SCORPIO

Journal of the Astronomical Society of Frankston Inc

Vol 1, No. 4 | P.O.Box 596, Frankston Victoria 3199 | JULY/AUG 1992

FUTURE EVENT

GENERAL MEETING

15 July 1992 Technical Session

Session Leader: David Murray

Subject: You and Astronomy

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19 August 1992

Speaker: Mr.Peter Nelson

Subject: Mutual Phenomena of Jupiters Moons 1991

VIEWING NIGHTS

Society Viewing Nights

Observing Nights will be held at the Peninsula School 7.30pm on the following dates:

3rd July & 7th July

{ If weather is unsuitable the backup dates are 4th July & 8th Aug }

COMMITTEE MEETING

The committee will be held at the Brown's residence on:-

23rd July 1992

27th August 1992

The Astronomical Society of Frankston was founded in 1969 with the aim of fostering the study of astronomy by amateurs and promoting the hobby of amateur astronomy to the general public. The society holds a General Meeting each month for the exchange of ideas and information. Regular observing nights, both private and public are arranged to observe currently available celestial objects. In addition the Society provides the services of its members for educational presentations or observing nights for schools and local community groups.

ASTEROID OCCULTATION

At 6.34pm on Saturday 18th July, the asteroid 3148 Grechko is likely to occultate the star rho Leo. If this occurs in our neck of the woods, it will be easy to see because the star is magnitude 3.9 and thus easily visible in binoculars. The asteroid is invisible at magnitude 18

The asteroid is some 51 kilometers in size and if the shadow passes over an observer the star should disappear for about 1.3 seconds.

Now for the bad news, the orbit of 3148 Grechko is not known precisely and the shadow is expected to cross the southern half of Australia. It's a bit like Cosmic Tattslotto, you hope the 51 km wide shadow passes over you.

Anyone attempting to view this event should try to get accurate timings of the disappearance and reappearance of the star. A radio tuned to the VNG time signals on 5mHz and a portable tape recorded can be used. Just let the radio "beep" away in the background and shout "gone" if the star disappears and "back" when it reappears.

View the star between 6.25pm and 6.45pm just to be on the safe side. Remember to send in a result even if the star did not disappear since this helps to show where the shadow didn't go. Results can be sent to Peter Skilton

Finder charts are shown on page 3.

EDITORS MESSAGE

Don't forget it's that time of the year again when annual fees are due. Fees can be paid at the next General Meeting.

WELCOME TO NEW MEMBERS

It is with great pleasure we welcome the following people as new members of the society:

Dr.David. Lewis

Meeting Venue:

The Peninsula School

Wooralla Drive, Mt Eliza

(Melways Map 105, F5)

Room F6 at 8.00pm on the third Wednesday of each Month except December/January

Visitors are always welcome

Annual Membership Fees

Full Members	$20
Concession Members	$15
Family Members	$30
Family Pensioners	$25

Membership Fees due 1st July each year

SOCIETY NEWS

COMMITTEE NOTES

The council meet on the 28 May. Although we have yet to receive official notification, our application for a grant from the Frankston council has been rejected. Apparently you have to be a charity for approved.

The lapel badges have been ordered and should be available in July.

There is a need for a Librarian to help bring the library back to life. If a suitable volunteer could be found it was considered that funding should be made available to develop this facility otherwise the library would be closed.

The possibility of visiting the Ballaarat Society will be explore at the next General meeting. A large scale viewing night for the Langwarrin Primary School has been deferred to September and will be held over two nights.

Christmas Party Advance Notice

It is proposed to hold our Christmas Party at Mt.Matha park on the 5th Dec. Last years BBQ party at Mt Matha was very successful despite the rain and it is considered we should do it again. If you have any other ideas please bring them to the next general meeting.

WANTED - ONE LIBRARIAN

The ASF library has been one part of the Society that has seen happier times. The Society needs a volunteer to help develop and operate the library facility. Any volunteers should seen Dave Murray.

1992 FIVE DOLLAR COIN

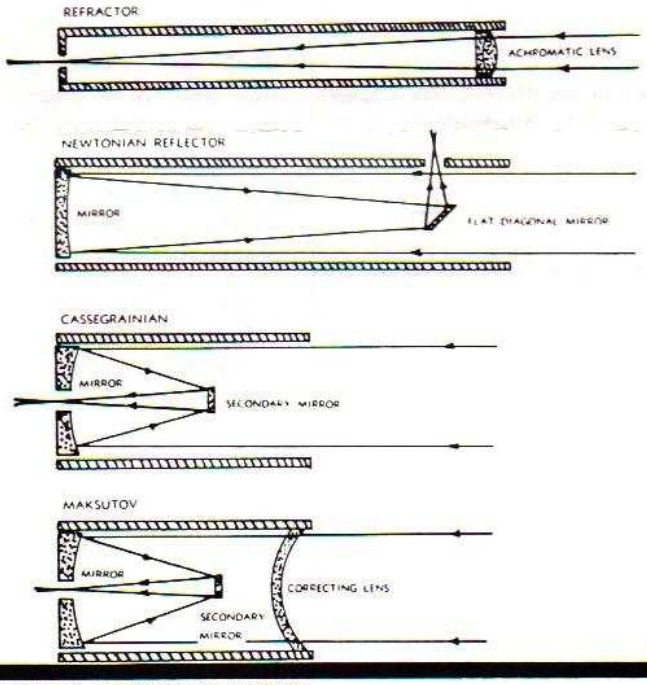
The Royal Australian Mint has released a limited number of $5 dollars coin to commemorate the International Year of Space and Australia's involvement. The coin design was the result of a competition won by John Skillington from Albury N.S.W.

Made from Aluminium-Bronze, it weighs 28gm (and I've got one!!)

QUESTIONS AND ANSWERS

If a F7 12" Newtonian is 7 feet long, why is a F10 8" Celestron only 15" long?

When people talk about the focal length of a telescope this is usually an indication of the physical size of the instrument. In the case of a Newtonian telescope the main mirror is the only part with an optical magnification. The secondary mirror merely transfers the telescope image to another location, namely the side of the telescope where an observer can see. The figure below shows the optical path of some typical telescopes. The actual mirror focal length and the telescope's Effective Focal Length (EFL) are the same. This holds true for binoculars. The objective len focuses through two special prisms that relocates the image and folds the instrument up to a manageable size. In some more complex optical systems such as Cassegrain's, the secondary mirror has some optical power and thus when you work out the EFL, the power of all the optical elements needs to be considered. In the case of the Celestron Schmidt-Cassegrain, the primary mirror has a positive power and the secondary has a negative power. Thus the total power as determined by the EFL is lower than the mirror alone. By folding the light path inside the telescope it is possible to produce a F10 8'' telescope only 15'' long while the equivalent Newtonian would be 80'' in length. Using these principles, it is possible to build combination telescopes such as the Cassegrain-Newtonian. By changing the secondary mirror power it is possible to change the telescope from a simple F7 Newtonian for instance to a F/23 Cassegrain. Most large professional telescopes have the ability to change configuration like this allowing astronomers a greater variety of magnification options.



THE BRIARS OBSERVATORY.

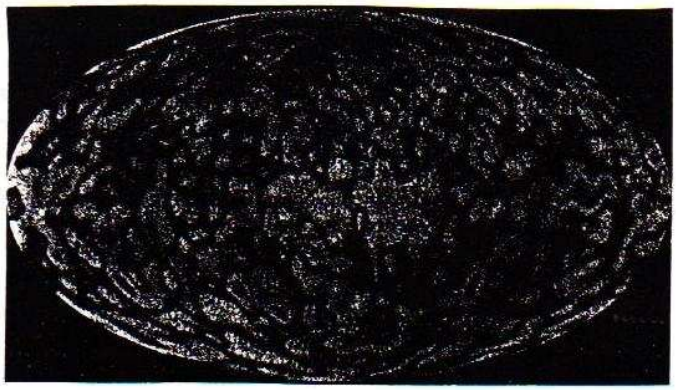
Further discussions have been held with the Mornington Council about the possibility of building an observatory at The Briars. They have asked us to submit a proposal. A sub-committee has been formed to develop a proposal that meets both our astronomical needs and their plans to make The Briars a showpiece cultural and tourist centre. This is a wonderful opportunity to bring astronomy to the Mornington Peninsula and its tourist visitors while also establishing a permenant observing facility for the Society.

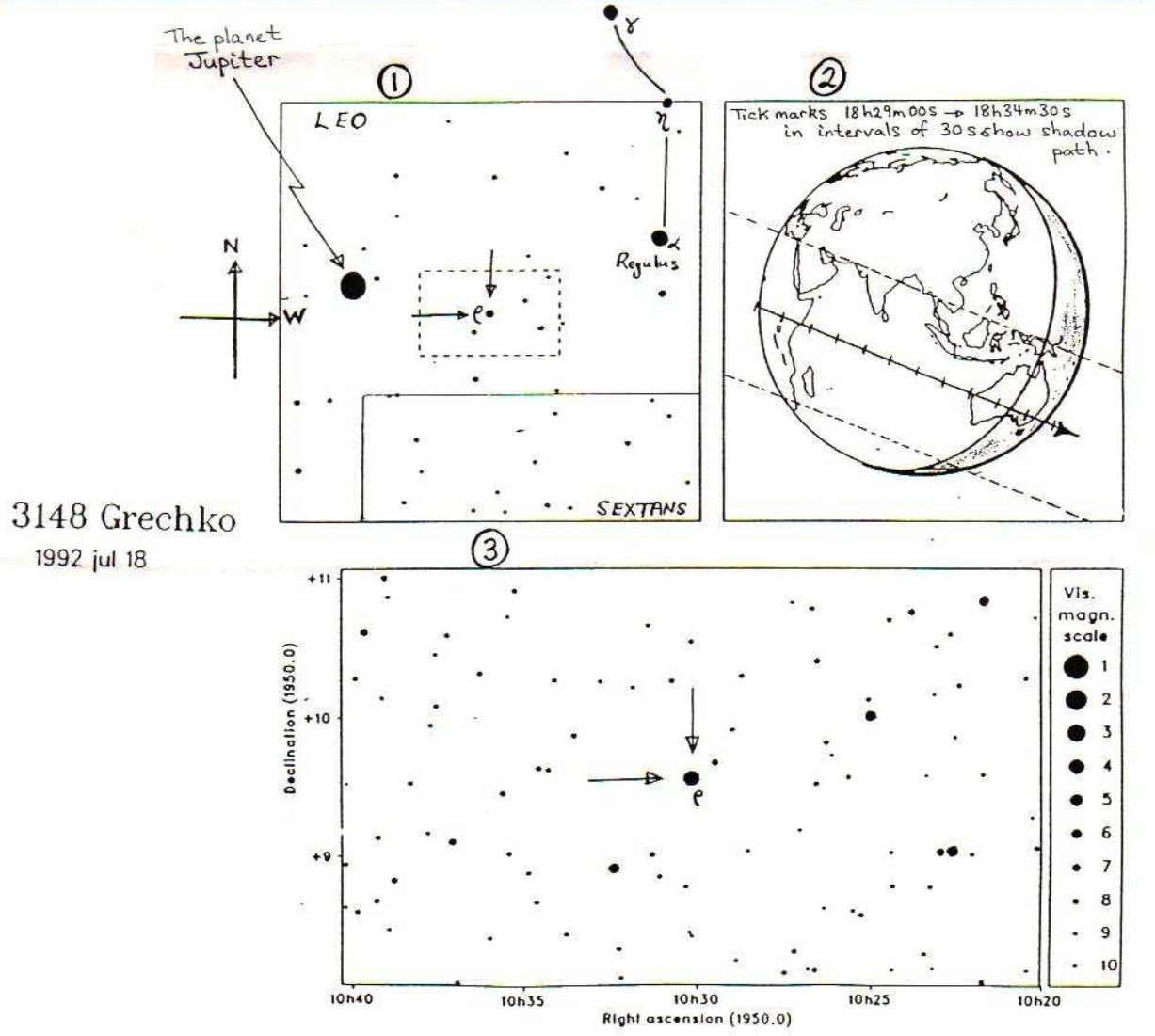
It is hope to get some viewing nights going there to show members the possibilities.

WHAT'S NEWS IN ASTRONOMY

MICROWAVE BACKGROUND SATELLITE SHOWS EARLY UNIVERSE.

After completing two full surveys of the microwave sky, the COBE {Cosmic Background Explorer} satellite has revealed a patchy distribution in the microwave radiations coming from the deepest parts of space. Studies in the early 1960's showed that at microwave wavelengths the sky glowed no matter what direction you looked. This glow was extremely uniform and appeared to come from a gas with a temperature about 3 degrees above absolute zero. This radiation is thought to be the remains of the vast amounts of energy released in the Big Bang at the start of the present universe. The COBE satellite measured this temperature at 2.735 degrees Kelvin. Astronomers have predicted there should be small variations in this background radiation to explain how the Big Bang produced those pockets of matter later to become galaxy clusters. Early results from the satellite showed a very uniform energy distribution suggesting the theories were wrong and frustrating the advocates of the Big Bang theory. By observing the sky at three microwave wavelengths, astronomers have been able to remove the effects of radiation from local sources suchs as our galaxy thereby revealing possible variations left from the Big Bang itself. The variations are very small typically only 30 millionths of a degree and it is believed that this radition came from hot gases only half a million years after the big bang. Apart from giving further evidence for the existance of the big bang, the detection of these variations in the background radiation may allow astronomers to choose between the various cosmological theories put forward to explain the big bang itself. Plans to put another satellite some 100 times more sensitive into orbit are being made and it is hoped this new instrument will show temperature variations on a smaller scale and enable astronomers to explore the big bang in finer





SPECIAL ACTIVITY GROUPS

DEEP SKY OBSERVING by David Murray

As a keen deep sky observer I love looking at galaxies. It seems to be the trend though to look for the faintes galaxies you can see with your telescope which I do enjoy, but sometimes this would seem to be easier than finding that proverbial needle in a haystack. As years have gone by, I have got sick of just finding objects and then going onto the next one. The challenge for me is to see how much detail can be seen in the galaxy.

I remember when I first started to really look at galaxies. It was the spring of '89, I had an 8'' SCT at that time. I seemed able to find galaxies OK, but not see much more than a smudge of whitish light. So I thought to myself : ''I need a bigger telescope''. Fact is I didn't! I was too used to jumping from object to object with just a five to ten second look. So in '89 I started my now regular 30 minute stop beginning with what I call the ''Big-2'' in Sculptor. NGC-253 and NGC-55 are well placed for viewing in the spring each year. Firstly 253 once found looked no different from when I last viewed it. I said to myself '' Don't be tempted to move on''. With the drive going on the telescope and a 20mm eyepiece giving 100 magnifications, after a few minutes I started to see the light (no pun intended). Really the galaxy seemed to get bigger and brighter. I was so excited I could not draw away from the scope. I started seeing what seemed like dark spaces in the galaxy. ''Dust lanes''?? As the galaxy is nearly side on to our view, I did not expect to see any dark lanes but one was very prominent with two more a bit harder to see. The field was scattered with stars and two very bright stars were near one edge of the galaxy.

The use of different eyepieces was helpful in seeing different things. Low power for viewing the galaxy in its full glory while higher powers around 250-300X are useful for picking out subtle detail in different parts of the galaxy.

NGC55 is quite different. It does not seem as big or as bright as 253. The galaxy is bright at the edges but about halfway across this galaxy it fades away dramatically. In the fainter section of the galaxy there seems to be some bright HII regions. I can't see any dark lanes in this galaxy but in the brighter parts there does seem to be some breaks which may be dark lanes. NGC55 does not take to high power eyepieces very well. Anything over 200X magnification and the galaxy fades away too much. Since 1989, I have been taking my time and having a much longer look at all the objects I view. The use of different power eyepieces makes a difference in seeing small details one may miss at lower power (or may miss in high power!)

So next time you go out an observe our wondrous universe, whether it be sun,moon, planets or deep sky objects, take your time and experiment with different eyepieces (and filters)

The more you look, the more you see.

David Murray

Note:-

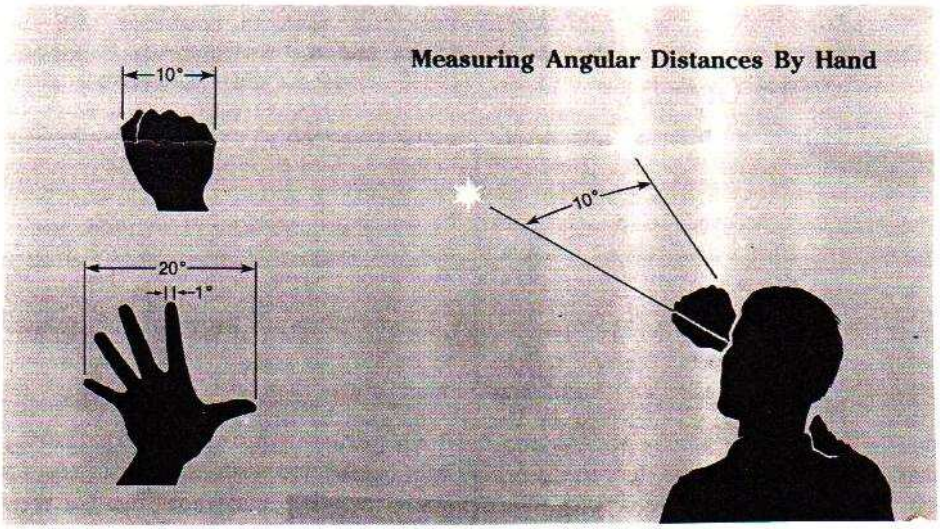
Due to bad weather there were no observing nights held in May/June. Hopefully July/August will be better. The observing dates are 25th July and 29th August. Constellations for these months will be Pavo, Indus and Grus. These may not be the most popular constellations but are well worth a look. So get out those reference books, do some research and on the next clear night go out and hunt some objects down.

DO YOU KNOW YOUR HAND SIZE?

Finding your way around the sky can be difficult at the best of times and it is important to have a feel for the angular measures used to star hop about the sky.

Holding your hand at arm's length and sighting with one eye, your fist covers about 10 degrees of sky while an outstretched hand covers about 20 degrees.

The tip of your finger covers one degree. Don't believe me? Try covering the moon {30 arcmins in diameter} with your finger.



TELESCOPE MAKING

Everyone has their list of favourite telescopic objects that always give a thrill when observed. There is however no greater thrill than to see those favourite objects through a telescope made with your own hands. There is something special about taking a piece of glass and turning it into a precision optical instrument capable of revealing the wonders about us. I still remember my first telescope with an inner glow. While I had a commercial 4'' for years, my first handmade telescope was a very, very rough 4'' mirror mounted on a wooden board using an old binocular eyepiece. The first object was of course my favourite: Saturns. I say Saturn in plural because the mirror was so badly made I had three images of Saturn from which to choose. It didn't matter, just to see Saturn and its rings was excitement enough and my father and I spent many hours with that first scope looking at all our favourite objects again. We of course knew the mirror was flawed and that my "better" commercial 4'' was in the house just waiting to be brought out but I preferred the telescope I'd built. After that I was hooked. The next mirror was better of course and in no time flat I was making telescopes better than my commercial one. There is still a thrill when a new telescope sees first light. Ask any telescope maker, it doesn't matter if it's a 4'' or a 200'' the man who made it gets an enormous surge of pride seeing something through his new telescope.

Now putting pride aside, ''why would anyone build a telescope?'' you ask. The answer is very simple. Firstly to pursue amateur astronomy you will invariably start looking at reasonably sized telescopes. There are those who extol the virtues of naked eye or binocular astronomy but I'm not one of them. Eventually every amateur wants a good telescope. Unfortunately when it comes to good telescopes, the old adage '' You gets what you pays for'' is very true. Good quality instruments bought from professional manufacturers cost heaps and if you can't afford the $1,000+ needed then building it yourself is a much, much cheaper option. Secondly if you buy a telescope in the middle-lower price range you can't always guarantee the quality of the instrument. I have seen some ''expensive'' commercial instruments that were real lemons. In a lot of cases, short cuts in design or tolerancing in manufacture are made to meet a price. Building your own, means you can take as much time as you like to get to what every degree of perfection you desire. Thirdly who wants just one telescope. There are literally thousands of telescope designs and there is no such thing as the ideal telescope for everything. Once you have the skill, you can start building instruments for deep sky work, or looking a planets, or photographing large areas of sky or for heaps of reasons why different telescopes are used for different observations. And this third reason is the most important of all because Telescope Making is FUN.

Apart from the old lens and cardboard tubing telescope, the easiest instrument to build is a simple 150mm F6 Newtonian. Over the next few issues I will be describing the methods needed to build such an instrument with the occasional forage off the path into some interesting side subjects to help our understanding of the topic.

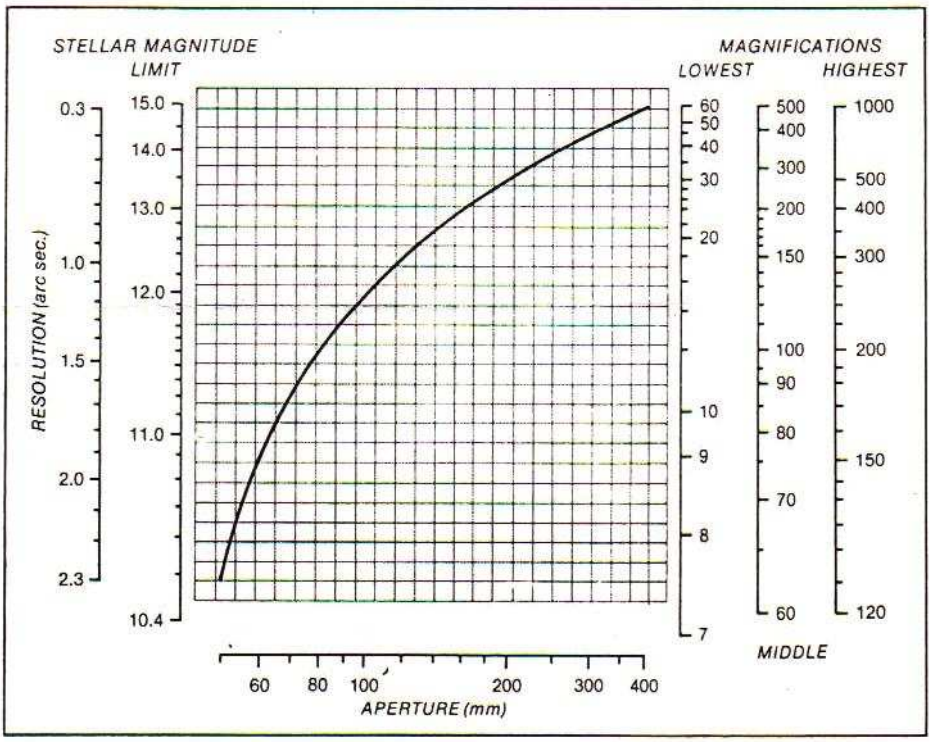
Remember the telescope making group meets at 7pm, an hour before the general meeting each month for a discussion and problem solving session.

Peter Lowe.

For those interested in the performance of their telescope, the diagramme at right is an easy way to find out. The chart shows the theortical performance of telescopes from 50 - 400mm aperture.

The chart is easily used. First draw a line vertically from the aperture axis and where that vertical line meets the curve draw a horizontal line. The horizontal line allows you to read off the theoretical resolution, limiting magnitude, and highest/lowest magnification.

For instance, a 100mm telescope should in theory have a resolution about 1.2 arcsec, show stars to about 12th magnitude and be capable of producing magnifications from 14 - 250 { in theory !! }

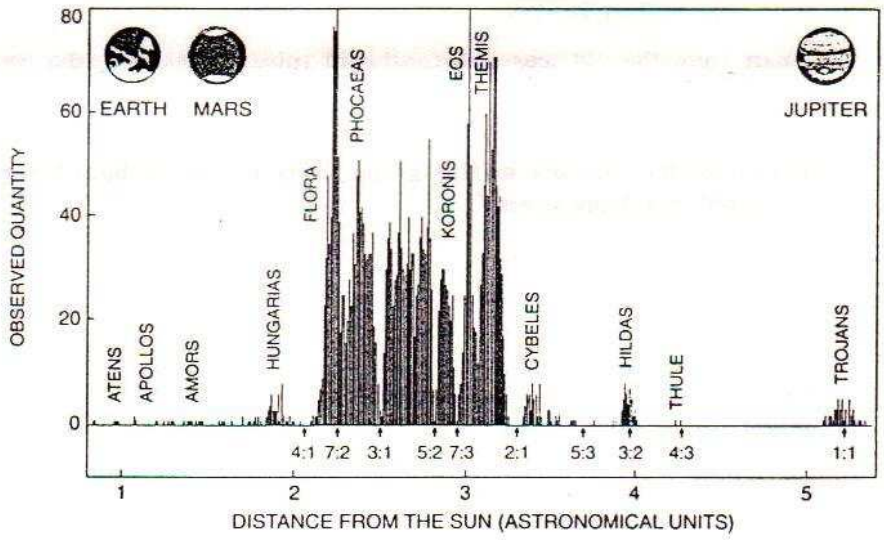


DISCUSSIONS - ASTEROIDS

January 1, 2001 marks the discovery bicentennial of the asteroid Ceres. On the first night of the 19th century Giuseppe Piazzi of Palermo discovered a moving star. It took several nights to convince himself it really moved and he eventually observed it for some six weeks. Unfortunately he then fell seriously ill and before he recovered the object had moved too close to the Sun for further observation. Astronomers at this time had been galvanised by the prediction and subsequent discovery of the planet Uranus. The discovery appeared to confirm the validity of Bode's Law. This so called law had been popularised in the 1770's. According to Bode's Law another planet should exist about 2.8AU from the Sun. A group of astronomers calling themselves "The Celestial Police" decide to conduct a determined search under the direction of Baron Francis Xavier von Zach. They divided the sky into 24 zones and assigned each one to a different astronomer who would conduct a search. Giuseppe Piazzi was allocated a search zone. Little did Baron von Zach know Giuseppe had already made his crucial discovery while working on an entirely different project. His allocated search charts were still in the mail {Nothing changes!!}. Piazzi's observations were insufficient to allow orbital calculations using the methods of the day and the object was lost. Fortunately the mathematical genius Karl Gauss became interested and devised a new method of calculation that required only three widely spaced observations. Ceres was recovered. Everyone of course was delighted because Ceres seemed to fit right in as predicted. It came as a complete surprise however when three more asteroids were discovered over the next few years until by 1890 some 300 were known. Sir William Herschel suggested the classification name **asteroid** {Greek for "starlike" which is how they appear in a telescope}. Olbers suggested they were the remains of a disrupted planet that existed in this orbit long ago. Since that time and with the invention of astrophotography the number of known asteroids totals about 18,000 with some 5,000 known orbits. It is estimated from statistical studies, there may be millions of low mass asteroids. The total mass of the asteroids is quite small being less than our own moon. The majority of the asteroids are found between the orbits of Jupiter and Mars although they are also found inside the Earth's orbit and one has been found almost out to Saturn.

The region between Mars and Jupiter is filled with gravitational effects known as resonances and the structures found in the asteroid orbits reflect these gravitational effects. During the 1860's the American astronomer Daneil Kirkwood found the asteroid belt was not a uniform distribution of objects but gaps occurred in regions where the orbital period of a body would be an exact integer ratio of Jupiters orbital period. For instance the region where an object in the asteroid belt would orbit twice for every single orbit of Jupiter was found to have very few asteroids, so were the regions for three and four orbits to one of Jupiters. These are the 2:1, 3:1 and 4:1 resonances. These breaks in the asteroid belt are called Kirkwood Gaps. It was later found that some resonances tended to produce assemblages of asteroids, for instance the Hildas group is found at the 2:3 resonance, that is a Hildas asteroid will orbit three times for every two orbits of Jupiter. It is now believed these resonances are responsible for preventing planet formation between Mars and Jupiter. While collisions are no doubt still occurring in the asteroid belt over geological timescales, Olders was wrong when he suggested a planet had been formed in this region later to be disrupted by a large collision. The gravitational interactions between the asteroids and the nearby planets serve to keep the orbital conditions such that any impacts are mainly at high velocity which favour disruption rather that coalescence.

While the majority of the asteroids are found between the orbits of Mars and Jupiter, there are a number of asteroid families that have orbits furthers out than Jupiter or closer in toward the inner solar system. One group of asteroids know as the Trojans are found at Jupiters 1:1 resonance. They have the same heliocentric distance and orbital period as that of Jupiter. The Trojans are found at two stable regions known as the Legrangian Points which lie some 60 degrees East and West of Jupiter. There are three groups of asteroids that seem to inhabit the inner parts of the Solar System. One class known as the Atans have orbits that keep them always within one AU of the Sun. The second group known as the Apollo asteroids have orbital distances that takes them beyond Earths orbit. Thus the Atens and Apollo asteroids have orbits that cross the Earths orbital path. The third class is the Amors. These asteroids travel between the orbit of Earth and Mars and often cross the path of Mars. The three groups of inner



solar system asteroids, the Atans, Apollos and Amors are collectively known as the Near Earth Asteroids. Recently astronomers have become far more interested in these near Earth asteroids after evidence has built up suggesting that at least one extinction episode occurred 65 million years ago when the dinosaurs and a large proportion of the animals living at the time were destroyed by a large meteor collision. A similar collision today would have fatal consequences for the human race.

The observation of asteroids by amateurs can be quite exciting and rewarding. Some possible projects is given at right. If you would like to dabble in this area why don't you have a talk to Peter Skilton about a possible work

PROJECT ONE - Timing Stellar Occultations by Asteroids.

As asteroids move through the sky they often pass in front of a background star. In the telescope the star appears to blink out for a short period of time. In effect the asteroid is casting its shadow across the face of the Earth as a sort of stellar eclipse. If an observer accurately times this period of black out, the size of the asteroid can be accurately measured. On a few rare occasions groups of amateurs have organised themselves to take a number of timings with the observers spread along a line. In this way a rough picture of the asteroid can be assembled from the timings. Observations of this type require the observer to be at the right place, at the right time with a reasonable telescope. The Solar System Special Interest Group has held several occultation observation nights and Peter Skilton has arranged to get information on possible events. To take this type of observation you will need a reasonable telescope (4"+) preferably with equatorial drive, a portable tape recorder, a radio tuned to the VNG time signals and the usual charts, maps plus of course warm clothing, hot coffee etc.

PROJECT TWO - Modeling Asteroid Shapes.

Most of the larger asteroids are believed to be basically spherical in shape however the smaller asteroids can be quite irregular in shape as witnessed by the photograph of the asteroid Gaspra shown in the March/April Scorpio. As an asteroid tumbles in space, it presents a differing face toward the Earth and thus changes in brightness depending on their rotational dynamics. Asteroids typically rotate once every 4 - 20 hours giving a brightness variation of about 20%. Spherical objects will not vary in brightness very much however irregular shaped objects can vary considerably. Having located an asteroid, its apparent magnitude can be estimated in much the same way as that of variable stars. The rotational data for asteroids provides some in-site into the collisional history of an asteroid. In non-destructive collisions, rotational angular momentum is added to the asteroid in some random way. Thus small asteroids tend to rotate quickly while large asteroids rotate more slowly because their larger masses are less easily disturbed. By plotting the light variation curve for an asteroid it is possible to estimate the shape of the object.

PROJECT THREE - Searching for Aten Asteroids.

Aten asteroids generally stay within the orbit of Earth because their aphelia are just 1AU. These asteroids are visible only in twilight and thus are very difficult to see. A suggested alternative is to look for Sun-Transiting Dark Objects. There have been reports over the years of objects being seen passing in front of the Sun taking from a few seconds to hours in transit across the solar face. The fast transits (5- 60 seconds) are objects very close to the Earth while the longer transits may be intra-terrestrial asteroids. This area of research is so new that it is only now being suggested as a topic where amateurs can contribute. To quote from a paper at the XVth NACAA by Dr.D.Steel: "Quite simple equipment would be needed. Each observing site, which could be your own backyard would need a simple heliostat to project an image of the Sun continuously onto a screen, a calibrated clock hung next to the screen, white paper below the clock to show the date clearly and a video camera to film the lot. Simply setup and film then play back at high speed in the evening after the Sun has disappeared for the day. Most of the time the film would be pretty boring but every so often a dark object would be seen crossing in a straight line."

METEORITE SMUGGLING.

I see in the newspapers that the government has taken action to prevent Australian meteorites from being sold overseas. The claim being they are part of our heritage. I find this a bit amazing given they are the remains of other solar system bodies and the only connection to Australia is they happen to fall on it. It seems to me that if the meteorite trade encourages people to go looking for the things then its worth the loss of a few to our overseas amateur mates.

GIOTTO'S SECOND CHANCE

In its suicidal dive toward the core of Halley's Comet the spacecraft Giotto got within 600km of its goal before collisions with dust and rocks brought its mission to a sudden halt. Moving at 240,000 km/hr relative to the comet, the collision struck a mortal blow to the spacecraft systems. The main battery, cameras, spectroscopes and plasma analysers were either destroyed or disabled. Only three instruments are still working, looking at charged particles, dust and magnetic fields.

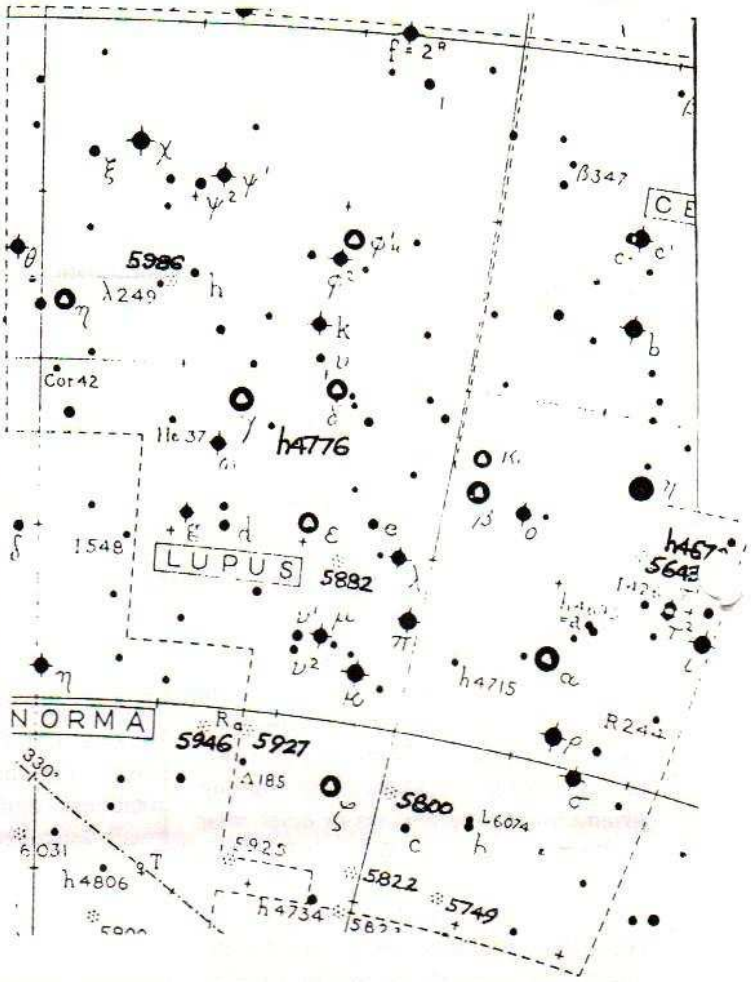
Using the last gasp of its manoeuving gases, Giotto has been directed to pass through the tail of another comet. Comet Grigg-Skjellerup is smaller than Halley and has less gas and dust. It orbits the Sun every five years. This second comet rendezvous is due on 10 July and will allow astronomers to compare the two comet tails. After this pass, Giotto will spend to rest of its days in a stable solar orbit until some future generation collects its as a historic artifact of early space exploration

CONSTELLATION LUPUS

The constellation of Lupus, The Wolf, lies between Centaurus and Scorpius. It is a small constellation to which only nineteen stars are assigned. The constellation has no definite outline but does contain several bright stars between 2nd - 4th magnitude and a wide variety of objects to be hunted down. Lupus lies in a rich region of the sky and includes a variety of double stars, globular clusters, open clusters, planetary nebula and galaxy. It is ideally suited for low power binoculars and 7X50's show the general constellation outline quite well.

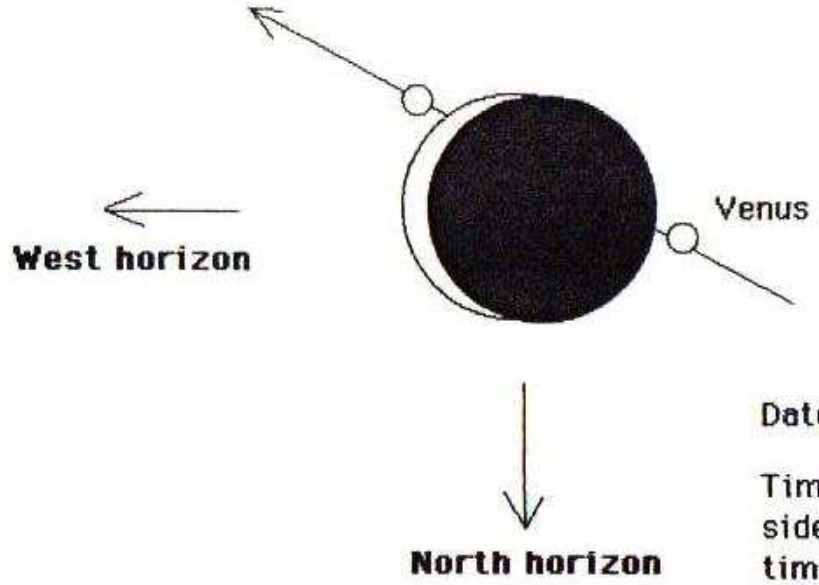
The availability of relatively bright stars allowed me to try some comparative studies of various instruments to find and identify some objects. Choosing a clear moonless night in late May, I decided to explore the constellation of Lupus with binoculars and telescope to see what I could find. The two binoculars were a pair of 7X50 and 16X50 and the telescope was a Celestron 8. These instruments show objects suitable for the novice using simple binoculars plus a few objects for the more adventurous observer. The results are shown in the table below. Remember just because I couldn't see them doesn't mean you can't. (Note:-Dark adaption of the eye is important.)

P.J.Lowe



OBJECT	TYPE	7X50	16X50	20cm
NGC5882	Planetary 7" dia	Not Visible	Not Visible	Not Visible
NGC 5986	Globular 2' dia	Barely visible using averted vision	Visible as a faint smudge	Easily visible but no structure seen
H4776	Double Star	Visible but not separated	Visible but not separated	
NGC 5800		Not Visible	Not Visible	Not Visible
L6074	Double Star	Easily Visible	Easily Visible	Easily Visible
NGC5927	Globular 8" dia	Not Visible	Not Visible	Not Visible
NGC5946		Not Visible	Not Visible	Not Visible
NGC5822	Open Cluster	Easily Visible	Easily Visible	Easily Visible
NGC5749	Open Cluster	Not Visible	Not Visible	Not Visible
NGC5643	SB0 Galaxy	Not Visible	Just visible with averted vision	Visible with low power
H4672	Double Star	Visible but not separated	Visible but not separated	Visible but not separated
NGC5873	Planetary 3" dia	Not visible	Barely Visible	Just Visible
NGC5824	Globular 1" dia	Not visible	Not visible	Starlike image
NGC6026	Planetary 40" dia	Not visible	Not Visible	Barely visible

UPCOMING OCCULTATIONS SUITABLE FOR EYES OR BINOCULARS

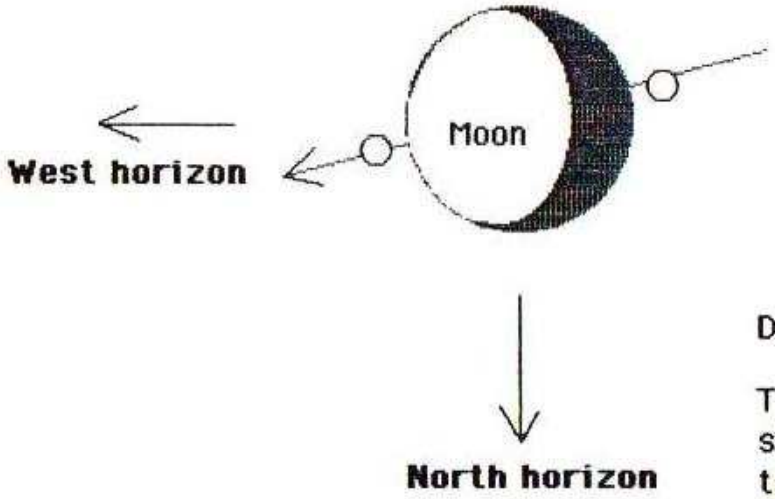


Binocular and naked eye view of the occultation of Venus by the Moon

Date: Thursday 25 February 1993

Times: Venus disappears into dark side of moon at 2:09 pm local time, and reappears from the bright side at 3:34 pm.

Brightness: Magnitude -4.6



Binocular and naked eye view of the occultation of the bright star Mu Gemini by the Moon

Date: Wednesday 3 March 1993

Times: Star disappears into dark side of moon at 10:40 pm local time, and reappears from the bright side at 11:56 pm.

Brightness: Magnitude 2.8

SOME OF WHAT'S ON IN THE SKY FOR 1993

CONJUNCTIONS

Alignments visible to the eye/binoculars of the planets in the sky occur on:

Sep 7	Mars and Jupiter (evening)
Sep 24	Mercury and Jupiter (evening)
Oct 6	Mercury and Mars (evening)
Oct 28	Mercury and Mars (evening)
Nov 8	Venus and Jupiter (morning)

OCCULTATIONS

Disappearances visible to the eye/binoculars occur on:

Feb 25	Venus behind moon (afternoon)
Mar 3	Magnitude 2.8 star Mu Gem behind moon (night)
Jul 5	Magnitude 3.3 star Beta Cap behind moon (morning)

SPECIAL EVENTS

Harvest Moon	Mar 8	
Jupiter Brightest	Mar 30	
Hunters' Moon	Apr 7	
Pluto Brightest	May 14	A challenge for a big telescope.
Total Lunar Eclipse	Jun 4	
Uranus Brightest	Jul 12	
Neptune Brightest	Jul 12	
Saturn Brightest	Aug 19	
Transit	Nov 6	Mercury passes across the face of the Sun (afternoon)
Partial Solar Eclipse	Nov 13	