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

NEWSLETTER MARCH 2007

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

Date and time	Wednesday 28 March at 19h15
Chairperson	Michael Poll
Beginner's Corner	"Webcam astrophotography " by Karl Crous
What's Up	by Tony Viljoen

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

MAIN TALK

Spectroscopy

by

Prof Cor Rademeyer (UP)

The meeting will be followed by tea/coffee and biscuits as usual.
The next social/practical evening will be held on Friday 23 March 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

Only 40 attended the meeting. Everyone else missed something special.

Hein Stoltsz discussed Solar Eclipses (during Solar Week!) in Beginner's Corner. He explained how solar eclipses occur and mentioned the various types. He then told us about his attempts to see total eclipses – Zambia fell through, Northern Province was clouded out, but it got very dark, and success at last in Turkey in 2006. He observed from the Side peninsula on the Mediterranean coast. His photos and the video (with comments in the background in an American twang) made us all realise that there are not nearly enough total solar eclipses.

In What's Up Wayne Mitchell toured his favourite Messier-type objects that are visible at present. He showed us how to find them, what they look like and what he sees in them – the number 37, a face, etc. (Do other members "see" objects in the skies? The ancients certainly did!) He reminded us to look at the rings of Saturn, before they "disappear" for a few years in the edge-on position. He also mentioned the total lunar eclipse on 3-4 March (that I could not see through 7mm of rain).

The highlight of a really super evening was Dr Robert Groess' talk about our close neighbour – Andromeda (M31). With so much dust in the Milky Way and Andromeda, we have never been able to see much detail in our neighbouring galaxy. It has just been a large oval glow in the sky. Infrared viewing, by filtering out the cold dust, has changed that, especially since Spritzer was launched. Spritzer is an infrared satellite observatory that is trailing earth in solar orbit, is getting further away, will run out of coolant and cannot be serviced. However, the huge volume of data from the various instruments means that astronomers will have enough information for research for decades after we have lost contact.

The Andromeda project was finally approved by the authorities who schedule viewing by Spritzer and the data streamed down. The first marathon task was to filter out the images of the thousands of stars in the Milky Way that mask the Andromeda galaxy. Once that was done, the data from the galaxy could be manipulated. Robert Groess of Wits spent many hours, using lots of maths (Fourier transforms, etc.) to subtract various wavelength images from others to arrive at images that showed structure. The skewed ovals in the main structures fascinated the researchers and models were created of the possible theories. The best fit showed that Andromeda had received a direct hit in the centre from another galaxy - M32 is the likely culprit.

We heard about the suppressed excitement of the international team of researchers, while there was a news embargo, but, at last, the "father" of Spritzer, who made it all possible, joined Prof David Block and Robert Groess in South Africa for the official announcement of the "galaxy-shattering" event – on the day that the report was published in Nature!

None of us will see the collision of Andromeda and the Milky Way scheduled for millions of years from now, but viewers in another galaxy may experience something similar to what the Spritzer researchers (from South Africa!) have been through.

Observing Evening February 23rd 2007 - Johan Smit and Michael Poll

Not much success again. We were pleased to welcome a number of visitors, including a number of students from Medunsa. The sky was clear for some early observing, we did some naked eye tours and showed how Orion's Belt pointed north west (downwards) to Aldebaran and the Pleiades, and pointed south east to Sirius. Through the telescope we looked at the Pleiades and Hyades, and looked at the Orion Nebula (M42) and the cluster next to it (M43). Johan gave an open air talk on some astronomy basics (How small a feature can you see on the moon with the naked eye and various sizes of telescope?) While Johan was talking a bank of cloud moved in that that was about that for the evening.

Because of the bad weather, and the keen interest of the students the presentation and viewing were repeated in the following week on 2nd March. Johan, Christo Barnard and the students and lecturers gathered after sunset and Johan gave them a short presentation on stellar evolution.

Unlike the previous week the evening started cloudy, but cleared up during the talk. After the talk Saturn was viewed through the 12 inch in the dome. Needless to say, every-one was suitably impressed. Johan, standing at the bottom of the ladder could see every one's face as they looked into the eyepiece, and cannot forget how all the facial expressions changed when they realised what they were seeing. The look changed from on of intense concentration (fear of falling of the ladder) to wonder and amazement. Many a jaw dropped and faces lit up. It turned into a truly unforgettable evening.

Many new friends were made and best wishes go to 3rd year medical students from Medunsa. We hope to see more of them in the future.

Volcanic eruption on Io

By fortuitous timing, the New Horizons spacecraft flew by Jupiter on 28 February 2007 just as a massive volcano on Io (one of its moons) erupted, sending a thick plume of dust into space. The plume from the volcano known as Tvashtar stretched about 240 km above the surface of Io.

See the image of the plume on Io and other images made by the spacecraft on website

http://dsc.discovery.com/news/2007/02/28/io_spa.html?category=space&guid=20070228130000

COROT

COROT (**CO**nvection, **RO**tation and **T**ransits) was launched on 27 December 2006 by a Soyuz 2-1b rocket from the Baikonur Cosmodrome in Kazakhstan. One of the mission's scientific goals is to detect planets around other stars by the transit technique. 'Transit' refers to the technique whereby the presence of a planet orbiting a star can be inferred from the dimming starlight caused when the planet passes in front of it.

COROT will monitor some 120 000 stars and will lead a bold new search for planets around other stars. In the decade since the first discovery in 1995 of an exoplanet (51 Pegasi b), more than 200 other such planets outside our solar system have been detected using ground-based observatories. The COROT space telescope promises to find many more during its two-and-a-half-year mission, expanding the frontiers of our knowledge towards ever-smaller planets.

Left: An artist's representation of COROT orbiting Earth.

Read more on website:
http://www.cnes-tv.com/corot_en/

Nobel Prize in Physics for Cosmology Result

The Royal Swedish Academy has awarded the Nobel Prize in Physics for the year 2006 to two scientists who have provided an insight into the early history of the Universe. They are John C Mather of the Goddard Space Flight Centre, Maryland, and George F Smoot of the University of California, Berkeley. Their work involved a satellite called COBE (Cosmic Background Explorer) which could measure the ubiquitous background radiation from the Big Bang at a temperature of 2.7 degrees above absolute zero. Extremely small variations in the temperature reflect the formation of aggregates such as galaxies in the early Universe. Their result provided strong support for the Big Bang theory for the origin of the Universe. Subsequently, COBE has been followed up by even more precise measurements using the WMAP satellite and soon the Planck satellite will be launched to do better still.

The Pleiades Part 2 — by Michael Poll

Nebulosity Surrounding the Pleiades

The Pleiades are a group of hot young stars surrounded by wispy dust clouds which reflect the blue colour of the stars. The nebulosity was first seen in 1859 by Ernst Wilhelm Temple (1821 – 1889), and it can be seen with a small telescope, although it does provide an observing challenge (this writer has yet to see it!).

The nebulous haze is at its brightest, largest and most obvious around Merope, ("The Merope Nebula") and extends mostly to the south of the star. This part of the Pleiades nebulosity is designated as NGC 1435. The next easiest part to see is a smaller patch, NGC 1432, around Maia.
For many years the dust clouds were presumed to be left over from the stars' birth, but pictures from the Infra Red Astronomical Satellite (IRAS – operative in the 1980s) suggest that the nebulosity is not related to the star cluster, and that cloud and cluster are travelling in different directions in space. The proximity of the nebula to the stars is a chance encounter.

Infra red (IR) maps generated by IRAS showed a triangular cavity extending about 5 degrees east of the cluster, tapering from 2 degrees to 1 degree in height. The cavity is interpreted as a wake trailing behind the Pleiades after an interstellar cloud approached from the west and which is now ploughing through the cluster (i.e. it is the cloud that is moving).

The cloud of gas is thought to have been launched towards the Pleiades about 15 000 000 years ago by an energetic supernova explosion associated with Gould's Belt, which is about 750 light years distant in Vulpecula. The belt is an expanding shell of young stars gas and dust now about 1000 light years away and tipped 20 deg relative to the plane of the galaxy. Possible support for this idea of the origin of the gas is that there is a pulsar (PSR 1919+21) 1100 light years away in Vulpecula with an estimated age of 15 million years, and which is near the proposed site for the supernova blast.

Evidence of the supersonic interaction between stars and dust may be seen visually by amateurs using telescopes big enough to reveal detail in the nebulosity – there are east-west streamers in the reflection nebula.

The Age of the Cluster

Clusters have previously been dated by measuring magnitudes of the brightest stars in the cluster which are still on main sequence. These stars are still fusing hydrogen, but are on the brink of finishing their stores of nuclear fuel and are about to turn off the main sequence. Calculations are used to determine how old a star of given luminosity and colour will be when it reaches this point in its lifetime. Using this technique on the brightest members of the Pleiades gives them an age of about 70 million years. As the saying goes, given this age, the dinosaurs would not have seen the Pleiades.

New dating methods have added tens of millions of years to "textbook" age of the Pleiades. One new dating method examines the faintest cluster members (M red dwarfs) for lithium. M stars turn lithium into helium, and the older the M dwarf, the less lithium it will have. The dating is done by finding the brightest M stars that still show lithium, as these are the ones that would have evolved the most. This method yields an age of 125 million years for the Pleiades.

To reconcile the age discrepancy of these two methods, it is proposed that, in the massive stars at the upper end of the main sequence, the convective layer reaches further up from the centre towards the surface than previously thought. This makes more hydrogen available for fusion, and this lengthens the amount of time a star can spend on the main sequence. Some observers are not convinced by lithium dating method because effects of atmospheric composition and rotation of the stars are not known.

The Mass of the Pleiades

The total mass of all the matter in the Pleiades has been determined to be 735 times the mass of the sun. The Pleiades do not contain much unseen mass in form of sub-stellar brown dwarfs – there are thought be just over 3000 brown dwarfs, making up, at the most, 130 of the 735 solar

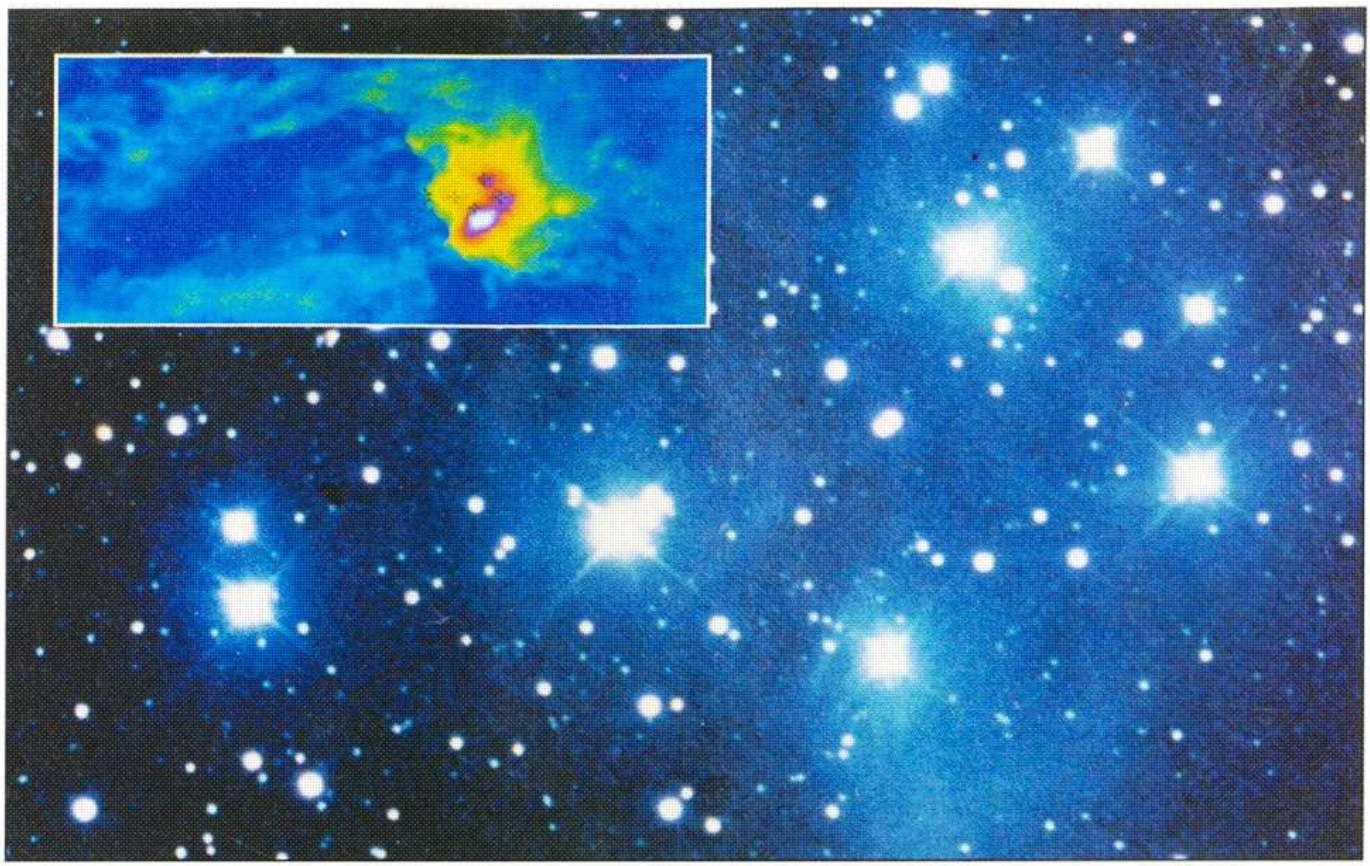
masses. The total mass is determined by plotting the distribution of stars in the cluster and thereby calculating the amount of gravitational attraction. The Pleiades Cluster has so far resisted tidal disruption by the Milky Way.

Distance of the Pleiades

The Hipparcos satellite in the 1990s determined the distance of Pleiades as 375 light years, which is 15% closer than previously estimated. They are therefore not as intrinsically bright as previously thought, and are therefore less massive. They do not now fit into existing theories of star formation, and the idea that position of a star on the Hertzsprung Russell Diagram depends only on mass, age and the heavy element content is now viewed as too simplistic, and may need to be reviewed.

References for Part 1 and Part 2 (All from Sky and Telescope)

1993	July	page 12	News Note	The Pleiades Illusion
1999	April	page 25	News Note	New Mass Estimate
1999	June	page 47	Michael Perryman	Hipparcos: The Stars in Three Dimensions.
1999	December	page 22	News Note	Cluster Age Conundrum
2001	January	page 109	Sue French	Fireflies
2001	October	page 111	Jay R Freeman	My Favourite Deep Sky Objects
2006	February	page 69	Sue French	Icy Blue Diamonds



Inset: This false-color infrared mosaic from the Infrared Astronomical Satellite shows a curious wake (dark blue triangular wedge) in a dust cloud surrounding the Pleiades (yellow and red patch). The feature might result from a supersonic collision between the Pleiades and interstellar material unrelated to the cluster's origin. The field extends more than 2° north, west, and south of the cluster, and 5° east. This 100-micron image, rendered by Duncan Chesley of American Image, Inc., was supplied by Richard E. White.

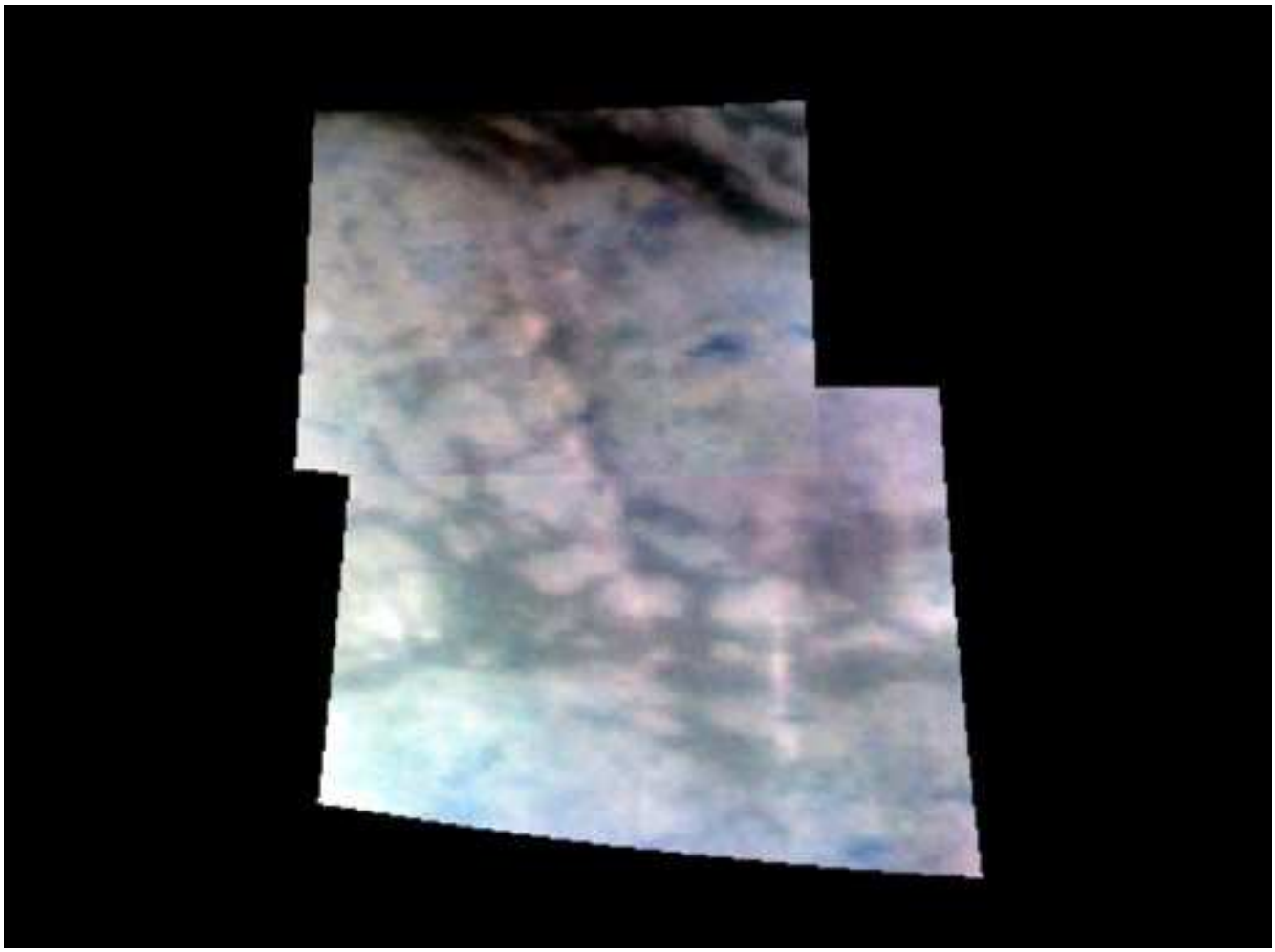
Mountains on Titan

The tallest mountains ever seen on Titan - coated with layers of organic material and blanketed by clouds - have been imaged by NASA's Cassini spacecraft.

This composite image below shows a massive mountain range running just south of Titan's equator. Near the center of the image, the mountain range runs from southeast to northwest. It is about 150 kilometers long, 30 kilometers wide and 1.5 kilometers high. This range, and smaller ranges to the west and east of the main range, probably result from material welling up below as the crust of Titan is pulled apart by tectonic forces.

"We see a massive mountain range that kind of reminds me of the Sierra Nevada mountains in the western United States," said Dr. Bob Brown, team leader of the Cassini visual and infrared mapping spectrometer at the University of Arizona, Tucson.

Website: **http://www.nasa.gov/mission_pages/cassini/media/cassini-20061212.html**



Hubble servicing mission approved

After assessing the pros and cons and with three successful shuttle flights since the Columbia disaster in 2003, on 31 October 2006 NASA Administrator Mike Griffin gave the green light for Hubble servicing mission 4 – the fifth such mission. (The four previous ones were missions 1, 2, 3A and 3B.) The mission is expected to take place in 2008 and will feature several space walks. It can extend Hubble's life by as much as another ten years and will increase its capabilities significantly in some key areas.

The upgrade will include two new scientific instruments to be installed: the Cosmic Origins Spectrograph and the Wide Field Camera 3. Each has advanced technology sensors that will dramatically improve Hubble's potential for discovery and enable it to observe the faint light from the

youngest stars and galaxies in the Universe.

Hubble's successor, the James Webb Space Telescope – a project of international collaboration between NASA, ESA and the Canadian Space Agency – is scheduled for launch in 2013, but without another servicing mission Hubble would stop working many years before this. This mission is therefore widely welcomed by Hubble's user community.

Read about the previous servicing missions on website
http://hubblesite.org/the_telescope/team_hubble/servicing_missions.php

OUTDOOR AFRICA:- The selective with Adrenaline… - by Christo Barnard

Seventeen 3rd year medical students from Medunsa were recently entertained at the CBC Observatory on two consecutive Friday nights. The themes, presented by Johan Smit were "How far can you see?" and "An introduction to objects in outer space."

On 23 February the wind was gusting about and Christo Barnard had to cling to the portable projection screen for dear life in order to keep the stand firmly on terra firma.
The students were introduced to the basics of vision ("The focal plane" and "your eye vs. the telescope") and a view of Mother Earth from Father Moon. The journey continued to Mars where Johan showed us a Martian sunset and views on Mars terrain, taken by "Spirit."

The students were totally taken aback by the relative sizes of planets and stars, distances from earth and they came under the impression of the relative "insignificance" of mankind. The idea of the speed of light covering millions of kilometers really astounded them and the realization that the present visible light of Andromeda left the Galaxy approximately 2,4 million years ago, almost sounded like a fairy tale! The stormy weather approached menacingly from the South and the disappointment was almost tangible when the sky became overcast, ruling out any possible viewing. Johan ended the first evening's presentation with "each of us is totally unique….now that is really special."

Fortunately, program leader Gerda Botha arranged for the students to troop down to CBC the ensuing Friday evening. Almost the same type of weather prevailed and similar sentiments were expressed in terms of threatening weather conditions. Lo and behold! The skies cleared to such an extent that viewing of Saturn and its splendid ring system was possible. Johan did a presentation on "Stellar evolution: Birth, life and death…and life after death" and the audience was mesmerized by the intricacies of luminosity, the Hertzsprung-Russel diagram, spectral lines and Doppler shifts, super giants and white dwarfs and last but not the least, gravitational collapse and the spectacular end-of-the-road for celestial bodies. The greater part of the sky cleared up, and Johan and Christo were able to demonstrate sky-map reading and navigating your way amongst the stars.

This splendid evening was concluded with a moving speech by one of the lady students on behalf of the group thanking Johan and Christo for the two evenings. A carry bag with gifts and a very much appreciated card was handed to the two gentlemen.

Bo: Komeet McNaught gefotografeer vanaf SAAO se terrein naby Sutherland in die Karoo.

Links: Die 60" Boyden reflektorteleskoop se gebou op Boyden koppie naby Bloemfontein. Doen 'n virtuele toer van Boyden Sterrewag op jou rekenaarskerm. Gaan na webwerf

http://www.assabfn.co.za/friendsofboyden/boydenpictures.htm

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