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mnassa

monthly notes of the astronomical society of southern africa
Vol 70 Nos 9 & 10 October 2011

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monthly notes of the astronomical society of southern africa

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subscriptions

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contributions

Contributions for the respective issues should reach the editorial address by the due dates below.

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Vol 70 Nos 11 & 12 (Dec 2011 issue), 01 Nov 2011
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recognition

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

Phil and Anne Charles waving good-bye

It was with a royal wave from a *Karoo stage coach* that Phil and Anne Charles greeted the Sutherland staff during a farewell function held in their honour on 31 August 2011 in Sutherland. This donkey cart drive was the culmination of a fun-filled series of events, put on by staff to bid the "royal couple" good-bye after their seven year tenure in South Africa. See article on p.185. Image credit: Lisa Crause

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assa news

Dr Darragh O'Donoghue receives the Gill Medal

The Gill Medal of our Society, its highest honour, is awarded for exceptional services to astronomy, particularly in Southern Africa.

It was announced at the Annual General Meeting of ASSA, held in Pretoria on 3 August, that Council had decided to award the Medal this year to Dr Darragh O'Donoghue of the SALT project. The actual hand-over of the Medal took place on 10 August at the Annual General Meeting of the Cape Centre, held at the SAAO.

In introducing Dr O'Donoghue to the meeting, Dr Ian Glass, President of ASSA, mentioned that he had contributed to the success of SALT in two very different ways. Firstly, his unique optical design had greatly increased the capability of the telescope compared to the prototype, the Hobby-Eberly telescope in Texas, USA, by greatly increasing its field of good definition. Secondly, Dr O'Donoghue and his team had saved the SALT project from disaster by diagnosing and correcting deficiencies in its mechanical design that had caused its actual optical performance to be unexpectedly poor. A lengthy process of checking, measurement and remedial action had eventually brought the telescope to its full potential.

The following citation was read:
The Southern African Large Telescope (SALT) is an evolution of the Hobby-Eberly Telescope (HET) at McDonald Observatory in Texas, USA. Arguably the key component of both SALT and HET is

Dr Darragh O'Donoghue (right) receiving the Gill Medal from ASSA President, Dr Ian Glass during the Cape Centre AGM. Image courtesy Maciej Soltynski.

the Spherical Aberration Corrector (SAC) which enables light from the spherical primary mirror to be brought to a sharp focus. Dr Darragh O'Donoghue re-designed and greatly improved the original HET SAC design enabling it to optimally utilize the entire collecting surface of SALT's primary mirror and positioning the focal plane in a moreadvantageous position for the associated instrumentation. In particular, the SALT SAC has more than four times the field of view of the HET SAC and a significantly better theoretical image quality across the entire field.

The Gill Medal was first awarded in 1956 to Harold Knox-Shaw, who brought the Radcliffe observatory to South Africa. It was designed by the noted Pretoria sculptor, Peter Kirchhoff, who was President of ASSA in 1954-55.

During the commissioning of SALT it became apparent that the image quality (IQ) varied over the field of view (it exhibited a focus gradient and other variable image defects). Dr O'Donoghue initiated and led the investigation into the identification of the causes of the IQ problem and subsequently set-up and led a team of scientists, engineers and technicians to address and correct the problem. This investigation required identifying the source of the IQ problem (the SAC), its cause (very poor mechanical design of the SAC mounting to the telescope) and its correction (a kinematic mount following complete disassembly, testing and re-alignment of the SAC mirrors). On 29 August 2010 Dr O'Donoghue was able to announce that the IQ problem had been successfully solved. Not only did this mean that SALT would be able to operate within its design parameters, but it also showed that South Africa has the capacity, and ability, to successfully design, and maintain scientific equipment of the highest technological demands. In addition this entire process has led to a better understanding of the SALT spherical mirror paradigm and how it operates.

Dr O'Donoghue's ability, dedication and outstanding efforts in designing and maintaining the SAC and leading his IQ team to this result should be recognised and loudly applauded by the South African scientific community and makes him a very worthy recipient of the Gill Medal.

In thanking the Society for its award, Dr O'Donoghue drew attention to the support he had received from the other team members. ☆

The 2011 ASSA Annual General Meeting (AGM) took place in the Auditorium of the Christian Brothers College, Mount Edmund, Pretoria Road, Silverton, Pretoria on 3 August 2011. The following Council and Section reports were presented.

ASSA Council Report 2010 - 2011

M Poll

Membership for 2010 - 2011

As of 16 July 2011 the membership of the national body stood at 241 including 13 Honorary Members. However the total number of members will now be revised upwards, considering that, under the new Constitution every paid up member of a Centre is a member of ASSA.

At its meeting on 25 June 2011, Council accepted the nomination of ASSA Auditor, Ronnie Glass for Honorary Membership of ASSA.

Council Meetings

The ASSA Council has met seven times during the current year. All the meetings were held at the War Museum in Johannesburg, and thanks are due to Lerika Cross for arranging this venue. A number of Council members attended via Skype and this form of attendance was generally successful. The average attendance was just over 7 persons per meeting.

A number of Skype conferences were held in between meetings, particularly in connection with the drafting of the new Constitution.

Council Persona

At the 2010 AGM no nominations for the posts of Secretary, Business Manager and Membership Secretary had been received. Both AJ Nel and Lerika Cross offered their services in the post of Secretary. After discussions after the AGM, Lerika Cross' offer was accepted. The nomination was ratified at the ASSA Council meeting of 21 August 2010.

Johan Smit offered to take over as Membership Secretary, and this appointment was also ratified at the 21 August Council meeting. The fact of Lerika Cross and Johan Smit taking over specific portfolios left two vacancies for members without portfolios - Adv AJ Nel and Auke Slotlegraaf were subsequently co-opted into these positions.

The position of Business Manager was left open, pending the results of the negotiations with Struik publishers for Struik to market and distribute the *Sky Guide*, and the pending decision about making *MNASSA* an electronic publication. If Struik were to market and distribute *Sky Guide*, and *MNASSA* became electronic, most of the Business Manager's tasks would become

redundant. In the event, the position remained unfilled.

Isobel Bassett finalised administrative loose ends with respect to the 2010 Edition of *Sky Guide* and Council conveys its grateful thanks to Isobel for the work she did. Maureen Rogers' assistance in the hand over of the membership list to the new Membership Secretary is also noted.

During December 2010, both the Membership Secretary and the Treasurer tendered their resignations from Council. Council thanks both Johan Smit and Rynhardt van Rooyen respectively for their input while on Council. Ian Glass and AJ Nel offered to take over as Membership Secretary and Treasurer respectively. Their offers were formally accepted at the Council meeting of 5 February 2011. It should also be noted with thanks that, when the post was vacant, Johan Retief of the Hermanus Centre offered his services as Membership Secretary

Constitution

In February 2011 the Council of ASSA mandated a task team to review and revise the ASSA Constitution which was last revised in 1979 amendments at various times since then, with the last revision being in 2004. The task team comprised Michael Poll, Ian Glass, Chris Stewart, Lerika Cross and AJ Nel. The final draft was submitted for a ballot of ASSA members and the draft was accepted for implementation. The new Constitution was effective from 25 June 2011.

In the new Constitution there were fundamental changes from the previous version, and Council has in the past few weeks been implementing these changes. It is hoped that the new Constitution at least addresses the problem of confusion about joining two separate but overlapping entities viz. the ASSA national body and the local Centres.

Thanks are due to the task team members for the time, trouble and travel that they expended in this exercise.

It has been noted that there are some aspects of the new Constitution that could be amended, and it is suggested that these be attended to before the next AGM.

***Sky Guide* Editor**

In November 2010, members of the Editorial Board held discussions with Wayne Trow, the Editor of the 2011 Edition of *Sky Guide Africa South* and were informed, *inter alia*, that Wayne Trow could not make a commitment for more than one year further. Accordingly, because of the concerns about continuity, the Editorial Board members approached Auke Slotegraaf to ask if he would consider resuming the Editorship, and Auke accepted, indicating that he would be prepared to make a commitment for longer that one year. Council accepted his appointment as Editor at its meeting of 5 February 2011.

***Sky Guide* Assistant Editor**

In July 2011 Maciej Soltynski advised Council that he would like to step down as

Assistant Editor of *Sky Guide Africa South* [SGAS] with immediate effect.

In late 2002 / early 2003 Maciej envisioned a much improved version of the Society's Handbook and to this end he approached Auke Slotegraaf, then editor of *MNASSA* and Auke was enthusiastic about the idea. The two of them approached the ASSA Editorial Board, who gave them their blessing, and thus *Sky Guide Africa South* was born.

Maciej has given freely and generously of his time and expertise to three *SGAS* Editors, with whom for eight years he worked in a spirit of partnership, teamwork and mutual agreement, on tasks ranging from the time-consuming and tedious but essential proof-reading, to content and layout and other related matters.

When the first Editor resigned unexpectedly, and when it appeared that no volunteer replacement was forthcoming, it was Maciej who suggested that the *Sky Guide* Editor should be financially compensated for the services rendered in editing and producing the publication. The implementation of this proposal has ensured continuity in the Editorship.

A further initiative from Maciej came when difficulties arose regarding the distribution of *SGAS* by ASSA. Maciej opened and directed negotiations with the publisher Struik which resulted in an agreement with Struik Nature to print, publish and distribute *SGAS.* When the third editor advised that he would not continue for more than another year, on behalf of Council, Maciej initiated an invite Auke Slotegraaf to be editor again – for 2012. Maciej indicated that it is with a strong sense of sadness that he withdraws from further involvement with *SGAS.*

Contract with Struik for the printing and distribution of Sky Guide

The 2011 Edition of *Sky Guide Africa South* was the first edition published under the terms of a contract between ASSA and Struik, whereby Struik printed and distributed the publication. The arrangement has proved extremely successful, and in this connection a very large "thank you" goes to Maciej Soltynski for driving the negotiations on behalf of ASSA, both for the 2011 and the 2012 Editions.

***MNASSA* Editor**

Willie Koorts stepped down as Editor of *MNASSA* and Case Rijsdijk took over with Willie still doing the layout. The appointment was confirmed by Council at its meeting held on 30 October 2010. The offer from Allen Versfeld to be involved with *MNASSA* is noted with thanks, as is an offer from Lia Labuschagne to assist the Editor. Ian Glass is Assistant Editor. Council acknowledges the time and effort that Case and Ian have put in to the production and circulation of *MNASSA*.

As of the August 2011 edition of *MNASSA*, the publication will be electronic, except that provision has been made for members without internet access.

Website

The ASSA website has been well managed by Christian Hettlage during the year, and Council acknowledges his input with thanks

Sections of ASSA

Thanks are due to the observing section directors for work done during the year, and for the reports submitted. Jacques van Delft has submitted his resignation as director of the Solar Observing Section due to other priorities on his time. Thanks are due to Jacques for the work he has done.

ASSA Symposium

The Pretoria Centre of ASSA hosted a three day Symposium under the auspices of ASSA in October 2010. The theme was "Light and Spectrum Pollution". More than 30 people attended. Thanks are due to Johan Smit (Chairman of the Pretoria Centre), Andrie van der Linde and Danie Barnardo for organizing what was a very successful event. The Symposium report was published in *MNASSA* for December 2010.

Visit of US scientists, November 2010

Michael Poll, as President, was invited to Bloemfontein on 10 November 2010, to represent ASSA at function hosted at the Boyden observatory on the occasion of the visit of US scientists Dr Jeffrey A. Hoffman, Prof Charles H. Mc Gruder II, and Dr Robert Williams. The occasion was also used to launch the Boyden Observatory Museum. Michael was asked to give the vote of thanks at the close of the public lecture.

In connection with the Boyden Observatory, in August 2010, on behalf of ASSA, the President wrote a letter of motivation and support for the proposed Digital Dome Theatre and Planetarium at the Observatory

IAU Office

It was learned during 2010 that South Africa had been selected to host the IAU Office for Astronomy Development. The agreement was to be signed in Pretoria on 30 July 2010. The President was invited but was unable to attend.

The President was invited to the launching of the Office at a function that was held in Cape Town on 16 April 2011, but was unable to attend. Some members of the ASSA Council attended, including Lia Labuschagne, Case Rijsdijk and Matie Hoffman.

The President and some members of the Pretoria Centre attended a function at the SAASTA offices in Pretoria on 26 May 2011, where the Director, Kevin Govender, introduced the Office.

Department of Science and Technology : Astronomy Desk

As reported in the December 2010 issue of *MNASSA*, (p. 202) the Department of Science and Technology established an "Astronomy Desk" to be headed by Prof Manfred Hellberg. On 25 October 2010 the President received a letter from Prof Hellberg, inviting input from ASSA about any of the items in the brief. The letter

was circulated to Council, and Case Rijdijk and Maciej Soltynski communicated with Prof Hellberg. It is noted that Prof Hellberg's appointment was for the six months beginning on 1 October 2010.

South African Institute of Physics.

A letter was received by the President from Jaynie Padayachee (PhD), the Editor of *Physics Comment*, the publication of the South African Institute of Physics. Jaynie indicated that a forthcoming issue would focus on ***Astronomy in South Africa***. The President was invited to write a short article on the history and current status of the Astronomical Society of South Africa. The submission accordingly appeared in the 25 September issue of the Publication. (Download is about 1.2MB from http://www.saip.org.za/PhysicsComment/)

Honour for Case Rijsdijk

A letter was received from Prof JD Skinner, President of the Royal Society of South Africa, stating that Case Rijsdijk had been made an Honorary Member of the Society. Honorary membership is awarded to persons who have furthered science in South Africa in a manner apart from their academic positions at Universities and other research institutions. Council congratulates Case on this honour.

Honour for Hermanus and the Hermanus Centre

With input from Dr Amanda Gulbis from the SAAO in Capetown, the Hermanus Astronomy Centre applied to the Minor Planet Committee to have asteroid 260824 named "Hermanus", and the designation was recently approved. The citation reads in part "This minor planet is named in recognition of the Hermanus Astronomy Centre's enthusiasm for astronomy and their dedication to educational outreach in South Africa". This achievement certainly recognises all the effort that the Hermanus Centre has put into bringing astronomy to the public.

Case Rijsdijk (right) receiving his honourary membership of the Royal Society of South Africa. It was presented by Vice-President Jane Carruthers during the Society's annual dinner at Kelvin Grove. Image by Maciej Soltynski

Deaths

ASSA Council noted with regret the death of Jan Hers on 24 August 2010. The Obituary was published in *MNASSA*, October 2010, p. 175.

Thanks

I would like to thank all those members of Council who have assisted in the func-

tioning of ASSA during the past year. At the risk of omitting some worthy names, I would like particularly to thank Lerika Cross for her work as Secretary. She really has done a tremendous amount, and has been of great assistance to everyone on Council, and indeed, to the membership of ASSA. I would also like to mention Ian Glass and AJ Nel who took on the portfolios of Membership Secretary and Treasurer respectively at short notice, and Chris Stewart who organised the Skype conferences.

Personal note

I have been President for two years and it has been quite an experience. I did not expect to be quite as busy, and I have had to put a lot of personal activities aside to deal with ASSA business. I will not be on Council for the coming year, and, although I do not want to sound indispensable, I will be available if anyone wants to tap my ASSA database and make use of the experience of ASSA business that I have accumulated. I wish the incoming Council all the best for the coming year. ☆

Cosmology Section Report

Frikkie de Bruyn

Purpose

The purpose of the Cosmology Section is:

- To promote an interest in the study of cosmology among members of ASSA.
- To disseminate news, articles, press releases and scientific papers of a cosmological nature among members by way of emails and post.
- To promote the scientific study of cosmology.

Activities

A wide variety of matters were circulated and discussed by members. Below is a summary of the most important issues:

Two books of note were published and discussed. Stephen Hawking's book on "The Grand Design" and Roger Penrose's book on possible evidence of a cyclical universe and the possibility of the existing of time before the Big Bang.

The discoveries at the Large Hadron Collider at CERN such as the containment of anti-matter, the ongoing hunt for the Higgs particle, matter as it would have existed in the very first instances of the universe's life are just a few of important matters of ongoing research at CERN. Mr Maciej Soltynski supplied the major part of news from the LHC. Many thanks to Mr Soltnski.

The possible existence of dark energy and its effects on the accelerated expansion of the universe has been narrowed down to the Local Group of galaxies.

The results of the Sloan Digital Sky Survey.

The director's research on the possible effects of dark energy in the merger (or not) of the Milky Way Galaxy and the Magellanic Clouds continue.

The director was involved in discussions in the press on the incorrect assumption of zero gravity in space.

Future activities

The circulation of news of interest to members and research into dark energy and its effects will continue. ☆

Deep-sky Section Report

Auke Slotegraaf

Observers actively contributing to the Section are Magda Streicher, Richard Ford and Auke Slotegraaf. Several new observers are on the brink of active participation: these include Lynnette Foster, Hendrik van Rensburg, and Pieter Koornhof.

Astrophotos of deep-sky objects were received from Kos Coronaios, Lucas Ferreira, Dale Liebenberg, Dany Duprez, Pete Scully and Anthony Ayiomamitis.

It's a particular pleasure to be able to report that the Deep-sky Observer's Companion Database website was launched in September 2010. The URL for the site is http://www.docdb.net. DOCdb is a free online resource for deep-sky observing. In addition to functioning as a growing archive of observations, an array of software tools allows observing sessions to be planned and managed. It also acts as a repository for observing tutorials and guidelines and has a growing selection of historical material of interest to deep-sky observers. As of this writing, the website has not yet been actively promoted in the observing community as technically it is still in its testing phase. However, it is fully functional and already has 54 registered users.

During the year under review, the "ConCards" resource was developed and released. This consists of basic star charts, one per constellation, with each chart showing a (subjective) selection of the "best" deep-sky objects in that constellation. By including only the most prominent deep-sky objects, the ConCards fill the gap between planispheres (such as the Southern Star Wheel) and star atlases. The ConCards are available as a free download from http://www.docdb.net/tutorials/concards.php.

Largely the creation of Martin Lyons, an affordable, robust and portable observing shelter has been field-tested. Four have been assembled and are in regular use. The shelter is made of PVC tubing and plastic sheeting and can be used as a semi-permanent structure or when out in the field.

In closing, special mention has to be made of Richard Ford's continued efforts to improve his deep-sky observing skills and of Magda Streicher's ongoing contributions and her work at compiling two new publications. For the past two years Magda has been collaborating with Australian observer Jenni Kay on a book

about small open clusters. This work will be published by the Webb Society in January next year. Meanwhile, Magda has been hard at work on her own book of southern deep-sky objects, a 350-page tome spanning 45 constellations. This book will be published at the end of 2011. ☆

Historical Section Report

Chris de Coning

Introduction

During the past year (Calendar Year 2010) the following has happened concerning the History of Astronomy.

Website

Selected pages of the website were updated as new information was found.

Archive

Over the past ten years members of the public donated material and the Archives now has a wealth of original material. This includes nearly all the minute books of the Council and the Cape Centre from 1922 to present.

The Archive was kindly housed by the SAAO in a room at the McClean Building. This room was needed for other purposes however and the Archive was moved to another building where the conditions are far from satisfactory for housing irreplaceable original documents. The Manuscripts & Archives Department at the University of Cape Town (UCT) was approached and they showed an interest in safeguarding the material. Since the material is original and irreplaceable, a project was launched to make digital copies of the most valuable documents, i.e. the minute books. Special mention needs to be made to Gregory Harvey who scanned the material, as well Lesley Hart from UCT who allowed us to use special equipment for this task.

Publications

Individuals in their private capacities wrote articles with historical content. Please note my appreciation to the following people:

- Ian Glass for "The Astronomical Museum at SAAO" published in *MNASSA* Vol. 69, nos. 1 & 2, pp. 20-30.
- Willie Koorts (and Cliff Turk); "Disappearance of Lacaille Plaque", *MNASSA* Vol. 69, nos. 3 & 4, pp. 45-48.
- Greg Roberts; "Amateur Rocketry in South Africa 1952-63", *MNASSA* Vol. 69, nos. 7 & 8, pp. 134-146.

Obituaries

MNASSA published an obituary for Jan Hers in *MNASSA* Vol 69, nos 9 & 10, pp. 175-176.

Friends of the Cape Town Observatory

The friends' activities also gathered momentum. The main focus is to get the McClean Telescope, a favourite for public events, operational.

Opinions and quotes were gathered but the cost is staggering to a volunteer organisation such as ours. Different ingenious options are being considered. "Thank you" to the engineers, Martin Lyons and Wim Filmhalter, who are giving their expertise for the love of the cause, and to Anne Charles for her unwavering dedication.

The Arc of the Meridian Project was resurrected. This is a government initiative to link Cape Town with other centres on the Meridian. Ian Glass contributed technically to the project. ☆

Education and Public Communication Section Report

Case Rijsdijk

It is clear that the Director needs to review the structure and working of the section and it seems an opportune time to do so with the implementation of the new constitution.

However it is encouraging to note that many ASSA Centres are involved in a wide range of activities. Many of these have been reported in *MNASSA*, highlights being ScopeX, the Karoo Star Party, the Southern Star Party and the Hermanus Centre with their MONET project involving local schools.

The establishment of the African Astronomical Society, AfAS, has meant that the director has been approached for assistance in developing astronomical resources for groups in other parts of Africa. A fuller report will be available next year. The opening of the IAU Global Office of Astronomy Development, GOAD, based at the SAAO in Cape Town, means that there are many opportunities for co-operation between GOAD and the ASSA, and a working relationship has already been established. In addition good relations are being maintained with the South African Institute of Physics, SAIP, as well as the African Physical Society, AfPS. Continued close cooperation with the SAAO outreach programme is also being maintained.

The director wishes to thank the SAAO for continued support, especially in being able to attend the 2nd Middle-East and Africa Regional IAU Meeting, MEARIM 2, in Cape Town in April 2011. ☆

Double Star Section Report

Lucas Ferreira

Having been the Director of the Double Star section for just about a year now, more has happened in this section than in the last previous years. My immediate goal as Director was, and still is to:

- identify people who are doing double star work,
- inspire others to take an interest in

observing double stars,
- try and find other methods of observing double stars, i.e. digitally vs. micrometer, and
- make regular contributions to *MNASSA* and the local newsletter on observations or topics of interest.

To date, I have updated the Double Star Section Webpage, updated and enhanced the ASSA Introduction to Double Stars manual and written a couple of double-star articles for *MNASSA* which included photos of Double Stars taken by myself. These articles were uploaded to the Section web page for keen Amateur Astronomers and Double Star observers to read and study. By writing these articles, I hope that it would inspire others to become interested in Double Stars. I have also made contact with Mr Bob Argyle from The Institute of Astronomy in Cambridge, in the UK and have established a good relationship with him. He is well known in the astronomy world for studies, observations, measurements and research in the Double Stars. By having such a valuable contact in this field, worthful Double Star data can now be submitted to him from South Africa and published worldwide and be recorded in the Washington Double Star Catalogue. I was originally introduced to Mr Bob Argyle by Magda Streicher who has also recently made available all her previous Double Star observations and measurements to me and the Double Star section. Magda has been a great support to me and the section. Sadly, very few had shown interest in this section in past the year and I have had very few people contact me regarding double stars measurement and observations. Hopefully this will increase in the years to come.

There is however an exception: I have received numerous observations and measurements from a gentleman in Vereeniging by the name of Mr Dave Blane. He is very enthusiastic about double stars and has been measuring them for many years now. For his valuable contributions to the Double Star Section he was awarded a Merit Certificate for Valuable Measurements & Observations which he received at the Johannesburg ASSA branch during their annual meeting earlier this year.

I am currently in the progress of experimenting with software to find a better, more modern way of measuring the position angle and separation of Double stars thru astrophotography i.e. using digital photos of Double Stars. The method is digital instead of manual, using a Micrometer. It is quite complicated with a steep learning curve, but I hope to conquer this challenge in the near future to be able to assist others doing their measurements digitally

I presented a talk on Double Stars at our local astronomy club, GRASSA in May 2011 and am sure to do so again at other ASSA centres in the near future.

My conclusion is that it is still early days in a new era for the ASSA Double Star

section, and that a more aggressive approach to promoting Double Stars by observing them through telescopes at local Astronomy club meetings, monthly ASSA centre meetings and on open events evenings at our South African Observatories is very much required. People must also be made aware of the important role they can play and the valuable contributions they can make in this field of astronomy as amateurs, by means of simple observations and if you'd like to take it a step further by measuring Double Stars. These suggested measures can turn the tide and restore Double Star Section to its formal glory. I am very excited about the New Year, and am looking forward to an exciting year. ☆

Occultation Section Report

Brian Fraser

Once again there were no favourable minor planet events taking place over the areas covered by our observers in 2010. Also the weather conditions proved an obstacle for the observers in the Gauteng area, as it does in normal years for the coastal areas.

The highlight of the year was the expedition by a team of American astronomers to observe the occultation of a star by Pluto in July 2010. Groups of two members travelled to Boyden, the Karoo near Upington, the Aloe Ridge hotel observatory and the Innes dome to observe the event. The team at Aloe Ridge managed good results. All the other stations suffered from cloudy conditions of some sort. Dave Hughes, Chris Curry and Rodney Hyman put in a huge amount of effort to get the Innes telescope in working condition for this observation. ☆

Comet and Meteor Section Report

T P Cooper

Six meteor showers were observed by three individuals totalling 38.5 hours observations.

Summary of Observed Meteor Showers

Observer (no. of showers observed)	Showers Observed and duration	Total Time hrs
Tim Cooper (4)	Eta Aquariids (2.0), Orionids (8.0), December Phoenicids (3.0), Geminids (3.0)	17.0
Mary Fanner (3)	April Lyrids (4.8), Geminids (6.6), Velids (4.8)	16.2
Cliff Turk (1)	Geminids 2009 (1.1), Geminids 2010 (4.2)	5.3
Total		**38.5**

Notes on some Specific Showers Observed

April Lyrids – the shower was observed by Mary Fanner

Eta Aquariids – observations pre-maximum were entirely washed out by rain. Tim Cooper observed on the morning of 6 May seeing 15 eta Aquariids in one hour with LM=5.4

Orionids – despite the near-full moon, the shower was well observed by Tim Cooper. The enhanced activity predicted by Sato and Watanabe (CBET No.2507 dated 19 October 2010) was observed on the morning of 21 October, seeing 10 Orionids per hour under LM=5.3 skies.

December Phoenicids – Tim Cooper observed weak but definite activity from this shower on the evenings of 4 and 5 December, seeing 5 Phoenicids in 3 hours. All observed members were plotted.

Geminids – were observed by Tim Cooper. Cloud badly affected the nights of 12/13 and 13/14 December so that the maximum was missed.

Velids – were observed by Mary Fanner on the nights of 29/30 and 30/31 December, seeing 16 shower members and 21 sporadics in just under 5 hours observation.

Summary of Observed Fireballs

A total of six fireball reports were seen in 2010. The full details have been submitted for publication in *MNASSA* as a separate article.

Summary of Observed Comets

Six comets were observed in 2010 by four individuals as follows:

ICQ Observer Code	10P	29P	81P	103P	C/2009 R1	C/2010 B1
BEG01				●		
COO02	●	●	●	●		●
STR03		●	●			
WAL					●	

Key to observers in Table:

BEG01 = Mike Begbie
COO02 = Tim Cooper
STR03 = Magda Streicher
WAL = Simon Walsh

Notes on Specific Comets Observed

10P Tempel – observed and imaged by Tim Cooper

29P Schwassman Wachman – observed by Magda Streicher and imaged by Tim Cooper

81P Wild – observed by Magda streicher and imaged by Tim Cooper

103P Hartley – observed by Mike Begbie and Tim Cooper, imaged by Tim Cooper

C/2009 R1 McNaught – was imaged by Simon Walsh
C/2010 B1 Cardinal – was imaged by Tim Cooper

Summary of Asteroid Observations
Photometry was conducted by Tim Cooper and Paul Ludick on the following objects.

Paul Ludick: 209 Dido, 1056 Azalea
Tim Cooper: 94 Aurora, 631 Phillipina

Tim Cooper and Brian Fraser observed the occultation of TYC1914-00301-1 by 20000 Varuna on 19/20 February. Both observed misses.

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

Dark-sky Section Report

J Smit

After some period of inactivity in the section the challenge was taken up during the last year again.

The main purpose of this section is educating everyone about the fact that light pollution is not really an astronomical problem. This statement sound counter-productive coming from an astronomer, but even superficial study of the causes and effects will show that it actually is a symptom of an underlying problem. So the work this year concentrated on bringing the message across that addressing the underlying causes will automatically solve the symptom. At the core of the problem is this statement: Light pollution is caused by improper lighting installations. The number one effect of improper installations is wasted energy with its associated negative consequences, the most serious for us being increased cost and reduced safety and security.

Talks were presented at ASSA Pretoria, ASSA Johannesburg, the Gauteng land service for schools event and at the Green Market events in Pretoria. Informally the topic was touched on at every observing opportunity that ASSA Pretoria attended. The purpose of these talks was to educate the audiences to see the problem as follows:

- Higher energy cost
- Reduced safety and security
- The artificial disturbance of the natural day/night cycle may, as a result, have serious psycho-physiological and even medical consequences for humans, along with ecological and evolutionary implications for animals, plants, and even entire ecosystems.

- Light pollution is the only pollution that cost more to perpetuate than to eliminate.

Feedback form audiences was always very positive and everyone agreed that they see the problem in a completely different light. Anyone wishing to use it can contact me for a copy of my presentation. An entry on the Enviropaedia web site was subscribed to, as well as a page created on the ASSA Pretoria web site. No formal feedback was received through either of these two channels. A plan is in place to start a Facebook group to make the message accessible to the modern (younger, on-line active) generation. The most positive feedback so far reached was from Dawie van Vuuren from MetroGIS (PTY) Ltd. They do environmental impact studies and are looking for a repeatable method to easily judge the state of light pollution in areas that they study.

We are currently experimenting with recording the state of the sky photographically. The basic idea is to find standard camera settings to use that show what can be seen naked eye and are sensitive enough to see changes and are repeatable. All that is needed is then to take photos of predetermined areas at different times to create a permanent record that can be compared with a similar set of photos taken at a different date. The first results are very encouraging. Having a photographic record of the sky over a location enables seeing changes over time and provides physical proof of any change. We also found this simple method very valuable to identify sources of light pollution and sky glow, and most importantly, it does count as physical evidence in court. A full report will be done once our current experiments are completed.

The only advice that I can give is: Talk about this, inform everyone you meet, apathy is our biggest enemy. ☆

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. There were no successful candidates in 2010.

In 2011 the ASSA Scholarship was awarded to Claire Antel, a 3rd year BSc student at UCT. The holder in 2006 and 2007, Wendy Williams, has completed her MSc in astronomy at UCT, and is now working towards her PhD on LOFAR observations of radio galaxies at the University of Leiden. Renée Holzek, holder of the ASSA Scholarship in 2005, continued with her DPhil studies in observational cosmology at Oxford University.

South African Astronomical Observatory - Astronomical Society of Southern Africa Scholarships

The purpose of the three SAAO - ASSA 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 2010 was R4 600, and in 2011, R5 000

In 2010 the Scholarship was awarded to Riyaadh Jamodien, a 1st year BSc student at the University of Stellenbosch. In 2011 the Scholarship was awarded as follows: To Allen Versfeld (an ASSA member) who is in his 2nd year of BSc studies at UNISA and to Fawaaz Davids, 1st year BSc student at UCT. Mpati Ramatsoku, who held the Scholarship in 2007 and 2008 and Rocco Coppejans, who held the Scholarship in 2008 and 2009, both completed their BSc (Hons) in the National Astrophysics and Space Science Programme (NASSP) at UCT and are now studying for their Masters degree in the same programme.

Expression of appreciation

Dr Ian Glass, Andrew Gray, Kevin Govender in (2010) and Dr Enrico Oliver (in 2011) 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. ☆

Farewell to Phil and Anne Charles

After seven years at the helm of the SAAO in South Africa, several farewell occasions were held for Phil and Anne Charles. Described here are two functions on two consecutive days, held at SAAO Sutherland and Cape Town respectively.

Sutherland

The Sutherland staff put on something extraordinary to bid Phil and Anne goodbye. Something they will remember for a long time to come. Before going off to lunch at the Recreation Centre on site, everybody gathered in the parking area in front of the hostel. Martin Wilkinson, SALT Systems Engineer, acted as master of ceremonies.

Possibly sensing something unusual was to follow, the guests of honour appeared slightly nervous. First, the Royal couple were to be welcomed by a trumpet solute. But "due to budgetary constraints, *'n boer maak 'n plan*", this had to be replaced by a vuvuzela chorus! Phil was then presented with his very own vuvuzela (custom made, hexagonally shaped to match the SALT mirror segments) and signed by members of the SALT team. This he was obviously obliged to blow. For the safety of all concerned, it was decided that Phil should

Pictures: Lisa Crause

Picture: Steve Potter

first attend a vuvuzela training course before attempting to operate his new instrument.

Martin pointed out how Phil somehow misunderstood the term "sabbatical leave" and instead of taking off one year in seven, he took seven years instead! So, next up was a 21 gun salute, meant to be performed by three G5 guns, each firing seven shots, representing the seven years of Phil's directorship. But "due to budgetary constraints, *'n boer maak 'n plan*", and a single – very loud – shot from a home-made cannon, firing on home-made black powder, made by SALT technician Eben Wiid, had to suffice.

Keeping to the royal theme, an aerial display by the Red Arrows, or the South African Air Force's Silver Falcons was envisaged, but due to the fact that all these proposals were rejected by SALT's financial manager, Ismail Osman, 'n boer again had to make a plan. So instead, SALT electronics engineer, Hitesh Gajjar, was called upon to do a series of flybys with his radio controlled airplane. Amazingly, this amounted to an invasion of the local Vereaux Eagle's airspace, soon had the pale intruder joined in the sky by the menacing resident which it eventually escorted out of range.

The, by now familiar budgetary constraints, also prevented the purchase of a sword. Phil was therefore presented with a hand-made gentleman's folder knife, yet another of Eben's beautiful works of functional art; with a blade of RWL34 steel, a bolster of Alphen Powder Damascus and a handle made of fossilised mammoth molar. The blade was etched with the SALT logo and Eben's trademark.

Finally, to transport the royal couple to the dinner venue, for reasons by now well known, a boereplan had again to be resorted to. So, instead of a horse-drawn stage coach, out of nowhere a donkey cart appeared to fulfil this function (see cover picture). After a quick speech (something Phil has had to learn about during his seven years in South Africa) and a Sutherland staff photograph, dinner was served.

Cape Town

On 1 September, the Cape Town staff greeted them with a lunch in the SAAO Auditorium (arguably the first project completed during his term of office!). This was also preceeded by staff group photo.

Phil and Anne's tenure at the SAAO saw many and significant changes. David Buckley (SALT), Patrick Woudt (UCT) and Peter Martinez (SAAO) addressed those present before lunch. Each in turn briefly highlighted some of these and gave interesting personal insights into a number of events, often in a light-hearted manner. Like assorted incidents around the making of coffee, both in Cape Town and Sutherland!

Foremost of course has been Phil's involvement with SALT and making sure

that it achieved its full capacity by giving enormous support to the team, led by Darragh O'Donaghue, that eventually sorted out the poor image quality [1] and the throughput problems of Robert Stobie Spectrograph, so that both became fully operational. In addition there were other lasting developments like the extended hostel accommodation, the construction and development of a Recreation Centre in Sutherland and moving the old stand-by generator from Sutherland to Cape Town which proved invaluable during the dreaded power-shedding era.

Phil was also very keen in promoting the National Astronomy and Space Sciences (NASSP) programme hosted at UCT and to the development of astronomy in South Africa. He will be particularly remembered for the strong stand he took against the increasing culture of managerialism in South African science and in particular the NRF's approach [2]. This cost both Phil and Anne dearly, but the resulting benefits are a review of astronomy governance, which will probably lead to a much wider review of science in South Africa in general.

Another milestone of Phil's tenure at SAAO, was his strong support for the successful bid by Kevin Govender to host the IAU's Global Office for Astronomy Development (GOAD) at the Observatory and his continued support for the Space Sciences development by Peter Martinez: both reflect his management style, which was to support those that were developing their own areas of expertise.

But it was not only Phil who made a lasting impression at the SAAO, Anne too was busy! She made significant contributions to the Cape Town Observatory site by setting up the SAAO Grounds and Buildings Committee. This is of particular importance due to the environmental sensitivity of the site which hosts the world's only natural population of the near extinct *Moraea aristata* and the northernmost population of the endangered Western Leopard Toad. Her untiring efforts culminated in two recently completed direction-giving documents: the *Observatory Landscape Framework* and a *Heritage Survey* of the buildings. The former already resulted in a huge tree-planting project on site, serving as a lasting memory of her efforts.

We will all miss Phil's infectious enthusiasm and positve approach and, as there are still some obligations to UCT, we look forward to having him visit us in the future and giving us more of those wonderful 40-minute lectures that last an hour – excluding questions! There is so much he wants to share with us! No doubt Anne will come as well, even if just to make sure the trees are being watered!

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1 *MNASSA*, Vol. 70 Nos. 3 & 4 p.61
2 *MNASSA*, Vol. 69 Nos. 1 & 2 p. 9; Nos. 3 & 4 p.48; Nos. 7 & 8, p.115; Nos. 11 & 12 p. 202 and Vol. 70 Nos. 7 & 8, p.125 ☆

Preliminary results from the observations of DT Lupus, a newly discovered oscillating Algol binary

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Abstract

Observations using personal telescopes in light polluted skies in Kyalami, Johannesburg suggest that the Algol system DT Lup be re-classified as an oscillating eclipsing Algol system. Preliminary frequency calculations produce an oscillation frequency of ~ 8.73 cycles day^{-1}.

Key words: DT Lup, oEA stars, Algol binary stars, oscillations in binary stars.

Oscillating Algol stars

All pulsating Algols detected and analysed thus far lie inside the classical δ Scuti star instability strip very close to the ZAMS (Mkrtichian *et al*. 2002). The authors also adopted the oEA (oscillating eclipsing Algols) designation for mass accreting, pulsating components in Algols. This was to distinguish them from the earlier designation EA/DSCT from the General Catalogue of Variable Stars (GCVS) wherein by default, detached systems with normal δ Scuti pulsations were included. oEA form a completely separate group of pulsators that differ from δ Scuti stars but will include Algols with both EA and EB type light curves. The main difference between the two classifications, EA and oEA, is their previous evolutionary life in close binary systems. Rapid Mass Transfer or Accretion (RMT/RMA) evolutionary stages see low mass progenitors of oEA stars accreting a large portion of mass from Roche lobe overflow of the formally massive secondary component. These stars have now evolved rapidly on thermal time scales to higher mass and luminosity. They are presently situated close to the ZAMS on the HR diagram, are of spectral type B – F, and are at a slow mass accretion (SMA) stage in their evolution. SMA maintains a thermal imbalance and ensures a slow evolution along the MS towards higher masses and earlier spectral type. In the mass accretion process they do not follow standard evolutionary tracks of normal MS or post MS δ Scuti stars.

Furthermore, the changes of the mean density of the gaining star as a result of accretion of matter can affect the pulsation periods and pulsation properties of oEA stars. These changes in periods could be used to estimate mean accretion rates (Mkrtichian *et al*. 2002). The

mass transfer/accretion episodes would be initiated by the magnetic activity of the mass losing star. It is yet uncertain though, how the effect, whilst working on dynamic and thermal time scales could affect the pulsation properties and mode selection mechanisms in the gainers on time scales of weeks to years.

Early work by Wood (1950), Kopal (1954), Crawford (1955) and Hoyle (1955) recognised the importance of semidetached configurations in binary stars.

Also of interest is the fact that these stars are known to have changes in frequency amplitude over short periods.

Observations

Observations of OEA stars using personal telescopes (PT) on the outskirts of Johannesburg, South Africa, began in autumn 2011. The principal objective of the campaign is the detection of pulsations in selected antipodean Algol stars. Table 1 lists the program star details.

Hoffmeister first reported the variability of DT Lup in 1943. Horak, Grygar, van Houten *et al.* (1999) from a least squares fit of seven minima, report the following ephemeris:

Min I = *HJD* 2 427 897.643(±3) + 1.4530891(±6) x *E*

Candidate selection

1. The candidates should display "high" Δmagnitude amplitude, which is important considering the size and sensitivity of the equipment deployed.
2. Observations within the $14>m_V>8$ band should not be adversely affected by bright moon nights.

Equipment and observations

Here we present B filter data from 2011. The B filter is preferred as pulsation amplitude changes are more obvious than in the V filter. A Starlight Xpress MX716 self-guiding camera was coupled to a pier mounted Meade LX200GPS 30cm (12inch) PT at a light polluted site in Kyalami, on the northern outskirts of Johannesburg, South Africa. Images including the program star were captured to fits

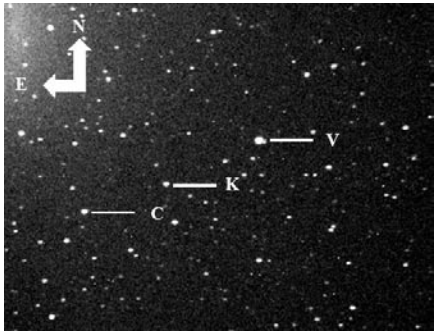

Figure 1 DT Lup (V) and Check (K) and Comparison (C) star

Table 1. Program star details

DT Lup

STAR		DT Lup			
SPECTRAL TYPE		A0V C (Simbad)			
RA	Dec	HD	TYC	GSC	
(2000)	(2000)				B
14 36 36	-51 24 49	128087	8290-1495-1	08290-01495	9.8

files with a field of view (FOV) of ~660 x 600 arcsec^2 and a resolution of about 110 arcsec mm^{-1}. Control of the PT and camera was done using MSB Astro-Art. The Computer clock is reset every 4 minutes, automatically via the World Wide Web from Dimension 4 using a local time server.

Table 2: Month of observations and integration time, B Filter Observations 2011

Star	Observing Period	Integration Times
DT Lup	DT Lup	75 seconds

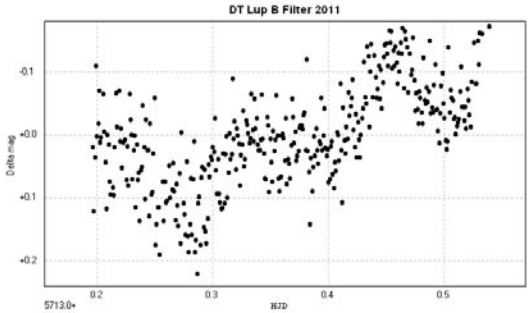

Figure 2 Observations of 3 distinct pulsation cycles of DT Lup during an ~ 8 hour period.

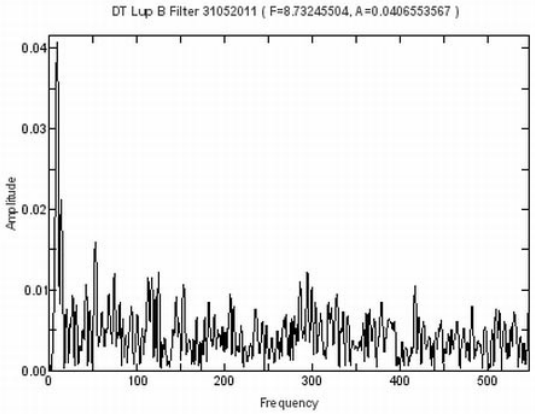

Figure 3 Periodogram of DT Lup after prewhitening the binary orbital period from the data of ~HJD 245 5713.2 – HJD 245 5713.5

Image reductions

Astronomical Image Processing 4 Windows (AIP4Win - www.willbell.com/aip/index.htm) was utilised in data reduction. AIP4Win uses two dimensional aperture photometry in the reduction process.

Analyses of reductions

Figure 2 shows DT Lup observed during the evening of HJD 245 5713.2 approaching a secondary maximum. Over this ~ 8 hour observation period three distinct cycles are evident. Running these data through Period04 (Lenz and Breger, 2005) produces a frequency of 8.73 cycles day^{-1} after prewhitening of the binary orbital period. Figure 3 shows the periodogram of the frequency analysis.

Figure 4 shows DT Lup at primary maximum during the observation as well as a primary minimum calculated by spline fitting. Period Analysis software (Peranso) fits a polynomial to a segment of a light curve by marking a left and right margin cursor. The program calculates the extremum to be located where the

gradient of the fitted polynomial = 0. That is, the red vertical line shown in figure 4. The minimum in this instance is calculated at HJD 245 5715.474917 ± 0.00205.

Investigation of the next closest minimum from the ephemeris given above suggests E = 19144.927 cycles and HJD (Min_1) 2455715.58073040. With this preliminary result we cannot confirm a change in the binary orbital period but it is compelling to entertain the thought of a significant change in period through mass transfer.

Conclusion

The preliminary investigation of DT Lup suggests that it is another oscillating eclipsing Algol system. Further observation with a larger telescope is recommended. If this Oscillating Eclipsing Algol is confirmed, the number of these stars thus far detected would swell to just over 20.

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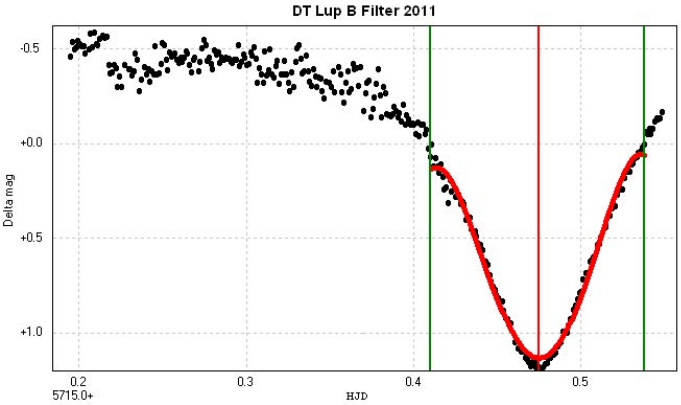

Figure 4 DT Lup showing a primary maximum and minimum from which a time of minimum is calculated by spline fitting.

Lunar Parallax Measurement: Explained at Lower and Upper Secondary School Level

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Abstract: Measuring the distance to the Moon is not a very hard task for high school students and amateur astronomers. The article explains the measurement and the calculation details – for students of lower as well as higher secondary school levels. The article also aims to promote cooperation between Slovenian and South African amateur astronomers, as these two countries are very good observing points for the measurements required.

Introduction

Parallax is a term used to describe a phenomenon where, due to the different viewing positions of two observers, there is a difference in the apparent position of an object with respect to its background. The value of this apparent displacement also depends on the distance from the object to the observer. Based on the apparent displacement of the observed object and some simple mathematics, it is possible to determine the distance to the object. In addition to some mathematical formulae and manipulations, some distances need to be known, the finding of which will be explained. The method is quite useful for objects that we cannot reach with a measuring tape, and this is the reason the measurement of parallax was, and still is, widely used in astronomy.

This traditional old method is now simpler with the advance of technology, such as a digital photography and a printer. The method will be introduced using distances that can be physically measured and then applied to measuring the distance of objects far away, such as the Moon, and the calculation is adapted to the mathematical knowledge at lower and higher secondary school levels.

Parallax

Three chairs in the room are positioned as is shown in Figure 1, and are facing a window. The neighbouring house and its chimney can be seen from the window. Is it possible to find how far the chimney is from the observer?

Fig 1. The chairs (A, B and C) facing the window.

The chimney is first photographed as it is seen from the chair "A" and then as it is seen from the chair B. Comparing the images on paper or on screen it is seen that the distance between the chimney and a bell tower on a hill in the distance behind the chimney appears larger in the second image as shown by the red double arrow. Second image taken from chair B, see Fig 2.

Fig. 2. Picture taken from chair A (left) and chair B (right)

In order to find the distance to the chimney, a reference image and a measurement of the displacement of the camera, as intermediary standards, when the camera was moved from chair A to chair B. First a reference image of an object that is approximately 30 m away is needed. The focal length of the camera lens needs to be kept constant all the time, and was f = 80 mm for all the images in this article. Next a wooden plank of length 1.205 m and placed 28.0 m from the camera is photographed. This image is then displayed on a screen or on paper at same magnification (same size) as the chimneys of the previous image. The plank's image is only 74 mm long. The black cloths are placed at the ends of the plank for better visibility (Fig 3).

Fig. 3. A white plank, positioned at 28 m distance.

If we moved for 1.205 meters when photographing the chimneys and the apparent displacement seen from Figure 2 were 74 mm, the distance to the chimney would be 28,0 meters. But this is not the case and some calculations are needed to find the distances. With some simple mathematics and using the following equation, the distance D to the object can be found.

$$D = \text{distance - between - observers} \times \frac{\text{distance - to - plank}}{\text{plank - length}} \times \frac{\text{plank - length - on - ref - image}}{\text{apparent - displacement}}$$

Substituting the known values into the above equation, namely the distance to plank, plank length on reference image and the actual plank length results in:

$$D = \text{distance - betwwen - observers} \times \frac{1.72\ \text{m}}{\text{apparent - displacement (m)}}$$

To use this method correctly, all images must be recorded (and then displayed) at the same focal length and magnification setting.

To find the distance to the chimneys, the apparent displacement of the chimneys in the two images and the distance that the camera moved from chairs A to B are measured and found to be 0.28 m and 0.5 m respectively. The distance to the chimney is found to be 31 m. That is reasonably close to the actual distance measured, 31.8 m, using a tape measure. An error of around at least 3% is expected, due to the uncertainty of the measurements.

If the pictures were taken from chairs C and B instead, the image taken from chair C would be practically the same as the image taken from chair A. But if the distance between the chairs C and A is large, the value of the chimney's displacement would be significantly larger than the distance calculated from chairs A and B measurement. Chairs C and B, can also be used, but in this case the distance between the observers is not the distance between the two chairs, but rather the "perpendicular distance". (see Fig.4).

Fig. 4 Instead of the distance between B and C (dashed line) we need to take the »perpendicular distance«, which is marked by the full line. The full line is perpendicular to C-object and B-object line, as these two lines are almost parallel.

Bright, bright Moon

There are no problems when photographing the Moon, but a sturdy tripod is needed. But for measurements, the real problem is to get the exposure of the photograph to show both the Moon and the background stars. A good photograph of the Moon we will need an exposure of about one hundredth of a second, the background stars will need an exposure of several seconds. During such a long exposure, the Moon will be much too

bright, have fuzzy edges and the result will be just a strange very bright unfocused spot. There are at least two methods to resolve this problem.

The first one can be achieved with a minimal amount of equipment. The exposure time is set to 6 seconds. The camera focus is set to infinity, with focal length the same as was used for the reference image. An object to shadow the Moon needs to be set up in front of the camera. After approximately 5 seconds the object is quickly pulled aside and the other hand is used to obscure the lens. With this we have given the Moon just a fraction of second to send the light into the camera, while the neighbouring stars were given more time. There is no need to worry about the last second or two, when the hand obscures the camera lens (see Fig. 5).

Fig. 5. An object is used to shadow the lens, but But is quickly pulled aside. Because it would be hard to replace it the other hand to cover the lens.

With more sophisticated equipment, it is possible to use the following method as suggested by Mr. Oleg Toumilovich, South African astrophotographer:

To have the stars and the Moon in one shot a filter of a suitable density is attached on a 2 mm steel (or even better copper) rod, directly attached to the camera mount, so where ever we move the camera, disc stays in the centre of the FOV, we only need to move the camera until the disc fully covers the moon (Fig. 6)

Fig. 6. Advanced option to achieve balanced exposure (stars, Moon)

Participation (and cooperation)

When taking pictures of the neighbour's chimney it was possible to just move from one chair to another. But for the Moon, which is very far away, the photographer would need to move for a couple thousand kilometres to get an image with a usable apparent displacement. The other problem is that the Moon will move during the photographer's travels and different stars will form the image background. To apply the parallax measurement to determine the distance to the Moon, the image needs to be taken at the same time from two different observing points. In practice, this means that one needs to find a willing colleague who will take a picture of the Moon on the other side of the world. South Africa and Europe can be good complementary choices. Finding a volunteer is not an easy task, but the rewards are definitely worth it. Half a year ago the first volunteer was Mr. Auke Slotegraaf, this time the weather conditions were favourable to Mr. Oleg Toumilovich; both observers are from South Africa and are the members of the Astronomical Society of Southern Africa.

Images

The photographs can be taken in a couple of minutes, but the preparation and coordination is a more time consuming task. It needs to take into account the weather at both places and available time of the cooperating partners. Oleg, in South Africa (SA) used a balancing filter to take his image, while the author chose to use the method of physically shadowing the Moon – this approach requires some skills but less equipment (no filter is needed). In order to determine the direction to the Moon, a perpendicularly placed rod was used and the shadow it cast are sufficient for this measurement. The rod was 88 cm high; the shadow was 125 cm to the west and 191 cm to the north. This data will be used later.

At the first glance the image taken using the method shown in Fig. 5 is a failure (Fig. 7 a), and the same could be said for the image taken by following Oleg's advanced method (Fig 7b). However, both images were perfect after some computer manipulations to enhance the images.

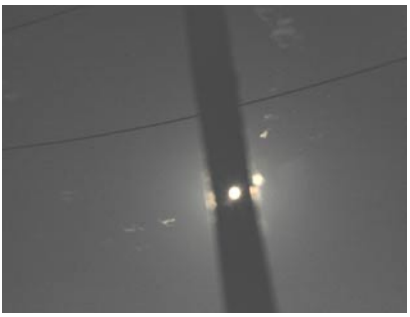


Fig. 7 a. Image of the stars and the Moon taken method as shown on fig. 5

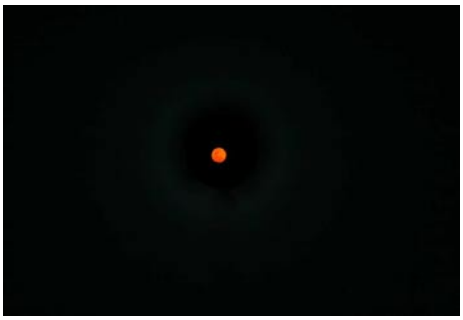


Fig. 7b. Image of the stars and the Moon taken by by method as shown on fig. 6. Photo: O. Toumilovitch.

To obtain a picture where both Moon and stars can be clearly seen, some image image-processing software needs to be used. One of the possibilities is to first use brightness, contrasts and midtone adjustment functions in such a way, that the stars are clearly visible (the Moon will be much too bright and without sharp edges in this phase). Next step is to open so modified file in MS Paint® or similar program. It is now possible to locate the position of the brightest stars with accuracy of a pixel. The coordinate position of each stars, is recorded. Next, a sharp image of the Moon is created from the original image, but the stars will be invisible because of the darker image. This file is then saved and opened in MS Paint® again. Using the stars' coordinates their positions are drawn at the correct positions, as a white square of nine pixels for each star. At a magnification of 800%, this is a relatively easy task. To save the printer cartridges, the negative of the image is used, see Fig. 8.

Fig. 8. Negative image of the Moon and stars. (to see the stars use 200% or more display)

The author's image was printed on a piece of paper and attached with Scotch tape to the window. The second image, taken by Oleg in SA, was enlarged so that the star images coincided, and then superimposed on the author's image, while the Moon was displaced by a bit more than one diameter, see Fig.9. For accuracy of further calculations, special care needed to be taken to ensure that the image from Ljubljana was taken at same magnification and focal length settings as the reference image. Certainly the focal length of the South Africa camera could be different. What matters is the magnification of his image.

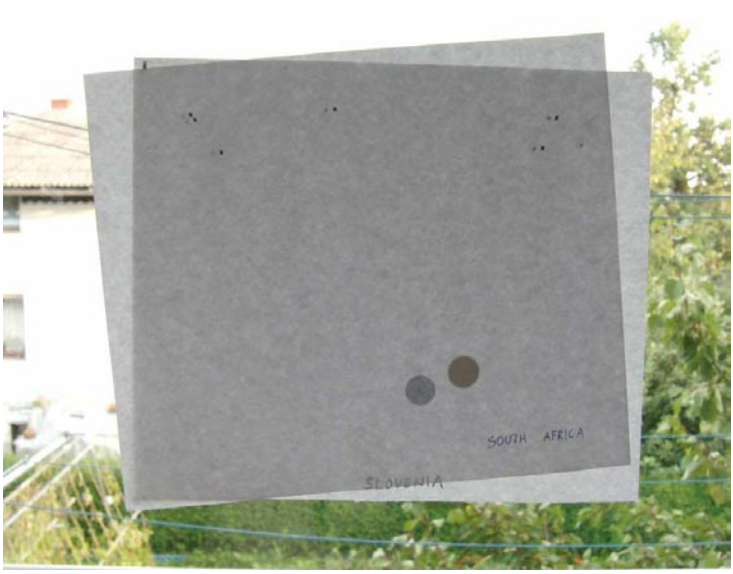


Fig. 9. The image from observing point Ljubljana, Slovenia printed on paper on the window. The second image from Johannesburg-South Africa covers it. Intentionally it is displaced a bit to see the coincidence of the stars. Slovenian stars are left dots, while S. African stars are right. However, South African Moon is left while Slovenian Moon is right.

The easier part of the task is now to measure the apparent displacement of the centre of the Moon with regards to the stars in the background (in this case 29 mm when stars are not displaced, of course!), but it is

much more difficult to determine the distance between the two observers – is it the case of chairs A and B or chairs B and C?

Finding the distance to the Moon

1 A (mathematically) simpler method

An accurate calculation requires some knowledge of trigonometry, but it is also possible to go along a simpler, but less accurate, way. This is especially suitable for lower secondary school students and amateur astronomers who don't like too many equations. After this, an alternative, but harder, and more mathematical way to calculate the distance between the observers, which is also more accurate..

The simpler route is based on measuring the distance using a globe, see Fig. 10. One, with a diameter of about 30 cm, will do. Remove it from its stand and place it in a bowl, so that it can move around freely. It was oriented so that Ljubljana was now right on the top. Two pencils and a rod (used as a pointer) were clamped on a retort stand and positioned near the globe: the rod over the line of longitude from Ljubljana towards south, a pencil that touches Johannesburg and another pencil. The tip of this pencil and Ljubljana determine a vector pointing towards the Moon. The pencil position was determined by going 191 mm towards south on the rod, then 88 mm directly upwards and finally 125 mm east.

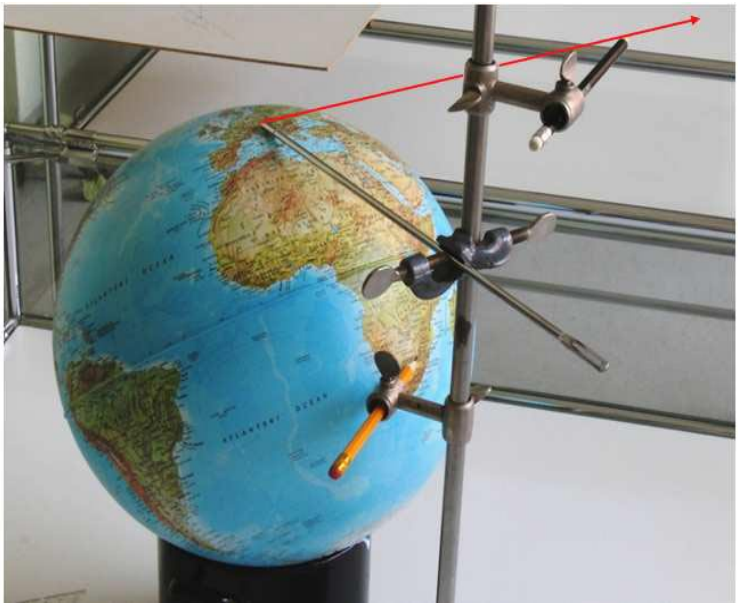


Fig. 10. The positions of the rod and two pencils are determined by the position of Ljubljana, Johannesburg and the direction towards the Moon, red arrow.

With the pencils and the rod set up, the globe is removed and replaced with a hard piece of cardboard so that it touches the points of the pencils. All three intersection points are marked, see Fig 11, which shows that this represents the situation of chairs B and C.

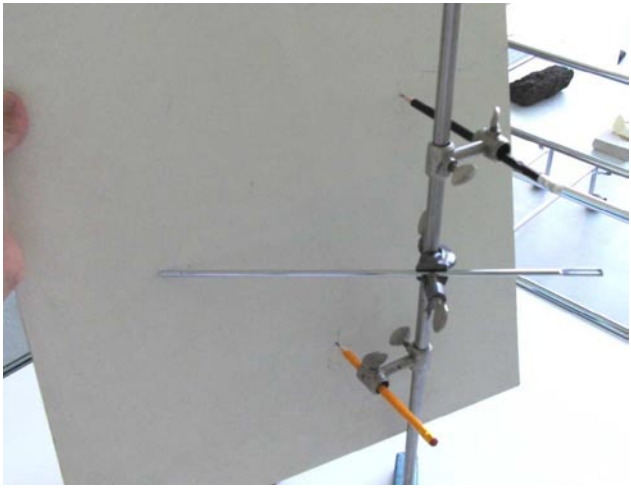


Fig. 11. A simple method to determine the distance between observation points: the three points are marked on cardboard.

The three points define a triangle which is drawn on the card. Then a line, orthogonal to the line Ljubljana-Moon, is drawn passing through Johannesburg, see Fig 12. The distance between Ljubljana and Johannesburg on the card is 15.6 cm ±1.0 cm. Then as the scale of the globe is known, the actual distance between Ljubljana and Johannesburg is found to be 6 625 km ± 400 km.

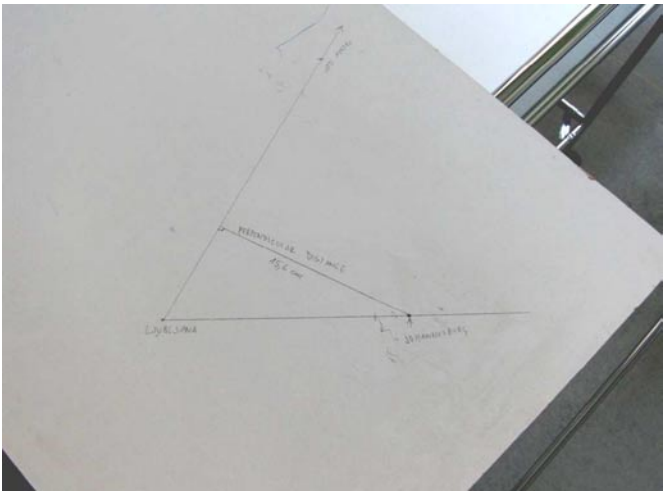


Fig. 12. Johannesburg corresponds to "chair B" while Ljubljana obviously corresponds to "chair C". Therefore "perpendicular distance" must be used in the parallax calculation (See also Fig. 4).

The distance to the Moon is then:

$$D = \text{perpendicular-distance} \times \frac{172\,\text{cm}}{\text{apparent-displacement (cm)}}$$

$$D = 6\,625\,\text{km} \times \frac{172\,\text{cm}}{2.9\,\text{cm}}$$

which gives 393 000 km (±20 000 km), taking into account that the estimated error is at about 6%, due to the measurement errors.

2 Using trigonometry

The model of the Earth is positioned in a three-dimensional coordinate system, as is shown in Fig.13. The line of longitude passing through Ljubljana is in the *zx* plane. The coordinates of Ljubljana are 14.7° E and 46.2° N.

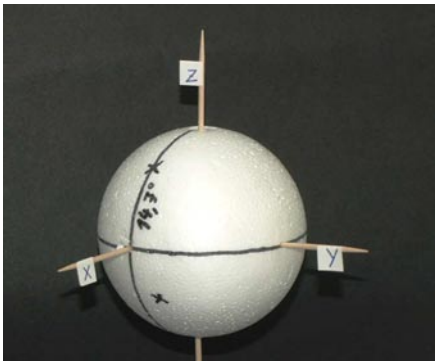


Fig. 13. A styrofoam ball serving as a model of the planet Earth. Author's observing point is the upper cross, the observing point in Johannesburg is marked by the lower cross.

The radius of the Earth is 6 370 km and the coordinates of Ljubljana (in Cartesian coordinate system chosen above) are (4409, 0, 4598) with kilometres as units. Oleg's position, Johannesburg, SA, 26^0 S 28^0 E, has coordinates (5572, 376, -3562). The using Pythagoras the distance between the observers is:

$$d_{obs} = 7\,606 \text{ km}.$$

It also needs to be established if this corresponds to the case of "chairs B and C". The angle between line segments Ljubljana – Johannesburg and Ljubljana – Moon needs to be calculated. To do so, the coordinates need to be transformed twice. To do this Ljubljana is made the origin of the coordinate system. In this case it will be easy to write the vector pointing from Ljubljana towards the Moon. The first step is a rotation around *y*-axis, which will position Ljubljana on the top of the Earth model. The angle is $\phi = 43.8^0$ and only *x* and *z* coordinates change. The new coordinates will be:

$$z_N = z\cos\phi + x\sin\phi$$

and

$$x_N = -z\sin\phi + x\cos\phi$$

so now Ljubljana is positioned at (0, 0, 6370) and Oleg is at (5954, 1317, 1841). The second transformation will be a parallel translation in direction of *z*-axis. The coordinates of the first observing point (0, 0, 0), needs to be the origin of

the coordinate system. This transformation means that Oleg is now at (5954, 1317, -4529). The longitude line 14.7^0 is still in the *xz* plane.

Because Ljubljana is now in the origin of the coordinate system, the vector towards the colleague in South Africa is the same as the coordinates. The other vector, obtained from the rod that was illuminated by the Moon, in this coordinate system points from Ljubljana to the Moon direction: (191, 125, 88). Now all that still remains to be done is to calculate the angle between these two vectors and use it to determine the distance between "chairs A and B".

The angle between these vectors is given by:

$$\cos\varphi = \frac{\bar{m}\bar{n}}{mn},$$

The first vector is **m** = (5954, 1317, -4529) and the second **n** = (191, 125, 88), and so $\varphi = 60.9^0$. The distance that needs to be inserted into the parallax equation is

$$d_p = \mathrm{d}\sin\phi,$$

which gives 6 646 km (so called parallel distance). Finally, we can now calculate the distance to the Moon:

$$\mathrm{D} = \mathrm{perpendicular\text{-}distance} \times \frac{172\,\mathrm{cm}}{\mathrm{apparent\text{-}displacement\,(cm)}}$$

$$\mathrm{D} = 6\,646\,\mathrm{km} \times \frac{172\,\mathrm{cm}}{2.9\,\mathrm{cm}}$$

Which means that the distance between the Earth and the Moon is $(3.94 \pm 0.15)\cdot 10^5$ km. The estimated error is below 4%. The Stellarium program gives $3.90\cdot 10^5$ km at that time.

Conclusion

The measurement is described in a way that is understandable also to lower secondary school students. Another important thing to note is that no advanced equipment was needed and that it is possible for the students to carry out the experiment using the tools they already have at home. The calculation can be performed in two ways, and mathematically more advanced students can be challenged with the second method.

This article was also printed in Slovenia in a slightly different form based on different measurement. As a result, it is believed that it can be fruitfully used as a teaching tool for teachers of both (and also other) countries to point their students towards the real world. The perfection and appeal of the virtual world (using programs like Stellaruim), is gaining momentum, and so the field of astronomy is nowadays so comfortable and well designed that it often shadows the possibilities for real-world explorations and experiments. However, it is the excitement of actually measuring the parallax that will motivate the students, and for other observations of the night sky.

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.

Title: **Hazards in space! Will SumbandilaSAT survive?**
Date: Wednesday, 31 August 2011
Time: 13h00
Venue: RW James C
Presenter: Chijioke Cj Nwosa
Abstract: Satellites have to operate in a hostile space environment that poses numerous threats from natural space material and man-made space objects. The variability of the space weather environment and the proliferation of space debris constitute major hazards for spacecraft in Earth orbit. SumbandilaSAT, South Africa's micro-satellite, was built with Commercial-Off-the-Shelf (COTS) components and was launched in a bid to harness Earth observation applications for sustainable development. COTS components though cheaper, are more vulnerable to the effects of space weather than space-qualified components. Assessing the feasibility of this COTS-based approach by examining the in-orbit performance of SumbandilaSAT is therefore imperative to the development of future South African indigenous satellites. I have modeled the environmental impositions on SumbandilaSAT expected during its operational lifetime with which I assessed the in-orbit risks due to natural space material. Its failure probability due to hypervelocity impacts, and the probability of collision with identified conjuncting space objects have also been estimated. The results are presented.

About the speaker: Cj Nwosa holds a bachelors (hons) in Astrophysics and Space Science from University of Nigeria/University of Cape Town. He recently handed in his Masters thesis titled "Orbital risk assessment for SumbandilaSat". His growing interest in Space Technology and its applications has driven him to be a member of the Space Generation Advisory Council, an international volunteer organisation representing young space enthusiasts to the UN Office for Outer Space Affairs, Space Agencies, and related entities. He has been involved in experimental rocketry, satellite orbit analysis, space weather, and planetary wave projects.

Title: **Getting the most out of 1-D High-Time-Resolution Data: Results from a SALTICAM campaign**

Date: Thursday 8 September

Time: 12.30 PM

Venue: SAAO Auditorium

Speaker: Mellony Spark (SAAO)

Abstract**:** We are living in an era where High Time Resolution Astrophysics (the domain of sub-second astronomy) has only recently been realised and is truly coming into its own. Innovations in CCD technology -- such as operating SALT's Imaging Camera (SALTICAM)'s detector in a slotmode configuration, on-chip amplification techniques birthing a new breed of photon-counting devices -- have created modes of fast, high-performance data acquistion never before seen. As the limits of detector performance are pushed forward (often in sudden leaps), so should the sophistication of the statistical techniques used to analyse their data outputs. In this way, `cold' modelling techniques, previously overly compromised by poor time resolution data, can be successfully revived. This talk focuses on the analysis of 1-dimensional high-time resolution photometry. In particular the results of a campaign conducted on SALTICAM, where high time resolution data was acquired with the aim of mapping the surface brightness distribution of an eclipsing dwarf nova's central object, are presented. The time resolution and good signal to noise afforded by SALT offered unprecedented insights into the nature of accretion right at the boundary of the dwarf nova's white dwarf. However this would not have been possible without the use of a modified modern data regularisation technique which allowed the first effective application of a method for accurately determining white dwarf masses in eclipsing dwarf novae. The regularisation technique, and its application to the analysis of other eclipsing compact objects -- from albedo mapping of solar system objects, to the detection of rings around extra-solar planets -- are briefly discussed.

Title: **Nature or Nurture - neutron stars in X-ray binaries in the SMC**

Date: Monday, 19 September

Time: 12h00

Venue: PD Hahn, F

Speaker: Malcolm Coe

Abstract: The population of Be/X-ray binaries in the Small Magellanic Cloud is proving a superb, homogeneous sample of this type of HMXBs. They are all at the same distance, the same extinction and probably born around the same time. As such we can use this sample of over 50 systems to explore evolution and accretion processes in these systems. In particular, recent results we have just published in Nature suggest the existence of two types of neutron stars, possibly linked to the two proposed types of SN explosions. So is it birth, or the environment, that important in dictating how they behave when they are grown up?

Title: **The Earth's Atmosphere and its Impact on Solar Radiation**
Date: Wednesday, 28 September 2011
Time: 13h00
Venue: RW James C
Speaker: Hartmut Winkler
Abstract: The Earth's Atmosphere affects incoming radiation from the Sun or astronomical sources in a variety of ways. The talk will review the state of knowledge about the extinction properties, refraction and night sky brightness. It summarises Rayleigh and Mie scattering processes and how these depend on the wavelength of radiation. Finally, the talk will highlight opportunities for the utilization of SAAO archival astronomical observational data for atmospheric studies.

Hartmut Winkler obtained his PhD in Astronomy at the University of Cape Town in 1990. He has since been a Senior Lecturer and Professor in Physics at Vista University in Soweto, and more recently at the University of Johannesburg. His research interests include Active Galactic Nuclei (particularly the spectra and variability of Seyferts) and Solar Irradiation. He has also done work in B[e]-stars, novae, B-stars in the infrared and aerosols.

Title: **The SEDs of 250um selected galaxies in the Herschel-ATLAS**
Date: Thursday 6 October
Time: 12.30 PM
Venue: 1896 Building
Speaker: Dan Smith (University of Hertfordshire)
Abstract: I will present the results of applying a panchromatic SED-fitting technique to a sample of 1404 local galaxies selected at 250μm in data from the Herschel ATLAS project. I will discuss our results, including the determination of dust luminosities and masses, star formation rates, and a variety of other physical parameters. I will also present the results obtained by using our large sample to create a new set of empirical template SEDs for these galaxies, binned according to their physical properties, and show their differences from other currently-available panchromatic SED template libraries. ☆

Fornax, an Oven Full of Fuzzies

by Magda Streicher
magdalena@mweb.co.za

Image source: Stellarium.org

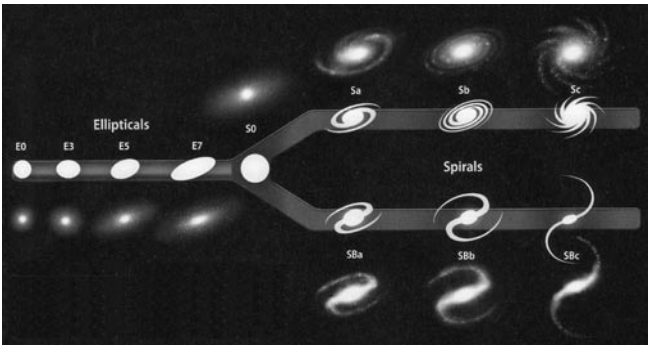
The constellation Fornax was previously known as Apparatus Chemicus, translated as Chemische Apparat, Chymische Ofen and L'Apparat Chimique in 1782, in honour of the celebrated chemist Antoine Laurent Lavoisier. These titles have, however, fallen into disuse for the constellation and only the name Fornax the Furnace has stuck (*Star Names: Their Lore and Meaning* - Richard Allen).

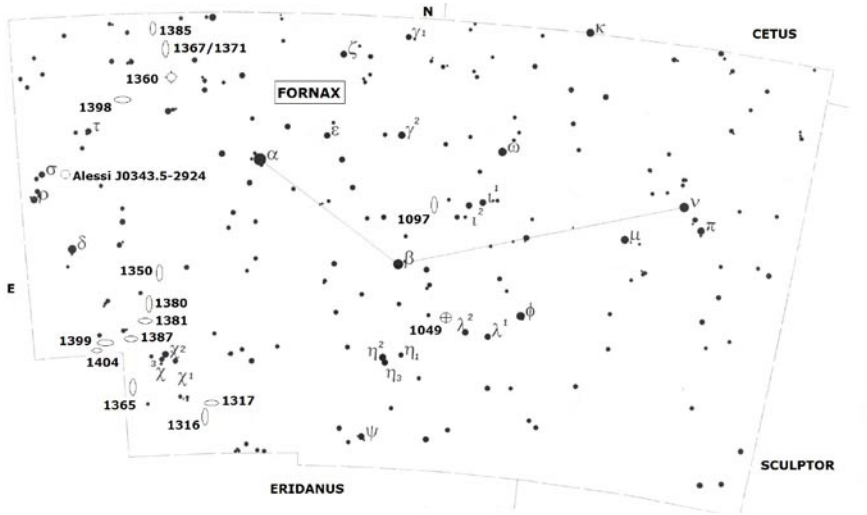
It is a constellation that is generously blessed with galaxies and is not at all reluctant to share them with us. The constellation Fornax is situated west of Eridanus and east of Sculptor, which is also situated in a galaxy-rich part of the starry skies.

Gaining an understanding of galaxies by just talking about them, or thinking about them, is not always very successful and can bring about confusion. Observing them sometimes seems to be even more difficult, but when you succeed in doing so, it is very satisfying.

As a warm-up exercise, let us first illuminate the panorama with omega Fornacis, a close pair of suns, fairly bright with a separation of 11" and position angle (PA) 237°. The primary has a lovely yellow-white colour, while its fainter companion reflects as a light grey-blue. The combination of colours makes this pair quite outstanding, and not shy to share a southern field of view encircled by galaxies.

If you aren't yet ready for galaxy pie, then have a look at iota[1]&[2] Fornacis, situated 2° south of omega, a beautiful, wide, buttery-yellow pair, shining with stars of magnitudes 5.7 and 5.8.





The Hubble's model with ellipticals on the left, lenticulars in the middle (SO) and both kinds of spiral galaxies on the right (*Astronomy* Magazine, Roen Kelly - NASA/ESA). Edwin Powell Hubble developed a classification system for galactic structure based on the design of a cosmic "tuning fork" diagram. This model to classify galaxy shapes makes it easy to deal with the different types.

A closer look at the constellation reveals that it is liberally strewn with galaxies – a real challenge to take on. Everything is there: from stately spirals and giant ellipticals in different classes, to barred, edge-on, ring galaxies, irregular's and the more unfamiliar early types of lenticulars.

A familiar galaxy to find is more or less in the middle area of the Fornax oven's shelf: **NGC 1097** is situated just 1.7° east of iota Fornacis and 2.2° north of the orange-coloured beta Fornacis. Also known as Arp 77 and Bennett 10, the galaxy displays an elongated and diffused barred spiral, extending from the north-west to the south-east, with a bright bar-shaped nucleus that works up to a stellar point. Towards the north-western rim of the galaxy the companion galaxy NGC 1097A is barely seen as a dusty patch. With very high magnification and perhaps with larger than average amateur telescopes, traces of spiral arms can be seen as soft wisps of haze streaming outwards from the eastern and western sides. A triangle of three attractive yellow magnitude 10 stars is visible slightly to the south. NGC 1097 is also a Seyfert-type galaxy, and in deep photographs has revealed four narrow optical jets. Halton Arp interpreted these jets as manifestations of the currently weak active nucleus. Studies

show that the jets are in fact composed of stars and could well be the shattered remains of a cannibalised dwarf galaxy. Arp is known for his 1966 catalogue, *Atlas of Peculiar Galaxies*, which lists 338 examples of interacting and merging galaxies.

Feeling brave now? Then try the trio galaxy group NGC 1858, 1859 and 1860 situated just a degree south-east of NGC 1097.

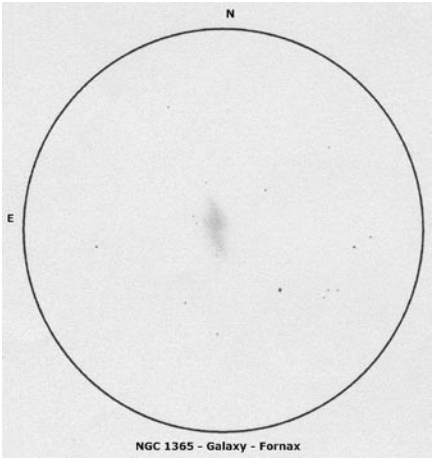
The Fornax Dwarf Galaxy, also catalogued as ESO 356-G4, is situated barely 40' north-east of lambda Fornacis. A tough nut to crack is the globular cluster **NGC 1049,** situated inside the northern part of this dwarf galaxy. The object truly has the character and hazy look of a galaxy, but I doubt whether anyone can resolve any stars in this object. The globular cluster was discovered by John Herschel in 1834, but the parent dwarf galaxy was not discovered until 1938 by Harlow Shapley. Do not miss out on the beautiful trio companion stars eta Fornacis situated 2° south-east of the galaxy.

The easiest way to the Fornax galaxy cluster is to locate chi Fornacis in the midst of galaxy world towards the far south-eastern part of the constellation. The area is home to as many as 30 NGC galaxies. The south-western flank of the Fornax Cluster weaves around **NGC 1316.** It is also a lenticular galaxy with unusual dust lanes and is about 70 million light- years away. The galaxy is also known as Arp 154 and Bennett 14. This object is an active giant radio galaxy with a super-massive black hole, known as Fornax A, which has been feeding on a remnant it cannibalised. NGC 1316 is slightly elongated in a north-east to south-west direction. The companion galaxy **NGC 1317**, on the northern tip of NGC 1316, is much smaller, round in shape, and brighter towards a sharp, dense core. It would not be strange if NGC 1316 eventually absorbed NGC 1317. A few faint stars between the two galaxies connect the pair beautifully (see sketch). The trio galaxies NGC 1316 A, B and C are situated north-west of the pair. Another faint baby companion, NGC 1310, lies further away to the west, but is perhaps too faint to glimpse.

The treat of this galaxy swarm in Fornax are the dozens of star cities that can be seen dotted about in the background,

around **NGC 1365**, which is also known as Bennett 16, usually known as the largest barred spiral, but is sadly not a member of the Fornax group of galaxies. Although the galaxy displays a low surface brightness, the bar lines up beautifully from east to west, with a relatively bright small nucleus. Higher magnification, however, brings to the fore the barely visible flimsy arms of this spectacular object. The arm from the western end fades towards the north, while the other arm stretches from the east in a southern direction. Both arms decrease in brightness towards the edges, with the western arm perhaps better defined. NGC 1365 could possibly see as the shape of our own Milky Way.

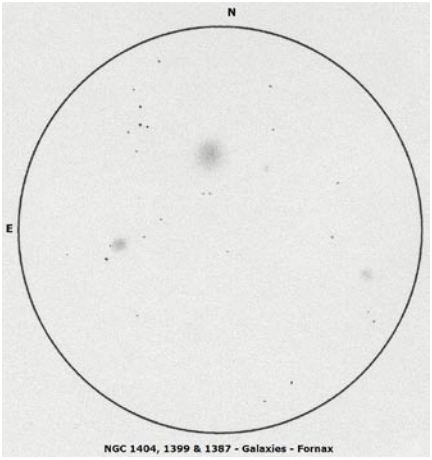
In the heart of the Fornax group of galaxies, **NGC 1399**, situated north-east of NGC 1365, appears as one of the largest and brightest elliptical galaxies. Also known as Bennett 19, the galaxy displays a hazy outer envelope and brightens gradually towards a large core and tight prominent nucleus. A faint star superimposed on the northern edge of the core region lends a completely different look. The galaxy is located some 65 million light-years from Earth. Astronomers using the Chandra X-ray Observatory have discovered an intermediate-sized black hole in NGC 1399, ripping a star to shreds. The shredded debris shows spectral lines of oxygen and nitrogen, but no hydrogen – a sign that the disrupted star was a white dwarf (*Astronomy* magazine).



NGC 1365 - Galaxy - Fornax

The companion galaxy **NGC 1404**, also known as Bennett 20, is situated only 8' to the south-east. This companion galaxy is little more than half the size of NGC 1399. Although small, it displays with pride a quite bright circular glow and dense core, beautifully rounded off with a red-coloured magnitude 8 star about 2' toward the south.

Barely 20' west, another elliptical galaxy, **NGC 1387**, occupies a spot in this crowded cooking oven full of fuzzies (see combined sketch with NGC 1399, 1404, with 1387 on the western edge). Although rather small and faint, it displays yet another round ball of light, brightening to a star-like nucleus. The galaxy is also known as Bennett 18 and with higher magnification displays a soft outer envelope. This rich group of galaxies could be as far as 45 000 light-years away.



The edge-on galaxy **NGC 1381** find its home 25' north-west of the mother galaxy NGC 1399. It displays a slightly stretched-out ellipse from north-west to south-east with an obvious centre.

A fat, oval-shaped galaxy **NGC 1380** is situated further towards the northern edge of the galaxy group; it is not a spindle in the real sense of the word, but still very elongated in a north-south direction. Also known as Bennett 17, it is an impressive moderately large galaxy gradually brightening to an almost star-like nucleus. Three more galaxies, NGC 1373, 1374 and 1375, approximately 20' to the south-west, form a fine group. This area is dotted with galaxies and the best way to explore it, is to use a detailed star map in excellent dark skies.

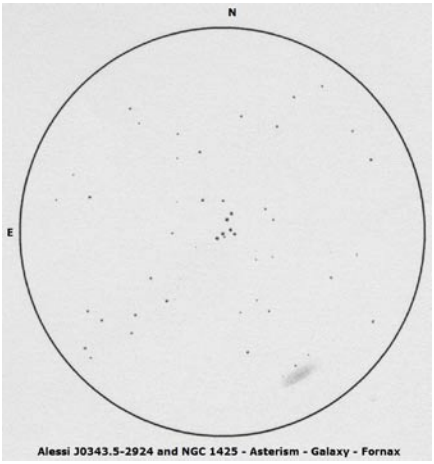
Interestingly, astronomers pushed the NASA/ESA Hubble Space Telescope to its limits when they found a very dim and tiny object, in Fornax called UDFj-39546284, which is likely to be a young compact galaxy. The object existed 480 million years after the Big Bang, only four percent of the universe's current age. More than a hundred such mini-galaxies would be needed to make up our own galaxy, the Milky Way. It is possibly the most distant object ever seen in the universe. Its light will have travelled for 13.2 billion years to reach Hubble, which corresponds to a red shift of around 10. The age of the universe is more or less 13.7 billion years (NASA/ESA).

Just outside and towards the north of this dense and rich galaxy area is the somewhat lonely member, **NGC 1350**. It is a beautiful spiral galaxy, displaying a dust lane stretching in a north-south direction, and gradually brightening to a small but very bright nucleus. A slight, flimsy haziness can be glimpsed towards the western edge. The galaxy is also listed as Bennett 14a. A very faint star is situated in the southern tip and a delicate double star can be seen 4' away in the north-eastern field of view.

Bruno Alessi who sifts through the galaxies discovered an asterism in the eastern part of the constellation forming a triangle to the north-east with NGC 1350 and alpha Fornacis. Asterism **ALESSI J0343.5-2924** can be found more easily situated midway between the stars tau and sigma Fornacis. The group displays a modified letter J with a

few, approximately magnitude 9 yellow-coloured stars. The top bar is towards the south and also houses a double star. The grouping stands out well against the starry field accompany by the galaxy NGC 1425 towards the south-west.

The Two-Tiered Spiral galaxy, perhaps better known as **NGC 1398**, can be found in the north-eastern part of the constellation. Also listed as Bennett 19a, this large round spiral galaxy displays a relatively high surface brightness. The galaxy brightens evenly to a compact dense nucleus with the edge displaying a soft and hazy outer envelope. Very high magnification is needed to glimpse the outer spiral arms responsible for its nickname. According to astronomers it is not known why the central bar in some spiral galaxies rotates around the disc at different speeds from that of individual stars.



What a nice surprise to find a bright and eye-catching planetary nebula just a degree north-west from **NGC 1398**. **NGC 1360** is a large irregular planetary nebula that displays an oval glow in a north-south direction. With careful observation and higher magnification it shows an uneven texture with a slightly brighter northern region. Also known as Bennett 15, this object is bathed in a pale washed-out grey colour and hosts a magnitude 10.5 centre star, visible with careful observation. An attractive white-coloured magnitude 6 star is situated approximately 20' to the north-west of this planetary nebula.

Perhaps the two northern-most NGC galaxies in Fornax are NGC 1367 and NGC 1385. The brighter of the two, NGC 1367, also listed as **NGC 1371** (slightly confusing!), is situated only a degree north of the above-mentioned planetary nebula. The galaxy displays a very soft oval, relatively large with a slightly brighter nucleus. What makes this galaxy special is the pair of orange-coloured stars situated close to the north-eastern edge.

The last galaxy to be discussed in this very special constellation is **NGC 1385**, barely 30' south of the border with Eridanus. Like so many other galaxies this one also displays just a faint oval haze against the background star field. It appears elongated in a north-south direction, brightening gradually towards its nucleus. The colourful star field comes

as a bonus and complements the galaxy in a very special way.

You were warned that there are many fuzzies cooked up in this chemical oven? What a delightful journey through this galaxy world to be able to discover and explore these misty, distant Milky Ways. ☆

Object	Type	RA (J2000.0)	Dec	Mag.	Size
NGC 1049	Glob. Cluster	02^h39^m7	-34°17′	12.9	4′
NGC 1097 Bennett 10	Galaxy	02 46 2	-30 15	9.2	10.5′x6.3′
NGC 1316 Bennett 14	Galaxy	03 22 7	-37 12	8.2	13.5′x9.3′
NGC 1317	Galaxy	03 22 8	-37 06	10.8	3.5′x3.0′
NGC 1350 Bennett 14a	Galaxy	03 31 1	-33 38	10.3	6.2′x3.2′
NGC 1360 Bennett 15	Planetary Neb	03 33 3	-25 51	9.4	390″
NGC 1365 Bennett 16	Galaxy	03 33 6	-36 08	9.3	10.9′x6.5′
NGC 1367 NGC 1371	Galaxy	03 34 7	-24 56	10.6	4.9′x3.4′
NGC 1380 Bennett 17	Galaxy	03 36 5	-34 59	10.0	4.8′x2.8′
NGC 1381	Galaxy	03 36 6	-35 18	11.5	2.6′x1.0′
NGC 1385	Galaxy	03 37 5	-24 30	10.7	3.6′x2.4′
NGC 1387 Bennett 18	Galaxy	03 37 0	-35 31	10.8	3.1′x2.8′
NGC 1399 Bennett 19	Galaxy	03 38 5	-35 27	8.8	8.1′x7.6′
NGC 1404 Bennett 20	Galaxy	03 38 9	-35 35	9.7	4.8′x3.9′
NGC 1398 Bennett 19a	Galaxy	03 38 9	-26 20	9.5	7.1′x5.2′
ALESSI J0343.5-2924	Asterism	03 43 5	-29 25	8	16′

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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