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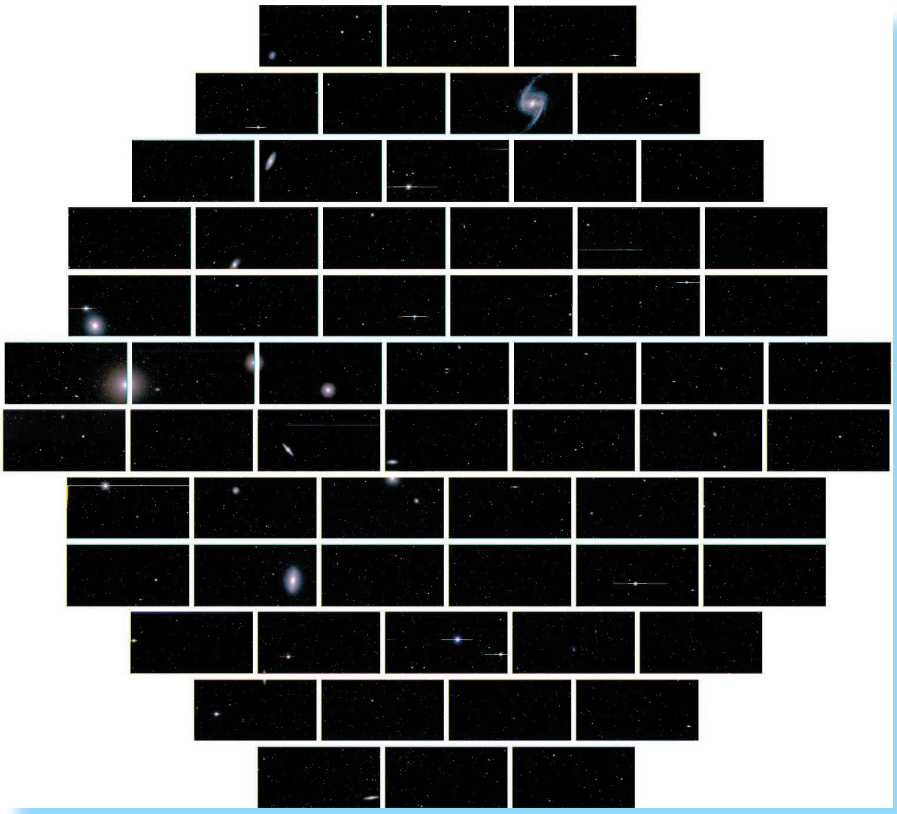

- ScopeX 2012 • 100th ASSA Annual General Meeting •
- New SAAO Director • Sir Bernard Lovell 1913-2012 •
- Paardefontein Satellite Tracking Station 1965 – 1981 •

monthly notes of the astronomical society of southern africa

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subscriptions

From January 2011 *MNASSA* is available free of charge on the Internet. Paid subscriptions will no longer be available (see *MNASSA*, August 2010, p.113).

advertising rates

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contributions

MNASSA mainly serves the Southern African astronomical community, professional and amateur. Articles and papers may be submitted by members of this community and by those with strong Southern African connections, or else the papers should deal with matters of direct interest to this community. Due dates for contributions are:

Vol 71 Nos 9 & 10 (Oct 2012 issue), 01 Sep 2012
Vol 71 Nos 11 & 12 (Dec 2012 issue), 01 Nov 2012

recognition

Articles in *MNASSA* appear in the NASA/ADS data system.

Dark Energy Camera captured the Fornax cluster

Full Dark Energy Camera image of the Fornax cluster of galaxies, about 60 million light years from Earth. The centre of the cluster is the clump of galaxies in the left portion of the image. The prominent galaxy at the top is the barred spiral NGC 1365. Credit: Dark Energy Survey Collaboration (DEC). The DEC uses a 570 Megapixel 62 CCD element array.

mnassa
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Vol 71 Nos 7 & 8 August 2012

assa news

ScopeX 2012

Lerika Cross and her team again produced a remarkable ScopeX this year. The programme was full and very different, including a number of firsts.

The activities consisted of the usual wide range of lectures, telescopes, workshops, sundials, gadgets, Experilab Science Shows, stalls and displays. But the programme also included a number of presentations which used some very new technology enabling those attending to listen to speakers live from other parts of the world! There were also two competitions: Astrophotography and ATM (Amateur Telescope Making). The former was judged by Case Rijsdijk and the latter by Chris Stewart and Dave Blane.

The morning programme consisted of:

Dr Kobus Olckers - SANSA Space Science who presented a talk on short introduction about the Sun and Space Weather followed by what we can expect as we reach the peak of the 11-year solar maximum.

Dr Ian Glass, ASSA President, who spoke on 40 years of Infrared Astronomy - how infrared astronomy differs from visible-region astronomy.

Dr Adrian Tiplady spoke on the Square Kilometre Array SKA – humankind's quest to build the largest, and most sensitive telescope in history and enable humans to begin to answer the most fundamental questions facing science today.

The afternoon programme was novel in that it consisted of a series of Webinars; a first for ScopeX.

Dr Rick Fienberg, AAS Press Officer, speaking from Boston US, told the audience about SOFIA entitled – To Pluto with the World's Largest Portable Telescope.

Tom Field then presented, again from the US, how you can almost touch the Stars, or how to get started in spectroscopy.

Finally the ESO Photo Ambassador told us about Remote Astronomy.

These presentations were running in parallel with a host of other activities and the day ended with the usual Star Party in the evening, which despite the cold, carried on till well after 21:00! ☆

SpaceX meets ScopeX

Chris Stewart

Perhaps you are wondering how come the ScopeX 2012 garments sported a Dragon mission patch? Let me tell you a story...

"Once upon a time" (as the saying goes - but to be more exact, 28 June 1971) a little boy was born in Pretoria. He had big dreams. His name was Elon Musk. At age 10 he bought his first computer. Within two years he taught himself to program and sold his first computer program, a space game, for the princely sum of around $500. In 1988, at age 17, he ventured out into the wide world all by himself, soon finding himself in the US (the land of possibilities) by way of Canada.

A bachelor's degree in Economics was quickly followed up with one in Physics. Elon was particularly drawn to three areas of interest: the Internet, Clean Energy, and Space. In 1995, with his brother Kimbal, they started Zip2, a company which provided online content publishing software for news organisations. Four

years later this was sold for $307M in cash and $34M in stock options. In 1999 he co-founded X.com, an on-line financial and payment company which he merged a year later with a similar firm, Confinity. The combined entity became known as PayPal and in 2002 was acquired by eBay for $1.5billion in stock.


Elon with the Falcon 9

Later that year Elon founded his next company, Space Exploration Technologies (SpaceX), to develop, manufacture and operate space launch vehicles. The company's first two launch vehicles were the Falcon 1 and Falcon 9 rockets with Dragon its first spacecraft. On 23 December 2008, SpaceX was awarded a $1.6 billion NASA contract for 12 flights of their Falcon 9 rocket and Dragon spacecraft to the International Space Station, replacing the Space Shuttle after it retired in 2011. Initially Falcon 9/Dragon will replace the cargo transport function of the Shuttle while astronaut transport will be handled by the Soyuz. However, SpaceX has designed Falcon 9/Dragon with astronaut transport in mind.

In seven short years SpaceX designed the family of Falcon launch vehicles and the Dragon multi-purpose spacecraft from the ground-up. In September 2009, SpaceX's Falcon 1 rocket became the first privately funded liquid-fuelled vehicle to put a satellite into Earth orbit. NASA selected SpaceX to be part of the first program that entrusts private companies to deliver cargo to the International Space Station.

Dragon captured by the robotic arm of the ISS

SpaceX's goals include simultaneously


Elon Musk with President Obama at the Falcon 9 launch site in 2010

lowering the price of orbital spaceflight and improving reliability, both by an order of magnitude, while creating the first fully reusable orbital launch vehicle. In the coming years SpaceX will focus on delivering astronauts to the International Space Station. However, Elon has stated his personal goal of eventually enabling human exploration and settlement of Mars. In a 2011 interview, he expressed his wish of sending humans to the Martian surface within 10–20 years.

On 25 May 2012 the SpaceX Dragon capsule docked with the ISS, making history as the first commercial company to launch and dock a vehicle to the International Space Station. The ISS crew were happy to get supplies delivered, and to pack their junk in the capsule to be returned to Earth. Dragon then made its way home, braving the intense heat of re-entry into the Earth's atmosphere and splashing down safely.

To commemorate this marvellous achievement, ScopeX asked SpaceX if we could this year use the mission patch for the Dragon spacecraft's historic mission as an emblem. Permission was graciously granted for us to do so. Wear it with pride to show the world what South African dreamers can do when they set their heart to it.

The story is not quite over. Elon also co-founded the Tesla - a company, makers of the beautiful Tesla Roadster electric sports car. With his cousin Lyndon, he co-founded Solar City, the largest provider of solar power systems in the United States. He is currently the CEO and Chief Technology Officer of SpaceX, CEO and Product Architect of Tesla Motors and Chairman of SolarCity. Not bad going for our Pretoria boy – and an inspiration to dreamers everywhere. ☆


Falcon 9 lift-off

Symposium2012: Looking back, looking forward

Have you registered yet for our 100th anniversary symposium? There may still be time. The venue will be the Auditorium at the SAAO in Cape Town. For the latest details and how to participate please look at the website *http://symposium2012.assa.saao.ac.za*

Here is the great line-up so far:

Friday, 12 October 2012

10h00 – 14h00	LRGB Astrophotography Processing Workshop
15h00 – 18h00	Visit to the Iziko Planetarium / Outreach activities (to be confirmed)
18h00 – 20h00	Registration
19h00 – 22h00	Welcome braai

Saturday, 13 October 2012

8h30 – 18h00	Registration

The Square Kilometre Array I

09h00 – 09h45	Justin Jonas (Rhodes University / SKA): *The Square Kilometre Array*
09h45 – 10h30	Jasper Horrell (SKA): *Technical challenges of the SKA*

Galaxy Clusters

10h30 – 11h00	Maciej Soltynski (Cape Town): *Galaxy Clusters*
11h00 – 11h30	Tea break

Observing I

11h30 – 12h00	Dale Liebenberg (Port Elizabeth): *Astrophotography from a backyard observatory*
12h00 – 12h30	Auke Slotegraaf (Somerset West): *Some Open Clusters I Didn't Discover*

Science in Sutherland I

12h30 – 13h00	Willie Koorts (SAAO, Radio Sonder Grense): *The many new domes at Sutherland – turning photons into paper*
13h00 – 14h00	Lunch

Observing II

14h00 – 14h30	Barbara Cunow (Pretoria): *Doing astrophotography with a DSLR on a tripod*
14h30 – 15h00	Johann Swanepoel (George): *Mirror making and testing*

Education and Public Outreach I

15h00 – 15h30	Allen Versfeld (Pretoria): *Astronomy Online*
15h30 – 16h00	Neville Young (Pretoria): *Lessons Learned in Outreach*
16h00 – 16h30	Tea break
16h30 – 17h00	Keith Gottschalk (University of the Western Cape): *ASTRONAISSANCE: Communicating Astronomy and Space to the African Imagination*

Exoplanets

17h00 – 17h45 John Menzies (SAAO): *Extra-solar planets*

History I

17h45 – 18h15 Magda Streicher (Polokwane): *Collection of old Astronomers in Pencil Sketch*

18h15 – 19h15 Dinner

20h00 – 20h45 Ian Glass (SAAO): *Nicolas-Louis de La Caille at the Cape* (public talk, followed by a tour of the SAAO and star-gazing)

Sunday, 14 October 2012

08h30 – 13h00 Registration

History II

9h00 – 09h30 Chris de Coning (Cape Town): *Cape Astronomical Association – origins of the ASSA on its 100th birthday*

09h30 – 10h00 Atze Herder (Johannesburg): *History of the Republic Observatory, Johannesburg*

Education and Public Outreach II

10h00 – 10h30 Case Rijsdijk (Wilderness): *Analogies in Astronomy and Physics*

10h30 – 11h00 Lia Labuschagne (Cape Town): *Talking about Astronomy in the Internet era*

11h00 – 11h30 Tea break

The Square Kilometre Array II

11h30 – 12h15 Renée C. Kraan-Korteweg (UCT): *Astronomy programmes with the SKA*

Science in Sutherland

12h15 – 13h00 David Buckley (SALT): *South African Large Telescope*

13h00 – 14h00 Lunch

Cosmology

14h00 – 14h45 Bruce Bassett (AIMS): *Recent cosmological developments*

Observing III

14h45 – 15h15 Berto Monard (Calitzdorp): *Observing programmes at the Bronberg and Klein Karoo Observatories*

15h15 – 15h45 Greg Roberts (Cape Town): *Tracking Space Debris – including Spy Satellites*

15h45 – 16h15 Tea break

Education and Public Outreach III

16h15 – 16h45 NN (SAAO): *The SAAO outreach programme*

16h45 – 17h15 Anthony Lelliott (Wits University): *Astronomy and the School Curriculum in South Africa*

17h15 End of symposium

The 100th ASSA Annual General Meeting (AGM) was held at the SAAO Auditorium in Observatory, Cape Town on 1 August 2012. The following Council and Section reports were presented.

ASSA President's Report 2011 – 2012

IS Glass

New Constitution

A new Constitution came into effect this year, with the idea of simplifying our operations and making the Society more inclusive. Members are now encouraged to join via the ASSA regional Centres but may choose to stay affiliated as Country Members if necessary. All Centre Members are now full members of ASSA and all Centre Chairmen are automatically Council members.

During the year a number of relatively minor problems relating to the new Constitution emerged and a committee consisting of Lerika Cross (Hon Secretary), Adv AJ Nel (Hon Treasurer), Michael Poll (Past President), Chris Stewart (Council member) and myself has produced an update which will be presented to the Members for ratification later in the year. This should give enough time for membership numbers for 2012-13 to stabilise.

Another significant change is the abolition of the Business Manager post. With the popularity of the new *Sky Guides* this had almost become a full time job. Cliff Turk as (unpaid) incumbent for several years effectively marketed the publication, delivered it to bookstores and dealt with a very large number of private subscribers. With a circulation of about 4000 copies, it had become too much for one voluntary officer to handle. The distribution of the *Sky Guide* to non-members has now been handed over to Struik Random House Publishers on contract, with the understanding that all members may receive it through their Centres at a special low price. The handling of well over 100 non-member subscriptions to *MNASSA*, many of them in foreign currencies, also required a great deal of correspondence. The printing, postage, subscription agents' fees, bank charges, reminders and replacement of missing issues had also become costly. It was decided that *MNASSA* should no longer be printed and that it would instead be downloadable free of charge by all from the website www.mnassa.org.za which SAAO kindly agreed to host.

Registration as a non-profit organization

There are considerable advantages to the Society to register as a non-profit organization. The Hon Treasurer, Adv AJ Nel, has set this process going.

A number of the proposed changes to the Constitution are being made to comply with the requirements for this registration.

Membership 2011-2012

Pat Booth agreed to be co-opted as Mem-

bership Secretary following the 23 August 2011 Council Meeting and I (as acting Membership Secretary) handed over to her.

Mr Ronnie Glass who has acted as Honorary Auditor for many years, was made an Honorary member on 9 November 2011.

As mentioned, all members of the Centres are now ASSA members according to the new Constitution. The following are the membership numbers (July 2012):

Bloemfontein	75
Cape	60
Garden Route	49
Country Members	169
Durban	90
Hermanus	92
Johannesburg	159
Pretoria	101
Grand Total	**795**

AGM 2011

The contributions to the 2011 AGM were reported in the October 2011 *MNASSA* and the minutes have been placed on the Society's web site.

Council Matters

Because the Council members are scattered around South Africa, one of the changes allowed by the new Constitution is the possibility of meeting via Skype or similar means. Chris Stewart is thanked for acting as the "exchange" for this year's meetings. Using Skype has not always been problem free but it has functioned well enough to be a practical arrangement.

The Hon Secretary, Lerika Cross, has prepared and distributed agendas and minutes for each Council meeting.

Mike Poll (Past President) has prepared a checklist of deadlines etc. for matters that have to be considered by Council each year.

Dates of Council meetings and attendances:

23 Aug 4 (7)
15 Oct (10)
7 Nov (7)
7 Feb (11)
27 March (10)
8 May (12)
26 June (not yet available)

Sky Guide

Auke Slotegraaf took over once again as *Sky Guide* Editor for the 2011 edition. He had previously edited the *Guide* in 2003-5 and, with M Soltynski, had been responsible for putting it into its current form. Since the time that AB Jones (followed by W Trow) took over for the 2006 edition, the editors have been paid for their work. Their honoraria have been well-covered by the sales revenue.

Auke has accepted a contract for the 2013 edition, which is well under way. I would like to congratulate Auke on the high standard he has brought once again to this onerous task.

Sales of the *Sky Guide* over the last few years have contributed strongly to the financial well-being of the Society. I would like to pay tribute to Cliff Turk for building up its circulation over his years as Business Manager. Sales as of 30 July came to 4964 for the 2012 edition.

The arrangement with Struik Random House has so far worked very smoothly as mentioned above.

MNASSA

MNASSA under the editorship of Case Rijsdijk has been published six times during the year. Internet distribution appears to have worked well. The hit rates can be seen at http://www.saao.ac.za/awstats/awstats.pl?config=www.mnassa.org.za

Willie Koorts has continued to do the layout and typesetting of each issue and has placed each one on the *MNASSA* download page (www.mnassa.org.za).

Maciej Soltynski has assisted as book editor and I have contributed some news items.

We thank all those who have reported news and contributed items during the year.

Website

Christian Hettlage (Cape Centre) has been webmaster during the year. A small subcommittee driven by Auke Slotegraaf has been considering a new layout for the pages.

ScopeX

I would like to congratulate our Hon Secretary Lerika Cross and members of the Pretoria and Johannesburg Centre for another successful ScopeX, held this year on 21 July and which I had the privilege of attending. This has become I believe the most successful astronomy outreach event in South Africa with an attendance of about 1400.

ASSA Symposium

The Biennial Symposium of ASSA will be held in Cape Town in the SAAO auditorium on October 13-14. This year is an exciting one for Southern African astronomy, following the SKA siting decision, the successful operation of the SALT telescope and the enhancement of the HESS gamma-ray telescope in Namibia.

Registration will open and there will be a braai on the 12th. The Cape Centre will host this event. The Organising Committee consists of C de Coning, IS Glass, C Hettlage, R Jones, K Kirkham, L Labuscagne, S Manxoyi and J Richards and has met on several occasions.

C Hettlage has set up a web site for the event, viz http://symposium2012.assa.saao.ac.za/

ASSET

Council has been unhappy about the absence of reports from the ASSA Endowment Trust (ASSET) since the year ending 2006 and has asked its Secretary and Trustees to bring us up to date as soon as

possible – not that anything untoward is believed to have occurred. According to the Trust deed of ASSET they should give us a report at each Annual General Meeting. We have no rights otherwise over ASSET, which is completely separate as an organization from ASSA and was founded to support us in case of financial difficulties. These were a worry at the time when we provided *Sky and Telescope* for members and exchange rates were fluctuating wildly.

ASSA being at present in good financial condition, we have asked the ASSET Trustees to give us some indication of how they see their role in the future.

The ASSET balance sheets for the years ending 2004 to 2008 inclusive have been presented to the Hon Auditor for signing and will be posted on the ASSA web site when this has been done.

Financial Reports

The former Honorary Treasurer, due to personal circumstances, was not able to present audited reports for several years. However, with the recovery of his health, he has now completed the outstanding items. The five years up to mid-2010 have been audited and have been placed online at http://assa.saao.ac.za/html/235_reports.html and http://assa.saao.ac.za/resource/AuditedAccounts/Audit2010.pdf

I thank the former Hon Treasurer, Cliff Turk, and the Hon Auditor, Ronnie Glass, for their work on behalf of the Society.

Gill Medals

A further six blanks were ordered by Chris Stewart from Gold Reef City Mint and received. They are stored in a safe at SAAO.

Guidelines for Section Directors

Auke Slotegraaf is drafting a set of uniform guidelines for Section Directors

Sky and Telescope for Hon. Members

It was decided that those honorary members entitled to a *Sky and Telescope* subscription should arrange for this themselves and claim the cost back via the Hon Treasurer and the Hon Membership Secretary. It was felt that this arrangement would obviate delays and confusion.

Thanks

We would like to express here our thanks to the South African Astronomical Observatory for hosting our meetings and for providing web facilities for the Society and its publication *MNASSA*.

Council would also like to express its appreciation to Magda Streicher, one of the Society's stalwarts, for her kindness in preparing the Observing Awards certificates, which she has done since 2005.

The Section Directors have also provided an important service to the Society, especially its actively observing members.

Tony Jones and Karen Koch of the Cape Centre kindly organized for the refreshments for tonight's Annual General Meeting and we here express our gratitude to them.

Finally, I would like to express my appreciation to the very helpful 2011-2012 Council and especially to Lerika Cross as Honorary Secretary and Adv AJ Nel as Honorary Treasurer. Meetings have gone very smoothly and efficiently and the Society seems to me to be running well thanks to their untiring efforts. ☆

Double Star Section Report

Dave Blane

During the course of the year, double star observations have been received from one observer, Magda Streicher. She used her 12-inch and 16-inch S/C telescopes with an Astrometric eyepiece to measure the position and separation of a 16 double stars in Circinus. She also gave detailed descriptions of the colours and appearance of these stars in the eyepiece. In addition she discussed the possibility of other stars in the field being associated with some of the systems. The observations of doubles in Circinus reported are only samples of her much larger programme undertaken.

The director continued his programme of measuring double stars using a 6-inch refractor and an Astrometric eyepiece. These measurements will be published in due course.

Other than this no other activity has been reported. ☆

Variable Star Section Report

Christopher Middleton

Very few observations have been reported during the last year. Personally, my observation time has been dramatically reduced due to university work load and my PhD progress.

The ESKOM tariff hikes have also had a very negative effect on Highveld winter observations. The levels of pollutants in the air have increased dramatically with the effect of making any accurate photometric measurements almost impossible. The future of photometry in the Highveld during winter is bleak.

Submission of observations to AAVSO has been hindered by the change in the software platform that AAVSO has made. It is a challenge trying to keep up with their improvements!

A concerted effort will be made during the summer recess to continue with observing programs. ☆

Comet and Meteor Section Report

Tim Cooper

Summary of Observed Meteor Showers

Observer (no. of showers observed)	Showers Observed and duration	Total Time hrs
Mary Fanner (2)	Gamma Normids (7.4), delta Pavonids (5.0)	12.4
Tim Cooper (2)	Eta Aquariids (2.0), alpha Circinids (4.2)	6.2
Tony Jones (1)	Alpha Centaurids (5.0)	5.0
Karen Koch (1)	Alpha Centaurids (4.8)	4.8
Total		**28.4**

Five meteor showers were observed by four individuals totalling 28.4 hours observations.

Notes on Some Specific Showers Observed:

Alpha Centaurids - the shower was observed by Karen Koch and Tony Jones.

Gamma Normids – observed by Mary Fanner, who found peak activity of nine gamma Normids in 1.9 hours observation with LM=5.5 on the night of March 13/14.

Delta Pavonids – observed by Mary Fanner seeing 11 shower members in 5.0 hours under LM=5.3 on the nights of April 4/5 and 5/6.

Eta Aquariids – Tim Cooper managed observations on the only clear morning, that of May 4, seeing 13 eta Aquariids in 2.0 hours with LM=5.4.

Alpha Circinids – a possible repeat outburst of this shower, observed in 1977, was predicted by Peter Jenniskens. Tim Cooper detected no shower members amongst 22 meteors in 4.2 hours observation.

Summary of Observed Fireballs

2011 saw a total of eight fireball reports. The full details have been submitted for publication in *MNASSA* as a separate article. The observed events are summarised in the table below.

Summary of Observed Comets

Five comets were observed in 2011 by four individuals as summarised in the

Summary of Observed Fireballs

Date, 2011	Time, UT	Observer	Location	V mag
May 6	22h31	Simon Walsh and others	Waterberg, Limpopo	-5
July 20	16h28	Louis Piovesan	Estcourt, KZN	-5
August 18	16h25	Sarah Coronaios	Makhado, Limpopo	-7
August 19	19h07	Lourens van Niekerk and Andrew Morgan	Makhado and Tuli Wilderness Area	> -5
August 23	20h15	Peter Herbert	Seapoint, W Cape	> -3
August 27	04h00	Laurence Matthews	Barrydale, S Cape	-4
September 23	17h13	Constant Volschenk	Observatory, Gauteng	-3
October 21	17h15	Jessy de Kock and Brandon Talbot	Peninsula, W Cape	-5

Summary of Observed Comets

ICQ Observer Code	C/2009 F4	C/2006 S3	C/2009 P1	213P	C/2011 W3
BEG01			●		●
COO02	●	●	●	●	●
STR03			●		
WAKxx			●		
KORxx			●		●
TOUxx			●		

Key to observers in Table:

BEG01 = Mike Begbie
COO02 = Tim Cooper
STR03 = Magda Streicher
WAKxx = Nigel Wakefield
KORxx = Kos Coronaios
TOUxx = Oleg Toumilovic

table above.

Notes on Specific Comets Observed

C/2009 F4 McNaught – imaged by Tim Cooper.

C/2006 S3 LONEOS – imaged by Tim Cooper.

C/2009 P1 Garradd – was well observed by Magda Streicher, Nigel Wakefield, Mike Begbie and Tim Cooper, photographed by Kos Coronaios and Oleg Toumilovic, sketched by Magda Streicher and CCD imaged by Tim Cooper.

213P van Ness – was imaged by Tim Cooper.

C/2011 W3 Lovejoy – observed by Mike Begbie and Tim Cooper, photographed by Kos Coronaios.

Summary of Asteroid Observations

The following asteroidal occultation events were attempted:

TYC 1275-01666-1 by (559) Nanon on 2011 March 16 - cloud reported by Nigel Wakefield.

TYC 0807-00901-1 by (7) Iris on 2011 April 25 – cloud reported by Nigel Wakefield and Tim Cooper

All observers of comets, asteroids and meteors, are heartily thanked for their contributions. ☆

Deep-sky Section Report

Auke Slotegraaf

It is a pleasure to thank a growing list of contributors to the Section during the year under review. The regular contributors remain Magda Streicher, Richard Ford and Auke Slotegraaf. First-time contributors include Andre de la Porte (Pretoria, South Africa), Etienne Entres (Harrismith, South Africa), Daniel Acker, Kim Gowney (UK) and Tom Bryant (USA).

A special word of thanks is due to Percy Jacobs of the Pretoria Centre for taking the initiative to co-ordinate an active

group of observers in the Centre. The director looks forward with great anticipation to future reports from George Dehlen, Louis Kloke, Grant Thompson, Pat Kühn, Michael Poll, Andre de la Porte and Craig Kloke.

Observation of the deep sky forms a natural part of the activities of most observing groups. Observers are encouraged to submit their observations to the Section. Examples include the observing evenings arranged by the Cape Centre and the West Rand Astronomy Club.

During the Spring Southern Star Party (October 2011) three observers, Pierre de Villiers, Andre de Villiers and Wim Filmalter, successfully completed the Beginner's Observing Challenge.

Section stalwart Magda Streicher published her long-awaited tome, "*Astronomy Delights*", the first book of its kind in South Africa (for a book review, see *MNASSA*, April 2012, pp.84-85). This beautifully illustrated limited-edition work encapsulates Magda's unique perspective on the Universe beyond our solar system.

The Director gave two observing workshops during the year, on 5 March (at the Autumn Southern Star Party) and 25 November at a deep-sky weekend near Sutherland. Given that the Internet (and particularly Skype) has become a reliable communication channel, the Director invites all Centres or observing groups to take part in these workshops through a web-based meet-up.

Finally, Merit Awards for deep-sky observing have been awarded to Richard Ford, Andrie van der Linde, Percy Jacobs, George Dehlen, Louis Kloke, Grant Thompson, Pat Kühn, Michael Poll, Andre de la Porte and Craig Kloke. ☆

Solar Section Report

Johan Retief

Since my appointment in October 2011, I have been doing a review of the work being done by the ASSA regarding Solar Observation in the RSA during the past five years. A quick review of the situation is as follows:

a. The website of the solar section was last updated in May 2007.
b. The last solar bulletin was published by ASSA December 2009.
c. The website of the Bloemfontein Solar Section was last updated in 2006.
d. There are no ASSA solar programmes running since 2009.
e. At no stage were there more than seven observers involved in the observation programmes by the section and observations have mainly been limited to sun spot counts.
f. I have failed to find any organization in the RSA that is currently interested in the results of solar observations by amateurs.

g. There are many robotic telescopes and cameras, on earth and in orbit, that seem to cover the entire scope of the possible results that can be obtained by amateurs in Southern Africa.
h. Amateur solar telescopes like the Coronado range are more aimed at the recreational solar observation by the amateur than for serious research, these telescopes are also quite expensive.
i. There has been no recent communication to the directorate by any amateur observer that indicates an interest in solar observation.

I have visited the website of the Solar Section of the British Astronomical Society (BAS) at http://britastro.org/baa/index.php?option=com_content&view=article&id=43&Itemid=81 and found that they have an active and well organized solar section with about 70 observers sending reports to them. These latter observers are from as far afield as New Zealand, Australia and most of Europe.

I have reviewed the information provided to observers by the solar section in the past and have produced a rough draft of a guide on solar observational techniques for beginners in astronomy (this has been done for the beginners section of the Hermanus Astronomy Centre and not specifically for ASSA's Solar Section).

Conclusion

It is my contention that the continued maintenance of a Solar Directorate by ASSA should be seriously reconsidered. After the review it seems that the continued maintenance of the section is really not worthwhile.

Recommendations

Based on the above the following recommendations are made to the Council for consideration:

1. That ASSA's Solar Section be discontinued.
2. That the websites for both the ASSA and Bloemfontein Solar Sections be closed down.
3. That amateur astronomers in Southern Africa who wish to participate in solar observation be invited to join BAS's Solar Section. ☆

Occultation Section Report

Brian Fraser

Once again there were very few favourable minor planet occultation predictions for the areas where our active observers reside and no occultations were observed. We have again used the predictions provided on Steve Preston's website.

An attempt was made to observe a lunar occultation with a Philips webcam attached to a motor driven 8-inch telescope with an audible time service recorded on top of the visual picture. This proved to be very successful and will be used again for bright lunar occultations. ☆

Cosmology Section Report

Frikkie de Bruyn

Purpose

The purpose of the Cosmology Section is:

- to promote an interest in the study of cosmology,
- to disseminate news, press releases and scientific papers of a cosmological nature,
- to promote the study of cosmology as a science.

Activities

A wide variety of events were discussed in 2011 among a total of 51 members. It was 32 years since Guth proposed his theory to explain the exponential expansion of the early universe. This theory is still accepted by most cosmologists today to describe cosmological principles such as the homogeneity and isotropy of the universe. An interview with Guth about his theory was circulated to members of the Cosmology Section.

The effects of dark energy were detected in the Local Group of Galaxies and a great deal of research papers about dark matter were made available to members. Since some members do not read scientific papers, a summary of the paper was provided with a link to the internet to enable those members who wish to do so, to read the paper.

The director responded to articles about the early universe published in the local newspaper and some of the director's responses were published on the internet.

A great deal of attention was given to continuing experiments at the Large Hadron Collider at CERN to detect the possible existence of the Higgs boson. The particle will, if discovered, complete the Standard Model of Particle Physics. The particle was not found but the mass range within which it should be present has been established. A new particle, the chi.b(3P) was discovered which could help to explain the structure of matter.

An interesting paper explaining the expansion of the universe as being the result of turbulence at the Planck temperature and not dark energy has been circulated.

A total number of 218 submissions were made by members, including discussions on submissions, questions arising from submissions, etc.

Future activities

Attempts by scientists at the LHC to confirm or reject the existence of the Higgs boson will be of great interest. Research to detect the true nature of dark energy or, an alternative explanation for the accelerated expansion of the universe will continue. ☆

Historical Section Report

Chris de Coning

During the past year (Calendar Year 2011) the following has happened concerning the History of Astronomy.

Website

The Website has undergone a major change. Previously, in 2007, the look and layout was totally changed. In 2009 more content was added to the website. The process is on-going in nature.

Archive

- The scanning of the most valuable documents in the Archive, the minute books of ASSA Council and Cape Centre, was completed. A digital version of the Archive is in the process of being made available to researchers and the public by placing it on the website of the Historical Section. Thanks to Lesley Hart for her assistance and for allowing us to use the A3 scanner, a special piece of equipment required to scan Imperial (non-metric) documents
- The Archive, which was housed in totally unsuitable conditions (see previous report), has been relocated. The original irreplaceable material has been placed on loan to The Manuscripts & Archives Department at the University of Cape Town (UCT).
- In 2011 MNASSA became a digital publication. This represents special challenges to the Archive as a secure method and format to store digital material for long periods of time still needs to be developed.

Publications

Individuals in their private capacities published articles of historical nature in MNASSA. Please note my appreciation to the following people:

- Case Rijsdijk: *Neptune turns One*, Vol 70, nos. 3 & 4, April 2011.
- Greg Roberts: *Yuri Gagarin - The Columbus of Space*, Vol 70, nos. 3 & 4, April 2011.
- *Hubble turns 21*, Vol 70, nos. 5 & 6, June 2011.
- Ian Glass: *In the footsteps of La Caille, Everest and Maclear on the Kapokberg*, Vol 70 nos 7 & 8, August 2011.

Obituaries

MNASSA published obituaries on the following astronomers:

- Willard Boyle: 1924 - 2011. Vol 70 nos. 5 & 6 Jun 2011.
- Christina Scott, Africa's foremost science journalist dies. Vol 70, nos 11 & 12, Dec 2011

Friends of the Cape Town Observatory

The Friends of the Cape Town Observatory was created in order to save and conserve buildings and instruments that are of historical value. Their first priority was the McClean building at the SAAO which had developed serious problems with its hydraulic floor and dome. Prior to 2011, due to the cost involved and the recession not much happened.

Then the South African Government hosted the G8 and BRICK countries ministers on science and technology. It was decided to host an event in the McClean building. Adequate money was made available to repair and paint the McClean dome. Due to this unexpected windfall the building is now repaired. A special word of gratitude needs to be expressed towards the Department of Science and Technology, the Friends of the Cape Town Observatory, and in particular to one of their members, an engineer who took the task upon himself to co-ordinate and do many of the repairs himself. Thanks to Wim Filmhalter.

Boyden Observatory Museum

In 2011 Boyden Observatory renovated the administration building on the premises and turned it into a museum. Previously, some of the objects were housed at the Mangaung Fire station Museum but have now been moved to a venue that is more in keeping with the topic. Education and astronomical outreach forms an integral part of the museum. ☆

Education and Public Communication Section Report

Case Rijsdijk

Since the inception of this section it has been difficult to achieve the original aims set out, mainly due to poor communication between centres. The director has continued to develop resources for many educational establishments and Science Centres, in addition to presenting many talks and workshops at schools and other groups on behalf of ASSA. And other centres have achieved many good outreach activities, eg JHB/Pretoria with ScopeX, Hermanus with the MONET project and Durban with the Astronomy Starter kit.

Originally it was hoped that all centres would send through their outreach programme and materials to enable the section to approach major funders for an annual ASSA function along the lines of ScopeX or the biennial Symposium. However several efforts at doing this failed – probably because the centres are far apart and are unable to meet on a regular basis. It is clear that this section needs to revisit its role within ASSA, and this will be done in accordance the councils' aim of reviewing of the role, purpose and objectives of all sections within the ASSA. ☆

Scholarships Report

Maciej Soltynski

The ASSA Scholarship was established in 2000 to encourage the study of Astronomy at any Southern African university at the 2nd and 3rd year level. The Scholarship is funded by ASSA with occasional financial support from the ASSA Endowment Trust. In 2012 ASSA Council specifically set aside an amount of R100 000 as capital to generate funding for the Scholarship.

There were no successful applicants in 2012. In 2011 the ASSA Scholarship was awarded to Claire Antel, a 3rd year BSc student at UCT. Claire obtained her B.Sc. degree at UCT with distinction in Astrophysics and Physics, and the degree with distinction. In 2012 she has embarked on a B.Sc. Honours in Astrophysics and Space Science in the National Astrophysics and Space Science Programme (NASSP) at UCT.

The holder in 2006 and 2007, Wendy Williams, is now working towards her PhD on Giant Metrewave Radio Telescope (GMRT) and LOFAR observations of radio galaxies at the University of Leiden.

Dr Renée Hlozek, holder of the ASSA Scholarship in 2005, successfully completed her DPhil studies in observational cosmology at Oxford University, and has been appointed a Lyman Spitzer Jr. Postdoctoral Fellow in the Astrophysics department of Princeton University.

SAAO – ASSA Scholarships

The purpose of the three South African Astronomical Observatory – Astronomical Society of Southern Africa Scholarships is to encourage current or *intending* undergraduates (i.e. 1st, 2nd or 3rd year) studying for a BSc degree at any university in South Africa, who have a stated interest in astronomy, to prepare for furthering their interest. The Scholarships are financed by SAAO and are administered by ASSA. The value of each Scholarship in 2012 was R6 000, up from R5 000 in 2011.

In 2011 the Scholarships were awarded as follows:

To Allen Versfeld (an ASSA member) who was in his 2nd year of BSc studies at UNISA, and is continuing his studies in 2012.

To Fawaaz Davids, 1st year BSc student at UCT.

In 2012 Fawaaz Davids was re-awarded the Scholarship, and continues with his studies towards a BSc at UCT.

Mpati Ramatsoku, who held the Scholarship in 2007 and 2008 and Rocco Coppejans, who held the Scholarship in 2008 and 2009, continue their studies for a Masters degree in the NASSP at UCT. Rocco is working on a project which involves commissioning and characterising the new Sutherland High-speed Op-

tical Cameras (SHOC) that will be used on the 30, 40 and 74-inch telescopes at Sutherland.

Expression of appreciation

Dr Ian Glass, Sivuyile Manxoyi (SAAO) and Andrew Gray are thanked for their valued inputs in the evaluation and selection of candidates during the period under review. Thanks also go to the teachers and lecturers who supplied assessments of candidates. SAAO is thanked for making funds available for the SAAO-ASSA Scholarships. ☆

Concise Financial Report

AJ Nel (Treasurer)

Note: Numbers in [square] brackets are for the previous financial year.

Overview of Financial Year, July 2011 – June 2012

The ASSA derived a gross income of R101 561.06 for the financial year, compared to R127 658.49 for the previous year. Gross expenditure amounted to R73 297.94 [R106 742.04]. The Society thus made a net profit of R28 263.12 [R20 916.45].

As at 30 June 2012 the Society's major assets consisted of the cash in its business account amounting to R194 238.04 [R167 100.72], as well as approximately R270 000 in two investment accounts.

Royalties made up 68.88% [40.1%] of the income received whilst membership fees made up 10.5% [18%] and the internal sale of *Sky Guides* equated to 9.82% [18%].

Almost 53% [25%] of the expenses related to editorial cost, whilst 27.75% [25%] of the cost was associated with printing. Reimbursements were down to less than 10% [25%] and once off costs made up approximately 15% of the expenses.

Forecast

In lieu of constitutional changes it is foreseen that membership income decrease slightly as some benefit of the previous dispensation was still derived in the current financial year. This decrease will however be set off against costs associated with *MNASSA* incurred in the current financial year, which cost will not be incurred in future years. Editorial cost will, as in the previous year, be built into the production cost of the *Sky Guide* and as such the expense will be covered, though no future profit (other than royalties) would be derived from *Sky Guide* sales by the Society.

The Society will early in the 2012/2013 financial year become a registered non-profit organisation and will be required to conform more actively to its aim of distributing bursaries. In this regard it is foreseen that approximately fifty percent of the funds in the current business ac-

count as well as all the funds in the two investment accounts be transferred to a central investment account and that the annual interest earned with the said funds be used to settle the bursaries.

It is further foreseen that auditing (which has been an ongoing problem) will be brought up to date during the 2012/2013 year, specifically as only the 2010/2011 and 2011/2012 years are still to be audited.

Conclusion

The Society is currently financially strong and stable with ample reserves. It is foreseen that the Society will show similar financial results in the 2012 / 2013 financial year. See the ASSA website for further details. ☆

Summary of ASSA Awards 2012

Deep-sky Section: Director, Auke Slotegraaf

Richard Ford was awarded the General Observer's Certificate for deep-sky observations submitted to the Section during the year 2012.

Andrie van der Linde received a Merit Award for deep-sky observations submitted to the Section.

George Dehlen, Louis Kloke, Percy Jacobs, Grant Thompson, Pat Kühn, Michael Poll, Andre de la Ponte and Craig Kloke received Merit Awards for deep-sky observations made during the year 2012.

Cosmology Section: Director, JF de Bruyn

Case Rijsdijk and Maciej Soltynski received Merit Awards in recognition for outstanding contributions to the Cosmology Section

Comet, Asteroid and Meteor Section: Director, Tim Cooper

The following people received General Awards for Observations of the events indicated. Mary Fanner for the gamma Normid and delta Pavonid meteor showers. Tony Jones and Karen Koch for the alpha Cantaurid meteor shower. Mike Begbie and Kos Coronaios for comets C/2009 P1 and C/2011 W3. Magda Streicher and Nigel Wakefield for comet C/2009 P1.

Presidential Awards 2012

Auke Slotegraaf was awarded the Long Service Award for his devotion of many years of service to ASSA in a variety of ways such as the *Sky Guide*, outreach and Deep-sky Section.

Citation: Auke Slotegraaf has devoted many years of service to ASSA and has always made himself available to help the Society. He has many times led the way in promoting outreach activities and has been the backbone of Deep-sky Observing in South Africa.

Auke was ratified as a new member on 8 April 1991 and has since taken on many roles. He was Editor of *MNASSA* in the

years 1994-2005 and Webmaster in 2004-6. He has been an Honorary Member since 2002 and a Presidential Award was made to him in 2006. He undertook the onerous task of editing the *Sky Guide* in 2003-5 and has been its Editor again since the 2011 edition.

He has contributed via his star charts, his constellation wheel chart and his webpage which contains a plethora of southern hemisphere astronomical information. Not content with just providing the basics, he has also included information about astronomers and has given detailed data about objects in an easily understandable way.

Willie Koorts got the Presidents's Award for all his hard work editing and setting *MNASSA* for many years.

Citation: Willie Koorts has made an enormous contribution to the ASSA over the years in a wide variety of ways. Since he joined the ASSA in 1990 he has been active in many outreach activities which include the local schools in both Wellington and Sutherland, talking at holiday camps, participating and helping in ASSA Star parties and every year he spends time with various Voortrekker groups. In addition he is always there to help sort out other people's telescope and other technical problems. He has also been a frequent presenter at the Annual ScopeX exhibition in Johannesburg, and he continues with these activities up to the present

In 2004 he took on the onerous task of editing and producing the ASSA Monthly Notes, *MNASSA*, which he handed over to the current editor at the end of 2010, but he continues as layout editor, a time consuming task. His work is always produced to the most exacting standards. ☆

New Director for SAAO

NRF press release, 12 July 2012

We are pleased to announce that Professor Ted (TB) Williams has agreed to join the NRF as Director: South African Observatory (SAAO) with effect from 01 January 2013.

Prof Williams brings with him a wealth of experience and knowledge which includes research in observational extragalactic astronomy and instrumentation development, as well as major leadership positions at the Southern African Large Telescope (SALT) and Rutgers University Department of Physics and Astronomy.

Prof Williams has served as Director of the Graduate Programme and Associate Chair of the Physics and Astronomy Department at Rutgers from 2002-2005 and again since 2010. He has also been involved in the development of SALT since its inception, serving on the Board of Directors since 1998 and as Chair since 2005.

His participation in SALT has allowed him to become familiar with the SAAO and its people, and South African astronomy in general. We believe that Professor Williams has the leadership skills and scientific vision to serve effectively as the Director of the SAAO.

We welcome Prof Williams to the NRF family and we are confident that the staff at SAAO, all the colleagues in the NRF and the astronomy community at large will support him in his exciting and challenging role. ☆

Sir Bernard Lovell (OBE FRS) – 1913-2012

Press release, edited

Sir Bernard Lovell, Emeritus Professor of Radio astronomy, died on 6 August 2012 at the age of 98. He was the founder and first Director of The University of Manchester's Jodrell Bank Observatory in Cheshire.

Born in 1913 in Oldland Common, Gloucestershire, Sir Bernard studied at the University of Bristol before coming to Manchester to work in the Department of Physics in 1936. During the Second World War, Sir Bernard led the team that developed H2S radar, work for which he was later awarded the OBE.

Sir Bernard returned to the Manchester Physics Department in 1945 and began work on cosmic rays using ex-military radar equipment. He brought this equipment to a University botany site at Jodrell Bank in late 1945, founding the world-famous Observatory which now exists here. Jodrell Bank is dominated by the 76-metre Lovell Telescope, conceived by Sir Bernard. He worked with engineer Sir Charles Husband to build the telescope which has become an icon of British science and engineering and a landmark in the Cheshire countryside.

A hugely ambitious project, the telescope was by far the world's largest when it was completed in 1957 and within days tracked the rocket that carried Sputnik 1 into orbit, marking the dawn of the space age. It is still the third largest steerable telescope in the world and a series of upgrades mean it is now more capable than ever, observing phenomena undreamt of when it was first conceived.

Today the Lovell Telescope plays a key role in world-leading research on pulsars, testing our understanding of extreme physics including Einstein's General Theory of Relativity. In 2011, Jodrell Bank Observatory was placed on the UK Government's shortlist for World Heritage Site status, recognising its unique role in the development of our understanding of the Universe.

The Observatory continues to play a key role in astronomical research. It is now home to the e-MERLIN array of seven radio telescopes spread across the UK. Based on the techniques of linking telescopes over long distances pioneered by the team which Sir Bernard assembled at Jodrell Bank, the network is now connected by a high-speed optical fibre network making it one of the most powerful telescope arrays in the world.

Later this year the international headquarters of the SKA Organisation will move to Jodrell Bank. The Square Kilometre Array (SKA) will be the world's largest telescope. Combining thousands of dishes and other receivers spread across thousands of kilometres, the SKA itself will be sited in Africa and Australia.

Over the last seven decades, many hundreds of scientists and engineers have worked and trained at Jodrell Bank, often going on to work at other observatories across the world. Jodrell Bank has also inspired generations of schoolchildren who have visited the Observatory to pursue careers in science, engineering and medicine.

In person, Sir Bernard was warm and generous. He is survived by four of his five children, fourteen grandchildren and fourteen great-grandchildren. He retained a keen interest in the development of science at Jodrell Bank and beyond. Indeed he continued to come in to work at the Observatory until quite recently when ill health intervened. Outside the world of science he was an accomplished musician, playing the organ at the Swettenham Church for many years. He was also a keen cricketer, captain of the Chelford Cricket Club and past President of the Lancashire County Cricket Club. He was also renowned internationally for his passion for arboriculture, creating arboretums at both The Quinta and Jodrell Bank itself.

Sir Bernard's legacy is immense, extending from his wartime work to his pioneering contributions to radio astronomy and including his dedication to education and public engagement with scientific research. A great man, he will be sorely missed.

President and Vice-Chancellor of The University of Manchester, Professor Dame Nancy Rothwell, said: "We are all greatly saddened by Sir Bernard's death. He was a towering figure, not just in Manchester or the UK, but globally. Sir Bernard leaves a fantastic legacy at the University's Jodrell Bank Observatory which is a world class centre for astronomy research, an iconic science monument and a centre that attracts thousands of visitors and inspires scientists of the future." ☆

UCT professor elected IAU Vice-President

Prof Renée Kraan-Korteweg, Chair of Astronomy and Head of the Astronomy department at the University of Cape Town has been elected Vice-President of the Executive Committee of the IAU at the 2012 General Assembly of the IAU in Beijing. Please join us in congratulating Renée on this election. ☆

Paardefontein Satellite Tracking Station 1965 – 1981

Greg Roberts *grr@telkomsa.net*

From an early date France was very active in space research. In 1961 the CENTRE NATIONAL D'ETUDES SPATIALES (CNES) was established by President Charles de Gaulle with headquarters in Paris, France and under supervision of the French Ministries of Defence and Research. Also in 1961, the Hammaguir missile range was established in Algeria, some 113 kilometres to the south east of Colomb-Bechar. Tests were conducted with various missiles, including the ballistic DIAMANT rocket which had satellite launch capability. The site operated until it had to be evacuated before 1 July 1967 and was replaced by the Guiana Space Centre in South America.

In order to track its own satellites, CNES set up several tracking stations: at Bretigny (France), Beirut (Lebanon), Brazzaville (Congo), Hammaguir (Algeria – transferred to Gran Canaria in 1967), Ouagadogou (Upper Volta) and South Africa. An agreement between the governments of South Africa and France was signed in January 1964 which allowed CNES to establish a tracking station on a 52.4 hectare site near Hammerskraal, some 45 km north of Pretoria, on a small farm called Paardefontein.

Sign at entrance to the Tracking Station – admittance was by appointment only. Picture: Greg Roberts, Easter 1966.

The first personnel arrived April 1965 to operate the already installed DIANE system. This was a French

Part of the DIANE interferometer (the French equivalent of the United States MINITRACK). This operated in the 136-138 Mhz radio frequency band and was used to determine the orbit of a satellite using the satellites onboard radio transmitter. Picture: Greg Roberts, Easter 1966.

version of the United States MINITRACK interferometer setup to track transmitting satellites (only American at this time). It uses the principle that if plane wavefronts are intercepted and detected at two antennas separated by a baseline, one can use the phase difference between the two signals and baseline separation to determine the direction to the satellite. In order to resolve quadrant ambiguities the interferometer consisted of an array of four antennas in a north/south/east/west configuration.

Thursday, 29 April 1965 marked the day it received its first analogue telemetry from the US BEACON EXPLORER C satellite (65032A). During 1965 the station was expanded with extra staff and in September 1965 the IRIS telemetry and telecommand antenna system was installed. This antenna received transmissions in the 136-138 MHz band and could transmit telecommands on about 149 MHz, standard frequencies used at that time.

The IRIS antenna – a large array of eight cross-axis yagi antennas used to receive telemetry from satellites operating in the 136-138 Mhz radio band. In addition, commands could be transmitted to the satellite on a frequency close to 148 Mhz. The entire array could be moved in azimuth and altitude to any part of the sky and could follow the satellite as it passed over the station. Picture: Greg Roberts, Easter 1966.

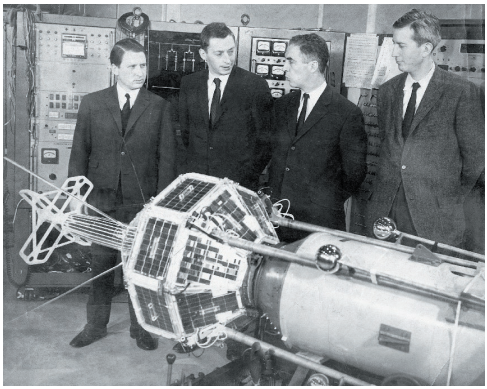
The tracking console used to control the IRIS antenna. The two circular dials on the left of the console displayed the azimuth and elevation of where the array was pointing. Above the dials is the digital clock display. Source: http://nospremieresannees.fr

France became the third nation after the USSR and the US to achieve the capability of launching its own satellites. On 26 Nov 1965, from their Hammaguir launch site, a three-stage DIAMANT rocket placed the A-1 ASTERIX satellite into orbit. It transmitted a weak signal for 2 days before becoming silent. This was followed by the D-1A DIAPASON satellite on 17 Feb 1966. It was also launched by a Diamant rocket from Hammaguir and carried out geodetic research. An Internet article states that: "formal inauguration took place on 12 Nov 1965 when signals were received from the A-1 satellite". However, this cannot be correct as the A-1 satellite was only launched from Hammaguir on the 26 Nov 1965.

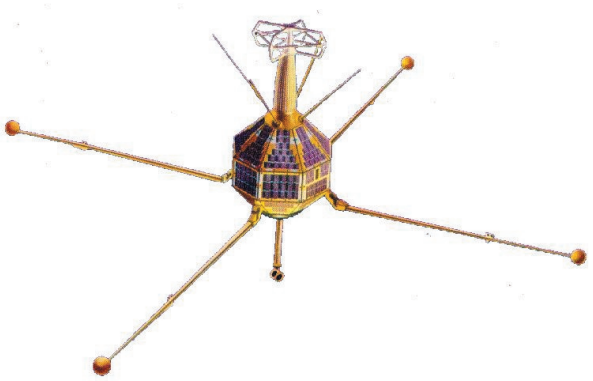
A historical landmark occurred on 6 Dec 1965 when signals were received from the French FR-1 satellite, some 40 minutes after launch from California, by the USA on a Scout rocket. This satellite conducted ionospheric studies until it ceased transmitting on 28 Feb 1969.

Predictions were supplied to Paardefontein by telegraph from the Space Centre, Bretigny, France. In return, Paardefontein supplied magnetic tapes and graphics data recordings of the radio signals received.

In March 1968 the agreement between South Africa and France was expanded to allow the release of scientific balloons to test the capabilities and behaviour of high pressure balloons that would be used in the future EOLE project. A large



The FR-1 satellite, attached to its upper stage, being testing in the laboratory. Solar cells can be seen attached to the body of the satellite. Source: http://fr.wikipedia.org/wiki/Programme_spatial_français



Drawing of the FR-1 satellite as it looked in orbit. Source: http: //centaur.sstl.co.uk/SSHP/micro/micro60s.html

building was erected in which balloon payloads could be prepared and the balloons inflated. An extra office was added and two Racal receivers installed to track the signals from the balloons. The first balloon launch occurred on 10 May. A total of 22 balloons were launched of which several had a life time of more than 100 days.

On 16 Aug 1971 the French EOLE satellite was launched from the Wallops Island launch facility in the United States, using a Scout rocket. The satellite was also known as CAS 1 (Co-operative Application satellite) and as FR-2. It was an experimental data relay satellite, used to receive meteorological data such as pressure, temperature and upper atmospheric wind velocities from 500 balloons, launched from Argentina in South America, circling the Earth above the southern hemisphere. The satellite maintained the balloons at a constant internal pressure of 200 mbar which allowed them to fly at an altitude of about 12 000 metres where temperatures ranged from +20 deg C to -80 deg C.

The satellite transmitted data on a frequency of 136.350 MHz which also served as a tracking beacon. Telecommands were transmitted from the ground to the satellite on an uplink frequency of 148.25 MHz, whilst the satellite in turn transmitted to the balloons on a frequency of 464.84 MHz and received data back on 401.7196 MHz. The experiment was judged a success even though there was an early destruction of 89 balloons due to an incorrect ground command. The last balloon transmitted until January 1973, after which the satellite was used to track and receive data from icebergs, ships and ocean buoys.

The station was managed by Robert Guedj, from 1964 until the station closed down on the 31 July 1980. Originally born in Algeria, Robert moved to South Africa in 1964 where he joined SODETEG which was the company that operated the station for CNES. In April 1973 the agreement between South Africa and France was changed to allow the CSIR to operate the station on behalf of CNES. The CSIR took over the station with Robert remained as operations manager.

Robert Guedj – station manager from 1964 until the station closed down on 31 July 1980. Source: http://nospremieresannees.fr

When Paardefontein finally closed down he transferred to the Haartbeesthoek Tracking facility. Up to this stage the station had been manned by staff that could speak French. In January 1974 the CSIR appointed Jack Goddard, former assistant station manager at the Hartebeesthoek Deep Space Tracking facility (now HartRAO), as operations manager at Paardefontein.

After 15 years of operation it became necessary to upgrade the tracking station as the frequencies used for scientific satellites was moved from 136-138 MHz (VHF) to the much high frequency of 2200-2300 MHz (S-band). This was necessary to allow satellites to use much wider bandwidths for the transmission of data. In Sept 1980 it was decided that, at the end of that year, tracking operations would be transferred to the Satellite Remote Sensing Centre (SRSC) at Hartbeesthoek. Nearly all station personnel that had been employed from France returned except for two staff members who had married South African girls and elected to join the CSIR. From January to July 1981 Paardefontein was kept operational under Guidj with a reduced staff to support the delayed launch of the Ariane II rocket. This finally took place in June 1981 after which the site

The "tracking" centre. The IRIS control console can be seen in the centre of the picture. The racks on the left monitored the telemetry/ data received from the satellite. In the foreground is one of the terminals and next to it is a radio teletype (RTTY) used to receive prediction data. All data received was recorded and sent to France. Source: http://nospremieresannees.fr

was closed and all remaining staff transferred to SRSC.

The balloon infrastructure however was retained, and used until 1989. This was the most active period as regards balloon activities. A new type of balloon was developed in France, called MIR (Mongolfier Infra Red) which was able to carry out much longer duration flights. These balloons were launched from South America to stratospheric altitudes and drifted in a more or less straight line around the earth, passing over Argentina, Southern Africa and Australia. They were highly reflective on account of their metallic coating and on a clear day could be easily seen with the naked eye from as far away as 130 kilometres, giving rise to numerous UFO reports.

I recall one incident in Cape Town when the SAAO started to get reports of a bright light hovering in the sky in the direction of Muizenberg. I eventually went outside to check and sure enough there was a bright slow-moving object. I used the 6-inch refractor and had a look at it and could clearly see the balloon shape and the instrument package above it (the telescope gave an inverted image, so everything was "upside down".)

When satellite tracking ceased, the facility was taken over by the CSIR and converted into a radar antenna test range at the request of ARMSCOR under the direction of Dr Dirk Baker who was then employed by the CSIR. The facility was subsequently adapted to cover a much wider radio frequency coverage and became known as the National Antenna Test Range (NATR). Dr Baker is considered the founder of this facility and although now retired, still plays an active role. The facility was then taken over by a private company, still under contract to ARMSCOR. Since 1994 NATR has been managed and operated by Gerotel Test Facilities under ARMSCOR contract. ☆

References:

In compiling this report I obtained most of the information from the Internet from numerous sites.

The most useful one, with numerous photographs, was http://nospremieresannees.fr/reseauops/05-pretoria/entree_pretoria.html

Other sites were: http://dirkbaker.com/ http://www.paardefontein.co.za/ http://en.wikipedia.org/wike/CNES http://stratocat.com.ar/bases/51e.htm

A large collection of recordings of satellite signals, containing most of the active satellites active in the period covered by this article, may be found at http://www.dd1us.de/spacesounds 4.html

As may be noted I contributed many of the signals as a result of my radio satellite tracking activities during this period.

Astronomical 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, NASSP and the Astrophysics, cosmology and Graviuty Centre at UCT, ACGC. Also included 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.

Editor.

SAAO

Title: IC4663, The First Unambiguous [WN] Wolf-Rayet Central Star of a Planetary Nebula

Speaker: Brent Miszalski (SALT postdoc)

Date/time: Thursday 21 June 2012 at 12:00

Venue: SAAO Auditorium

Abstract: Several [WC]-type central stars of planetary nebulae (PNe) are known to mimic the spectroscopic appearance of massive carbon-rich or WC-type Wolf-Rayet stars. In stark contrast, no [WN]-type central stars have yet been identified as clear-cut analogues of the common nitrogen-rich or WN-type Wolf-Rayet stars. Previous [WN] candidates either cannot be proven to be low-mass central stars or may belong to a hybrid [WN/WC] class. We have identified the [WN3] central star of IC4663 to be the first unambiguous example in PNe. The exceptionally faint nucleus and an asymptotic giant branch (AGB) halo surrounding a nebula typical of PNe prove the bona-fide PN nature of IC4663. Model atmosphere analysis with CMFGEN reveals an exotic chemical composition of helium (95%), hydrogen (<2%), nitrogen (0.8%), neon (0.2%) and oxygen (0.05%) by mass. Such an extreme helium-dominated composition cannot be predicted by current evolutionary scenarios for hydrogen deficient [WC]-type central stars. A binary merger origin may be an alternative explanation. The strong match between IC4663 and the O(He) central stars requires a second H-deficient and He-rich evolutionary sequence, [WN]->O(He), to exist in parallel to the [WC]->PG1159 sequence. There may be connections to other H-deficient/He-rich objects including R Coronae Borealis stars and AM Canum Venaticorum stars.

Title: Commissioning the New Sutherland High-Speed Optical Camera (SHOC)

Speaker: Rocco Coppejans (SAAO)

Venue: SAAO Auditorium

Date/Time: 26 July 2012 at 11:00

Abstract: Based on two existing instruments POETS (Souza et al., 2006, PASP, 118, 1550) and MORIS (Gulbis et al. 2011, PASP, 123, 461), two new instruments, SHOC (the Sutherland High-speed Optical Cameras), have been developed for use on the SAAO 1.9-m, 1.0-m and 0.75-m telescopes at Sutherland. The aims of the instruments are twofold: first to replace older generation instruments currently in use and secondly, to provide users with new capabilities that are not currently available. Each SHOC system consists of a camera, GPS, control computer and peripherals. The primary components are two, off-the-shelf Andor iXon X3 888 UVB cameras, each of which utilises a 1024x1024, frame transfer, thermo-electrically cooled, back-illuminated CCD. Some of SHOC's features include a moderate field of view (ranging from 1.3 arcsec on the 1.9-m to 3.7 arcsec on the 0.75-m), high frame rates (between one and a hundred frames per second, dependent on binning and subframing), frame-by-frame GPS triggering, high quantum efficiency (> 90% from roughly 480 nm to 700 nm), low read noise, and negligible dark current. Users also have the freedom to choose from a range of custom settings in order to optimise observations. These settings include different readout amplifiers: 1 MHz (16 bit) and 3 MHz (14 bit) in conventional mode or 1 MHz, 3 MHz, 5 MHz, and 10 MHz (all 14 bit) in electron multiplying (EM) mode, with each amplifier having multiple gain conversion settings. More options include custom subframing and binning. A unique capability is the choice of operation in either conventional or EM mode. While operating in EM mode, photoelectrons undergo impact ionisation before read out, resulting in the observed signal being strengthened without increasing read noise. This effectively reduces read noise to sub-electron levels, allowing a significant increase in data quality for low-light applications. Here, we will present the instrument, characteristics, work that has been completed during the commissioning phase, development plans, and SHOC's applications to different fields of astronomy.

Title: Sutherland Seeing Monitoring Status and Adaptive Optics for SALT

Speaker: Laure Catala, PhD student (UCT/SAAO)

Date/Time: 8 August 2012 at 11:00

Venue: SAAO Auditorium

Abstract: Since the latest site testing campaign in 2000, prior to the construction of SALT, no regular measurements of seeing conditions at the Sutherland site were carried out. In early 2010 we set up and starting operating a MASS-DIMM (multi-aperture scintillation sensor - differential image motion monitor) instrument which is

now automated and is running every night SALT is operating. In addition, to provide all observers on the plateau with the current seeing conditions, the extensive amount of data acquired over the last two years constitute a highly-valuable statistical sample in order to extract general trend and profiles of the atmospheric turbulence. Those results can then be used to implement simulations in order to determine the best configuration and expected performances of an adaptive optics (AO) system on SALT. In this talk I will give a brief update on the current status of the Sutherland seeing monitoring instruments, as well as an overview of the seeing conditions measured over the past two years. I will then present the preliminary results on the dimensioning and expected performance of an AO system on SALT. I will conclude with ongoing and future work and would like to request some input from you, as SALT users, seeking to determine which system would bring the most benefits to SALT science output.

Title: Science as a Service: Institution as Platform

Speaker: Dr Cameron Neylon, Director of Advocacy, Public Library of Science

Date/Time: 13th August at 11:00

Venue: SAAO Auditorium

Abstract: It comes as a surprise to many computational researchers that they are viewed with great envy because "obviously" their work must be easily repeatable, much more straightforward to document, and trivial to roll back when you realise you've done something wrong. Experimentalists, in turn are usually shocked to discover that they are held up as examples of the very highest standards of reproducibility by computational researchers. Both views result in part from a "grass is greener" perspective and a lack of appreciation of the fact that the weaknesses in the research process, whether it is poor documentation, a lack of reproducibility, or the problem of transferring results to new systems, are fundamentally human weaknesses. But if the worst examples of both computational an experimental research have strong parallels, then the best aspects of both can provide inspiration to the other. What is unit testing but the running of a fabulous set of controls? Could continuous integration teach us how to continually test new research results against the existing body of knowledge? And what do the best standards of scientific writing have to tell us about good software documentation? These parallels also help us to ask questions about the architecture of the research enterprise - the success of agile development approaches, modularity, and "many parts-loosely coupled" are examples that can and should guide our thinking about the structure of effective research communities. Pursuing this view to its logical conclusion takes us into uncomfortable territory, does modularisation, the easy interchange of one research group for another suggest a grey homogeneity, or a riot of APIs and

services that an interoperate but do not necessarily have to agree? I will propose that viewing researchers as service providers provide a new way of guiding our thinking for both how we manage and fund but also how we do research, and in turn, how we should think about the platforms, the institutions, that these services run over.

ACGC

Title: Evolution of Protoplanetary Discs: Formation of our Dry Earth
Speaker: Rebecca Martin (STSCI)
Date/Time: Friday 22 June 2012 at 12:00
Venue: M304, Maths Building, UCT
Abstract: We describe the evolution of a protoplanetary disc from the initial accretion infall to FU Orionis outbursts to the formation of planetesimals. Protoplanetary discs are thought to contain a dead zone - a region without turbulence (or viscosity) that prevents free flow of material through the disc. Fully turbulent disc models cannot explain the formation of our dry Earth at its current location because the snow line moves inside its orbit. However, if the disc contains a dead zone we show that the snow line is further out and the Earth can form from water devoid planetesimals.

Title: Connecting Cosmology and Collider Physics
Speaker: Robert Poltis
Venue: M111, Maths Building, UCT
Date/Time: 7 August at 13:00
Abstract: The addition of higher order non-renormalizable terms to the Standard Model Higgs potential offers interesting prospects for the evolution of the universe. For a certain range of parameters, the usual second order electroweak phase transition is followed by a first order phase transition that might drive the late time accelerated expansion of the universe. The explicit connection to cosmology allows such a model to in principle be tested in both collider experiments and cosmological experiments such as gravitational wave measurements.

Title: Phenomenological Aspects of f(R) Theories
Speaker: Jose A. R. Cembranos, Universidad Complutense de Madrid, Spain
Venue: M111 (Maths Building, UCT)
Date/Time: Tuesday 14 August 2012 at 13:00
Abstract: Gravitational theories have received increased attention during the last years. The last observational cosmological advances have inspired a large number of theories attempting to explain them. The f(R) theories, whose action depends on a general form of the scalar curvature are nowadays alternative candidates to a better understanding to Einstein's General Relativity. In this framework, I will review some aspects of these theories paying particular attention to the chameleon mechanism, dark matter,

gravitational collapse, black holes and focusing theorem.

Astro-coffee

Title: The Effect of Cosmic Rays on Astronomical Images and Spectra at Sutherland

Speaker: John Menzies

Date/time: Thursday 5 July 2012 at 11: 00

Venue: SAAO Auditorium

Abstract: Cosmic rays are a nuisance for CCD imaging, whether direct or spectroscopic. I was surprised at the apparently high cosmic ray rate on some MOSS spectra, so I conducted some tests to determine the actual rates at SALT. I will discuss results obtained for cosmic ray rates in RSS and SALTICAM on SALT, and what to do about cosmic rays in data. I will compare the rates with those for CCD cameras on the 1.0-m and 1.9-m telescopes.

Title: Some Highlights from the 2012 SPIE Astronomical Telescopes & Instrumentation Conference

Speaker: Dr Lisa Crause, SAAO

Date/Time: Thursday 19 July 2012 at 11:00

Venue: SAAO Auditorium

Abstract: Every two years, SPIE (the Society of Photo-optical Instrumentation Engineers) hosts a conference on Astronomical Telescopes & Instrumentation. The 2012 meeting, held in Amsterdam during the first week of July, drew 2 300 attendees & the exhibition area featured 91 companies. Of the hundreds of talks, posters & exhibits presented over the six days, I will share some of the highlights drawn from the subset of presentations that I managed to take in. These include status updates on the three ELTs, the JWST, the phenomenal LSST project, news from various existing telescopes, exciting new instruments & various novel technologies.

NASSP

Title: A Journey Through the Natural Freezer

Speaker: NASSP Alumni Nicholas Ssessanga

Venue : RW James Lecture Hall D

Date/Time: 15 August 2012 at 13:00

Abstract: Antarctica is one of the most difficult places to describe when it come to beauty. The expedition to this continent is a story filled with so much emptiness but with a lot that touches your heart forever. This continent is the world's largest natural freezer with no contamination at all hence the perfect place for any scientist to carry out the desired experiments. This talk will describe the experience by the first Ugandan to visit Antarctica from the South African National Space Agency (SANSA) and the kind of work that was carried out while at the SANAE (South African National Antarctica Expedition) IV base. ☆

The Proud Indian

by Magda Streicher
magdalena@mweb.co.za

Image source: Stellarium.org

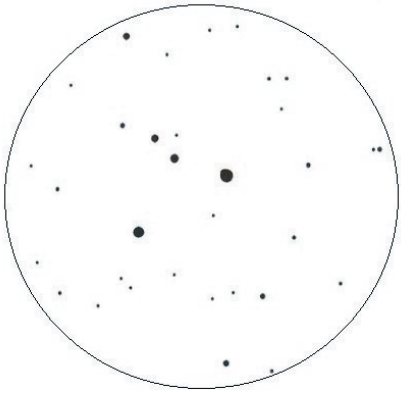
What an honour to represent your nation against the stars in the heavens as one of the newer constellations, Indus, which, as many people know, is named after the American Indians. In China it has also been known as The Persian, a title from the Jesuit missionaries (*Star Names Their Lore and Meaning* – Allen).

This faint constellation is located between the two magnificent starry birds Grus and Pavo. The word "colourful" is synonymous with the American Indians as reflected in their traditional clothing. The constellation was named by Pieter Dirkszoon Keyser. Frederick de Houtman mapped the southern sky during an expedition to the East in about 1596.

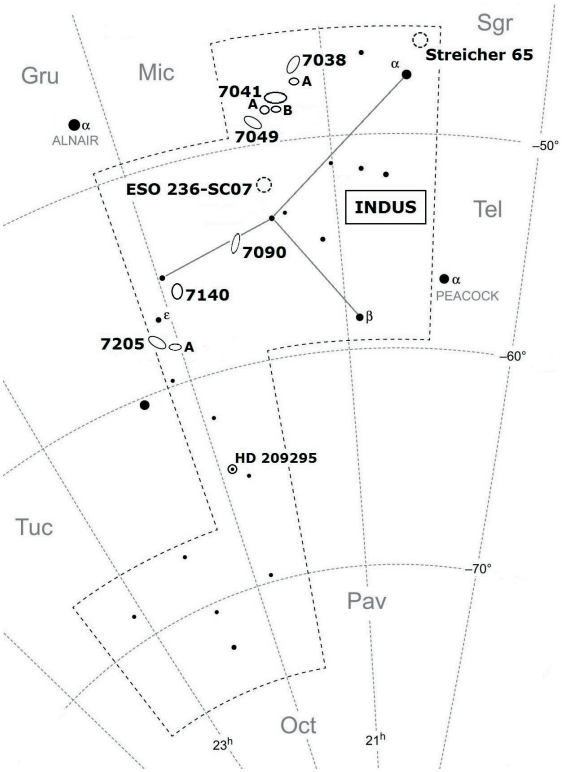
The author's faithful Streicher asterisms are always a blessing to fall back on. **STREICHER 65** is situated 2° north of the magnitude 3 orange-coloured alpha Indi, which could indicate the head of the Indian figure. The asterism displays an elongated handful of varied-magnitude stars with the brightest magnitude 8.2 (GSC 8406808) to the south-east, which may also be a triple star (see sketch). The stars form an upside down *Y* which can be seen very clearly with higher magnification.

Indus is also one of those constellations containing a large number of galaxies. **NGC 7038**, the first of many, can be found in the north-eastern corner. The galaxy is immediately seen as

Streicher 65 - Asterism - Indus



a relatively bright oval in a north-west to south-east direction, displaying a star-like nucleus. Higher magnification however, removes the star-like appearance and one is left only with a slight brightening towards the middle. A lovely magnitude 11 buttery-yellow-coloured star can be seen towards the north of the galaxy.



If you are brave and are looking for a challenge, seek out the companion galaxy **NGC 7038A** just 22' to the south. Together with the two galaxies, a lovely triple star completes a triangle to the north-east with colours ranging from yellow to orange.

A degree further south reveals a cluster of galaxies. **NGC 7041**, the northern galaxy, which is quite outstanding against the star field, displays a lovely, very elongated east-west oval with a misty edge. **NGC 7041A** which is situated 12' towards the east was just suspected as a drop of haze, but I could not detect the companion sibling **NGC 7041B** on the western edge. In the field of view there is another galaxy named ESO 235-84, but you need a star map and very dark skies to locate it.

A further 27' towards the south-east the galaxy **NGC 7049** can be found. It is the brightest galaxy of the group with a magnitude of 11.2, displaying a relatively bright oval in a north-east to south-west direction quite outstanding against the star field (see astrophoto).

Indus lacks known objects like globular clusters and planetary nebulae, but there is one lovely open cluster, **ESO236-SC07**, which the Indian man appears to be holding against his chest. This bundle of joy is situated 1.7' north of theta Indi, quite outstanding with more than a handful of various colour stars. Two parts attract the attention

NGC 7049 by Dale Liebenberg

immediately. First there is the northern part, consisting of an outstanding half-moon shape running from north-west to south-east, including the brightest magnitude 6.7 (HD 203021). Secondly, the stringy southern part of the grouping in combination creates a shape excellently resembling a hang-glider. Have a look and see what picture or shape crosses your mind as you look at these stars.

Now shift your attention to the magnitude 4.4 star theta Indi, which is situated more or less in the middle area of the constellation. The double star displays lovely smoky white and orange colours. The system has been previously labelled as "multiple" in the *Hipparcos Input Catalogue*.

One of the brightest galaxies in Indus can be found halfway between theta and delta Indi. **NGC 7090** is a beautiful, bright, large and very elongated galaxy in a north-west to south-east direction, and is actually a barred galaxy seen edge-on. It displays a sudden brighter nucleus, although not outstanding. The more slender north-western point seems slightly brighter than the fatter and hazier south-eastern edge. A lone magnitude 12 star towards the southern part of the galaxy stands out, underlining this rather beautiful, very long spindle. However, field stars draw the attention towards the northern field of view.

Appearing to be showing due deference, the galaxy **NGC 7140** takes its position at the Indian's feet a degree

south-west of delta Indi among faint field stars. The galaxy displays a soft north-south hazy oval with a nucleus slowly getting brighter, but not outstanding. A prominent triangle of yellow-coloured stars overpowers the southern view of the field. RNGC does not list this as a galaxy, but indicates it as possible non-existent. This is one of John Herschel's discoveries during his stay at the Cape of Good Hope in 1834 to 1838. Feedback from Auke Slotegraaf indicates that Herschel observed NGC 7140 (h3892) and 7141 (h3893) on two consecutive nights. The former he described as pretty faint, round, gradually brighter in the middle; and the latter as faint, large, round first gradually, then pretty suddenly a little brighter in the middle. For NGC 7140 he recorded a declination of DEC -57°20'25" (50' north-west of pi Indi, but the position indicating a lovely orange double star) and for NGC 7141 recorded DEC -56°21'52". He commented that it is not improbable that NGC 7141 and NGC 7140 are identical, one or the other being mistaken one degree in polar distance. Still, as both observations are clearly written, and as the difference in polar distance of 1'28" is rather considerable even then, it is necessary to enter them separately. Paturel et al. (1991) note that NGC 7140 = NGC 7141.

Let's now talk about epsilon Indi, which shines with a magnitude of 4.7 and is situated along the western edge of the constellation, 2° south of delta Indi. This faint star is located only 11.8 light-years away, the 17th closest, and racing across 5" in a year towards the constellation Tucana. It has now been discovered that epsilon Indi also harbours a family with a binary pair of brown dwarfs close to it. Another star in the constellation, magnitude 6 rho Indi, also harbours a possible planet at least twice the size of Jupiter.

Barely a degree further south, and virtually on the boundary between Indus and Tucana, the galaxy **NGC 7205** and its companion **NGC 7205A** can be traced down, with one galaxy apparently in Indus and the other in Tucana. NGC 7205 is relatively bright and uneven in texture, elongated north-east to south-west and gradually brighter towards the nucleus. The north-eastern tip is perhaps slightly thinner than the slightly blunt south-western point. It was discovered by Herschel at the Cape of Good Hope, one of the five brightest members of the Pavo-Indus group of galaxies. The companion member, NGC 7205A, is situated just 8.5' towards the west, which I suspect as a diffuse spot with averted vision. Towards the south of the galaxies the star field is rather busy with varied-magnitude stars.

The far southern part of the Indus constellation is crowded with galaxies which spill over the boundary into the constellation Tucana. A special star,

however, in the middle of this galaxy colony is **HD 209295**. A South African team has discovered that this star pulsates in two completely different ways at once – at least 11 different frequencies, nine of them relatively slow (1–3 cycles per day) and two much faster vibrations (about 14–26 cycles per day). The reason is that an invisible companion star orbits each other every 3 days (*MNASSA*, December 2001).

Some time ago, when I visited a nature park in South America, my path crossed that of the true American Indian people. I vaguely remembered then that there is a constellation referring to them in the starry skies, but never thought that I would someday be able to write an article on the now well-known Indus constellation. ☆

Object	Type	RA (J2000.0)	Dec	Mag.	Size
Streicher 65	Asterism	20^h32^m5	-45°18′	11	3.5′
NGC 7038	Galaxy	21 15 2	-47 13	11.6	3.2′x1.6′
NGC 7038A	Galaxy	21 15 4	-47 37	13	1.1′xo.6′
NGC 7041	Galaxy	21 16 5	-48 22	11.2	3.3′x1.4′
NGC 7041A	Galaxy	21 18 3	-48 24	13	1.6′x1.3′
NGC 7041B	Galaxy	21 17 8	-48 24	14	0.3′x0.3′
NGC 7049	Galaxy	21 19 3	-48 34	10.7	4.3′x3.2′
ESO 236-SC07	Open Cluster	21 21 5	-51 49	9.1	30′
NGC 7090	Galaxy	21 36 5	-54 33	10.7	8.1′x1.4′
NGC 7140/41	Galaxy	21 52 2	-55 34	11.9	3.0′x1.4′
NGC 7205	Galaxy	22 08 5	-57 25	11.2	3.7′x1.9′
NGC 7205A	Galaxy	22 07 5	-57 27	13.5	1.2′x0.8′
HD 209295	Star	21 36 5	-54 33	7.3	*

astronomical society of southern africa

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 own electronic journal, the *Monthly Notes of the Astronomical Society of Southern Africa (MNASSA)* bimonthly and an annual printed *Sky Guide Africa South*.

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

Local Centres: Local Centres of the Society exist at Bloemfontein, Cape Town, Durban, Harare, Hermanus, Johannesburg, Pietermaritzburg (Natal Midlands Centre), 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 Centre membership required) . Please contact membership secretary for details.

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