# The PRETORIA CENTRE

of the

## Astronomical Society of Southern Africa

www.pretoria-astronomy.co.za

# NEWSLETTER JUNE 2006

The next meeting of the Pretoria Centre will take place at Christian Brothers College, Pretoria Road, Silverton, Pretoria

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| Date and time | Wednesday 28 June at 19h15 |
| Chairperson | Lorna Higgs |
| Beginner's Corner | "Planetarium Programs" by Tony Viljoen |
| What's Up | by Michael Poll |

**++++++++++ LEG BREAK - Library open ++++++++++++**

**MAIN TALK**

**"Animals in Space"**
**by Johan Smit**

The meeting will be followed by tea/coffee and biscuits as usual.
The next social/practical evening will be held on Friday 23 June at the Pretoria Centre Observatory, which is also situated at CBC. Arrive anytime from 18h30 onwards.

## INSIDE THIS NEWSLETTER

# Last month's meeting - by Fred Oosthuizen

Fred Oosthuizen chaired the meeting. The meeting was well attended in spite of it being a rather cold winter's evening. Those present at the meeting were reminded of the forthcoming events.

Johan Smit gave a brief report back on Scopex and was very proud to announce that the Pretoria Branch won 2 out of the 3 prizes awarded.

In Beginners Corner, Michael Poll presented a talk on the Origins of the Zodiac: Naming of the Zodiacal Constellations. Observers in Ancient Times wanted to unite the bright starry groups in the sky into constellations but in doing so they wanted to mark certain important areas in the sky. "The Egyptian Goddess Nutt surrounded by all 12 zodiac signs is evidence that the naming of the zodiacal constellations was a dynamic process that took place over several thousand years."

Whatever the angle, or the orientation of the earth's axis (and by extension the equator) the sun will always pass through the same zodiacal constellations. There are 4 special points along the ecliptic: the 2 equinoxes, in March and September, when the sun crosses the Equator, and day and night are of equal length; and the 2 solstices in December and June, which mark the furthest limit of the sun's movement North and South.

The four points would have been important because the seasons could be predicted by observing the sun's annual movement through them. Michael also pointed out that the equinoxes and solstices move from one zodiacal constellation to another on average about every 2150 years (The precession cycle has a 25,800 year period.) Every 2000 years or so, the equinoxes and solstices will be in a new group of 4 constellations. It can be seen that our current names for the March Equinox (the first point in Aries) and for the Tropics (Cancer and Capricorn) have been outdated by precession. The March Equinox is now in Pisces, and the sun is overhead at the Tropics when it is in Gemini (June) and Sagittarius (December). The twelve zodiacal constellations can therefore be divided into three groups of four, or three "quartets", depending on which four of the zodiacal constellations the four special points occupied at any one time.

The first quartet "Gemini" comprising Gemini, Virgo, Sagittarius and Pisces would have been created in around 6000 BC and the other three namely Taurus, Aries and Pisces at intervals of about 2000 years. The names given to the constellations in each quartet would have reflected the socio-cultural and economic conditions of the time.

Michael concluded by stating that the first quartet is somewhat exceptional in that three of the four are named after "human" figures even though the word "zodiac" means "circle of animals", and that they are all dual in concept-twins, mother and child, half man half animal, and a pair of fishes.

In What's Up, Wayne Mitchell did his usual well-informed What's Up. He gave us a well-illustrated idea of what we can expect to see in our night skies at this time, especially for those of us who will be going to Nylsvley this coming weekend. The planets Mars, Saturn and Jupiter can be seen in the evening sky. Jupiter will be exceptional to view toward midnight as it will be almost directly overhead. Venus can be seen in the morning twilight. A number of open and globular clusters can be seen, such as the splendid NGC 6752 cluster, and some galaxies, including the large barred spiral galaxy NGC 6744 in the Pavo constellation. Many more galaxies are to be found in Coma Berenices, amongst them is the massive M64 nicknamed "The Black-eye" galaxy at a distance of around 44 million light-years. M51, the Whirlpool galaxy, is in Canes Venatici and the Sombrero Hat Galaxy M104 in Virgo. Our two neighbors, the small and large Magallanic clouds, and many nebulae such as The Trifid, The Lagoon, The Veil, The Swan, Eta Carina, and various Planetary nebula can be seen.

The main speaker for May was Paul Botha on the subject: *METEORITES - Their Origin, Classification, Falls, Finds, and Find Identification*. Meteorites originate from three main areas, namely the Asteroid Belt, the Oort Cloud/Kuiper Belt and closer to home Mars and the Moon. A meteorite is a fragment of extraterrestrial material that has fallen onto the earth's surface and they can be classified into 4 main groups: Stony; Iron; Stony Iron; Mars and Moon.

Chondrites are stony meteorites that contain chondrules. These meteorites represent aggregates of material formed very early on in the evolution of the Solar System and have not been melted since. They are often made up of the minerals Olivine and Pyroxene, thought to represent primitive material formed by crystallization from material in a nebula prior to the formation of the Solar System. This type of fall is the most common type of meteorite found on our planet.

Stony iron meteorites are composed mostly, but not only, of silicate materials and are very rare.

Iron meteorites are composed mostly of iron-nickel metal and are very common.

Various samples of meteorites were passed around and slides were shown.

The largest meteorite field found is Sikhote-Alin in eastern Siberia.

The Vredefort structure in South Africa is considered to be one of the largest meteorite impact sites on our planet.

In 1908 a huge explosive event occurred in the region of Siberia known as Tunguska. Study of this event by Russian Scientists led to the “Impact Theory” for the formation of craters as a result of meteorite impacts. The largest known meteorite, which fell some 5000 years ago, is the 60 ton iron Hoba meteorite near Grootfontein in Northern Namibia.

Paul concluded by stating that all meteorite finds in the Republic of South Africa belong to the state and must be reported accordingly.

## Last month’s observing evening — by Michael Poll & Johan Smit

It was quite busy, starting slightly cloudy but clearing up later. We were pleased to welcome a number of people from the Photographic Society who came to join us for the evening. Johan gave a short informal talk to the visitors, covering the mechanics of the Earth’s rotation and it's effects on long exposure photography. Practical advice was given and simple devices to track the stars were described.

As hoped, the sky cleared up and out came the cameras and telescopes. To make the most of the excellent seeing conditions, the 12 inch spent most of the evening aimed at Jupiter. As luck would have it, the red spot was favourably placed for observation, and all the people present, including the first time visitors, were able to see it clearly. It is a very special experience when your first look through a telescope is at the red spot on Jupiter!

The nice clear evening gave us much to see. Jupiter and Saturn were well placed, and the brilliant sights of the Carina Milky Way, including the Theta Carinae cluster, Eta Carinae and NGC 3532 were noted. Other open clusters observed in Carina were NGC 2516 near the False Cross, and NGC 3114, which is near the variable star S Carinae. S Carinae itself was also checked out - it was near the fainter part of its cycle at about magnitude 8 or so.

A number of globular clusters were located, including Omega Centauri, but also NCG 2808 near the Diamond Cross, and NGC 6388, M 4 and M 80 in Scorpius. Also in Scorpius, Sigma Scorpii (the star to the left of Antares as the constellation rises) is a rather pretty double, with components of magnitude 2.9 and 7.8.

In the north we saw Lyra, with its bright star Vega. Higher up was the famous double, Albireo, in Cygnus, and the Coathanger Cluster. Some of us trooped onto the hockey field to catch the stars of the handle of the Plough, also known as the Big Dipper, which is part of Ursa Major.

It is very special to see a good number of people at all our practical sessions.

# Brown Dwarf Stars Part 2 – by Michael Poll

**Formation of Brown Dwarfs**

Stars in pairs are very common, but it was not known whether brown dwarfs could pair with normal stars, or even whether a pair of brown dwarfs was possible. If brown dwarfs could form a pair with a normal star, then it was felt that they could be discovered in the way extra solar planets are being discovered, that is, by noting changes in the radial velocities of the parent star, a change which is caused by the gravitational effect of the unseen object, but no brown dwarfs have been found in this way, even though they would be more massive than a planet.

Taking images of nearby stars was also not productive. Although Gliese 229b was found in this manner, several hundred stars were sampled in this survey and 229b was the only one found. It was concluded that very few brown dwarfs orbit sun like stars.

However, a search for brown dwarfs near other brown dwarfs quickly yielded results. In one survey, the first double brown dwarf was found after imaging only three L dwarfs, and it has since been found that at least 20% of brown dwarfs have a brown dwarf companion. It has also been found that brown dwarf pairs orbit much closer to each other than pairs of normal stars. Whereas the median separation between normal stars is 40 AU*, (approximately the distance of Pluto from the sun) the separation between brown dwarf pairs is 10 AU or less.

Why are there so few brown dwarfs orbiting sun like stars? The reason for this is that the ratio of the mass between a star and a companion star is important. The ratio is generally less than 10:1 i.e one star in a pair is normally not greater than 10 times the mass of the other. In the case of extrasolar planets, the ratio is far more than 10:1, ie the star is far more massive than the planet. This suggests that, although they can be comparable in mass, brown dwarfs form in a different manner to giant planets.

It is now thought that brown dwarfs start their lives in the same way that normal stars do, that is, from the collapse of a molecular cloud. Later, young normal stars show accretion and outflow phenomena, (dusty accretion discs around the equator, and polar jets), and it seems that young brown dwarfs do the same.

One theory to account for young stars finishing up as brown dwarfs is that they formed from a small molecular cloud, so that not so much star forming material is available. A second possibility is that of a brown dwarf being formed in a stellar subcluster consisting of about three to six objects. This scenario would mean that some of the objects being formed would have unstable orbits, and the smallest objects would be ejected from the system. If this happened early in the history of the cluster, a small, ejected body would be deprived of its gas supply and would not accrete enough material to become a normal star. This latter theory is not so strong, because it has been found that a high proportion of brown dwarfs are in pairs, and it is very difficult to eject a *binary pair* from a system, although if a binary pair were ejected it would explain the small orbital separation between the components.

**Masses and Sizes**

If the orbital elements of a pair of brown dwarfs is determined, then the mass of each object is easily calculated, but as of May 2005, very few of these orbital elements were known. One of the early orbits measured, that of a brown dwarf pair orbiting a $10^{th}$ magnitude star in Bootes, yielded masses for the brown dwarfs of about 70 and 55 times that of Jupiter.

The discovery of an eclipsing binary has given precise measurements of mass *and* size. A pair of brown dwarfs found in the Orion Nebula have masses calculated at 56 ± 5 and 36 ± 3 Jupiters and the diameters of 6.5 ± 3 and 5.0 ± 3 Jupiters.

**Summary**

Brown dwarfs fill a gap between stars and planets. They have intermediate masses and have atmospheric temperatures that span the range between stars and planets. Their chemistry, the presence of clouds (“weather”) and their magnetism also span this gap. Brown dwarfs form in the same way as stars do, but in appearance may look more like planets.

AU : Astronomical Unit, the average distance between the Earth and the Sun : 149 600 000 km.

References

A Decade of Brown Dwarfs Gibor Basri
Sky & Telescope May 2005 p 34
Brown Dwarf Enigma Robert Naeye
Sky & Telescope May 2006 p 18

## Global warming and ground-based astronomy - sent in by Lorna Higgs

Ground-based astronomy may be almost impossible by 2050 as global warming causes a dramatic increase in cloud cover.

Clouds and aircraft condensation trails, or contrails, already hamper astronomy, says Gerry Gilmore, an astronomer at the University of Cambridge. Worries about cloud cover prompted a study, which Gilmore chaired, to look into how global warming and rising air traffic will affect the forthcoming 100-metre-wide Overwhelmingly Large Telescope in Chile. This is one of a planned series of extremely large telescopes designed to observe the skies in unprecedented detail. Contrails and global warming feed off each other, Gilmore says. "Contrails increase global warming, and global warming helps larger contrails form."

Though they realised that increasing cloud was a potential threat, astronomers did not appreciate the scale of the problem before the study, Gilmore says. "The study shows that ground-based telescopes will be worthless by 2050."

Gilmore hopes to make the wider public aware of this overlooked consequence of global warming. "We can only go to the least affected places and try to make governments pass laws to protect these sites," he says. "But the future of cheap aeroplane transport and climate change is out of our hands."

From: New Scientist 11 March 2006

## Local news items

- Mr Auke Slotegraaf has resigned as editor of MNASSA and Sky Guide Africa South as well as ASSA webmaster.
- Mr Gerrit Penning of the Bloemfontein Centre has taken over as ASSA webmaster. If ASSA Centres or ASSA members would like to have information placed on the website, they can send it to him for placement. His email address is: gpenning@webmail.co.za.
- The ASSA council has decided to go ahead with the placing of MNASSA on the Internet.
- Proposals have been received for the SKA (**S**quare **K**ilometer **A**rray) from four sources:
  1. Argentina & Brazil.
  2. Australia & New Zealand.
  3. China.
  4. South Africa & 6 other countries.

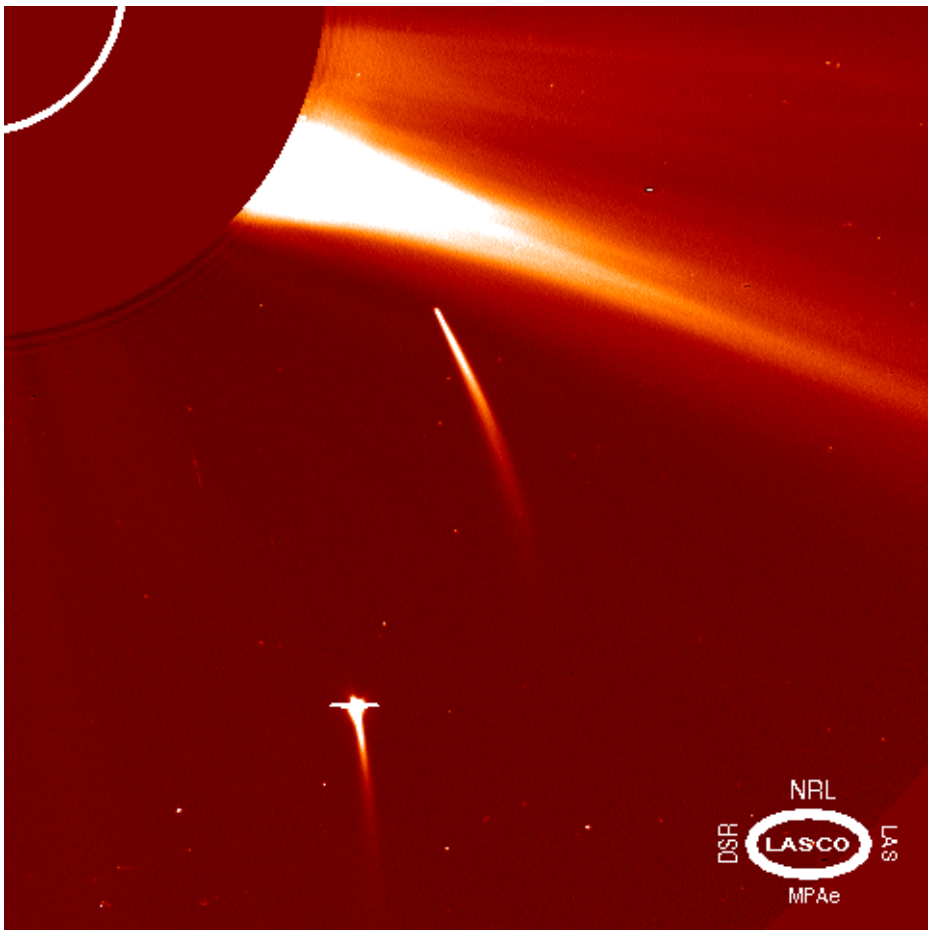
  Ranking of the sites may become available by 1 September 2006.
- With the tremendous public interest raised by SALT, day visitor numbers at SAAO have increased greatly. After many public requests for night visits, a schedule was introduced allowing public viewing on Saturday nights, using the 20-inch telescope. Initially, one night per month was set aside, but it was soon extended to every weekend, due to popular demand. The 30-inch telescope also had to be included for larger groups at times. Towards the end of last year, the Visitors' Centre was upgraded and a small observatory was built next to it. Although the finishing touches are still being put to this facility, it has already been well utilised. In fact, it is so popular that every weekend for 2006 has already been fully booked!

## Find a sun grazing comet – with your PC

The **So**lar and **H**eliospheric **O**bservatory (SOHO) orbits around the Sun in lockstep with Earth. It swings in a "halo orbit" around the Lagrangian point $L_1$, which is 1.5 million kilometres sunward from Earth, from where it has a perpetual view of the Sun. Amateur astronomers have found hundreds of sun grazing comets from images made by SOHO and which were placed on the INTERNET. These images were made mostly with its **L**arge **A**ngle **S**pectrometric **Co**ronagraph (LASCO). Its narrow-field (C2) and wide-field (C3) telescopes fitted with cameras, registered the images.

A coronagraph uses an occulting disk to create an artificial eclipse, revealing the corona and objects hidden in the solar glare. Even if you used such an instrument from Earth's surface, the blue part of sunlight scattered by the molecules of Earth's atmosphere would give a bright foreground that would swamp the light from the corona and from objects at a small angular distance from the Sun. However, out in space, outside Earth's atmosphere, there is no such bright foreground.

See Sky & Telescope, August 2005, p 32 & p 96. I invite members to visit the website http://ares.nrl.navy.mil/sungrazer/. There is a wealth of information there designed to help newcomers discover their first comet on images from SOHO. If you find one, let me know, and I will announce it in the newsletter. Editor




Two comets SOHO-54 and SOHO-55 of the Kreutz group of sun grazing comets can be seen in this image from LASCO C2 on SOHO. The bright streak in the upper part of the image comes from the corona, the outer part of the atmosphere of the Sun. The occulting disk of the coronagraph is on the upper left.

## Nylsvley Visit - May 26th 2006

The visit to Nyslvlei was wonderful, but we will have a full report about it in the July newsletter. Meanwhile, it would be very nice if any (all?) of the people who went could write a line or two about how they experienced the weekend, so that we could give a nice roundup. Please submit reports to Pierre Lourens at email address pierre.lourens@pbmr.co.za or even handwritten ones can be faxed to Pierre at 012 675 9298.

## SuperWASP

The Southern station of the SuperWASP programme (**W**ide **A**ngle **S**earch for **P**lanets) is now running at SAAO near Sutherland and is approaching fully robotic operation. The station has an array of wide-angle CCD cameras that monitors the night sky for possible variations in the brightnesses of stars caused by planetary transits. The image below shows the array. There is an identical twin of it on the island La Palma in the Canary islands.
Website: www.superwasp.org

## Subscriptions

Subscriptions for the period 1 July to 30 June fall due on 1 July. The subscription form sent to you with the May newsletter should be completed by new members **and** by current members to renew their membership. The easiest way is to fill in the form and send it with your payment to our Membership Secretary, Rynhardt van Rooyen. However, he will also be available at the meeting on June 28th for the poor old latecomers.

When you fill in the subscription form, you must indicate whether you want to receive the newsletter by email or snail mail. The advantages of receiving it by email are:

1) You receive it sooner than by snail mail.
2) There is little chance of it not arriving.
3) You get all colour pictures in the newsletter in colour.
4) The Pretoria Centre saves money.
5) The newsletter editor (who sends out the newsletters) saves work.

Members who fail to renew their subscriptions will receive newsletters only until August.

**Please print your email address clearly on the subscription form.**

## SALT telescope building

The SALT telescope building at SAAO near Sutherland, with the Milky Way in the background. Image taken off their website at http://www.salt.ac.za/

## PRETORIA CENTRE COMMITTEE

| | | |
|---|---|---|
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