The PRETORIA CENTRE
of the
Astronomical Society of Southern Africa
www.pretoria-astronomy.co.za

NEWSLETTER JULY 2007

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

Date and time	Wednesday July 25 at 19h15
Chairperson	Michael Poll
Beginner's Corner	AGM (It will be as short as possible)
What's Up	Hein Stoltsz

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

MAIN TALK

Long period variable stars — what makes them tick

by

Fabio Frescura

The meeting will be followed by tea/coffee and biscuits as usual.
The next social/practical evening will be held on Friday 20 July at the Pretoria Centre Observatory, which is also situated at CBC. Arrive anytime from 18h30 onwards.

INSIDE THIS NEWSLETTER

Last month's meeting — Lorna Higgs

Once again our meeting coincided with a cold snap, but 45 astronomers proved that they are hardy. (It is perhaps lucky that we did not have too many attendees, as we were all very fat in our many layers of clothing and we took up lots of space.)

Once again, Hein had a disaster and we did not have What's Up. Hopefully, everyone has a Sky Guide and could find out what to look for during July (freezing weather permitting).

The Beginner's Corner was presented by Jan Plomp. He had a new idea of an Interactive Quiz and tested it on us. He presented some topics that cause problems for beginners, or are worth knowing, but get lost amongst all the other information. He gave the audience (who did not admit to being beginners) the chance to supply answers or explain concepts. The wild guesses were very entertaining, even though they were not correct! It certainly made us realise that there are some real problem areas (e.g. orientation on the moon, which used to be the opposite of on earth, was changed when earthlings started walking around up there, but still gets reversed by telescopes!), but we all learnt a lot and we will make sure that Jan provides more of his Quizzes.

The Main Topic was Neutron Stars, presented by Chris Engelbrecht. If anyone does not understand exactly what neutron stars are and how they are formed, then they were not listening. Chris reduced nuclear physics, and other subjects that we thought were so difficult to understand, to simple matters. His body language certainly helped, because we almost felt the pressure and gravity between his fists, we followed matter into space during super novas with his out-flung arms, and his angled arms while he turned explained exactly the "lighthouse beams" of the pulsars. (The following is a summary of what was said, but it was too dark to take notes!)

Chris started with the familiar H-R diagram to show us which of the millions of stars will end up as neutron stars. Only 1% of the corpses of stars end up that way and they are all found in the top left-hand corner of H-R, i.e. big, hot and short-lived. But not too big – only 8 to 12 times the mass of the sun. (The larger ones end up as black holes.) Nuclear reactions continue throughout the life of the star until, eventually all the hydrogen inside the star has been converted to something else. In stars that are destined to be neutron stars the onion-like layers go from hydrogen at the surface, through to iron at the core. There is no more fusion after iron is formed and once the outward forces overcome the inward pressures, there is a supernova explosion. We see the effects of the explosions across vast distances of the universe and the long-term effects result in some of our favourite planetary nebulae, e.g. Crab, but the cause of the "fireworks" and beauty is an insignificant dot (the neutron star – NS).

The NS, although small, is exceptionally dense. If there is a companion star, then it will be cannibalised by the NS. Its matter will be dragged into a disc around the NS, and will spiral inwards until hitting the NS in a burst of energy. We can detect this energy emission with our radio telescopes. It appears to be periodic, because the NS rotates (up to 1000 times a second) and the "lighthouse beam" is only directed towards us once in every rotation. These neutron stars are called pulsars.

Although only 1% of stars will end up as neutron stars, there must be a significant amount of matter in space that we cannot see, because the lighthouse beams are not directed towards earth, or because the planetary nebula has dissipated and we do not know to look for a NS in the middle of it. The matter that has been ejected in the supernova in the planetary nebula, including all those heavier elements, ends up in new stars and solar systems. That is where we come from.

Not many stayed for tea or coffee after the meeting (warm heaters and beds were obviously more appealing), but the few who stayed really enjoyed the discussions triggered by the talks of the evening.

Gorged Star Could Explode

Astronomers have discovered that a piggish, belching little star might just bust a gut - spilling secrets about the universe in the process. The scene of interstellar swilling is called RS Ophiuchi, a dense and voracious white dwarf star with what looks to be a red giant companion star that is footing all the dining bills.

RS Ophiuchi has a long history of outbursts every 20 years or so, which astronomers - using new radio, infrared and X-ray observations - now ascribe to thermonuclear burps when the white dwarf eats too heartily from the red giant.

Here's how they think it works: As the red giant material is sucked down onto the white dwarf and piles up on its surface, the pressure at the bottom of the pile builds up until it's enough to trigger a thermonuclear explosion. Such an explosion happened on Feb 12, 2006 and astronomers have since been gathering data with an armada of modern space and ground-based telescopes. At thousands of kilometers per second, the blast wave from the explosion crashes through the gassy, dusty nebula region created by the red giant, lighting it up in visible light, infrared radiation, radio waves and even X-rays. The explosion actually made RS Ophiuchi visible to the naked eye, if you knew where to look.

This little white dwarf appears to be a Type 1A supernova progenitor. If it is, it's the first chance astronomers have to watch as a star gets ready to blow itself up.

Two papers about the ongoing event appeared in the July 20, 2006 edition of the journal Nature.

Website: **http://dsc.discovery.com/news/2006/07/21/stellarswine_spa_02.html?category=space&guid=20060721103030**

Left: An artist's representation of the white dwarf accreting matter onto itself from the nearby red giant via an accretion disk, and undergoing an outburst.

Introduction to Astronomy

This four-session course at the Johannesburg Planetarium will be repeated in August on Tuesdays, starting Aug 7th. Cost is R150 per person. Each session starts 6:30pm. To register, visit website

www.planetarium.co.za

Energetic event

NASA's Chandra X-ray Observatory captured a sight of awesome upheaval. It has seen an arc of incredibly hot gas extending over two million light years, which requires one of the most energetic events ever detected. Although astronomers cannot exactly say what formed this arc of gas, they can provide two interesting explanations.

The favored explanation is that two massive galaxy clusters are undergoing a collision at a speed of 6.4 million km/h. Shock waves generated by the collision of the two clusters' hot gas clouds could produce a sharp change in pressure along the boundary where the collision is occurring, giving rise to the observed arc-shaped structure.

Another possible explanation is that the disturbance was caused by an outburst generated by the infall of matter into a supermassive black hole located in a central galaxy. The black hole inhales much of the matter but expels some of it outward in a pair of high-speed jets, heating and pushing aside the surrounding gas.

Website: **http://chandra.harvard.edu/press/07_releases/press_053007.html**

The X-ray image by the Chandra X-ray Observatory (left) shows a massive arc-like structure to the lower left. There are also hints of a cavity in the hot gas to the upper left. The words on the image are “CAVITY” and “ARC”.

ASSA Pretoria Centre Annual General Meeting 2007 Agenda

1 Opening and Welcome
2 Apologies for Absence
3 Approval of Minutes of AGM of July 2006
4 Chairman’s Report
5 Treasurer’s Report
6 Election of Committee for 2007 – 2008
7 Jack Bennett Award
8 Any Other Business

Dark Sky Observing Weekend June 15th - 17th 2007— Michael Poll and Johan Smit

About 20 people, (and many telescopes!), took advantage of good weather, and the prospects of a dark sky, to go and stay with Mike and Joy at their new plot and venture at Ezulweni near Warmbaths. Visitors included Johan from Namibia and Clive Callaway, from the USA currently working in South Africa. Ezulweni is conveniently situated about 120 km from Pretoria, and with a sky better than that at Nylsvley, we were not disappointed. Observing went on until 11.30pm on the first night, and until 2 am (for most of us), on the second. However, thanks to Henry and Roxy's sherry and thoroughly enhanced coffee Johan, Danie and Henry were the last to go to bed at about 04:00 in the morning. Amongst other things they were hunting down galaxies with Clive's 12 inch truss tube Discovery Dobsonian.

The winter Milky Way was at its best, with many delights to see, and with staying up so late, we had early sightings of objects we do not normally see until later in the year. Amongst the objects observed were the Moon (only a sliver), Venus, Jupiter and Saturn; Messier Objects M4, M7, M13, M17, M27, M30, M57, M51, M53, M57, M64, M71 and M83; NGC numbers NGC6231, NGC3532, NGC6752, NGC5128, NGC4945, NGC362; Double stars gamma Leonis, sigma

Scorpii, epsilon Bootis (not split), alpha Centauri, gamma Virginis (not split), epsilon Lyrae, beta Cygni, alpha Capricorni; The variable stars RR Scorpii and V380 Scorpii were identified; and other objects seen, identified by name, were Eta Carinae, the Jewel Box, Omega Centauri, the Coathanger asterism, and 47 Tucanae. We also did some naked eye tours, and reviewed some of the northern constellations.

With a free day on the Saturday, some took the opportunity to go to Warmbaths, others took walks or lazed in the sun to enjoy the lovely bushveld, and some spent the afternoon collimating telescopes with Johan's home-made collimation tool. This tool was the subject of many jokes, but proved easy to use and as effective as any commercial one. At some point during the evening Clive mentioned "I cannot believe what I see. It looks like I am using a different telescope".

We hope to repeat this trip in the near future.

Neptune

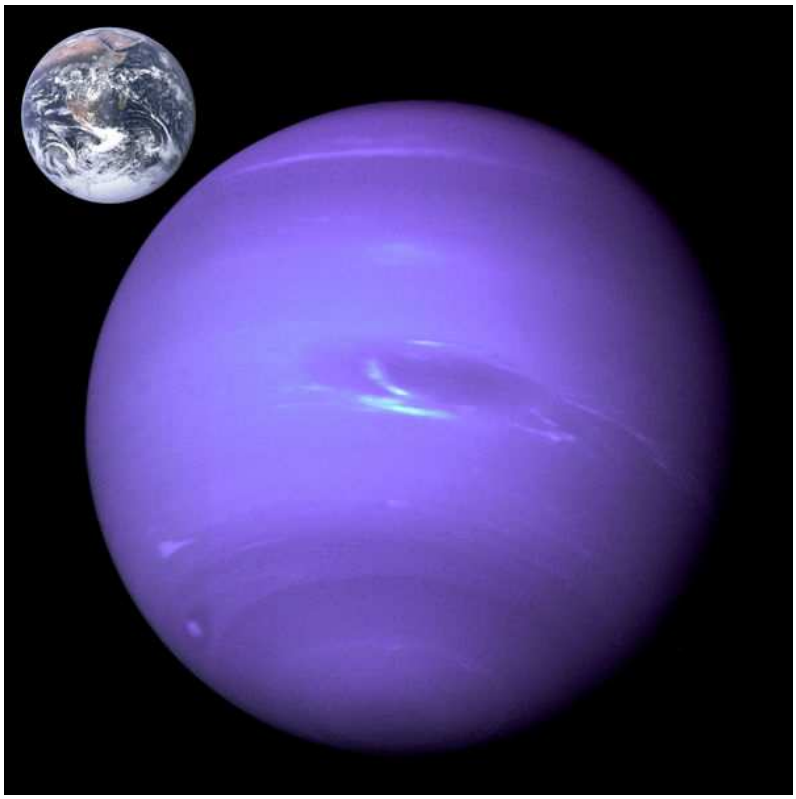
Neptune was the first planet discovered using mathematical prediction rather than through telescopic observations. Disturbances in the orbit of Uranus led astronomers to theoretically determine Neptune's existence. It was subsequently found by telescope.

Neptune is the 8th planet from the Sun and the 4th largest in the solar system. As with Uranus, Neptune is commonly referred to as an "ice giant", consisting of molten rock and metal in its core surrounded by a mantle of icy rock, water, ammonia and methane.

The planet's vast atmosphere consists mostly of hydrogen and helium. Its blue appearance is due to a small presence of methane. Neptune has the strongest winds of all the planets. Wind speeds of 2,100 km/h have been measured.

The planet has a very faint ring system. It has 13 known moons, of which Triton is the largest. Neptune has not been orbited by a satellite yet. However, the famous Voyager 2 probe did fly by Neptune while on its tour of the outer gas giants.

Much more information can be found at website **http://en.wikipedia.org/wiki/Neptune**



Left: Size comparison of Neptune and Earth. **Right:** The Great Dark Spot, as seen by Voyager 2.

Alpha Centauri A, B and C revisited, part 2 — Michael Poll

Alpha Centauri A (magnitude 0.0) is a yellow star with a spectral type of G2, exactly the same as that of the Sun. Therefore its temperature and colour also match those of the Sun, though it is slightly larger. Its mass is 1.1 times that of the sun, diameter 1.26 times, and it is about 60% brighter than the Sun. Astrosiesmology* shows that A is slightly more evolved than the sun, being around 7 billion years old as compared with 4.6 billion for the sun.

It has recently been found that x ray emission from the corona of alpha A has decreased by a factor of 80 in the last 5 years. Far ultra violet emissions have also reduced markedly. It is speculated that the star is undergoing a decrease in magnetic activity, analogous to the Maunder Minimum, which is a similar period of reduced activity that the sun went through form 1645 – 1715, a period known as “the Little Ice Age”.

Alpha Centauri B (magnitude +1.4) is a reddish-orange star with a spectral type of K1. It has 45% of the Sun’s luminosity and just about 90% of its mass and diameter.

Alpha Centauri C (Proxima) is an 11^{th} magnitude red dwarf star, spectral type of M5. Its mass is estimated to be 12% of the Sun’s mass, and its diameter 14% that of the sun, making it about one and a half times the diameter of Jupiter. It emits only 1/13 000th of the light of the Sun.

The stars of Alpha Centauri are the nearest stars to the Earth, apart from the sun. Although the German born astronomer, Friedrich W Bessel, is credited with the first publication of measurement of the true distance to a star, Scotsman Thomas Henderson was the first to take serious measurements. Henderson took parallax measurements of Alpha Centauri at the Cape, finishing his observations in 1833. However, he put off the task of reducing the data, because he was discouraged by the fact that he knew the telescope he used was flawed. Bessel started taking measurements of 61 Cygni in 1835, and by 1838 had sufficient data to show that the star was 10.3 light years away. (The modern value is about 11 light years). As a result of the publication of Bessel’s results for 61 Cygni, Henderson did his calculations and produced his results two months after Bessel. Henderson’s value for the distance to Alpha Centauri was 3.5 light years, which is somewhat less than the current value of 4.4 light years. Alpha Centauri C lies measurably closer to us than the other two: it is only 4.22 light-years away, and so it is the nearest individual star to the Sun.

(Astroseismology is the study of ultra low frequency sound waves echoing through the body of a star, and is the equivalent to studying earthquakes by seismology on earth. As sound waves resonate through the interior of the star, stellar material moves towards or away from the centre, giving a displacement at the surface of about 40 metres).

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Observing Evening June 22nd 2007 — Michael Poll and Johan Smit

Another clear evening for observing, and ***so*** many people and telescopes, (and vehicles!). Not able to count all of them, but 6, 8 or 10 telescopes, at least two mounts for binoculars, and many things to observe. With this many telescopes available, the Centre 12 inch was not opened, but it was shown to some people who wanted to see it, or who wanted to get out of the cold for a few minutes.

Julian Shellard, an instructor at our telescope class, visited us from Johannesburg, and we had some visitors from as far as Rustenburg. Since this visit Gustav has joined the telescope making class and is currently busy grinding an 8 inch mirror.

The early evening centred on the objects due to set in the north west – Venus, now showing a marked crescent phase, Saturn to its upper right, and the moon, which will be drifting through our observing evenings for a few months. There were splendid views of the moon, especially via the binocular eyepiece that Charl had on his 11 inch telescope. Jupiter was next, it is now high in the east in the early evening. Three of its moons were visible, the fourth appeared later.

We looked at some old favourites, including Messier 7, (the open cluster in Scorpius), Alpha Centauri, Omega Centauri (NGC 5139 - globular cluster) and the Jewel Box (NGC 4755).

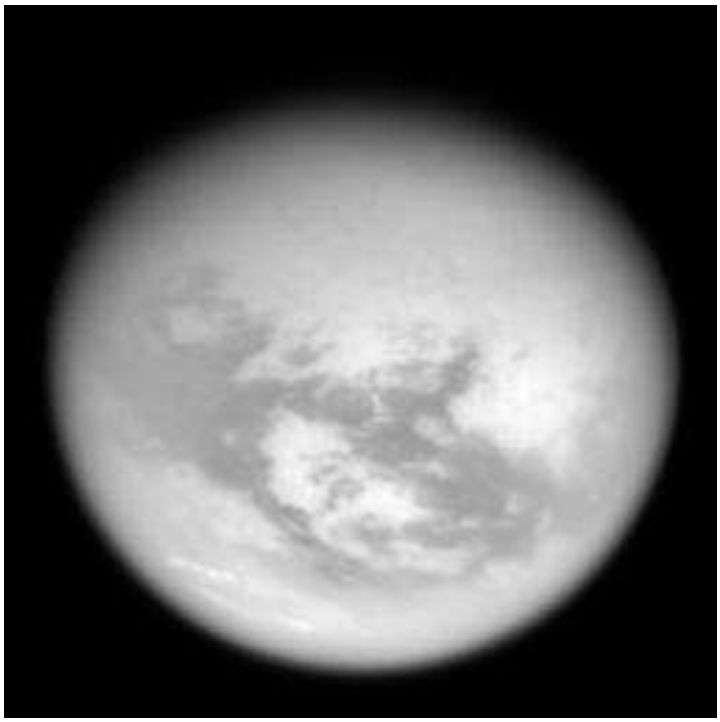

Stargate Asterism

We also saw some less visited objects. Two galaxies found were NGC 5128, the "Hamburger Galaxy" in Centaurus, not far from Omega Centauri in the sky, and M104 (NGC4594), the Sombrero Galaxy, which is in Virgo, but on the border with Corvus. Charl introduced one of these writers (MP) to the "Stargate Asterism", a curious collection of six stars forming an equilateral-triangle-within-an-eqilateral-triangle, lying near M104. *(MP subsequently found that Magda Streicher talked about the Stargate Asterim at the 2002 ASSA Symposium, and this was written up in MNASSA for June 2003, p 145. The co-ordinates for the asterism are given as RA 12h 35.7 m and Declination –12 degrees. See picture).*

Andrie pointed out some "new" globular clusters. The first was NGC 6441 in Scorpius, and was easily located right next to the star G Scorpii, just east of M7 in the tail of Scorpius. Next was Messier 19 (NGC 6273), which was hopped to from Jupiter, currently in this area of the sky. Near M19 we saw NGC 6293, another globular - M19 and NGC 6293 are both in the constellation Ophiuchus, and are near the stars 26,28 and 31 Ophiuchi. A very successful evening, but it was getting cold.

After everyone left Johan, Hein and Julian stayed behind and did some binocular sky touring. Just two of the objects viewed were the Lagoon Nebula (M8) and the Coathanger Cluster. While in this part of the sky, they viewed the ever-popular Albireo with Hein's 8 inch Dobsonian. They also tried to split the double-double (epsilon) in Lyra with the same instrument. They were sure that they managed to split both pairs, but by that time eyepieces were fogging up regularly. Julian left when the dewing got too bad and because he still had to travel to Johannesburg. Hein and Johan had also decided to pack up when they discovered that there was a shadow transit of one of the Jovian moons in progress. This convinced them to brave the cold some more and with regular eyepiece warming, a bit of quick viewing until it fogged up again, and then inserting another warm eyepiece while the fogged up one got re-warmed, they managed to see the shadow and followed it until the cold got the better of them at about 02:00 am. Two frozen observers went home very tired and satisfied.

Hierdie foto's is in die dag geneem. Links is Venus te sien net voordat die maan voor dit in-beweeg het. Regs is Venus weer te sien net nadat die maan voor dit verbybeweeg het. Foto's vanaf Dries van Zyl se webwerf by **www.weatherscenes.co.za**.



Weather without water

Bright mid-latitude clouds near the bottom of the image at left hint at the ongoing cycling of methane on Titan. These cloud streaks are near the same latitude as similar clouds observed above different longitudes on Titan. The view is centered on Titan's trailing hemisphere, over the 1,700 kilometer wide bright region known as Adiri. North on Titan (5,150 kilometers across) is up and rotated 15 degrees to the right.

The images were taken with the Cassini spacecraft wide-angle camera on May 13, 2007 at a distance of approximately 104,000 kilometers from Titan.

For views of other moons of Saturn, go to website **http://saturn.jpl.nasa.gov/multimedia/images/image-details.cfm?imageID=2229**

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