PERTH OBSERVATORY
Department of Conservation and Land Management

PERTH OBSERVATORY VOLUNTEER NEWSLETTER

November 1998

Editor: Bevan Harris

Editorial

November must have been a rather disconcerting month for our ancient forefathers. Not only was the midnight culmination (its highest position in the sky) of the normally benevolent Pleiades (occurring on the 17th in ancient times, but now happening on the 21st) considered by many civilizations to be a portent of doom, but at regular intervals throughout history the usually quiescent skies appeared to rain fire as the Leonids meteor shower became a storm of calamitous proportions. One cannot help but wonder if these two events were in some way considered to be linked.

Unhindered by the superstitions of old, this month's possible Leonid meteor storm could prove to be once in a lifetime experience. Check out "Leonids *LIVE!*" for your opportunity to witness this extraordinary event in convivial surroundings and then read on to "When the Stars Begin to Fall" for background information and details of where and when to look.

This month's "In the Eyepiece" takes a slightly closer look than normal at the other focus of this editorial, namely the Pleiades. Revered for so long and by so many civilizations, the history and lore of this star cluster abound much more than can be adequately addressed in this forum. For further reading on this subject matter I can recommend *Burnham's Celestial Handbook Vol III* (by Robert Burnham Jr.) pp 1863-86 and Richard Hinkley Allen's *Star Names : Their Lore and Meaning* pp 391-413.

IN THIS ISSUE

Highlights In The Sky

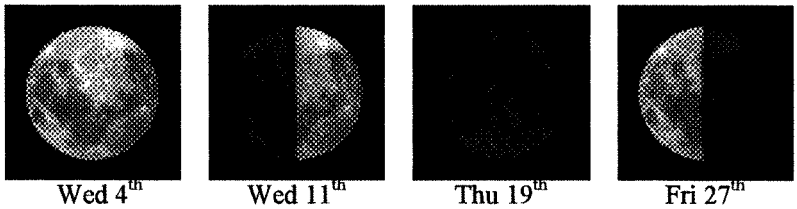
The 1833 Leonid meteor storm

At the beginning of the month **Mercury** crosses from Libra into Scorpius and will be visible next to Dschubba, the Head of the Scorpion, on the 4th. It will be near Antares on the 9th and for the following week tracks along the Scorpius/ Ophiuchus border, reaching its greatest separation (or elongation) east from the Sun along the way on the 11th. This provides us with the best opportunity for viewing during this evening apparition. On the 21st Mercury will be passed by the two-day old Moon and will begin its journey back towards the Sun on the 22nd, when it is stationary. Deep in twilight, it will pass by Venus on the 29th before reaching inferior conjunction on December 4th.

Having just passed through superior conjunction, **Venus** is now in the evening sky but remains hidden in glare of Sun as it travels through Libra and Scorpius before passing into Ophiuchus (25th). It will be unobservable until late December.

Rising some two hours before twilight, **Mars** begins the month located near the hind feet of Leo. It will be very near to the 25-day old Moon on the 14th, when an occultation occurs in Asia & North America. The planet passes into neighbouring Virgo on the 16th, where it will be visible low in the ENE when the Leonids are (hopefully) booming on the morning of the 18th. By the end of the first week of December Mars will be rising shortly after 0130, still located in the western part of Virgo.

PHASES OF THE MOON



Wed 4th | Wed 11th | Thu 19th | Fri 27th

Still in Pisces, **Jupiter** is situated right alongside the Moon as the month opens. Having been in retrograde motion since July, it will be stationary on the 14th, thereby marking its return to prograde (or easterly) motion. On the succeeding nights of the 27th and 28th it will be in the vicinity of the First Quarter Moon. By early December Jupiter will be essentially lost from morning skies, setting prior to 0100 at the end of the first week.

Following its larger sibling distantly across the sky, **Saturn** is visible low in the East as darkness descends at the start of the month. Remaining in eastern Pisces near its border with Aries throughout November, it will be close to the almost full Moon on the 3rd. Saturn will again be near the Moon on the morning of December 1st when they approach within 1° of each other prior to setting at 0300.

Both located in Capricornus, **Uranus** and **Neptune** continue their descent of the evening sky. With Neptune leading by 45 minutes, they set shortly after midnight early in the month, with both gone before 2300 in early December. **Pluto** is now lost in evening twilight and will be unobservable until January. It passes through conjunction on the far side of the Sun on the 30th.

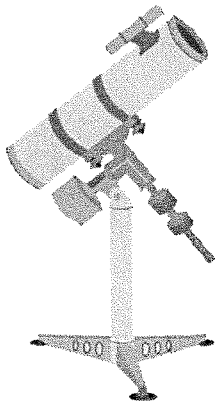
Time Sheets - URGENT

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.

Telescope Practice Nights



At October's training night Andrew Williams presented an interesting and informative talk on the Observatory's supernova search program. He described what causes different types of supernovae and how frequently they occur, as well as both the equipment used and the results flowing out from the Perth supernovae program. Of particular interest was his account of the Observatory's first supernova find for this year (SN1998A) which is of an unusual type. The only similar supernova to receive extensive study was SN1987A, located in the Large Magellanic Cloud, which was the brightest supernova to be discovered for more than 400 years.

The next training night will be held next Monday, **November 16th**, when Tom Smith will present a talk on searching for meteorites. While the upcoming Leonid meteor shower is unlikely to produce much of a bounty on which to practice your newly acquired meteorite hunting skills, it provides a topical focus to what is sure to be an absorbing presentation.

Weather permitting, there will be the usual telescope practice after Tom'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 next few training nights are:

December - none	**January - none**	**February 11th (Thurs)**	**March 15th**
(due to Christmas)	**(due to holidays)**	**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 - The Pleiades

The **Pleiades**, also commonly known as the Seven Sisters, is indisputably the most well known of all the galactic stars clusters. It has been known since time immemorial and appears countless times in historical texts, sacred writings and other literature, as well as in the unwritten legend of many cultures.

The name 'Pleiades' is commonly thought to have originated from a Greek word meaning 'to sail', as the heliacal rising of the Pleiades marked the beginning of the Mediterranean navigation season to the early Greek navigators. It may also have come from the word *pleios*, meaning 'full' or 'many', however it is considered more likely to be derived from Pleione, the mythological mother of the Seven Sisters.

Located in the constellation of Taurus, the Pleiades appears as a tight knot of stars trailing Aries and rising about an hour ahead of Aldebaran and the Hyades Cluster. The average unaided eye can resolve six or seven stars, while in exceptional conditions some observers have reported being able to count as many as sixteen!

Binoculars reveal a stunning vista containing a dozen or so brilliant blue-white stars strewn across a rich carpet of fainter background stars. The nine brightest stars may be encompassed in a field slightly exceeding one degree while modern observing methods reveal the cluster contains at least 500 mostly faint stars spread over an almost two degree field, some four times the diameter of the Moon.

Under dark skies a low power telescope (25×) or large binoculars may reveal the faint nebulosity which pervades the cluster, with the brightest nebula concentrated around the star Merope. Their bluish colour, readily seen in photographs, indicates that they are reflection nebulae. Spectroscopic studies have confirmed their nature with the spectra of the nebulae being identical to the spectra of the stars illuminating them.

FACT *file*

Name :	Pleiades Cluster
Type of object :	Cluster w/nebulosity
Other names :	M45, Mel 22
Constellation :	Taurus
RA :	3h 46m 56s
Dec :	+24° 06' 41"
Magnitude :	1.2
Distance :	380 L.y.
Size :	110.00'
Dimensions :	12 L.y.
Number of Stars :	500
NGC Description :	vvB,vL,brilliant naked eye cluster, neb inv

The Pleiades is one of the nearest of the galactic clusters, recent estimates from the Hipparcos satellite placing it just 380 light years distant. Its nine brightest members, all B-type giants, are concentrated in a region almost seven light years in diameter. Alcyone, the central and brightest member, is nearly 1000 times more luminous than our Sun and perhaps 10 times greater in size, while at the other end of the scale the faintest members shine at just 1/100 the Sun's luminosity. Another trait shared by all the bright Pleiades stars, with Pleione being the leading example, is that they rotate very rapidly. In the case of Pleione, the surface velocity of the star is some 100 times faster than that of our Sun.

Included amongst the fainter members of the Pleaides are a number of red and white dwarf stars, both of which are objects of curiosity amongst professional researchers. The red dwarfs are erratic variables which are believed to be still in the process of gravitational contraction, whereas the presence of the white dwarfs is considered unusual in such a young cluster. Present knowledge suggests that the cluster has an age of 100 million years.

The Pleiades' location so close to the ecliptic ensures that the cluster is frequently occulted by the Moon. Such events serve as a good comparison of the apparent sizes of the Moon and the cluster. The planets also often pass near and, in the case of the near planets, through the Pleiades, yielding frequent opportunity to view these spectacular events.

"In a dark sky the 8 or 9 bright members glitter like an array of icy blue diamonds on black velvet; the frosty impression is increased by the nebulous haze which swirls about the stars and reflects their gleaming radiance like pale moon light on a field of snow crystals." *Robert Burnham Jr.*

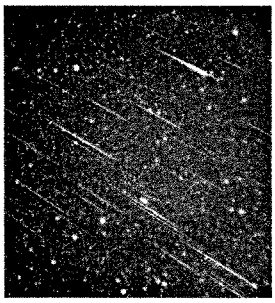
Christmas Barbeque

All volunteers and their immediate families are invited to the Perth Observatory Xmas BBQ on 5th December, 1998 starting at 6pm. You will need to bring your food, refreshments and picnic furniture (seats are recommended). The Observatory will provide barbecue facilities, star viewing and tea/coffee around 9:00pm. Please contact Janet or Sheryle by Tuesday 1 December, 1998 in order to let them know how many in your family will attend. It is important to get in early as other CALM officers and their families will be invited and in order to keep things safe and manageable only 100 guests will be accommodated. Also, it would be appreciated if Star Viewing Volunteers could render a little assistance with the star viewing sessions to be conducted between 8:00pm until 9:30pm. Please note that this event will be abandoned if there is a significant chance of rain during the event.

Travellers from afar

Returning home from last month's training night I was privileged to see a bright fireball emanating from the then active Orionid meteor shower. I duly reported this on an Internet newsgroup I frequent and was subsequently contacted by US-based amateur astronomer and author David Chandler who will be visiting WA next week in order to view the expected Leonid meteor storm and to take in the sights of our southern skies. He will be accompanied by his wife Billie and another US couple, as well as Quasar Publishing (who produce Astronomy 199x) staffers Glenn Dawes and Ken Wallace. While they will not be in Perth the morning the Leonids are expected to be visible, it is hoped that an opportunity will be available for them to meet volunteers as well as some of the local amateur astronomers (BH ☺).

Leonids *LIVE!*



The Leonids in 1966

All volunteers are cordially invited to view the **POTENTIAL** Leonid meteor storm from star astrophotographer and Observatory Volunteer Vic Levis' orchard. Vic's property is 131 Glenisla Road, Carmel – South off Lawnbrook Road near the valley in between Lesmurdie and the Observatory, proceed 1.2km, the entrance will be marked with an triangular Observatory "petrol-station type" sign. You will need to bring a chair, snacks, drinks, binoculars, camera with tripod (optional) and probably lots of patience. Turn up around **1:30am** on 18 November, 1998. Thanks Vic for kindly offering to host this potentially spectacular event. The Observatory only has one vantage point with a good view to the northeast. However, it's at the top of the Lowell Dome and can only be used by one person. Vic's property is in a darkish site and has quite a reasonable view to the north east. Please contact Janet or Sheryle before 5pm 16/11/98 if you want to attend.

When the Stars Begin to Fall

"And I beheld when he had opened the sixth seal, and, lo, there was a great earthquake; and the sun became black as sackcloth of hair, and the moon became as blood; And the stars of heaven fell unto the earth..."

It was undoubtedly these words from the Book of Revelation which caused many to believe that the great Leonid meteor storm of 1833 was an indication of the wrath of God and that the Day of Judgement must surely be at hand. People of the time rushed outside their houses begging and crying for the mercy of the Almighty as the stars of heaven appeared to rain fire on the earth.

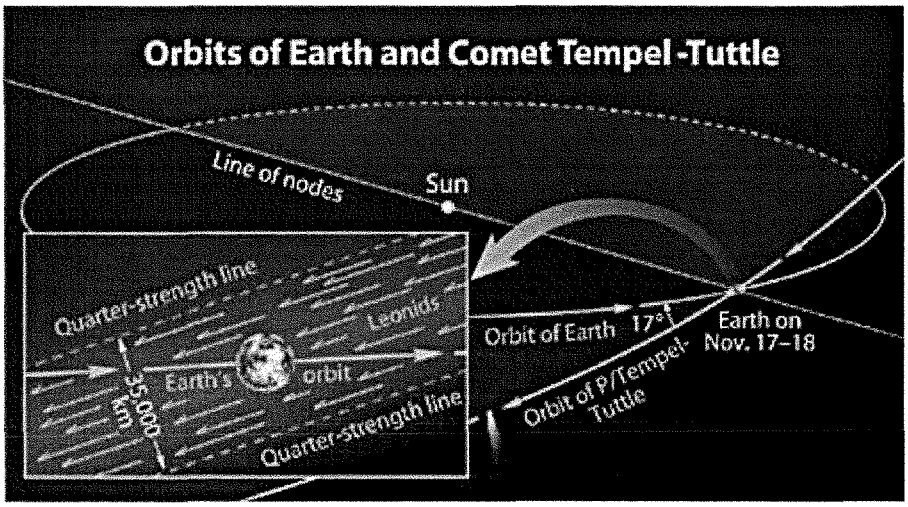
However, instead of the heaven being *"departed as a scroll when it is rolled together"* and *"every mountain and island (were) moved out of their places"*, the events of that November morning ushered in the dawning of a new science - the study and understanding of meteors.

In the months and years following the 1833 display it became clear that this was not a unique event and that similar showers had been observed in earlier times. There had been reported sightings at various places around the world occurring as far back as 902 and it was readily apparent that the displays repeated in a 33.25 year cycle. Thus, the world's first repeating meteor shower had been identified and it became known as the Leonid meteors after its observed radiant in the constellation of Leo.

The Leonids over the Mississippi

Subsequent to the publication of the meteoroid swarm's orbital elements prior to the predicted 1867 return, astronomers recognized that the orbit of the swarm was almost identical to that of the periodic comet Tempel-Tuttle, establishing beyond doubt the origin of the meteoroid particles.

Meteors are now known to occur when a particle of cometary debris barely the size of a grain of sand, called a meteoroid, collides with Earth's upper atmosphere producing a momentary streak of light. In the case of the Leonids these meteors move very quickly, as the Earth is travelling almost directly head on into the opposing path of the meteoroid swarm. The typical velocity of a Leonid meteor relative to the Earth is 71 km/s and it is this high speed which can cause some Leonids to become extremely bright and also contributes to their usual blue or green tinge. Approximately half leave luminous vapour trains which in some cases can linger in the upper atmosphere for several minutes.



The Leonid meteoroids and Earth orbit the Sun in nearly opposite directions, so they run into each other nearly head on. The meteoroid stream follows the orbit of periodic Comet 55P/Tempel-Tuttle, which is inclined only 17° to the Earth's orbital plane. The line of nodes is where the planes of the two orbits intersect.

(Image and caption from : Sky and Telescope)

Occurring each year in mid-November, the Leonids are ordinarily just another weak, almost nondescript shower. Normally producing only a paltry ten or so meteors per hour in the hours before dawn, if it weren't for the occasional spectacular fireball it would hardly rate much attention at all. However in the years surrounding a perihelion passage of the comet, particularly those following, the number of observed meteors can rise substantially.

Recent years have seen a marked increase in Leonid activity with the observed rates for 1995 climbing to 40, or four times the usual rate. During the 1996 shower counts ranged between 50 and 80 and exhibited a higher than usual incidence of bright meteors and fireballs. Last year, despite severe moonlight interference, the ZHR remained around 80 for a period of some twelve hours and a brief, sharp outburst was recorded from both the US West Coast and Hawaii. The shower once again exhibited a high ratio of bright meteors and fireballs, easily exceeding that of the previous year.

With the most recent passage of the comet (now officially designated as Comet 55P/Tempel-Tuttle) occurring in the February just past, the prospects for a strong display this year are very good. Most pundits are predicting a similar display to that of 1866 with rates of around 1000 meteors per hour, which qualifies for the status of major meteor shower and is spectacular in its own right, however some sources suggest that a ZHR of between 2000 and 4000 may be achieved. These rates, though they are a long way short of the estimated 150000 meteors per hour during 1966, constitute storm status.

Although the peak of activity could occur anywhere over an eight hour period (1400 - 2200 UT on the 17th), the most likely time is centered on 1940 UT. This favours viewing from locations in eastern Asia, such as China and Mongolia, and in places of a similar longitude - such as Western Australia.

So what does one do to see what promises to be the astronomical spectacle of a lifetime? For a start, you don't need any fancy equipment, just yourself and a comfortable chair. Furthermore there will be no hindrance from the Moon as in previous years, so as long as you find yourself a reasonably dark location with a good view to the north east, all

Terminology

Fireball	a very bright meteor.
Meteoroid	a cometary particle in space that becomes visible as a meteor when it collides with Earth's atmosphere.
Radiant	a point in the sky from which meteors appear to radiate.
Storm	a meteor shower with a ZHR greater than 4000.
Swarm	a cloud of debris (or meteoroids) left in the wake of a comet.
ZHR (Zenithal Hourly Rate)	the number of meteors that a single observer would see each hour if the sky were dark enough for magnitude 6.5 stars to be visible and the shower's radiant was at the zenith.

you need to do is sit back and wait for the show to start. The constellation Leo will rise above the east-north-east horizon by 0200, but if the shower or storm starts early, it may be possible to see meteors rising up from below the horizon. By 0340 Leo will be about 20 degrees above the horizon towards the north east. Meteors will appear over a wide area of the sky and seem to emanate from Leo's head.

A word of caution must be said though - as the performance of comets and meteor showers can be notoriously fickle, the predicted meteor storm may not eventuate. If it commences early, the show may be over before Leo rises. Similarly the storm may be late, in which case daylight will be a severe cause of interference - although there will be the chance of seeing daylight fireballs. It is also possible that the predicted storm may not occur this year at all, but either next year, which will favour Europe and Middle Eastern countries, or less likely in 2000, which will once again favour North America.

Preview of the Leonids

What ever happens, we can be guaranteed of a some spectacular fireballs as the Leonids put on their show. If last year is anything to go by, we can expect numerous fireballs as bright as magnitude -9, or perhaps even brighter. The important thing though is to get out there and have a look - you won't get another chance. Comet 55P/Tempel-Tuttle will be perturbed by Jupiter in 2029 which will delay the possibility of another Leonid storm until 2098 or 2131.

Will you be there when the stars begin to fall?

Footnote:

This meteor storm may pose a hazard to over 500 satellites orbiting the Earth. There were relatively few satellites aloft during the 1966 Leonid storm so this will be the first time that mankind has faced such a potential problem to its modern communications systems. Satellite damage by small meteoroids less than one thousandth of a millimetre across will be insignificant, but millimetre-size meteoroids will create a plume of charged particles that can catastrophically short circuit the electronics of modern satellites. Satellite controllers are organizing to orient their satellites such that they make the smallest cross section to Leonid meteoroids on the 18th of November.

Field Stop

Many a night from yonder ivied casement,
ere I went to rest,
Did I look on great Orion,
sloping slowly to the west.

Many a night I saw the Pleiads,
rising thro' the mellow shade,
Glitter like a swarm of fireflies
tangled in a silver braid.

from the poem "Locksley Hall" by Alfred, Lord Tennyson

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