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

NEWSLETTER OCTOBER 2004

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

Date and time	Wednesday 27 October at 19h15
Chairperson	Wait and See
Beginner's Corner	"How to make a model of a comet" by Koos van Zyl
What's Up	by Neville Young

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

Main Topic: "Interplanetary Transfers" by Michael Poll

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

The next social/practical evening will be held on Friday 22 October at the Pretoria Centre Observatory, which is also situated at CBC. Arrive anytime from 18h30 onwards.

INSIDE THIS NEWSLETTER

LAST MONTH'S MEETING by Johann Swanepoel

In "Beginner's Corner", Johan Smit gave a talk on "Understanding Coordinate Systems" and their value in determining the positions and movements of celestial objects. He compared the Alt-Az (Altitude-Azimuth) system with the polar coordinate system and showed a number of simple calculations of RA (Right Ascension) and Dec (Declination).

This was followed by "Whats Up" by Wayne Mitchell who, via his usual good astro photographs, showed us the location of interesting objects for this coming month.

After a brief break, Jorrie Jordaan gave the main talk of the evening titled: "Ocean Tide Principles and Prediction". Jorrie gave an explanation of tidal gravity as predicted by Einstein's General Relativity, the resultant tidal currents and the night low and high tides at full moon. He then went on to explain the complex orbital mechanics of the moon/earth/sun system, like: the primary astronomical cycles of the moon, its perigee advance, the moon's orbital plane inclination and the moon's orbital precession. This complex motion of the moon and the daily rotation of the earth about its own axis results in tidal motion over time that can be resolved into many components or tidal constituents.

His talk was supplemented by two "Sidebar" explanations:

Johann Swanepoel gave an explanation on the effect of tidal friction in the long term slowing down of the Earth's rotation around its axis and the speeding up of the moon in its orbit around the Earth.

Tim Cooper gave an explanation of the occurrence and significance of occultations of background stars by the moon. By carefiully observing and timing such occultations, the information so obtained is used in the more precise determination of the position of the moon and the consequent prediction of tides.

The evening ended with an actual observation of the occultation of a magnitude 3 star by the moon at about 21:13. There were many oohs and aahs from those observing as the star suddenly disappeared behind the rim of the dark edge of the moon.

Attendance was down from its usual highs, there being only 24 members and 4 visitors present.

The new 2004 name tags are available at the meeting, so please be sure to collect yours at the next meeting.

VERLEDE MAAND SE WAARNEMINGSAAND deur Johan Smit

Al wat ons met die 12" teleskoop gedoen het, was om vroegaand na die maan te kyk en later het ons hom op die "Double-double" in Lyrae gemik. Fantasties - split altwee komponente. Dit was die hoogtepunt van die aand. Ons het ook vir oulaas na die “Jewel box” gekyk. Dit sal nou al vroeër sak en ons sal dit vir die volgende paar maande nie sien nie.

SPEECH CRAFTERS COURSE

The Speech Crafters course presented by Kommunika Toastmasters has just passed the halfway mark and the talents of the participants are developing noticeably. We are learning how many times we 'uhm', how we hitch up our trousers, how we scratch our noses and play with our wedding rings while we tell you about astronomy. It may not always be obvious at our monthly meetings, but our nerves certainly do go a little ape when our names are called to step forward and talk.

We are learning how to compose a talk, how to remain within time limits, how to speak in earnest, how to add variety to our voices, to use gestures and look more lively than a mummy. There is a wealth of astronomy knowledge in our membership, so it is important that we learn to convey it most effectively while entertaining.

Some of the budding orators have been invited to present a light combined 20 minute talk at a formal Toastmasters meeting. We wish them will.

The participants in the Speech Crafters Course. Left to right: Wayne Mitchell, Neville Young, Michael Poll, Koos van Zyl, Pierre Lourens, Johann Swanepoel, Johan Smit. All are Pretoria Centre committee members, except Koos.

NEWSLETTERS BY EMAIL

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

FOR SALE

I have a Celestron NexStar 130GT for sale. Asking price is R 4800.00 (R8200 new) . The telescope is now 6 months old, and comes with all the standard accessories mentioned below. Anyone interested in it can come and look at it before they purchase it. But once taken it is "as is" (voetstoets). I myself have not had any problems with it, I have even tried my hand at taking photos with the telescope. The only reason I am selling it is to get a larger telescope. If you need any additional information please contact me.

Contact Bruce Zangel at zangelbd@state.gov or 083 423 9653.

Pictures and specifications can been seen on our local website at http://www.pretoria-astronomy.co.za/astro-ads.php.

COMMENTS ON ASTEROID 4179 TOUTATIS

Is it a bird? Is it a plane? By Toutatis, no! It's an asteroid!

Asteroid 4179 Toutatis is a small chunk of rock, about 4.8 km in diameter, and its earth-crossing orbit brings it into the vicinity of the earth approximately every 4 years. One such occurrence is 2004. My interest is in observing occultations of stars by asteroids, which enables us to study the size and shape of these objects in greater detail than is possible with other techniques. This work can be done from your backyard and with very small telescopes if the occulted star is bright enough.

During late September, Toutatis was predicted to occult 360 stars from different locations. Only two were predicted for South Africa, the most favourable being the occultation of HIP 99270, a magnitude 6.6 star, on the evening of Monday September 27. Due to the closeness of the asteroid to earth, the prediction had a high error margin. So, I started out early. Using complete overkill, I trained the 16-inch telescope on HIP 99270, but, no asteroid. So, I panned around the field, and just outside found Toutatis. It was about this time my jaw hit the dusty floor of the observatory. I could actually see Toutatis moving!

I have been observing for 38 years, and seen some pretty neat things, but nothing like this. To see a 6km rock hurtling past earth in real time was just awesome! I was using my mobile phone to time the occultation, which was a wide miss, and the first number that sprang to mind was that of Neville Young. I phoned him while peering through the eyepiece, captivated. I knew Neville would do the rest. Pretty soon he phoned back to say he was watching it, and then to confirm Mauritz was too.

Scientific work aside for once, I just enjoyed watching this celestial event, which was not the showpiece of an eclipse, or the adrenalin rush of a meteor outburst, just a tiny spec crossing the sky, and I am glad that this tiny planet had the same reaction on others too.
----------Tim Cooper

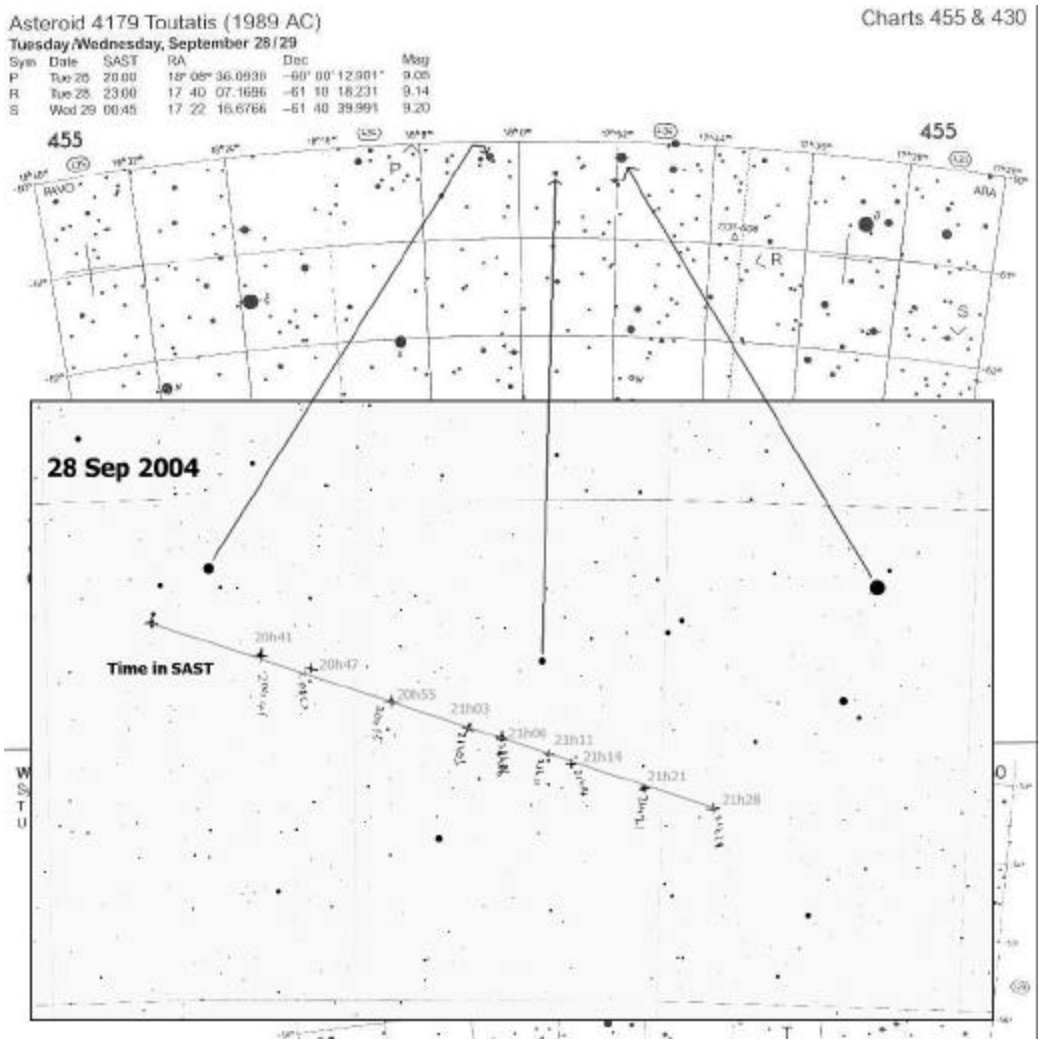
Got it!!! Amazing how fast it moves relative to the background stars. I've never seen something like this before.
----------Mauritz Geyser

Tim called me this Monday evening (27/09/2004) saying he was watching Toutatis move through the sky. He was very excited.
90 minutes later, after navigating through Telescopium under a full moon, I finally found Toutatis and watched it slide past a 9.8 magnitude star. Truly amazing. I was using the Bennett 5" refractor.
The asteroid was 10 degrees away from the zenith, which meant that I had to lie underneath the eyepiece on the ground with the tripod legs as short and as wide as they could be. Very uncomfortable - stiff neck tomorrow - but worth it all the way!
----------Neville Young

One Toutatis website address is

http://news.nationalgeographic.com/news/2004/09/0924_040924_asteroid_toutatis.html#main

Right: The approximately 4.8-kilometer-long peanut-shaped asteroid 4179 Toutatis passed 1.6 million km from Earth (4 times the moon's distance from Earth) at 16:00 on Wednesday 29 September. The approach is the century's closest for any asteroid of similar or greater size. Computer-animation image done by NASA/JPL.



Star map which shows the movement of asteroid 4179 Toutatis in the constellation Ara (the altar) observed by Mauritz Geyser on Tuesday 28 and Wednesday 29 September 2004.

Stellar Spectral Types Revisited Part 1 by Michael Poll

Stars are classified by their spectra, each type of stellar spectrum is given a defining letter from the sequence OBAFGKM.

Starlight (including sunlight!) can be broken into its constituent colours by allowing the light to pass through a prism or a spectroscope. Examination of a spectrum reveals thousands of dark lines set against the colours. The lines are superimposed on the continuous colour spectrum of the surface, and are caused by the presence in the star's atmosphere of ions or atoms, which absorb certain wavelengths. (Ions are atoms which have been stripped of some, or gained some, electrons). Ions and atoms give single narrow absorption lines, but if molecules are present they give wider lines, called absorption bands. Each atom, ion or molecule has its own unique pattern of lines, so by studying the stellar spectra it is possible to determine which substances are present in a star. It was shown that the sun was composed of elements found on Earth, but that 92% of the sun was hydrogen. The rest is mostly helium, but there are small percentages of elements common on earth, e.g carbon oxygen and iron. If the hydrogen and helium were to be removed from the sun, the remaining substances are in the same proportion as they are in the Earth's crust, which is strong evidence that the planets and the sun were formed at the same time, and out of the same cloud of gas. (When the sun started "burning", the hydrogen and helium were driven out of the inner solar system, but were retained by the gas giant planets which did not get quite so warm and had stronger gravity).

Absorption lines in the sun's spectrum were discovered in 1802 by the British chemist William H Wollaston, who showed seven dark lines in the spectrum. In 1814 Joseph Fraunhofer showed several hundred lines in the solar spectrum. More than 22 000 are now listed. The first stellar spectra were seen by Fraunhofer in 1817.

In 1825 August Comte, a French philosopher, said "the chemical composition of the stars is an indisputable example of knowledge that will remain permanently unknown to mankind".

By the 1860s numbers of stellar spectra were being studied by William Huggins in England and Angelo Secchi in Rome. Huggins showed that the sun and the stars contained the same chemicals, but they did not

Top: Angelo Secchi, a Jesuit priest, was also a spectroscopist. His early stellar-spectrum classification scheme was used throughout the late 19th century and was the basis for the expanded stellar classes developed by New York astronomer Henry Draper *(center)* and Edward C. Pickering *(bottom)*, who was director of the Harvard College Observatory.

have the same spectral patterns, so it seemed that the stars were all made of the same basic substances, but in different proportions.

To try and understand the observations, in 1863 Secchi devised a system whereby the stars were classified into 5 groups.

Group I were blue-white stars with simple hydrogen spectra - e.g Vega and Sirius.

Group II were stars with complex spectra e.g. the Sun, Arcturus and Aldebaran.

Group III were orange red stars with even more complex spectra and with absorption bands as well as absorption lines e.g Betelgeuse.

Group IV were deep red stars with different kinds of complex bands (e.g.19 Piscium).

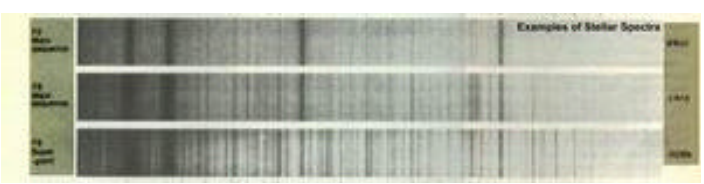
Group V were stars which had absorption bands and bright emission lines (e.g. Gamma Cassiopeiae and Beta Lyrae).

However, it was found with this scheme that stars any in one class could be quite different from each other. Progress was made in 1872 when Henry Draper, a physician and amateur astronomer in New York just beat Huggins to take the first photograph of the spectrum of a star, when he photographed the spectrum of Vega. After Draper's death, his recorded spectra and his telescope were given to Harvard University, where Edward Pickering, the Professor of Astronomy took up Draper's work.

By placing his prism at the front of his telescope, Pickering could capture the spectrum of all the stars in the field at once, so that many spectra were obtained. To classify them, Pickering expanded Secchi's scheme with a system of Roman letters starting with A and going through to O, with the classification based mainly on the strength of the hydrogen lines. He had three assistants analysing the spectra - Williamina Fleming, Antonia Maury and Annie Jump Cannon. It was soon found that some of the letters could be discarded, and Cannon realised that, based on the appearance of absorption lines other than hydrogen, the scheme worked better if B were placed before A, and O was classified before B. With the redundant letters removed this gave the OBAFGKM sequence, which covered Secchi's first three groups, the M stars being Group III. Secchi's fourth group became class N. Cannon also expanded the sequence by subdividing each letter type into 10 e.g from B0 to B9.

The Henry Draper Catalogue of Stellar Spectra was published by Cannon and Pickering between 1918 and 1924. It contained the spectra of 225 300 stars classified by Cannon herself. She later extended the total to 359 082.

……..To be continued



AFRICA, THE DARK CONTINENT

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