



# The PRETORIA CENTRE

of the

## Astronomical Society of Southern Africa

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

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Newsletter Date

## NEWSLETTER, NOVEMBER 2004

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

Date and time            Wednesday 24 November at 19h15  
Chairperson             Michael Poll  
Beginner's Corner    by Johann Swanepoel    Some telescope basics  
What's Up                by Johan Smit

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

### Main Topic:

**“The Cassini-Huygens mission” by Neville Young & Mike Haslam**

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

The next social/practical evening will be held on Friday 19 November 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 Wayne Mitchell**

### **Preliminary:**

As most members know by now, some of our members went on a speech craft course presented by Toastmasters. As an example of what was learned Johan Smit was surprised by Neville Young to present and impromptu, unprepared table topic called "The clothes I wear in winter". As our regular attendees at the monthly practical know by now, Johan does not feel the cold as much as every-one else.

The impromptu speech did raise quite some laughter from the audience. We trust the reaction was caused by the quality of speech craft learned.

All the other topics was also presented by members who have attended the course.

### **Beginners Corner:**

Koos van Zyl was very brave and demonstrated the creation of a comet. It turned out to be a rather messy and dangerous activity. The end result was a brilliant, but rather dirty snowball. The model comet performed exactly as the real item, displaying impressive jets of gas when heated by a lamp. If a photo was taken of this "comet" against the right background it will fool most people. The comet was discussed and admired right to end of the evening. Well done Koos.

### **What's up:**

Neville young showed us when the next lunar eclipse will take place (the next morning). I trust that every-one got up early to have a look, as it will be last favourable one for quite a while. He also showed us where the planets will be, but with a difference, in the daytime. It is well worth taking a few minutes off in our busy days to look at the little diamond (Venus) in the day.

### **Main Topic:**

Michael Poll gave a thought provoking talk about interplanetary transfers. It was not about ET travelling in a spaceship, but about ejected debris landing on another solar system body and about the probability that primitive life forms may survive such a journey. This topic was also discussed enthusiastically during tea. It makes me wonder. Are we descendants of Martian or Venusian microbes? We may not be alone. Makes you think doesn't it.

All the presentations ran exactly according to the planned timings. I am sure the disciplines taught by Toastmasters have a lot to do with that.

### **Observing Evening Report October 22<sup>nd</sup> 2004 by Michael Poll**

About 10 or 12 were present, including some visitors – Francois, his wife and three children. The sky was so hazy, we could hardly even see the first magnitude stars, let alone much else. However, the moon was up, and we studied some lunar craters. Casper and Andrie drew our attention to the craters Theophilus, Cyrillus and Catharina (Sky & Telescope, October 2004 p 70), which are examples of craters in different stages of degradation. We also looked at another trio of craters – Ptolemaeus, Alphonsus and Arzachel, which were nearer the terminator than the previous three. The Alpine Valley was well seen, it is near the crater Plato, which was also seen. We also looked at Tycho and Clavius.

The only other object we looked at was a glimpse of M7 in Scorpius.

The next observing evening will be on November 19th, when the moon will be at first quarter, so we will be able to learn some more lunar geography – properly called "selenography".

## **Stellar Spectral Types Revisited. Part 2. By Michael Poll.**

Stars are classified by their spectral type, each type is given a defining letter from the sequence OBAFGKM. The surface temperature of a star determines the type of spectrum that it has, so the OBAFGKM sequence represents a temperature gradient from the hot O stars to the cool M stars. The colours of the stars in the sequence show a gradient related to the temperature, from blue O stars to white A stars, and then to yellow G stars (the sun is a G2), orange K stars and orange-red M stars. The surface temperature ranges from 50 000 ° Kelvin for the hottest O stars to 2000 ° Kelvin for the coolest M stars. The change in temperature explains findings in the spectra, because the temperature determines the state of the atoms and molecules present. At low temperatures molecules survive, but, as temperatures increase, molecules are split into neutral atoms, and with even higher temperatures, atoms lose electrons, becoming ionised. The splitting of molecules and ionisation of atoms occurs because of collisions in the gas, the number of collisions increases with temperature because the atoms and molecules are moving faster. O stars show ionised helium, B stars show neutral (i.e. atomic) helium. Hydrogen is ionised in O and B stars, and so does not show strong lines. Hydrogen shows its strongest line in A stars, where it is in its neutral state, and weakens toward M where it disappears. From A to M, elements heavier than helium (known as “metals” to astronomers) appear.

Ionised calcium is strong through class G and then weakens to be replaced by neutral calcium and sodium. M stars (Secchi's class IV) show molecules in their atmospheres, mainly those of titanium and vanadium oxides. Pickering's class N did not fit the sequence, because, although they were red like M stars they showed carbon lines instead of titanium oxide, hence they were regarded as side branch. Type N and R were combined to into C (for carbon) stars.

Stars in which hydrogen appears to be absent in the atmosphere are still mostly composed of hydrogen, but the hydrogen does not show up in the spectra because of a phenomenon called electron excitation. If a photon of light hits an atom, the electron(s) may move to a higher energy state, producing an absorption line. If the temperature is too low, hydrogen will not accept any photons, and so does not show absorption lines, and so seems to be missing.

### ***The infrared cellar***

For more than a century the stellar sequence ended at M, apart from the side branch RNS, which are dying stars. M stars were the coolest, and the faint red dwarfs were the end of the sequence. The faintest known main sequence star is Van Biesbroeck 10, which is visual magnitude 17, even though it is only 20 light years away. If it were situated in the orbit of Jupiter, would only appear one tenth as bright as the full moon.

The reason why the red dwarfs shine so feebly is that they have a very low mass, which means that they have so little gravitational energy that their interiors do not get very hot, and the thermonuclear reaction that converts hydrogen into helium proceeds very slowly. A star with less than 8% of the mass of the Sun represents the end of the main sequence, because in these stars the internal temperature is too low for hydrogen fusion to take place.

However it was long predicted that there would be bodies with masses lower than the 8 % limit. They were called “brown dwarfs” and would glow from heat generated mainly by gravitational contraction. The first was identified in 1995. These stars are so cool that most of their energy is radiated in the infrared rather than visible light, and so many more have now been found by infrared surveys. Their luminosity in visible light is less than 0.03% of that of the sun. A new spectral type, L, has been designated for these objects. The spectra show molecules such as methane, and hydrides, and look nothing like M spectra. The temperatures for this class range from 2000°K down to 1 300°K. At the lower temperatures the spectral lines of potassium rubidium and caesium are present. The stars are so cool that below L 2 some compounds precipitate as solids – for example the titanium compound perovskite (CaTiO<sub>3</sub>), vanadium oxide and lithium chloride are present. In an old “true” star, any lithium would be destroyed by nuclear reactions, so a star with lithium absorptions must be a brown dwarf (unless it is a very young normal star)

Class L did not include all candidate low mass objects. The first "brown dwarf" found (Gliese 229B) is rich in methane and has a temperature of only 1000°K, and does not fit in to type L. These stars are being labelled as "T dwarfs", but at present there is insufficient information to subdivide the group.

The new classes T and L may affect our understanding of the galaxy. Although M dwarfs constitute 70% of the main sequence, and there may be twice as many brown dwarfs as there are normal stars. However the total mass of these small objects gives no solution to the "missing mass" problem of the galaxy.

The extreme faintness and large number of brown dwarfs could mean that there is an undetected star closer to us than Proxima Centauri (itself an M5 dwarf). To be visible with the naked eye, an M0 dwarf has to be within 13 light years of us, and an M8 dwarf would have to be less than half a light year away. A dim L or T star could even be closer, and be close enough to stir up the Oort cloud of comets and send them towards Earth.

The lower limit of mass of brown dwarfs is not known, but they are stellar in the sense that they would still be formed in a collapsing interstellar cloud, as opposed to planet formation, which is achieved by the building up of a body from solids in the dusty discs that form around new stars. It could be that the smallest mass brown dwarfs overlap with the largest mass planets.

#### Reference

Stars in the Cellar : Classes Lost and Found James B Kaler Sky & Telescope Sept 2000 p 38

### Planned Observatory at Fort Schanskop

Thanks to a donation of parts for a 14 inch telescope by Pierre Lourens the society is in a position to build an observatory at Fort Schanskop .

The project is run by Johan Swanepoel and Neville Young. Any-one that is willing or able to assist with this project is welcome to contact Johan or Nevill.

The goal is to establish a facility in a secure place that can be used to spread the knowledge of Astronomy and science.

Even though it is close to the city, the place is higher than the pollution layer affecting the seeing conditions over most of Pretoria.

Who knows, one day when this project is completed you may be able control this telescope remotely from the comfort of your own home.

### Newsletters by E-mail

Some members have indicated on their membership application forms that they want to receive the monthly newsletter by email. Other members who also want to receive it by email, should contact the **membership secretary** of our Centre. The advantages of receiving it by email is that you receive it sooner than by snail mail, there is little chance of it not arriving, you get all colour pictures in the newsletter in colour, the Centre saves money, and the newsletter editor (who sends out the newsletters) saves work. Editor

## NASA ACKNOWLEDGES HISTORIC SPUTNIK FLIGHT

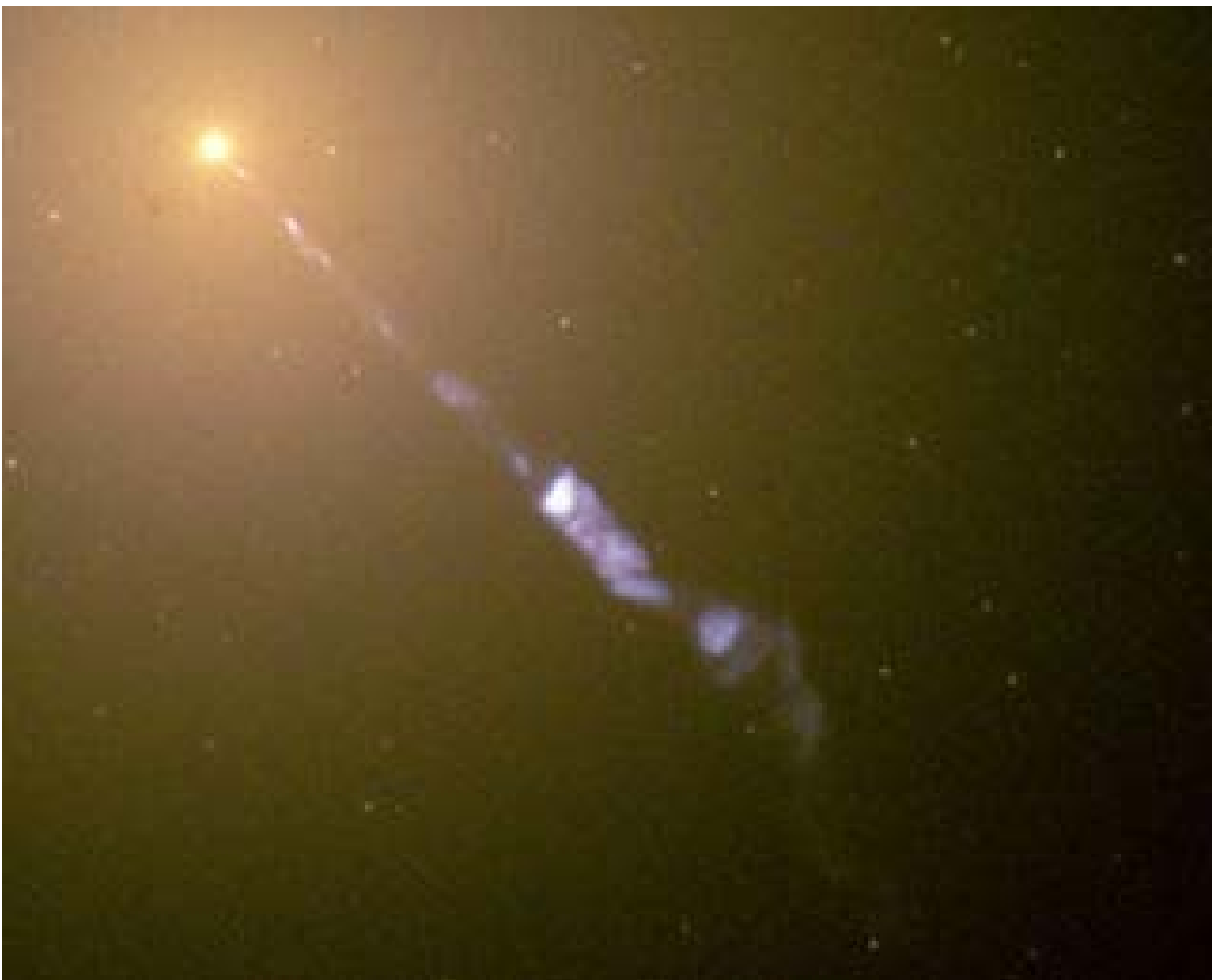
Forty-seven years ago, the world changed, when the Soviet Union successfully launched Sputnik I on October 4, 1957.

The world's first artificial satellite was about the size of a basketball, weighed only 183 pounds. It took about 98 minutes to orbit the Earth on its elliptical path. That launch ushered in new political, military, technological, and scientific developments. While the Sputnik launch was a single event, it marked the start of space exploration.

For information about NASA and agency programs on the Web, visit: <http://www.nasa.gov>

## THE M87 JET

Streaming out from the center of the galaxy M87 like a cosmic searchlight is one of nature's most amazing phenomena, a black-hole-powered jet of electrons and other sub-atomic particles traveling at nearly the speed of light. In this Hubble telescope image, the blue jet contrasts with the yellow glow from the combined light of billions of unseen stars and the yellow, point-like clusters of stars that make up this galaxy. Lying at the center of M87, the monstrous black hole has swallowed up matter equal to 2 billion times our Sun's mass. M87 is 50 million light-years from Earth.



The magnificent Sombrero galaxy. A sombrero is a wide-rimmed Mexican hat. The galaxy looks like such a hat on a person's head, hence the name.



### **THE CASSINI/HUYGENS MISSION:**

Remember that the Cassini spacecraft is presently in orbit around Saturn. It will dispatch the Huygens probe to Titan, one of the moons of Saturn, on 25 December 2004. The probe will descend through Titan's thick, hazy atmosphere and land on its surface on 14 January 2005. For more information, see :

1. Sky & Telescope, July 2004, pp. 32-36 and pp. 38-41.
2. The astronomical website addresses in this newsletter.

### **ASTRONOMICAL WEBSITE ADDRESSES**

#### **The Cassini/Huygens mission:**

<http://saturn.jpl.nasa.gov>

<http://soc.jpl.nasa.gov>

<http://www.jpl.nasa.gov/scalemodels>

<http://sci.esa.int/huygens>

#### **Basics of Space Flight:**

[www.jpl.nasa.gov/basics](http://www.jpl.nasa.gov/basics)

Dear Pretoria Member

One of our members is Andrie van der Linde - he was on the front page of the Pretoria News at the time of the Venus Transit.

His brother - also a member - is Casper. If you attend Friday evening practicals, you will certainly know them and their large telescopes which they imported.

Andrie has just started an optical equipment company and has asked that I publicise it for your benefit, and especially to alert you to a special offer.

Andrie says:

Eridanus optics is a newly registered company (CC) specialising in the import of optical equipment. It plans to import a consignment of telescopes, including about seven Celestron telescopes.

Celestron currently has an introductory special on their Nex imager (\$99 until 31 December), if you buy any Celestron telescope. There is thus the opportunity for people interested in buying those imagers to do so at R1000 per imager on a first come first serve basis (provided the R/\$ remains below R6.15).

Eridanus optics can also import larger aperture telescopes or other accessories at competitive prices. Savings of between 20% and 40% compared to the local prices have been achieved on previous consignments. People planning to buy a telescope, solar filter or other accessories can contact us for a quote.

Details of the imager can be found on the Celestron website:

[www.celestron.com](http://www.celestron.com)

Our contact details are as follows:

e-mail: [eridanusoptics@yahoo.com](mailto:eridanusoptics@yahoo.com)

cell: 083 632 4894

Phone: 012 998 8092 (ah)

Andrie

I understand this offer to mean that due to importing several telescopes, Andrie gets the Nex imager at a special deal and wants you to know that he can thus make these imagers available to you.

To take up the offer, Andrie will need to place orders before the end of November, so decision time is now.

Neville Young

**Crater ridge sunrise.** Sybil de Clark, Michael Poll, Mauritz Geyser and Frikkie le Roux watching a crater ridge sunrise at the meteorite crater known as Tswaing, or the Pretoria Salt Pan. It is situated 40 km north of Church Square, Pretoria.



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