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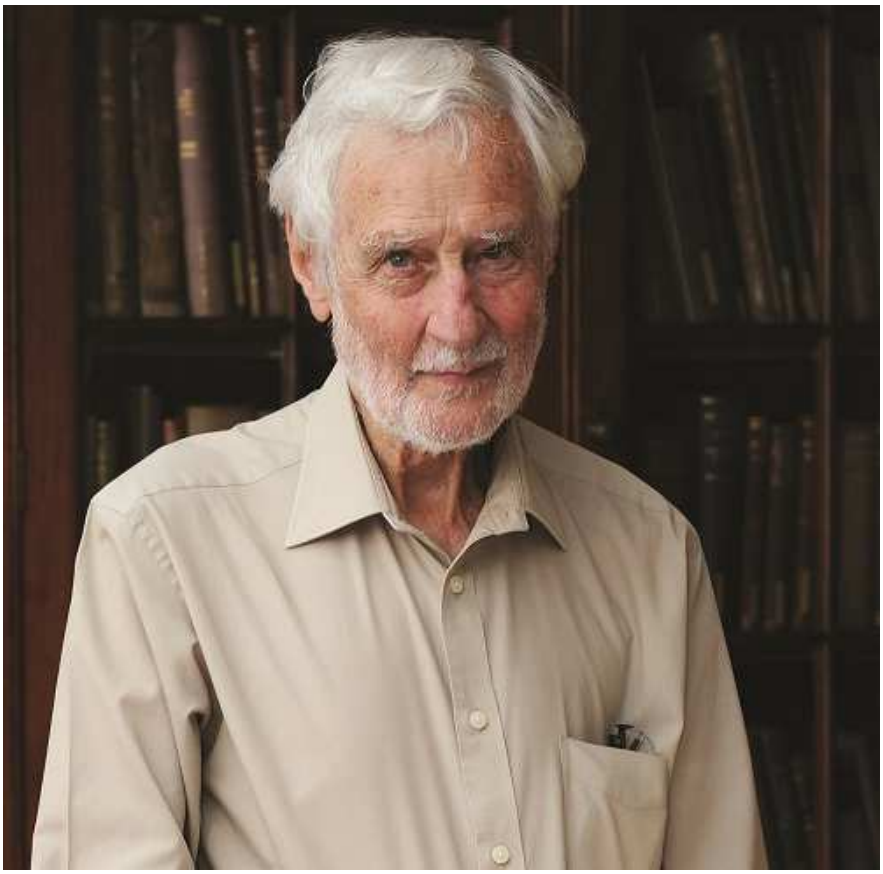


In this issue:

Cover Photo: Michael William Feast (See obituary on page 54).

Astronomical Society of Southern Africa
ASSA

mnassa

Vol 78 Nos 3 & 4 **April 2019**

News Note: SA - MPG Collaboration on extending MeerKAT

In a partnership between SARAO and MPG, an extension to the current MeerKAT array is being planned. In the basic scenario, MeerKAT could be expanded by about 20 additional dishes and fully integrated into MeerKAT. The dishes would follow the German- Chinese SKA dish design, similar or identical to the SKA-MPG prototype dish currently installed on site.

In order to maximize the operation time of extMeerKAT (extMK), the receivers would be limited to the currently available packages, i.e. L- and S-band instruments, so that little or no new technical development would be needed. The dishes would be placed in positions identified for SKA1, but other important details like maximum baseline lengths and exact distribution of the dishes still need to be decided and will be driven by a compromise between costs and science requirements and by minimizing the impact on the science operation of the existing MeerKAT array and the already planned science.

Current technical, financial and timeline considerations suggest that the new dishes would be placed at positions providing up to 18km baselines and excellent snapshot capabilities.

It is the wish of the partners that the opportunities provided by extMK will be exploited within a strong partnership between South Africa and the MPG. This document sets out the basic principles of the joint scientific exploitation. Based on previous discussions and feedback, the following key criteria have been identified:

- Implementation of extMK will be done so as to minimize impact on LSPs and Open Time plans
- Science should reward investment by matching interests of both SA/MPG communities

• extMK should produce legacy value (that persists even at the time of SKA)
• “New science” should be complementary to LSPs, not competing with them, while exMK may also benefit existing LSPs
• “New Science” should make best use of new extMK capabilities
• The scheme implemented for a joint exploitation of extMK may follow previously established examples (e.g. “GTO” time at other facilities)

Following these principles, the SA/MPG collaboration will

• Define a legacy project that serves a number of science purposes relevant and interesting for both SA and MPG (with complete joint PI-ship). Estimating that about 10% of observing time may be dedicated for the extMK Legacy observations suggests that one (rather than more) projects would be selected.
• Make extMK available beyond the chosen legacy project to the whole community, including LSPs, as extMK may also be used to enhance LSP science goals.
• In order to foster strong future SA and MPG partnerships, SA and MPG scientists are strongly encouraged to collaborate in further joint Open Time projects, achieved most easily by extending invitations to the other partners to develop or join an application for open time.
• These activities should be supported by additional proactive measures involving the exchange and training of students and staff. Visits should be planned for extended periods of time and should for instance also include co-supervision, joint degrees etc.
• It may be explored how the German community can assist the SA colleagues in developing data access infrastructure outside current the LSPs.

The above plans, especially the selection of the legacy project(s) or other joint projects should be determined by a 2-day workshop on 3-4 June in Cape Town, bringing together SA and MPG colleagues.

(Ass. Prof Roger Deane, University of Pretoria)

News Note: Black hole imaged

An international collaboration of millimeter-wave observatories known as the “Event Horizon Telescope” and using the techniques of Very-Long Baseline Interferometry has succeeded in imaging the nucleus of M87 with a resolution of about 25 micro-

arcseconds. This is the first time such an image has been produced and is a formidable technical achievement.

Earth-bound visible-region telescopes are normally limited to resolutions of about 0.5 arcseconds, or about 20 000 times coarser than the Event Horizon Telescope (EHT). Even the Hubble Space Telescope is limited to a resolution about 2 000 times coarser than the EHT. Only by using a wavelength of 1.3 mm, about as short as radio telescopes can go and by combining observations from mm-wave observatories spread across the Earth, could this resolution be achieved.

M87 is a supergiant elliptical galaxy in the Virgo cluster of galaxies and is one of the brightest radio sources, known as Virgo A. It is characterized by a long jet emanating from its nucleus. It is also bright in x-rays and gamma-rays.

The newly published mm-wave image is of a shadow cast by the black hole against radiation from material near the nucleus. Its radius is 2.6 times the Schwarzschild radius of the black hole (1.9×10^{10} m) which has an estimated mass of around 6.5×10^9 $M_\odot$ (solar masses). Neither light nor particles can escape beyond this radius from the region inside, hence the name "black hole". The possible existence of Black Holes was suggested by the astronomer Karl Schwarschild in 1916, based on Einstein's General Theory of Relativity.

Both the data processing of the radio data and the theoretical modeling of the shadow are highly complex. The results and their interpretation were published in a special edition of the *Astrophysical Journal Letters* **875**, L1, 2019 Apr 10. There are many authors, affiliated with 143 institutes including two from South Africa, the University of Pretoria and Rhodes University. The papers are available on open access at https://iopscience.iop.org/article/10.3847/2041-8213/ab0ec7.

News Note: Bernard Fanaroff elected FRS

Dr Bernard Fanaroff, until recently the Director of SKA South Africa, has been elected a Fellow of the Royal Society of London, a special honour bestowed on eminent scientists.

In addition to having worked for the Square Kilometre Array, Fanaroff was the Director of MeerKAT radio telescope from its inception in 2003 until 2015.

Born in Johannesburg in 1947, he studied for his BSc at Wits and obtained his PhD from Cambridge University, specialising in radio astronomy. He is known for being the co-author of the influential Fanaroff-Riley classification (1974) of radio galaxies and quasars that essentially divides them according to whether they are dominated by central sources or by lobes of radiation that extend outwards.

On returning to South Africa he decided to devote himself to social projects. He was successively a metal industry union organizer, Head of the Office for the Reconstruction and Development Programme and Deputy Director General in President Mandela's Office of the President, Chairman of the Integrated Justice System Board and the Inter-departmental committee on border control. He left government in 2000.

He has been awarded the Order of Mapungubwe, the Karl G Jansky Lectureship, Lifetime Achievement award of the National Research Foundation, Academy of Science of South Africa Science-for-Society Gold Medal, award for Science Diplomacy from the Minister for Science and Technology and the President's Award of the SA Institute of Electrical Engineers. Manchester University inaugurated the Fanaroff Lecture series. He is co-chair of the BRICS working group on high-performance computing and a trustee of the Paleontological Scientific Trust.

He is currently Special Advisor to the Managing Director, South African Radio Astronomy Observatory and Square Kilometre Array South Africa

News Note: The Birth of a New Star : The African Astronomical Society (AfAS)

Formation of the AfAS

After months of consultation and planning, a new Professional Astronomy society with a clear mandate took off the ground in the wake of the «Astronomy in Africa» meeting hosted at the South African Astronomical Observatory, SAAO, in Cape Town on 25-26 March 2019. This meeting which focused on the strategy, policy, and governance issues related to the field, as well as plan the future of astronomy on the continent, after an intense two days of presentations and discussions which led to the adopting of a new constitution, has finally given birth to a new star. This star in the African Skies (a sky renowned for its immaculate dark skies away from light pollution) was christened the African Astronomical Society (AfAS). Key to the coming of age and structure of this ambitious continental association was the generous offer by the South African government to host a staffed secretariat for the first 3 years. The meeting, which brought together some 80 delegates from 20 countries including

astronomy researchers, stakeholders from government and research institutions, concluded by electing an Executive Committee to take the organisation forward.

Figure: Participants in the "Astronomy in Africa" meeting, Cape Town, March 2019.

A Continental Association not shy of Ambitions

This meeting was held at the birthplace of modern astronomy in Africa, namely the SAAO in Cape Town, where the first modern astronomical observatory in Africa was set up. The discussions build upon the massive international projects in the region such as the Square Kilometre Array (SKA), the Southern African Large Telescope (SALT) and African Very-long-baseline Interferometry (VLBI) Network. These projects already involve several African countries and scientists working on these are leading cutting edge research globally. These are complemented by capacity building efforts by training young Africans in astronomy, engineering and related fields, such as the DARA Newton Fund program. The scientific potential of other facilities in countries like Ethiopia, Burkina Faso, Ghana, Mozambique, Morocco, Egypt, Algeria, to name of few, were also touched upon during the meeting. Scientific expertise and commitment to astronomy in Africa recently received a boost when Cape Town was chosen to host the biggest conference in astronomy, the International Astronomical Union General Assembly (IAU GA), in 2024. This will be the first time that the GA is hosted in Africa since the founding of the IAU in 1919.

In the words of Kevin Govender, director of the International Astronomical Union's Office of Astronomy for Development, who was the local organiser:
"This meeting is of particular significance given the growing stature of astronomy on the continent. Given the amazing spirit of cooperation and camaraderie that prevailed in this meeting, I am confident that the future of astronomy in Africa has just become significantly brighter."

Elected Executive Committee: Expertise, Diversity and Representativeness

The members of the AfAS Executive Committee elected at this meeting are people of various expertise in academic research, teaching, public interactions and outreaching. They are as diverse as one would expect from a continental association which as we believe truly representative of Africa in its diversity and human potential.

The AfAS Executive Committee

President: Jamal Mimouni (Algeria)
Vice-President: Lerothodi Leeuw (South Africa)
General Secretary: Sarah Abotsi-Masters (Ghana)
Assistant General Secretary: Charles Takalani (South Africa)
Public Relations and Education Officer: Olayinka Fagbemiro (Nigeria)
Early Career Representative: Zara Randriamanakoto (Madagascar)
Additional Member #1: Palesa Nombula (South Africa)
Additional Member #2: Etsegenet Getachew (Ethiopia)

News Note: Founding members sign SKA Observatory Treaty

Countries involved in the Square Kilometre Array (SKA) Project came together in Rome, Italy on 12 March 2019 for the signature of the international treaty establishing the intergovernmental organisation that will oversee the delivery of the world's largest radio telescope. Ministers, Ambassadors and other high-level representatives from over 15 countries have gathered in the Italian capital for the signature of the treaty that establishes the Square Kilometre Array Observatory (SKAO), the intergovernmental organisation (IGO) tasked with delivering and operating the SKA.

South Africa's signature on the establishment of the SKAO as an intergovernmental legal entity to oversee the construction and operational phases of the SKA project is a crucial milestone and one that should be celebrated. What makes this particularly unique is the fact that for the first time, Africa, Asia, Australasia and Europe, commit at the inter-governmental level to collaborate on a large-scale science project as equal partners. This represents the start of a new era for global science governance. International cooperation in science plays a crucial role in fostering international friendship and solidarity and bolster commitment to multilateralism which will assist our world in addressing global challenges like poverty, inequality and climate change. The signing of the Convention puts science diplomacy into practice. Already South Africa has delivered on the MeerKat, a pathfinder to the SKA, and our government

looks forward to the next phase of this global initiative in building a platform for this extraordinary scientific achievement.

Seven countries signed the treaty today, including South Africa, Australia, China, Italy, The Netherlands, Portugal, and the United Kingdom. India and Sweden, who also took part in the multilateral negotiations to set up the SKA Observatory IGO, are following further internal processes before signing the treaty. Together, these countries will form the founding members of the new organisation.

The signing ceremony, at the Ministry of Education, the Treaty for the establishment of the SKA Observatory comes after a long phase of negotiations, in which Italy has played a leading role. The Rome Convention testifies the spirit of collaboration that scientific research triggers between countries and people around the world, because science speaks all the languages of the planet and its language connects the whole world.

The SKA project is the icon of the increasingly strategic role that scientific research has taken on in contemporary society. Research is the engine of innovation and growth: knowledge translates into individual and collective well-being, both social and economic. Participating in the forefront of such an extensive and important international project is a great opportunity for the Italian scientific community, both for the contribution that our many excellences can give and for sharing the big amount of data that SKA will collect and redistribute.

Figure: The initial signatories of the SKA Observatory Convention. From left to right: UK Ambassador to Italy Jill Morris; China's Vice Minister of Science and Technology Jianguo Zhang; Portugal's Minister for Science, Technology and Higher Education Manuel Heitor; Italian Minister of Education, Universities and Research Marco Bussetti; South Africa's Minister of Science and Technology Mmamoloko Kubayi-Ngubane; The Netherlands Deputy Director of the Department for Science and Research Policy at the Ministry of Education, Culture and Science Oscar Delnooz; and Australia's Ambassdor to Italy Greg French (Credit: SKA Organisation).

The SKA will be the largest science facility on the planet, with infrastructure spread across three continents on both hemispheres. Its two networks of hundreds of dishes and thousands of antennas will be distributed over hundreds of kilometres in

Australia and South Africa, with the Headquarters in the United Kingdom. Together with facilities like the James Webb Space Telescope, CERN's Large Hadron Collider, the LIGO gravitational wave detector, the new generation of extremely large optical telescopes and the ITER fusion reactor, the SKA will be one of humanity's cornerstone physics machines in the 21st century.

Like Galileo's telescope in its time, the SKA will revolutionise how we understand the world around us and our place in it. Today's historic signature shows a global commitment behind this vision, and opens up the door to generations of ground-breaking discoveries. It will help address fundamental gaps in our understanding of the Universe, enabling astronomers from its participating countries to study gravitational waves and test Einstein's theory of relativity in extreme environments, investigate the nature of the mysterious fast radio bursts, improve our understanding of the evolution of the Universe over billions of years, map hundreds of millions of galaxies and look for signs of life in the Universe. South Africa is proud to be one of the countries signing the SKA Convention today. The signing of the Convention formally establishes the Intergovernmental Organisation, which is tasked with the construction and operations of the SKA. South Africa has already made significant contributions to the design of the SKA, particularly via the recently launched MeerKAT telescope, and our participation in the Intergovernmental Organisation will ensure our continued involvement in a project that will push technology boundaries, and quite possibly produce Nobel Prize-winning science.

Two of the world's fastest supercomputers will be needed to process the unprecedented amounts of data emanating from the telescopes, with some 600 petabytes expected to be stored and distributed worldwide to the science community every year, or the equivalent of over half a million laptops worth of data.

Close to €700 million worth of contracts for the construction of the SKA will start to be awarded from late 2020 to companies and providers in the SKA's member countries, providing a substantial return on investment for those countries. Spinoffs are also expected to emerge from work to design and build the SKA, with start-ups already being created out of some of the design work and impact reaching far beyond astronomy. Over 1 000 engineers and scientists in 20 countries have been involved in designing the SKA over the past five years, with new research programmes, educational initiatives and collaborations being created in various countries to train the next generation of scientists and engineers.

Guests from Canada, France, Malta, New Zealand, the Republic of Korea, Spain and Switzerland were also in attendance to witness the signature and reaffirmed their strong interest in the project. They all confirmed they are making their best efforts to prepare the conditions for a future decision of participation of their respective

country in the SKA Observatory. The signature concludes three and a half years of negotiations by government representatives and international lawyers, and kicks off the legislative process in the signing countries, which will see SKAO enter into force once five countries including all three hosts have ratified the treaty through their respective legislatures.
SKAO becomes only the second intergovernmental organisation dedicated to astronomy in the world, after the European Southern Observatory (ESO).

Planetarium for Sutherland

Nico van der Merwe

For some years now it has become clear that Sutherland is now no longer only an excellent site for an Observatory, but also a tourist attraction. Since its humble beginnings in the early 1970s with 4 telescopes, more and more people visit the growing observatory each year. Since the completion of the Southern African Large Telescope, SALT, Sutherland has become a tourist centre. The observing plateau now has over 20 telescopes and other scientific instruments; a hypersensitive seismometer and a gravimeter.

Fig 1. Location of the Planetarium in the centre of Sutherland.

Nicol and Marina van der Merwe and family, were for many years entertaining visitors and showing them the beautifully clear skies around Sutherland on their guest farm Blesfontein. Nicol had a passion for showing his visitors the night sky through his telescopes. Over the years they realized that there is a big potential for astro-tourism in Sutherland. Marina always had the dream of constructing a planetarium in Sutherland with the aim of entertaining tourists during the day with emphasis on astronomy. Marina's dreams were turned into reality by her son Nico, the only engineer in the family, with his unique and unconventional planetarium design, constructed a planetarium entirely from bricks! Two domes were built; one to serve as an information centre and coffee shop, the other the Planetarium

Fig. 2. Caption – Circular walls 2.2 m high.

Two circular brick walls, 2.2 m high walls were built. Before the platform was added a pivot point on top of a beam (in the epicentre of the dome) was put in place in each dome, rods with the perfect radius were attached to the pivot point with a 90 degree T-piece at the ends were used to guide the builders to place the bricks with a perfect curve. This was continued to provide the first 1.5 m of curved brickwork for the roof on top of the vertical walls. An unconventional affordable housing concept, including a giant inflatable balloon, made it possible to construct a brick dome to the required scale with a relatively smooth finish.

Fig 3: Base walls with the first 1.5 m curved wall.

The idea then was to place an inflatable balloon onto the platform inside the constructed circular wall and part roof, inflate it and continue laying bricks to create the perfect dome.

Figure 4. The inflated balloon to be used as a "mould" outside the walls.

Fig 5: The deflated balloon placed inside the walls.

Fig 6: The inflated balloon with bricks being laid on it. Note the bars with the T-pieces resting on the balloon.

Fig 7 (right): Progress

Fig 8: Nearing completion of the brickwork

Bricks continued to be laid and so constructing the hemispherical dome to completion.

With the brickwork complete, the balloon was deflated and removed and then the plastering of the outer and inner surfaces was done. Now that the first dome was complete and had been successfully constructed, the second dome, that for the planetarium, was built the same way.

The inside of the projection dome was plastered to perfection with a very smooth and light plaster. Using the smooth inner roof surface as a screen optimized the screen size; traditional planetaria made use of an expensive aluminium screen taking up a lot of precious projection surface and causing a lot of dust to build up.

Fig 9: Plastering the outside of the dome.

The unconventional concept was literally and figuratively made concrete by Nicol; a sheep farmer, amateur astronomer and skilled builder. Nicol and his team of local

builders were able to construct the planetarium building using locally sourced material and the inflatable air support, nicknamed “the balloon”, to achieve the desired dome shape roof.

The result of Nico’s design and Nicol’s hard work is captured in the twin domes standing 6.5m tall in the centre of Sutherland, en-route to the Southern African Large Telescope. The first dome is a coffee shop, serving the best barista style coffee in town. But it also acts as the Discover Sutherland tourism office.

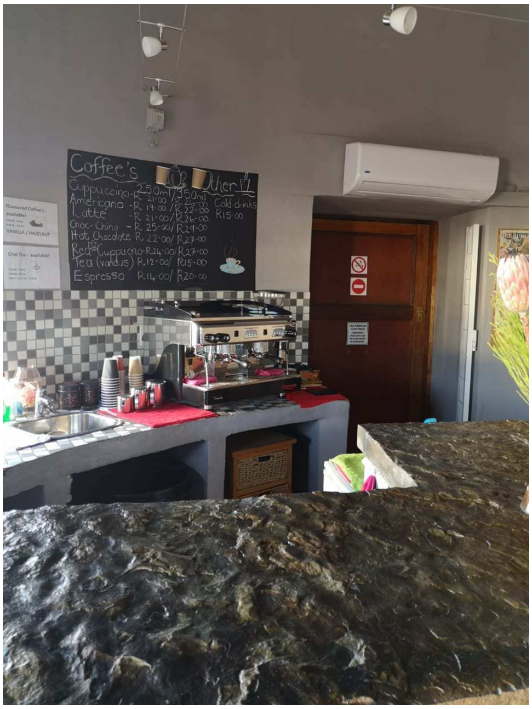


Figure 10: The Inside of the Coffee shop and Discover Sutherland tourism office.

The projection dome contains the planetarium’s crown jewel, the Fulldome Pro DX4 digital projection system. The five stage auto calibration function, capable of calibrating the dome within 5 minutes of arc, ensures that no paying customer is ever disappointed. The Fulldome Pro system makes use of a single revolutionary Fulldome Pro media server to blend four Full HD digital projectors into a 3K resolution screen. The Projection dome is fitted with a Dolby Atmos 7.1 sound system moving three-dimensional sound affects around the theatre with astonishing realism.

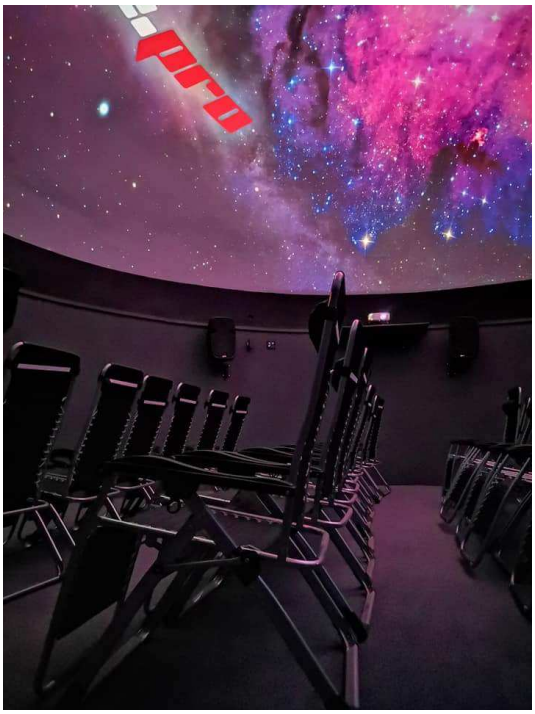


Fig 11: Inside the Planetarium

The Planetarium is open to the public Mondays to Saturdays with several shows each day. Show times are timed to fit in with the SALT tour times to showcase astronomical discoveries/findings and refer to the SAAO telescopes and equipment, and telescopes in general, as the tools that made these discoveries possible. Private shows for groups up to 31 people per show can be scheduled where the film material can be selected by the group to best suit the audience. Sutherland Planetarium currently has over 40 films to choose from, ensuring entertainment for the whole family. Special rates will be given to school groups visiting the planetarium. A typical

50 min Planetarium show consists out of two trailers (or a 3-D show, depending on the audience), a full dome film and a Stellarium star forecast that simulates the night sky at various points in time, with the main focus on identifying and visualizing constellations that will be visible that evening. The same constellations will be focused on during the Sutherland planetarium telescope stargazing session later that evening.

By popular demand, Sutherland Planetarium is now joining forces with Lucas Ferreira from Night Sky Tours to expand Sutherland's attractions and will soon open a telescope stargazing facility. The facility will house fully automated Celestron 11" and 14" telescopes and have room for 60 visitors. In the case of bad weather or cloudy nights the planetarium will accommodate the stargazers and the show will go on using software to simulate the cloudless night sky. A warm room is being built enabling astrophotographers to do their work in more comfortable surroundings it sub-zero temperatures.

As part of an educational program Sutherland Planetarium is working with the NRF and SAASTA towards creating the opportunity for astro-educational tours for learners to visit SALT and Sutherland Planetarium. The aim is to aid schools interested in visiting Sutherland and its facilities without the means to do so. Sutherland Planetarium promotes the opinion that early exposure to the field of astronomy could stimulate youngsters to develop and grow into knowledge loving adults, striving towards a better and more mindful tomorrow.

Fig 12: The completed planetarium complex.

News Note: SALT Science Highlight – Supersoft X-ray Binary System

A new binary star system has been discovered where a small white dwarf star is cannibalising its larger Sun-like companion. Such objects are actually quite common, but for this new object the white dwarf binged on its neighbour at a prodigious rate,

heating part of it to nearly a million degrees. The object, named ASASSN-16oh, was found on 2 December 2016 by the *All-Sky Automated Survey for Supernovae* (*ASASSN*), a network of about 20 optical cameras distributed around the globe which automatically surveys the entire sky every night in search of transient events, objects which suddenly appear. ASASSN-16oh was found to be in the Milky Way's satellite galaxy, the Small Magellanic Cloud, at a distance of ~200 000 light years.

Optical follow-up observations were conducted by the Southern *African Large Telescope (SALT)*, the Polish *OGLE* telescope in Chile and the *Las Cumbres Observatory (LCO)* telescope network. It was also discovered to be a so-called "supersoft" X-ray source by the NASA *Neil Gehrels Swift Observatory* and the *Chandra X-ray Observatory*, produced by gas at temperatures of ~900 000 degrees. Such supersoft systems have previously always been associated with a thermonuclear runaway explosion on the surface of a white dwarf, as occurs in a hydrogen bomb, brought on by the accumulation of hot and dense accreted gas which eventually reaches a critical explosive limit.

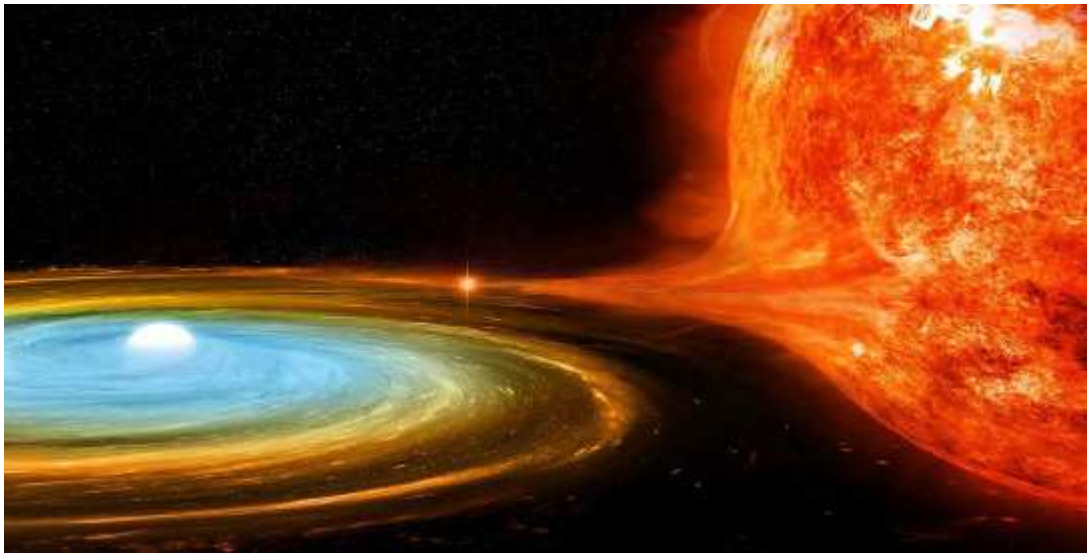


Fig 1: An artist's impression of the supersoft X-ray binary system, ASASSN-16oh, with a small white dwarf star (left) accreting hot gas from its Sun-like companion (right), through an accretion disk. The stream of gas from the companion forms a flattened accretion disk and the gas gradually spirals down to the white dwarf, getting hotter as it does so. Eventually the accreted gas impacts the equator of the white dwarf, heating it up to nearly a million degrees, emitting in soft X-rays (Picture credit: NASA/CXC/M.Weiss).

"Supersoft sources are a really interesting class of transient events, and ASASSN-16oh is no exception", says David Buckley, the Principal Investigator of the SALT Large Science Programme on transients, who is based at the South African Astronomical Observatory. "We were fortunate to be able to react quickly to its discovery and

undertake crucial observations during the outburst phase", he said. "Our SALT spectra showed all the hallmarks of a highly energetic system, with an intensely strong emission line from ionized helium which changed in velocity from night to night", says Buckley. In addition robotic observations were triggered with the LCO telescopes in South Africa, Chile and Australia, allowing for monitoring over a 34 hour period, beginning on Christmas Day 2016. "A nice Christmas present courtesy of the LCO Director who granted the time", quipped Buckley. The SALT and LCO data were then quickly analysed by another member of the SALT transients collaboration, Andry Rajoelimanana, at the University of the Free State, in Bloemfontein, South Africa.

It became clear after the optical and X-ray observations were analyzed that ASASSN-16oh was no normal thermonuclear powered supersoft source. "In the past, the supersoft sources have all been associated with nuclear burning on the surface of white dwarfs," said lead author Tom Maccarone, a professor in the Texas Tech Department of Physics & Astronomy, lead author of the ASASSN-16oh discovery paper that appeared in the December 3rd issue of Nature Astronomy.

If nuclear fusion is the cause of the supersoft X-rays from ASASSN-16oh then it should begin with an explosion and the emission should come from the entire surface of the white dwarf. However, the optical light does not increase quickly enough to be caused by an explosion and the *Chandra* X-ray data show that the emission is coming from a region smaller than the surface area of the white dwarf. The source is also a hundred times fainter in optical light than white dwarfs known to be undergoing fusion on their surface. These observations, plus the lack of evidence for gas expelled away from the white dwarf, provide strong arguments against fusion having taken place on the white dwarf.

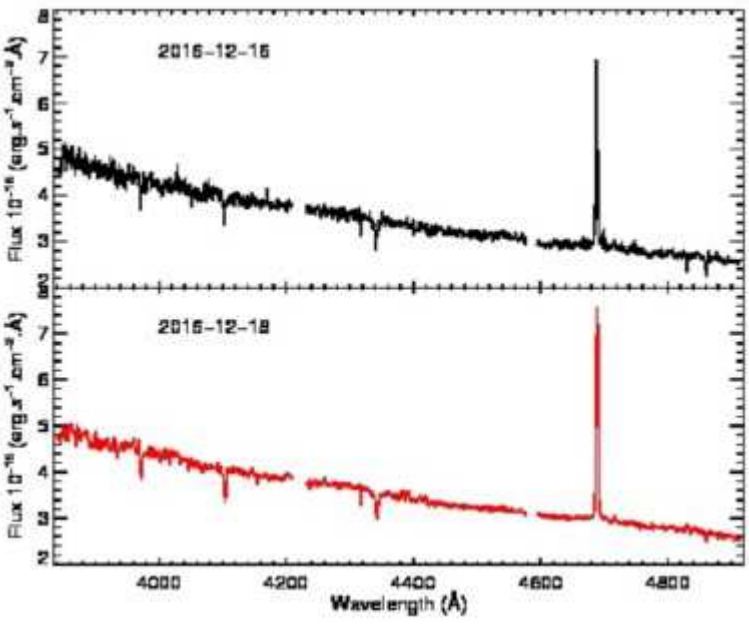


Fig 2: SALT optical spectra taken shortly after the optical peak brightness on 14 December.

Because no signs of nuclear fusion are present, the authors present a different scenario. As with the fusion explanation, the white dwarf pulls gas from its companion star, a red giant, in a process called disk accretion. The gas forms a large flattened rotating disk surrounding the white dwarf,

becoming hotter as it spirals inwards, as shown in our illustration. The gas then falls onto the white dwarf, producing X-rays along an equatorial belt where the disk meets the star. The rate of inflow of matter through the disk varies by a large amount and when the rate of mass loss from the companion increases, the X-ray and optical brightness of the system becomes much higher. The transfer of mass is happening at a higher rate than in any system we've caught in the past.
If the white dwarf keeps gaining mass it may reach a mass limit and destroy itself in a Type Ia supernova explosion, a type of event which was used to discover that the expansion of the universe is accelerating. The team's analysis suggests that the white dwarf is already unusually massive, so ASASSN-16oh may be relatively close – in astronomical terms – to exploding as a supernova.

This result contradicts a decades-long consensus about how supersoft X-ray emission from white dwarfs is produced; we now know that the X-ray emission can be made in two different ways: by nuclear fusion or by the accretion of matter from a companion.

Obituary: Michael William Feast 1926-2019

Michael William Feast died peacefully on the morning of , 1 April 2019, aged 92. He is survived by his wife Connie, three children and eight grand-children.

Michael was an Honorary Professor in the Astronomy Department at the University of Cape Town, a former Director of the South African Astronomical Observatory (SAAO), a Founding Member of the Academy of Science of South Africa, a member of the International Astronomical Union, an Honorary Fellow of the Royal Astronomical Society, a Fellow of the Royal Society of South Africa and the South African Institute of Physics (SAIP) and an Honorary member of the Astronomical Society of Southern Africa, ASSA.

Born in Deal, Kent, England on 29 December 1926, as a young boy he was removed from his family and, with the other village children, was sent to live with host families in Wales for the duration of the war for security reasons.

He came to South Africa in 1952, after a postdoc position in Canada, to work at the Radcliffe Observatory in Pretoria. In 1974 he moved the SAAO in Cape Town, where he served as Director from 1976 to 1992. In 1992 he took South African Nationality so as to participate fully in the transformation of South Africa. He was passionate about astronomy and continued to do research up to a few months before his death. He read widely, enjoyed talking to students and was an Editor of the leading UK astronomy journal, Monthly Notices of the Royal Astronomical Society, from 1993

until 2018 and served on the Editorial board of the Monthly Notes of the ASSA, MNASSA, until his death.

Using the 1.9m telescope, first in Pretoria and later at Sutherland, Michael did pioneering work on the Magellanic Clouds, our nearest extragalactic neighbours. His measurements enabled the first estimate of the mass of the Large Magellanic Cloud, which allowed us to understand how it was formed. He also established that the history of the Small Cloud must have been quite different. Many of his papers from the 1950s and 60s continue to be quoted. He established that luminous stars were losing mass and that this set a limit to stellar masses, which is crucial to many things from stellar evolution to the formation of planets.

Michael has also made major contributions to the understanding of our own Milky Way Galaxy. A pioneer of multi-wavelength techniques, between 1958 and 1965 he made the first comparison of optical data on young stars with radio measurements of the hydrogen gas. These led him to a new determination of the distance to the Galactic centre and an improved understanding of Galactic rotation. Much more recently, from 1997 to 2015, he combined data from the Hipparcos Satellite with observations from the Hubble Space Telescope and from various SAAO telescopes at Sutherland to investigate the structure of our own Galaxy and to derive a new calibration of the extragalactic distance scale. He has also used the Southern African Large Telescope (SALT) to good effect, discovering Cepheid variables at large distances behind the Galactic Centre. He published over 300 refereed papers, the first in 1948 and the latest in 2019.

At the time of his death, Michael was a National Research Foundation (NRF) A1 rated researcher. He had won the Gill Medal of the Astronomical Society of South Africa, the de Beers Gold Medal of the SAIP and in 2014 was presented with the NRF Lifetime Achievement award.

He was responsible for the development of SAAO as a major national and international facility. Initially a joint enterprise with the British Science Research Council, this developed into an entirely South African operation under his leadership. The telescope time was available to anyone who had a good enough project and this attracted international visitors. This also led to fruitful exchanges of scientific and technical knowledge and was highly stimulating to the SAAO staff, both scientific and technical. He took a strong personal interest in all research done at the SAAO and critically read every paper written by a staff member before it was submitted for publication. He encouraged international collaborations and insisted that publication was in first rank international journals.

The work carried out at SAAO by staff and by astronomers from South African and international universities and institutions during the time of Michael's directorship of SAAO has not only led to the recognition of South Africa as a major component in world astronomy, it has shown that South Africa's geography, climate and its technical development makes it an excellent place to establish astronomical facilities. It is clear that these factors were significant in convincing international partners to join with South Africa in SALT at SAAO, Sutherland. That in turn positioned South Africa to bid to host the Square Kilometre Array.

When SAAO and UCT held a conference to celebrate Michael's 90th birthday he insisted that it must not look back, but focus on the future and the wonderful opportunities that astronomy and South Africa offered each other. He lived a life of integrity and dedication to work, whilst still enjoying the simple pleasures of family dinners, listening to music, reading poetry, and walking deep in conversation with friends. He read widely on a broad range of subjects, especially history, art, music, philosophy and religion. He was an Anglican and was especially interested in what lay beyond and outside of the concepts of space and time as we know them. He was a source of wisdom and good council to many who loved him, and an inspiration and help to many who worked with him. His is a life worth celebrating in so many ways.

Figure: Royal Society of SA Fellows at the "Feast Fest" 2017 from l to r: D Lynden-Bell, P Whitelock, M Feast, R Kraan-Korteweg and G Ellis.

(Prof Patricia Whitelock)

Colloquia and Seminars

These 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

Also included in this section are the colloquia/seminars at the SAAO, UWC, the Astrophysics, Cosmology and Gravity Centre at UCT, ACGC and the NASSP lectures, aimed the at the students and interested astronomers. In addition there are the SAAO Astro-coffees which are 15-20min informal discussions on just about any topic including but not limited to: recent astro-physics papers, seminal/classic publications, education/outreach ideas and initiatives, preliminary results, student progress reports, conference/workshop feedback and skills-transfer.

SAAO

Title: Looking at the Biggest (Binary) Stars with the Smallest Space Telescopes
Speaker: Dr Noel Richardson (U. of Toledo, USA)
Date: 24 January
Time: 11h00 – 12h00
Venue: SAAO Auditorium

Abstract: Massive stars, despite being rare, are important to understanding our Universe – they provide critical feedback to their host galaxies, triggering new star formation, and have strong ionizing radiation fields that can alter their environments. The vast majority of these stars reside in binary systems, so interactions with a companion can alter the course of their evolution. Through detailed analyses of bright, massive stars, we can study the ways in which they evolve and impact their host galaxies. I will detail multiple, on-going studies to understand the ways in which the massive stars interact with their companions. This has been accomplished through a combination of techniques, involving both large and small telescopes, professional and amateur astronomers, and facilities on the ground and in space. Recent observations of the unique binaries WR 140 and eta Car will be highlighted.

Title: Cosmology: Now and Future
Speaker: Assoc. Prof Yin-Zhe Ma (University of KwaZulu-Natal, SA)
Date: 25 April
Time: 11h00 – 12h00
Venue: SAAO Auditorium

Abstract: In this talk, I will give an overview of the current status of precision cosmology and highlight some of the unsolved problems that will impact the future research in CMB and radio astronomy. These include the cosmological parameter measurements, gravitational lensing and its measurements on neutrino mass, B-mode polarization, current constraints on inflation, and intergalactic medium. I will discuss the current measurements and their physical implication for the early Universe, and what new knowledge that radio experiments (SKA, HERA, HIRAX) can bring to.

UWC

Title: Probing Dark Energy with the Hydrogen Intensity and Real-time Analysis eXperiment
Speaker: **Jonathan Sievers (UKZN)**
Date**:** 3 May
Time**:** 11h30 – 12h30
Venue: Rm 1.35 New Physics Building, UWC

Abstract: Dark energy, the energy density associated with empty space, is one of the biggest enigmas in physics. It is driving the expansion of the universe to accelerate, effectively acting like a form of anti-gravity. Its observed value is 120 orders of magnitude smaller than its natural value - given this discrepancy there is no strong theoretical reason to think the simplest model (that of a cosmological constant) is correct. Recent measurements of the Hubble constant give conflicting answers when measured in the local universe and when measured far away, when the cosmos was much younger. This tension could be a sign of time evolution of dark energy, which would be one of the most surprising results in physics of all time. The Hydrogen Intensity and Real-time Analysis eXperiment (HIRAX) is a planned 1 024-element radio telescope, let by UKZN, that will study the evolution of the universe when the universe was approximately 2-6 billion years old (redshift 2.5 to 0.8). By tracing out the growth of structure in the universe during this period, it will measure basic cosmological parameters of the universe, including the evolution of dark energy. We give an overview, aimed at a general physics audience, of the instrument status and the science to be addressed by HIRAX (which will also include searching for new pulsars and fast radio bursts, which are perhaps the most mysterious objects in astronomy today).

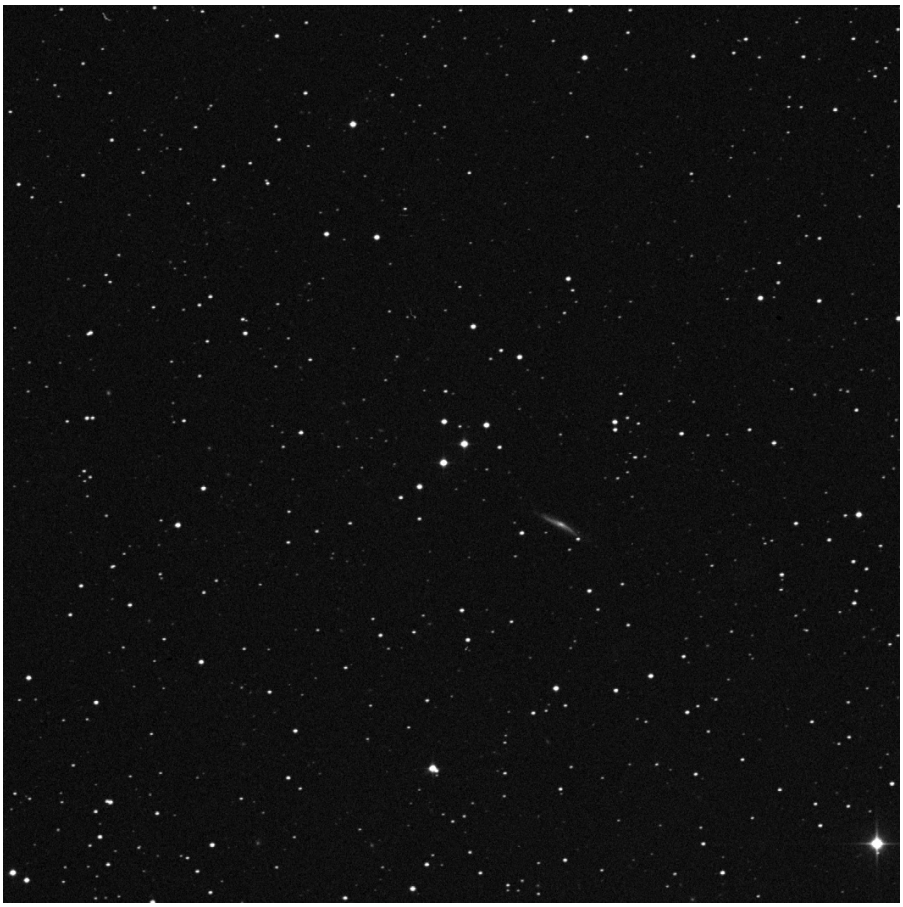
Asterisms – the Hidden Jewels (continued)

Magda Streicher

Ever sit at the telescope and wonder which object is next to be adored through dark adapted eyes, perhaps another cluster, globular or nebulae? Well, as one scans the night sky one might find a few stars in a somewhat loose grouping of sorts; somewhat less scattered than the rest of the starry skies. To observe deep sky objects is one thing, but there may be a gem in the sky just waiting to be discovered in exceptionally small star groups or asterisms. Searching for star asterisms is full of fun; inspiring vivid imagination and thoughts. The real beauty lies in the story-telling part of these small groupings with fewer stars than the usual known larger open clusters.

Asterisms are decidedly among the most exciting star groupings for launching a celestial search, either through the telescope or using a star programme, followed by a telescopic observation. The Deep Sky Hunters forum consists mostly of amateurs looking for unknown star groups who will be credited in the Deep Sky Hunters Catalogue if certain criteria are satisfied.

Streicher 4

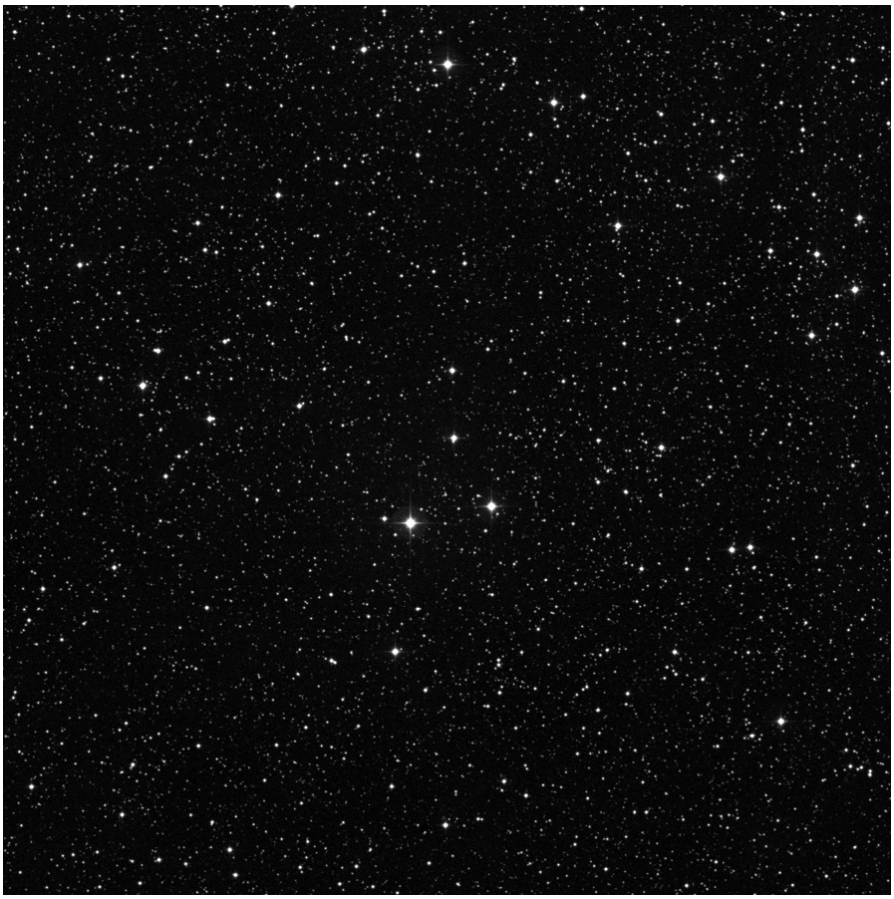


Towards the northern hemisphere Gemini offers a unique asterism found in the far north-east of the constellation. About 2° east of omni Geminorum and only half a degree north of the galaxy IC 2207 a string of five stars with magnitudes varying between 10 and 10.5 were located. The string, in a north-west to south-east direction, is outstanding against the busy starfield. All of them show a position angle of more or less 210° which, in space, could be regarded as lying in the same direction, and their possibly being related to one another. A few extremely faint stars is situate just off towards the west, and the faint edge-on galaxy UGC 4029, a very close neighbour, is situated a few arc minutes to the south-west, I love this one.

OBJECT	TYPE	RA	DEC	MAG	SIZE
Streicher 4 DSH J0748.6+3422	Asterism	07h48’.37”	+34°22’12”	10	3’

Picture Credit: archive.stsci.edu/cgi-bin/dss

Streicher 5

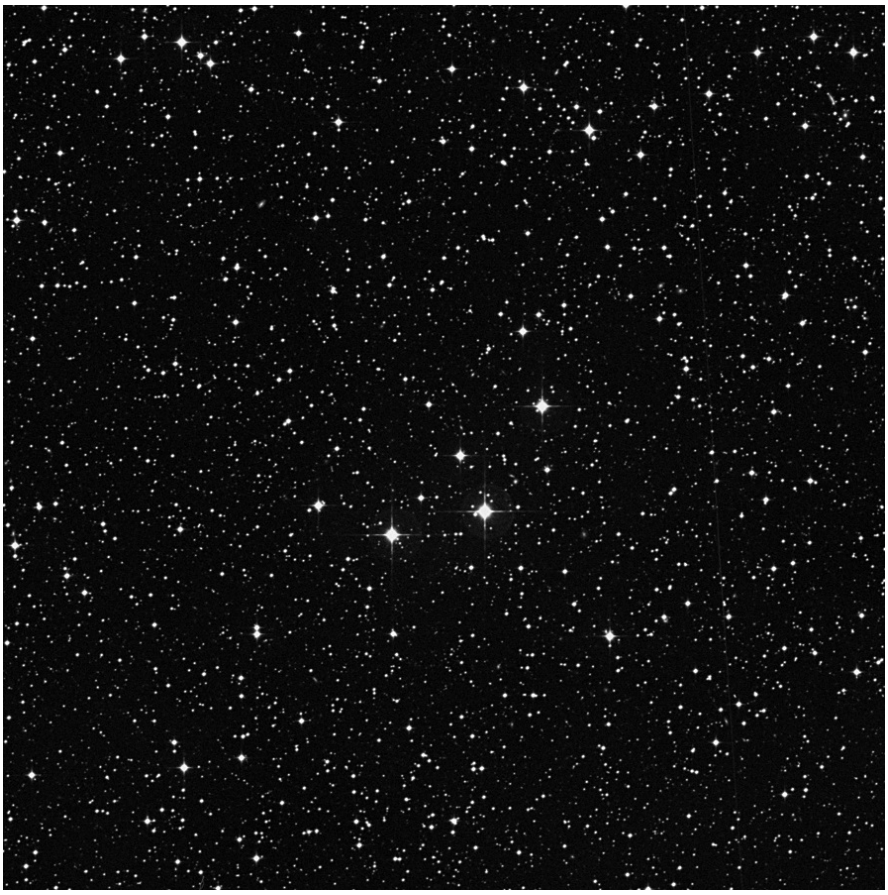


A few bright stars in the shape of a triangle are situated within a fainter starfield in the constellation Cassiopeia. A tight grouping of a few very faint stars, not outstanding, can be glimpsed inside the triangle and just to the immediate north-west, indicate the size of 5.5' given by the DSH. The brightest star of the triangle is HD 7361, situated at the southern-most point, with a magnitude of 7.5. Seen as a whole, and in a broader context, the mass of fainter stars gives the impression of a grouping of sorts. This starfield needs more investigation for one to be able to get a better picture of it. Only half a degree north is the small open cluster NGC 433, consisting of a handful of varying-magnitude stars, with the brightest displaying a lovely yellow colour.

OBJECT	TYPE	RA	DEC	MAG	SIZE
Streicher 5 DSH J0114.8+5947	Asterism	01h14'.48"	+59°47'34"	10	5.5'

Picture Credit: archive.stsci.edu/cgi-bin/dss

Streicher 6

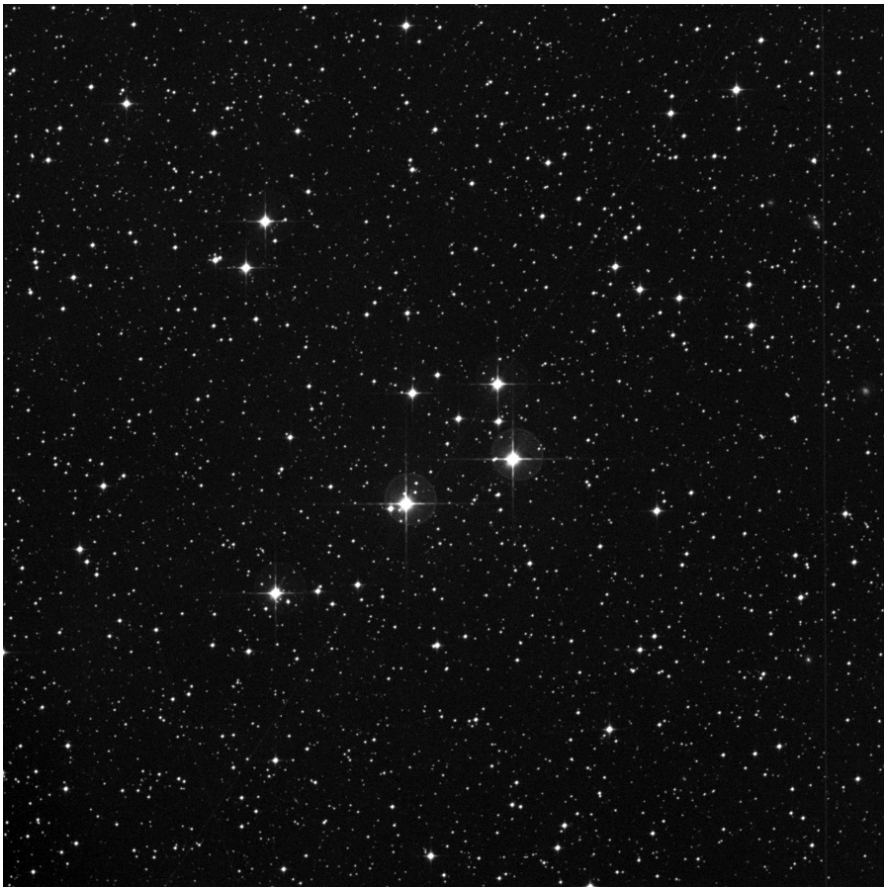


In the northern corner of the southern constellation Puppis, a mini-constellation of stars in the shape of Cassiopeia can be seen. The galaxy IC 500 is situated 1.5° south-east of this little gem. The asterism of stars is neatly arranged in a W formation, with three of them displaying a rich light-yellow colour, while the other two are a brilliant white. This group is outstanding towards the rich Milky Way southern star-arm section.

OBJECT	TYPE	RA	DEC	MAG	SIZE
Streicher 6 DSH J0808.6-1511	Asterism	08h08’.37”	-15°11’06”	8.6	10’’

Picture Credit: archive.stsci.edu/cgi-bin/dss

Streicher 7



The beauty of star groupings, and especially the ones with fewer but relatively brighter stars, is that, with a bit of imagination, they always tell a story of one kind or another. This lovely kite-shaped asterism, situated only 1.5° south of the splendid open cluster NGC 2516 (a naked-eye group) in the southern constellation Carina. The asterism stars display a long axis points south-east, where the brightest star in this grouping is located – it has a magnitude of 7.7 and is a beautiful yellow colour. The asterism is strikingly outstanding against a very faint starfield.

OBJECT	TYPE	RA	DEC	MAG	SIZE
Streicher 7 DSH J0753.6-6220	Asterism	07h53’.36”	-62°20’54”	9.5	6’

Picture Credit: archive.stsci.edu/cgi-bin/dss

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 as well as the annual *Sky Guide Africa South.*

Membership: Membership of the Society is open to all. Potential members should consult the Society's web page assa.saao.org.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, Natal Midlands, Pretoria and Sedgefield district (Garden Route Centre). Membership of any of these Centres automatically confers membership of the Society.

Sky & Telescope: Members may subscribe to Sky & Telescope at a significant discount (proof of membership is required). Please contact the Membership Secretary for details.

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CONTENTS