ORWELL ASTRONOMICAL SOCIETY IPSWICH

Charity No 271313

SOCIETY NEWS

1 Committee Meeting

The next committee meeting will be held on Saturday 29th November at the observatory, from 19:30. This will be an open meeting an any member is welcome to attend.

2 Christmas Meal

The Swan at Westerfield has been booked for this years Christmas meal. The cost will £12.95. The meal has been booked for 20:30 on Wednesday 10th December. Any one interested in coming, please contact Roy Gooding

NIGHT SKY

All times GMT

Moon

First Quarter	7th
Full Moon	14th
Third Quarter	22nd
New Moon	30th

MERCURY Mercury reappears in to the evening sky this month. It reaches greatest eastern elongation on the 28th. Mercury will be setting less than an hour after the sun this month.

VENUS Venus will be well placed again this month an reaches greatest eastern elongation on the 6th By the end of the month it will be setting 3 hours after the sun. Mag -4.5

MARS Mars is also visible in the evening sky this month. It will be setting about 2½ hours after the sun this month Mag. 1.2

JUPITER Jupiter will be setting by 21:00 at he end of the month. Mag -2.5

SATURN Saturn will be most until the small hours of the morning this month. It will be setting at about 02:30 at the end of the month Mag. 0.4

URANUS Uranus will be setting at 20:00 at the end of the month. Mag. 5.8

Neptune Neptune will at about 21:30 at he end of the month
Mag. 7.9

Meteor Showers this month.
Taurids Max. November 3rd ZHR 25
Orionids Max. November 17th ZHR 100?

R.Gooding

OCCULTATIONS DURING NOVEMBER 1997

The table lists stellar occultation events which occur during the month under favourable circumstances. The data relates to Orwell Park Observatory, but will be similar at nearby locations.

	Date & Time (UT)	Lunar Phase	Sun Alt (°)	Star Alt (°)	Min Dist rad	Star	Mag
D	05 Nov 17:31	.27+	-11	17	.43N	187 B. Sgr	6.4
D	05 Nov 18:23	.27+	-19	13	.62S	SAO162234	6.7
D	05 Nov 18:31	.27+	-21	12	.37N	SAO162239	7.4
D	09 Nov 17:45	.70+	-14	26	.32S	lambda Aqr	3.7
R	18:53		-25	30			
D	09 Nov 19:02	.71+	-26	30	.25N	78 Aqr	6.3
D	09 Nov 23:26	.72+	-55	14	.48S	82 Aqr	6.5
D	10 Nov 18:11	.81+	-18	29	.95N	20 Psc	5.6

Saturn is the only planet subject to a lunar occultation during 1997. The occultation occurs in the early hours of the morning of 12th November. The following table lists the circumstances of the event as seen from Orwell Park Observatory. (Details will be similar for neighbouring locations.)

	Date and Time (UT)	Lunar Phase	Sun Alt (°)	Saturn Alt (°)	Min Dist rad	Saturn Mag
D	Wed 12 Nov 01:29	.91+	-49	20	.48N	0.4
R	02:21		-43	13		

James Appleton

JOVIAN SATELLITE PHENOMENA

by James Appleton

On 7th January 1610, Galileo turned his telescope towards Jupiter, and saw that it was attended by 'three little stars'. Within a few weeks, Galileo determined by further observations that there were in fact four such objects, and that they were satellites of Jupiter. The four satellites later became known as the Galilean satellites, and they have been under more-or-less continuous observation ever since their discovery.

In order of mean distance from the planet, the Galilean satellites are named Io, Europa, Ganymede and Callisto. They are also referred to as Jupiter 1, 2, 3 and 4. Table 1 summarises the main data on the satellites and their orbits.

Satellite	Dist from Jupiter (km)	Diam (km)	Mag	Orbital Inc (deg)	Orbital eccentricity	Siderial period (days)
Io	422,000	3,630	4.9	0.0	0.0001	1.8
Europa	671,000	3,130	5.3	0.5	0.0001	3.6
Ganymede	1,070,000	5,280	4.6	0.2	0.0014	7.2
Callisto	1,880,000	4,820	5.6	0.2	0.0074	16.7

Table 1 . Key data for Galilean satellites.

Table 1 shows that the orbits of the Galilean satellites are all very close to perfect circles and all lie very close to Jupiter's equatorial plane. As a result of this, approximately every six years, the Earth's orbit carries it through the plane of the satellites, and when this happens, for a period of approximately 18 months, it is possible to observe the following mutual phenomena of the satellites:

eclipse - one satellite enters the shadow cast by another satellite. As with eclipses of the sun and moon, eclipses of Jovian satellites may be total, partial or annular. Because of the finite distance from the sun, the eclipses exhibit penumbral and umbral phases.

occultation - one satellite passes in front of another as seen from the Earth. The difference in sizes of the satellites, together with the slight

differences in orbital inclination, mean that total, partial and annular occultations may occur. In the latter two cases, light from the occulted body continues to contribute to the total light flux associated with the phenomena.

The Bureau des Longitudes (BDL) of Paris is one of the major astronomical centres disseminating predictions and recording observations of mutual phenomena of Jupiter's Galilean satellites. The BDL refers to its current activities as the 'PHEMU97' program, and provides public access to predictions via the Internet at url ftp://ftp.bdl.fr/pub/ephem/satel/phemu97.

On the evening of 25th September, I observed an occultation of Ganymede by Io followed by an eclipse of Ganymede by Io. I was alerted to the events by the BDL predictions. The predicted event times were as follows:

- Io occults Ganymede, predicted central time 19:55:28 UT,
- Io eclipses Ganymede, predicted central time 22:33:28 UT.

Atmospheric conditions throughout the evening were reasonable: although Jupiter had an altitude of only some 18°, and was seen through a layer of haze, the air was very steady and I was able to glimpse considerable detail in the planet's main belts. I observed with my 10" f10 reflector, using mainly a 12.5mm eyepiece giving a magnification of 200x.

Figure 1 shows the general configuration of the Jovian system at 19:30 UT on the evening of the 25th. Callisto was some 20 Jovian radii to the East of Jupiter, while Europa was closer at approximately six radii East of the planet. To the West of Jupiter, Ganymede and Io were approximately six radii distant from the planet and very close together (with Io slightly further out). The glare from Jupiter extended to approximately three radii from the planet, so fortunately did not materially affect observations of the satellites.

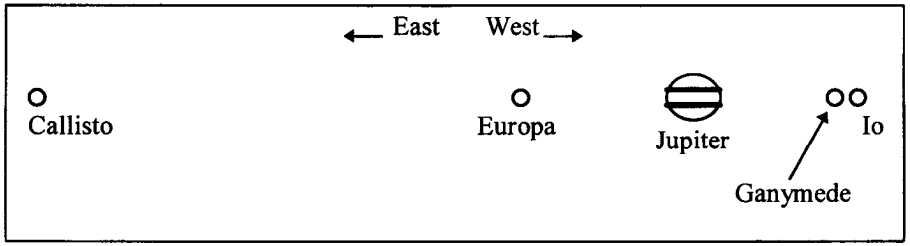


Figure 1. Jovian system, 19:30 UT, 25th Sept 1997.

Denoting the predicted central time of the occultation by C, the sequence of events throughout the occultation was as follows. Io and Ganymede drew slowly closer together, until at approximately C-5 minutes, they appeared to merge. They were then visible as a slightly elongated bar of light until approximately C-2 minutes. From then until approximately C+3 minutes, the two moons appeared together as a single point of light. At C+3, the two moons appeared once more as an elongated bar of light. Finally, at C+8, I was able to discern the two moons as separate points of light.

It's not clear why it was possible to discern the moons as separate until five minutes before C but impossible to separate them again until eight minutes after C. Examination of the satellite's orbits using the Jovian moon simulator in *The Sky* software package suggests that the line of sight geometry should have resulted in the moons appearing to separate faster than they appeared to merge.

Following the occultation, later in the evening, Io was responsible for an eclipse of Ganymede. The geometry of the eclipse was such that the moons appeared well separated as seen from the Earth: Io cast a shadow deep into space which landed on the earth-facing hemisphere of Ganymede. The eclipse was annular.

The most noticeable aspect of the moons in the minutes immediately prior to the eclipse was their differing luminosity and colour. Prior to eclipse, Ganymede appeared noticeably brighter than Io; and whereas Ganymede appeared yellow-white, Io had a reddish-ochre tinge. The atmospheric haze made it difficult to be definitive about the colours of the moons, so these are impressions only.

As the eclipse progressed, Ganymede grew progressively dimmer. I could not discern the dimming with certainty until approximately a minute before mid-eclipse. At mid-eclipse, the dimming of Ganymede was most noticeable (BDL predicted a reduction in the light flux from Ganymede by 45%). Following mid-eclipse, Ganymede brightened again, regaining its pre-eclipse luminosity after a few minutes.

This was my first observation of mutual events of Jupiter's satellites, and I found both the occultation and eclipse fascinating to observe. I would encourage others to attempt observations of the remaining events of the 1997-98 season. It's also interesting to observe occultations and eclipses of the moons by Jupiter, and transits of the moons across the disk of the planet - these events are much more frequent than mutual phenomena of the satellites, and the BAA journal contains predictions of them.

Table 2 lists the most prominent mutual satellite events for the remainder of the current season. The table lists only two events, both occurring during November -

BDL predict a very much larger number of phenomena, but many occur under unfavourable observing circumstances, for example the planet is near to the horizon as seen from Ipswich, or the moons lie close to the glare of the planet etc.

Glare caused by Jupiter is, in fact, a particular problem. Telescopically, Jupiter creates significant glare which extends to some four - five radii from the planet's limb. This can present a major problem when attempting to estimate changes in brightness of the satellites. Because of this, one of the main criteria for selecting events to include in table 2 is that the satellites lie outside the main glare of the planet.

The columns of the table are as follows:

- Date of phenomenon.
- Nature of phenomenon, and moons involved. P indicates partial and A indicates annular. (Thus, *3 OCC 2 P* means Ganymede partially occults Europa, etc.)
- Starting time of the event, UT. For the eclipse event, the start time quoted is the time at which umbral eclipse begins. The penumbral eclipse begins some 15 minutes earlier, but is typically invisible in a small telescope.
- Time of maximum eclipse / occultation, UT.
- End time of event, UT. For the eclipse event, the end time listed marks the end of the umbral eclipse; this is followed by a phase of penumbral eclipse lasting some 8 minutes, but this is unlikely to be readily visible in a small telescope.
- The maximum drop in light flux during the event, as a proportion of the usual flux from the bodies concerned.
- The distance of the body eclipsed/occulted from the planet, in Jovian radii.
- The minimum distance of the centres of the moons / centres of moon and shadow during the event.

Date	Phenomena	Event Start	Maximum	Event End	Drop Light	Dist Jup	Dist Moons
Yr Mn Dy		H M S	H M S	H M S	Flux	(RJ)	(")
97 11 18	3 OCC 2 P	19 6 00	19 10 11	19 14 22	0.26	8.0	0.29
97 11 24	3 OCC 1 P	20 26 5	20 33 7	20 40 23	0.31	5.9	0.26

Table 2. Most prominent events for remainder of season.

NEW LIBRARY ACQUISITIONS

The OASI library has recently acquired the following items:

Astronomical Tables Of The Sun, Moon And Planets, J Meeus, 2nd Edition, Willmann-Bell Inc., 1995.

This is a standard reference work describing many of the main astronomical events visible in coming years. Chapters cover the following subjects:

- Planetary phenomena to 2020, including inferior and superior conjunctions of the inferior planets, oppositions of the superior planets and minor planets, close and exact planetary conjunctions.
- Equinoxes and solstices during 1 - 3000.
- Phases of the moon during 1970 - 2050,
- Occultations of planets and bright stars during 1990 - 2020.
- Historical record of sunspot activity 1749 - 1994.
- Miscellaneous data, including: date of Easter, perigee and apogee of the moon, transits of Mercury, solar eclipses to 2050, lunar eclipses to 2050, Martian seasons to 2060, and positions of bright zodiacal stars.

Meeus has a well deserved reputation for the comprehensive and accurate nature of his work, and this book is likely to become the definitive list of predictions of astronomical events over the next few decades.

Astronomical Algorithms, J Meeus, Willmann-Bell Inc., 1991.

This book provides a cornucopia of techniques for predicting astronomical events. The author is an internationally renowned expert on astronomical data processing and there is no doubt that the book will become a standard reference work for many years hence. The book includes algorithms for the following:

- Day and date conversion between the various worldwide calendar systems,
- Transformation of astronomical co-ordinate systems,
- Inter-relationship of the various systems of time measurement,
- Effects associated with the rotation of the Earth's globe (precession, nutation, etc.),
- Ephemerides of the main solar system bodies,
- Low and high precision ephemerides of the Galilean satellites of Jupiter.

UK Solar Eclipses From Year 1, S Williams, Clock Tower Press, 1996.

This book provides a comprehensive guide to all solar eclipses observable from the UK during the years 1 - 3000 AD. The book provides a brief description of each eclipse plus a map of the eclipse track. Additional chapters explain the mechanics of solar eclipses, the Saros cycle (whereby eclipses tend to repeat one another after an 18 year cycle) and detailed maps of the 1999 UK eclipse.

In view of the heightened interest that will accompany the 1999 UK solar eclipse, this book is likely to become a best seller!

Astro Calendar 1997/98, Federation Of Astronomical Societies.

Provides a month-by-month listing of the main astronomical phenomena and associated sky maps during the period October 1997 - December 1998.

Federation Of Astronomical Societies Handbook, 1997.

Provides a wealth of astronomical data for 1997, including contact details for all UK astronomy societies, a list of potential astronomical speakers, and some comments on the astronomy material available on the Internet.

Light Pollution Information

The library has obtained the following two leaflets:

- the revised *Guidance Notes For The Reduction Of Light Pollution*, produced by the IEE (Institution of Electrical Engineers), which explains the benefits of providing appropriate lighting levels and avoiding contributing to skyglow.
- *A Review Of The Law Relating To Light Pollution*, produced by the UEA (University of East Anglia). This paper, produced by a member of staff of the School Of Law of UEA, provides an interesting summary of the current legal situation in the UK relating to light pollution.

The library is housed in the Orwell Park Observatory. It holds a selection of astronomy books, videos and magazines. All members of OASI are welcome to use the library. Please contact me with suggestions for purchases of books, videos and software.

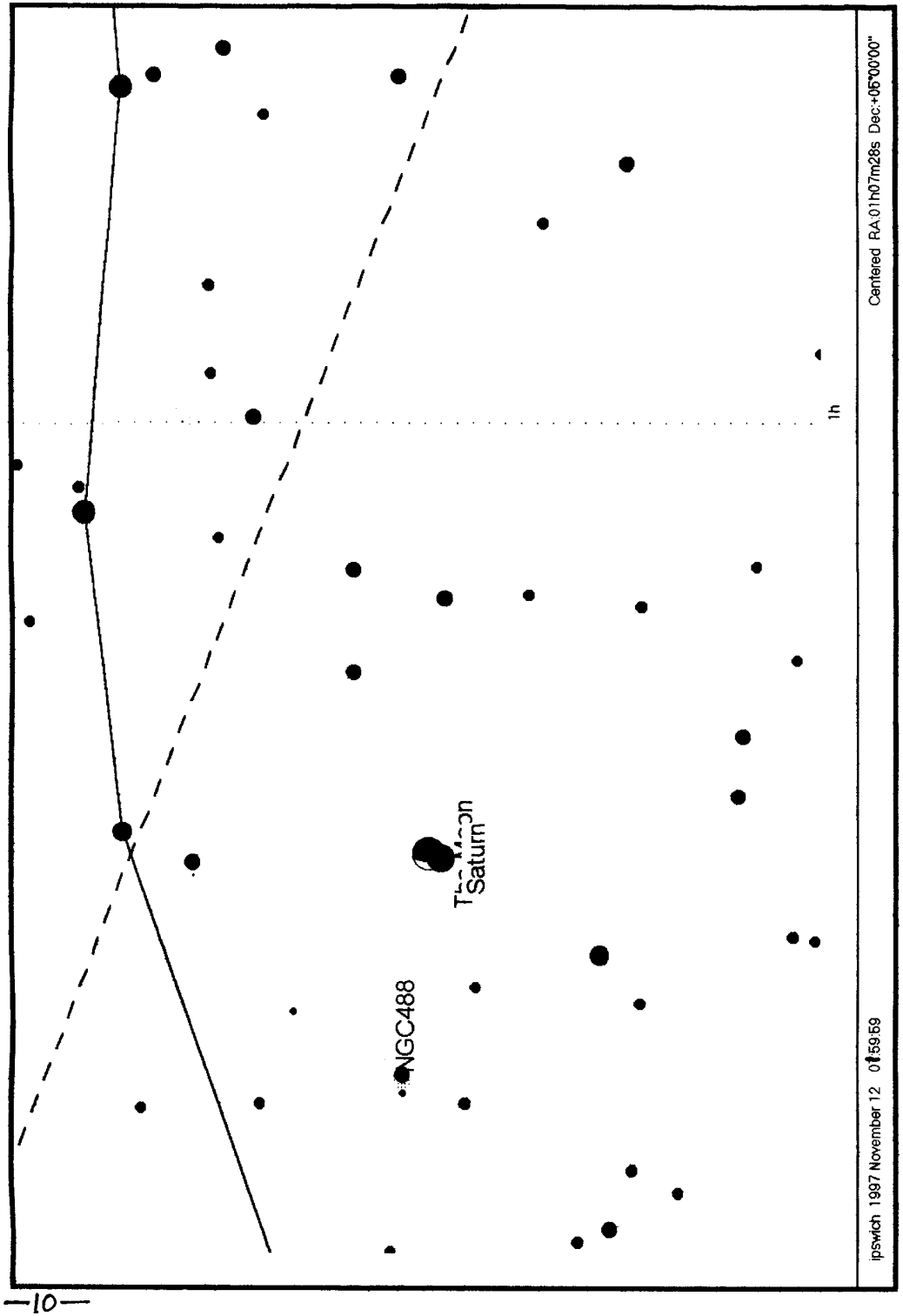
James Appleton

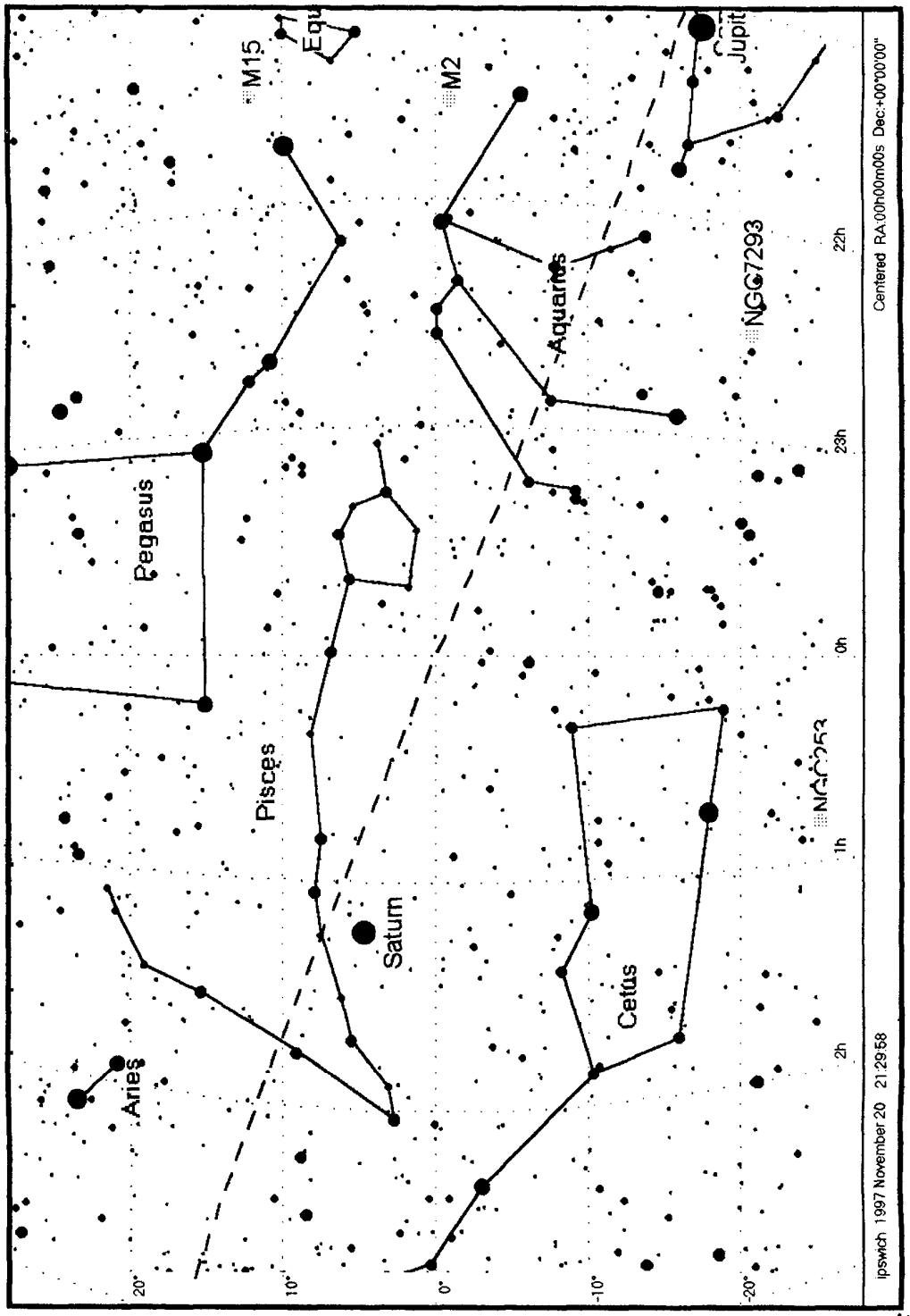
Leonid meteor shower - November

The Leonids meteor shower is caused by the debris left behind by the comet Temple-Tuttle which has an orbital period of just over 33 years. The Leonids have in the past produced very spectacular displays in which meteors really do shower down for a hour or so. This happens at times just after the comet passes the Earth's orbit as in 1933 and 1966.

The Leonids have become more active in recent years and Temple-Tuttle passes perihelion in March 1998. This year should see a good display, but the best is likely to be kept for 1998 or 1999 when a spectacular display may be seen. Unfortunately Moonlight interferes in 1997. The time limits of the shower are November 15th to 19th with the peak predicted to occur at 16:00 hours (4pm) on 17th.

Pete Richards





PROGRAMME FOR NOVEMBER

Mondays from 7.30pm *No Director for this night*	*GENERAL OBSERVATION SECTION*
Tuesdays from 7.30pm *Mr P Richards*	*OBSERVATORY VISITS FROM OUTSIDE GROUPS*
Wednesdays from 8.00pm *Mr M Cook*	NEBULA & FAINT OBJECTS SECTION *Mr D Payne*
Thursdays from 7.30pm *Mr P Richards*	OBSERVATORY VISITS FROM OUTSIDE GROUPS
Fridays from 7.30pm 7th - 21st *Mr J Hood*	DOUBLE STARS

All members are welcome on any night, but on nights other than Wednesday please check with the director of the night that the observatory will be open.

Lectures and other events:

Committee Meeting -------On Saturday 29th November at 7.30pm in the club room at the observatory. All members are welcome to attend.

e-mail enquires to oasienq@btbcs.bt.co.uk
WWW url http://www.ast.cam.ac.uk:80/~ipswich/

1997 COMMITTEE

		Home Phone	Work Phone
CHAIRMAN	D Payne		
SECRETARY	R Gooding		
TREASURER	M Nicholls		
MAINTENANCE CO-ORD	M Cook		
JOURNAL CO-ORDINATOR	E Sims		
PUBLICITY & VISIT CO-ORD	P Richards		
EQUIPMENT CURATOR	M Harlow		
SPECIAL EVENTS CO-ORD			
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