

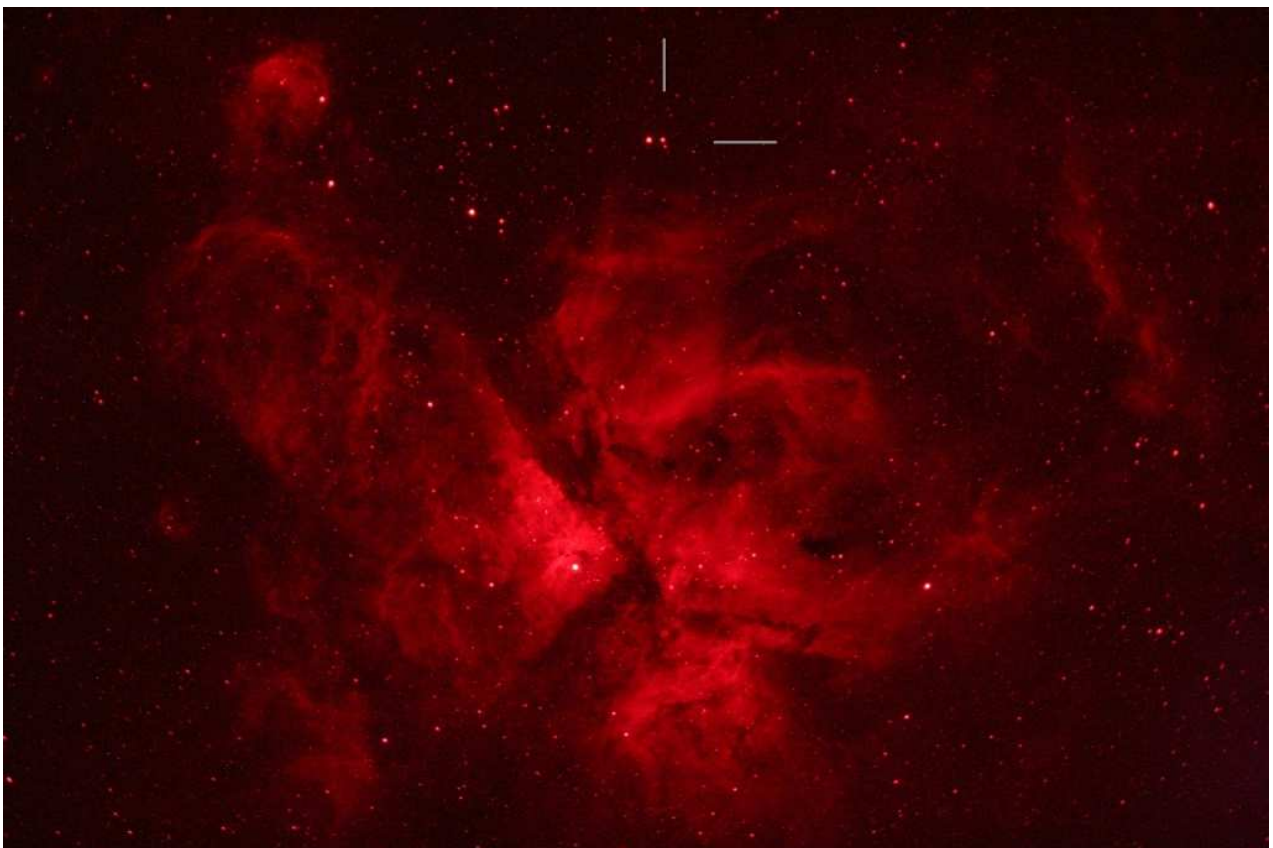
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# **mnassa**

monthly notes of the astronomical society of southern africa

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April 2018



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**11<sup>th</sup> ASSA Symposium**

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### Cover Photo:

Nova ASASSN-18fl in Carina imaged by O Toumilovitch in H-alpha on 24 March 2018 from Johannesburg. See article, p. 25.



# mnassa

Vol 77 Nos 3 & 4

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## **News Note: MeerKAT observes a rare burst of activity from a Magnetar**

South Africa's MeerKAT radio telescope recently observed a rare burst of activity from an exotic star, demonstrating its outstanding capabilities as a new instrument for scientific exploration.

An article published today in the *Astrophysical Journal* presents the study of a magnetar -- a star that is one of the most magnetic objects known in the universe -- that awoke in 2017 from a 3-year slumber. Radio observations that could only be made with MeerKAT triggered observations with NASA X-ray telescopes orbiting the Earth. This first publication in the scientific literature of astronomical discoveries requiring the use of MeerKAT heralds its arrival into the stable of world-class research instruments.

Dr. Fernando Camilo, Chief Scientist at the South African Radio Astronomy Observatory (SARAO, which includes the Square Kilometre Array South Africa project), describes the setting one year ago: that on 26 April 2017, while monitoring the long-dormant magnetar with the CSIRO Parkes Radio Telescope in Australia, one of our colleagues noticed that it was emitting bright radio pulses every 4 seconds. A few days later Parkes underwent a planned month-long maintenance shutdown. Although MeerKAT was still under construction, with no more than 16 of its eventual 64 radio dishes available, the commissioning team started regular monitoring of the star 30 000 light-years from Earth. The MeerKAT observations proved critical to make sense of the few X-ray photons we captured with NASA's orbiting telescopes -- for the first time X-ray pulses have been detected from this star, every 4 seconds. Put together, the observations reported today help to develop a better picture of the behaviour of matter in unbelievably extreme physical conditions, completely unlike any that can be experienced on Earth, according to Camilo.

The article, entitled *Revival of the Magnetar PSR J1622-4950: Observations with*

*MeerKAT, Parkes, XMM-Newton, Swift, Chandra, and NuSTAR* by F. Camilo et al. has 208 authors. A handful of these are astronomers specialising in the study of Magnetars and related stars. The vast majority belong to the so-called MeerKAT Builders List: hundreds of engineers and scientists overwhelmingly from the SKA South Africa project and commercial enterprises in South Africa that over more than a decade have been developing and building MeerKAT -- a project of the South African Department of Science and Technology, in which 75% of the overall construction budget has been spent in South Africa

MeerKAT is an enormously complex machine. In order to make the exquisitely sensitive images of the radio sky that will allow scientists to better understand how galaxies like the Milky Way have formed and evolved over the history of the universe, the 64 MeerKAT antennas generate data at enormous rates. The challenges involved in dealing with so much data require clever solutions to a variety of problems at the cutting edge of technology. MeerKAT has a team of the brightest engineers and scientists in South Africa and the world working on the project, because the problems that need to be solved are extremely challenging, and attract the best.



*Fig 1. Recent view of MeerKAT*

Some of these people were in high school when the project started. SKA has implemented a human capital development programme focused on producing the South African engineers and scientists with the skills required to design, build, and use the telescope. Many of these young people are now employed at SARAO, at South

African universities, and in the broader knowledge economy, according to Kim de Boer, Kim de Boer, Head of the SARAo Human Capital Development Programme.

According to Prof. Roy Maartens, SKA SA Research Chair at the University of the Western Cape, the first scientific publication based on MeerKAT data is a wonderful milestone. Although MeerKAT isn't yet complete, it's now clearly a functioning telescope. The training a new generation of researchers has begun, and soon SA young scientists will be using what promises to be a remarkable discovery machine.

Early in 2018, SARAo received the first Early Science MeerKAT observing proposals from South African researchers. Later in the year, already approved Large Survey Projects that will use two-thirds of the available observing time over 5 years will start their investigations with the full array of MeerKAT antennas. These 64 dishes, each 13.5 metres in diameter, are distributed across a span of 8 kilometres in a remote area of the Northern Cape. The 64 MeerKAT antennas are standing tall in the Karoo. The official unveiling of the telescope is being planned for the second half of 2018. Prof. Phil Diamond, Director-General of the SKA Organisation, congratulated his colleagues in SA for this outstanding achievement, building such telescopes is extremely difficult, and this publication shows that MeerKAT is becoming ready for business. As one of the SKA precursor telescopes, this bodes well for the SKA. MeerKAT will eventually be integrated into Phase 1 of SKA-mid telescope bringing the total dishes at our disposal to 197, creating the most powerful radio telescope on the planet.

Getting to this point required the hard work and support of countless South Africans over more than a decade. This first article indicates, the telescope is now beginning to make scientific discoveries. As MeerKAT's capabilities continue to grow, many more will follow. It's tremendously gratifying to lead a team of such talented and passionate colleagues, who've been building in the Karoo a research instrument with few parallels anywhere, concluded Dr. Rob Adam, SARAo Managing Director.

## **Nova ASASSN-18fv in Carina**

*O Toumilovitch, D Blane and C Rijdsdijk*

This Nova was discovered on 2018/03/20.32 UT with a visual magnitude 10V+ (Image was saturated) [1]

ASSA Members were alerted by Kos Coronaios (Observing Section Director, ASSA) via the ASSA discussion mailing list on 2018/03/23. One of the authors, Oleg Toumilovitch, was very interested by the discovery of ASASSN-18fl, as the object is located in the



most beautiful and easily accessible part of the sky, for observers in the southern hemisphere and therefore frequently imaged!

Over the years a large number of wide field images of the Carina Nebula were obtained and it was hoped that some of the images include the area where Nova ASASSN-18fl was discovered.

Images from 2008 and 2015 were selected as examples as they clearly show that there was no outburst recorded in the region. The next evening, 24 March, gave an unexpected window of observations and imaging for a few hours, as the sky cleared up after weeks of cloudy weather.

For regular observers of Carina Nebula it is very easy to locate the Nova as it is situated approximately  $01^{\circ} 06' 30''$  West of the central star Eta Carinae and within  $03'$  from a bright star SAO 23 8242 (mag. 5.08). Please refer to Fig. 1

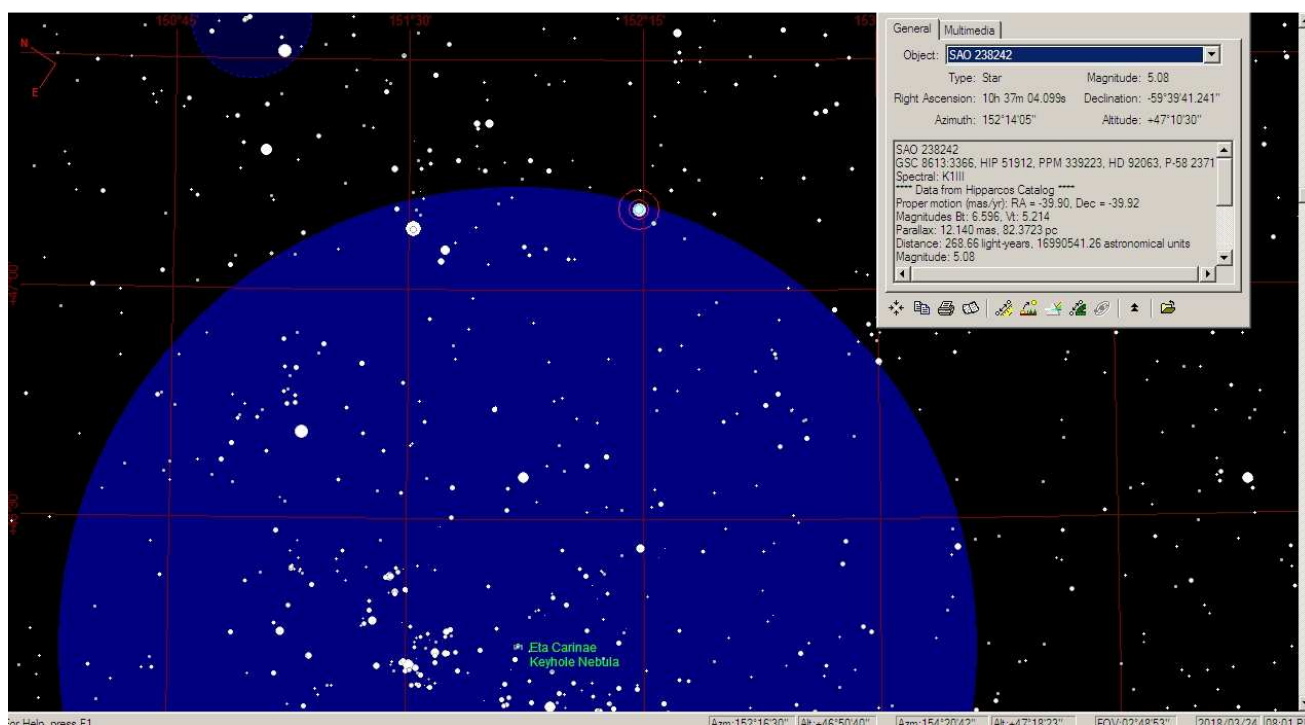


Fig 1. From Celestron's "The Sky"

An attempt to identify the Nova through binoculars was unsuccessful as the seeing conditions were far from ideal, so a small telescope was chosen to take a series of images in visual spectrum and in the 7 nm H-alpha band; see Fig. 2. Both methods showed the outburst near SAO 23 8242 clearly when compared to the images from 2008 and 2015, Fig. 3 and 4.



Fig 2. (left) Visual image 2018-03-24. Fig 3 (right) 2008



Fig 4. (left) 2015

The apparent brightness of ASASSN-18fl can be compared with the brightness of SAO 238296 (mag. 6.50). Refer to Fig. 5 and compare with the visual image of 2018/03/24, Fig. 2.

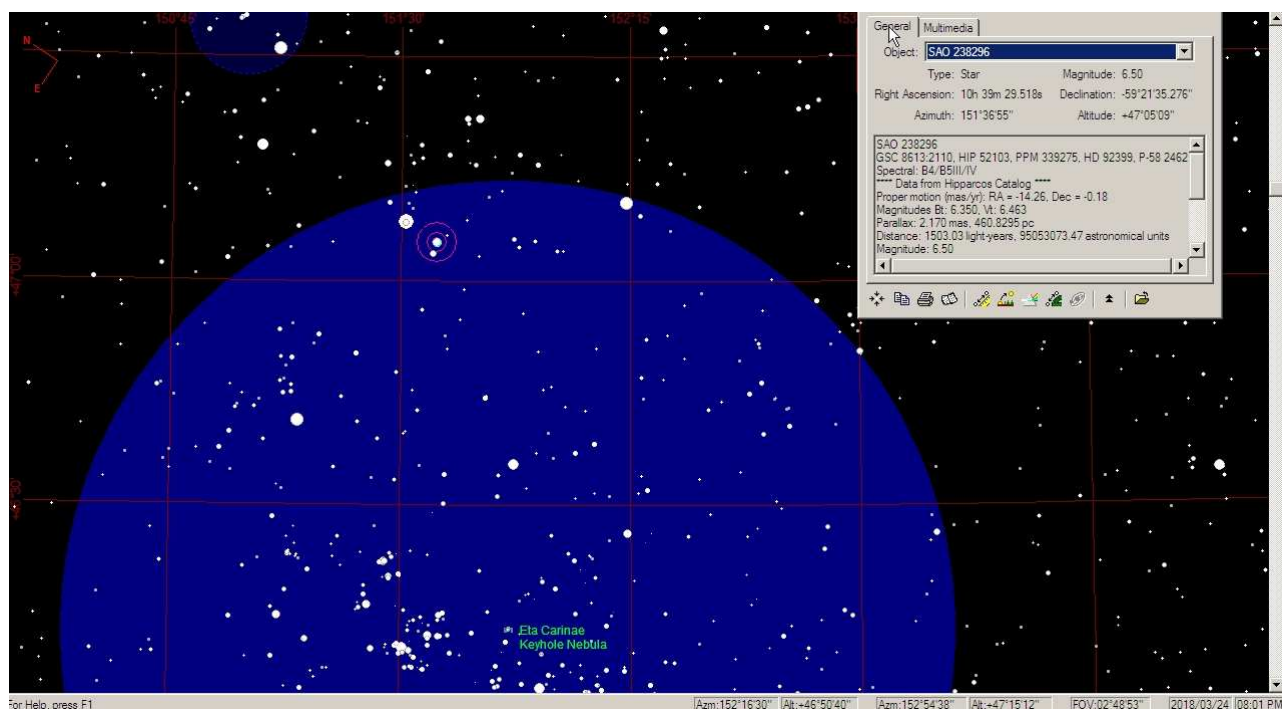


Fig 5. Johannesburg. Celestron's "The Sky".

Unfortunately weather conditions remained very unfavourable for imaging or visual observations since then.

The Nova in Carina continues to provide some surprises, according to Dave Blane. In communication with other observers, some have described it as a classical Nova while others have disagreed but its nature should become clearer as the nova expands.

In a communication with AAVSO Director, Dr Stella Kafka says it is too far south (and too bright!!) for most of our CCD observers. It has been behaving in a very, VERY bizarre way.

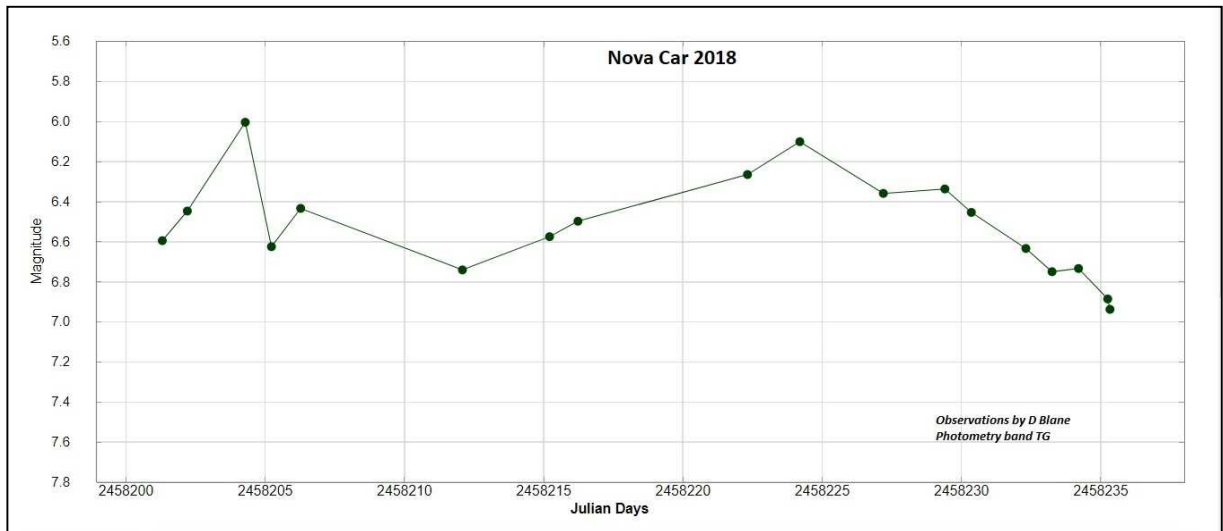


Fig 6. Light curve of Nova Carina 2018



This is clearly shown in the light "curve" plotted by Dave Blane, see Fig. 6. Maybe by the next edition there will be more data from some other observers as well. His annotated image shows magnitudes of comparable stars, see Fig. 7 (left)

Fig 7 (left). Image by Dave Blane.

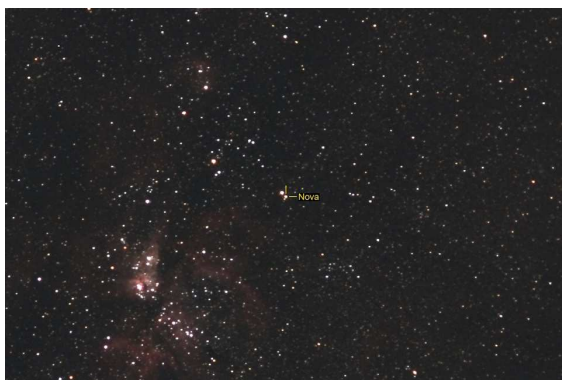


Fig 8 (above left) by Barbara Cunow; Fig 9 (above right) by Cos Coronaios.

1 <https://www.aavso.org/aavso-alert-notice-626>



# SAAO Astronomical History Symposium 2018

*IS Glass (SAAO)*

The SAAO History Symposium was held 7 & 8 March 2018 in the SAAO Auditorium in Observatory, Cape Town. It attracted 60 attendees from the universities, ASSA, the National Research Foundation (NRF) and the Department of Science and Technology. It was opened officially by Dr Clifford Nxomani, Deputy CEO of the NRF.



*Fig 1. Group photograph of SAAO History Symposium participants (A Slotegraaf).*

The Symposium was designed to be a precursor to the anniversary celebrations of the foundation of the Royal Observatory (now South African Astronomical Observatory) that will be 200 years old in 2020 and is the oldest extant scientific institution on the continent of Africa.

The range of subjects covered was intentionally made very wide and included the major areas of astronomical endeavour in South Africa: the visible-region, radio and gamma-ray observatories as well as the planetaria, education, outreach and cosmology. It further discussed ways of preserving the rich traditional astronomical lore of the region. This latter was encouraged through a workshop on gathering oral history. There were 19 oral presentations. Seven poster papers were displayed in the anteroom of the Auditorium.

## **Additional Events:**

Theresa de Young, librarian of SAAO, mounted an exhibition of some of the rare items from the SAAO Library. WP Koorts and IS Glass led tours of some of the old buildings

and domes on the Observatory grounds. A dinner was held for the participants at the Wild Fig restaurant nearby.

## **Proceedings**

All lectures were recorded on video and will be placed on YouTube with the presenters' Power Point slides interspersed as appropriate. The posters will be available as downloadable pdf files. The links will be found (by mid-June) at <http://history2018.sao.ac.za/videos>.

## **Acknowledgements and thanks**

We thank those who presented papers for their effort and care over their presentations, as well as those who participated as listeners, especially those who came from afar.

The Symposium was financed by the National Research Foundation and SAAO gave free use of its Auditorium as well as help from its staff. In particular, we thank the procurement and finance departments for the help they gave us, and also of course the domestic staff who took care of the preparation for the coffee and tea breaks and the cleaning up afterwards.

Noel Miller helped with preparing the Auditorium and various other issues. A Slotegraaf recorded the lectures and will place them on YouTube. Christian Hettlage acted as webmaster and kept the web site up-to-date. He also ensured that the data projection ran smoothly. Case Rijdsdijk arranged the catering contract with K-line caterers. Mrs Hettie Glass assisted at Registration. Dan Cunnema assisted with trouble-shooting during the event. Thembela Matungwa printed extra Observatory pamphlets.

The Organising Committee was composed of Dan Cunnema, Ian Glass, Christian Hettlage, Case Rijdsdijk and Petri Vaisanen.

## **ABSTRACTS**

### **ORAL PRESENTATIONS**

D Buckley (SAAO)

#### **A History of SALT**

This rather personal account of the history of the SALT project will range from the initial ideas of developing a 4-m class telescope in Namibia and its eventually realization as a 10-m telescope in South Africa. I will discuss the initial efforts to

motivate for the telescope and the attempts to raise support and find partners, eventually leading to the “green light” in 1999. The rest of talk will highlight the construction, commissioning and eventual steady-state transition of SALT into a state-of-the-art astronomical facility.

D Cunnama (SAAO)

### **Celebrating 200 years of the Cape Town Observatory**

I will outline SAAO’s plans preparing for the 200th anniversary of the establishment of the Royal Observatory in Cape Town to be celebrated in 2020, and the role the broader community will play in this event.

C de Coning (ASSA Historical Section)

### **Prominent Amateur Astronomers of the Early Society**

A brief history of how the Astronomical Society came into being with emphasis on the personalities involved, most of whom were amateur astronomers.

G Ellis (UCT)

### **Cosmology in South Africa**

Cosmology has changed over the past 50 years from a mainly theoretical subject based in general relativity studies, to a data-rich subject due to many new kinds of telescopes and observational techniques, with a corresponding change in emphasis in research. This talk will outline effects of those changes in the South African context.

B Fanaroff (SKA SA)

### **History of the SKA SA**

A survey of the history and efforts to write it up for publication

MW Feast (UCT)

### **The Radcliffe Observatory Pretoria, from Start to Finish**

The complexities involved in closing the Radcliffe Observatory, Oxford and setting up the (then) largest telescope in the southern hemisphere will be summarized.

This will be followed by an outline of the main early programmes and a selection of later projects by staff members and visitors. Finally, the reasons behind the closure of the observatory and the move of the telescope to SAAO, Sutherland will be briefly mentioned.

IS Glass (SAAO)

### **History of the Royal Observatory, Cape of Good Hope**

With the 200th anniversary of its foundation occurring in 2020 I will emphasize the significance of the ROCoGH's contributions to astronomical history and heritage.

Starting as an almost purely utilitarian naval observatory it reached its zenith under David Gill as a technically innovative research institution. By the end of the 19th century it was widely admired and emulated.

During the 20th century the Royal Observatory slowly fell behind the times with a few honourable exceptions such as its work in the field of precision photometry. The small size of its telescopes, a deteriorating sky and political problems nearly ended its existence in the 1960s. However, it found a new life in 1972 as the headquarters of the SAAO.

K Gottschalk (UWC, South African Space Association)

### **Astronomy, Space and Politics**

In South Africa, Astronomy and Space have as much linkages to politics as in other countries. These links increased dramatically after we became a democracy in 1994.

This paper starts with a historical overview, then analyses the linkages between Astronomy and the state. It also discusses the articulation between Astronomy, the other space sciences, astronautics, and politics. It concludes that these linkages ought to be nurtured.

M Hoffmann (UFS)

T Ferreira (IZIKO Museum)

### **Planetariums in South Africa**

K Kirkham (Space Advisory Company, Centre for Astronomical Heritage)

### **Engaging the general public in astronomical heritage – the bicentenary celebrations and a public exhibition**

The history of astronomy is not everybody's area of interest, and yet the public often express amazement concerning South Africa's lengthy and illustrious track record in astronomy. Fuelling interest in the history of astronomy leads to consideration of the future, particularly if engendered from the point of view of astronomical data. This presentation will put forward ideas for an exhibition focusing on the history and future of astronomical data, preparing the way for the SKA and our involvement in analysing and visualising the phenomenal data output of this massive radio telescope. The exhibition is being partly funded by the Royal Astronomical Society and will form part of the bicentenary celebrations at the SAAO in 2020.



Willie Koorts (SAAO)

### **The 1882 Transit of Venus and its relics**

Worldwide there are very few direct pieces of evidence/relics left of the 1874/1882 Transit of Venus expeditions that were dispatched all around the globe. In 1882 expeditions were sent to Wellington (American), Touws River (British), Durban (local, from the Royal Observatory) and Aberdeen Road (local, from the Royal Observatory). As far as was known, the only direct relic of a Transit of Venus expedition is two cement piers (with a beautiful hand-written inscription) in Touws River. During former research into all the sites back in early 2000, Fiona Hobson volunteered to inspect the coordinates of the Aberdeen Road site, but found nothing. In July 2014, the author had the opportunity to visit Fiona and see the site. A set of very well preserved piers as well as relics from small buildings were found some distance away. On closer investigation it was found that the use of a different coordinate system at the time can explain the offset. The piers were measured to be very closely north-south orientated and resemble the layout of the relics at Touws River quite closely, suggesting the discovery of the relics of a second Transit of Venus site in South Africa.

L Leeuw (Unisa)

J Holbrook (UWC)

### **Oral histories of individuals involved in astronomy in South Africa – progress and future plans**

We will present a progress and future plans of an project on oral histories of individuals involved in astronomy in South Africa, lead by Prof Lerothodi Leeuw, UNISA, and Prof Jarita Holbrook, UWC. The project is to conduct, archive and showcase the recording of histories of individuals involved in astronomy in South Africa, and will mark one of the first initiatives of the National Research Foundation Roadmap for the History of Astronomy in South Africa. In oral interviews of these individuals, the scientific practice, discovery and innovation of astronomy in South Africa will be recorded for analytical study and presentation in scholarly outputs and public presentations as well as archiving.

L Marchetti (UWC)

### **Hemelliggaam/The attempt to be here now**

The Hemelliggaam project aims to portray in a novel and very intimate way the historical deep connection that exists between the South African people, the Land and the Sky. This 3-year project (2017-2020) is currently supported by the NRF “Roadmap for the History of Astronomy in South Africa” and by the Italian Ministry for Foreign Affairs and International Cooperation.

Hemelliggaam is not only portraying the present of the rural communities living in key areas of SA historical/astronomical interest and of the people involved in astronomy research in South Africa, but is also recording stories and map the sites of ancient indigenous communities that lived or traveled in these areas and that first started to wonder about the Southern Sky. This collection of testimonies will produce an on-line photo/video archive and a traveling exhibition that will lead the audience along a virtual path in space and time following the development of Astronomy in South Africa.

In my talk I will describe the development of the Hemelliggaam roject and its first outcomes, including its first public exhibition currently underway in Cape Town's Company Gardens and at the Iziko South African Museum & Planetarium

C Rijdsijk (President of ASSA, SAIP)

### **Outreach and publicity – history and current**

Up to the 1990s the primary link between the public and astronomy was mainly through the planetaria in Cape Town and Johannesburg, with a sprinkling of the occasional open night at SAs Observatories. Media usually also the planetaria for information. There was a significant change in the middle 1990s when both HartRAO and the SAAO launched outreach and communication programmes. But it was the first Year of Science and Technology, YEAST, in SA that really provided the funding to initiate sustainable programmes at all major observatories with significant support from the amateur community. The identifying of an astronomer at observatories to liaise with the media also made a significant improvement in communication. The inclusion of astronomy into the school's curriculum also meant that teachers were becoming involved. With the bulk of SKA being in SA has meant that, in line with most Observatories round the world, education and communication is now an integral part of the budget of all Observatories.

A Slotegraaf (Centre for Astronomical Heritage)

### **Archival Rescue: Lessons learnt at the Royal Observatory (SAAO)**

Efforts undertaken to rescue valuable materials generated by individuals associated with the Royal Observatory, and later the SAAO, are described. The past and present condition of the Archive is sketched, solutions to problems encountered are presented, and practical advice on implementing basic archival practices is given.

M Soltynski (ASSA)

### **Gill and the RTC**

David Gill was Her Majesty's Astronomer at the Cape of Good Hope from 1879 to 1906. A brief biography and a list of his notable contributions to astronomy will be

presented. In 1879 he proposed that a reversible transit circle (RTC) be built at the observatory to accurately measure the right ascension and declination of stars, but it was 20 years before his project received approval from the Admiralty, and the RTC finally became operational in 1905. The design and construction of the RTC will be discussed, showing Gill's amazing passion for detail as he strove to reduce all possible errors of measurement to the absolute minimum, making it by far the most advanced telescope of its type for a number of decades.

K Van Der Heyden (UCT)

### **The NASSP and HCD in South Africa**

South Africa faces the exciting challenge of preparing a new generation of scientists to use the international astronomy facilities which are now available (the Southern African Large Telescope – SALT – in South Africa and the High Energy Stereoscopic System – HESS – in Namibia – the Karoo Array Telescope – MeerKAT) and in future even the Square Kilometer Array – SKA – radio telescope.

I will describe how the astronomy community has responded to the challenge and will specifically focus of the rationale and achievements of the National Astrophysics and Space Science Programme (NASSP).

D Van Jaarsveldt (Boyden Observatory)

### **One dream ignites another: A short history of the transformation of Lamont-Hussey Observatory**

In this presentation the history and fate of the Lamont-Hussey Observatory in Bloemfontein will be explored from 1928 until 2013. The work of Alfred Rossiter to establish a world record for the most double stars measured, Earl Slipher's work of finally discovering the canals on Mars (!) and the work of Karl Henize will be discussed. This is followed by a time of "astronomy drought" leading to the closure of the observatory and use of the dome as a performing arts theatre. Finally the observatory gained new life when the building was transformed into a planetarium. The history therefore reflects the evolving of a dream into the creation of new dreams.

C Venter (NWU)

### **The History of Gamma-ray Astronomy in South Africa**

South African astronomers have been privileged to contribute to the revolution that took place in high-energy astrophysics during the last several years. Local experience in cosmic-ray air-shower experiments placed them in a unique position to make pertinent contributions to this exciting new branch of astroparticle physics. I will trace the history of South African involvement in Gamma-ray Astronomy by referring to the

construction of the first local telescopes in the 1980s, our involvement in the H.E.S.S. experiment during the 1990s and 2000s until present, the formation of the SA-GAMMA Consortium, and our current and future involvement in the Cherenkov Telescope Array (CTA) Collaboration. I will also cover some fundamentals including gamma-ray production mechanisms, typical astrophysical source types, environments, complementarity of multi-wavelength observations, and outstanding questions in Gamma-ray astronomy.

## **POSTERS**

IS Glass (SAAO)

### **People of the Observatory 1820-1975**

A poster giving brief accounts of 15 interesting people associated with the Royal Observatory site, ranging from the first HM Astronomer's slave Rebecca to Sir Richard Woolley, the first Director of SAAO.

IS Glass (SAAO)

### **The Astrographic Telescope**

A poster describing the construction and many subsequent uses of the Astrographic telescope originally erected for the Royal Observatory's part in the international Carte du Ciel project.

A Slotegraaf (Centre for Astronomical Heritage)

### **The Centre for Astronomical Heritage**

I describe the recently formed Centre for Astronomical Heritage (CfAH), a non-profit company that seeks to preserve the History, Archives and Relics associated with the history of South African astronomy.

A Slotegraaf (Centre for Astronomical Heritage)

### **RO CoGH/SAAO**

This presents a recent large-scale aerial view of the Royal Observatory/SAAO site with unprecedented detail. We acknowledge City of Cape Town Information and Knowledge Management for their assistance. The map is Copyright City of Cape Town.

A Slotegraaf (Centre for Astronomical Heritage)

### **A Cartographic History of the Royal Observatory, Cape of Good Hope**

This presentation incorporates a series of maps and property diagrams showing the Royal Observatory site at different periods of its history. Many buildings have come and gone during the last 198 years.



A Slotegraaf (Centre for Astronomical Heritage)

### **A Photographic History of the Royal Observatory, Cape of Good Hope**

I show here a number of historical aerial photographs of the Royal Observatory site, including numerous buildings that have now disappeared.

K Snedegar (Utah Valley University, USA)

### **At the Threshold of Professional Astronomy: AW Roberts's Variable Star Observations**

A summary of the life and contributions of the celebrated variable star observer AW Roberts of Lovedale.

### **WORKSHOP**

J Holbrook (UWC)

L Leeuw (UNISA)

### **Oral History Project**

The South African Astronomy Oral History Project has the goal of video recording and archiving interviews with scientists. We will interview scientists at various career stages as long as they have a connection to South Africa in that they are South African, have lived and worked in South Africa, or are collaborators that have made scientific advances through South African partnerships. We aim to get a spread in ages, genders, and other social categories, not just the luminaries; in order to get a snapshot of the lived experiences of scientists as they navigate their careers. Details of their science are important, but we will include discussion of current debates and issues that are effecting astronomers today. This training is aimed at those interested in being interviewers for the project as well as those curious about being interviewed.

## **11<sup>th</sup> ASSA Symposium 2018**

*C Rijdsdijk*

The 11<sup>th</sup> ASSA Symposium was held from 9 to 11 March, 2018 in the SAAO Auditorium in Observatory, Cape Town. The aim was to discuss what the amateur community could do with current digital technology at a time when there were large scale sky surveys. To achieve this 19 astronomers, both professional and amateur, were invited to present papers. In addition there were a further 30 odd attendees, mostly ASSA members.

Prof Patricia Whitelock welcomed everyone and the Symposium was officially opened by Dr Rob Adam. MD SAAO and SKA.



*Fig 1. Group photograph of ASSA Symposium 2018 participants (A Slotegraaf).*

The topics covered a wide range and were intended to bridge the ever increasing gap between the professional and amateur, or as Dr Stella Kafka (Dir. AAVSO) said, the non-professional! It became clear during the Symposium that the amateur could in fact still make significant contributions to science; in spite of the large scale sky surveys carried out by observatories around the world. In all there were 23 oral presentations and two workshops.

### **Proceedings**

All lectures were recorded on video and will be placed on YouTube with the presenters' Power Point slides interspersed as appropriate. The links will be found (by *ca* end-April) at: <https://symposium2018.sao.ac.za/videos>

### **Additional Events**

A buffet dinner was held in the SAAO Auditorium on the first night, attended by many of those attending, and it was good to see the amount of discussion that took place; networking would be appropriate! There was a visit to the new Iziko Planetarium and Digital Full Dome. Delegates were addressed by Prof Tom Jarrett, Astrophysics Dept., UCT, who gave all an excellent presentation on the science that was now possible using this new facility. Many thanks to Theo Ferreira for organizing this event.

### **Acknowledgements and thanks**

Thanks to all those who presented papers, especially those who travelled from afar, for their effort and care over their oral presentations and workshops. Especially to the

SAAO with deep appreciation to Dr Petri Vaisanen and many members of the SAAO staff who made it all possible by so generously providing the essential resources to



make the ASSA Symposium the success that it was. In particular Ms Glenda Snowball who managed the procurement and finance department through the SAAO/NRF accounting services and Noel Miller for managing the Auditorium.

*Fig 2. Meeting old friends and making new ones; Prof Brian Warner, Dr Stella Kafka and the author during the Symposium Buffet.*

Also to the NRF for providing the bulk of the funding to run the Symposium, the OAD/RAS for generously providing funding to support Prof Katherine Blundell, enabling her to attend the ASSA Symposium and the ASSA for both financial and other support, in particular the Council members for their encouragement, advice and continued support. ASSET for support in kind and finally, the Local Organizing Committee for making sure that all those little things that get forgotten were not forgotten! Thanks to Dr Petri Vaisanen, Dr Ian Glass, Auke Slotegraaf, Dr Daniel Cunnama and Eddy Nijeboer.

## ABSTRACTS

### **Spectroscopy in the Rainbow Nation: a case study of SS433**

*Prof Katherine Blundell, Oxford*

**Abstract:** I will describe what a powerful tool in the toolkit spectroscopy is in general for investigating and exploring objects in the night sky, and in particular when used in time-lapse monitoring for objects whose dynamics change and evolve with time. This talk will be illustrated by sequences of spectra of the Galactic microquasar SS433, and a recent Galactic nova, from the Aquila spectrographs in the multi-longitude Global Jet Watch observatories.

### **Mass transfer in binaries with long term spectroscopic data**

*Dr Vanessa McBride OAD/UCT*

**Abstract:** Be X-ray binaries comprise neutron stars orbiting massive, blue stars with circumstellar discs. They show distinctive X-ray behaviour, interpreted as a marker for mass transfer from the blue star to the neutron star. However, the method of mass transfer in binaries with wide orbits and circumstellar discs is unlikely to be Roche

lobe overflow. I discuss some of the current ideas for mass transfer in these systems, and show how long term optical spectroscopy is crucial for our understanding of the mechanism of mass transfer.

### **Monitoring Redback ms Pulsars**

*Andre van Staden – ASSA – Overberg Observatory*

**Abstract:** Millisecond pulsars (MSP) are rapidly rotating neutron stars with rotational periods in the range of 1-10 milliseconds which have been spun up or "recycled" through accretion of matter from a companion star in a close binary system.

In a recent campaign of continue photometric monitoring of a Redback MSP companion, the author will present surprising results, showing stellar activity on timescales much shorter than previously thought. This strategy exposes an exciting opportunity for amateur astronomers to fill-in the gaps not viable for continues monitoring by professional astronomers and how we can collaborate to advance science

### **The AAVSO for your research in the large surveys era**

*Dr Stella Kafka – Dir. AAVSO*

**Abstract:** The contribution of citizens in research is irrefutable. Especially this century with the outburst of all-sky surveys, professional astronomers use citizen science projects to engage the public in analyzing and sorting large quantities of data leading to noteworthy discoveries. From crowdsourcing to acquiring data, citizens are leaving a notable mark in the science landscape, assisting professional astronomers with their work. Furthermore, the time domain enables a more active engagement of backyard observers in research. Citizen astronomers not only take data, but also reduce and analyze them and participate in scientific manuscripts.

For more than 100 years, the AAVSO's role is to support cutting-edge science and help our observers participate in projects that further out knowledge about some of the most dynamic phenomena in the universe. In this presentation, I will discuss the main aspects of the association and how it has evolved with time to become a premium resource for variable star researchers. I will also discuss the various means that the AAVSO is using to support cutting-edge variable star science, and how it engages its members in projects building a stronger international astronomical community

### **Observing transiting exoplanets from your backyard**

*José da Silva – ASSA Pretoria Centre*



**Abstract:** Observation of exoplanets has largely been in the realm of professional observatories using expensive equipment since their discovery in 1992. However, the availability of high quality and relatively inexpensive imaging devices has allowed amateur astronomers to not only observe, but in some cases, discover transiting exoplanets. During 2014, differential photometry was used to successfully observe five known transiting exoplanets from the Unisa Observatory utilising the 14" SCT telescope and a mainstream CCD camera. The photometric techniques and equipment used are easily within reach of the amateur astronomer with the location of the Observatory posing air and light pollution challenges analogous to those experienced by many amateurs. The application of these techniques and results obtained will be presented

### **Amateur astronomy in the evolved digital age**

*Berto Monard – ASSA - Kleinkaroo Observatory*

**Abstract:** The introduction of affordable goto telescopes and CCD cameras has allowed amateurs to make an enormous step forward and to enter the realm of professionals with the advantage of full autonomy. The new millennium brought the start of a pioneering period for such amateurs and many of their endeavours still continue today.

The advent of global surveys in the same period has threatened many of the niche fields of the amateur astronomers. The involvement of professional groupings and with it the sophistication of survey instrumentation, the use of satellites as observing platform and the quasi instant data processing have now taken over the world of discovery and marginalised the successes of the amateurs.

On the positive side, those surveys and their prompt alerts have opened fields of opportunity well suitable for amateur observers.

### **The SAAO's Asteroid Program**

*Dr Nic Erasmus – UCT/SAAO*

**Abstract:** Since the discovery in 1801 of the dwarf planet Ceres, the Minor Planet Center has reported the detection of over 700 000 Solar System objects ranging from a few meters to several kilometres in diameter. Most of these objects are asteroids in the main belt and are considered to be left-over material from a failed planet formation. Determining composition and the distribution of the composition of the asteroid population as a whole is therefore valuable information to ultimately understand the beginnings of a solar system and the formation of planets.

The SAAO has several ongoing projects involving asteroid characterisation using telescopes located in Sutherland. By taking images of asteroids with different colour filters the spectral class of the specific asteroid can be confined. Each spectral class is linked to a known composition type and hence the chemical makeup of the asteroid can be inferred by using broadband photometry. In this talk I will show our most recent results of two surveys studies of Main-belt asteroids (MBAs) and near-Earth Asteroids (NEAs). I will also present the SAAO's contribution towards a global effort to simultaneously observe an extremely close approach of NEA 2012 TC4 that occurred in October 2017.

### **Detection of Meteor Streams and Potentially Hazardous Comets using CAMS**

*Tim Cooper, ASSA Bredell Observatory*

**Abstract:** Meteors are the debris left behind during the passage of comets around the Sun. After release from their parent comet, these meteors continue to orbit the Sun in a similar orbit to the parent comet, and when the orbits of the Earth and meteor stream coincide, the result is a meteor shower. While many showers exist for which the parent is unknown, these showers are the smoking gun of comets that have previously intersected with Earth's orbit, and may do so again in future. The use of low light video to detect meteor streams and its use in the identification of potentially hazardous comets which have yet to be discovered is described. The participation in the Cameras for All-sky Meteor Surveillance (CAMS) network in conjunction with the SETI Institute, initial results and plans for local expansion are outlined.

### **Citizen science plays a central role in tracking sky-glow**

*Dr Chris Kyba, GFZ German Research Centre for Geosciences*

**Abstract:** The famous satellite images of Earth at night provide a dramatic demonstration of how light polluted much of Earth has become. These images, however, provide only limited information about sky brightness, and cannot be relied upon as cities switch to LED lighting. Ground based radiometric observations are very useful, but are so far only performed in a relatively small number of locations, and have their own limitations. This talk will present an overview of the current state of light pollution science, review the Globe at Night and "Loss of the Night app" citizen science projects, and discuss the challenges presented by white LEDs. The aim of the talk is to demonstrate that the best possible method to measure skyglow change on large scales is via naked eye observations by amateur astronomers and other citizen scientists.

## **LADUMA survey/Education**

*Dr Sarah Blyth*

No Abstract received

## **Planetary Pro-Am collaboration**

*Clyde Foster – ASSA JHB Centre*

**Abstract:** Since the early 2000's, the Planetary Science field has seen a significant increase in the contribution by amateur astronomers. Professional-Amateur (Pro-Am) collaboration in this field is now well established due to the latest advancements in high speed imaging cameras, in addition to the development of image capture and processing software. Such high resolution images are being produced by the worldwide amateur community, enabling the planets to be monitored on an almost continuous basis, and so to some extent, bridging the gap between images generated by large telescopes such as Hubble Space Telescope, Keck and the VLT. The presentation showcases a number of the more significant projects that have been, and are being, not only supported, but in some cases driven by the amateur planetary imaging community. One of the better known ones is the Junocam project which is an element of the current NASA Juno mission at Jupiter.

## **Engaging with Amateurs: towards (spectral) binocular vision**

*Prof. Katherine Blundell, Oxford*

**Abstract:** I will present a new programme being commenced at the Global Jet Watch observatories, to obtain particular types of time-variable candidates from our Galaxy, for example microquasars, that will subsequently be explored and identified by follow up spectroscopy. I will describe our approach and illustrate how enthusiastic amateurs might contribute to our endeavours.

## **Sketching using a Telescope.**

*Magda Streicher – ASSA Pretoria Centre*

**Abstract:** Sad but true; visual observing through a telescope is faltering. Sketching an object brings to the eye and mind the real impression and with luck spot just something that is been overlooked in a digital image because of the impressive look of it. Important and essential before starting a telescopic observation is the usual planning for success: detail documentation, map work, telescope and eyepiece information ext. One has to be prepared with the necessary equipment at hand to sketch, such as paper, pencils, red lights and magnifying glass. Sketching various objects needs different approaches and skills; which will be discussed in detail. Capture the object, perspective, imagination and lots of care is needed. Valuable

thoughts and tips made it an easier task. Satisfaction and pure joy is rewarded when a sketch is completed

### **Using podcasts to build bridges between professional and amateur astronomers**

*Allen Versfeld – JHB Centre*

**Abstract:** Modern online media channels, including blogs, YouTube, podcasts, and social media, are being used by a growing number of scientists to communicate their work directly with the public, both as a way to perform general outreach, and to communicate specific information about their research. This provides a unique opportunity for professional researchers to recruit amateur scientists who can make observations or help process data.

There exists a perception of scientists as unreachable elites, which can be discouraging to interested members of the public, and amateur scientists who would like to do “real science” by assisting in professional research projects. This can make it hard for scientists who hope to collaborate with amateurs to find people who are willing, able and available.

Podcasts, featuring the voices of real scientists (whether as hosts or guests) are an effective way to break down these barriers. When a listener hears the voice of a scientist in an audio recording, especially if their speech is natural and unforced, the effect is to humanise the speaker and make them relatable and more approachable. Combined with the obvious option of using the podcast to directly announce and advertise a citizen science project or potential professional-amateur collaboration, this can go a long way towards building bridges between amateur and professional researchers

### **Amateur Spectroscopy**

*Percy Jacobs – ASSA Pretoria Centre.*

**Abstract.** I will explain how amateur Astronomers can do the spectroscopic analysis of a range of astronomical objects, including stars, comets, novae, SNe, quasars and nebulae. I will describe the equipment and the software needed to process and analyse the observed spectra; giving details of the composition, temperature, Doppler Shift and distance of these objects, how their spectral lines can be identified and wavelengths calibrated, by comparing these with standard references. This enables amateur astronomers to identify objects that can then be followed up by larger, professional spectroscopes. Such amateur spectroscopy becomes particularly relevant in the preliminary confirmation of SNe for example. In addition I will give examples of the above, outline the challenges faced and the hours of practice needed to achieve the results that will lead to amateurs contributing to real science.

## **The Cosmic Web**

*Maciej Soltynski – ASSA Cape Centre*

**Abstract:** Computer simulations have suggested that the space between galaxies is not entirely empty, and this conclusion has recently been verified by observational results. Both show that surrounding and stretching between galaxies is a rarefied plasma that is organized in a galactic filamentary structure, now known as the cosmic web. It is possible that the cosmic web contains more normal matter than all the stars in the universe. The simulations and observational results will be discussed.

## **Title: Citizen Astronomy in the era of large surveys**

*Dr Stella Kafka – Dir. AAVSO*

**Abstract:** For centuries, citizen astronomers have been making important discoveries and significant contributions to science. With the outburst of all-sky surveys and the availability of appropriate software, professional astronomers depend on the public to analyze, sort and understand large quantities of existing data, or to acquire new data sets leading to noteworthy discoveries. Nowadays our philosophy, our view of the role of the public in time-domain science has changed. From crowdsourcing to data acquisition, citizens are now leaving a notable mark in the science landscape, also assisting professional astronomers with data analysis and publications. In turn, scientific projects and opportunities of active engagement are used to increase science literacy and public understanding of science. I will give a short overview on how astronomy has benefited from citizen contributions in various projects. I will also discuss how now, more than ever, citizen involvement in projects is needed to advance our knowledge and understanding of variable objects, and I will present ways citizen astronomers can significantly participate in new collaborations, complementing data acquired from facilities such as MeerKAT and SALT, for cutting-edge science

## **Digital Planetary imaging**

*Clyde Foster – ASSA JHB Centre*

**Abstract:** Advances in high speed digital camera technology, combined with the development of image capture and processing has taken current planetary imaging to previously unseen levels. Around opposition, incredibly high resolution images of the planets such as Mars, Jupiter and Saturn are being achieved from amateur backyard observatories. High frame rates are used to "freeze" atmospheric turbulence, and low noise final images are produced by aligning and stacking large numbers of frames. Amateurs are now using both specialised narrowband and broadband filters to extend their imaging beyond the visible spectrum to both UV and IR wavelengths. The

presentation gives an overview of some of the capture and processing techniques used by planetary imagers.

### **Adventures in Astrophotography**

*Johan Moolman – ASSA Pretoria Centre*

**Abstract:** In this talk different aspects of astrophotography are visited, highlighting some of the myriad of targets that can be explored by the amateur astro-photographer. Reference is made to various software programs available, as well as hardware set-ups employed. Mistakes made and lessons learned during this ongoing adventure will be shared in a “visual journey”.

### **Emission streaming from the LMC into Chameleon & Tri. Australe.**

*Doug Bullis ASSA Grahamstown*

**Abstract:** Amateurs and professionals should not be seen as separate communities; in reality, both communities can work as a team; clearly shown by activities such the Galaxy Zoo Forum, Astronomy Stack Exchange, CosmoQuest Q&A, and Astrobites. The amateur community is in fact an under-utilized asset that can provide a service to the professional community. In the process professionals can raise the general level of sophistication with which amateurs approach their activities. This paper suggests a current Pro-Am project where amateur observers in the southern hemisphere have noticed a band of emission that emanates from the underside of the LMC, passes through the centre of Mensa, and continues as far as Apus. The phenomenon that amateurs have observed is not mentioned anywhere in the professional literature; hence there is a visual phenomenon in search of physical explanation. It is a ready-made opportunity for collaboration. The project has two goals; to inspire and improve the amateur astro-imaging capacity and train interested amateurs how to research and organise archived data

### **Celebrating 200 years of the Cape Town Observatory**

*D Daniel Cunnamo – SAAO*

**Abstract:** I will discuss SAAO's plans around the 200 year anniversary of the Cape Town Observatory and how amateur astronomers will play a vital role in these events

### **Light pollution workshop**

*Dr Christopher Kyba - Helmholtz-Zentrum Potsdam, Deutsches GeoForschungsZentrum GFZ*

**Abstract:** This workshop will consist of two parts. In the first part, we will discuss tools related to understanding light pollution, for example online resources, measurement



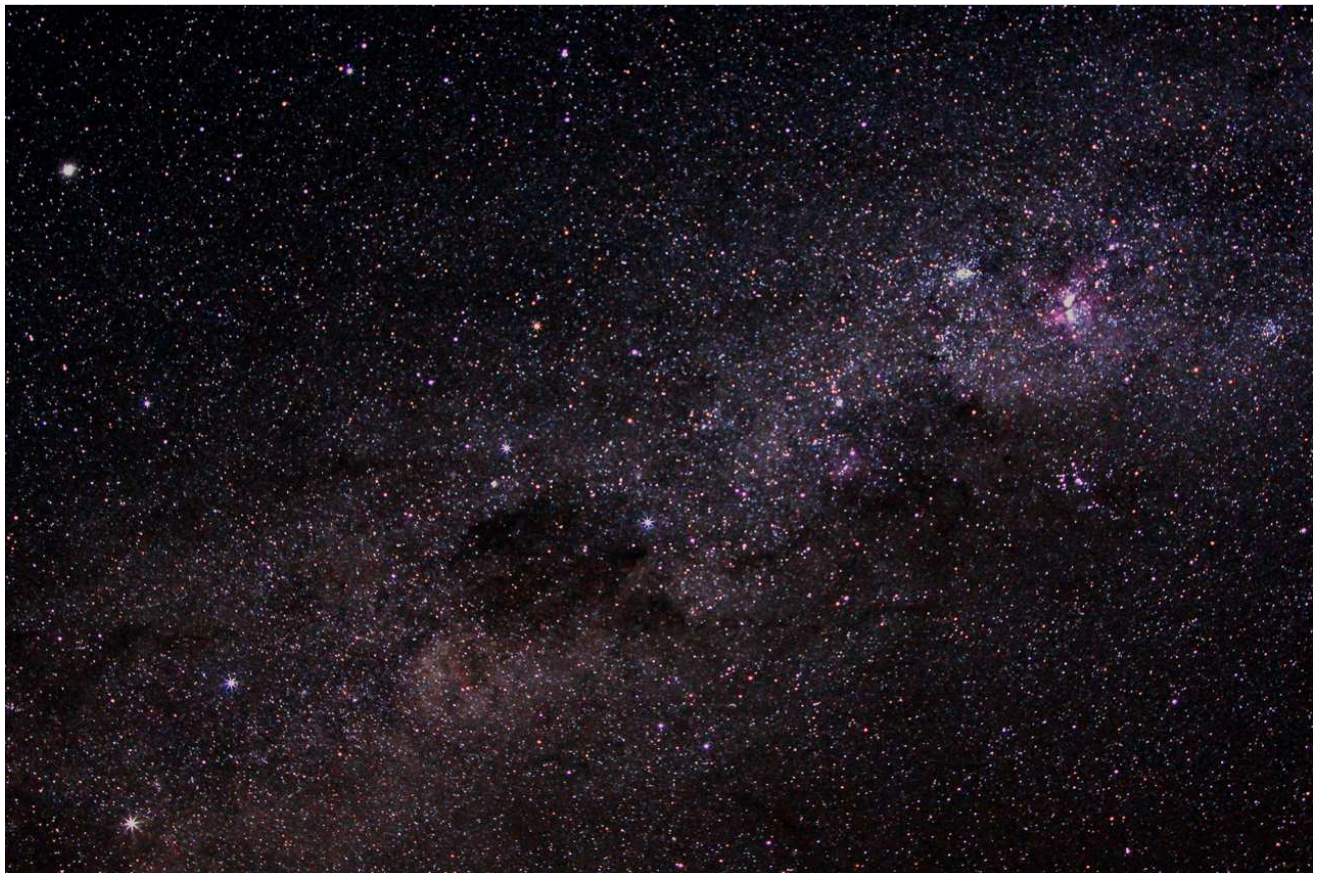
techniques, and strategies for light pollution measurement campaigns. In the second part, we will discuss strategies for minimizing the growth of light pollution. This will include how best to communicate with decision makers and the public about light pollution, possible light pollution laws, and how to establish an International Dark Sky Park or Reserve.

## Note: Star Charts

Oleg Toumilovitch has produced an annotated star chart that would be useful for observers, especially ASSA members of the Deep Sky Section. This will increase the download size a little, but I think that in this “Big Data” age MNASSA will still be considered small! Anyway, this is a trial, and feedback from readers would be very much appreciated.

The first one included covers the Crux region of the night sky.

Editor



*Fig 1. 2014-01-17 Crux region image*



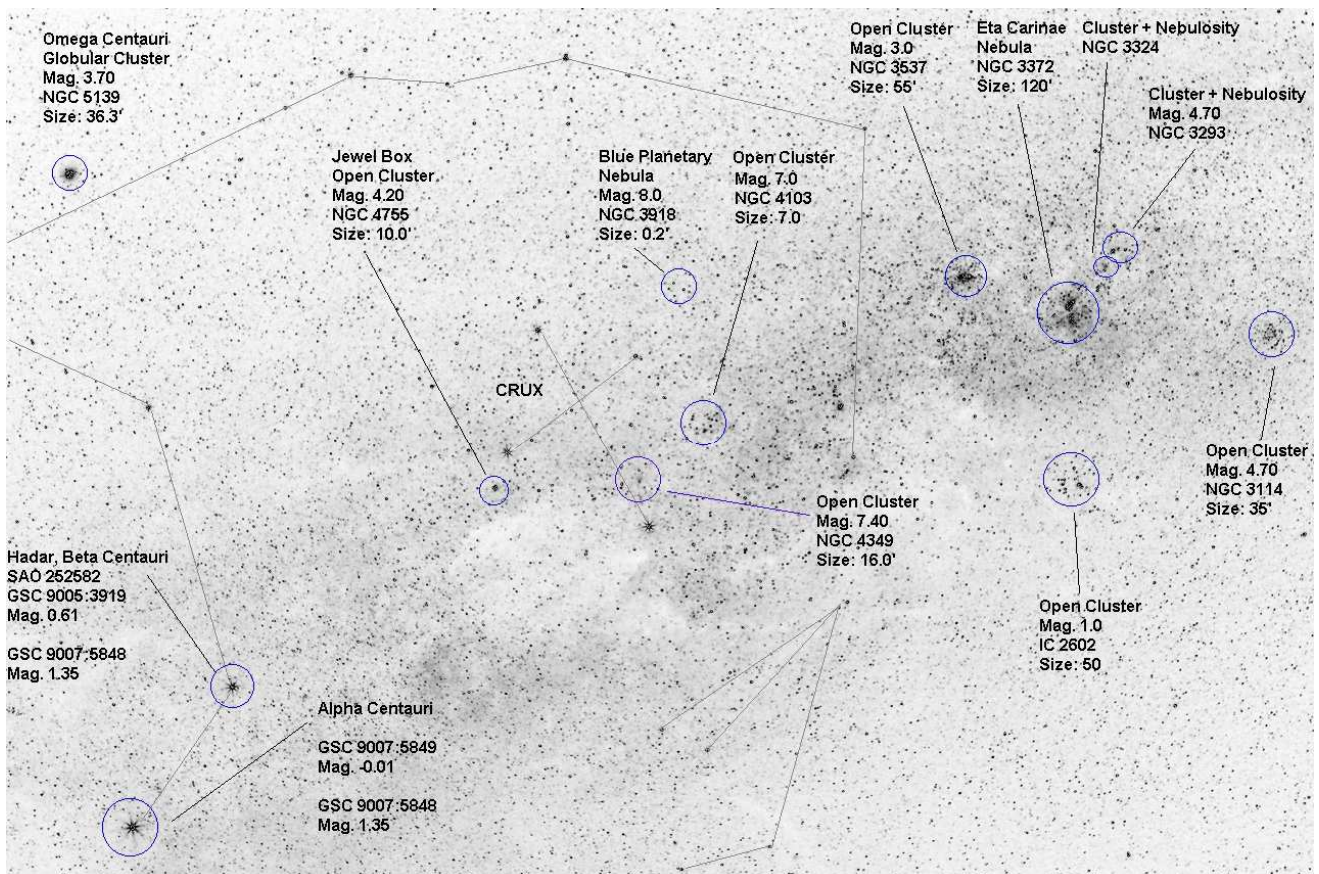


Fig 2. Crux region chart

## Recent Southern African Fireball Observations

*Tim Cooper*

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]. All times were converted to UT unless stated, and all coordinates are for epoch J2000.0.

### Event 285 – 2017 May 27 – Kaapmuiden, Mpumalanga

Observed by Bertus van der Merwe at 17h35. He provided a sketch and location which allowed me to determine the path from RA/Dec 15h30,  $-62^\circ$  to 08h26,  $-61^\circ$ . The fireball travelled horizontally from below Centaurus to Carina, was slow moving, visible for 3-4 seconds, and was seen to disintegrate before losing sight of the fireball behind trees. Colour was yellow and very bright, to the extent that Bertus was clearly

moved by the event. Left a persistent train, visible for about 3 seconds after the passage. While the fireball appeared to explode and Bertus expected to hear sounds, none were heard.

**Event 286 – 2017 June 3 – White River, Mpumalanga**

Observed by Fred Bence at 18h00. Returning home after placing bee hives on his farm, travelling south on the road from White River, the fireball passed from behind and moving in the same direction of his truck, from altitude about 50°, direction towards azimuth about 190°. The fireball was intense bright white, and disintegrated into four or five pieces.

**Event 287 – 2017 June 6 – Alkmaar, Mpumalanga**

Observed by Carney O'Reilly at 18h30, looking roughly south-east, very bright flaming ball descending at a steep angle from right to left, duration 6-8 seconds. Colours noted were red and yellow, and the fireball broke into four pieces before disappearing. No persistent train and no sounds heard.

**Event 288 – 2017 June 15 – Eastern Cape, Free State, KwaZulu Natal, Gauteng, Mpumalanga**

Fifty independent reports were received of a very bright bolide at 04h03. Duration 8-10 seconds, with brightness probably in the range  $m_v$  -12 to -15. The path was from south of Dordrecht in the Eastern Cape, crossing Fouriesburg in the Free State, and burned out in the north eastern Free State somewhere near Frankfort or Cornelia. Sounds were heard over the area of the Northern Drakensberg. The event was widely seen from Gauteng as it burned out towards the south east. A report from Dullstroom indicates it burned out to the south of that location. A full report and analysis was given in MNASSA Vol 76 No. 9 & 10, October 2017, pp 218-231.

**Event 289 – 2017 June 18 – Danielskuil/Kuruman, Northern Cape**

Observed by Etienne van der Bank at 17h00 travelling northwards from Danielskuil to Kuruman on the R31. The fireball came from behind and overtook his vehicle, and was visible for about 4 seconds, heading NW, bright green colour, and he said 'like a pencil flare that soldiers carry in their pocket for emergencies. We first saw the area light up and then it came into view in the windscreen'.

**Event 290 – 2017 June 18 – Makhado, Limpopo**

Observed by Kos Coronaios at 17h45, during the course of the Soutpansberg Astronomy Club's stargazing evening. Magnitude about -4, moving from 20° south (to the right) of Saturn and just below the planet, brightness increased as it descended almost directly downwards, and disappeared 5° above the horizon. Duration 1 second, fast moving, yellowish-white in colour with no train.

### **Event 291 – 2017 July 1 – Cape St Francis, Eastern Cape**

Observed by Sarah-Leigh Rose at about 19h45 while walking on the beach at Rebelsrus Nature Reserve, near Cape St Francis, Eastern Cape. 'There was a half moon and there was a moon-bow around the moon that night. Extremely bright and rather large ball [Sarah said brightness and size were similar to the moon] burning with a beautiful iridescent blue and green light with a tail behind it, and then burnt up into a trail of red-orange light'. Duration was about 5 seconds, and no sound was heard. From Sarah's description of the path I determined the start and end points approximately as RA = 19h30, Dec =  $-40^\circ$  to RA = 19h50, Dec =  $00^\circ$ , that is from below Corona Australis moving northwards towards the bright star Altair.

### **Event 292 – 2017 July 23 – Durban, KwaZulu Natal**

Observed by Praveena Ramnandan at about 19h20. While sitting on her veranda, saw a large bright meteor, duration about 5 seconds. The head showed white, yellow and red colours, with a distinct green train. The meteor suddenly disappeared. No sounds heard. From a description of the path I determined the start and end points approximately as RA = 19h30, Dec. =  $-31^\circ$  to RA = 21h15, Dec. =  $-49^\circ$ .

### **Event 293 – 2017 August 22 – near Krugersdorp, Sunninghill, and Albertyn**

Observed by Jan Breytenbach at 17h00, footage was secured from a dashcam, while driving on the N14 freeway towards Krugersdorp, about the 1km sign for off-ramp 287 to M5 Zwartkop/Randburg. The vehicle was travelling in azimuth  $248^\circ$ , and the appearance time of the meteor from above is 18h59m56s, disappearance time of the meteor is 18h59m59s, giving a duration of 3 seconds for the time the meteor was visible in the footage. Angle of descent was  $6^\circ$  to the vertical. I recreated the field of view at this time and superimposed the probable path to give start and end coordinates as RA = 13h48, Dec. =  $-29^\circ$  to RA = 12h02, Dec. =  $-21^\circ$ . Angular path was  $25.6^\circ$  giving an angular velocity of  $8.5^\circ/\text{sec}$ . The fireball descended to the left of Jupiter, which was the brightest object visible at the time,  $m_v -1.3$ . Jan said that the fireball was brighter than the full moon (not visible at the time).

Cindy Booysen also observed the fireball from Sunninghill, with yellow in front followed by a blue tail. Duration was 5-6 seconds after which it disappeared. No sounds were heard.

Sidney Gilroy observed the fireball traveling on Dr. Bellairs Drive, Albertyn, having just crossed the intersection of Michelle Avenue and Hennie Alberts Rd. Travelling in the direction of azimuth  $250^\circ$ , Sidney saw the fireball to his right and moving towards his left descending at an angle of about  $25^\circ$  to the horizon. Duration was 1-2 seconds, and colours were bright yellow and white, the brightness about three times as bright as the moon. Before disappearing it split into four pieces. No sounds were heard.

### Event 294 – 2017 September 2 – Cape Town, Western Cape

Observed by Alfonso Smuts and Patricia Wainwright at 17h15, while travelling on the N2 freeway towards Cape Town centre, in direction of azimuth  $310^\circ$ . The fireball travelled from the right downwards at an angle of about  $20^\circ$  to the left where they lost sight of it behind the city skyline, starting in Corona Borealis, passing below Arcturus and ending in Virgo. Jupiter was visible to the upper left of the end point. From the description of the path I derived the start and end points as RA = 15h00, Dec. =  $+39^\circ$  to RA = 12h50, Dec. =  $+22^\circ$ . Patricia commented that 'she had never seen a sighting like that before. This was an impressive display and not likely to be forgotten'.

### Event 295 – 2017 September 5 – Noordhoek, Western Cape

Observed by Coenrad Morgan from Seascape Road, Noordhoek at about 20h40-20h45. Very bright when compared to moon, which was full at the time at altitude  $67^\circ$  towards the NE. Slow moving fireball, duration 8-10 seconds (he said "Oh Wow" several times as he described it to someone on the phone at the time). Colours seen were white, yellow and orange with a long and wide tail, which he said was a striking feature. Coenrad was facing due west according to the compass on his mobile phone, and the fireball moved high from the direction of Slangkop/Kommetjie [which I determine to be in azimuth  $\sim 240^\circ$ ] towards the direction of Houtbay [azimuth  $\sim 340^\circ$ ]. The fireball disintegrated into four smaller pieces at about azimuth  $270^\circ$  and continued to move high above Chapman's Peak. At the end of its path it broke up further, at which point Coenrad lost sight of it.

### Event 296 – 2017 September 9 – Kenilworth and De Kelders, Western Cape

Observed by Gordon Richardson at 18h22. An amateur astronomer, he estimated  $m_v = -6$  to  $-8$ , duration 2-3 seconds, start and end points RA = 15h10, Dec. =  $+12^\circ$  to RA = 14h30, Dec. =  $+08^\circ$ .



Figure 7  
Event 296 – 2017 September 9

Definite green colour, appeared to explode at end of its path, but no persistent train. He said it was the brightest meteor he had seen in over 50 years of observing.

Figure 1 Event 296 –  
2017 September 9 –  
De Kelders, Western  
Cape



Observed by Jonathan Shock who said 'I was photographing the night sky on Saturday evening from De Kelders, looking in the direction of Hermanus, and captured a fireball. It lasted for another couple of seconds after the shutter closed (it was the last few seconds of a 30 second exposure). His image is shown as in Figure 1, from which I derive the start and end points as RA = 15h42, Dec. = +26° to RA = 14h50, Dec. = +26°.

#### **Event 297 – 2017 October 12 – Somerset West, Western Cape**

Observed by Sam Lovatt shortly before midnight, 'sitting outside my house I saw a bright orange ball with an orange tail suddenly appear which then looked like pieces flew off of it. It seemed as if it exploded and then disappeared'. Duration 3-5 seconds. No further details could be obtained.

#### **Event 298 – 2017 November 5 – Vereeniging and Centurion, Gauteng**

Observed by Kevin Meiring at 19h30, travelling on the R59 passing Vereeniging in direction azimuth 50°. The fireball was seen high in front and slightly to the right at azimuth/altitude about 60°, 80°, and ended at about 105°, 45°. Duration was approximately 5 seconds, and the colour changed from bright yellow to green/blue. It disintegrated into several pieces about 3 seconds before burning out.

Observed by Julia Van Wezel from Die Hoewes, Centurion at 19h30, facing east, it was headed in a southerly direction. She said despite the full moon which was low in the east, the meteor was 'highly visible, fluorescent with an orange/ reddish tail'. Duration about 7 seconds, and no sounds were heard.

#### **Event 299 – 2017 December 3 – Flamingo Vlei, Western Cape**

Observed by Anton Jacobs at 20h10 while sitting outside looking towards Table Mountain, duration perhaps 8-10 seconds, descended almost vertically in azimuth 196°, veering slightly towards the left, from altitude about 45° and burning out a few degrees above the horizon which it appeared it might impact. From Anton's description I derive the start and end points approximately as RA, Dec 23h10, -74° to 15h30, -60°, from below right of the Small Magellanic Cloud to close to alpha Centauri which was close to the horizon. Though the moon was full, altitude 25° in the north east, the fireball was bright enough to light up the whole area, and neighbours said it lit up their bedroom. Head was bright white surrounded by red and green, with a long tail. No sounds heard.

#### **Acknowledgements**

Thanks to Kos Coronaios and Dr Daniel Cunnamo for forwarding various reports from the public. The screenshots used to show the paths were generated with Stellarium (<http://www.stellarium.org/>)



## Obituary - Malcolm Andre Le Fraper Gray

Andrew Gray (30-4-1928 – 22-2-2018) was born in Edinburgh where he attended Gordenstoun School and at the age of 14 joined the Merchant Navy. There he learnt to navigate with a sextant, as was the norm in those days; one could say his love of astronomy and the stars started then began.

He later joined the Union Castle Line, and as expected, travelled widely and eventually settled in Durban where he started his career as a salesman for Remington Type-writers after which he joined Bankcorp International, an Insurance company, and rose to become the Head Assessor for the company due to his unsurpassed knowledge of combustible materials.



He met his wife Ann in Durban and married in 1954, remaining married for 57 years. He had two children, Julian and Anita, two grandsons, Seam and Liam and one great grandson, Cole.

His love of astronomy started when he was at school, and as mentioned, this was reinforced doing navigation in the merchant marine where he learnt a lot more! He joined various astronomy clubs and eventually the Durban Centre. Here he researched and wrote a book on the History of Astronomy in Natal and often presented talks at local schools and other clubs. He was President of the ASSA from 1980 to 1981 and made an Honorary Member of in 2000. He really delighted in showing people the night sky with the telescope he built himself. On retirement, he joined the Cape Centre. He was also a trustee of ASSA Endowment Trust, ASSET, a trust set up to create a support fund for the ASSA.

Andrew was ordained a lay Minister in the Anglican Cathedral in Durban in 1954 and served the church with distinction for the rest of his life; giving guidance and support to his family and many others.

Whilst living in Johannesburg, he became a Freemason (in the early 1950s) and with his usual energy and passion served his Lodge; presenting them with a well-researched and written history marking the 100<sup>th</sup> Anniversary of the Goldfields Lodge.

On retiring to Cape Town he became involved in raising substantial funds for the Masonic Education programme.

After the death of his wife, Andrew moved to Little Brak to live near his daughter, Anita. Here, with the help of Anita, he founded BRAC, the Brak River Astronomy Club, in 2014. This rapidly grew into a successful club and now forms a part of his legacy to astronomy.

Andrew led a full and active life and will be sorely missed by his family, friends and colleagues.

*Anita and Liam Hechter.*

## Colloquia

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-ph papers, seminal/classic publications, education/outreach ideas and initiatives, preliminary results, student progress reports, conference/workshop feedback and skills-transfer.

## SAAO

### **Title: Global trends in outdoor light and light pollution**

Speaker: Dr Chris Kyba (German Research Centre for Geosciences, Potsdam)

Date: 12 March

Time: 11h00 – 12h00

Venue: SAAO Auditorium

### **Abstract**

Outdoor artificial light is a global environmental change that threatens many of the world's nocturnal animals. Artificial light affects the behaviour and physiology of diurnal animals (including humans) and even affects urban plants. Outdoor light is undergoing a dramatic change at the moment, as LEDs will replace vapor lamps worldwide during the next decade. This talk will provide a brief overview of these topics and discuss two analyses in detail: first, the spatial distribution of artificial

skyglow worldwide, and second, how Earth's lights changed during the period 2012-2016.

**Title: Beyond the Borders of the Known Solar System: The New Horizons Mission to Ultima Thule**

Speaker: Anne Verbiscer Asst. Project Scientist, NASA New Horizons Mission to Pluto and the Kuiper Belt, University of Virginia

Date: 22 March

Time: 11h00 – 12h00

Venue: SAAO Auditorium

**Abstract:** NASA's New Horizons spacecraft is currently exploring the Kuiper Belt in an extended mission, the centerpiece of which is the close flyby of the cold classical Kuiper Belt Object (KBO) Ultima Thule (486958), 2014 MU69, on 1 January 2019 UT. Ultima Thule's orbital parameters (low eccentricity ( $e = 0.0471$ ), low inclination ( $i = 2.45$  deg) and semi-major axis 44.46 AU) place it within the cold classical Kuiper Belt where objects likely formed in place and escaped perturbation by giant planet migration. Ultima Thule is therefore one of the most distant remnants of the original protoplanetary disk. New Horizons' encounter with Ultima Thule will be the first (and only, for the foreseeable future) close look at a cold classical KBO, and the most distant (at a heliocentric distance of 43.2 AU) close encounter with any object in history. The nominal close approach distance for the flyby trajectory is 3,500 km,  $\sim 3$  times closer than the 2015 flyby of Pluto by New Horizons. I will summarize our current knowledge of Ultima Thule, the scientific objectives of the flyby, as well as the other Kuiper Belt science New Horizons is performing in its extended mission until 2021 when the spacecraft reaches 50 AU.

**Title: Stellar GPS: Navigating the Solar System**

Speaker: Mr Christopher Jacobs

Date: 26 March

Time: 11h00 – 12h00

Venue: SAAO Auditorium

**Abstract:** How does one navigate to a planet such as Mars? Will GPS work?

Since ancient times sailors have navigated by following a path guided by markers with known locations: bottom sounding, landmarks such as mountain peaks, and of course stars overhead in the sky. In modern times the GPS satellites in the sky are providing the needed markers. However, when our spacecraft travel to the planets they go beyond the reach of GPS signals. What then can the navigator do?

Needing markers which are very, very stable in position and very far away, the modern navigator chooses beacons powered by supermassive black holes: quasars! Yet even super-powerful quasar signals are very diluted by the time they travel

billions of light years to Earth. So we need large antennas (~30-meters) and super-cooled electronics (-270 deg C) and averaging over billions of bits of data in order to detect the quasar signals—and even that is not enough. Next we need to link antennas from around the world into a super-antenna we call an “interferometer.” Only then, with these super-antennas and their lever arms the size of the Earth, can we pinpoint the location of the spacecraft to within about the 100 meters accuracy needed to initiate the landing sequence from the top of the Martian atmosphere. The last part of the trip is the most exciting. First, a parachute slows the lander down enough to fly on auto-pilot (because round trip light time is ~10 minutes) using radar to guide us almost to the ground. Lastly, in the case of MSL, the Curiosity Rover is lowered from a sky crane”. Mission accomplished!

**Title: X-ray and Near-Infrared Study of the Galactic Ridge X-ray Emission**

Speaker: Kumiko Morihana (Nagoya University)

Date: 29 March

Time: 11h00 – 12h00

Venue: SAAO Auditorium

**Abstract:** Apparently diffuse X-ray emission has been known to exist along the Galactic Plane (GP), which is referred to as the Galactic Ridge X-ray emission (GRXE). Recent deep X-ray observations have shown that numerous X-ray point sources account for a large fraction of the GRXE. However, the nature of these sources is poorly understood due to a lack of X-ray photon statistics. In order to know the nature of them, we focus on Near-infrared (NIR), which has a similar penetrating power with X-ray into the deep interstellar extinction toward the GP. We carried out Near-Infrared imaging and spectroscopic observations using IRSF/SIRIUS and Subaru/MOIRCS for two GP fields that were studied with deep X-ray observations: (l, b)=(0.1°, -1.4°) and (l,b)=(28.5°, 0.0°). As the results, there are three groups of sources constituting the GRXE using X-ray hardness and NIR spectral features: (1) those having hard X-ray spectra and NIR spectra with emission line such as H I, He II, H II, (2) hard X-ray spectra with NIR spectra with absorption lines such as Na I, Ca I, and CO bandheads, and (3) soft X-ray spectra with NIR spectra with absorption lines same as (2). From these features, we consider that the group (1) sources are Cataclysmic Variables and (3) sources are Galactic single or binary late-type stars. On the other hand, (2) sources are unexpected type of sources before. In this talk, I present the nature of these three type of sources constituting the GRXE.

## UWC

### **Title: Particle dark matter searches in the anisotropic sky**

Speaker: Marco Regis (University of Turin)

Date: 6 April

Time: 11h00 – 12h00

Venue: Rm 1.35 New Physics Building, UWC

**Abstract:** The backbone of the network of structures we see in the Universe is constituted by dark matter [DM]. Yet, the fundamental nature of DM remains unknown. If DM is a particle then it is expected to induce an indirect electromagnetic radiation in astrophysical structures. This radiation traces the cosmic network, forming a "non-gravitational cosmic web". In this talk, I will review how to detect this pattern in the sky by means of statistical correlations at different frequencies, including the radio band.

## Astro-Coffee

### **Title:**

Speakers: Catherine Cress, Sean February, Matthew Cawood & Israel

Tshililo

Date: 29 June

Time: 13h00 – 14h00

Venue: 2nd floor auditorium SKA office, Pinelands

## NASSP

### **Title: Travel through Space and discover the mysteries of Sprites: First recordings of these dazzling lights in South Africa**

Speaker: Professor Michael Kosch from SANSA.

Date: 12 April

Time: 10h00-11h00

Venue: Astronomy Seminar Room, 5th Floor RW James Bld

## AIMS

### **Title: Using CWL and containerization for scalable data reduction pipelines**

Speaker: Gijs Molenaar

Date: 7 March

Time: 11h00

Venue: KAT-7 boardroom, Floor 3 SKA building

**Abstract:** For the last couple of months, I have been working closely together with ASTRON and SURFsara on a series of prototype data reduction pipelines for the

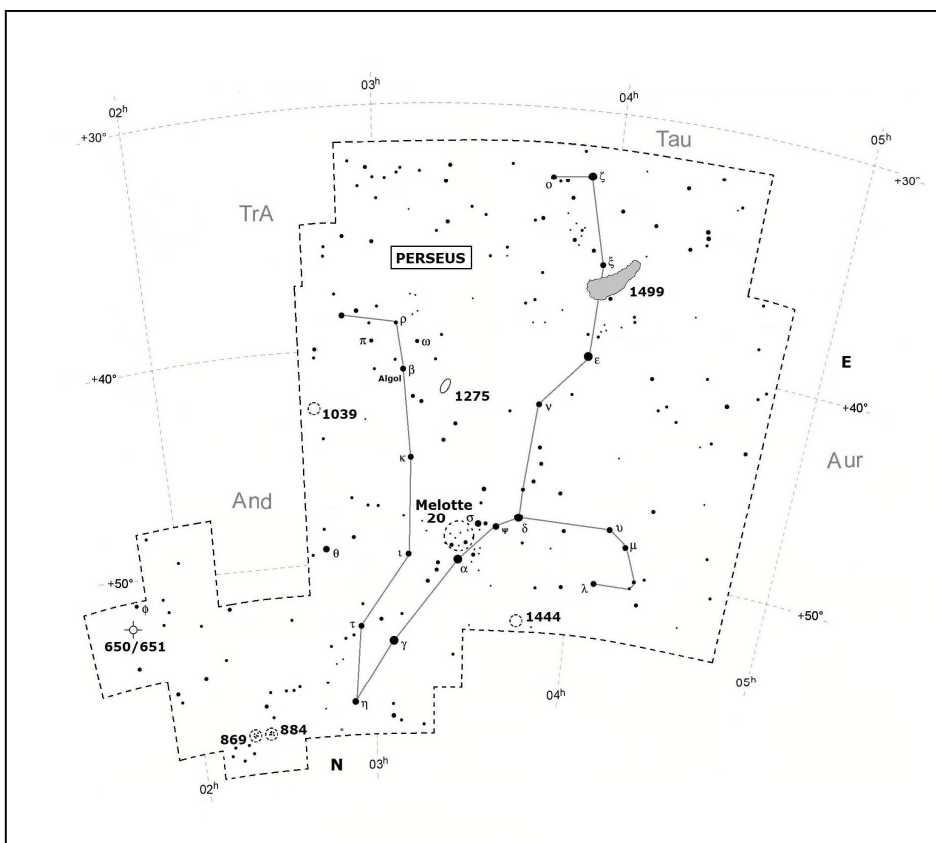
LOFAR science demonstration as part of the EOSC pilot (European Open Science Cloud for Research Pilot Project). Our goal was to make existing radio astronomy research software and hardware available to a broader audience. We successfully achieved these project goals and moreover, we found that these prototype pipelines are useful as a guide for the creation of pipelines used by radio astronomers.

In this talk, I will describe how we have used CWL and containerization to deploy 3 astronomical pipelines on various platforms, from Macbook to supercomputer.

## Sky Delights: Perseus the Young Man

*Magda Streicher*

His name is Perseus and in ancient times was known as a champion for various reasons. One of the images of him is that of a young man wearing a piece of cloth around his body, perhaps showing off and wanting to impress the Pleiades women towards the south. Perseus is one of the largest constellations between Andromeda and Auriga with Taurus towards the south. This stellar young man has quite a variety of open clusters to offer, with a very intriguing star in among them. Although the constellation is very low on the northern horizon it is not easy for southern observers to observe deep-sky objects within its boundaries.



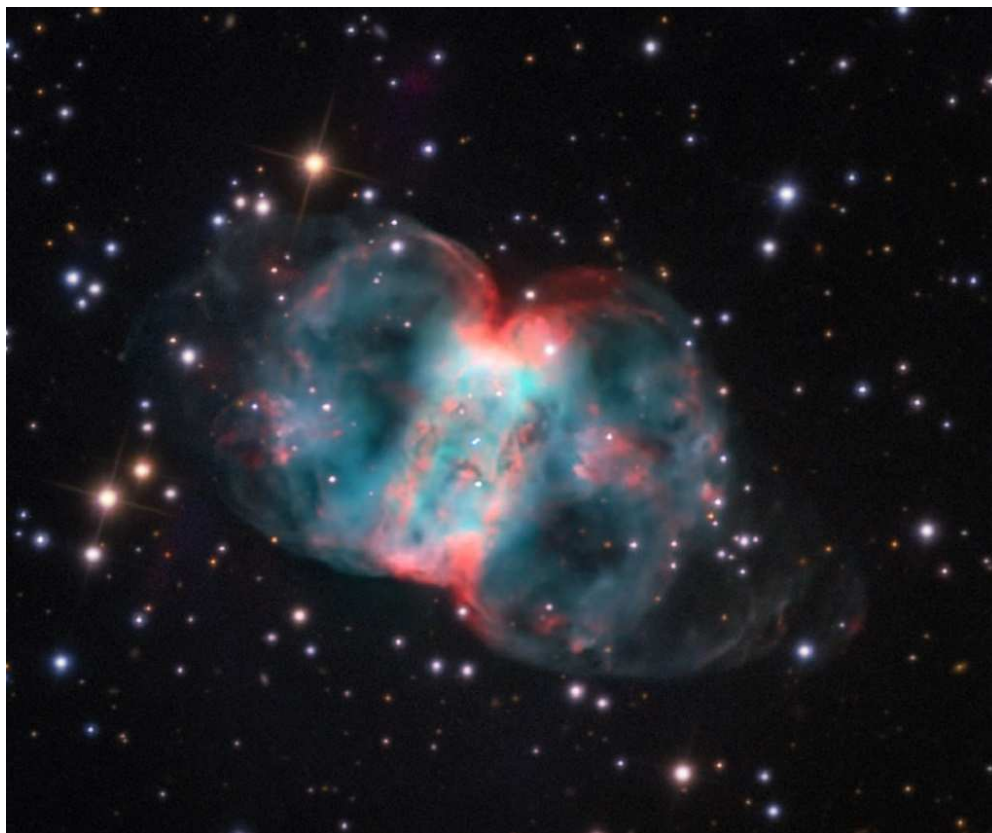
*Fig 1. The Constellation Perseus.*

The double cluster **NGC 869** and **NGC 884** are possibly among the most outstanding and discussed objects to have found their place in the constellation. Against a dark night sky, the open star clusters can be seen with the naked eye as two hazy objects situated cosily close together, just half a



degree apart. NGC 869, the western twin, is much denser than the companion cluster NGC 884. Through an amateur telescope NGC 869 is outstanding and compact with stars seen dominating the centre part. The western part of NGC 869 contains bundles of faint stars which extend the cluster, making it slightly larger as NGC 884. These are two very young clusters with NGC 884 slightly further away than NGC 869. The companion cluster NGC 884 is slightly fainter, not so dense, although also bright and outstanding and slightly more spread out than NGC 869. The eastern side of NGC 884 is very busy, with fainter stars than the sparse western side, with a broken middle core in two parts. NGC 884, has in its midst a few colourful stars on display which include the yellow RS Persei. Studying the groupings through an amateur telescope offers concentrations of fainter stars, dark lanes and elegant star strings that merge with stars in the field of view. According to the largest study ever made of the pair they really are twins and part of the Perseus OB1 association of young supergiant stars, about 7 300 light years away, formed from the same interstellar cloud of gas.

The planetary nebula **NGC 650/651** situated close to the Andromeda border is better known as Messier 76 or by its more popular names Little Dumbbell and (although less familiar) Barbell, according to Kepple and Scanner. They are so called because they remind one strongly of Messier 27 in the constellation Vulpecula with a very strong similar appearance. The planetary was catalogued with two numbers because of the



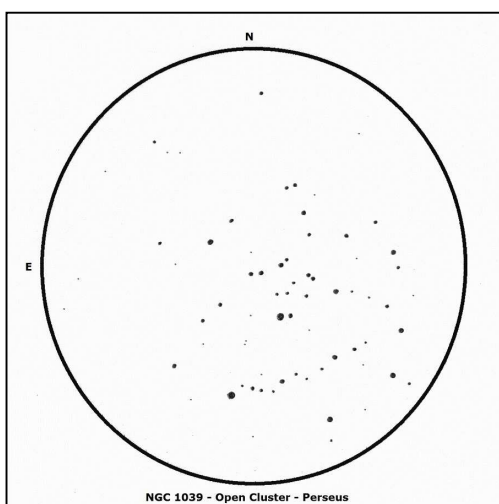
two separate lobes, which show excellent detail through higher power in a medium-sized amateur telescope. The elongated boxy nebula is seen without difficulty with the south-western lobe slightly brighter.

*Fig 2. Messier 76 (Adam Block).*

**NGC 1444** is a small, compact, open cluster consisting of only a handful of stars surrounding the multiple star Struve 446. The focus of this group is obviously the bright deep yellow triple star which contrasts with the group of fainter stars.

A beautiful area to explore is the cluster **Melotte 20**, which emphasises Alpha Persei, an F-Type supergiant star, and its surroundings in an excellent way. Several stars of this large cluster spread out around and mostly south-east of Alpha Persei. It is a nice target for binoculars, which will show fainter stars in loops and curls that fill the space between the brighter ones. This large cluster is bound together by gravity, similar in age and at a distance of about 600 light years from us. A nice asterism of various magnitude stars immediately south of Alpha Persei displays the shape of a grocery cart – using one’s imagination! – it’s easy to spot.

Virtually on the border with Andromeda is a typical open cluster, **NGC 1039**, which can be found situated in a triangle with Beta and Kappa Persei. With approximately 60 stars in its midst it is bright and outstanding against the background starfield. The cluster is not very compact, and seen as a whole it appears slightly square with faint stars forming circles and lines that flow into various patterns. The cluster centre is dominated by a few double stars, one of which is a deep yellow. It is about 1 500 light years distant and 200 million years old. Messier discovered the cluster in August 1764. Interesting to know is that the object NGC 1233 were the first catalogued as unknown objects, now known as a galaxy, situate only 23’ east of Omega Persei.



*Fig 3. NGC 1029, an open cluster in Perseus.*

Think of an eclipsing binary star and beta Persei, also known as Algol, immediately comes to mind as perhaps the most controversial star known to us. Its name, Demon Star, is wholly appropriate. It is a three-star system, consisting of Beta Persei Aa1, Aa2, and Ab - in which the large and bright primary Beta Persei is regularly eclipsed by the dimmer Beta Persei Aa2. It regularly dips to magnitude 3.4 every 2.86 days during the roughly 10-hour-long partial eclipses. There is also a secondary eclipse (the second minimum) when the brighter star occults the fainter unseen secondary, only detected photoelectrically. The star’s altering brightness can be observed in the course of one night, hence the name Demon Star.

The strongest source of an extragalactic galaxy is **NGC 1275**, perhaps better known as Perseus A, situated 2° east of Alpha Persei. The galaxy is the brightest and largest member of the Perseus I Galaxy Cluster situated towards the middle area of the

galaxy cluster. It is an erupted massive active Seyfert-type galaxy with a faint circular halo and the brightest radio source in the sky.

**NGC 1499** is probably the most famous of all Emission Nebula – at least in the northern hemisphere – not because it is bright, but rather for its shape, which resembles that of the state of California. The nebula is nearly 3° long, and difficult to detect through a telescope, but is beautiful seen through the eye of Hubble. The nebula is larger towards the western side with a more defined northern edge. The best option is to make use of filters which can bring out some of the brighter streaks inside this emission nebula.

The dark night sky filled with its starry splendour is a telescope-equipped amateur observer's best friend, even if all you see is just a hazy spot or a double cluster with your naked eye. The enthusiasm and effort alone bring timeless rewards and satisfaction.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 650 NGC 651	Planetary Nebula	01h42m.4	+51°34'.0	10.2	65"
NGC 869	Open Cluster	02h19m.0	+57°09'.0	5.3	29'
NGC 884	Open Cluster	02h22m.4	+57°07'.0	6.1	27'
NGC 1039	Open Cluster	02h42m.0	+42°47'.0	5.2	35'
NGC 1275	Galaxy	03h19m.8	+41°31'.3	11.8	3.2'x2.3'
Melotte 20	Open Cluster	03h22m.6	+48°36'.8	3	184'
NGC 1444	Open Cluster	03h49m.4	+52°40'.0	6.6	4'
NGC 1499	Bright Nebula	04h00m.7	+36°37'.0	6.6	158'x40'

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](http://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, Harare, Hermanus, Johannesburg, 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.

**Internet contact details:** email: [assa@saao.ac.za](mailto:assa@saao.ac.za) Home Page: <http://assa.saao.ac.za>

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# **mnassa**

monthly notes of the astronomical society of southern africa

**Volume 77 Nos 3 & 4**

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