



# The PRETORIA CENTRE

of the

**Astronomical Society of Southern Africa**

[www.pretoria-astronomy.co.za](http://www.pretoria-astronomy.co.za)

## NEWSLETTER FEBRUARY 2007

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

Date and time                      Wednesday 28 February at 19h15  
Chairperson                        Lorna Higgs  
Beginner's Corner                "Turkey Eclipse Travelogue" by Hein Stoltsz  
What's Up                            by Wayne Mitchell  
+++++++ **LEG BREAK - Library open** ++++++

### MAIN TALK

**Andromeda's Ripples of Creation: Dead-ringer for a Head-on Collision \***

by

**Dr Robert Groess (Wits)**

The meeting will be followed by tea/coffee and biscuits as usual.

The next social/practical evening will be held on Friday at the Pretoria Centre Observatory, which is also situated at CBC. Arrive anytime from 18h30 onwards.

\* See page 6

### INSIDE THIS NEWSLETTER

LAST MONTH'S MEETING.....	2
REPORT ON OBSERVING EVENING.....	5
KOMEET MCNAUGHT AFGENEEM DEUR MAURITZ GEYSER.....	6 & 7
ANDROMEDA GALAXY INVOLVED IN ANCIENT GALACTIC COLLISION.....	6
THE PLEIADES PART 1.....	8
NEW HORIZONS SPACECRAFT NEAR JUPITER.....	10
NEWS FROM THE SKA AND KAT.....	10
TITBITS.....	11
THE ASSA - SAAO SCHOLARSHIP.....	11
KOMEET MCNAUGHT AFGENEEM DEUR H PIETERSE.....	12
PRETORIA CENTRE COMMITTEE.....	12

## Last month's meeting — Pierre Lourens

In "Beginner's Corner", Michael Poll talked about "Crosses and clusters in Carina and Vela". In these constellations, there are three crosses, all in front of the Milky Way. He focused on the area around these crosses. There is the false Cross which straddles Carina and Vela, the Southern Cross in Crux, and the Diamond Cross. There are several clusters, like cluster 2516 and the magnificent NGC 3532. He also showed a photo of the  $\eta$  Carinae Nebula.

In "What's Up", Andrie van der Linde Told us that Venus and Mercury will be in conjunction on February 24. Venus will be visible in the daytime on 19 February, with apparent magnitude -4. Saturn is best viewed in February. He also discussed the three crosses mentioned above, and pointed out the four stars Betelgeuse, Sirius, Procyon and Rigel, which form the "Summer Cross". He showed a daylight photo and several others of Comet McNaught. He mentioned that the Alpha Centaurids (a meteor stream) would be seen on 7 February.

Mauritz Geyser gave us a ten minute presentation in which he showed us his photos of Comet McNaught.

The main talk on "Stellar Evolution" was given by Johan Smit. He first discussed the relationship between colour and temperature. From knowledge of the distance of a star and its measured intensity, the luminosity can be calculated. From study of the orbits of double stars, the masses of the participating stars are determined. Stellar evolution models are confirmed by observations of star clusters. From these models, the following relationships are derived:

The M - L relationship :  $L \propto M^{3.5}$  ( $\propto$  means "is proportional to")

$L \propto$  fuel consumption

$T \propto M/L$

$T \propto (1/M)^{2.5}$

The structure of a HR diagram is explained in figure 1. It shows the relationships between mass, luminosity, spectral class, temperature and life expectancy. The position on the HR diagram of some common stars is shown in figure 2.

The steps in the formation of a star are as follows. A cloud of gas and dust collapses under

gravity. The pressure and temperature rise. It starts to glow in the infrared part of the spectrum, and later in the visible part, but dust that has formed, blocks it. The core temperature eventually reaches 15 million K, and hydrogen fusion starts. Four hydrogen nuclei (protons) form a  $\text{He}^4$  nucleus.

Proto-stars, some with proplyds (proto planetary disks), are found in dense clouds of gas and dust, e.g. the Orion Nebula. At the Theta Tauri stage they have strong stellar winds and these eject the cocoon of dust. The central star reaches a balance between hydrostatic and thermal equilibrium. The Sun has a core, a radiative zone and a convective zone. Small stars have a relatively large core and are cooler.

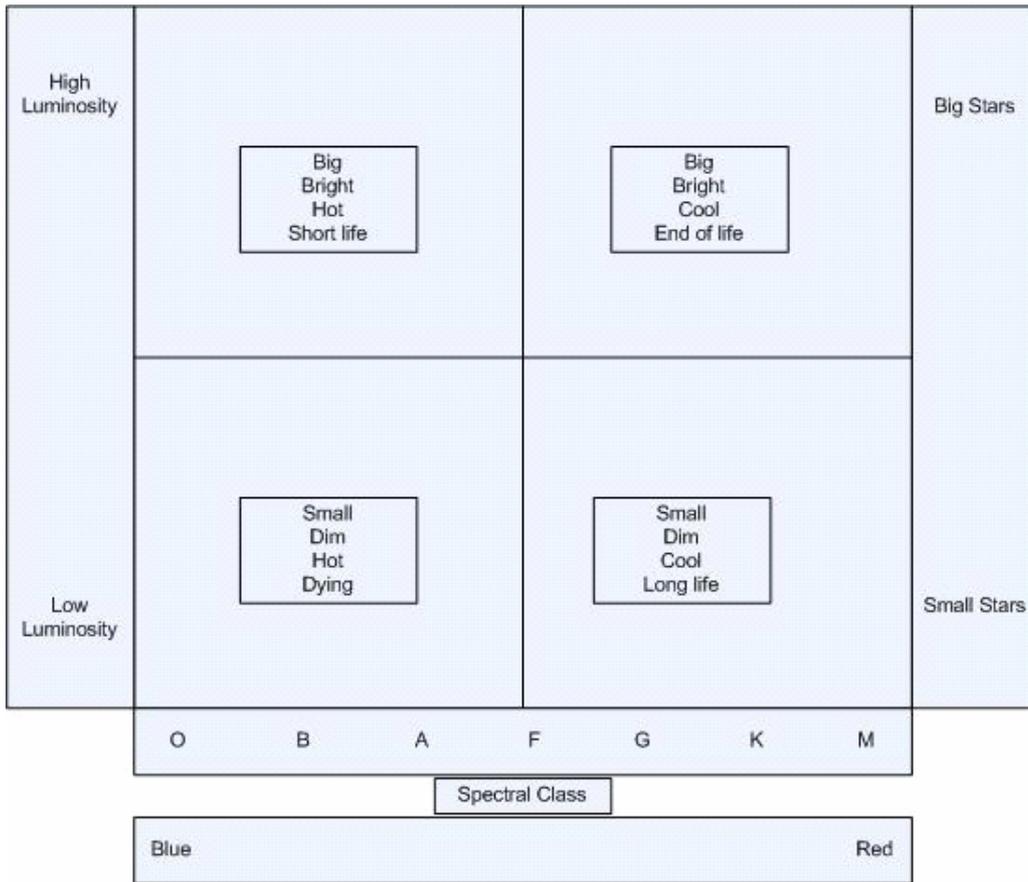
When the H is exhausted, the core contracts and heats up. A shell of H around the core is ignited. The temperature, pressure and star radius increase. It becomes a red giant. When the temperature reaches 100 million K, the He flash occurs. This is the start of the He burning process. When the He is exhausted, other nuclear fusion processes start. Progressively heavier elements are formed in the core, until eventually Fe is formed.

During the red giant stage, the star sheds its outer layers, which form a "planetary nebula". The star then contracts and becomes a white dwarf.  $8M_{\odot}$  stars produce C-O white dwarfs.  $8 - 15M_{\odot}$  stars produce Ne-O white dwarfs.

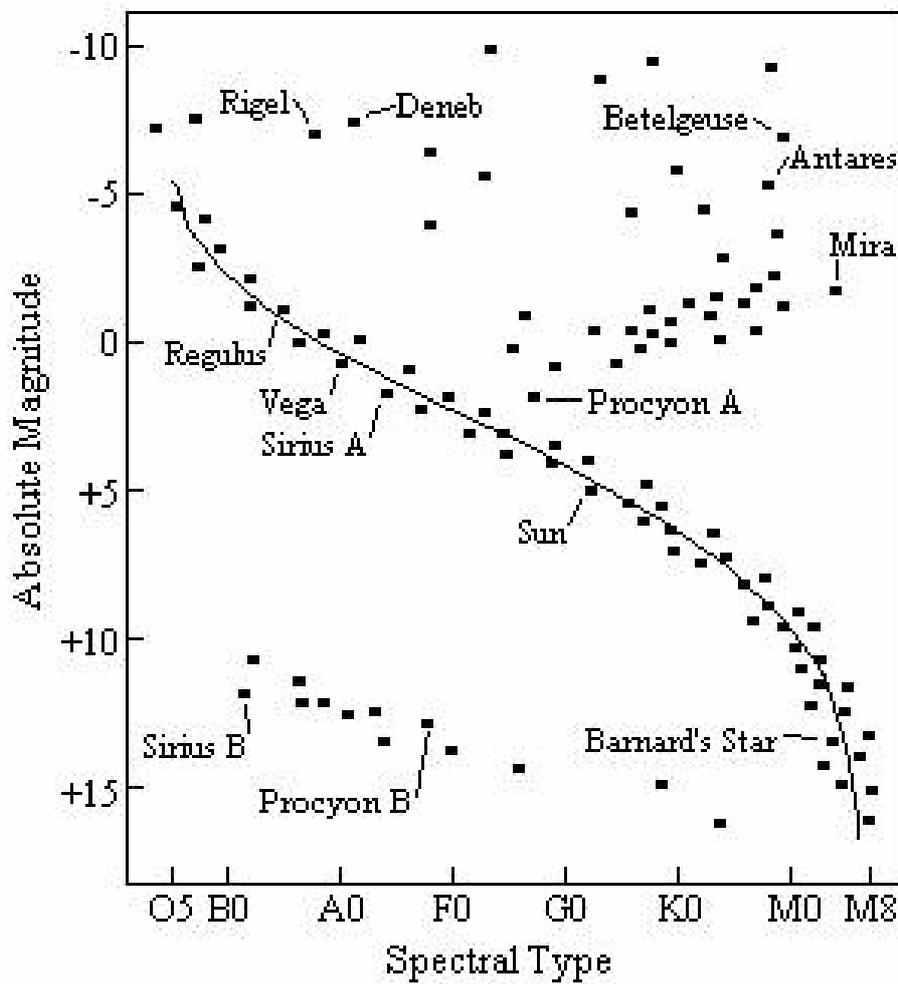
If  $M > 15M_{\odot}$ , the star becomes a supernova. A  $20M_{\odot}$  star undergoes contraction, becomes a main sequence star, then follows a zigzag course through the H-R diagram until it explodes as a supernova.

Supernova explosions also occur in close binaries in which one component is a white dwarf. Matter from the other star accretes on it, until its mass exceeds the Chandrasekhar limit of  $1.4M_{\odot}$ , when it explodes.

He finally showed a chart which summarizes stellar evolution. The complete stellar evolution flowchart is shown in figure 3. The evolution of our sun on the HR diagram is shown in figure 4.



**Figure 1**



**Figure 2**

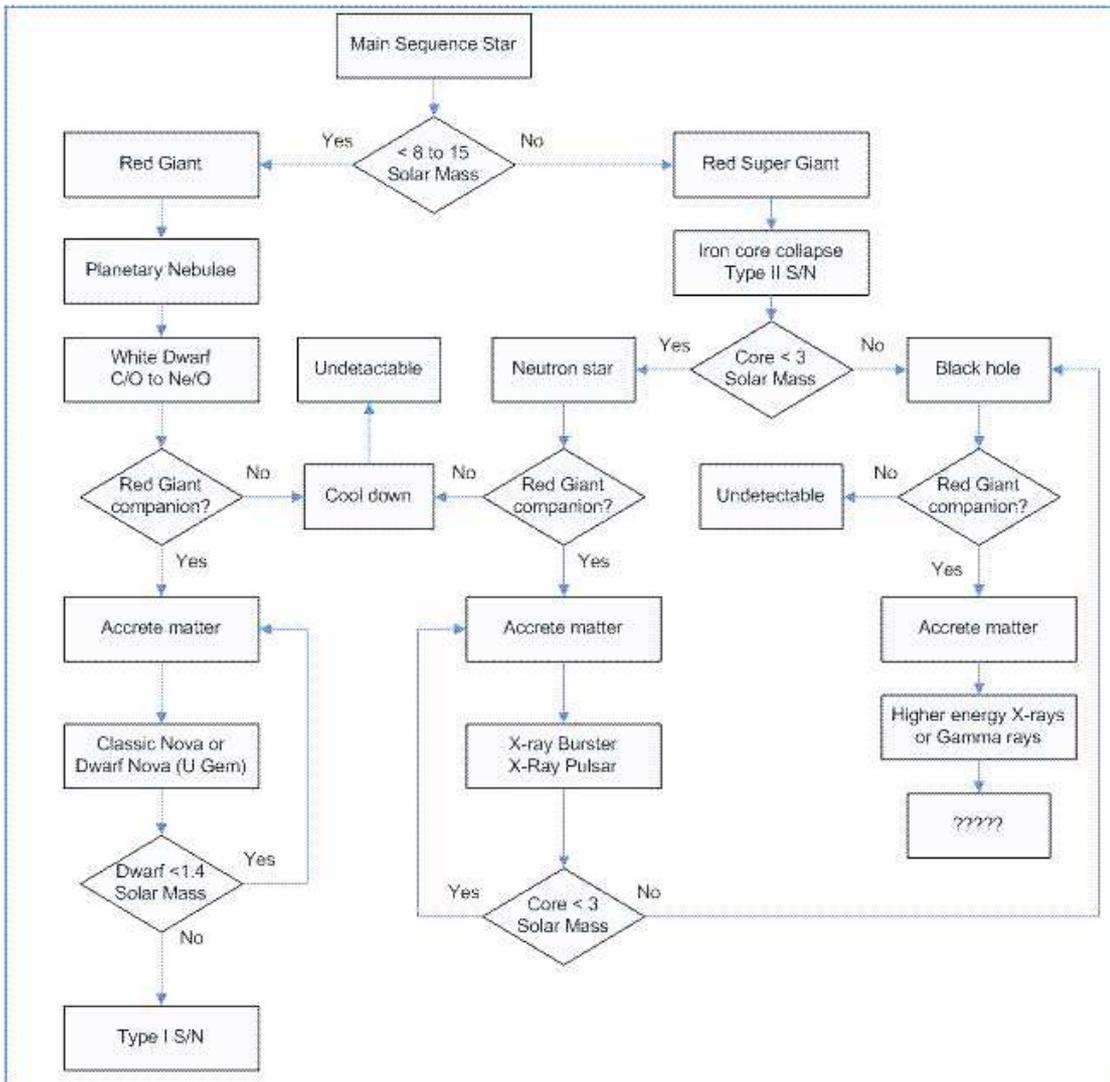


Figure 3

### Evolution of the Sun

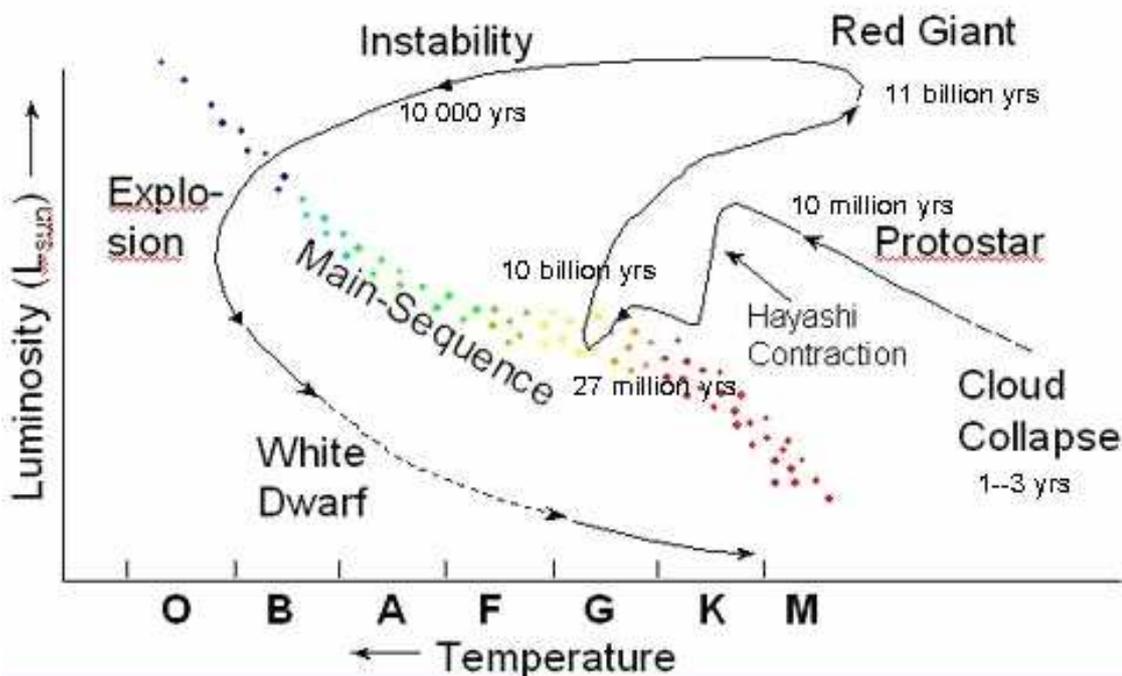


Figure 4

## Report on Observing Evening January 19<sup>th</sup> 2007— Johan Smit & Michael Poll

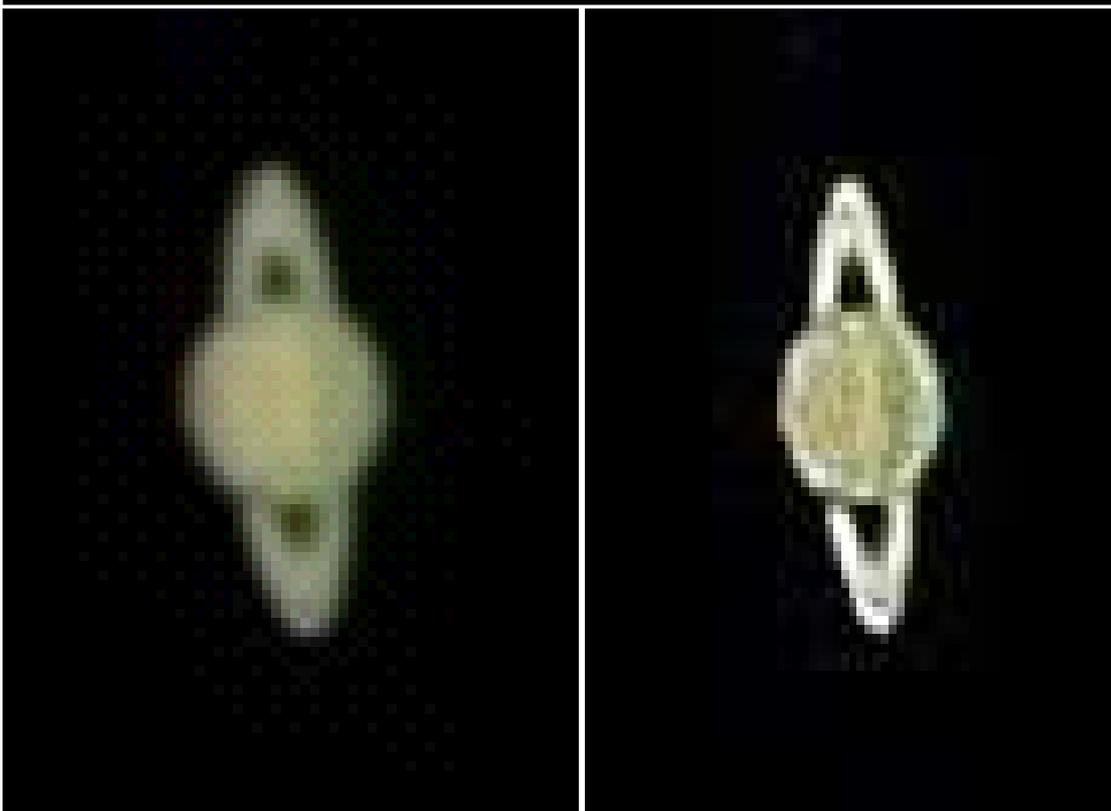
A good crowd assembled for the first observing evening of 2007. There were a number of visitors, including Nancy and Clive who are staying in South Africa from the USA, also our centre's first two lady telescope builders, Hetta and Surita, and not to mention William and his son with a splendid 5 inch refractor. There was some cloud about but which hardly interfered with the observing, except that early on we thought our view of comet McNaught might be obscured. Happily the offending nebulosity moved away and we had a good view of the comet, albeit in a hazy sunset. It was first seen at 7.25 pm and we saw the tail quite well.

Many of the nice southern Milky Way clusters are climbing into the evening sky. We looked at NGC 2391 near delta Velorum, NGC 2516 to which the long axis of the False Cross points, and IC 2606, the Theta Carinae cluster. Higher up were was the perennial favourite, the Orion Nebula, M42, but also M 43 right next to it. The compact group of stars around Sigma Orionis was viewed. It is the radiation from Sigma that creates the silhouette of the Horsehead Nebula. The open cluster M41, near Sirius was also well placed for observation. This is the only Messier object in Canis Major. Further north, Castor is now a fine double star. Well, it always was a multiple star, but only in the last couple years have Castor A and Castor B opened up enough to be viewed as two.

Soon Saturn was up in the east, and, with its retinue of moons, was eagerly viewed. Then back to the southern sky where we found the globular cluster 47 Tucanae (NGC 104) and we looked at Gamma Velorum which is a multiple star comprising two bright components which can be split with binoculars, and two fainter stars at right angles to the first pair, making a letter T. At 950 light years, one of the bright components of gamma is the nearest Wolf Rayet star to the Earth.

While observing Saturn, Hetta held a digital camera to the eyepiece of the centre 12 inch Newtonian and, considering that she was standing on a ladder at the time, captured an amazing image of Saturn. She gave new meaning to the term "hold steady". The images are reproduced below. One is the original and the other has been cleaned up with Photoshop in order to bring out more detail. Well done Hetta.

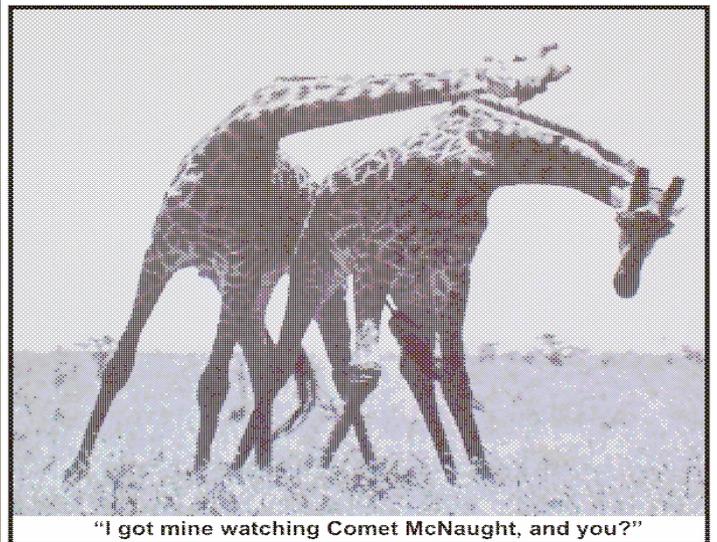
We invite everyone to our next observing evening on the 23rd of February to come and see sights like this for themselves.



Hetta Pretorius' two photographs of Saturn with a digital camera through our 12" Newtonian telescope at CBC.



Bo en links: Twee foto's van Komeet McNaught (C/2006 P1), gefotografeer deur Mauritz Geyser vanaf Centurion op 18 Januarie 2007. Kamera gebruik: Canon EOS 350D.



"I got mine watching Comet McNaught, and you?"

**Andromeda galaxy involved in ancient galactic collision**

As preparation for the main talk, you can read about this on website

<http://edition.cnn.com/2007/TECH/space/01/29/andromeda.collision/Index.html>



Mauritz Geyser en Frikkie le Roux het 230 km ver gery om hierdie foto's van komeet McNaught te neem vanaf 'n plek bo-op die Magaliesberg suidoos van Rustenburg op 23 Januarie 2007. Op die foto links is 'n baie vae aanduiding van 'n tweede stert. Op die foto onder is Frikkie (links) en Mauritz. Kamera gebruik: Canon EOS 350D.



One blonde in Cape Town asks another: "Which is further, Durban or the Moon?". The other replies: "HELLOOOOO, can you see Durban from here???"

## The Pleiades Part 1 — by Michael Poll

The Pleiades form a conspicuous open star cluster, in the constellation of Taurus. Visible to unaided eye and known since antiquity, they must have also been noted in pre-historic times. They command attention from all cultures across the globe - most ancient peoples kept track of the Pleiades, not the least because they are not far from ecliptic so they are associated with changes in the seasons.

The group is mentioned in the Bible, in the Book of Job, which was written in about 2000 B.C. God is asking Job some difficult questions concerning what Job can and cannot do. In Chapter 38, verse 31, God asks **“Can you tie the Pleiades together, or loosen the bonds that hold Orion?”**

The Pleiades have also featured in literature. In “Locksley Hall”, Alfred Lord Tennyson wrote:

**“Many a night I saw the Pleiads,  
Rising through the mellow shade,  
Glitter like a storm of fireflies  
Tangled in a silver braid.”**

Marjorie Lowry Christie Pickthall wrote in “Stars” (1925):

**“And now the stately moving Pleiades,  
In that soft infinite darkness overhead  
Hang jewel-wise upon a silver thread.”**

Burnham’s “Celestial Handbook” also gets poetic : **“In a dark sky the 8 or 9 bright members glitter like an array of icy blue diamonds on black velvet; the frosty impression is increased by the nebulous haze which swirls about the stars and reflects their gleaming radiance, like pale moonlight on a field of snow crystals.”**

### Visibility

At the latitude of Pretoria the Pleiades are high in the north during January and February evenings. Six stars are easily visible to the naked eye, and more are seen if the sky is dark. Although known as the “Seven Sisters”, the number of stars visible to unaided eye varies from person to person and with sky conditions. Up to 10 or more stars can be seen with unaided eyes in a dark sky. Walter Scott Houston found 18 under exceptional skies. A 60 mm telescope shows more than 60, and a 150 mm telescope shows more than 180 stars. Nevertheless, the group is best viewed with low power giving a wide field of view – narrow fields of view are not so impressive because there are not many faint stars between the cluster’s brightest members. The cluster contains about 400 stars altogether and the main mass of stars is about 1.6 degrees across.

### Names

The Pleiades group were loosely called the “Seven Sisters” from Greek mythology. The Greeks saw these stars as the seven daughters of Atlas and the sea-nymph Pleione. The sisters’ names are Alcyone, Maia, Asterope, Taygeta, Celaeno, Electra and Merope. However, the names were not applied to specific stars until

Renaissance times, and even then, the sisters' names were not given to the seven brightest stars but to five relatively bright stars and two faint ones. The remaining two bright stars are named after Atlas and Pleione.

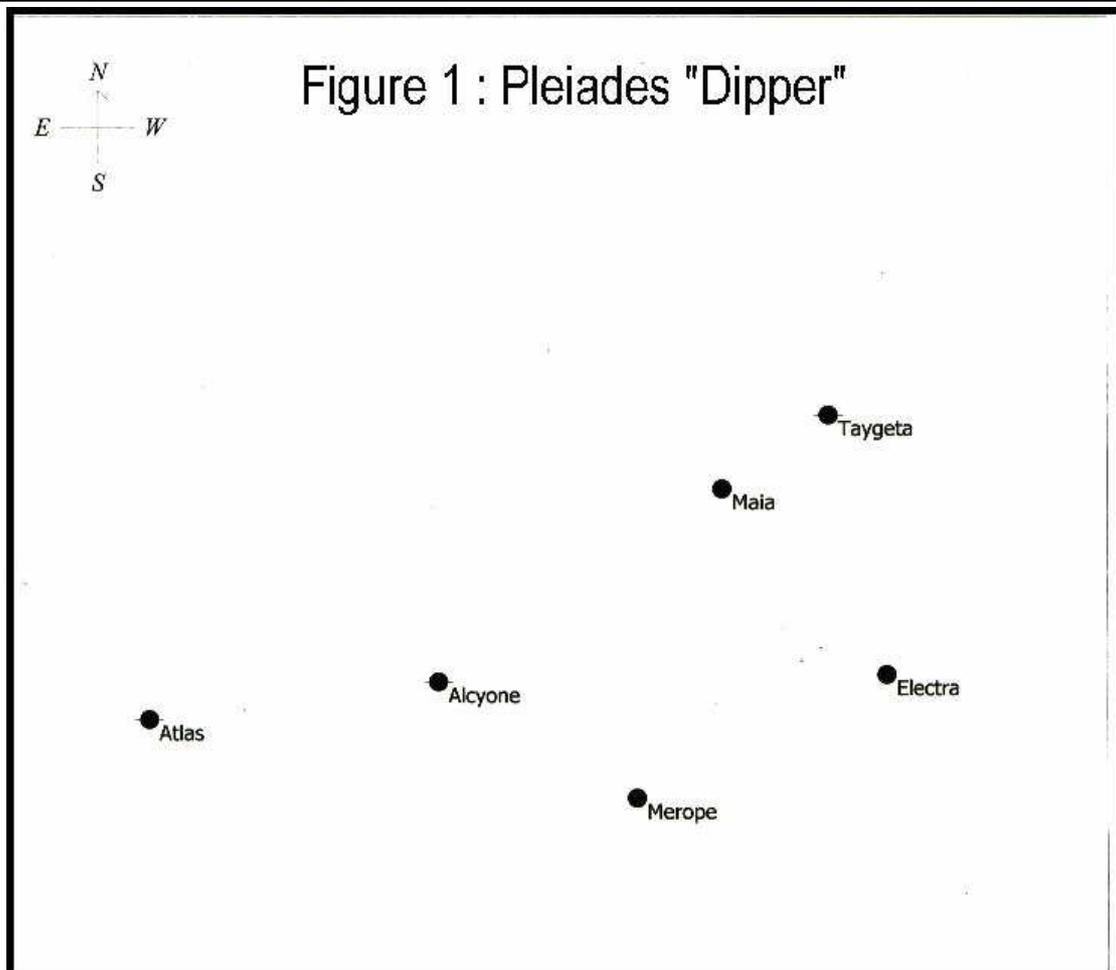
Given that only six stars are easily visible, many legends have a postscript to account for missing seventh star – one is that the seventh sister ran away to become Alcor, next to Mizar, in the handle of the Plough in Ursa Major. (Although known as the Plough in England and elsewhere, the seven stars are known as the Big Dipper in North America, because they look like a saucepan, or ladle).

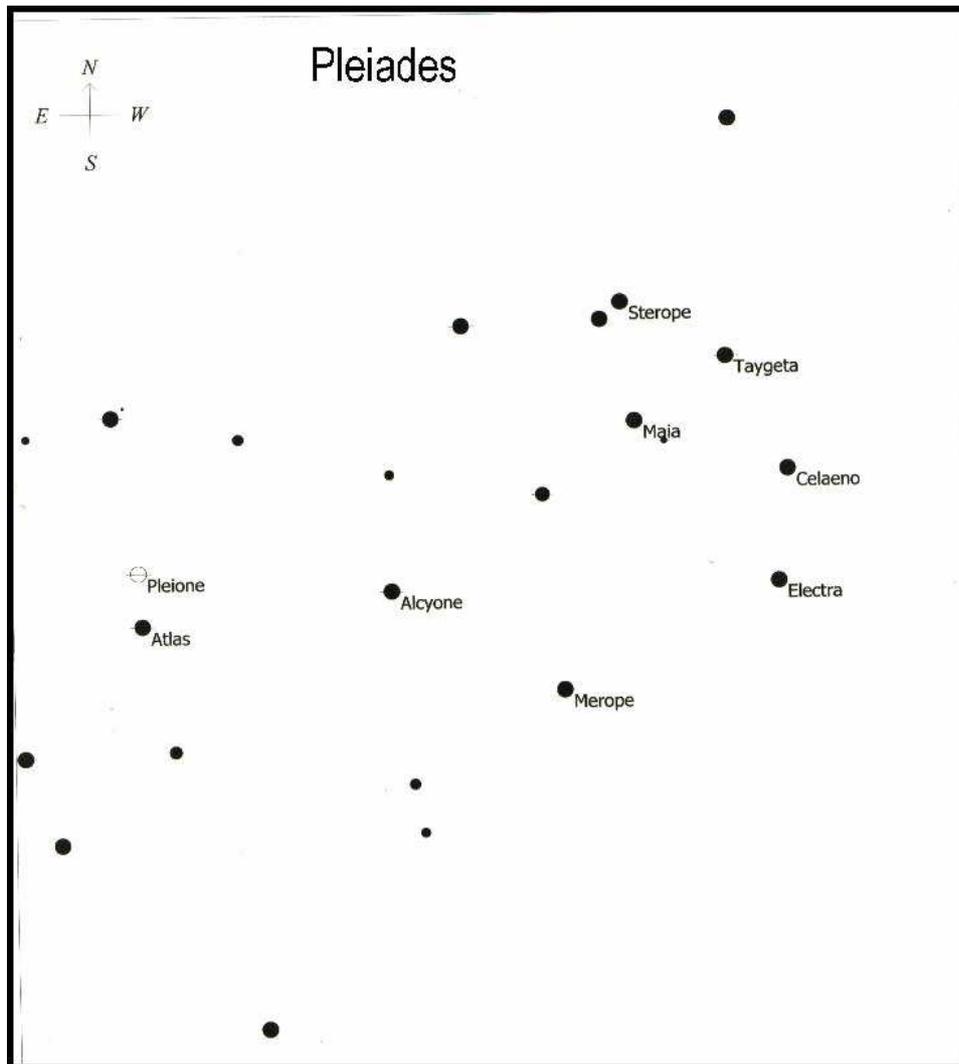
### **Dipper Asterism**

The magnitudes of the named Pleiads are : Alcyone (Eta Tauri) 2.9 ; Atlas 3.6 ; Electra 3.7 ; Maia 3.9 ; Merope 4.2 ; Taygeta 4.3 ; Pleione 5.1 ; Celaeno 5.5 ; and Sterope 5.8.

The seven brightest stars form a “dipper” asterism - see figure 1. Atlas marks the handle of the dipper, and the daughters Alcyone, Merope, Electra, Maia and Taygeta form the bowl. Close to the north of Atlas is Pleione, the two stars forming a naked eye double. Atlas is brighter than Pleione, and Pleione may be lost in its glare if sky conditions are poor. Sterope is north of Maia, and Celaeno lies between Taygeta and Electra. Sterope is a pair of 6<sup>th</sup> magnitude stars, which, under suburban skies, require at least binoculars to be seen.

Please note that the accompanying diagrams need to be inverted to match the view in the sky i.e the diagrams should be orientated with north at the bottom .





### New Horizons Spacecraft near Jupiter

NASA's New Horizons spacecraft is on the doorstep of the solar system's largest planet. The spacecraft will study and swing past Jupiter, increasing speed on its voyage toward Pluto, the Kuiper Belt and beyond.

The fastest spacecraft ever launched, New Horizons will make its closest pass to Jupiter on February 28, 2007. Jupiter's gravity will accelerate New Horizons away from the sun by an additional 14,500 km/h, pushing it past 83,700 km/h and hurling it toward a pass through the Pluto system in July 2015.

Websites: <http://www.nasa.gov/newhorizons> and <http://pluto.jhuapl.edu>

### News from the SKA and KAT

South Africa and Western Australia have been short-listed as the site for the SKA (**S**quare **K**ilo-**m**eter **A**rray). Argentina and China are now out of the race. The proposed SA site is in the Karoo. This is a mammoth project, with an estimated cost of 1.5 billion Euros and an operating budget of 150 million Euros per year (multiply by about 10 to get Rands).

The KAT (**K**aroo **A**rray **T**elescope), a demonstrator of SA capability to host the SKA, is progressing and has received generous government funding. The first 15m diameter antenna will be installed at Hartebeesthoek by March 2007 and its final acceptance tests must be completed by July 2007. The full KAT array of 20 telescopes is to be installed in the Karoo by December 2009. It will have about 0.1% of the area of the complete SKA.

Websites: [www.ska.ac.za](http://www.ska.ac.za) and [www.kat.ac.za](http://www.kat.ac.za)

### Titbits

**Total Eclipse of the Moon coming up.** There will be a total eclipse of the Moon late Saturday night March 3rd, visible from all of South Africa. The eclipse starts at 11:30pm on March 3rd, and ends 3:11am on March 4th. The Moon will be totally eclipsed from 00:44am to 1:58am. Moon-watching charts can be found at website [www.planetarium.co.za](http://www.planetarium.co.za)

**Get to Know your Sky.** Sat 24th Feb 7pm at the Johannesburg Planetarium. This is a practical introduction to the night sky for youngsters 9-12 years old. Bring torch and pencil. Cost R20 pp.

**Astrophotography Course.** Astronomical Society of SA (Johannesburg Centre) is planning two astrophotography workshops at the Military History Museum in Johannesburg on 27 February and 1 March. For details, visit website [assajhb.co.za.temp.glodns.net/](http://assajhb.co.za.temp.glodns.net/)

### The SAAO - ASSA Scholarship

The South African Astronomical Observatory - Astronomical Society of South Africa Scholarship for 2007 is announced.

The purpose of the SAAO - ASSA Scholarship is to encourage current or *intending* undergraduates (i.e. 1st, 2nd or 3rd year) studying for a B.Sc. degree at any university in South Africa, who have a stated interest in astronomy, to prepare for furthering their interest. Applicants must be resident in South Africa.

The value of the SAAO - ASSA Scholarship for 2007 is four thousand rand per annum. One quarter of this amount will be paid to the Scholarship holder to assist with expenses and prescribed book purchases, and the rest will be paid into the holder's university fees account. The holder will automatically be considered for the SAAO - ASSA Scholarship in future years, until completion of the B.Sc. degree, *subject* to good progress being made.

Applications must be submitted to the below *before* 1 March 2007. There is no standard application form, and the following items must be submitted:

- A covering letter by the applicant, including CV, and a statement of interest in Astronomy, giving reasons.
- A statement of the applicant's intended course of study (full details of subjects and modules, and their costs) for 2006, and if possible and relevant, for the remaining years of undergraduate study.
- A statement or proof that the applicant is resident in South Africa.
- A statement that the applicant either has no other bursary or scholarship, or where the applicant has a scholarship or bursary, the amount, source and conditions.
- A copy of the applicant's official results, whether matric or university, from the previous year of study (this will be 2006, unless there are unusual circumstances).
- A letter of support from a lecturer or teacher.

Full contact details, including e-mail, postal address, cellphone and landline numbers.

Applications and queries may be addressed by e-mail to [[Maciej@ifr.sun.ac.za](mailto:Maciej@ifr.sun.ac.za)] or in writing to: Astronomical Society of Southern Africa, Scholarships, c/o P0 Box 9, Observatory, 7935.

### Komeet McNaught (C/2006 P1) afgeneem deur H Pieterse

Onder: Komeet McNaught afgeneem deur Hannes Pieterse op 19 Februarie 2007. Tegnieuse Inligting: Canon D30 met 17-85 f4.5/f5.6 Canon lens; 38 mm, 15 sekonde beligting, 800 ISO F5.6. 20H33. (Foto en byskrif uit: "Die Nagemel", Nuusbrief van die ASSA Bloemfonteintak, November 2006 tot Januarie 2007.)



Komeet McNaught is ook gefotografeer met die Gemini South teleskoop op die bergpiek genaamd Cerro Pachon in Sentraal-Chile op 18 Januarie 2007. Die hoë-resolusie foto is te sien by webwerfadres [http://www.gemini.edu/images/stories/websplash/ws2007-3/fig1\\_full.jpg](http://www.gemini.edu/images/stories/websplash/ws2007-3/fig1_full.jpg)

### PRETORIA CENTRE COMMITTEE

Chairman :	Michael Poll 012 331 1615 (h)
Vice Chairman :	Johan Smit 083 306 1199 (c)
Secretary :	Tony Viljoen 012 654 5783 (h) 072 247 6648 (c)
Newsletter Editor :	Pierre Lourens 012 654 6366 (h) 072 207 1403 (c)
Treasurer and	
Membership Secretary :	Rynhardt van Rooyen 011 441 3458 (w) 083 654 1862 (c)
Centre Representative :	Michael Poll 012 331 1615 (h)
Public Relations Officer	
and Deputy Treasurer :	Lorna Higgs 012 333 9366 (h)
Librarian :	Wayne Mitchell 012 719 9065 (w) 072 465 7739 (c)
Curator of Instruments :	Johan Smit 083 306 1199 (c)
Member :	Dirk Wolmarans 083 303 0348 (c)
Member :	Fred Oosthuizen 072 373 2865 (c)
Member :	Hein Stoltsz 083 302 5096 (c)