The PRETORIA CENTRE

of the

Astronomical Society of Southern Africa

www.pretoria-astronomy.co.za

NEWSLETTER NOVEMBER 2010

Next meeting

Venue: The auditorium behind the main building at Christian Brothers College (CBC), Mount Edmund, Pretoria Road, Silverton, Pretoria.
Date and time: Wednesday 24 November at 19h15.
Programme:

- **Beginner's Corner:** "The Classification of Nebulous Objects - sorting out those Fuzzy Blobs" by Michael Poll.
- **What's Up in the Sky:** by Johan Smit.
- 10 minute break — library will be open
- **Main talk:** "Cosmology and General Relativity" by Peet van der Walt.
- Socializing over tea/coffee and biscuits.

The chairperson at the meeting will be Danie Barnardo.

Next observing evening: Friday 19 November at the Pretoria Centre Observatory, which is also situated at CBC. Turn left immediately after entering the main gate and follow the road. Arrive from sunset onwards.

CONTENTS OF THIS NEWSLETTER	

Last month's meeting - by Johan Smit

The meeting was probably the best attended this year and the audience included visitors who attended our cloudy observing evening on the previous Friday. The main announcements were our Karoo star party that will be taking place over the last weekend in April 2011, and the prize giving ceremony at Menlo Park primary school on November the 11th. ASSA Pretoria is sponsoring an annual book prize for learners that excel in science. This year there were two boys that performed equally well and are both deserving candidates. We could not decide between them, so we are giving each of them a prize. Congratulations to ALSTAEDT HULME and CHRISTIAN KRIEK.

Dr Hubrecht Ribbens volunteered to do a talk at Alkantrant Library during the week of 24 to 28 January 2011.

Percy Jacobs kicked off the newly formed ASSA Pretoria observing section with an introductory presentation. He presented the ASSA top 100 object list as an observing goal for our members. This list consist of 40 open clusters, 24 globular clusters, 15 galaxies, 8 planetary nebulae, 7 bright nebulae, 5 dark nebulae and 1 star cloud. These are spread over the whole sky and anything between 45 and 70 of these are visible in any month. We should never ask ourselves again: "What shall we look at?"

He presented tips on planning, observing, recording of observations and where to find information about locating these objects. The list was distributed to interested members after the meeting. Members must submit their observations to Percy who will verify the observations.
Successful completion of the top 100 list will earn the observer a special recognition certificate from ASSA Pretoria. And there will be a mystery prize for the "top observer". Taking part in this challenge will teach you the sky and turn anyone into an expert observer. Anyone interested in this adventure can contact Percy

Then Hein Stoltz took us on a what's up tour of November 2010. Planetary observers are starved this month with Jupiter being the only bright planet visible early in the evening. The others are either not visible or is visible early in the morning. This is the time of year to see Andromeda in the north and the Magellanic clouds in the south. November is a good month for galaxy hunting. What better reason to go and visit a dark place.

The main speaker, James Thomas introduced us to software for the amateur astronomer. I saw myself as a bit of an expert in that field, but James proved me very wrong. He covered topics from what types of software are available, what they do, strengths and weaknesses, how to evaluate software and even had time to show samples of some of them in operation. He also showed members how some of the pretty programs eat up your internet bandwidth. Do not blame your children for using all you internet cap—it is you that used it all playing deskbound astronomer.

Apart from these programs being "nice toys", they are a very important tool to use in learning astronomy, planning observing sessions and identifying and finding objects. Would-be observers that wish to take up the top 100 challenge will find that these tools are virtually indispensible. At this meeting not only set a challenge, but also provided tools to win the challenge. I look forward to a busy observing year.
Some of the popular free programs that are available will be copied to CD's that will be placed in the library for the benefit of our members.
The meeting ended just after 21:00 and was concluded with much more lively than usual discussions over tea and coffee.

Last month's observing evening - by Johan Smit

No viewing was possible. The sky was totally clouded over. There were about 15 visitors and we entertained them by showing them around the observatory.

One surprise was a visit by an ex-committee member, Mike Haslam, who has emigrated to America, and came to South Africa for a visit.

We are honoured that he did not forget us and made the effort to pay us a visit.

Orbital Basics - by Barbara Cunow

When a celestial objects moves around another one, there are different types of orbits it can follow. Here I describe the basics of elliptical orbits for a small object moving around a massive one. Examples include the planets of our solar system orbiting the Sun, Jupiter's moons moving around Jupiter and a satellite orbiting the Earth. This article is based on my presentation on orbits at the September meeting of the ASSA Pretoria Centre.

Figure 1 shows the basic properties of an ellipse. The main parameters are the semimajor and semiminor axes a and b, the eccentricity e and the foci F and F'. The eccentricity is the quantity that describes the shape of the ellipse. It is given by

$$e^2 = 1 - b^2 / a^2$$

We always have $b \leq a$, so the range of e is $0 \leq e \leq 1$. The more elongated the ellipse, the larger is e. For a circle we find b = a and e = 0 with both foci being at the centre. Hence a circle is a special case of an ellipse. If e = 1, the ellipse is a line.

Let us now consider a point A on the ellipse. If c is the distance between A and F, and d the distance between A and F', then we have c+d = 2a. This relation determines the positions of F and F', and holds for any ellipse and for any position of A on the ellipse.

In the 17th century, Johannes Kepler determined how elliptical orbits work. His three famous laws of planetary motion in the solar system state the following:

The planets move in elliptical orbits with the Sun in one focus of the ellipse.
As a planet orbits the Sun, equal areas are swept out by the radius vector in equal times.
The square of a planet's orbital period is proportional to the cube of the semimajor axis of the planet's orbit.

Kepler derived his laws for the solar system objects (then the only celestial objects for which enough information was available to allow any conclusions on their motion in space), but his findings are actually very general and hold for any two objects moving around each other in an elliptical orbit.

Figure 2 shows an object q with mass m in an orbit around an object Q with mass M, and we assume $m << M$. Then Q is stationary in one focus, while q moves in an elliptical path (like the planets around the Sun, see Kepler's first law). If $m << M$ was not true, then both q and Q would move around the common centre of gravity in ellipses, and the situation would be much more complicated.

Now we can apply what we have seen in Figure 1, as illustrated in Figure 2. When q is closest to Q (perihelion for orbits around the Sun or perigee for orbits around the Earth), its distance to Q is $d_p = (1-e)a$. When q is furthest from Q (aphelion or apogee), its distance to Q is $d_a = (1+e)a$. We are able to observe the position of q relative to Q, so we can measure d_p and d_a. They are related to e and a as:

$$d_p / d_a = (1 - e)/(1 + e)$$

and

$$a = 0.5 (d_p + d_a)$$

So if we measure the smallest and largest distances between q and Q, we know the size and the shape of the ellipse.

Figure 3 illustrates Kepler's second law. A, B, C and D are positions of q in its orbit, and F_1 and F_2 are the areas of the respective ellipse sections. The radius vector is the line connecting q and Q. Kepler found that if it takes q the same time to move from A to B than it does from C to D, then $F_1 = F_2$. That means that the closer q is to Q, the faster it moves.

Kepler's third law gives a relation between the semimajor axis a and the period P of an orbit. Let us assume that we have two different orbits of q around Q. The first orbit has semimajor axis a_1 and period P_1, the second one has a_2 and P_2. Then we find

$$a_1^{\,2} / P_1^{\,2} = a_2^{\,2} / P_2^{\,2}$$

Using his universal law of gravity, Isaac Newton showed several decades after Kepler published his laws that the following relation holds if q orbits Q in an elliptical orbit:

$$a^2 / P^2 = G (M + m) / (4 \pi^2)$$

M and m are the masses of Q and q, respectively, a is the semimajor axis, P the period and G the gravitational constant. We have m << M, so m can be neglected with respect to M and we find that a^3 / P^2 is proportional to M. That shows that Kepler's third law holds for all small objects orbiting the same massive object. With that I mean that Kepler's third law can be applied if we compare the orbits of Venus and Jupiter around the Sun or if we compare the orbits of Io and Ganymede around Jupiter. However, it cannot be applied if we compare the motion of Venus around the Sun with the motion of Io around Jupiter.

There are three conclusions we can draw from Kepler's third law:

- The further away q is from Q, the longer the orbital period.
- The period only depends on the size, but not on the shape of the ellipse.
- For objects orbiting the Sun we have

$$\{ a [AU] \}^3 = \{ P [years] \}^2$$

This holds because of the choice of the units. The Earth has a = 1 AU and P = 1 year.

Equipped with Kepler's laws we can understand what happens when an object moves around another one in an elliptical orbit. In order to illustrate the effects of Kepler's laws, I will give a few examples.

We know that the Earth is in an elliptical orbit around the Sun. It reaches its perigee at the beginning of January and its apogee at the beginning of July. According to Kepler's second law, the Earth moves faster in January than in July. Therefore the time interval between the June solstice and the September equinox is a few days longer than the time interval between the December solstice and the March equinox. This means that South Africa has shorter summers than the UK and longer winters than Canada.

Another example is Mars. When Mars reaches its opposition in August, it is much brighter than at an opposition in February, something that is easily visible with the naked eye. This would not occur if the orbits of Earth and Mars were circular. It is actually the eccentricity of Mars' orbit that dominates this effect, the eccentricity of Earth's orbit has a smaller effect on Mars' brightness at opposition.

The International Space Station (ISS) orbits the Earth in 90 minutes at an altitude of 350 km, whereas a geostationary satellite has an orbital period of 24 hours and an altitude of 36000 km. This confirms Kepler's third law. Whether or not the astronauts onboard the ISS are happy about this fact, I do not know.

Figure 1: Basic properties of an ellipse.

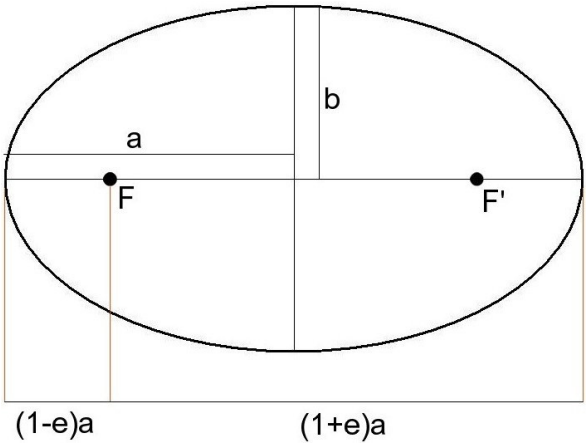
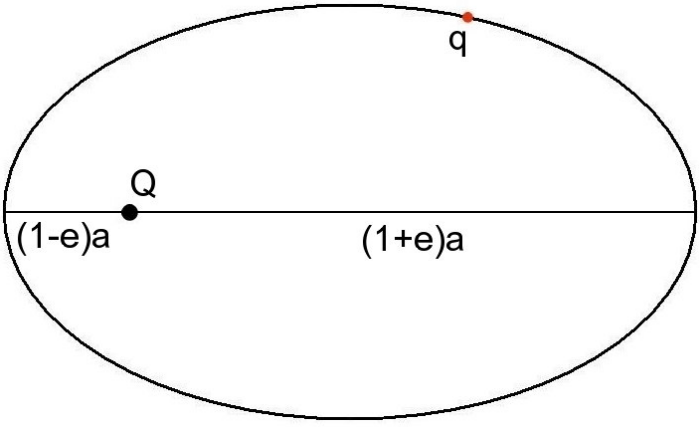


Figure 2: Low mass object q orbiting the massive object Q.



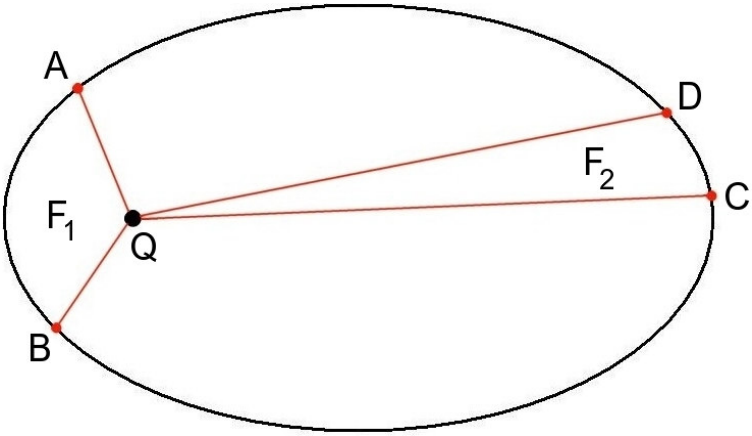


Figure 3: Kepler's second law. A, B, C and D are positions of q in its orbit, and F_1 and F_2 are the areas of the respective ellipse sections.

Right:
Comet Neat

The multiverse

When cosmologist George Ellis turned 70 last year, his friends held a party to celebrate. There were speeches and drinks and canapés aplenty to honour the theorist from the University of Cape Town, South Africa, who is regarded as one of the world's leading experts on general relativity. But there the similarity to most parties ends.

The multiverse has developed rapidly from being merely a speculative idea to a theory verging on respectability. There are good reasons why. Several strands of theoretical physics - quantum mechanics, string theory and cosmic inflation - seem to converge on the idea that our Universe is only one among an infinite and ever-growing assemblage of disconnected bubble Universes.

Despite the many virtues of the multiverse, Ellis is far from alone in finding it a dangerous idea. The main cause for alarm is the fact that it postulates the existence of a multitude of unobservable Universes, making the whole idea untestable. If something as fundamental as this is untestable, says Ellis, the foundations of science itself are undermined.

http://www.newscientist.com/article/mg20527501.100-a-measure-for-the-multiverse.html?

NASA's Global Hawk completes first science flight

NASA has successfully completed the first science flight of the Global Hawk unpiloted aircraft system over the Pacific Ocean. The flight was the first of five scheduled for this month's Global Hawk Pacific, or GloPac, mission to study atmospheric science over the Pacific and Arctic oceans.

The Global Hawk is a robotic plane that can fly autonomously to altitudes above 18,288 meters -- roughly twice as high as a commercial airliner -- and as far as 20,372 kilometers, which is half the circumference of Earth. Operators pre-program a flight path, then the plane flies itself for as long as 30 hours, staying in contact through satellite and line-of-site communications links to a ground control station at NASA's Dryden Flight Research Center in California's Mojave Desert.

http://www.jpl.nasa.gov/news/news.cfm?release=2010-120&cid=release_2010-120

Goldilocks planet just right for life

Astronomers have detected an Earth-like exoplanet that may have just the right kind of conditions to support life. Gliese 581g lies some 20 light-years away in its star's "Goldilocks zone" - a region where surface temperatures would allow the presence of liquid water.

http://www.bbc.co.uk/news/science-environment-11444022

Interested in the SKA project?

If you are interested in the progress of the SKA (Square Kilometer Array) project, contact Marina Joubert at marina@southernscience.co.za and ask her to send you the free SKA newsletter by e-mail regularly (produced 2 - 3 times per year).

Pretoria Centre of the ASSA - Awards to outstanding members of the Menlo Park Primary School Science Club

The Pretoria Centre of ASSA has a friendly working relationship with a Primary School in Pretoria - Laerskool Menlo Park. The school has a Science Club, comprising about 40 children, and the Centre goes to the school about twice a year to give talks, and a viewing evening, for the student members of the Science Club, and for their parents.

As an outreach gesture, the Centre approached the school with a view to giving some sort of sponsorship or a prize to a deserving member of the Science Club. The recipients were to be chosen on criteria suggested by the School. The Centre was given three copies of a book about the oceans by Lerika Cross, and the Committee decided to donate these as prizes. Lerika is the prime mover behind the annual Scopex Exhibition. The books were donations to Scopex, and Lerika made them available to the Pretoria Centre. The Centre Committee decided to give one book per year, plus a book about astronomy to the recipient at the school. The total amount to be spent by the Centre would not exceed R500-00 per year.

The contact person at the school is Isabel Davis. When Danie Barnado and Michael Poll went to see Isabel to finalise the arrangements, she indicated that she appreciated the gesture very much and she was very excited about the project.

The following criteria were used to select a candidate for the ASSA prize:

The recipient would be chosen from their general performance in science and they should have participated in Science Club activities for at least one year. Additionally the person would have taken part in the School Science Expo and the Gauteng North Science Expo. The recipient would also be assessed on their performance in the Department of Education Astronomy Quiz, and in the Mathematics Olympiad.

In the event, the School identified two deserving candidates. Their respective performances were so close that the School felt that there was no choice other than to select both as winners, so the Centre decided to give one book to each. The winners were **Alstaedt Hulme** and **Christian Kriek.** Christian received the book entitled “Ocean”, and Alstaedt was awarded a book entitled “Space, a Children’s Encylopaedia”.

Although the above criteria were the ones used to decide on prize winners, apart from their obvious excellence in science it can be noted that the two also excelled in other academic areas and sport.

Alstaedt Hulme : obtained the highest marks in English, Mathematics and Technology, and was on the Academic Roll of Honour :- from Grade 4 to Grade 7 he averaged more than 85% every year. He was in the top ten for marks in Afrikaans, Human and Social Sciences, and Economy and Management Sciences. He has also shown exceptional spelling prowess. He had the highest marks in Grade 7, and was awarded the Honoris Dux. Alstaedt was the Afrikaans Ekspo winner, and the Amesa Maths Olympiad Gold medal winner. He was also was the Vice Head Boy.

Alstaedt was in the athletics “A” team, the Hockey team, and the Rugby First team. He was the Cricket senior bowler of the year, and the tennis Super 12 winner. In all he received 8 trophies.

Christian Kriek: was in the top ten for marks in Natural Sciences and Technology, Afrikaans, English, Human and Social Sciences, and Economy and Management Sciences. He was on the Academic Roll of Honour:- from Grade 4 to Grade 7 he averaged more than 85% every year. He was also an Amesa Maths Olympiad Gold medal winner. He participated in the Bible Quiz, and served on the Student Council.

Christian was the Cricket Senior Batsman of the year, and participated in cricket at National level and was in the Hockey team. He received five trophies.

The Pretoria Centre is pleased and proud to be able to acknowledge two such outstanding and balanced young learners, and we wish them all the best for the future.

See photograph on next page.

Summary of coming presentation "What's Up in the Sky" - by Johan Smit

Special events:

- Nov 30 -STS-133 Launch, Space Shuttle Discovery to the International Space Station.
- Dec 01 - Mercury At Its Greatest Eastern Elongation (22 Degrees).
- Dec 13 - Geminids Meteor Shower Peak .
- Dec 21 - Summer Solstice, 23:38 UT (= 01:38 SAST on Dec 22).
- Jan 08 - Venus At Its Greatest Western Elongation (47 Degrees).
- Jan 09 - Mercury At Its Greatest Western Elongation (23 Degrees).

Note how fast Mercury has moved from the evening side (east), to the morning (west), side of the Sun. Michael Poll explained this phenomenon very nicely, using Venus, in his "What's Up in the Sky" presentation at the September 2010 meeting. Since then, Venus has also moved form the eastern side of the Sun to the western side.

Other points of interest:

- A list of the ASSA top 100 objects to find in December 2010 and January 2011 will be provided at the meeting.
- Dark evenings are from End November to beginning of December, and from end December to the beginning of January
- New moon is on 5 December and full moon on 21 December.
- You can take a break from the top 100 and admire the Moon and other bright objects until after the Christmas period.
- New moon is again on 4 January and full moon on 19 January
- In summary, the best dark sky evenings will be at the beginning and end of each month, with the bright nights in the middle.

Observations of Venus - by Barbara Cunow

I was able to see Venus in the evening sky in October up to four days before inferior conjunction. My last observation of Venus was on October 25 from 18.10 SAST until 18.17 SAST. I was able to see Venus close to the horizon with binoculars and with my telescope. I could not see it with the naked eye. In my telescope Venus showed a beautiful and extremely thin crescent.

I was also able to see Venus during some of the days before. I took the picture of Venus through my telescope (6 inch Newtonian) on October 20 at 18.14 SAST.

A daylight observation of Venus - by Michael Poll

Seeing Venus in daylight in these parts is frequently a "ho-hum" observation, especially if the moon is near to it. However, at or near Inferior Conjunction (IC), Venus is very close to the Sun, and not easy to find. I had often read about people watching Venus pass through IC, when they would see it after sunset and again before sunrise on the due date. One forgets that generally at this time, Venus is not directly preceding the Sun or directly following it, but passes either north or south of the Sun. The planet passes north of the Sun if IC occurs between December 9th and June 7th, and south of the Sun if IC occurs between June 7th and December 9th. (On June 7th each year, Venus passes through its descending node, and moves to the south of the ecliptic, and on December 9th each year it passes through the ascending node, when it becomes north of the ecliptic). Therefore, in October in Pretoria, if you are facing east, or west, with the Sun nearly overhead, and with the ecliptic being at a fairly steep angle during the day, Venus will be on the south side of the Sun (to the right if facing east) at IC.

Venus was at IC on October 29th 2010 when it was at magnitude 4.1 and about 6 degrees south of the Sun. October 25th and October 26th were brilliantly clear days in Pretoria, with a deep blue sky right down to the horizon and a total absence of dust, cloud and haze. With the sky so clear, on October 26th (three days before IC), even with Venus being as close to the Sun as it was, I thought I would try to see it with binoculars at least. When I have read about people watching Venus pass through IC, I had thought "Nah!' – it would be a bit academic for me. The best I have previously done with finding Venus after a conjunction with the Sun was on September 9th 1979, when I found it in with binoculars in the evening sky 15 days after superior conjunction.

On October 26th I started looking at 11.20 am. The altitude of the Sun was 75 degrees, and its azimuth 23 degrees, i.e. it was 23 degrees east of north. Venus was about 7 degrees 40 minutes south of the Sun. With the Sun suitably hidden behind a roof, I found Venus with binoculars at 11.20 am after a not very long search. On and off, I kept it I view until about 11.40 am (when I had to go out). After finding it with binoculars, I tried to see it with the naked eye – and there it was! I was surprised and pleased to see Venus in daylight with naked eye with it being so close to the Sun. I did keep looking away and then finding it again.

I was hoping to see Venus on the actual day of IC, but the hazy sky came back on the following days, and there were clouds, and I did not recover it. One normally would have to wait 20 months to again try and find Venus on the day of IC, (by definition it would be with the Sun above the horizon) but the next time IC occurs is June 6th 2012, when there is a transit of Venus across the face of the Sun! – so, to try and find Venus passing the Sun on the day of IC we will have to wait until January 12th 2014.

Universe's most distant object spotted

A galaxy 13.12 billion light-years from Earth is the most distant object yet detected, a new study says. Astronomers spotted a faint glimmer of infrared light from this primitive galaxy, called UDFy-38135539, using the European Southern Observatory's Very Large Telescope in Chile.

Because of the time it takes for the distant galaxy's light to reach Earth, the recently captured signal is thought to have been emitted when the universe was only 600 million years old. That means the find can help scientists better understand the so-called era of reionization, the study authors say.

For about the first billion years after the big bang, the universe was filled with an opaque fog of neutral hydrogen. As the very first stars and galaxies formed out of this fog, their radiation charged any nearby hydrogen. This ionization transformed the fog into the optically transparent interstellar medium that exists today.

http://news.nationalgeographic.com/news/2010/10/101020-science-space-most-distant-galaxy-farthest-universe/

What is Neville doing these days? - by Jennifer Els

Neville Young has been an active member of the Pretoria Centre of the ASSA since 1985. Many of us have seen him explaining where and how the planets move, using his solar system model. This always attracts a crowd.

Neville has recently been very busy making a version of the model for production, sometimes using Fred Oosthuizen's workshop. He says it will soon be on the shelves at Experilab. Waterkloof Primary school somehow heard about it and have ordered one. Neville is excited by the idea that his model might end up being used in many schools.

Neville was recently invited to exhibit at the National Science week at Fort Hare University, where he also showed his constellation jigsaw puzzle – now on CD. He has included science simulations and various other astronomy related material on the CD. Experilab suggested that he produce a small telescope kit for them, the first batch are already on the shelves.

Neville is also writing a book on astronomy for the layman which was commissioned by a local publisher. He is branding these products with the Starwaders name, which he thought up a few years ago because he says we are all wading in the shallow waters on the edge of the Sun's ocean of radiation. Neville seems to be having a lot fun with all these projects.

Neville's Starwaders website adress is www.starwaders.com.

Notice about MNASSA

The Editorial Board of MNASSA (**M**onthly **N**otes of the **A**stronomical **S**ociety of **S**outhern **A**frica) has agreed that MNASSA will go electronic and free of charge from the end of 2010. There are 6 issues of MNASSA per year. The web link to MNASSA is http://www.mnassa.org.za/

An outcome of the Charles affair *

One of the actions recommended by Prof Belinda Bozzoli, Chair of the NRF, was the establishment of an 'Astronomy Desk'. This is now in place. The following statement was Issued:

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To All Media
For Immediate Release
15 October 2010

Prof. Hellberg heads DST's Astronomy Desk

The Minister of Science and Technology, Naledi Pandor, has appointed Prof. Manfred Hellberg, an Emeritus Professor of Physics and Senior Research Associate at the University of KwaZulu-Natal, to head the Astronomy Desk at the Department of Science and Technology (DST).

Prof. Hellberg's appointment, which is for six months, began on 1 October 2010. Minister Pandor recently established the Astronomy Desk in her department to advise on substantive policy and strategic matters regarding the development of astronomy and related sciences, as well as pertinent matters related to South Africa's bid to host the Square Kilometre Array (SKA) radio telescope.

A reference team of senior scientists will support Prof. Hellberg with technical and expert advice. The team consists of Professors Sunil Maharaj, George Miley, George Ellis and Harm Moraal and René Kraan-Korteweg. The Astronomy Desk will advise and make recommendations on the following:

- How should South Africa obtain maximum scientific advantage and return on the significant investment being made in astronomy?
- The most appropriate relationship between South African national research facilities and internationally funded projects to ensure optimal benefit to South Africa?
- An appropriate structural, organisational and management relationship between optical and radio astronomy and the High-Energy Stereoscopic System, which measures gamma rays, in Namibia? This includes assessing the possibility of creating a single multiwave astronomy facility or institute.
- In light of the above, what is the most appropriate governance model for astronomy facilities in South Africa?
- What would be a suitable site for the placement of the MeerKAT operations centre and any strategic or urgent matters that have a material impact on South Africa's bid to host the SKA?
- Any pertinent matters that require attention to ensure the continued health and functionality of the national astronomic facilities or the SKA project.

Issued by the Ministry of Science and Technology.

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* This refers to the affair in which Prof. Phil Charles, Director of SAAO, was involved. He was suspended pending a disciplinary investigation relating to “communication within the organisation”. He was subsequently found to be not guilty on any of the charges. Interested members can read about this in the issues of MNASSA for February 2010, page 6; April 2010, page 48; August 2010, page 115. (These issues have already been put on the website of MNASSA. See bottom of previous page.)

THERE WILL BE NO NEWSLETTER, NO MONTHLY MEETING AND NO OBSERVING EVENING IN DECEMBER. A COPY OF *“SKY GUIDE AFRICA SOUTH 2011”* WILL BE SENT TO EACH MEMBER AS SOON AS THEY ARE RECEIVED FROM THE PUBLISHERS.

HartRAO 26m radio telescope recommissioned after major repair

In a major engineering feat, the 200 ton, 50 year old, 26m diameter radio telescope at the Hartebeesthoek Radio Astronomy Observatory (HartRAO) has been recommissioned after replacing the main bearing in its polar shaft that failed in October 2008.

The photograph on the left shows the damaged main bearing after removal from the telescope. The cylindrical rollers were originally positioned between the two big concentric cylindrical rings. The photograph on the right gives an idea of the size of the bearing.

- MNASSA, October 2010, page 168.
- www.hartrao.ac.za/news/100906_26m_repair/index.html

Sundog

Below are two of the photographs (taken by Tony Viljoen) of the "sundog" that was visible in the sky over Gauteng recently. In some of his photographs a second and (with some imagination) a third ring is visible.

IST

The IST (International Space Station) is nearing completion. For a timeline and animation see

http://www.nasa.gov/mission_pages/station/structure/iss_assembly.html

For more information see http://www.nasa.gov/mission_pages/station/main/index.html

Symposium

A report of the Astronomy Symposium that took place in October 2010 at the Council for Geoscience in Silverton, Pretoria, has been written by Johan Smit. It will be put on our website.

M34

This pretty, open cluster of stars, M34, is about the size of the full moon on the sky. Easy to appreciate in small telescopes, it lies some 1800 light-years away in the northern constellation Perseus. According to Greek mythology dating from several centuries B.C., the hero Perseus was the son of the Greek supreme god Zeus and a human female named Danaë.

M34 spans about 15 light-years. Formed at the same time from the same cloud of dust and gas, all the stars of M34 are about 200 million years young. But like any open star cluster orbiting in the plane of our galaxy, M34 will eventually disperse as it experiences gravitational tides through encounters with the Milky Way's interstellar clouds and other stars. Over four billion years ago, our own Sun was likely formed in a similar open star cluster.

http://antwrp.gsfc.nasa.gov/apod/ap100211.html

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