The PRETORIA CENTRE

of the

Astronomical Society of Southern Africa

www.pretoria-astronomy.co.za

NEWSLETTER OCTOBER 2007

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

Date and time	Wednesday 24 October at 19h15
Chairperson	Tony Viljoen
Beginner's Corner	"How a telescope really works" by Johan Smit
What's Up	Hein Stoltsz

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

MAIN TALK

"Tunguska 1908"

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 19 October 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 about 30 attended the meeting, but perhaps the public holiday on Monday (that felt like a Sunday) confused people. The first rains of summer fell while the meeting was in progress. Cloud affects our viewing, but it was still wonderful to see that moisture.

The meeting started with Johan Smit presenting Beginner's Corner – The Dark Side of Light. His reminder that we cannot see the Magellanic Clouds these days was an effective opening to his talk on light pollution. His illustrations of just how serious and wide-spread light pollution is, was a wake-up call to those who accept light as just a part of life. He showed us that non-polluting light fittings are available and they could even save electricity and money. He stressed that we must ALL start talking (nicely!) to light-fitting suppliers, neighbours, municipalities, etc., before it is too late. We and our descendants should be able to see starry skies - not just as photos taken from space.

Danie Barnardo presented What's Up for the coming month in three sections:

- Naked eye – worthwhile targets for stargazing;
- Binoculars – targets for a quick search and look with binoculars and small telescopes;
- Telescopes – more challenging, but rewarding targets.

The Main Topic was presented by Carl Anhaeusser, Emeritus Professor and Research Fellow at Wits School of Geosciences. The breccia that he encountered in North West Province some years ago has finally been investigated and, although the study has not been extensive enough to meet all the criteria, it seems possible that it represents a sixth meteorite impact site for South Africa. (Tswaing, Kalkop, Roter Kamm, Morokweng and Vredefort are all confirmed impact sites, with Vredefort being the largest on earth.)

Breccia is a rock consisting of chunks of different sizes embedded in a very fine glassy matrix (pseudotachylite). It is found in fault zones, where there has been lots of movement and grinding of the rock. It is also found in meteorite impact areas. A meteorite (bolide) crashes into the ground, forming a depression, but there is then reaction to this pressure and much of the loosened material from the depression is flung upwards and outwards. Different sized rocks rain down over the surrounding area. Pressure and heat can melt some of the smaller rock particles and this liquid flows into the cavities between larger rocks (pseudotachylite). Eventually it all cools and hardens into a breccia.

The breccia at two sites in a stream bed at Setlagole have all the characteristics of an impact breccia, but the area is largely covered by Kalahari sand and calcrete deposits and drilling to investigate the rock under the sand is very expensive. The two geophysicists that the Prof. approached about the matter have managed to do detailed evaluations of the magnetic surveys that already exist. Not only do they show a circular structure under the sand, but there are also the distinctive concentric rings within the circle which are commonly found in impact sites.

Like the rocks under the Kalahari sands in this area, the debris in the breccia and the matrix are granitic. A granitic dyke, fused to the breccia, has also been found. This indicates that some of the granite melted (due to heat and pressure.) Under a microscope, PDFs (planar deformation features) are found in the mineral grains and there are also "graphic granite" features indicating that there was extreme heat and pressure. Unfortunately, shatter cones, evidence of which helps to confirm a meteorite impact, are unlikely to be found in granitic rocks. They are common in shales which are not present at the site.

IF this is indeed a meteorite impact site, then the bolide would probably have been 1 to 1.5 metres in diameter and travelling at 15 km/ sec. The temperature would have risen to 20000℃ in 20 seconds.

There are some dykes that cut through the circular structure and are therefore younger than the feature. They could be Karoo basalts or Ventersdorp lava feeders, but they indicate that the structure is at least 180 million years old and possibly older than 2700 million years. Expensive drilling, geochemical assays, geochemical dating, etc. would be needed to confirm that this structure hiding under the sand is a meteorite impact feature, but Prof. Anhaeusser managed to convince us that the current speculations are justified.

Last Month's Observing Evening
by Michael Poll, Johan Smit and Percy Jacobs

Not so many people this month, but nevertheless a successful evening. Jupiter and Scorpius are now going down in the west, so this area of the sky was looked at first. One of Jupiter's moons was just visible as a blip on the limb of the planet. In spite of the dusty sky and the moon, M7, M6 and NGC 6231, the open clusters in Scorpius, were well seen, as was the globular cluster NGC 6441. The latter globular is in the tail of Scorpius, and lies extremely close to the star G Scorpii, and so is easily located. G Scorpii itself is close to M7.

Percy has started some variable star observing, so we had a look at R Centauri, which is near beta Centauri, and S Pavonis, which can be star hopped to from alpha Pavonis. The season for looking at R Centauri in the evening sky is coming to an end, but S Pavonis is currently high in the south and will be in the evening sky until about the end of November. When located its distinct red colour can be seen. (These are Mira type red giants, also classified as Long Period Variables - the period for R Centauri is 548 days and for S Pavonis 384 days).

Also in the south we looked at alpha Centauri, and the bright globular cluster NGC 6752 near lambda (l) Pavonis. There is a star very close to this globular such that they nearly overlap. Later in the evening we could see the second brightest globular, and one of the favourites – this one is 47 Tucanae. The nearest bright star to it is beta Hydri, but it is also on the edge of the Small Magellanic Cloud. However the moon and the lights and the atmospheric dust rendered the Cloud "not visible".

The northern sky is quite interesting at this time of year, with the stars Altair (in Aquila) Vega (in Lyra) and Deneb (in Cygnus) well up. The showpiece double in Cygnus is Albireo (beta Cygni), which has blue and gold components.

Late in the evening the Square of Pegasus was up in the north east, and we looked at the globular cluster M15, which is daintily placed in a triangle of stars. It can be found near the "nose" of the winged horse, Pegasus. A line from theta Pegasi (q) to epsilon (e, also called Enif) extended half as much again locates the cluster. Finally, we caught a low down glimpse of M31, the Andromeda Galaxy. Although only the faintest smudge this month, it will be better placed at the next observing evening on October 19th.

The Centre 12 inch telescope was aimed at Jupiter for virtually the whole evening to give every-one a chance to have a good look at the planet. At our next observing evening Jupiter will be much lower in the west and so will be visible for a much shorter time. Later in the evening the 12 inch was aimed at the moon, spoiling every-one's night vision, but, because of the brightness of the sky and the spectacular view of the moon, it was worth it.

Johan brought his home designed and built binocular stand to look at some extended objects such as the Coathanger Cluster (Collinder 399) and M7 and M6 in Scorpius. Seeing a larger area of the sky gives spectacular viewing and it is amazing how much more detail is visible when binoculars are firmly mounted. Johan and Percy even saw a hint of the Ring Nebula (M57 in Lyra), the nebula appearing as a faint dot in the 12 x 50 binoculars on the stand. The moons of Jupiter were also observed with the binoculars. The moral is that a mounting for binoculars is a highly desirable astro-accessory.

Two free public talks at the Johannesburg Planetarium

SALT: After the Inauguration
Prof Phil Charles, Director, South African Astronomical Observatory
Thursday 25th October 2007 at 18h00

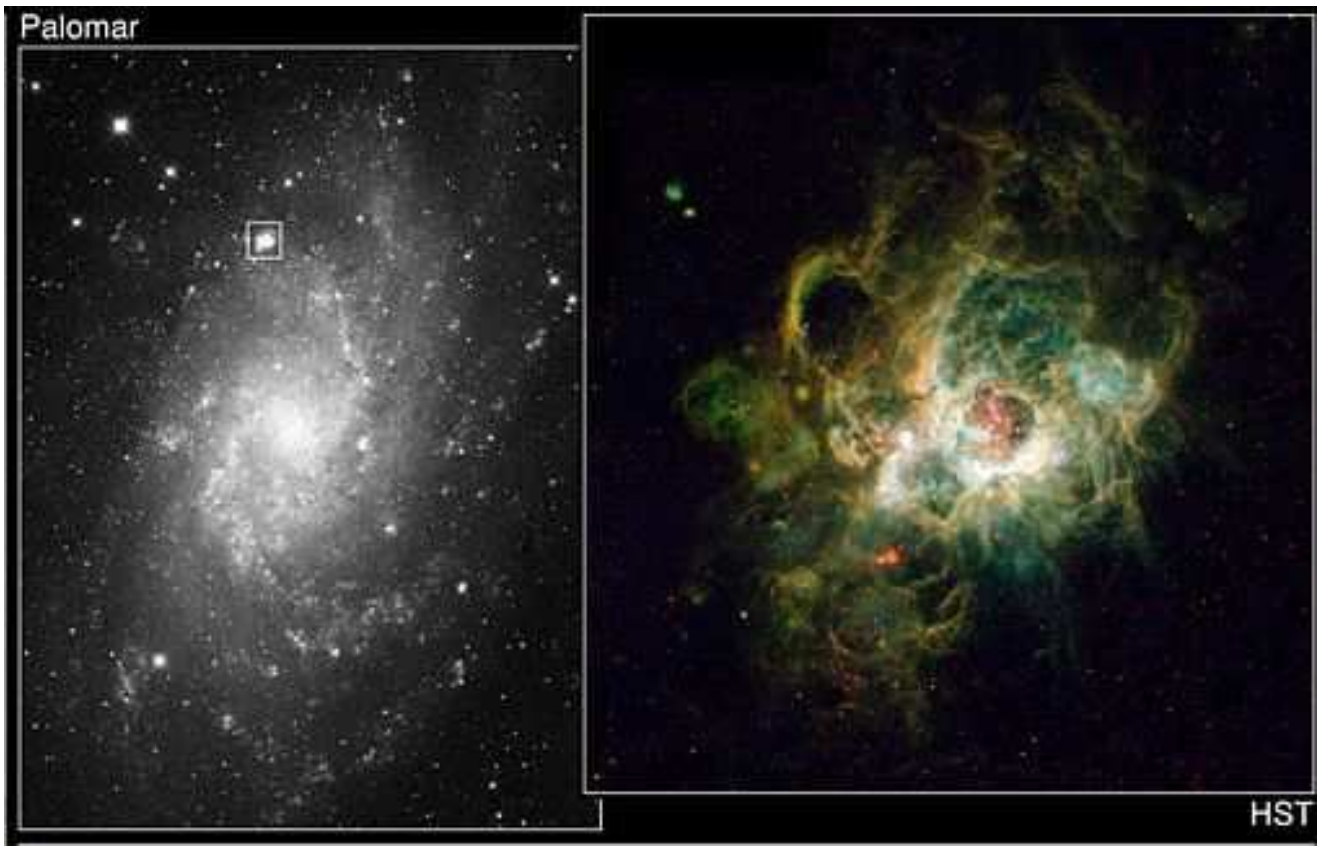
A Trip to the Edge of the Universe
Prof. Dr. Wolfram Kollatschny, Institut für Astrophysik, Universität Göttingen
Thursday 25th October 2007 at 19h30

Giant starburst region in neighbouring galaxy

This is a Hubble Space Telescope image (below, right) of a vast nebula called NGC 604, which lies in the neighboring spiral galaxy M33 (below, left), located 2.7 million light-years away in the constellation Triangulum. NGC 604 was discovered by William Herschel on September 11, 1784.

This is a site where new stars are being born in a spiral arm of M33. Though such nebulae are common in galaxies, this one is particularly large, nearly 1,500 light-years across. The nebula is so vast it is easily seen in ground-based telescopic images, like this one made by one of the five telescopes on Mount Palomar in California, USA .

At the heart of NGC 604 are over 200 hot stars, much more massive than our Sun (15 to 60 solar masses). They heat the gaseous walls of the nebula making the gas fluoresce. Their light also highlights the nebula's three-dimensional shape, like a lantern in a cavern. By studying the physical structure of a giant nebula, astronomers may determine how clusters of massive stars affect the evolution of the interstellar medium of M33. The nebula also yields clues to its star formation history and will improve understanding of the starburst process when a galaxy undergoes a "firestorm" of star formation.



Fifty years of space exploration

The image on the left shows Sputnik 1, the first man-made satellite to orbit Earth, in 1957 as a technician was putting finishing touches on it before launch. It was a 58.5 cm diameter sphere, made of highly polished 2 mm thick aluminium alloy, with mass about 83.5 kilograms. It went into orbit on 4 October 1957. Explore highlights of 50 years of space exploration from Sputnik 1 to Apollo 11 to Saturn's moons on website

http://magma.nationalgeographic.com/ngm/2007-10/space-travel/space-travel-timeline.html?email=Inside21Sept07

The Metonic Cycle, the Saros, and the Moon, Part 2 — by Michael Poll

The Metonic Cycle consists of a period of 19 calendar years (6939.6 days), 235 lunar synodic months (6939.7 days), and 254 lunar sidereal months (6939.79 days) after which the moon repeats exactly the same phase in exactly the same part of the sky.
Meton introduced the cycle in 432 BC, as a means of adjusting the Greek luni-solar calendar. (It also had to be applied to the Hebrew calendar). A luni-solar calendar has a sequence of months based on the cycle of lunar phases, but 12 lunar synodic months, (from new moon to new moon 12 times, which is a "Lunar Year") only lasts for 354.372 days, so that every 3 years or so there is a difference of more than a full month between the lunar and solar years. To bring the two back into phase it is necessary in some years to insert ("intercalate") an extra month. There will be 13 lunar months in the calendar year in which the intercalation is done, and it was done in years 3, 6, 8,11, 14, 17 and 19 of the 19 year cycle.

The Eclipse Year

Eclipses of the sun and moon occur in two "seasons" each year, and these seasons occur earlier each year. For example, see the table on the next page.

The plane of the moon's orbit is tilted with respect to the plane of the Earth's orbit around the sun by about 5 degrees. The line where the plane of the Earth's orbit intersects the celestial sphere is called the ecliptic, which is effectively the sun's path through the stars each year. The two points where the planes cross are called the nodes.(Figure 259) One node is called the "ascending node" because the moon then moves from below the plane of the earths orbit to above the plane of the earths orbit, the other node is called the "descending node" where the moon moves from above the plane back to below the plane.

Eclipses occur when a new or full moon occurs when **the sun is at, or near, a node.** The drift of eclipses to periods earlier in the year is due to the fact that the moons orbit moves in an anti-clockwise sense around the ecliptic when viewed from above. (Figure 261). This means that the nodes drift "backwards" along the ecliptic and the sun meets them earlier each year. The sun returns to the same node at intervals of **346.62 days**, and this period is called the **"Eclipse Year"**.

Prediction of eclipses using the Metonic Cycle.

19 Calendar Years = 6939.6 days.
20 Eclipse years = 6932.4 days
Difference = 7.2 days.

The Metonic Cycle can be used to predict the recurrence of eclipses at a given location on Earth. If the sun is near enough to a node for an eclipse to occur then 19 years later there will be a similar eclipse at the same time of year in the same part of the sky. However, because of the 7 day difference in these two periods, the circumstances will not repeat exactly. The sun moves around the ecliptic at the rate of about one degree per day (360 degrees in 365 days) so, although the moon would be new again for a solar eclipse, after 19 years the sun will be 7 degrees away from where it was previously. Eclipses of the sun can only occur if the sun is within about 18 ½ degrees on either side of the node, a span of 37 degrees altogether. This means that the series of eclipses can last for a maximum of 6 x 19 year cycles – the extreme case is when there is an eclipse exactly at the beginning and exactly at the end of the limits, with the sun shifting 35 degrees in between.

The Metonic Cycle must have been the means by which the ancients (Babylonians and Chaldeans) predicted eclipses, but it is an uncertain method because, if there is insufficient information, it cannot be known when a new series is about to start or if one is about to finish. Many references quote the story about the two Chinese astronomers, named Hi and Ho, who were executed because they failed to predict the eclipse of October 2132 BC.

(To be concluded)

SOLAR ECLIPSE "SEASON 1"	LUNAR ECLIPSE "SEASON 1"
2007 March 19	2007 March 03
2008 February 07	2008 February 21
2009 January 26	2009 February 09 (Penumbral)
2010 January 15	2009 December 31
2011 January 04	2010 December 21
SOLAR ECLIPSE "SEASON 2"	**LUNAR ECLIPSE "SEASON 2"**
2007 September 11	2007 August 28
2008 August 01	2008 August 16
2009 July 22	2009 July 27 (Penumbral)
2010 July 11	2010 June 26

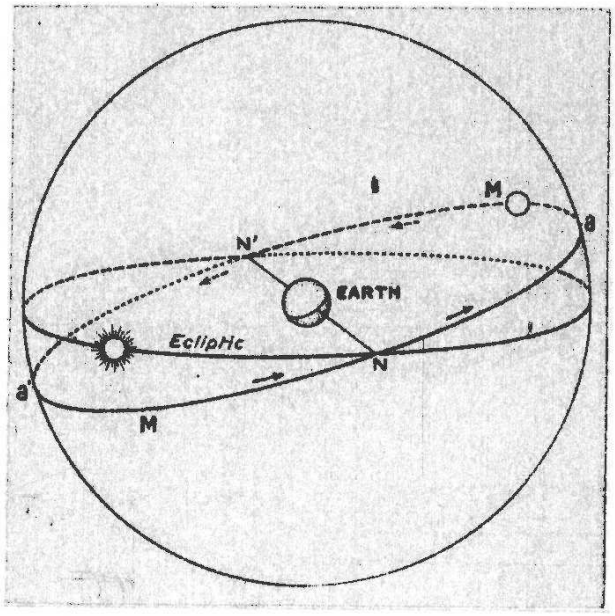


Fig. 259 — APPARENT MOTION OF THE MOON WITH RESPECT TO THE ECLIPTIC. N, ascending node; N′, descending node.

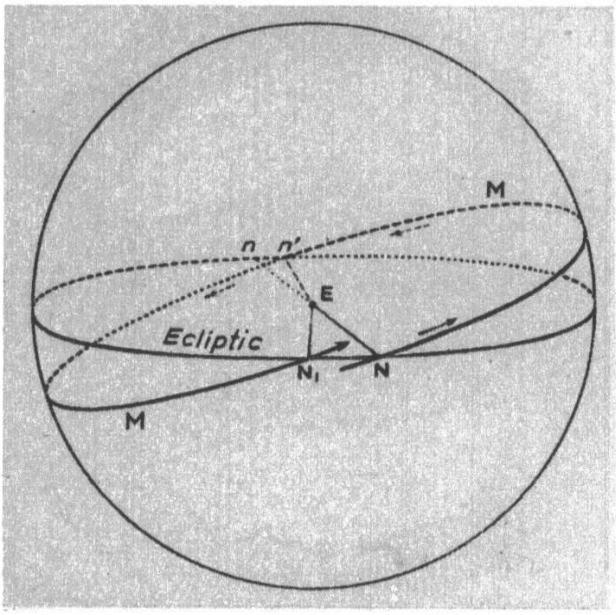
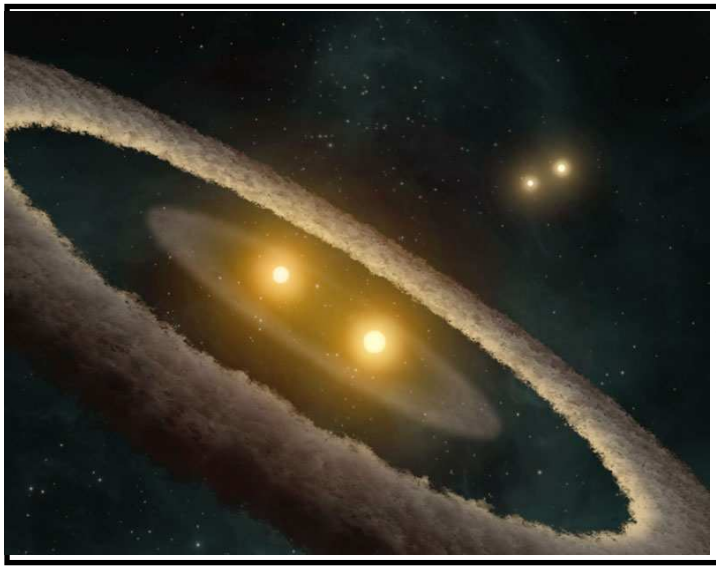


Fig. 261 — RETROGRADE SHIFT OF THE NODES OF THE LUNAR ORBIT. N, N′, ascending nodes; *n*, *n*′, descending nodes.



The Four Suns of HD98800

On the left is an artist's representation of the four suns of HD98800. Planets of the HD98800 system, if they exist, would experience such a view. HD98800 is a multiple star system about 150 light years from Earth - right in our section of the Milky Way. For years it has been known that HD98800 consists of two pairs of double stars, with one pair surrounded by a disk of dust. The star pairs are located about 50 AU from each other. For comparison, Pluto is about 40 AU from the Sun.

Website:**http://antwrp.gsfc.nasa.gov/apod/ap070730.html**

Phoenix

Sitting atop a Delta II rocket, spacecraft **Phoenix** experienced a successful early-morning liftoff on August 4, 2007 from the Cape Canaveral Air Force Station, Florida, USA. This was the beginning of its journey toward Mars.

In a nutshell, the **Phoenix Mars Lander** will investigate the history of water on Mars and determine whether the northern plains could ever have supported microbial life.

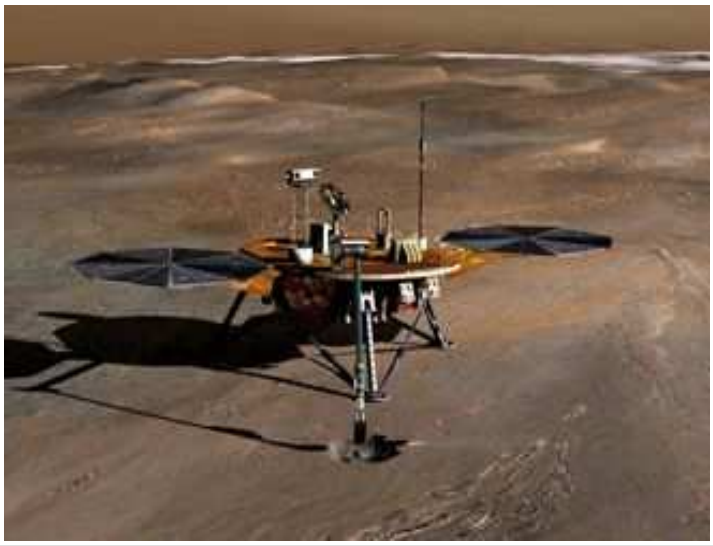
Phoenix will be the first mission to explore a polar region of Mars at ground level. It will land near Mars's northern polar cap on May 25, 2008 in an area known as Vastitas Borealis. The lander will then spend 90 days probing Mars's soil and atmosphere to determine if the environment could be hospitable to life.

Phoenix will use its 2.35-metre robotic arm to dig for clues about the history of water on Mars. The Mars Exploration Rovers, Spirit and Opportunity, have beamed back signs that water probably existed billions of years ago on Mars. Satellites orbiting the planet have also found strong evidence of permafrost ice in the polar regions. **Phoenix** will be the first mission to investigate these discoveries by scooping up samples for analysis by its onboard chemistry set. Specifically, scientists will determine whether the soil is salty, alkaline and/or oxidizing, and will test for complex organic molecules necessary for life. Unlike Spirit and Opportunity, **Phoenix** will remain stationary, since water ice is probably spread uniformly throughout the northern plains.

Why search for water? Water is a key clue to the most critical scientific questions about Mars: Have there ever been – or are there now – living organisms on Mars? How should humans prepare to explore Mars? What can Mars teach us about climate change? How do geological processes differ on Mars and on Earth? Water is a precursor for life, a potential resource for human explorers and a major agent of climate and geology.

The image below left is an artist's illustration of **Phoenix** on Mars. The one below right shows the Delta II rocket with **Phoenix** on board as it lifted off from the launch pad.

See websites **http://www.space.gc.ca/asc/eng/exploration/phoenix.asp**
http://phoenix.lpl.arizona.edu
http://www.nasa.gov/phoenix



Astronomical images

Over 2000 astronomical images can be viewed/downloaded at website

http://www.fotosearch.com/photos-images/space-astronomy.html

Over 1000 astronomical images can be viewed/downloaded at website

http://www.fotosearch.com/photos-images/galaxy.html

NGC 6744

This is one of the first-light images made by SALT (**S**outhern **A**frican **L**arge **T**elescope) at SAAO near Sutherland in the Karoo. It shows NGC 6744, which is one of the largest galaxies beyond the local group and one of the most spectacular galaxies in the southern sky. It is in the constellation Pavo (the Peacock) and is about 25 million light-years away. It is a barred spiral galaxy with graceful spiral arms and is relatively isolated with no large companions. It is a member of the Pavo-Indus galaxy cloud and in many respects (size, central bar, spiral arm morphology, chemical abundances) is similar to the Milky Way. Investigation of a prominent HII region within a spiral arm of NGC 6744 shows remarkably similar chemical abundances, particular in helium content, with HII regions in the Perseus arm of the Milky Way.

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