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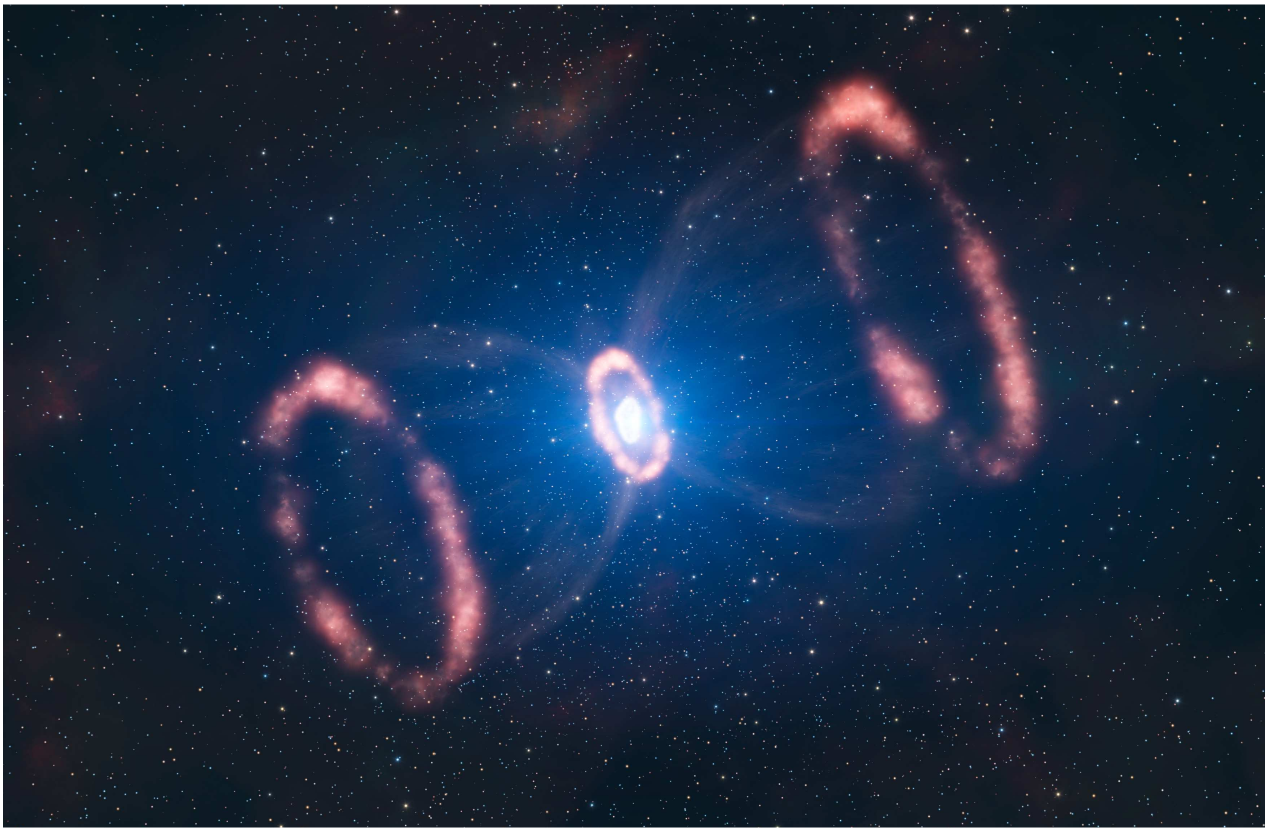

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News Note:

Fanaroff to be succeeded by Adam at SKA South Africa

Dr Bernie Fanaroff will retire at the end of 2015 as Director of the Square Kilometre Array (South Africa). However, he will remain as a “Strategic Advisor” to the project during 2016 and 2017.

Fanaroff studied physics as an undergraduate at Wits University and took his PhD in radio astronomy at Cambridge University. While a student, with Julia Riley, he was involved in setting out a widely accepted way of describing radio galaxies, known today as the “Fanaroff-Riley” classes.

On his return to South Africa around 1974, Fanaroff’s interests turned towards politics He became an organizer for the National Union of Metalworkers of South Africa, eventually becoming their National Secretary. Following the coming of the new regime in 1994, he entered government service. Since then, he has been Deputy Director-General in the office of former President Nelson Mandela, head of the office for the Reconstruction and Development Programme, deputy Director-General of the Department of Safety and Security and Chairperson of the Integrated Justice System Board and the Steering Committee for Border Control.

More recently, he returned to radio astronomy and became Project Director for South Africa’s Square Kilometre Array (SKA) bid and the construction of the Karoo Array Telescope.

His place will be taken by Rob Adam, who is currently a group executive in charge of the nuclear energy portfolio at Aveng Group. He will be director designate for the SKA South Africa Project from 1 April to 31 December next year, and then will become director for a period of five years.

Adam was previously the director-general in the Department of Science and Technology (DST) from 1999 to 2006. In this position he was heavily involved with the SALT telescope project. “Dr Adam is not new to the SKA South Africa Project; he spearheaded it in its early days when he was at the Department of Science and Technology, and is currently the Chair of the South African SKA Steering Committee,” according to Dr Naledi Pandor, Minister of Science and Technology.

Dr Bernie Fanaroff awarded Honorary Doctorate from UCT

Dr Bernie Fanaroff's achievements range from his work as a radio astronomer to contributions to the country's liberation through the trade union movement, and latterly, to South Africa's winning bid to host the Square Kilometre Array (SKA) radio telescope. His studies of extragalactic radio sources were pioneering and the Fanaroff-Riley classification of radio sources, developed with Julia Riley while at Cambridge, is still used today.

(Above) Dr Bernie Fanaroff with UCT group.

During the turbulent 70s and 80s Fanaroff devoted 18 years to establishing and building the trade union movement, specifically the Metal & Allied Workers' Union, later the National Union of Metalworkers, one of the largest and most influential unions in the country. After a nine-year stint with the Reconstruction and Development Programme he returned to radio astronomy as part of the nascent SKA project. His acumen as a leader and his expertise in radio astronomy were crucial to South Africa's winning the bid. The SKA promises to bring massive infrastructure development, create a significant legacy of skills, and attract young researchers in Africa to enter careers in science and technology.

Citation – Prof A Lewis

The Northern Cape is the largest and most sparsely populated province in South Africa. Besides some sheep farming, not much goes on. The arid desert stretches on and on. In the distance, a flat topped *butte.* Every few years, a rainstorm. And then, suddenly, in May 2012, the tiny dorp of Carnarvon became the coolest spot in the cosmos. After more than a decade of work by the South African Square Kilometre Array Team, Carnarvon got to be the site of the world’s biggest ever science project. Bernie Fanaroff had made the big big skies and the dryness and the emptiness and nothingness worth something.

If you want to look into the cosmos, there are only three things you can do from the ground: optical, gamma ray and radio wave astronomy. We already had optical and gamma ray telescopes, so the only missing element was radio. Astronomers had already done a back-of-the-envelope calculation and worked out that, in order to be sufficiently sensitive, the collecting area of the telescope would have to be a square kilometre. Hence the SKA - Square Kilometre Array.

When the idea for the South African SKA bid was first conceived, the Department of Science and Technology needed somebody to direct the project: somebody who was trusted; who had creditability and was respected by government, and somebody who could hold his own with scientists. *And of course,* that person was Bernie Fanaroff [1].

Bernie Fanaroff is more than the SKA – as big as that is – he has spent many years honing his skills and developing his talents.

His shrewd negotiating and strategizing skills were honed in the South African trade union movement in the 1970s, when he worked full time for MAWU and then NUMSA. He devoted 18 years to this work, and was totally consumed by it [2]. He lived in a simple flat in Hillbrow, in an almost derelict building[3], working, working, working. Many people thought that he was a lawyer, with his ability to "cut a deal" and his sophisticated strategizing.

His patience and stubbornness were honed in government, where he was Deputy Director General in the Office of the President, Head of the RDP Office and Advisor to the Minister of Safety and Security.

So, as the director of the SKA project, his job description was somebody who could convince; farmers to have thousands of dishes all over their farms, the Northern Cape premier that it was ok to have no cell phone signal in the province for 50 years, the Minister of Finance that he wouldn't be responsible for funding it, and of course somebody who could convince South Africans that we could do something that looked absolutely impossible… host the world's biggest ever science project.

It was only occasionally, in passing, that he might mention something about the stars and then it would emerge that not only did he have a PhD from Cavendish in Cambridge, but that the Fanaroff-Riley radio source classification is named after him. And not only that, but that his paper about the classification (*The morphology of extra galactic radio sources*) which was published 40 years ago (in 1974) has 2103 citations [4], and is still being cited today.

Back in Carnarvon, on the vast beige plateau [5], the real tribute to Bernie Fanaroff, is the soundless site that will eventually be the focus of the SKA – listening, listening, listening to the stars.

1. Adam, R., *Personal Communication,* 6 May 2014
2. Fanaroff, B,L., *Personal Communication,* 12 May 2014
3. Fiske, I., *Personal Communication,* 12 May 2014
4. Google Scholar Citation analysis, 2014.
5. Amato, C. “Starstruck in Carnarvon” Times Live. Retrieved from http://www.ska.ac

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News Note – SN 1987A

An enormous amount of work has recently been done on the core remnants of SN1987A, but no appealing images have emerged. This 2010 artist’s impression of the material around the recently exploded star is based on observations which have for the first time revealed a three dimensional view of the distribution of the expelled material. They were made using the ESO VLT. The original blast was not only powerful but was more concentrated in one particular direction. This is a strong indication that the supernova must have been very turbulent, supporting the most recent computer models. The image on the front cover shows various components of SN 1987A: two outer rings, one inner ring and the deformed innermost expelled material. The way the star exploded is imprinted on this inner material.

For further details, see: http://www.eso.org/public/news/eso1032/

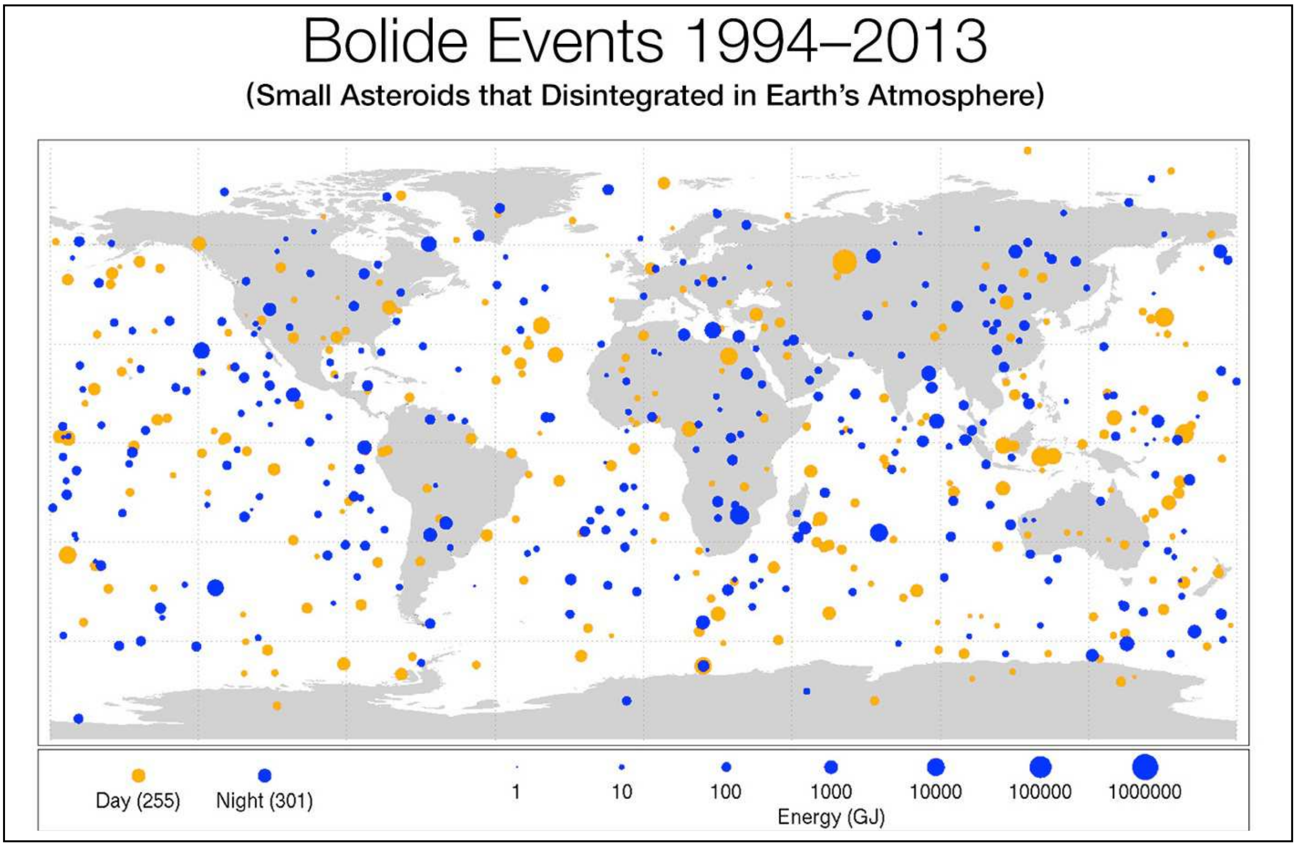
ASSA Neo Watch

This article was compiled by the editor using material collected from JPL, Dr Amanda Gulbis, Tim Cooper, Auke Slotegraaf and others.

The NASA Grand Challenge.

A map recently released by NASA's Near Earth Object (NEO) Program reveals that small asteroids frequently enter and disintegrate in the Earth's atmosphere with random distribution around the globe. Released to the scientific community, the map visualizes data gathered by U.S. government sensors from 1994 to 2013. The data indicate that Earth's atmosphere was impacted by small asteroids, resulting in a bolide (or fireball), on 556 separate occasions in a 20-year period. Almost all asteroids of this size disintegrate in the atmosphere and are usually harmless. The notable exception was the Chelyabinsk event which was the largest asteroid to hit Earth in this period. The new data could help scientists better refine estimates of the distribution of the sizes of NEOs including larger ones that could pose a danger to Earth.

NASA has embarked on the Asteroid Grand Challenge, a program to “find all asteroid threats to human populations and know what to do about them.” The Asteroid Grand Challenge involves detecting all near Earth objects (NEOs) larger than 100 metres, characterise them and determine a way to mitigate them. But while dedicated search programmmes do a great job of finding these objects, follow up observations are required to characterise them and more precisely define their orbits. This pastime is well suited to dedicated amateur astronomers.

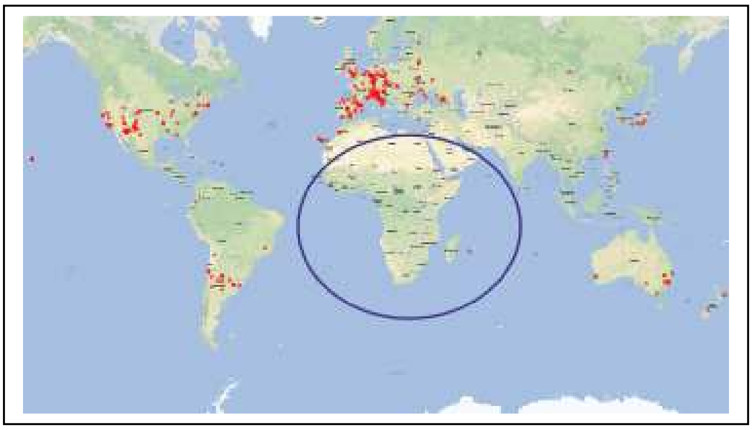


This diagram maps the data gathered from 1994-2013 on small asteroids impacting Earth's atmosphere to create very bright meteors, technically called "bolides" and commonly referred to as "fireballs". Sizes of red dots (daytime impacts) and blue dots (nighttime impacts) are proportional to the optical radiated energy of impacts measured in billions of Joules (GJ) of energy, and show the location of impacts from objects about 1 meter (to almost 20 meters in size.

Finding and characterizing hazardous asteroids to protect our home planet is a high priority for NASA. It is one of the reasons NASA has increased by a factor of 10 investments in asteroid detection, characterization and mitigation activities over the last five years. In addition, NASA has aggressively developed strategies and plans with its partners in the U.S. and abroad to detect, track and characterize NEOs. These activities also will help identify NEOs that might pose a risk of Earth impact, and further help inform developing options for planetary defence.

The Gap in Observational Coverage

The public can help participate in the hunt for potentially hazardous Near Earth Objects through the Asteroid Grand Challenge, which aims to create a plan to find all asteroid threats to human populations and know what to do about them. There are hundreds of NEOs that need observation. While there is excellent coverage in the northern hemisphere, coverage from the southern hemisphere is less, and from South Africa is non-existent! A gap exists in these time dependent observations, where South Africa enjoys a unique position on the globe, and ASSA amateurs are well positioned to make a significant contribution to this program.



To try and address this gap, two virtual workshops were held. The first NASA-SAAO asteroid workshop was held on 10-11 March 2014. The primary physical gathering was at the SAAO in Cape Town, with other participants connecting via internet. It was arranged to encourage African projects in detecting, tracking, and characterizing asteroids. Specifically, the lack of active regular asteroid observations from the African continent creates a gap in the observing coverage around the world. The USA's Asteroid Grand Challenge provides motivation for a global effort to find and study asteroids. The discussions at this workshop were mainly focussed on optical observations. The following is a list of the presentations (affiliations for the participants are listed below):

- NEO program overview (Lindley Johnson)
- Data collection and storage (Tim Spahr)
- NEA surveys (Eric Christensen)
- Astrometric Techniques (Dave Tholen)
- Followup astrometry & characterization (Eileen Ryan)
- Light- and phase-curves (Carl Hergenrother)

- Light curve data processing (Brain Warner)
- SSERVI as a platform for collaborations (Greg Schmidt)
- series of African presentations: optical observations, telescopes located & under development throughout Africa, KAT-7, OAD (Amanda Gulbis, Claude Carignan, Solomon Tessema, Lindsay Magnus, JC Mauduit)

Participants, alphabetical order, in the first workshop spanned a range of professions and international locations:

- Jim Adams (NASA)
- Michael Backes (University of Namibia)
- Claude Carignan (UCT/Burkina Faso)
- Eric Christensen (Catalina Sky Survey)Jose Luis Galache (MPC, Smithsonian Astro. Obs.)
- David Gilbank (SAAO) Keith Gottschalk (UWC/SA Space Association)
- Kevin Govender (IAU OAD)
- Amanda Gulbis (SAAO)
- Julia Healy (UCT)
- Carl Hergenrother (Univ. Arizona)
- Jasper Horrell (SKA)
- Mike Inggs (UCT; contributed presentation) Lindley Johnson (NASA)
- Tony Jones (Astronomical Society of SA)
- Zacharie Kam Sié (UCT/Univ. of Ouagadougou)
- Lindsay Magnus (SKA/KAT7)
- JC Mauduit (IAU OAD)
- Peter Martinez (SAAO)
- Wanda L. Diaz Merced (OAD visiting astronomer)
- Takalani Nemaungani (DST)
- Patrice Okouma (UCT/SAAO/UWC/NOMMO Astronomy Gabon)
- Eileen Ryan (Magdalena Ridge Obs.)
- Tim Spahr, (MPC, Smithsonian Astro. Obs.) Dave Tholen, (Univ. of Hawaii) Brian Warner (Center for Solar System Studies)
- Carla Sharpe (SKA)

- Prospery Simpemba (Copperbelt University, Zambia)
- Blaise Tapsoba (UCT) Solomon Tessema (Entoto Observatory, Ethiopia)
- Henry Throop (Univ. of Pretoria/PSI)

This was followed up with a second, shorter, but similar workshop, held on 27 October, 2014 which outlined how ASSA could contribute to the NEO watch programme and what observational requirements were needed.

What Observations are Required?

Most of the NEOs detected by search programs are never observed again! Follow up observations are required in the following disciplines:

- Astrometry - precise positional measurements as early as possible after detection, in order to refine the orbit of the object and prevent it being lost.
- Photometry - determining rotational light-curves (typically 4-12 hour periods) when near periapse. From this can be derived some idea of the size and shape, spin rate, pole orientation, and duplicity or the presence of satellite objects.
- Spectroscopy - measurement of reflection spectra to assist in determining composition, type and family membership, generally referred to as taxonomy.

What Equipment is needed?

The minimum requirements are slightly different for each of the three disciplines, but you can decide on where you can best contribute based on your own setup available. You will need at least the following setup available:

	Aperture	CCD	Software	Timing
Astrometry	14-16''	Yes	Capable of astrometric measurement with reference to UCAC-3 catalogue	Yes, accuracy to 1s in UTC synchronised to a primary reference
Photometry	12-16''	Yes	Capable of aperture photometric measurement of NEO and reference stars for differential photometry	Accuracy to 0.1 minutes sufficient for 0.1% on an rotation period of 3 hours
Spectroscopy	20''	Yes	Capable of converting the CCD output to a reflectance spectrum over the entire spectral range of the diffraction device	Not required, but UT time of observation must be recorded along with the observing location

Astrometry - regular follow up is required of objects in the region of Vmag 20-21. Pixel scale of the CCD should be half of FWHM. So if best seeing is 2" the pixel scale should be 1"/pixel. Good guiding accuracy will improve reliability in measurements. Since objects will be fast moving, exposures should preferably be as short as possible to avoid capturing motion, hence favouring larger aperture telescopes. The Minor Planet Centre requires timing accurate to 0.00001 day, Right Ascension to 0s.01, the Declination to 0".1, and derived magnitudes to 0.1 mag.

Photometry - Useful work can also be done with smaller apertures on objects in the region of Vmag 16-18. Good guiding accuracy is required, especially for longer exposures on fainter objects as a S/N ratio of at least 20 is necessary. Periods with an accuracy of within about 1% can be generated in a single night's photometry, and to within about 0.1% if photometry on the same object is conducted over several nights.

Spectroscopy - Useful work is only really possible with large apertures. About 4 magnitudes will be lost in the optical system, and spectroscopy can only be conducted on brighter objects unless the aperture is large. Good guiding accuracy is required to enable long exposures for fainter objects and to ensure acceptable S/N ratio.

Summary - All the foregoing require a telescope with aperture at least 12" but ideally 14-16", motorised mount, preferably polar aligned, CCD camera, suitable software for the chosen discipline, availability of UCAC-3 catalogue and an accurate time source.

If you are interested in participating in this initiative and contributing to the ASSA NEO-Watch or for further information or guidance, please contact us!

E-mail to Tim Cooper: tpcoope@mweb.co.za
Website: http://assa.saao.ac.za/neo-watch
Mailing list: https://groups.yahoo.com/neo/groups/assa-neo-watch/info

Obituary – Mary Fitzgerald

Goodbye Mary – a personal memory

Magda Streicher

In astronomy it is more or less the norm to be motivated and inspired by someone else who is familiar with the field and, most of all, creates within you a love for the starry skies.

Such a person was Mary FitzGerald. She was such an example to me. Every step I took in my attempt to observe as a youngster – how to observe, how to make valuable astronomical notes – was a learning experience with her as my mentor. Together with other astronomy friends, like Tim Cooper, Dave Gordon and Bruce Dickson, we spent time under the stars, drinking in the beauty of starry deep-sky objects, describing them to their full capacity to try and capture their glory in pictures, sketches and words.

(left) The author with Mary Fitzgerald.

Mary was the first to make a positive comment when "Deep-sky Delights" first saw the light. And then, always afterwards, she would motivate and praise, and most of all she was so proud of others' achievements.

Mary was a lecturer at the University of the Witwatersrand Planetarium in Johannesburg for more years than I can remember. She was well educated, and extremely well versed in her discipline.

Sharing a few of her thoughts in her own words, quoted below, would probably best help reflect the way she thought about, and adored, our beautiful night skies:

“The stars virtually blazed down, the Large Magellanic Cloud appeared as if it was just an ordinary cloud in the dark moonless sky. The soft Milky Way on the eastern horizon is the time of year which I adore our place in our home spiral galaxy. Why, because Crux shows the kink to the west indicating the arm which cuddles our neighbours and home Star.

”NGC 3581 located in Carina is an obvious large divided fan-shaped nebula, with a dark band running from south-east to north-west. Two stars appears as two human eyes to the south of the nebula staring down to our humans on earth, resembling a mask which could be used at a masked ball.

”NGC 3199, also in Carina, consist of a half-moon of stars that show the way to this large faint diffused nebula. Embedded into a multitude of stars, small pairs and even triplets involved. In the dark region east of the nebula there appears to be an island of very faint stars.

“Besides the pot full of sugar – named Omega Centauri, the globular cluster NGC 5927 is situated 45’ north of h4772 in the constellation Lupus. It appears as a large ball of cotton wool, with faint stars visible across its surface. Displays a relatively bright and dense centre with a soft outer envelope to please the eyes of a woman getting older by the day.”

(Left) Milky Way spiral arm: Picture credit - Dieter Willasch

She describes her stay with us further: “Dinner time came around, and we enjoyed a lovely crispy barbeque chicken in the Weber-braai with baked potatoes and real traditional African “Doek-pudding” with cream. Facing the telescopes again, we took a deep-sky tour from one galaxy to another. In the wee hours of the morning, with a cup of coffee in hand, at times until the rays of the morning Sun started brightening the sky once again. The starry night skies are indeed a wonderful reality, snuggling in the mystery Universe with its splendid deep-sky objects.”

Mary FitzGerald passed away in the late afternoon of 29 June 2014, and her ashes were scattered in the sea at Hermanus.

Observing the occultation of HIP 65106 by the asteroid Patientia

Allen Versfeld

Stellar occultations are popular events for amateur astronomers who want to make real scientific contributions. They have traditionally been observed by travelling to a location where an occultation will be visible and timing the moments when the star vanishes and reappears. This is usually done by means of a speaking clock service, or some other audible time signal, and a tape recorder. Shortly before the occultation begins, the observer turns on the time signal, and begins recording it with the tape recorder. The observer speaks into the microphone when the star blinks out, and then speaks again when it reappears. This captures an accurate record of the times when the asteroid (or other body) passed in front of the star, and the duration of the occultation.

These observations are very useful for confirming and refining the orbits of small Solar System bodies, and for rough measurements of the diameter of the asteroid. But if the precision of the measurements is increased, it becomes possible to see the shape of the asteroid and possibly even detect large surface features. Unfortunately, the method described above cannot achieve a precision of better than about one second, because of the limited time resolution of speaking clock services and the normal reaction time of human observers.

Members of the International Occultation Timing Association (IOTA), have been using video cameras to collect measurements of asteroid occultations to get a much higher precision. The camera is fitted to a telescope, and its output fed to a video recorder. The output from a GPS time receiver is also fed into the video recorder, and overlaid onto the

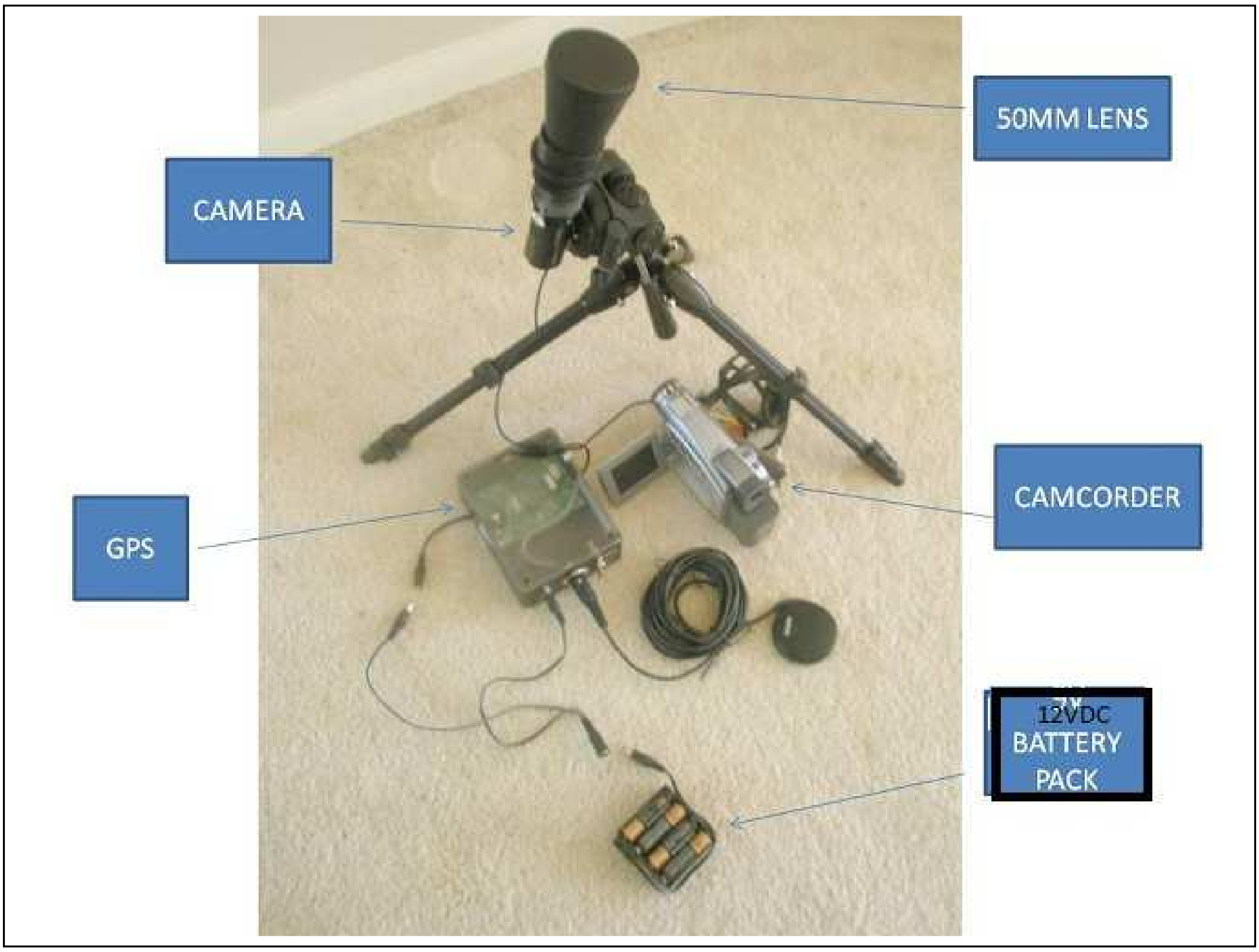


Fig.1. Typical equipment for recording an occultation.

video signal. Although GPS receivers can achieve time signals with a precision measured in microseconds, the video system only records at 30 frames per second, so that the final data has a resolution of about 33 milliseconds – significantly better than the traditional audio recording method.

Paul Maley, from Houston, Texas, and a member of IOTA, had identified that on 20 July, 2014 there would be an occultation of the 11th magnitude star HIP 65106 in Virgo by the asteroid 451, Patientia. It is a minor planet of the asteroid belt with a diameter of 225 km, making it one of the larger

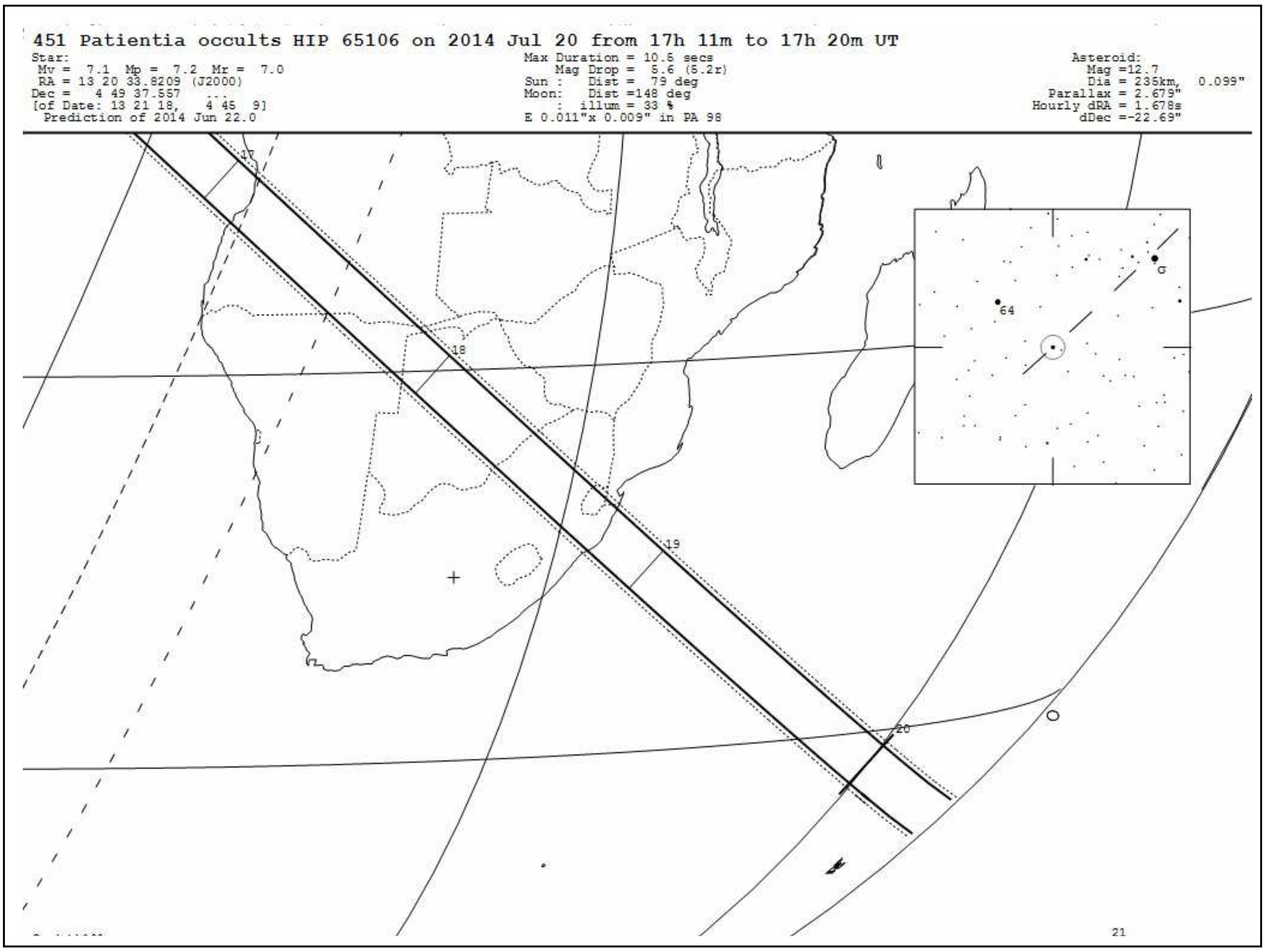


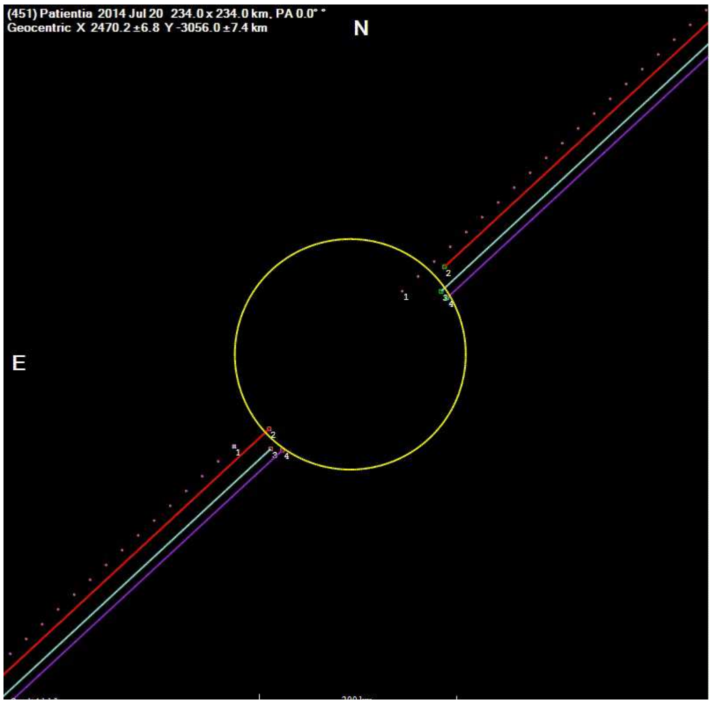
Fig 2. Asteroid Patientia's track across southern Africa.

asteroids in the belt and would therefore have a fairly wide "shadow" track across the Earth. He also knew that the occultation path would pass through South Africa.

So in March 2014 he put out a call to find volunteers to assist with his observations in South Africa. He had chosen a guest lodge outside Culinan, east of Pretoria as his base of operations, as it was comfortably within the shadow of the occultation. The group photo shows those who took part in the observation of the occultation.

Fig 3. From left to right, it's Johan Theron, Lynn and Paul Maley, Bosman Olivier, the author Allen Versfeld, Jose da Silva, Pierre Coetzee and Herman Bloemhof

Fig 4. (below) Occultation data.



On 20 July 2014, Paul Maley of the International recorded a set of video observations of the star HIP 65106 as it was occulted by asteroid Patientia. The observations were recorded with the assistance of from three different sites in Cullinan.

The data collected is shown in Fig. 4, where the broken line, labelled 1, is the predicted centre line of the occultation. The remaining tracks are the observed values. Track 2 was observed by J Theron and L Palmer, Track 3 was observed by Jose da Silva and Track 4 was observed by Bosman Olivier and the author. Paul Maley , extracted the data and the recordings from all three of the sites and coordinated all observations, although he was only present at one of the sites.

Fig 5 (right) Bosman Olivier and the author at Site 1.

Amateur Optical Tracking in South Africa during 1957 – 2014 – Part 5

Greg Roberts

Abstract: This article covers the activities of the MOONWATCH team in Johannesburg that was situated in the grounds of the then Union Observatory (later the Republic Observatory) and operated from 1957 till the end of the IGY (International Geographical Year) in 1958.

Introduction

There is no doubt that the Union Observatory played a major role in the first year of the Space Age. The Union Astronomer, W. S. Finsen threw body and soul into the activity and for the year that MOONWATCH operated at the Observatory it occupied his time and that of the majority of his professional staff full time, ably assisted by several amateur astronomers.

Johannesburg MOONWATCH is reasonably well documented so the interested reader should consult the following documents for a more detailed story:

1. Jan Hers' outstanding account of "MOONWATCH in South Africa 1957-1958" appeared in *MNASSA* Vol 72 Nos5 & 6 and gives the early background.
2. "IGY Reminiscences" by W.S. Finsen (*MNASSA* Vol 72 Nos 5 & 6).
3. "Recollections of William S. Finsen" (*MNASSA* 2005 Vol 64 Nos 3 & 4).
4. P.E. Spargo wrote an account of his experiences as part of Johannesburg MOONWATCH in "Johannesburg Moonwatch Recalled" (*MNASSA* Vol 72 Nos 1 & 2)
5. "Living amongst the stars at the Johannesburg Observatory" by Dirk J Vermeulen - a history of the Johannesburg Observatory. Dirk kindly gave me permission to use the relevant material from his very readable and interesting book.

So rather than rehash these important historical reports in detail, only a summary of the more important events will be noted.

Johannesburg MOONWATCH

This came into existence on 2 April 1957 with Dr Charles N. Williams (by profession a dentist) as team leader and Joe Churms (Union Observatory) as deputy team leader. By May 1957 the team had 16 observers, comprised of staff members and members of the Astronomical Society of Southern Africa. Two sets of optical components for the standard 2-inch aperture MOONWATCH telescope were ordered by airmail. They were received on the 21 May 1957, enabling them to be assembled. However the other sets ordered appeared to have been delayed and sent by sea mail. This team, together with the Pretoria team under Roy Smith, and a team in Hawaii were the first registered teams outside the USA. This was followed later by the team in Cape Town and Bloemfontein after they had also recruited teams.

The South African National Committee for the IGY undertook to supply local teams with suitable viewing instruments and the components were ordered from the United States but by mid-1957 nothing had materialised. No one was very concerned as the first satellite launch was not expected before 1958.

In a report by the National Co-ordinator, Dr David S. Evans, dated 15 September 1957, wrote as follows (regarding Johannesburg):

Leader: Dr C. N. Williams
Deputy: Mr J. H. Botham – replacing Joe Churms who was moving to the Royal Observatory, Cape
Sponsors: Union Observatory
Location: Old Franklin-Adams telescope building in the grounds of the Union Observatory. This building has a sliding roof and the instruments may be kept on fixed mountings, and protected against bad weather.
Geographical Co-ordinates: the coordinates of the Union Observatory are longitude 1h52m18.0s East, latitude 26 deg 10' 55".5 S, height 1806 metres (= 5925 feet).
Timing: Timing will be based on the Union Observatory one-second pips. A tape recorder will probably be used to report the pips continually, and each observer will be provided with a button to sound a buzzer.
Position Fixing: A mast and charts will NOT be used. Telescopes will be fitted with graticles, and preset in position.
Number of observers recruited: 38
Number of telescopes planned: 21
General: The project is being financed, except for the provision of most of the optics, by the Group themselves. Six sets of optics additional to those being provided by the C.S.I.R are being privately purchased. The team has been registered with the Visual Coordination Centre (MOONWATCH) at Cambridge, Mass. Copies of the Skalnate Pleso charts have been received. One prototype MOONWATCH telescope has been completed and it is understood that the mechanical construction of the

remainder is practically complete. Training has been seriously hampered by the failure of the optical equipment to arrive.

Without much fanfare, although they made no secret of the fact that they planned to do so (which was ignored by the west), Russia launched Sputnik 1 on 4 October 1957. This put everyone in the west in a flat spin. None of the western tracking stations - amateur or professional, were ready so there was a big scramble to use what was available. Johannesburg MOONWATCH was no exception. Despite the fact that the standard MOONWATCH 2-inch aperture telescopes only arrived from the USA on 7 October 1957, they were soon assembled. Using binoculars, they were soon tracking the satellite, eventually observing the rocket casing on 32 occasions and the satellite itself on possibly two occasions. In addition, 9 photographs were secured of the rocket casing by Finsen and one by Churms.

Fig 1. Image of Sputnik 1 casing.

This image appeared in *Living Amongst the Stars* but with little information.

By submitting a scan of this image to http://nova.astrometry.net/user_image/5606#annotated the field was identified. Using the orbital elements of Sputnik 1 rocket at the time, it was possible to determine that the photograph was taken on the 1 November 1957. The satellite was travelling from left to right after just exiting out of Earth's shadow at 03h25m33sec SAST. The regular breaks in the satellite trail were caused by a ~1 rpm hand-operated shutter. The longest "trail" being a minute marker and using 9 x 12 cm Royal-X pan sheet negatives. The brightest star is Alpha Columba and the two bright stars upper left corner are Gamma and Beta Leporus. The picture ends at

03h26m04s SAST. This photograph proved valuable as few images were secured on this satellite. It helped refine the orbit of the rocket casing for this period of time.

Fortunately the satellite itself transmitted a radio signal. This enabled the National Institute for Telecommunications Research, NITR, outside Pretoria to track the satellite and generate a fairly reliable orbit. This was very valuable as the information released by the Russians on the satellite was very sketchy.

Dr Finsen threw himself into the task and developed several models – which he referred to as a "*three dimensional slide rules*" to assist in predicting where the satellite was. He did a remarkable job with the limited information available.

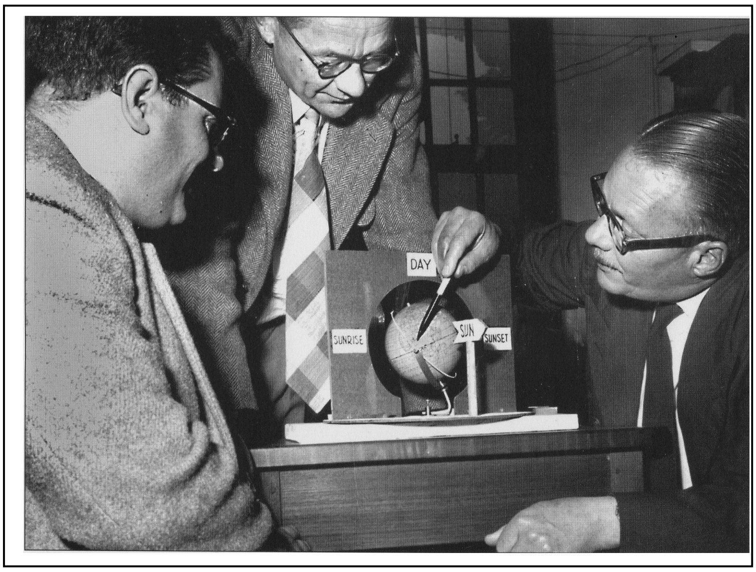


Fig 2. L-R Joe Churms, JA Bruwer and W Finsen with 3-D model made by Finsen.

He provided predictions to the press and SABC as to where and when the satellite (or rather more correctly, its carrier rocket) could be seen in the sky. The satellite itself was believed to be too small and faint to be seen with the naked eye. However, there were several reports of members of the public seeing, what appears to have been the satellite itself. The author was one of probably several thousand people in South Africa able to see the carrier rocket as a result of Finsen's accurate predictions.

The fiasco has already been commented on earlier, when it was decided in December 1957 to supply the larger 5-inch APOGEE tracking telescope to only Cape Town and Bloemfontein MOONWATCH. It was virtually impossible to see the first American satellite (EXPLORER 1, launched on 1 February 1958) using the small MOONWATCH telescopes which were originally supplied. This was due to their smaller size and the satellite's higher altitude than that originally planned for the first American launches. It is not surprising that Cape Town MOONWATCH, with its larger telescopes, was able to secure the first South African observations of EXPLORER 1.

After an unsuccessful attempt to observe Explorer 1 on 9 February 1958, it was realised that the satellite must have passed through the field of view of several of the small 2-inch aperture telescopes without being seen. The Johannesburg MOONWATCH committee therefore decided to suspend tracking operations until they were supplied with larger aperture equipment.

However this did not stop Finsen. Using the Cape Town observations and other limited data, he generated predictions. On 13 February, M. D. (Danie) Overbeek was able to observe the faint satellite from his private observatory using his 12-inch reflector. The predictions were pretty spot on and Danie's observing skill made this remarkable achievement possible. Further observations were made on 20 February showing the predictions to be accurate to about 23 seconds and one minute of arc.

Fig 3. Danie Overbeek with his 12-inch reflector in his Edenvale Observatory

As recounted earlier, Bloemfontein could not man all the apogee scopes supplied to them. After protests by the Pretoria and Johannesburg MOONWATCH teams the northern teams were eventually supplied with 5 instruments each (Johannesburg on

1 March and first observation with it on 3 March). This enabled regular observations of the small American satellites.

Finsen's skills did not end with supplying the country and the MOONWATCH teams with prediction data. He even generated predictions for the Smithsonian Baker-Nunn camera at Olifantsfontein. These were more accurate than the predictions they were officially supplied with, which were reported as being "haywire"! It was only until 18 March that were they able to photograph their first satellite using data supplied by Finsen.

Finsen was not the only expert. Explorer 4 was launched on 26 July 1958 but could not be located by the optical teams. Jan Hers, using rough data supplied by the newly installed MINITRACK radio system outside Krugersdorp, was able to generate data which enabled the Pretoria team to become the first in the world to see this satellite.

Fig 4. Google earth location of Johannesburg MOONWATCH which should be at bottom edge of the image.

Although the main observing site, allocated station number 0403 in the US Vanguard satellite computing centre, it would appear that a fair number of observations were made from other sites in the Johannesburg area so are not listed in the catalogue of MOONWATCH observations. An interesting anomaly arose when the given coordinates of the station, which was on the front lawn in front of the building housing the large Innes telescope, were plotted using Google Earth. It was found that the coordinates given did not match the site used. This was investigated and it was found that Google Earth is not that accurate as regards the coordinates displayed!

Johannesburg MOONWATCH played a critical part in the first year of satellite tracking. The Olifantsfontein Satellite Tracking Station manager, Robert Cameron, wrote as follows, congratulating the Johannesburg team on their efforts: "*The amazing world record number of turnouts for MOONWATCH sessions, held by the Johannesburg team, combined with the large number and high reliability of the observations deserves the highest commendation as a very important contribution to the International Geophysical Year*."

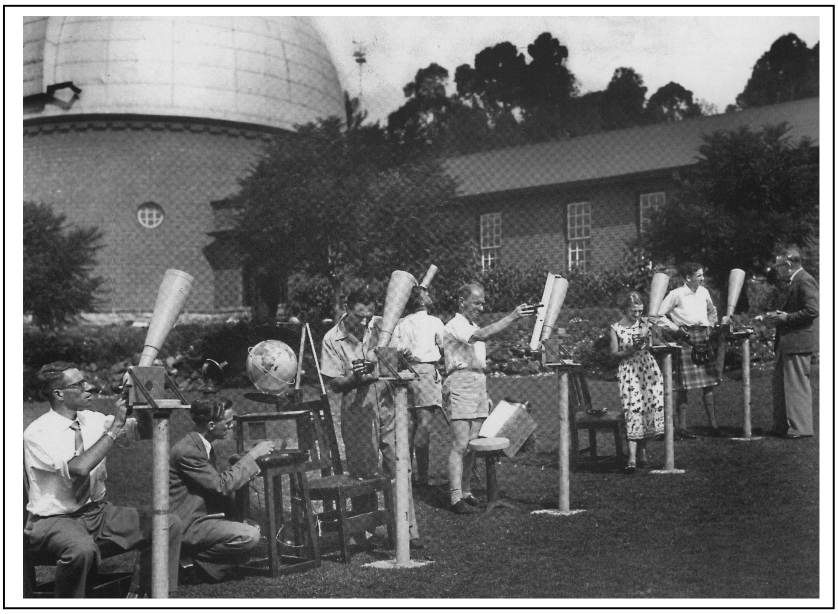


Fig 5. The Johannesburg Moonwatch team on the front lawn of the Union Observatory. L-R Ian Brickett, Dr CN Williams, J Vollmer, H van Toechen, Mr and Mrs Johnson and W Finsen.

At the conclusion of the IGY Programme at the end of 1958, Finsen decided that enough was enough! It was time for the Union Observatory to once more become an astronomical observing observatory rather than operate as a satellite tracking station as it had occupied the observatory staff and severely strained its resources for a year. This decision was greeted with dismay by both MOONWATCH headquarters in the USA and the Olifantsfontein Satellite Tracking station. However, the "South African Witchdoctor", as he was known in tracking circles, stood by his decision and Johannesburg MOONWATCH ceased to exist on 31 December, 1958 after making 467 observations.

Not all was serious work! On one occasion, when boredom set in, several "Chinese lanterns" were released which gave rise to a large number of UFO reports!

The author found this a bit surprising! Was no-one else in Johannesburg really interested in continuing? Apart from Bloemfontein (which also ceased operating at the end of 1958) the other two MOONWATCH teams (Cape Town and Pretoria) continued tracking for many more years.

The next article will deal with PRETORIA MOONWATCH.

Acknowledgements

The author would like to thank the following:
Dirk J. Vermeulen for his excellent book "*Living amongst the Stars*" especially for material and images, as well as the other publications mentioned at the start of this article. Also Ellen Alers, the reference archivist at the Smithsonian Archives, for her invaluable aid.

Editor's Comment

Southern Africa has virtually no established astronomical artefacts, but it has an extremely rich, and very mixed, heritage of oral traditions, especially about the night skies. Stories were told and retold and formed an important part of the social fabric of its peoples. However with the advent of industrialization and mining many of these oral traditions are dying out, and unless they are captured or known about, many, or most, will be lost forever. There are very few publications about this heritage and it is against this background that Dr Peter Alcock's book, ***Venus Rising***, must be viewed. As is to be expected, there will be a wide range of opinions on such a book, and I see these reviews and comments as the start of an intended extension of the book through discussion: it is a resource that is to be used and enriched.

Rejoinder to Snedegar, K., 2014. Venus Rising: Cultural Astronomy in Southern Africa, *MNASSA*, 73 (9/10), pp. 251–3

Dr P.G. Alcock

I thank the reviewer of my e-book (*Venus Rising: South African Astronomical Beliefs, Customs and Observations*) for his notes published in the October 2014 issue of the journal. I believe that certain points need to be explored in this regard. The main thrust of the reviewer's comments is that the book, consisting of 386 pages, lacks a detailed analysis of the material presented therein. It was made clear in the Preface of *Venus Rising* that further research and analysis of the topic is essential. It is evident that the book functions as a synthesis of the available material. The book is thus (as stated in the Preface) a beginning but not an end. It is interesting to note that not much has been written on the subject in recent years, where most of the literature is of considerable antiquity. The present author is satisfied that he has achieved his primary objective, which was to bring a very disperse literature together in one volume (notwithstanding omissions) for further work by interested parties over time. There is, in essence, only so much that can be achieved in any volume starting from a very limited base and covering a broad field. It follows that a concise analysis of all the material in the book would be a "step too far" and would have meant a book of impossible length and complexity. The reviewer's requirement that this be done in one volume is frankly unrealistic.

The reviewer's charge that some of the data in the book consists of lists which are "tedious" requires a response. This statement is presumably a reference to Chapter 3 which deals with the Moon. One taxing event for the reviewer must surely be that six versions of the Zulu moons or months are given in the chapter. These versions extend over a considerable period of time (i.e. an important clue). The reviewer appears to desire "one truth", specifically an official (non-tedious) version of the Zulu moons, although it is a mystery how and why such a version should be selected. There are good reasons for several versions of the moons, largely centred on different geographical sources of information and very possibly a number of Zulu dialects which were rather different from the "standard" Zulu of about 100 years ago. It was only at a certain point in history that a standardized Zulu language came into general use, along with a unified Zulu people as such. A related matter is that it is the Zulu women who performed much of the agricultural tasks involving crop cultivation, although most of the informants recorded were Zulu men (a point made in the book). Some discrepancies between Zulu men and women can therefore be anticipated (likewise mentioned in the text). Also at play is the fact that there was sometimes confusion regarding the exact Moon then in view, which may in a few cases, have contributed to different versions of the moons. Other examples of tediousness in Chapter 3 concern, for instance the Xhosa-speaking people, with important cultural and linguistic differences being apparent in previous times. Discussed in the book are the Bhaca, the Mpondo, the Mfengu and the Xhosa *per se* with their own names or spelling for the moons. Chapter 3, then, is full of untidy information especially since the literature cited is a mixture of archaic and slightly more modern versions of the moons (a fact readily apparent by reference to 12-month moons and 13-month moons). The elegance and simplicity so energetically sought by the reviewer is unfortunately not evident in the data provided in Chapter 3. Anthropological information is seldom available in neat, well-organised and concise bundles. That is reality. One practical solution to the problem, of course, is to deliberately suppress pertinent data in the interests of a tidy and undemanding text.

The present author, further, is unaware of any person in South Africa who has the necessary skills to unravel the linguistic reasons for different versions of the moons in all the groups dealt with in *Venus Rising*. The reviewer, nevertheless, would apparently have the present author undertake these tasks, and all in one volume. What can be said in this context is that tediousness represents diversity (richness) and in diversity resides opportunity. The author believes that readers will understand that the allegedly tedious nature of some of the data is a starting point for intellectual puzzles to be addressed by a number of academics in the years to come. The availability of the book in an electronic format should facilitate this process, given that many South African universities currently face budgetary constraints, which also have an impact on their libraries.

A minor issue is the viewpoint that bibliographic sources somehow need to be graded to sort out the good from the not-so-good. The reviewer in this instance refers to three writers: Hromnik, Ritter and Wade who are very briefly considered in the book (collectively about a page out of the 386 pages in the text). Does this procedure not suggest judgement? A careful reading of the relevant passages, significantly, will reveal that the language used in all three cases is circumspect and cautious. To grade all the literature sources in the book (presumably also including astronomical texts) would be an impossible task, even if a standard set of criteria (what would they be?) was used. Readers would probably find it trying to frequently encounter value judgements on the sources being referred to at that moment.

Finally, the present author on a personal note, records that he has a limited knowledge of crop production, although he was once a member of staff in the Department of Crop Science at the (then) University of Natal. His appointment, as a geographer, was for very specific reasons involving rural development programmes concerning water and sanitation in parts of the (then) KwaZulu. The present author must therefore decline the reviewer's perception that he is "an authority on crop science and the water supply in KwaZulu-Natal". Neither statement is true.

Venus Rising was made available as a free PDF e-book on 18 August 2014 and can be downloaded from the following website:
http://assa.saao.ac.za/astronomy-in-south-africa/ethnoastronomy/venus-rising/

Book Review

Venus Rising: South African Astronomical Beliefs, Customs and Observations

Lia Labuschagne

Author: Peter G. Alcock. First edition, 2014. ISBN 978-1-919966-04-5 Dewey No. 398.3620968

Note: Available as a PDF for download from the ASSA Website at: http://assa.saao.ac.za/astronomy-in-south-africa/ethnoastronomy/venus-rising/ The webpage also contains a complete table of contents.

When we look up at the night skies without the benefit of modern astronomical equipment such as binoculars and telescopes, most of us can identify at least some of the 88 constellations as defined by the International Astronomical Union. We can also point to well-known asterisms and the bright planets. When following the apparent paths of the Sun, Moon and those planets visible to the naked eye, and touched by their beauty as they slowly move against the backdrop of the familiar patterns of stars, most of us associate some those patterns with tales our parents told us, or with what we learn through astronomy courses, books or talks.

Some of the stories to explain natural phenomena in time become entrenched within families and even within larger social groups. In most cases, the well-known tales relating to the night skies would have their roots in Greek and Roman mythology. Among others they relate also to the seasons as they are experienced in the Northern Hemisphere, where those mythologies originated – and we repeat those stories when engaged in astronomy outreach or talking among ourselves, even though we may know that traditions of knowledge and mythology of archaeoastronomical value come from all parts of the globe.

Indeed, we are far less familiar with local stories, and very often we don't know the origin of those stories. Few set out to discover more, and even fewer give the topic serious academic attention. Compare, for instance the fact that only a relatively small group of people interested in the history of astronomy are likely to have an in-depth knowledge of how some southern constellations were charted and named by Nicolas-Louis de La Caille in the 18th Century – and that history has been well documented (most recently by Dr Ian Glass), and easily available. Knowledge about South African indigenous concepts and stories has been much harder to come by.

Venus Rising: South African Astronomical Beliefs, Customs and Observations adds the most comprehensive overview of South African cultural astronomy to date to a very limited library on South African cultural astronomy. In 2010 Author Peter Alcock, one of only a few working in the field of recording indigenous knowledge, wrote *Rainbows in the Mist: Indigenous Weather Knowledge, Beliefs and Folklore in South Africa,* and he has now followed it with *Venus Rising*. Its importance is evidenced by the fact that the book has been funded by the Department of Science and Technology, with administrative support supplied by North-West University.

Traditional knowledge is often threatened by one of the very things that give it its charm, namely that it is conveyed mainly in oral rather than written form. Capturing traditional knowledge so that it can be studied and enjoyed, is no easy feat – yet the sooner it is done, the better. As author Peter Alcock points out, "pertinent oral information has been allowed to 'simply wither away, without protest'. Not much can be done about this loss, except to accelerate efforts to record what oral information still exists." He adds that "some contemporary information, unfortunately is only half-remembered and is thus not fully reliable." Even the sources for *Venus Rising* were mainly old anthropological works and journal papers, and not mainly oral information because the latter is expensive and time-consuming to track down and record.

The author explains that there are three relevant terms: archaeoastronomy (the study of historical concepts, physical structures and artefacts), ethnoastronomy (the examination of indigenous astronomical knowledge) and cultural astronomy, which includes both the other concepts. This book is a contribution towards a more comprehensive understanding of South African cultural astronomy.

Adcock has divided the text into five sections that look at the Sun, the Moon, lunar & solar eclipses, the stars & planets, and comets & meteors. Within those chapters, he organised the relevant information relating to the following peoples: the Khoikhoi, the Lemba, the Ndebele, the Northern Sotho, the San, the Southern Sotho, the Swazi, the Tsonga, the Tswana, the Venda, the Xhosa and the Zulu, further divided into groups and subgroups. He also explains in the some of the subtleties and challenges in defining these groups and interpreting the complexities of linguistic expression.

The animals and plants of the African veldt, the weather, seasons and geography of South Africa with its varied landscapes come to life in stories that also tell about the confrontation between man and nature. Snakes and lions, birds and insects, sorcerers and ghosts, innocent children and initiates, the rain and mist, water and fire, supreme beings and the spirits ancestors – these are but some of the elements interwoven into the tales and indigenous beliefs that make up a rich heritage. It also becomes clear that the indigenous peoples of South Africa have, as elsewhere in the world, watched and studied the magic of the night sky and knew its subtle changes throughout the year very well. Those legends and beliefs originated under skies unpolluted by the lights of modern civilisation – but also among peoples without the means accurately to capture them as they developed. *Venus Rising* will be of tremendous academic importance for many, because it is not only a collection of the myths and legends, and charts the origins of linguistic expressions and beliefs, but puts them into context and gives comprehensive references about the sources of information.

In the useful appendices there is additional information to stimulate interest in the topic and provide tools for educators and others who want to delve deeper into the topic.

This has clearly been a labour of love giving serious academic attention to a neglected subject. Written for a more scholarly audience, interested not only in reading the stories, but in understanding their origins and cultural contexts, the material in *Venus Rising* is clearly not intended merely as an anthology of myths and legends, but rather succeeds in providing an important survey of currently available information on the topic. It may seem trivial to note that the book could possibly have benefited from some additional rigorous text editing to tighten the text and remover redundant phrases – but it could make an excellent volume even better.

Among the collaborators acknowledged in this book are a number of names well known to members of ASSA: Willie Koorts, Tim Cooper, Dr Ian Glass, Case Rijsdijk and Cliff Turk.

Alcock states that this book is a 'beginning and not an end' – thus pointing out that there is still much more information about South Africa cultural astronomy to be collected. Yet, as it stands it will already add to the enjoyment of naked-eye skygazing in South Africa and could stimulate a renewed interest in our rich heritage of indigenous astronomical knowledge and mythology. In addition to astronomy enthusiasts and academics, the information could be invaluable to educators, historians, and tourism organisations and tour guides.

Annual Index

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