The PRETORIA CENTRE

of the

Astronomical Society of Southern Africa

www.pretoria-astronomy.co.za

NEWSLETTER APRIL 2006

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

Date and time	Wednesday 26 April at 19h15
Chairperson	Michael Poll
Beginner's Corner	Resolving power - by Johan Smit
What's Up	by Andrie van der Linde

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

MAIN TALK

The Big Bang - by Ad Sparrius

The meeting will be followed by tea/coffee and biscuits as usual.
The next social/practical evening will be held on Friday 21 April at the Pretoria Centre Observatory, which is also situated at CBC. Arrive anytime from 18h30 onwards.

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Last month's meeting - by Michael Poll

Michael Poll was in the Chair. Announcements were made about the visit to Nylsvley on May 26th – 28th 2006, and a proposed night stay at Tswaing Crater later in the year. The draw for wearers of name tags was postponed, as not every one has a tag yet.

Fred Oosthuizen presented "What's Up" showing us the constellations visible both north and south, but with particular emphasis on the southern Milky Way, where the bright clusters and other nebulous objects in Carina are on view again.

In the absence of Beginner's Corner, Michael Poll and Eric Nockler gave an extended talk about the field visit to Vredefort Dome last year.

An outline of the geological strata that had been exposed by the impact was given – the layers, from older to younger were Archean Granitic Crust, the Witwatersrand Super Group (comprising the West Rand Group and the Central Rand Group), and the Ventersdorp Lavas. An outline of impact mechanics was also presented.

Our guide for the day was Prof Roger Gibson of Wits University. The first stop was at Salvamento Quarry where we saw network breccias, which are interconnected veins and pods of pseudotachylitic breccias with well rounded inclusions of granitic country rock. In the quarry, these rock formations have been exposed and were seen in a section of rock face about 3 metres high. The second stop was a beautiful view site of the Vaal River, but where we also saw examples of rock showing shatter cone features. The third stop was at an exposed conglomerate layer that formed what was known as the Amazon Reef, which was ultimately part of the Central Rand Group. It is in this conglomerate that much of the Witwatersrand Gold is found. Roger explained how the gold was deposited along an ancient beach, which was then uplifted and recycled, so the gold became concentrated. The fourth stop was at Askoppies Iron Age settlement, where hut circles were made of rocks of the Ventersdorp lavas.

The final stop was at a site of impact melt rock. The rocks were in the form of an exposed dyke - larger boulders that stand above the more readily weathered country rock. The matrix of the rock had embedding in it numerous inclusions of the variety of target rocks that were shattered by the impact, and which were trapped when the melt rock solidified.

The meeting was followed by tea and coffee as usual.

Last month's Observing Evening - by Michael Poll

The observing evening was a total cloud-out. Three of us came, and after some chat and discussion, three of us went home hoping for better things next month!

Scholarship

The Astronomical Society of Southern Africa offers a scholarship. The purpose of the ASSA scholarship is to encourage the study of astronomy. The scholarship is available in support of second and third year undergraduate studies (and, in exceptional cases, Honours) in astronomy subjects only, at any South African university. Preference will be given to ASSA members as well as to previous holders of the Scholarship who have made good progress in their studies. The Scholarship will cover academic fees for astronomy subjects only, as well as a contribution towards the cost of prescribed books for these subjects, and is valid for one year.

More details are available at

http://www.saao.ac.za/assa/html/25_scholarship.html

or: Maciej@ifr.sun.ac.za

or: The Hon Secretary, ASSA, c/o PO Box 9, Observatory 7935.

Mountains of creation

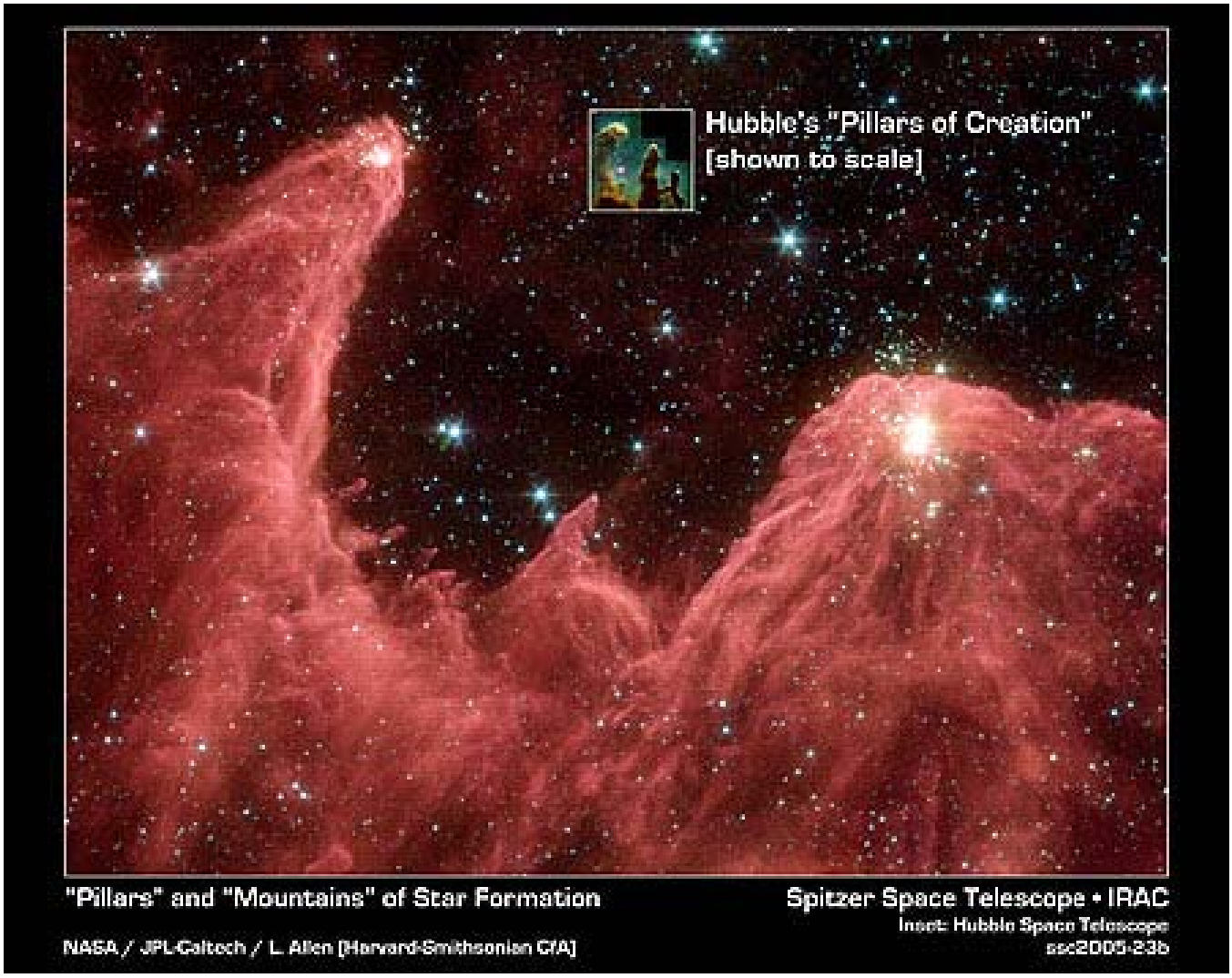
This majestic false-colour image from NASA's Spitzer Space Telescope shows the "mountains" where stars are born. Dubbed "Mountains of Creation" by Spitzer scientists, these towering pillars of cool gas and dust are illuminated at their tips with light from warm, embryonic stars.

The new infrared picture is reminiscent of Hubble's iconic visible-light image of the Eagle Nebula (inset), which also features a star-forming region, or nebula, that is being sculpted into pillars by radiation and winds from hot, massive stars. The pillars in the Spitzer image are part of a region called W5, in the Cassiopeia constellation 7,000 light-years away and 50 light-years across. They are more than 10 times in the size of those in the Eagle Nebula (shown to scale here).

The Spitzer's view differs from Hubble's because infrared light penetrates dust, whereas visible light is blocked by it. In the Spitzer image, hundreds of forming stars (white/yellow) can seen for the first time inside the central pillar, and dozens inside the tall pillar to the left. Scientists believe these star clusters were triggered into existence by radiation and winds from an "initiator" star more than 10 times the mass of our Sun. This star is not pictured, but the finger-like pillars "point" toward its location above the image frame.

The Spitzer picture also reveals stars (blue) a bit older than the ones in the pillar tips in the evacuated areas between the clouds. Scientists believe these stars were born around the same time as the massive initiator star not pictured. A third group of young stars occupies the bright area below the central pillar. It is not known whether these stars formed in a related or separate event. Some of the blue dots are foreground stars that are not members of this nebula.

Website: http://www.spitzer.caltech.edu/Media/releases/ssc2005-23/ssc2005-23b.shtml



Brown Dwarf Stars – by Michael Poll

Up until about 10 years ago, no objects with a mass between that of the lightest stars (red dwarfs) and the heaviest planets were known. The existence of Brown Dwarf stars was proposed to fill this missing link in astronomy. Although none had been observed, theories about brown dwarfs had been mooted in the 1960s. There was no reason why nature could not manufacture objects of the required mass, and it was realized that they probably had not been seen because they would be very faint - brown dwarfs would only be detected if they were very close to the Earth.

However, in spite of detailed searches, no brown dwarfs turned up until1994, when an object whose spectrum contained lithium was found in the Pleiades. If the object were a low mass star, lithium would have been destroyed. Within a year, lithium was found in two other Pleiads. This was followed by the discovery of a faint object orbiting the red dwarf Gliese 229. This binary system is only 19 light years away, so the companion (Gliese 229b) was too faint to be a true star, and its nature was confirmed when molecules of methane were found in its spectrum – molecules cannot exist in the hot atmospheres of normal stars.

The spectral sequence as originally defined early in the 20th century, ended with the coolest stars then known, the red dwarfs, which are spectral type M ("M dwarfs"). Each spectral class is divided into10 subclasses from 0 – 9, and, for example, M0 is hotter than M9. The spectral type of a star is determined by the temperature of its photosphere and by the composition of its atmosphere. With hot (i.e "normal") stars, the atmospheres are ionized gases. An ionized gas, also known as a plasma, consists of negatively charged electrons and positively charged ions – indicating that atoms have dissociated. However, if the star is very cool, as with the M stars, neutral (undissociated) atoms and even molecules can exist.

At visual wavelengths the spectra of M dwarfs are dominated by oxides of heavy metals in the form of molecules such as titanium oxide. Titanium oxide (TiO) is actually very rare in red dwarfs, but it appears to be abundant because TiO molecules have a lot of absorption lines in the visible part of the spectrum. (A similar effect occurs in the sun – its visible spectrum is dominated by absorption lines of iron, even though the sun has very little iron).

When stars cooler than M9 were found in the 1990s - the brown dwarfs - they were being classified as M10 or M11, which did not conform to accepted practice. In any case, their spectra were increasingly different from M stars. Eventually the classification of stellar spectra was extended to accommodate brown dwarfs. In 1997 the classes "L" and "T" were added at the cool end of the spectrum. Class L comprised stars with temperatures ranging from 2 200° K to 1 400° K. The "hotter" subclasses of these cool stars contain a mixture of red dwarfs and brown dwarfs. All the cooler L subclasses are brown dwarfs.

At temperatures below 1 400° K another chemical change takes place - methane (CH_4) is present – and this led to the introduction of spectral type T.

Dust

Below 2 200° K "dust" can form in the stellar atmosphere – the "dust" is, in effect, the "solidification" (freezing!) of heavy metals, including titanium oxide. Once the titanium oxide forms dust its absorption lines disappear from the spectrum, because the dust sinks below that part of the atmosphere where spectral lines are formed. The cooler the star, the more dust is formed, and with the cooler L dwarfs, spectral lines, predominantly due to alkali metals such as sodium and potassium are present. If the dust was not settling, it would remain above the atmosphere and *all* spectral lines would disappear, giving a featureless spectrum.

A question asks whether the dust clouds cover the whole of the brown dwarf or whether they form patchy clouds. It is suggested that the clouds are distributed much like they are on Jupiter – although that planet is covered with cloud, there are holes at various heights. In addition there are brightness variations in brown dwarfs that are not related to the rotation period, suggesting the presence of clouds. If the brightness variations were due to star spots, then these variations would match the rotation period.

Magnetic fields and rotation periods.
When stars are born, they spin rapidly, and, because the fast spin increases the dynamo effect, young stars are magnetically very active. Eventually the spin rate slows down because the stars throw off winds of charged particles, which interact with magnetic fields and rob the star of angular momentum. However, brown dwarfs have rapid rotation rates. This is because, even when young and warm, (a) they have a weak magnetic field, and (b) the atmosphere soon cools and becomes unionised, so the production of charged particles falls away. Thus there is very little loss of angular momentum, and the fast rotation rate is maintained.

To be continued

Stargazing weekend

WHERE? NYLSVLEY NATURE RESERVE, near Naboomspruit, about 160Km north of Pretoria.
WHEN? Friday to Sunday, 26th – 28th May 2006

Costs: R180.00 per person for the weekend, nonrefundable.
Children under 12 years free.

Directions: From the N1 take Nylstroom off ramp at the Kranskop toll plaza. Turn right onto the R101 towards Potgietersrus and Naboomspruit. Keep heading towards Naboomspruit with the mountains on your left. Turn right at the Boekenhout sign onto a gravel road for about 8km. Look carefully for the Nylsvley sign on the left.

Kindly deposit your payment into the following account and fax a copy of your deposit slip, with your telephone number to Rynhart van Rooyen at (011)-4413288 (w).
Account holder: ASSA Pretoria Center
Bank: ABSA Rose bank
Branch code: 630805
Account Number: 4058335681
Note: Please specify your FULL NAME and NYLSVLEY as a reference for the deposit or else we won't know who the payment is from.
First come, first serve, so book soon! Please confirm your booking by contacting Wayne Mitchell.
For more info: Wayne Mitchell: 0724657739 or (012)-7199065 (w), or see the March newsletter.

Telescopes for sale

I am an agent for TELESCOPE S.A.

Telescope S.A, distributors of Telescopes.
Great quality telescopes at surprisingly affordable prices.
Sky-Watcher, Celestron, Vixen and other brands.
Full range of eyepieces and other accessories.
Sky-Watcher is the most popular brand and very affordable, especially the Dobsonian type, so why not treat yourself?
Contact Wayne Mitchell 072 465 7739

Sloan Digital Sky Survey reveals a new Milky Way neighbour

A huge but very faint structure, containing hundreds of thousands of stars spread over an area nearly 5,000 times the size of a full moon, has been discovered and mapped by astronomers of the Sloan Digital Sky Survey (SDSS-II).
At an estimated distance of 30,000 light years (10 kilo parsecs) from Earth, the structure lies well within the confines of the Milky Way Galaxy. However, it does not follow any of Milky Way's three main components: a flattened disk of stars in which the sun resides, a bulge of stars at the centre of the Galaxy and an extended, roughly spherical, stellar halo. Instead, the researchers believe that the most likely interpretation of the new structure is a dwarf galaxy that is merging into the Milky Way. The new dwarf galaxy is found toward the constellation Virgo.
"Some of the stars in this Milky Way companion have been seen with telescopes for centuries,"' explained Princeton University graduate student Mario Juric, principal author of the findings describing what may well be our closest galactic neighbour. "But because the galaxy is so close, its stars are spread over a huge swath of the sky, and they always used to be lost in the sea of more numerous Milky Way stars. This galaxy is so big, we couldn't see it before."

Paper submitted to The Astrophysical Journal available in preprint form at
http://www.arxiv.org/abs/astro-ph/0510520

Function To Be Held At Pretoria Botanical Gardens

The Centre has been asked to give a presentation at the Pretoria Botanical Gardens on June 1st 2006. The invitation was accepted by Michael Poll and Johan Smit, who met with the organizer Tony Yoko, on March 25th.
Members of the public will be invited for meal at the Mokha Restaurant, and after the presentation of a short talk (will be done by Johan Smit) we will go outside and look at the night sky, both with naked eye and telescopes.
Members are invited to attend. The organizer has offered 6 complimentary meals for members involved who have brought telescopes. If more than 6 people bring telescopes the Committee can consider ways of sharing the costs of the extra meals. We need to know definite numbers of people who can bring telescopes, and it must be a firm commitment. Please communicate names to Johan Smit by no later than April 30th 2006.
The restaurant accommodates 200 people. If there is an overflow, the evening is to be repeated on June 6th 2006. If you are making a commitment, please indicate on which dates you would be available.
Members not involved with the presentation can still attend in their private capacity. The cost is R100.

JACK BENNETT AWARD : 2005 - 2006

Members of the Pretoria Centre of ASSA are invited to submit nominations for the Jack Bennett Award. The award is made annually to a member of the Centre, in memory of a founder member, Jack Bennett. The award is made to the Centre member who is considered have made the best contribution to the Centre, and / or to Astronomy during the year. Nominations should be made on this basis, and must be supported by a motivation.

The winner of the award is afforded the use of the Bennett telescope for one year. The telescope is a 5 inch, 20x refractor which was owned and used by Jack.
Please submit nominations to Michael Poll by May 31st 2006. The award will be presented at the Annual General Meeting on July 26th.

Black Hole Dust

The Hubble Space Telescope image (below, left) shows a spiral-shaped disk of dust fuelling a massive black hole in the centre of galaxy NGC 4261. Astronomers calculate that the object at the centre of the disk is 1.2 billion times the mass of our sun, yet it is concentrated into a space not much larger than our solar system.
No one has ever seen a black hole, and they never will. This bizarre cosmic phenomenon is a place where gravity reigns supreme, where any object, and even light, becomes trapped by the gravitational forces of a massive star that has collapsed or by galaxies that have collided.

Website: http://dsc.discovery.com/convergence/amazingspace/reports/holes.html

Pluto really has two more moons

Pluto has two more satellites. US astronomers tentatively announced the discovery of the two moons last November. Now they've confirmed their find, after spending six months analysing images from the HST. Pluto's first known satellite Charon was not discovered until 1978. In the image (above, right) Pluto is in the centre and Charon is just below and to the right of it. The new moons, P1 and P2, are to the right of Charon.
NASA's "New Horizons" mission, which was launched earlier this year, will be the first to take a detailed look at Pluto in 2015, and the Kuiper belt by 2020.

Website: http://www.abc.net.au/science/news/space/SpaceRepublish_1576661.htm

Astronomy discussion groups on the Internet

Website address: http://dir.groups.yahoo.com/dir/Science/Astronomy

See also **Sky & Telescope**, March 2005, p 110.

Summary of two recent astronomy - related talks in Gauteng - by Anton Nel

In recent weeks I was privileged to attend two talks that were astronomy related. It is a pity that one usually does not get a copy of the speaker's notes or presentation to share with friends who could not attend the talks. However, here is a very short summary of what I heard (perhaps not necessarily what was said!!!) for those of you who are interested. In the past I have found that one can usually contact the speaker if you are interested in the subject and they will generally provide you with more information or further reading references.

The first talk was at the Transvaal Museum, arranged by the Northern Flagship Institution on the 16th March 2006. Dr. Robin Catchpole (catchpol@ast.cam.ac.uk), recently retired Senior Astronomer at the Royal Observatory Greenwich, was the speaker. The subject of his talk was an old favourite, "Are We Alone in the Universe?"

From the outset he acknowledged that he can not answer the question. Who can?! But it was nevertheless interesting to hear some of the theories again. His talk highlighted the increasing number of extrasolar planets being found, the Mars meteorite with the hugely debated "fossil" in it, the Drake Formula and also the SETI Programme. The basic conclusion is that there is currently nothing to indicate that other life exists, but for the same matter, there is nothing to indicate that other life does not exist! However, even if it does exist, it is sadly unlikely that we, earthlings, will ever find it or make contact with it, simply as a result of the huge distances between objects in the universe. It was interesting to note (no pun intended!) Noot-vir-Noot's Johan van Rensburg and his son in the audience – it just shows that astronomy and cosmology are subjects of interest to a wide range of people! It was also nice the meet our chairman, Michael Poll, there.

The second talk was much more "technical", but just as interesting and also a lot closer to home! Prof. Eric Wilcots (ewilcots@astro.wisc.edu) from the University of Wisconsin-Madison in the USA gave a talk on SALT at the Johannesburg Planetarium on the 28th March 2006. He titled his presentation "Seasoning the Universe with a little bit of SALT"!

Despite the complexity of an observatory like SALT, prof. Wilcots explained it excellently in layman's terms and kept the audience's attention for the whole 90 minutes his talk lasted, also drawing a number of questions from the audience. Quite a few school learners also attended, which hopefully promises interest in astronomy as a study field. Prof. Wilcots explained the purpose of SALT (technology, science and society) and the value of having it in the Southern hemisphere for the partners of SALT working and living in the Northern hemisphere (SA has a majority stake of 35% in SALT, with the other 65% distributed through a range of institutions, most of them in the Northern hemisphere). Of particular interest were the self-aligning mirror structure and the efforts to keep it clean and to keep the birds out of the building! From all reports, it would seem that SALT is a benchmark in project management and certainly something SA can be proud of.

PRETORIA CENTRE COMMITTEE

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