



# The PRETORIA CENTRE

of the

Astronomical Society of Southern Africa

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

## NEWSLETTER NOVEMBER 2005

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

Date and time            Wednesday 23 November at 19h15  
Chairperson            Fred Oosthuizen  
Beginner's Corner    What Not to Buy for Xmas by Johan Smit  
What's Up              by Wayne Mitchell

+++++++ LEG BREAK - Library open +++++++  
MAIN TALK

### **Building the Sutherland Observatories by David Bryant**

**the Architect of the first two phases in the 70's**

The meeting will be followed by tea/coffee and biscuits as usual.  
The next social/practical evening will be held on Friday 18 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 Neville Young

The title of the main talk—**The Galaxy, the Universe, and Everything: an Hitchhikers Tour of the Cosmos**—must have been intriguing, enticing 60 members and visitors to the meeting.

Dr Fabio Frescura presented his talk in three parts - strongly influenced by the original Hitchhiker's Guide story and thus

*"Pertinently Punctuated by Portentous Poetry Wrought and Written by the Wraith of Cosmic Composition*

*Grand Master Bard of the Asgoths of Kria Granthos the Flatulent"* .

Part I dealt with the Milky Way, how it was perceived through history and what it really is.

Part II described the shape of our Milky Way galaxy and how we are able to see it using the full energy spectrum.

Part III finally tackled the inventory of what our galaxy contains; nebulae, clusters, gas and dust clouds, supernovae, dwarf stars, pulsars and black holes and the ubiquitous 'dark matter' that confounds astrophysicists like Fabio.

Certainly this was an entertaining but equally

edifying talk. Fabio will be invited back in due course for Parts 4 to 6!

As usual, the two talks before the halftime break added to the evenings entertainment and edification. Tony Viljoen's talk was *Beating the Seeing* which discussed the issues in the atmosphere and in the telescope tube which detract from seeing perfect images. Terms like 'wavefront distortion', 'atmospheric blurring' and 'boundary layer' now mean a lot more to all of us. We also learned how to improve seeing by using a fan inside the telescope tube and observing from a location which does not absorb heat and then radiate it away in atmosphere—rattling bubbles as—for instance - concrete does. Tony also discussed which weather conditions support good seeing, enabling observers to better seize the best evenings .

Michael Poll did his accomplished *What's Up*, going through the movements of the planets Mercury, Venus, Mars and Saturn and then introducing us to the jockey (Pisces) riding the horse (Pegasus). Take another look at these constellations and see this very funny picture!

## Last month's observing eve - by Wayne Mitchell & Michael Poll

We all had a very interesting observing evening. Sky conditions were rather favorable considering our city's sky, which boosted our enthusiasm. Early in the evening, we saw Mercury, which was just starting a favourable apparition. Above it was the brilliant evening star, Venus, and the two planets were standing in an almost vertical line. The Center 12" telescope looked at Venus first. The view was quite spectacular, with Venus showing a perfect "half-moon" shape.

Also seen were some scenes in Scorpius and Sagittarius, including M7 and M8 (the Lagoon nebula). Even a wisp of the gas associated with the Lagoon was seen. We looked at Albireo (beta Cyngi), and how to locate it between Altair and Vega, and the (northern) Summer Triangle was noted. As well as Albireo, other double stars seen were Alpha Centauri, Gamma Arietis, (equal brightness) and Gamma Andromedae (unequal brightness). M15, a compact globular cluster with a bright central core in Pegasus was carefully studied as well as its location amongst surrounding stars. The Wild-Duck cluster, M11, was also spotted with binoculars and its position relative to the brightest star in that area, Altair, was noted.

The evening highlight was the planet Uranus, a distinct blue-green disk as revealed by Michael's telescope. Even at 320x in Wayne's telescope, Uranus still maintained its form. The

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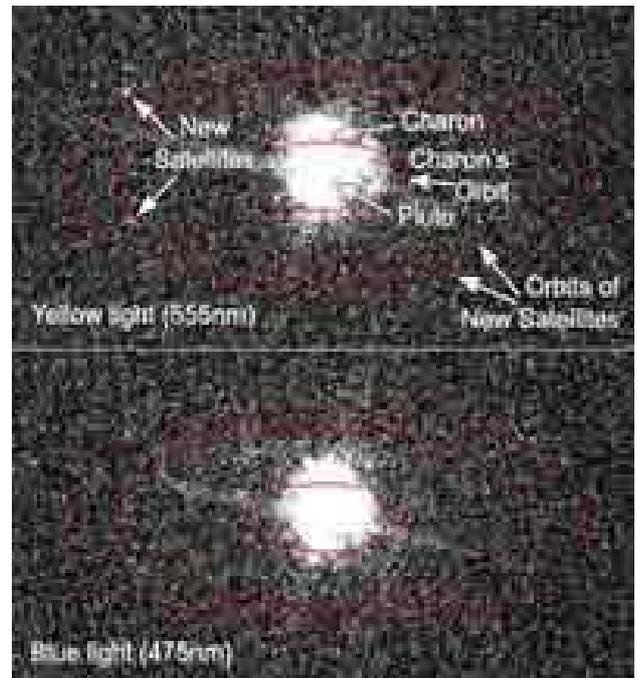
Great Andromeda galaxy M31 and its sister companion M32 were easily viewed in Wayne's telescope.

Later that evening Mars was rising above the tree tops, and of course we had to look at it, and it was exceptionally clear. Detailed "dark patches" were clearly seen across the entire surface of the red disk.

We quickly looked at the Great Orion nebula and its embedded Trapezium of stars, but these objects will be better placed for the November practical, as will M31.

### HST Reveals Two Possible New Moons Around Pluto

A careful search of Hubble images taken with the ACS/HRC on June 14th, 2002, reveals two objects that are consistent with the expected locations of the newly-discovered satellites. One image (top) was taken in yellow light (555 nm) and the other (bottom) was taken in blue light (475 nm). The ellipse shows the orbital path of the new satellites derived from the May 2005 Hubble observations. The satellites should lie somewhere along this ellipse and, indeed, there are two objects along the predicted path, thus confirming the 2005 observations. For more information, visit website <http://hubblesite.org/>



### New Horizons spacecraft

An artist's depiction of the New Horizons unmanned spacecraft of NASA at Pluto. The craft is due for launch on 11 January, 2006.

For more information, visit the website

<http://encyclopedia.thefreedictionary.com/New+Horizons>

### Telescopes for sale

Telescope SA, distributors of telescopes, offer the following great quality telescopes at surprisingly affordable prices: Sky-Watcher, Celestron, Vixen and other brands. Sky-watcher is the most popular brand and very affordable, especially the Dobsonian type. So why not treat yourself this Christmas?

Also on offer: a full range of eyepieces and other accessories.

Contact Wayne Mitchell, Pretoria Centre member, agent for Telescope SA, at 072 465 7739

## The Discovery of Neptune (part 3) - by Michael Poll

Neptune was discovered on September 23<sup>rd</sup> 1846. Here is further analysis of the history of the discovery: :

**“Airy instructed Challis to do a search”.**

**“Airy did not pass on the information about Le Verrier’s work”**

Airy had received a copy of Le Verrier’s predictions on June 23<sup>rd</sup> 1846. In a letter of July 9<sup>th</sup> 1846 to Challis, Airy wrote “You know I attach importance to the examination of that part of the heavens in which there is a possible shadow of reason for suspecting the existence of a planet exterior to Uranus”, and more urgently on July 13<sup>th</sup> 1846 : “I only add at present that in my opinion, the importance of this inquiry exceeds that of any current work [and] is of such a nature [that it will be] totally lost by delay”. In the letter of July 9<sup>th</sup> Airy stated that the only telescope suitable for the search was the Northumberland Telescope, which was in Cambridge. In effect, Airy was now asking Challis to do a secret sky search, using Le Verrier’s figures, but without telling Le Verrier.

**“Challis had observed the planet twice.”**

In a letter to Airy dated October 12<sup>th</sup> 1846, a month after the discovery, Challis wrote that the “zone of July 30<sup>th</sup>” contained every star in the corresponding position of the zone of August 12<sup>th</sup>, except one star of the 8<sup>th</sup> magnitude. This, “according to the principle of [the] search, which, in the want of a good star-map, I had adopted, must have been a Planet...by this statement you will see that, after four days of observing, the Planet was in my grasp if only I had examined or mapped the observations”. Neptune had drifted into the July 30<sup>th</sup> “zone” by August 12<sup>th</sup>, and Challis had recorded it on August 4<sup>th</sup> and again on August 12<sup>th</sup>, but had not realised the fact.

**“Challis had no good charts of the relevant area.”**

“...in the want of a good star map....” - this was the excuse as to why Challis had not found Neptune – he did not have a map! The explanation was mentioned by Challis in an

Oct.17<sup>th</sup> 1846 letter to the Athenaeum. The new Berlin Sternkalendar (Hour 21, of Right Ascension, by Bremiker) which covered the zone of the heavens in which Neptune was *eventually* discovered, had not yet been distributed - only the Berlin Observatory owned a copy. Challis developed this in his presentation to the RAS on November 13<sup>th</sup>, 1846: “If I had had this map [Hour 21], a first sweep would have been unnecessary: I should have compared my field of view with the map at once.”

The Dec 5<sup>th</sup> 1846 editorial of The Athenaeum also made this an issue: “If the Cambridge Library had possessed the twenty-first hour of the Berlin star-maps, Adams and Le Verrier would have changed places.” The map became a central part of the story. Even in 1946 William Smart (of Trinity College, Cambridge and RAS President 1949-1951) wrote: “There can be no doubt that if the star-chart had been distributed immediately after it had been engraved, Challis’s labours would have been immeasurably reduced and discovery at Cambridge would have been almost certain”.

However, Challis *did* have the Hour 22 Berlin star map, and, for the first four weeks of his sky-search, Neptune was in the area covered by Hour 22 map!

“The position assigned by Le Verrier differed by only one degree from that given by Adams”. In his letter of October 1<sup>st</sup> 1846 to the *Cambridge Chronicle*, Challis wrote “About four months ago, Mr Adams... and M. Le Verrier ...agreed in fixing on 325° of heliocentric longitude\* as the most probable position of the supposed planet, which has proved to be very little different from the actual position”.

James Glaisher, of the RGO, used almost the same words as Challis in a letter written to the Illustrated London News on October 3<sup>rd</sup>, and an editorial in the “Athenaeum” on October 31<sup>st</sup> 1846 claimed that “Mr Adams had furnished Mr Challis with the means of actually securing two observations of the

planet previous to any such announcement by Le Verrier”.

In the document that Airy presented to the RAS on November 13<sup>th</sup> 1846, he said “The position assigned by Le Verrier differed by only one degree from that given by Adams in the paper which he had left at the Royal observatory more than seven months before”

In spite of these claims, even a month after the discovery, no documents stating Adams' predictions had been made public.

Challis had started his search on July 29 1846, first examining “the position which Mr Adams' calculations assigned as the most probable place of the planet”. This appears as being the first document, clearly dateable to within a month, that Adams gave to any other person concerning the position of the new planet. It defines the planet's likely positions in RA and Declination, for the purpose of directing Challis' search. This document has *never* been described or reproduced in the history books, and was only known about from Challis' comments.

However, the figures that Adams actually provided to Challis for the search were based on Le Verrier's predictions. In this “July Ephemeris” Adams gave five possible positions for the planet, including its position for August 29<sup>th</sup>, 1846 which he stated was “336° 24', nearly”, and the 325° one specified by Le Verrier . In a further letter to Airy dated September 2<sup>nd</sup> 1846, Adams proposed that the position for 1st October, 1846, would be about 315° 24'. Thus between July and September 1846, Adams predictions ranged over 20° of heliocentric longitude.

In fact, Adams' and Le Verrier's final predictions differed by more than four degrees. Some of the confusion may have been caused by the way Adams expressed his results, which were expressed in mean heliocentric longitude instead of true heliocentric longitude. Converted to true heliocentric longitude, for the day of discovery, Adams first prediction using his

own calculations (October 1845) was 328° 41' and his second (September 2<sup>nd</sup> 1846) was 329° 27'. Le Verrier's first was 324° 35' and his second 325° 58'. The actual position of Neptune on discovery day was 326° 57' so only Le Verrier's prediction was “within one degree”, Adams was about four degrees out, and even then his original 1845 prediction was still his closest. Le Verrier's second prediction was more accurate than his first.

A reconstruction of Le Verrier's computations was performed in 1980 by Baghdady, who solved Le Verrier's equations to a higher order of accuracy and obtained a final error in celestial longitude of only sixteen arc minutes, as compared with the fifty-nine arc minutes error of the historical prediction – which proved that Le Verrier's prediction really was a brilliant feat of deductive logic, and not just a coincidence as is sometimes alleged.

*\* Heliocentric longitude is the longitude as measured around the ecliptic, with the ecliptic as the “equator”.*

*The picture in the October Newsletter is of James Challis. (To be continued.)*



**George Biddel Airy**

## SA COSMO workshop

As a result of the survey by Darragh O'Donoghue, it became clear that a large fraction (~50%) of the South African astronomy community was interested in cosmology; particularly the possibility of doing cosmology with SALT. Currently there is no forum for bringing this nascent community together and it is desperately needed.

The first SA COSMO workshop will take place at the Center for Theoretical Physics, WITS on 21 November 2005. This informal workshop will provide a vibrant learning environment for post-graduate students and post-docs and will focus on cross-disciplinary skill development. Students and post-docs can learn key research and presentation skills, develop their research network and start new collaborations. These opportunities are rarely granted to South African students and post-docs given our isolation from international conference and workshop venues.

It seems appropriate that in 2005, World Year of Physics, a workshop methodology that has been extremely successful elsewhere, should be introduced to South Africa. For more information, see website <http://neo.phys.wits.ac.za/sacosmo/>

## New moon

Tony Viljoen, our centre's secretary, has had a very unusual request. The Imam of the mosque in Laudium contacted Tony to urgently help him locate the new moon on Wednesday 2nd November, in order to announce the end of Ramadan. He said we can use the minaret on the mosque to get a good view to the west!

We were quickly able to realise that the moon would be only be 17 hours old on that day, be only 7 deg from the sun, be only 5 deg altitude and have a phase of 0,005 at 18h30, making it an impossible task from the city environs considering that the all time record early sighting by an Sky & Telescope astronomer, Steven O'Meara is 15h32m.

## Even 'Failed Stars' Can Form Planets

The process of building planets is more universal and robust than had previously been assumed. Brown dwarfs, like more massive normal stars, are formed when interstellar gas and dust clouds collapse. When this happens, a central, dense area builds up, embedded in a rotating disc made of gas and dust. These circumstellar discs produce infrared radiation according to their temperature.

The collapse of gas and dust clouds ends when the increasing pressure, temperature, and density in the central area causes nuclear fusion to start -- that is, the burning of hydrogen into helium. This causes the dense area to become its own star. If its mass is too small, however, for the fusion to take place, a brown dwarf is created instead. It will have no further source of energy, and will slowly radiate the compression temperature created by the collapse.

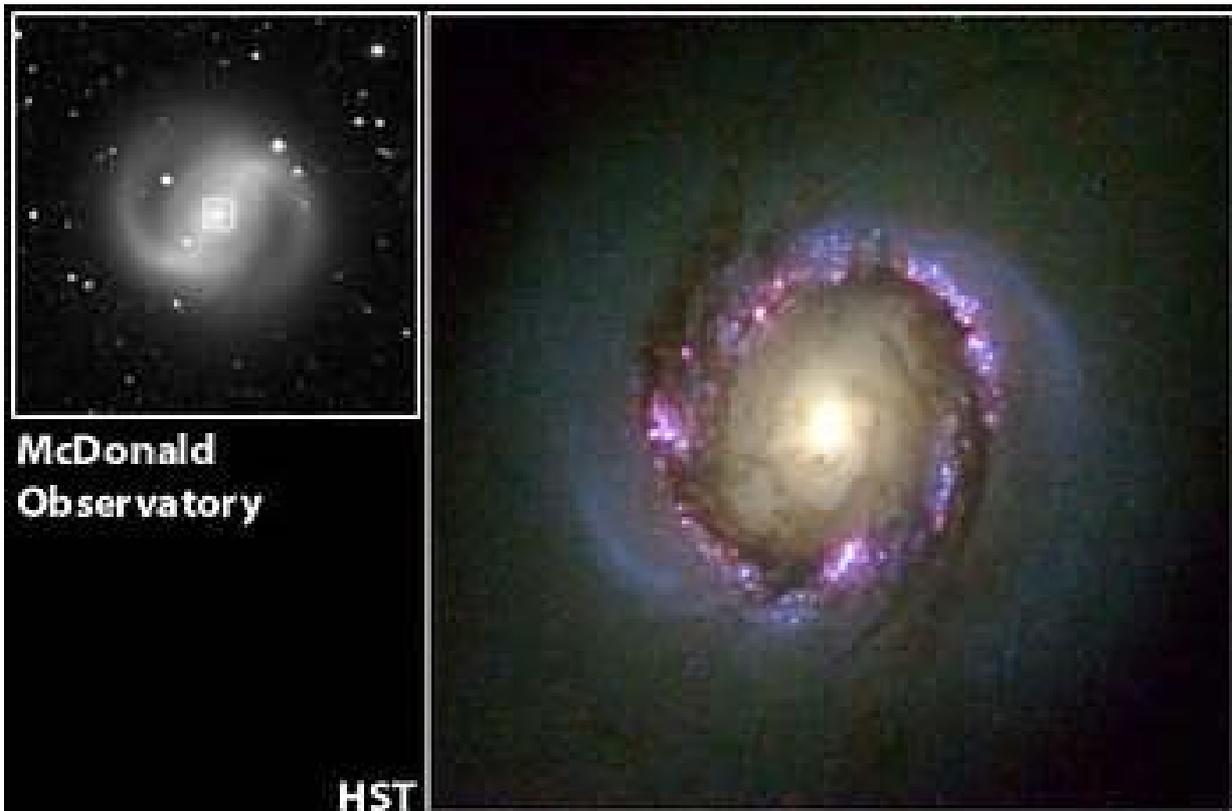
Astronomers have found evidence that planets have formed around brown dwarfs.

For more information, visit website  
<http://www.sciencedaily.com/releases/2005/10/051026090144.htm>

## NGC4314

This Hubble telescope snapshot reveals clusters of infant stars that formed in a ring around the core of the barred-spiral galaxy NGC 4314. This stellar nursery, whose inhabitants were created within the past 5 million years, is the only place in the entire galaxy where new stars are being born.

This close-up view also illustrates other interesting details in the galaxy's core: dust lanes, a smaller bar of stars, dust and gas embedded in the stellar ring, and an extra pair of spiral arms packed with young stars. These details make the center resemble a miniature version of a spiral galaxy. The black-and-white image on the upper left, taken by a ground-based telescope, shows the entire galaxy.





### Area around the Rosette Nebula

Image made by Mauritz Geyser from Kagga Kamma Nature Reserve, Western Cape.

Image and caption from his website.

Date: 2005/01/04

Time: 22h59 Local, 20h59 UT

Camera: Minolta X-300

Lens: 50mm at f/1.7

Exposure: 20 min

Film: Fuji Sensia 400

### PRETORIA CENTRE COMMITTEE

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