated data processing pipeline that scans through the data in near-real-time to search for interesting signals.

Breakthrough Listen is also working with SARAO to develop research opportunities for astronomers and data processing experts in Africa on this cutting-edge programme. The search for life in the Universe has become a major focus area for research internationally, and the Breakthrough Initiatives are leaders in the field.

Dr Cherry Ng, is very excited to be able to conduct a search for techno-signatures using one of the most sensitive telescopes in the world remarked Breakthrough Listen's Project Scientist for MeerKAT. It will take just two years to search over one million nearby stars. MeerKAT will provide the ability to detect a transmitter akin to Earth's brightest radio beacons out to a distance of 250 light years in our routine observing mode.

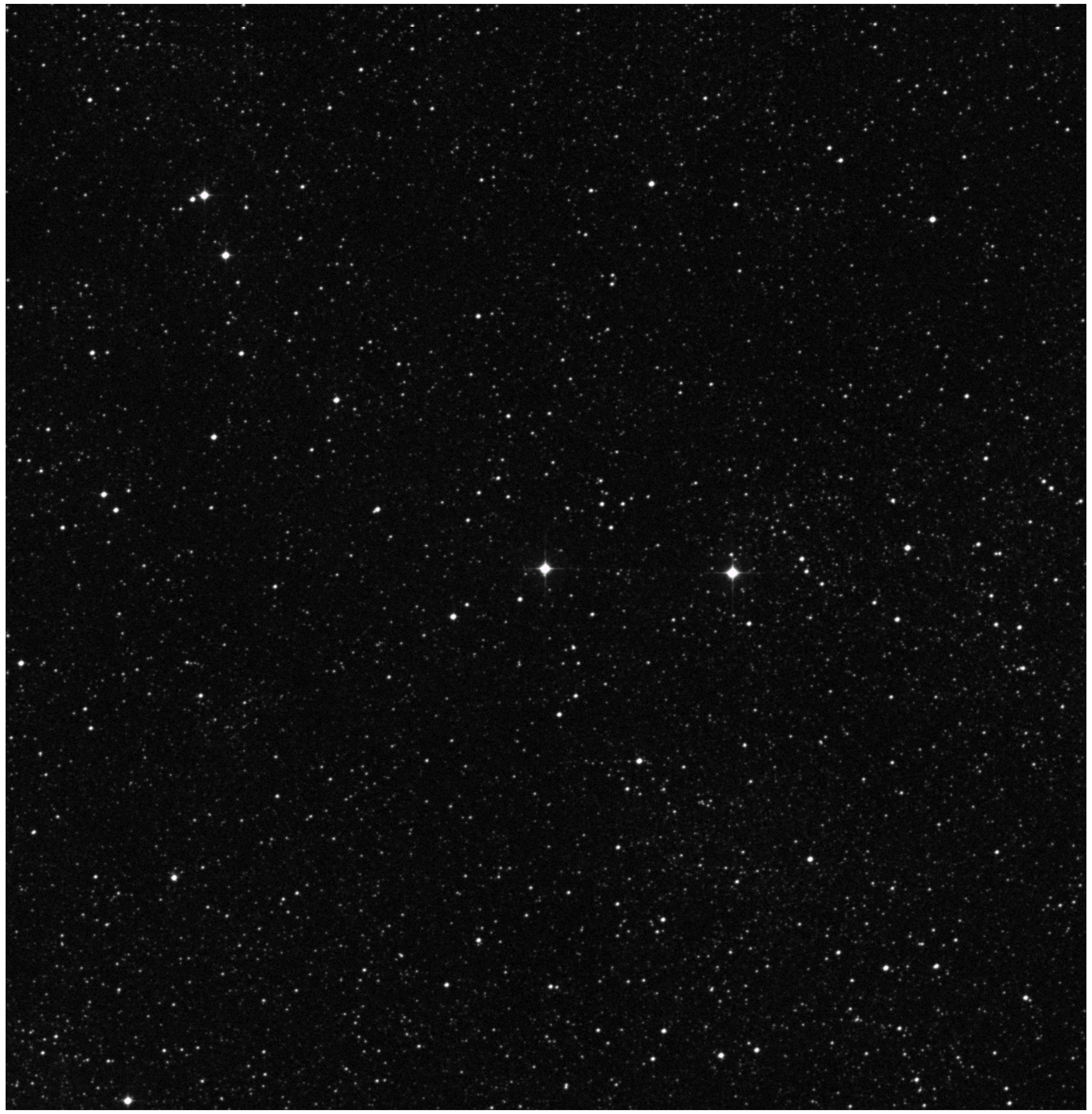
Dr Fernando Camilo, Chief Scientist for SARAO, the observatory that built and operates MeerKAT, is also excited about the new search. He said that MeerKAT has a remarkable combination of sensitivity and survey speed, which makes it a wonderful telescope for SETI. The telescope was planned and developed here in South Africa, and it's very exciting that young South Africans will have the chance to be involved at the forefront of the search for life beyond Earth.

Breakthrough Initiatives Executive Director, Dr S. Pete Worden said that one of the first targets to be observed is the nearest neighbouring star, Proxima Centauri, which appears to host two small rocky planets in the star's habitable zone; routine observations with the Listen backend on MeerKAT are now under way; the team looks forward to sharing the first science results in the coming months.

STREICHER 97 – J1544.3-5609 Norma

A plain magnitude 7.6 white-coloured star with approximately a dozen magnitude 11 stars that spiral out like arms into all 4 wind directions. A relatively large magnification is needed to observe this unique curly wheel of star formation, which is impressive. In the surrounding star field quite a few faint star knots can be picked up, and perhaps a real open cluster especially towards the west.

OBJECT	TYPE	RA	DEC	MAG	SIZE
STREICHER 97 DSH J1544.3-5609	Asterism	15h44m.16	-56°09'.00	11.2	11'



Streicher Asterisms

Magda Streicher

STREICHER 96 – J0914.3-6209 Carina

It is something of a challenge to search out faint groupings like this handful of faint stars slightly outstanding against the star field backdrop. Some of the stars in our line of sight could be background stars, just brighter than the fainter ones. Close outstanding groupings are beautiful and can tell a story of some kind or another.

OBJECT	TYPE	RA	DEC	MAG	SIZE
STREICHER 96 DSH J0914.3-6209	Asterism	09h14m.18	-62°09'.00	11.5	4'

Picture Credits for all Asterism images: http://archive.stsci.edu/cgi-bin/dss

Recent Southern African Fireball Observations Events # 416-424

Tim Cooper, Director, Comet, Asteroid and Meteor Section

This article continues the sequential numbering of reported fireball sightings from southern Africa. By definition, a fireball is any meteor event with brightness equal to or greater than visual magnitude (m_v) -4. The following events were reported to the author and details are reproduced as given by the observer [any comments by the author are given in brackets]. Where the report originated from the American Meteor Society Fireball page, the corresponding AMS event number is given. AMS reports are courtesy of Robert Lunsford (Secretary General of the IMO). All times were converted to UT unless stated, and all coordinates are for epoch J2000.0. Descent angles, if given, are in degrees, with directly upwards = 0°, horizontally left to right = 90°, directly downwards = 180° and horizontally right to left = 270°.

Event 416 – 2022 August 5 – Piet Retief, Mpumalanga
Observed by Sheldon van Wyk at around 17h00, duration 3-4 seconds, orange colour, fragmented into three larger pieces. m_v = -10, or nearly as bright as the first quarter moon, which was then magnitude -11, altitude 71° in azimuth 298°. Path from 241°, 56° to 255°, 48°, which is RA/Decl. 13h30, -37° to 12h54, -29°. The path is consistent with the alpha-Capricornids. AMS Report 4736-2022.

Event 417 – 2022 August 12 – Gansbaai, Western Cape
Observed by Johan le Roux at 20h42, bright green 'ball of fire with a tail', seen through an opening in partly cloudy sky, duration about 1 second. As bright as the moon, which was then 99% illuminated, magnitude -12.4, altitude 45° in azimuth 77°. From a plot provided, path approximately from az/alt 187°, 81° to 227°, 43°, that is RA/Decl. 19h14, -42° to 15h11, -53°, which is consistent with the radiant of the alpha-Capricornids.

Event 418 – 2022 September 7 – Goromonzi, Zimbabwe
Observed by Philippa Blake at 03h10, very bright ball of fire with tail, brightness estimated as about the first quarter moon [not visible at the time], so m_v perhaps -10, duration around 8 seconds, but said to be moving very fast. Red and orange 'flames' with blue-grey trail directly behind, which was not persistent. Broke into three fragments towards the end of its passage after which it faded quickly. No sounds heard. Path from very approximately az/alt 90°, 10° to 45°, 40°, path length 48°. Given the duration and long path from near the eastern horizon shortly before sunrise, the report is consistent with a bright Helion meteor.

Event 419 – 2022 September 9 – Cowies Hill, KwaZulu-Natal

Observed by Denise de Beer around midnight UT September 8/9, duration 7-8 seconds, m_v = -6, brighter and larger than Jupiter, which was then magnitude -2.9, altitude 56° in azimuth 334°, and just to the left of the starting point of the fireball; 'it looked on fire and had a small tail as it [disappeared] out of view behind trees really fast'. Yellow-orange colour, no fragmentation, no persistent train and no sounds heard. Path from 35°, 68° to 64°, 21°, that is from RA/Decl. 02h06, -11° to 05h10, 10°. AMS Event 6061-2022.

Event 420 – 2022 September 9 – Cape Town, Western Cape

Observed by Vanya Labuschagne at 20h55, said to be about the brightness of the full moon, then magnitude -12, altitude 60° in azimuth 48°. When first seen the fireball was bright white, turning through bright blue-green to green, fading to orange which turned to smoke. Fragmented into smaller orange 'sparks', and left a persistent train for 3 seconds before disappearing. The train had a distinct kinked or 'wobbly' appearance. Path from approximately az/alt 317°, 15° to 313°, 10°, that is RA/Decl. 18h13, 26° to 17h46, 28°. Duration perhaps 8-10 seconds.

Event 421 – 2022 September 28 – Mt Pleasant, Harare

Observed by Kevin Shaw at 18h24, looking north, first seen in the vicinity of Vega [then altitude 24° in azimuth 330°], travelling almost due west but start was obscured by a building. m_v = -5 or possibly brighter, colour was white, duration 3-4 seconds and broke into three fragments for the last half to one second of its path before burning out. All three fragments disappeared quickly at about the same time. The fireball 'looked like it was much lower than other meteors normally are'. No persistent train and no sounds heard. The approximate path may indicate a Taurid fireball.

Event 422 – 2022 October 25 – Pretoria, Gauteng

Observed by Tiny van Niekerk at 18h05, brightness said to be m_v -9 [the Moon was not visible at the time, Jupiter was above the fireball, magnitude -2.8, azimuth 51°, altitude 54°], white colour, duration 1-2 seconds and path from az/alt 31°, 65° to 313°, 60°, that is RA/Decl. 23h00, -04° to 20h48, -04°. Flash at end of the path at which point it split into two pieces which continued a short way before burning out. The fireball was possibly a Taurid. AMS Event 7351-2022.

Event 423 – 2022 November 5 – nr Citrusdal, Western Cape

Observed by Nick Worsley at 20h30, while staying on a farm near Citrusdal, saw a 'bright silvery white flash with a tail, and the body looked like it was turning with a corkscrew motion'. Appearance was sparkling, with particles breaking off. Duration 1-2 seconds, path very approximately from az/alt 36°, 41° to 94°, 15°, that is RA/Decl. 02h30, +8° to 06h00, -12°. Magnitude said to be -16, or considerably brighter than the

1.28 GHz spread out over the Southern sky, focusing on the diffuse emission detected in galaxy clusters highlighting a few significant examples to reveal both the much-improved radio images compared to previous observations, as well as new discoveries that open up new areas of investigation in cluster formation and evolution

Title: A small new experiment at CERN's Large Hadron Collider in search for new physics in far corners
Speaker: Dr Claire Antel, University of Geneva,
Date: 30 November
Venue: R W James Seminar Room
Time: 10h30 – 11h30

Abstract: FASER is a newly installed experiment designed to look for light, extremely weakly-interacting particles at CERN's Large Hadron Collider (LHC). Such particles may be produced in the very forward direction of the LHC's high-energy proton-proton collisions and then decay to visible particles inside the FASER detector, which is placed 480m downstream of the ATLAS interaction point, aligned with the beam collisions axis. The detector components were commissioned in a surface lab in 2020 and the full detector installed in the tunnel in March 2021. The experiment has now gone live for the start of LHC Run 3 in July 2022. During the seminar I will explain what FASER aims to do as well as what it took to fully commission this small detector at a large collider and the unexpected challenges we faced during first data taking.

Title: The radio AGN population revealed by LOFAR
Speaker: Dr. Wendy Williams (SKAO)
Date: 7 December
Venue: R W James Seminar Room
Time: 13h00

Abstract: I will present some radio AGN science results from LOFAR, including the first data releases of the LOFAR surveys and our plans for the future. I will discuss some of the details behind calibration and imaging at low radio frequencies as well as the process of determining optical identifications for the radio sources, which we use to classify star-forming galaxies and AGN. This provides a very large sample of radio AGN allowing us to study in detail the population of radio AGN and their host galaxies, out to redshifts of about 1.

Abstract: Despite the fundamental nature of cosmic magnetic fields, many questions remain regarding their origin, evolution, and structure. We are able to illuminate these otherwise invisible fields through observations of background polarised radio sources. By measuring the Faraday rotation this polarised emission experiences along the line of sight, we are able to reconstruct the magneto-ionic structure of foreground features, such as the Milky Way Galaxy. This technique would also be applicable to smaller foreground objects, such as galaxies and clusters, however, we are typically limited by the on-sky density of background sources detected by a given radio survey. On behalf of the Observatory team, I will provide an overview of observations from the Rapid ASKAP Continuum Survey (RACS); the first all-sky survey undertaken by the Australian SKA Pathfinder (ASKAP). Through a collaboration between the ASKAP Observatory and the Polarisation Sky Survey of the Universe's Magnetism (POSSUM) survey team, SPICE-RACS will catalogue linearly polarised sources from the Rapid ASKAP Continuum Survey (RACS) and deliver a background polarised source density 3-5x higher than the current state of the art. I will present the first data release of SPICE-RACS. This catalogue contains ~6000 polarised radio sources, imaged at 25'', over 1300 square degrees towards the nearby Spica HII region. I will describe our first science results derived from this catalogue, and the future plans for SPICE-RACS.

Title: "A multi-wavelength view of galaxy evolution across different environments: From Groups to Clusters"
Speaker: Dr Konstantinos Kolokythas (NWU
Date: 17 November
Venue: SARAO BRP MeerKAT Boardroom
Time: 12h00

Abstract: Much of the evolution of galaxies before they are assimilated into clusters takes place in groups where AGN feedback has the greatest impact on galaxy formation and evolution. On the other hand, clusters are the largest gravitationally-bound structures in the Universe, with their baryonic mass being distributed between the constituent galaxies and the ionized plasma of their intra-cluster medium (ICM). As such, radio observations of galaxy clusters are powerful tools for the detection of diffuse cluster-scale synchrotron emission, which carries information about the cluster formation history. In the first part of this talk, I will summarize results from studies of the central brightest group early-type galaxies (BGEs) of an optically selected, statistically complete sample of 53 nearby groups (within 80 Mpc; CLoGS sample), observed in radio 235/610 MHz (GMRT), CO (IRAM/APEX) and X-ray (Chandra and XMM-Newton) frequencies examining the jet energetics impact on the intra-group gas, the balance between hot and cold gas and the AGN activity and star formation in groups. In the second part, I will present an overview of the MeerKAT's Galaxy Cluster Legacy Survey (MGCLS), a program of long-track observations of 116 galaxy clusters at

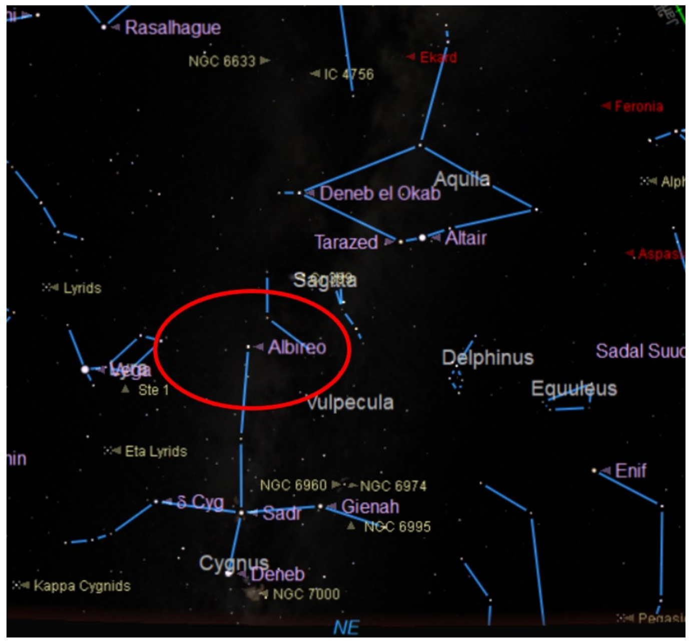
Moon, which was then 93% illuminated, magnitude -12.2, azimuth 2°, altitude 54°, and situated above left of the fireball. AMS Event 8230-2022.

Event 424 – 2022 November 23 – Nigel, Gauteng
Observed by David Pokorny at 18h30, duration 3-4 seconds, m_v -8 [though the Moon was not visible for comparison at the time], colour yellow. From a sketch provided, path from az/alt 15°, 50° to 330°, 26°, in descent angle 242°, or from RA/Decl. 01h12, +12° to 22h27, +31°. The fireball underwent a flash and fragmented into three pieces for the last third of its path. AMS Event 9237-2022.

Acknowledgments
I thank Peter Morris and Peter Hers for their continued efforts to report and investigate fireballs from their locations in Zimbabwe and Garden Route respectively.

Spectroscopy – Double Star Albireo

Percy Jacobs



It is not known whether the two components β Cygni A and B are orbiting around each other in a physical binary system, or if they are merely an optical double. If they are a physical binary, their orbital period is probably at least 100 000 years. [1]

[Figure: See text]

The primary component, Albireo Aa, has an apparent magnitude of 3.21 and the stellar classification K2II, indicating an orange bright giant. It is a red giant (or supergiant) star with a mass 5.2 times that of the Sun. With an effective temperature of 4,383 K, it shines with 1 259 solar luminosities. The star has a radius 62 times that of the Sun and spins with a projected rotational velocity of 8.34 km/s. [2]

[Figure: See text]

Albireo B is a blue-white main sequence star of the spectral type B8Ve. It has an apparent magnitude of 5.11. The star has a radius 2.59 times that of the Sun and a mass of 3.7 solar masses. With a temperature of 13,200 K, it is 230 times more luminous than the Sun. The star's estimated age is 100 million years. Unlike Albireo Aa, Albireo B is a very fast spinner, a Be star with a projected rotational velocity of at least 250 km/s at the equator. As a result, it is losing material and is surrounded by a circumstellar disk of gas. [2]

Spectrum of β Cygni A and B

A = K0 II = mag 3 (orange star)
B = B8V = mag 5 (blue star)

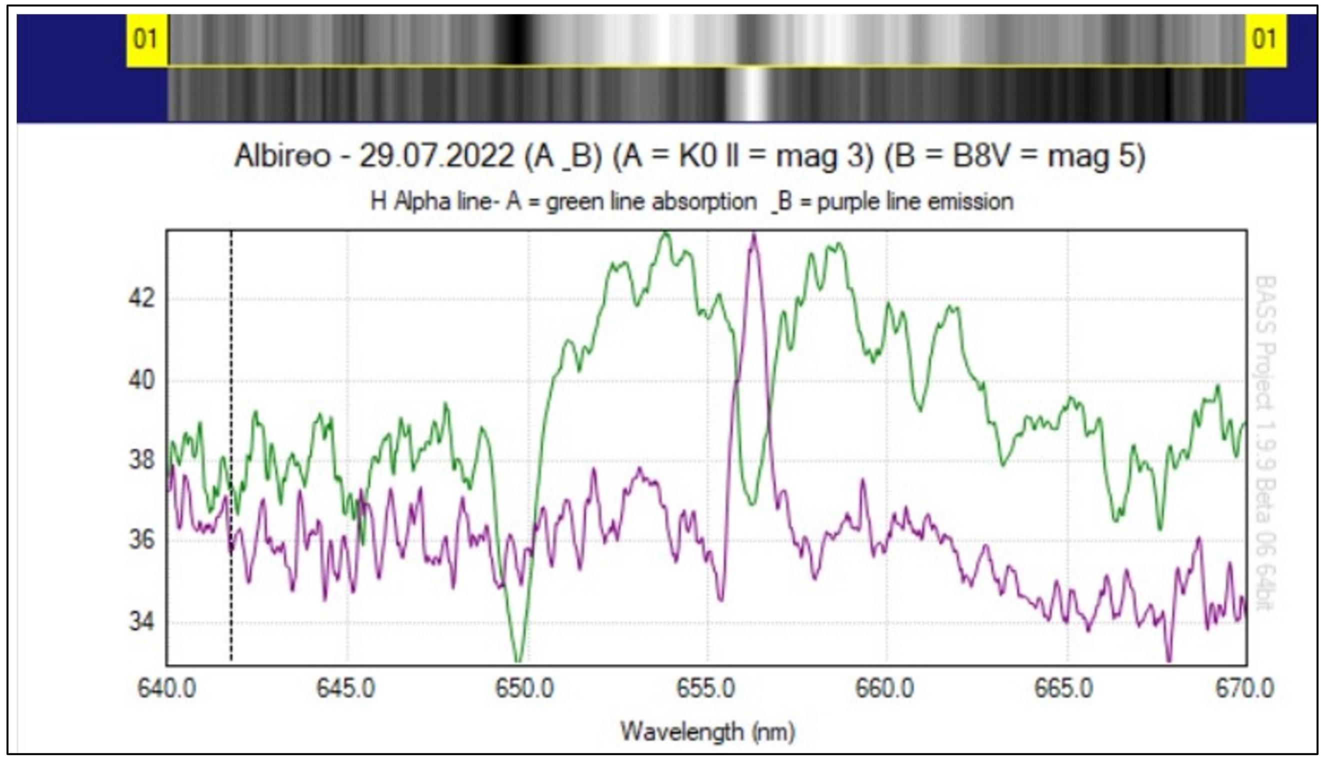


Figure: Spectra of the two components of β Cyg. The emission & absorption features atf Hα are highlighted.

Title: Discovering radio transients using the power of humans and machines
Speaker: Alexander Andersson
Date: 20 October
Venue: SAAO – Auditorium/Zoom
Time: 11h00

Abstract: The study of radio transients probes an immense range of astrophysical regimes - from flare stars to FRBs - and with the advent of current interferometers we can sample wide swathes of the radio sky with unprecedented sensitivity and cadence. In this talk I will discuss recent, serendipitous discoveries being made with the MeerKAT radio telescope and how we can make the best of new facilities coming online. This includes how citizen scientists have scoured our data and uncovered 100s of new variable sources - this is the first ever crowd sourcing project dedicated to radio transients in this manner. I will also discuss novel machine learning techniques being developed to speed up the search for interesting and anomalous sources, methods that will prove invaluable as we look towards observatories such as Rubin and the SKA.

Title: Finding the Unfindable
Speaker: Prof. Bruce Bassett. UCT/SAAO
Date: 3 November
Venue: SAAO – Auditorium/Zoom
Time: 11h00

Abstract: The SKA and LSST promise to unveil wonderfully weird new classes of astronomical objects: the "unknown unknowns". But how do we automate the search for these new classes of objects which may be so strange that we do not even know what to look for? We will explore this fascinating challenge through the lens of anomaly detection and highlight Ahunt, a new active learning algorithm that combines the best of human and AI intelligence to significantly outperform existing anomaly detection algorithms. It is another step towards fully personalised rankings that allow every researcher, with limited work, to find rare objects that are maximally interesting to them.

Title: SPICE-RACS: Spectra and Polarisation In Cutouts of Extragalactic sources from RACS
Speaker: Dr. Alec Thomson (CSIRO
Date: 16 November
Venue: R W James Seminar Room
Time: 13h00

Equipment Used

An 8" (200 mm) Bosma Maksutov telescope with a 2400 mm focal length, to which was attached a Lowspec Spectroscope ZWO colour camera, with a 600L/mm grating giving a resolution <1500 ie a low to medium spectrum.

This set-up was used for all spectra with differing time exposures in the same day/night period

References

1Spectroscopic Atlas for Amateur Astronomers – by Richard Walker - Version 5.0 - 04/2014 – pages 168 to 172
2BASS Project Software (Basic Astronomical Spectroscopy Software) – version 1.9.9 2022

Colloquia

Colloquia and Seminars (now Webinars) form an important part of a research facility, often as a sort of pre-publication discussion or a discussion of an individual's current research, and as such it is virtually impossible to "publish" this material. However by recording the topics discussed in the form below does indicate to those, who are unable to attend, what current trends are and who has visited to do research: it keeps everyone 'in the loop' so to speak
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With the advent of CV19, these Colloquia and Seminars are being presented to wider audiences via Zoom and other virtual platforms. The editor has started by identifying what would originally been "local" Colloquia and Seminars; not easy as there are now Webinars on interesting topics from around the globe! In time we will either return to the traditional Colloquia and Seminars or many will become Hybrid session.

Editor's Note. It is interesting that two of the contributors to this issue of MNASSA's Colloquia are former ASSA Scholarship holders; Dr Wendy Williams, 2006/7 and Dr Claire Antel, 2011

Equipment Used

An 8" (200 mm) Bosma Maksutov telescope with a 2400 mm focal length, to which was attached a Lowspec Spectroscope ZWO colour camera, with a 600L/mm grating giving a resolution <1500 ie a low to medium spectrum.

References

1Wikipedia - https://en.wikipedia.org/wiki/Albireo
2Star Facts - https://www.star-facts.com/albireo
3BASS Project – Basic Amateur Spectroscopy Software

Reflectance Spectroscopy of Planetary Atmospheres

Percy Jacobs

Using basic equipment it is possible to identify the gases of Methane (CH_4) or Ammonia (NH_3) that exist in the atmospheres of planets such as Saturn, Jupiter, Mars and Venus

Reflectance spectra of Jupiter and Saturn

The reflectance spectrum of Jupiter shows Methane (CH_4) but not as intense as that of Saturn which shows the strongest Methane concentration

The outer atmosphere of Jupiter consists of about 89% hydrogen and 10% Helium; these gases have hardly any influence on the reflectance characteristics (continuum course). This is in contrast

to the small percentage of the remaining gases, mainly Methane (CH_4) and Ammonia, (NH_3) which are shown as traces.

Saturn's outer atmosphere is composed slightly differently. It consists of about 93% Hydrogen and close to 7% of Helium. Traces of Methane and Ammonia can be detected. What is impressive to see here are, concentrated in the near-infrared range, the very broad Methane (CH_4) and Ammonia (NH_3) absorption lines in the spectral continuum. In this wavelength domain, these differences appear most pronounced in the areas of 620 nm and 730 nm. [1]

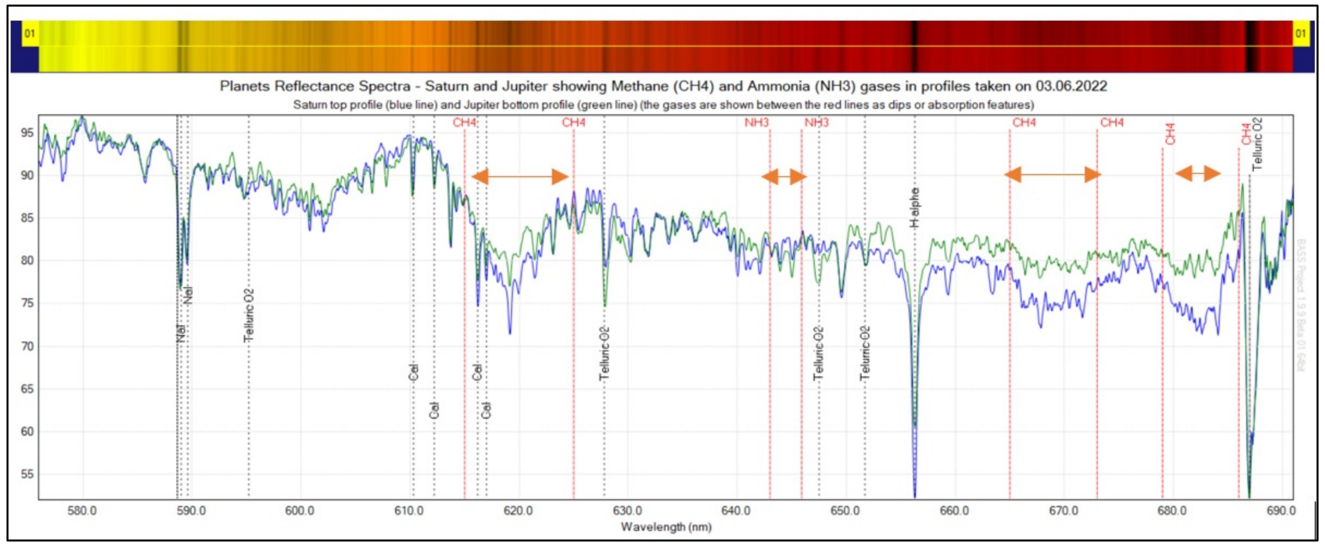

Fig 1. Jupiter and Saturn. {Saturn (blue line) & Jupiter (green line) [2]}

Reflectance Spectra of Mars and Venus

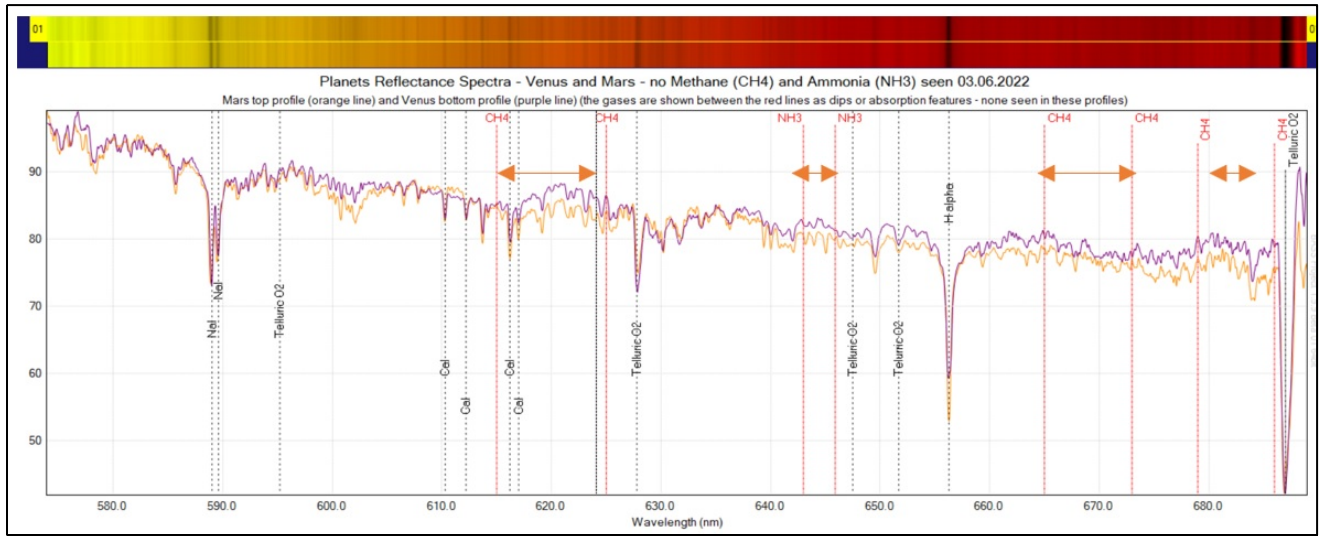

Fig 2. Mars and Venus

The extremely dense atmosphere of Venus consists of about 96% carbon dioxide (CO_2). The remaining shares are mainly nitrogen (N_2), water vapour (H_2O), and sulphur compounds in the form of sulphur dioxide (SO_2) and sulphuric acid (H_2SO_4).

The extremely thin atmosphere of Mars consists similar to Venus, to about 96% of CO_2. Here, particularly the rocky surface of the planet, might determine the reflectance properties. In the displayed range the spectra neither of Venus nor Mars show significant deviations from the shape of the Sun's spectral continuum. In higher resolved spectra, of course experts can recognise and analyse differences.

No Methane(CH_4) or Ammonia(NH_3) is seen in the Venus spectrum. The spectrum of Mars shows what could be a "trace" of Ammonia(NH_3). At this resolution, this is questionable though.

Comparison to Solar Spectrum

The Methane(CH_4) and Ammonia(NH_3) bands are not visible in the Solar Spectrum

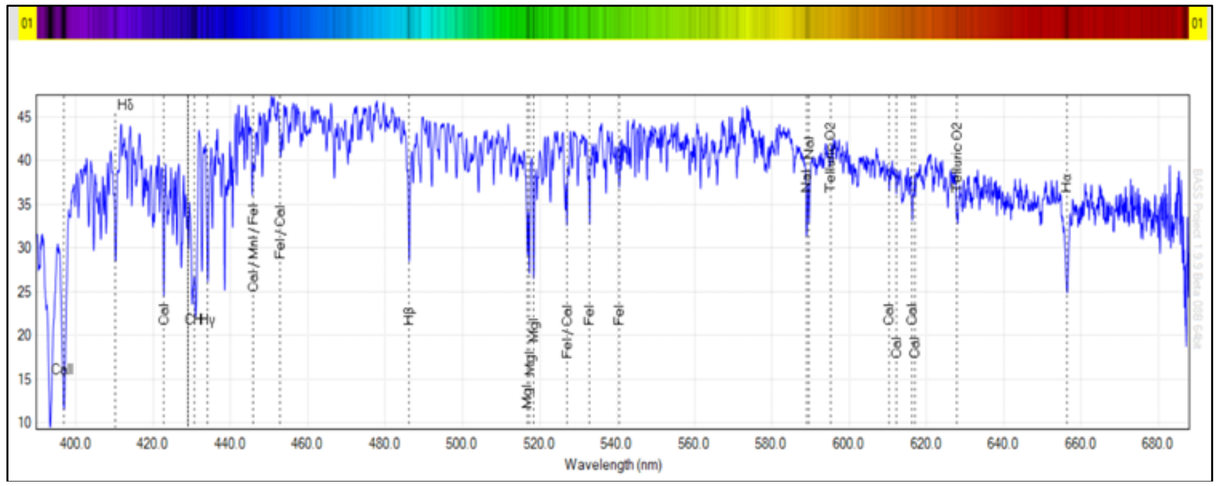

Fig 3. Solar spectrum for comparison.

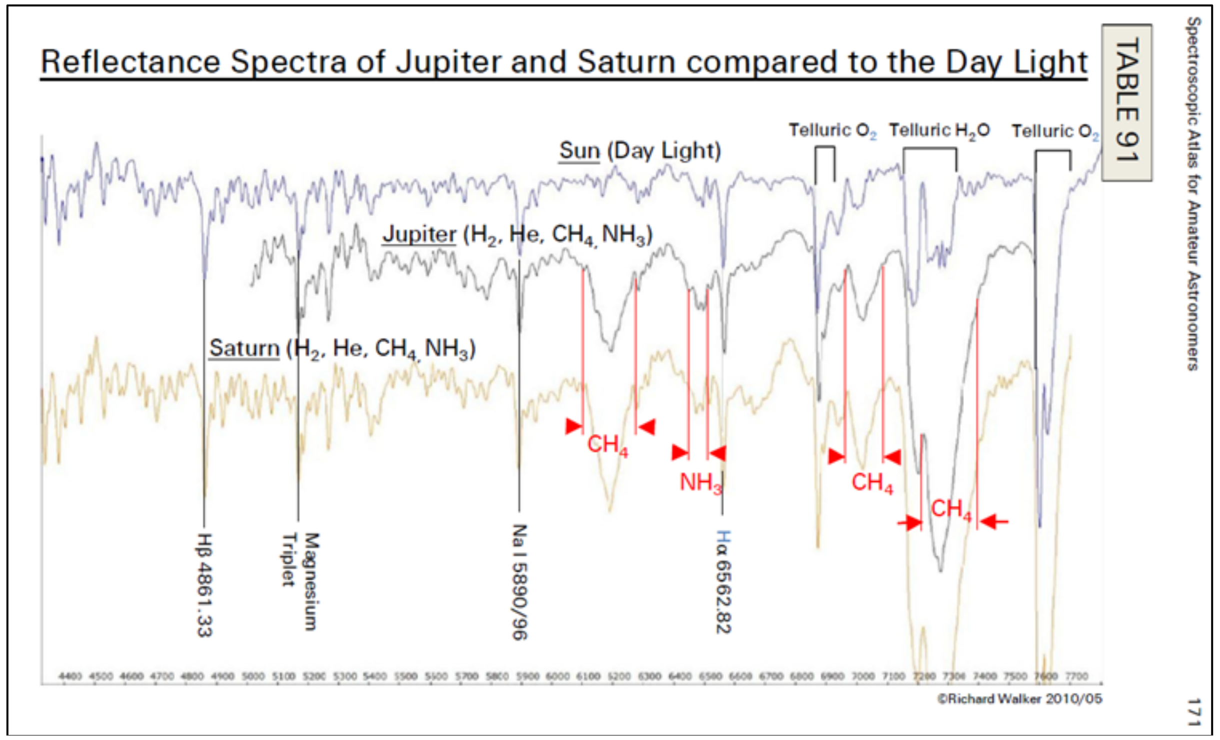

Fig. 4 Standard Text Book Spectra of Ammonia and Methane [2].

The spectra taken compare well to those shown in Fig. 4