PERTH OBSERVATORY
Department of Conservation and Land Management

PERTH OBSERVATORY VOLUNTEER NEWSLETTER

OCTOBER 1998

Editor: Bevan Harris

Editorial

One benefit flowing from the events which led to my brief moment of glory as a lead TV news story is that my half-completed observatory project has gained a reasonable view to the north - the culprit trees are in the process of being removed. Now if only I could do something about those pesky streetlights! (For those who don't know, my house was the prime target for a mini-tornado on the last Saturday of September - nothing too serious though ☺).

IN THIS ISSUE

Highlights In The Sky

The never-ending dance of the planets provides a spectacle for Observatory visitors and staff alike as the new tour season gathers momentum.

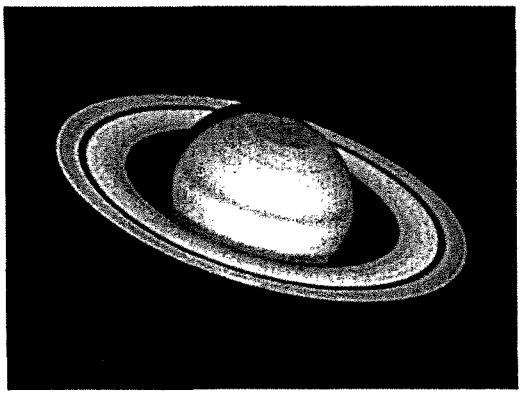
Following its recent passage through superior conjunction, **Mercury** begins the month still hidden in the glare of the Sun. Located in the constellation Virgo, it will pass by Spica on the 8th as it emerges into evening twilight. It will cross into neighbouring Libra around mid-month and will be adjacent (7° S) to the two day old Moon on the 22nd. During the first week of November it will cross into Scorpius to pass by Dschubba, the Head (or Crown) of the Scorpion.

Venus remains lost to view in the Sun's glare until late December, when it will reappear in the evening twilight. It will pass through superior conjunction on the 30th.

Already well risen at first light, **Mars** travels slowly through the constellation Leo for the whole month. Paired with alpha Leonis (Regulus) on the 7th, the two will straddle the waning crescent Moon on the 16th. Mars rises around 0400 at the beginning of October, less than two hours ahead of the Sun. By the month's end it will be rising around 0300, having stretched its lead to almost 2½ hours.

Jupiter is a showcase object in eastern Aquarius throughout the month of October. Shining at an approximate magnitude of -2.8, the planet is prominent in the eastern sky at sunset where it is superbly placed for viewing on night tours. Perth narrowly misses out on an occultation between Jupiter and the Moon on the 4th (it is a daylight event in the eastern states), while yet another near miss occurs on the 31st (actually November 1st). As the month closes, Jupiter will be setting around 0300, at the same time that Mars is rising.

With opposition occurring on the 24th, **Saturn** is at its best viewing for the entire year this month. At a distance of slightly less than 8.3 AU, it will not only be at its brightest (magnitude -0.2) and at its largest apparent size (slightly more than 20 arc seconds), but its ring presentation will also near its widest for the year. Still located in eastern Pisces, Saturn rises around 2000 in the early part of the month and will be in the vicinity of the Moon on the 6th and 7th. Later in the month it will rise near 1800 and will again be passed by the Moon on November 3rd.



Saturn - at opposition this month

Having been in retrograde (or westerly) motion since May, both **Uranus** and **Neptune** resume their normal prograde (or easterly) motion this month. They are stationary on the 19th and 11th respectively. Following this month, distant **Pluto** (located in Ophiuchus) will be virtually lost to view as it heads towards conjunction in late November.

Phases of the Moon	FM: Tue 6th	LQ: Mon 12th	NM: Tue 20th	FQ: Wed 28th

Time Sheets - URGENT

Could all volunteers who work out of normal hours and/or personally retain there time sheets please send them to the Volunteer Coordinator (Jamie Biggs) **AS SOON AS POSSIBLE**. It is essential that we have an official record of the time you have generously donated so that we can reward you, keep the insurance people notified and show the rest of our department the extent to which the Observatory and CALM are benefiting from the volunteer programme. Would you please forward your time sheets each quarter (ie the end of March, June, September and December).

IMPORTANT - Community Involvement Forms (CLM 205)

Thanks to J Bell, P Crake, R DeFonseka, T Dunn, M Fortsch, M Emmons, C Gazey, B Harris, D Hartley, M Haslam, L Hewett, K Hogan, B Hollebon, K Kotze, V Levis, J Mills, L Moore, J Morris, B Taylor, T Turner for returning their completed CLM 205. Would those people who still wish to be associated with any Perth volunteer programme, (even those not formally in operation - such as the archiving project) please return their CLM205 form ASAP. **If your Community Involvement Form is not current, you are not covered by CALM's volunteer insurance policy.** Only those people who return the form (and volunteers in dormant status) will be retained on the volunteer mailing list from 1st Jan 1999.

~~Star~~ Cloud Viewing Sessions

September was not a very fruitful month for the night visitors programme. All of the scheduled star viewing sessions in that month were cancelled due to inclement weather, although there were two education groups totalling about 60 people that were slotted in who viewed the night sky. There was one success in that the Friday (98/10/02) of this sequence of Night Sky Explorer visits was successful with both sessions being conducted.

AIP Conference

Ralph Martin and Andrew Williams both successfully presented talks at astronomy session of the Australian Institute of Physics conference which was held in Fremantle during the last week of September. Ralph talk outlined the PLANET microlensing programme and the results flowing from it, while Andrew presented an update on the statistics of the occurrence of supernovae determined by the Observatory's supernova search programme. Well done and congratulations to Ralph and Andrew for advancing Perth Observatory research!

Telescope Practice Nights

At last month's training night Jamie Biggs outlined the few changes made to the Night Tours program for the new season. The main changes related to the pricing structure - with increases across the board in order to comply with the full-cost recovery requirements as stipulated by the government - and some name changes. The plans for a new enclosure to house the 16" Meade telescope were also discussed. Thank you to all who attended.

The next training night will be held next Monday, **October 19th**, when **Andrew Williams** will present a talk titled **"The Supernova Search Program"**. This is the talk which was originally scheduled for September, but was postponed in order to permit the necessary briefing on changes to the tour programs. It is an excellent follow on to Ralph's account in August of the automation of the Perth-Lowell 24" telescope.

Weather permitting, there will be the usual telescope practice after Andrew's talk and subsequent refreshments. Those who are intending to participate should notify **Greg Lowe** on **9293 8255**.

Please note that Telescope Practice Nights are held each month on the Monday after Last Quarter and commence at 7:00pm. We will endeavour to provide a talk on an astronomical topic on each occasion, with the telescope practice following a refreshment break. These nights provide an ideal opportunity to expand your knowledge and skill, as well as have a bit of fun. The dates for the remainder of the year are:

November 16th	**December - none (due to Christmas)**	**January - none (due to holidays)**	**February 11th (Thurs) Eclipse briefing**

Annular Eclipse - 1999 February 16

ADVANCE NOTICE FOR NEXT FEBRUARY'S TRAINING NIGHT. A special training night will be held on Thursday, February 11th in lieu of the usual Monday night (which would ordinarily have occurred on the 15th). The night will be dedicated to preparation for the annular eclipse on February 16th and will be compulsory for any volunteers who will be involved in the eclipse tours to Greenough. Please note that should places be limited on the tours, preference will be given to those volunteers who have contributed the most hours and/or the Night Tour volunteers who attended the September telescope practice night (JB ☺).

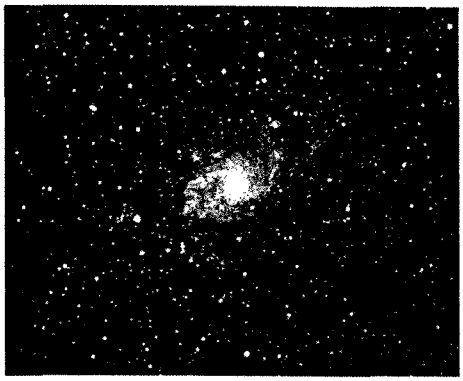
In the Eyepiece - Pinwheel Galaxy

Most commonly known as **M33**, but also bearing the designation NGC598, the Pinwheel Galaxy is one of the prominent members of the Local Group which also includes ourselves and the great Andromeda Galaxy. It was probably discovered by Hodierna before 1654, but was also independently rediscovered by Charles Messier in August 1764.

Located in the constellation of Triangulum, M33 is visible in binoculars as a dim, moon-sized glow about four-tenths of the distance from β Andromedae to α Arietis. Despite its reputation as a difficult object to observe in small instruments (on account of its remarkably low surface brightness), it is actually rather simple to view so long as a low magnification is used. Binoculars are ideal.

Current distance estimates place M33 some 3.0 million L.y. away, though a recent recalibration of Cepheid distance by the Hipparcos satellite may reduce this distance. It has a visual diameter about the same as the full Moon (30'), with photographic estimates ranging up 73.0'x45.0'. This corresponds to a major diameter of about 50,000 Ly, just half that of the Milky Way, with the faintest outer layers extending the true diameter to perhaps at least 60,000 Ly.

An irregular (Sc type) spiral, its conspicuous arms contain numerous reddish HII regions, including one of the largest known in any galaxy. NGC604 measures some 1500 Ly across and has a spectrum closely resembling the Orion nebula. The galaxy also contains at least 112 variables, which includes 4 novae and about 25 Cepheids, as well as a strong X-ray source. A population of predominantly blue supergiants (high luminosity O&B stars) contribute to the M33's somewhat blue appearance, although the galaxy contains large numbers of red supergiants as well. It has an integrated spectral class is A7.



FACT *file*

Name :	Pinwheel Galaxy
Type of object :	Galaxy
Other names :	M33, NGC 598
Constellation :	Triangulum
RA :	1h 33m 51s
Dec :	+30° 39' 36"
Magnitude :	5.7
Distance :	3.0 million L.y.
Size :	73.0' × 45.0'
PA :	23°
Dimensions :	60000Ly
Classification :	Sc
NGC Description :	eB,eL,R,vgbMN

"whitish light of almost even brightness. However, along two-thirds of its diameter it is a little brighter. Contains no star. Seen with difficulty in a 1-foot telescope..." Charles Messier

The Inconstant Moon

Everybody notices the phases of the Moon, but to most people every full Moon is alike—the rising or setting Moon looks large due to perspective's playing tricks on the eye, but surely the full Moon high in the sky is always the same, right? Wrong! One of the most spectacular phenomena in naked-eye astronomy escapes notice by the vast majority of people simply because the eye and brain can't compare the size and brightness of objects observed on separate occasions. This article explores the inconstant Moon in our everyday sky

The Moon's orbit around the Earth is elliptical, with a substantial eccentricity (as major Solar System bodies go) of 5.49%. In addition, the tidal effect of the Sun's gravitational field increases the eccentricity when the orbit's major axis is aligned with the Sun-Earth vector or, in other words, the Moon is full or new.

The combined effects of orbital eccentricity and the Sun's tides result in a substantial difference in the apparent size and brightness of the Moon at perigee and apogee. Extreme values for perigee and apogee distance occur when perigee or apogee passage occurs close to new or full Moon, and long-term extremes are in the months near to Earth's perihelion passage (closest approach to the Sun, when the Sun's tidal effects are strongest) in the first few days of January.

The images below show how strikingly different the Moon appears at a full-Moon perigee and apogee. Most people don't notice the difference because they see the Moon in a sky that offers no reference by which angular extent may be judged. To observe the difference, you have to either make a scale to measure the Moon, or else photograph the Moon at perigee and apogee and compare the pictures, as has been done here.

Notice how the two images of the Moon differ not only in size, but also in the position of features on the disc of the Moon. This might seem puzzling in light of the frequently-stated assertion "the Moon always keeps the same face toward the Earth". But this generalisation is not strictly true; in fact, the combination of the eccentricity and inclination of the Moon's orbit causes the Moon, as seen from the Earth, to nod up and down and left and right. These apparent motions, the lunar librations, allow us to observe, over a period of time, more than 59% of the Moon's surface from the Earth, albeit with the terrain in the libration zones near the edge of the visible disc, only very obliquely.

The Moon at perigee - August 10 1987

If you were able to scale the two images to one size, lay one over the other, and alternate between the two views, you would see that the Moon would appear to rotate around Mare Crisium (the dark circle near the lower left, or northeast limb of the Moon).

The Moon at apogee - February 2 1988

To understand the difference in the appearance of the Moon in these two images, you need to consider the position of the Moon with respect to the Earth. At the time of the perigee image, the Moon was located in the constellation of Aquarius and a little south of the ecliptic due to its position along its inclined orbit (Dec -14°07'). As a result, observers on Earth at that time were looking down onto the Moon's north pole, with the Moon's equator appearing below the middle of the visible disc. Since the Moon was, at that moment, south of the equator as seen from Earth, an observer in the northern hemisphere (where these pictures were taken) was additionally displaced northward and could see farther past the north pole of the Moon.

At the time of the apogee photo, the situation was the opposite; the Moon was both above the ecliptic and 22½° north of the celestial equator. Consequently, observers on Earth saw the south pole of the Moon tilted toward them, with the lunar equator displaced toward the northern limb.

In addition to the north-south displacement due to the inclination of the Moon's orbit, the eccentricity of the Moon's orbit creates an east-west displacement. The rate at which a massive solid body such as the Moon rotates with respect to the distant stars is, for all practical purposes, constant. Since the Moon's is tidally locked to the Earth, it rotates on its axis in a time equal to the time in which it completes an orbit around the Earth. Observers on Earth view the Moon not from the centre of a circle, however, but from a focus of its elliptical orbit. When the Moon is closer to the Earth, around perigee, its orbital motion is faster and carries it past the Earth faster than its constant rotation speed. When the Moon is near apogee, its slower orbital motion causes the rotation to get ahead of the orbital motion, revealing terrain on the other side of the mean limb.

Finally, the difference in the illumination of the Moon is due to the perigee picture's being taken almost a day after full Moon, as compared to the apogee picture, exposed 15 hours before the Moon was full. Practical considerations such as the Moon's position in the sky, the time of sunset and sunrise, and the need for clear skies usually require compromises which prevent capturing the Moon at precisely the moment it is full. The brightness of the Moon varies dramatically around the time of full Moon; as is evident from these pictures, the difference in appearance less than a day on either side of full is readily perceptible.

This article is adapted wholly from The Inconstant Moon, *a public domain document located on the Web. For the full article, including a graphic representation of how the Moon librates, see: http://www.fourmilab.ch /earthview/moon_ap_per.html*

Field Stop

Did you know that two anagrams for "astronomers" are "moon starers" and (sadly) "no more stars"?

If you have something to contribute to the newsletter, you can submit it to me via fax on (08) 9250 8240 or e-mail to <bmh@bigpond.com>. Alternatively, submissions may be pinned to the volunteer notice board for collection. Thanks, Bevan