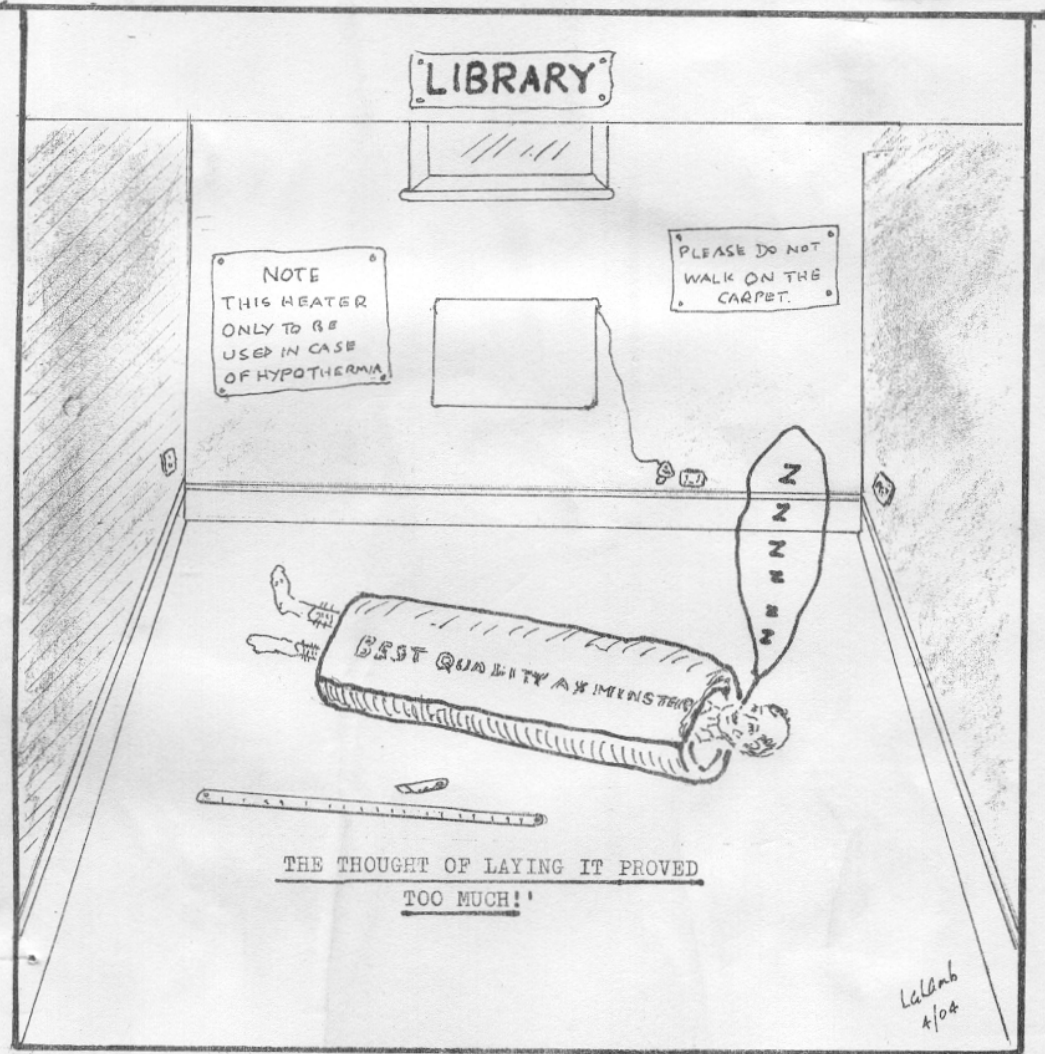


# ORWELL ASTRONOMICAL

## SOCIETY IPSWICH

Charity No 271313

MAY 2004



### Society News

#### 1 Next Committee Meeting Saturday 5<sup>th</sup> June 2004

The next committee meeting will be held on Saturday 5<sup>th</sup> June at 19:30 in a classroom in the courtyard. This is an open meeting and any one who is interested is invited to attend

#### 2 Events for 2004

Meeting	Venue	Date
7 <sup>th</sup> Astronomy Workshop	Paul Whiting The Radio Universe - A Look At Radio Astronomy	Wednesday 5 <sup>th</sup> May
Lecture meeting Fonnereau Road	Transit of Venus by Peter Hingley Meeting will start at 20:00	Friday 14 <sup>th</sup> May
Opening of new Society Library by Peter Hingle	Lecture on RAS Library Collection. by Peter Hingle At Orwell Park School in the Music Hall See Ken Goward's article	Saturday 15 <sup>th</sup> May
Society History Astronomy AGM	Institute of Astronomy Cambridge	Saturday 22 <sup>nd</sup> May 11:00 to 17:00
The Web society Annual Meeting	Institute of Astronomy Cambridge	June 19 <sup>th</sup> from 10:30
BAA Exhibition Meeting	The Cavendish Laboratory Cambridge	June 26 <sup>th</sup> 11:00 to 18:00
Summer Barbecue	Mike Whybray's garden. His address is [REDACTED] [REDACTED], Nacton, IPSWICH	Saturday in July Date to be fixed
FAS Convention	Institute of Astronomy Cambridge	Saturday 2 <sup>nd</sup> October
Christmas Meal	Red Lion Martlesham	15 <sup>th</sup> December at 20:00

**Sun**

The sun will be rising approximately between 04:30 to 03:40  
 The sun will be setting approximately between 19:30 to 20:10

**Moon**

Full Moon	3 <sup>rd</sup> Quarter	New Moon	1 <sup>st</sup> Quarter
4 <sup>th</sup>	11 <sup>th</sup>	19 <sup>th</sup>	27 <sup>th</sup>

**Mercury** Mercury will be at greatest western elongation on the 14<sup>th</sup>. It remains low in the early morning sky and will not be visible.

**Venus** Venus remains prominent in the evening sky, not setting till about 23:30 at the beginning of the month. During the month it moves westward towards the sun, setting about one hour after sunset by the end of the month. Magnitude -4.4

**Mars** Mars has moves into Gemini this month. It will be setting at about 23:00 at the end of the month. Magnitude 1.6 this month.

**Jupiter** Jupiter remains a prominent object this month, in Leo. It will be setting at about 01:00 at the end of the month. Magnitude -2.2

**Saturn** Saturn remains prominently visible this month in Gemini By months end it will be setting at about 22:00 Saturn will be at magnitude -0.1.

**Uranus** Uranus rises at about 01:00 at the end of the month. Magnitude 5.7

**Neptune** Neptune rises at about 00:00 at the end of the month. Magnitude 7.8

**Meteor Showers** Meteor source is the BAA Handbook

Shower	Limits	Maximum	ZHR
η Aquarids	April 24 <sup>th</sup> to May 20 <sup>th</sup>	May 4 <sup>th</sup>	40
α Scorpids	April 20 <sup>th</sup> to May 19 <sup>th</sup>	April 27 <sup>th</sup> & May 12 <sup>th</sup>	5

Contact	Time
Penumbra 1 <sup>st</sup>	17:50
Umbra 1 <sup>st</sup>	18:48
Moon rise	19:23
Umbra 2 <sup>nd</sup>	19:52
Umbra 3 <sup>rd</sup>	21:08
Umbra 4 <sup>th</sup>	22:12
Penumbra 2 <sup>nd</sup>	23:09

Phase	Time
DD	11:09
RB	12:19.6

The current series comes to an end on May 5<sup>th</sup>, with Paul Whiting taking a general look at radio astronomy.

As before, the question arises about another series from September 04 to May 05. The two relevant factors are, (1) sufficient members interested in attending another series, and (2), members willing to present a topic of astronomical interest, with the usual 'interactive' approach – which usually means taking questions and comments from the 'floor' as they occur. The workshops are as much a forum for discussion as a formal talk.

There have been one or two offers already, but a few more are needed to make a full series.

A list to express your interest has been started, and will be on the notice board, as well as at the May workshop. So please have a think, take courage, and make an offer. Help with visual aid presentation has kindly been available previously, and would be much appreciated again. But old fashioned flip charts and slides – if appropriate - are quite in order.

My thanks, on behalf of the committee, to all who have presented and supported the workshops so far. Ted Sampson.

**OCCULTATIONS DURING MAY**

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

D / R	Date & Time (UT)	Lunar Phase	Sun Alt (°)	Star Alt (°)	Star	Mag
R	23 May 21:13	0.18+	-9	23	76 Gem, c Gem	5.3
D	29 May 23:00	0.77+	-15	24	ZC 1828	6.8

James Appleton

## DESPITE THE 10/10 CLOUD COVER A SUCCESSFUL WEEKEND

A total overcast did not deter a total of 157 visitors (all age groups) from coming along to our Open Weekend on 27<sup>th</sup>/28<sup>th</sup> March. It did not deter an encouragingly high number of members from volunteering to help out either!

A great all-round effort ensured our visitors didn't go away disappointed and Mike Nicholls (operating the Tomline) even pulled a few celestial strings to get the Moon to do a couple of low passes so that some had a fleeting glimpse!!

Four new family member groups also took advantage of a special weekend only offer on subscription rates and have joined us. We extend a hearty welcome to:

*Andrew & Sally Munson.  
Rodney, Phillipa, Edwin, Elspeth and Sebastian Black.  
David & Katie Butler.  
John & Carol Spencer.*

A grateful **Thank You** goes to all those members who so freely gave of their time and effort.

## AN EVENING WITH THURROCK ASTRONOMICAL SOCIETY

On the first Saturday evening of April, 13 members of Thurrock AS visited the Orwell Park Observatory and, to say the least, were very impressed with the facilities we enjoy.

Following the format used for Crewkerne AS' visit last year, OASI members met our guests in the Shepherd & Dog Carvery for a meal and to get to know each other. Unfortunately, the sky was uncooperative for the second Saturday in succession, but that didn't deter our guests from staying for some time to listen to a brief history of Astronomy at Orwell Park, of the characters that created the observatory and afterwards chatting with our own members on a broad spectrum of astronomical interests. Believe it or not, they were also reasonably impressed with our 'Dark Sky' (?) – apparently the best they can usually aspire to around Thurrock is to play 'Spot the Moon'...!

The evening was most enjoyable and our thanks go to our Secretary, Roy Gooding, for organising the visit with his counterpart from 'darn sarf'!

Kenneth J Goward FRAS  
Chairman

## REPORT ON GEMINI OBSERVING PROJECT

### Introduction

During late winter to early spring months, the constellation Gemini is very prominent and is visible throughout most of the night. The constellation culminates at midnight on 07 January and it is conveniently placed for early evening observation from mid-December until early April. Gemini covers an area of 514 square degrees out of 41,253 square degrees for the entire sky: it thus covers approximately 1.2% of the heavens, slightly greater than the average constellation coverage of 1.1%. In a clear sky, Gemini and the surrounding constellations present a truly glorious vista: Canis Minor with the first magnitude star Procyon lie to the South; the magnificent Orion to the South-West; Taurus to the West; and Auriga to the North-West. The Milky Way runs through the Western edge of Gemini, providing many dense star fields to interest the binocular observer. Gemini and the surrounding area of the sky contain many objects of interest to the amateur astronomer. Figure 1 shows Gemini and the neighbouring constellations.

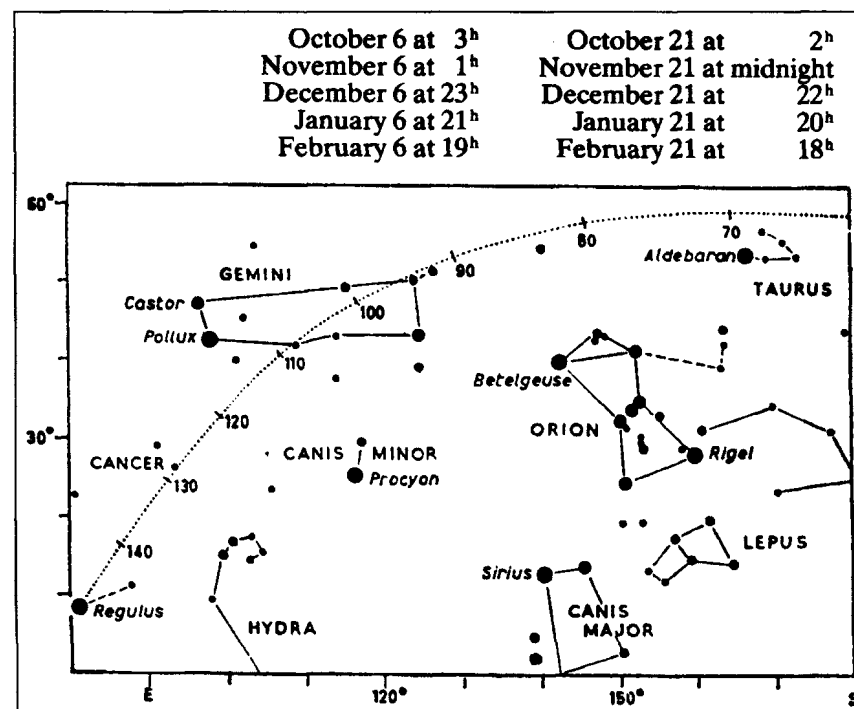


Figure 1. Gemini and its companions in the winter/spring sky.

### Historical Perspective

Gemini is an ancient constellation. Ptolemy of Egypt catalogued information on Gemini in circa AD 140 in *The Almagest*, his comprehensive compilation of Greek

astronomical knowledge. The leading stars of Gemini, Castor and Pollux, are separated by just  $4.5^\circ$  and form an unmistakable pair: mankind has believed since ancient times that they represent twins. In Greek legend, the twins were the sons of Leda and Zeus and were venerated by mariners and invoked for protection against storms & other perils of the sea. (The electrical glow sometimes seen above ship's rigging, St Elmo's fire, was referred to as the *Ledaeon Lights* in classical times.) The Romans venerated Castor and Pollux as the *Dioscuri*, the sons of Zeus, guardians of the city. Ancient Arabians called Castor & Pollux *The Twins*. In ancient India, Castor & Pollux were known as *The Horsemen*.

## Stars In Gemini

Figure 2 shows the main features of Gemini.

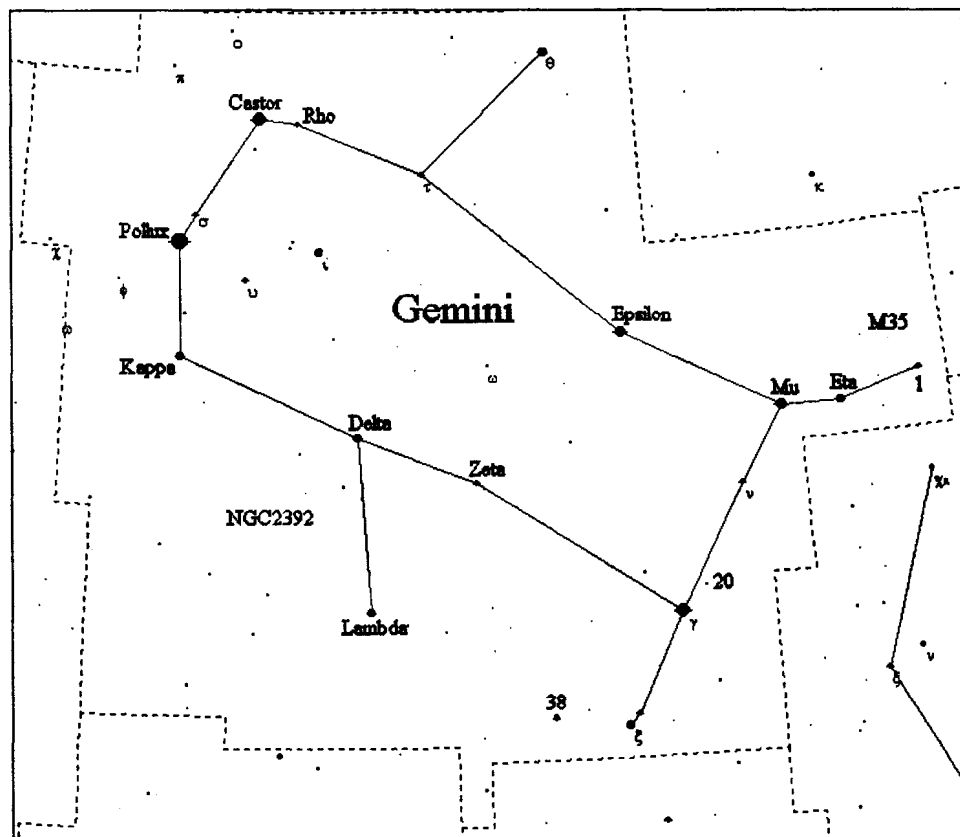


Figure 2. Main features of Gemini.

The most prominent stars of the constellation, Castor and Pollux, are both first magnitude objects, and together they mark the Eastern edge of the main part of Gemini. The remainder of the constellation typically visible to the naked eye consists

of two lines of stars running west from Castor and Pollux, together with some outliers. The main stars of the constellation are as follows:

- Castor, Alpha Geminorum, the Northern Twin. The name means *The Horseman*. Castor is the finest multiple star in the northern sky (see below).
- Pollux, Beta Geminorum, the Southern Twin. The name derives from the Greek *Polluces*, meaning *The Boxer*. Further details below.
- Delta, a magnitude 3.5 double star. Clyde Tombaugh, working at Flagstaff Observatory, discovered Pluto near Delta Gem on 18 February 1930, by "blink" comparing photographic plates exposed on 23 and 29 January.
- Zeta, one of the brightest Cepheid variables in the sky, with a magnitude range 4.4 - 5.2 and a period of 10.15 days. (Cepheids function as standard candles in astronomy through their period-magnitude relationship.) The star was discovered to be variable in 1847. In common with all Cepheid variables, the variability of Zeta Gem is associated with pulsations in the body of the star caused by tension between radiation/gas pressure and gravity in the outer layers of the star (the layer is more opaque when compressed) provide the mechanism to maintain the oscillation and prevent the star settling into equilibrium. Zeta has a luminosity some 5700 times that of the Sun.
- Eta, a red giant, magnitude 3.3, slightly variable, with a luminosity 160 times that of the Sun. There is a close secondary component at magnitude 6.5. The primary is itself a spectroscopic binary: there is a minor eclipse every 8.2 years. All three components are enveloped in a gas cloud some 300 AU in diameter. William Herschel discovered Uranus near Eta on 13 March 1781 with 6.2 inch reflector during his second sky survey.
- 1 Gem, which marks the approximate location of the Sun at summer solstice.
- Epsilon, a magnitude 3.0 supergiant G-type star, like a very much larger version of the Sun. Epsilon has a luminosity 5700 times that of the Sun (like Zeta).

Gemini contains several variable stars in addition to Zeta (mentioned above) – see *Burnham's Celestial Handbook* (available for consultation in Orwell Park Observatory) for details.

## Castor And Pollux

Castor and Pollux, the leading stars of Gemini, form an unmistakable pair. Chief characteristics of the pair are as follows:

**Castor:** magnitude 1.6, distance 45 light years. The Sun would shine at magnitude 6 at the distance of Castor - visible on a clear night if one looked for it! Castor is the most impressive multiple star in the northern hemisphere: it comprises six

components. The main components, Castor A and Castor B, orbit one another at a distance of 12 billion km (more than the diameter of the Solar System), with a period of approximately 400 years. A third component, Castor C, orbits the A/B pair at a distance of 160 billion km, some 15 times the diameter of Solar System, with a period of some 10,000 years.

Spectroscopic analysis shows each of the A, B, C components to be itself double. The A1 and A2 components of A are identical, each with a diameter of 3 million km and 12 times solar luminosity. They orbit one another at a mean separation of 6.5 million km with an orbital period of 9.2 days. The B1 and B2 components of B are also identical to one another, each with a diameter of 2.2m km and 6 times solar luminosity. They orbit one another at a mean separation of 5.0 million km with an orbital period of 2.9 days. The C1 and C2 components of C are two similar red dwarfs, with diameters 1.0 million and 1.1 million km. Each of the red dwarfs shines with a luminosity only 2.5% that of the Sun. They orbit one another at a mean separation of 2.5 million km with an orbital period of 19.5 hours.

The main A, B, C components are easily visible in a small telescope. The magnitudes are respectively 1.9, 2.9 and 9.1. The A, B components were widest (apastron) in 1880 at 6.5 arcsec, closest (periastron) in 1968 at 1.8 arcsec and are currently separated by 4.0 arcsec, a separation which is easily resolved in a small telescope. The C component is approximately 1.2 arcmin distant from the A/B components.

G D Cassini in 1678 was first to resolve the A/B components of Castor. J Bradley in March 1718 re-discovered the multiplicity of Castor. Astronomers noted the change in PA of the A/B components between 1719 and 1759: this led Sir William Herschel to conclude in 1803 that the components formed a system in which the stars are gravitationally linked. Castor was therefore the first physical binary to be identified as such, and the first object beyond our Solar System in which the force of gravity was shown to be operating.

**Pollux:** magnitude 1.2, distance 35 light years, approximately four times the diameter of the Sun and 35 times as bright. The Sun would appear as mag 5 star at the distance of Pollux. Note that Pollux lies close to the distance of standard magnitude (10 parsec) so its apparent & absolute magnitudes are similar. Pollux, although designated Beta Geminorum, is in fact slightly brighter than Castor, designated Alpha Geminorum. There are several faint stars close to Pollux, but none are physical doubles.

There is a pronounced colour difference between Castor and Pollux, clearly visible to the naked eye or in a simple time-exposure photograph: Castor is a white/bluish colour, while Pollux has a golden/orange hue.

## Double And Multiple Stars

Gemini contains a variety of double and multiple stars which provide varying degrees of challenge to the amateur observer. Table 1 lists the main details. The stars in table 1 are arranged in order of increasing difficulty, and the Tomline Refractor is suitable to

separate them all with the exception of Eta Gem, which is a challenge for a 300mm instrument.

Star	Magnitudes	Sep (")	Notes
Mu Gem	3.2, 9.4	122	Wide separation. Visible in binoculars.
Zeta Gem	3.8, 10.5, 8.0	87, 96	Wide separation. Visible in binoculars.
Epsilon Gem	3.0, 9.0	110	Wide separation. Visible in binoculars.
20 Gem	6.3, 6.9	20	Yellowish & bluish components – very pretty!
38 Gem	4.7, 7.7	5.2	White and white/yellow components
Castor	1.9, 2.9, 9.1	3.9, 70	Visible in small telescope
Kappa Gem	3.6, 8.1	7.1	Slightly easier than Delta Gem
Delta Gem	3.5, 8.2	5.8	Easier than Lambda, since magnitudes closer
Lambda Gem	3.6, 10.7	9.6	Test for 75mm telescope, but large difference in magnitudes
Eta Gem	3.3, 8.0	1.6	Difficult in 300mm telescope. Primary is variable. Companion discovered in 1881.

**Table 1. Double and multiple stars in Gemini.**

## Deep Sky Objects

The Milky Way runs through the West of Gemini: this results in the constellation containing a rich set of galactic clusters. However, the star clusters and deep sky objects in Gemini are in general difficult to observe from Ipswich, with exception of M35 and NGC2392. The problem is largely one of light pollution creating a background sky glow which offers poor contrast for faint, extended objects. The main deep sky objects accessible to the visual observer are as follows.

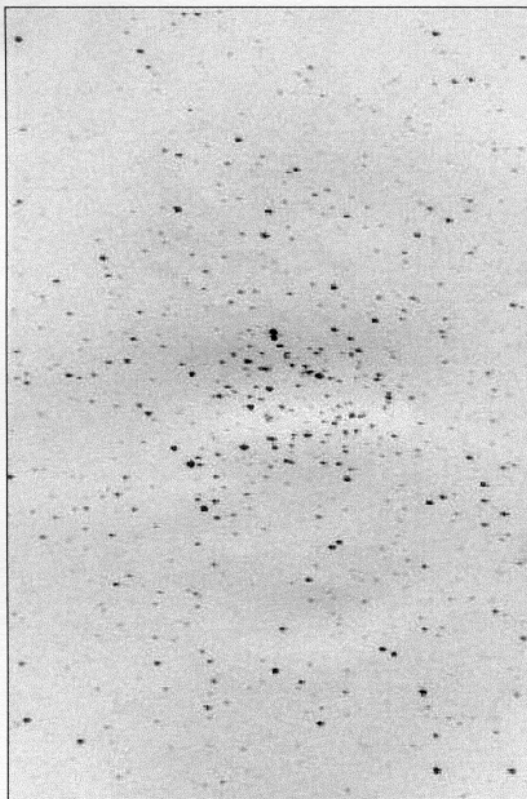
**M35:** a glorious galactic cluster, integrated magnitude 5.3, located 2.5° NW of Eta Gem. It has a visual diameter of 30 arcmin (similar to the Full Moon). M35 is visible to the naked eye on the clearest nights – I have seen it once with the naked eye from Ipswich (using averted vision to find it initially but then able to use direct vision once its precise location was known).

Messier included M35 in his catalogue in 1764, but he did not discover the object – it was known earlier, e.g. John Bevis showed it in his star catalogue in 1750. M35 is circa 2500 light years distant and has a diameter circa 30 light years. Lord Rosse (of Birr Castle, Ireland) counted 300 stars in M35 in the nineteenth century. However, he appeared to include some field stars, and a modern estimate for the number of stars in M35 is circa 150. The brightest star in the cluster is magnitude 7.5, and is 400 times



as luminous as the Sun. The Sun at the distance of M35 would shine at magnitude 14 – only just visible in Tomline Refractor!

M35 is easily visible in binoculars or a small telescope. Larger telescopes, up to circa 200-300mm instruments, give ever better views. Telescopes larger than about 300mm generally do not provide a field of view which enables the observer to appreciate the cluster in its entirety. M35 has something of a void at its centre, from which long streamers of stars lead out in all directions. Figure 3 is a negative image of M35 which shows well the central void and streamers.



*Figure 3. Negative image of M35.*

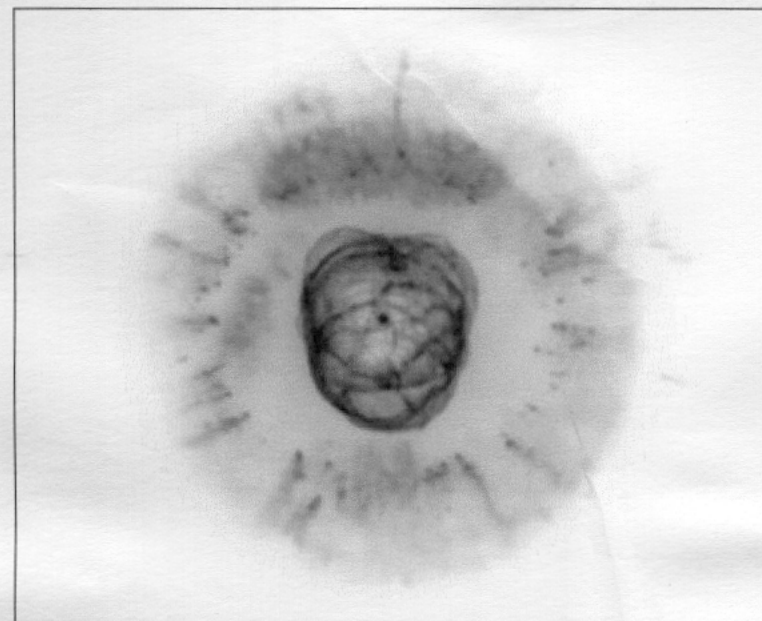
**NGC2158:** a discrete star cluster apparently entangled in the outer western streamers of M35. NGC2158 has integrated magnitude of 11; it is visible in a 150mm telescope as a faint blob, some 4 arcmin in diameter, but unfortunately is too faint to be visible in figure 3. NGC2158 contains circa 150 stars, the brightest shining at magnitude 16. It is circa 15,000 light years distant, lying on the outer rim of the galaxy. It would be a magnificent object if at same distance as M35. The Sun at the distance of NGC2158 would shine at a feeble magnitude 18, i.e. one of the faintest members of the cluster!

**NGC2392:** a small, bright planetary nebula lying midway between Kappa and Lambda Gem, discovered by William Herschel in 1787. It lies approximately 3000

light years distant and has a diameter of 0.6 light years. It appears as a magnitude 9.2 object circa 15 arcsec in diameter. NGC2392 shows good contrast against the background sky, and will stand a high magnification. A small telescope will show a bright disk (magnitude 8) standing out well against the background sky while a very large telescope will show detail within the nebula. The appearance of the object in large telescopes and some long-exposure photographs suggests the appearance of a face wrapped in a hood, so the object is sometimes referred to as the *Clown Face Nebula* or *Eskimo Nebula*

Note that a planetary nebula is nothing to do with a planet! Rather, it represents a late stage of evolution of a star of up to eight solar masses. The star develops into a giant star with a cool surface (could be as cool as 1000K or less) that is generally somewhat unstable and ejects mass. Mass ejection can continue until the remaining core star has a mass of only about 0.6 solar masses. The ejected gas is ionised by radiation from the compact, burnt-out stellar core at its centre – the radiation stimulates light emission, producing the so called planetary nebula. Planetary nebulae generally last for up to 50,000 years before fading & dispersing into the interstellar medium. The archetypal planetary nebula is M57, the *Ring Nebula*, in Lyra. The central star of NGC2392 is a magnitude 10 object, approximately 40 times the luminosity of the Sun. Its surface temperature is 40,000K.

Figure 4 shows a negative image of NGC2392 captured by the Hubble Space Telescope in January 2000. Analysis of this and other photographs shows that material in the nebula is receding from the core star at 100km/sec.



*Figure 4. Hubble Space Telescope negative image of NGC2392.*

Gemini also contains several fainter star clusters and planetary nebula, of which the most accessible are listed below. Consult *Burnham's Celestial Handbook* for positions and other details.

**NGC2420:** a cluster containing some 30 stars in the magnitude range 10-18 in a 5 arcmin diameter region.

**NGC2129:** a cluster containing some 50 stars, magnitudes 8-15 in a 5 arcmin diameter region, concentrated towards the centre. I counted 20 stars in this cluster on 24 Jan 2004.

**NGC2266:** a cluster containing some 75 stars of magnitude 11-15 in a 5 arcmin diameter region.

**IC443:** a very faint supernova remnant; not visible to the naked eye, needs a long exposure photograph.

**NGC2371/2:** an hourglass-shaped planetary nebula. Magnitude 12.5.

### Other Features Of Gemini

Gemini has several other key features, as follows.

**Geminid meteors:** the Geminid radiant is very close to Rho Gem. The Geminids are visible 07-15 December, with maximum on 13 December. ZHR 80. The shower has been fairly constant over the last century. The parent body is minor planet 3200, rather than a comet – so the meteor shower is relatively consistent. The Geminid meteors are medium speed, bright and leave few trains.

There is a report in an OASI newsletter of almost a quarter-century ago of a spectacular Geminid storm on the evening of 13 Dec 1980. Six OASI observers witnessed the storm outside the *Levington Ship* from 21:00 to 01:30. The observers counted 281 meteors, which equates to a rate considerably in excess of one per minute (allowing for breaks in the observing schedule – perhaps associated with the proximity of the *Ship*?) The count of meteors included two spectacular fireballs estimated at magnitude –5.

The ecliptic passes through Gemini, so the planets and Moon are occasionally visible in the constellation. Saturn is currently in Gemini, brighter than any of the stars. An occultation by Mars of Epsilon Gem occurred on 07 April 1976 – several UK observers reported a flickering of the starlight just before occultation, presumably due to the Martian atmosphere. There are no reports of members of OASI having observed this occultation.

### Gemini Observing Project

Gemini presents a magnificent spectacle and offers numerous interesting objects for the amateur to observe. I proposed an observing project in the February 2004 OASI Newsletter to encourage members of OASI to make observations of Gemini. I asked observers to forward their observations to me for collation. The project was linked

with the *Astronomy Workshop* on 04 February and the *Small Telescopes Observing Nights* on 16 February and 01 March. I asked observers to provide details of observations of Gemini as follows:

1. Naked eye observations: basic outline of constellation; comparison of Castor and Pollux and comparison of them with Saturn (currently in the constellation); attempt to find M35 visually.
2. Observing with binoculars: M35; NGC2392; widely spaced double stars Mu, Zeta and Epsilon Gem.
3. Observing with a telescope: M35; NGC2392; close double stars 20, 38, Alpha (Castor), Delta and Lambda Gem.

### Observers

A total of 11 members of OASI participated in the project and returned their observations to me. The following table lists the observers alphabetically.

Observer	Date	Observing Equipment
James Appleton	28 Dec & 24 Jan	Naked eye, 10x50 binoculars and 254mm Meade LX200 SCT
Alice Longhurst	22 Feb	Naked eye and 10x50 binoculars
Neil Morley	09 Feb (STON)	Naked eye, 10x50 binoculars and 250mm Dobsonian
Mike Nicholls	24 Jan	Naked eye, 10x50 binoculars and 200mm reflector
Paddy O'Sullivan	06 Feb & 09 Feb (STON)	Naked eye, 114mm reflector and 250mm Dobsonian
Pete Richards	?	Naked eye, 10x50 binoculars and 90mm Meade ETX-90 Maksutov-Cassegrain
Dave Robinson	25 Feb	Naked eye and 10x50 binoculars
Ted Sampson	25 Feb & 01 Mar (STON)	Naked eye and 125mm Meade ETX-125 Maksutov-Cassegrain.
Roy Tremlett	25 Feb	Naked eye and 8x30 binoculars
Harold Watters	29 Feb	Naked eye, 12x40 binoculars and 90mm Meade ETX-90 Maksutov-Cassegrain
Paul Whiting	15 Feb	Naked eye and 7x50 binoculars

**Table 2. Observers.**

Several observers collaborated at Orwell Park Observatory on the Small Telescopes Observing Nights (STON). At the STON on 09 February, Neil Morley, Paddy O'Sullivan and Gerry Pilling joined forces, while at the STON on 01 March seven members of OASI joined Ted Sampson to observe. The observers at the STON agreed that observing in a group in this way was much more rewarding than observing alone!

The observers spanned a range of ages and experience. All made their observations in and around Ipswich, with the exception of Paul Whiting who observed from Tiverton in Devon. Paul thereby maintained his record of *observation made furthest from Ipswich*, which he claimed in last year's Pleiades Observing Project, when he filed his observations from Woomera, South Australia!

The observers had to face the usual problems encountered by British astronomers, primarily light pollution and uncertain weather. Unfortunately, the weather during February was not kind to astronomers and it was not until the end of the month that many observers were able to make observations. By this time, the Moon was in Gemini, making observation of deep sky objects in the constellation very difficult.

### Naked Eye Observations

All eleven observers reported naked eye observations. The eleven were easily able to discern the outline of the constellation Gemini (this accords with the fact that the constellation is prominent, and has been recognised by mankind since ancient times).

Ten observers reported a pronounced colour difference between Castor and Pollux while one reported no discernible difference. Comments on the colour difference were as follows:

- Slight difference.
- Castor blue/white; Pollux orange.
- Castor bluish; Pollux yellowish.
- Castor slightly bluer and fainter; Pollux slightly orange.
- Castor bluish; Pollux orange tinge.
- Castor pale white/creamy; Pollux sandstone, brighter than Castor.
- Pollux slightly yellow/orange.
- Pollux slightly brighter than Castor. Pollux slightly orange, not as deep orange as Aldebaran or Betelgeuse. Castor white.
- No difference: both Castor and Pollux look white.

Ten observers reported discernible differences in magnitude between Saturn and Castor/Pollux. Observers' reports were as follows:

- Saturn much brighter than Castor/Pollux.
- Saturn twice as bright as Castor; Pollux half-way in between.
- Saturn brighter than Castor/Pollux and slightly yellowish.

- Saturn brighter than Pollux; Pollux in turn brighter than Castor. Saturn yellowish.
- Castor and Pollux similar in magnitude; Saturn a lot brighter.
- Saturn far more pronounced orange than Castor/Pollux.
- Saturn brighter than Pollux; Pollux in turn brighter than Castor. Saturn yellow.
- Saturn brighter than Castor/Pollux and tan/yellow.
- Saturn brighter than Pollux; Pollux in turn brighter than Castor. Saturn and Pollux a similar orange colour.
- Saturn much brighter than Castor/Pollux. Saturn yellowish, comparable to Capella.

Three naked eye observers reported seeing M35 for certain. One of the three reported needing averted vision to see the object. Another reported using averted vision to find the object, but once found being able to view it with direct vision. A fourth observer reported an uncertain observation of M35.

### Binocular Observations

Ten observers reported observations with binoculars (mostly 10x50, but also 8x30, 12x40 and 7x50).

Eight observers reported finding M35 in binoculars, while one reported being unable to locate the object due to moonlight interfering. Observers reported the following comments:

- An unexciting smear.
- A fuzzy blob.
- A misty patch.
- Large (possibly circa 30 arcmin diameter), faint object with slight hint of granularity.
- Visible (I think) with averted vision. Possibly triangular in shape.
- Hazy triangular shape.
- A fuzzy, featureless blob.

Only two observers were able to find NGC2392 with binoculars. They reported the following comments:

- A small, faint (difficult) object, definitely identified afterwards from Sky Atlas 2000.
- Very faint, hazy, no structure visible.

Six binocular observers reported being able to locate the wide double stars Mu, Zeta and Epsilon Gem; however only one observer was able to split the doubles, reporting this as *quite easy*.



Six binocular observers reported sweeping through the dense star fields at the western edge of Gemini. They reported the following comments:

- Many stars visible.
- Much greater density of stars than in the rest of Gemini.
- Spectacular – full of stars!
- Milky Way as spectacular as ever.
- Rich star fields evident despite strong moonlight.
- Very rich, patchy bright clumps of stars.

Another three observers reported strong moonlight and/or light pollution preventing them from making effective observations of the western edge of Gemini.

### Telescopic Observations

Six observers reported observations with telescopes.

Five telescopic observers reported observations of M35. Their comments were as follows:

- Open cluster.
- Open cluster with a number of strings of stars.
- Star cluster.
- Saw only a section of it in the eyepiece (Tomline Refractor and 250mm Dobsonian) – beautiful sight.
- Central void plus streamers visible – spectacular! NGC2158 very difficult to find, visible at the edge of M35.

The planetary nebula NGC2392 is a more difficult object than M35, and only one observer reported positively being able to find it, with one other observer reporting an uncertain observation. The observers' comments were as follows:

- I think that I found it - just a streak of nebulosity.
- Central star of NGC2392 clearly visible as a sharp point, surrounded by two rings of nebulosity – the inner ring brighter than the outer.

Three observers commented on moonlight interfering with their attempts to find NGC2392.

One telescopic observer reported splitting the wide double stars Mu, Zeta and Epsilon Gem.

Five telescopic observers reported finding and splitting some or all of the close double stars 20, 38, Alpha (Castor), Delta and Lambda Gem. Two of the five observers reported successfully observing all five close double stars. Three of the five observers reported being able to split Castor into its components, although one of the three was able to split only the wide components (A/B from C) but not the much closer components (A from B). Three of the five observers were able to split Lambda Gem,

but reported that this was difficult because of the large difference in the magnitudes of its components.

### Conclusion

Several members of OASI commented that they find observing projects useful in terms of encouraging them to undertake observations in the first place and subsequently in guiding them as to what to observe. I'm willing to help to get future observing projects off the ground. However, organising an observing project involves a considerable amount of work: initial research; observation of the objects to confirm the reality (or otherwise!) of the textbook descriptions; presentation to the Astronomy Workshop; preparation of observing forms; and analysis and dissemination of observations. I'm therefore keen to collaborate with other members of OASI to organise future projects. If any member of OASI would like to help with this, please contact me!

Finally I should say a big *thank you* to the observers who undertook this project.

James Appleton  
09 April 2004

## Summary of Committee Meeting Held 2004 March 06

**PRESENT:** Ken Goward, Monica Lustig, Pete Richards, Nicky Gillard, Martin Cook, Roy Gooding, Neil Morley, Ted Sampson, James Appleton

**APOLOGIES:** Mike Whybray, Garry Coleman, Paul Whiting, Eric Sims

### CHAIRMAN'S REPORT – KEN GOWARD

Following the meeting with Orwell Park School on 28 November 2003, Ken had received a letter dated 14 Jan 2004 the main points of which were as follows:

- School governors are keen to visit the Observatory 12 March following their meeting.
- The School continues to cover OASI's normal insurance risks via its insurance policy.

- The School is reviewing access arrangements and will advise OASI on any changes.
- Lucy Pembroke (Orwell Park School) will contact OASI re partnership arrangements for possible joint activities.
- The School accepts that OASI needs to continue with access to the rooms at the foot of the lift shaft.
- The School will consider what can be done to reduce glare from their security lights.

The committee warmly welcomed the new committee members elected at the 2004 AGM, Monica Lustig and Neil Morley.

Areas of responsibility for the 2004 committee are as follows:

Ken Goward	Chairman	Press Publicity with the Secretary. Open Weekend.
Roy Gooding	Secretary	Main point of Society Contact. Press Publicity with the Chairman. Observatory Decoration. Visits by potential new members.
Garry Coleman	Treasurer	Finance. Supervision of Grant Applications.
James Appleton	Committee	Committee Meeting Minutes. Web site.
Martin Cook	Committee	Membership. Tomline Refractor Maintenance.
Neil Morley	Committee	Equipment Curator.
Ted Sampson	Committee	Workshops. Tomline Refractor tutoring.
Eric Sims	Committee	Newsletter.
Mike Whybray	Committee	Librarian.
Paul Whiting	Committee	Visits by outside groups.
Monica Lustig	Committee	Safety & Security
Peter Richards	Working under Committee direction but not Co-opted	Lecture Meetings.

## SECRETARY'S REPORT – ROY GOODING

Roy continues to receive several enquiries each month by prospective new members of OASI.

Recently, Roy hosted a visit to Orwell Park by reporters from *Lets Talk* (a local magazine).

Thurrock Astronomical Society (TAS) contacted Roy regarding a potential visit – it is booked for Sat 03 April. 13 members of TAS are expected to attend. Roy will arrange a meal in the *Shepherd & Dog* then a visit to the Observatory.

## TREASURER'S REPORT – GARRY COLEMAN

Garry was not present at the meeting but submitted a report in advance. Finances are in general terms healthy, with an account balance of £2385.

Following informal discussion about possible ways of restructuring membership fees, the committee failed to reach a consensus for action and the existing structure will be retained.

## MEMBERSHIP – MARTIN COOK

OASI currently has 93 members including 8 honoraries. 27 members from last year have not renewed.

## TRAINING AND WORKSHOPS - TED SAMPSON

Ted has held six Astronomy Workshops so far in the 2003-04 session, with two more to go. Typically 20 members of OASI attend each workshop. Ted will ask for volunteers to lead another series of workshops next season. The committee unanimously agreed a vote of thanks to Ted for organising the workshops – they provide a very valuable “outreach” activity for OASI.

Four members of OASI are currently undergoing training in the use of the Tomline Refractor. They are at the stage of “supervised practice”, working with the Observing Director and a Tester. The committee authorised Ted to recruit an additional experienced member of OASI to act as a Tester, to work alongside the existing Testers Dave Payne, Garry Coleman and Martin Cook.

## NEWSLETTER – ERIC SIMS

Ken will produce a further update to the back page of the OASI Newsletter

## **WEB SITE – JAMES APPLETON**

James is continuing to extract material from the OASI Archives for the Web site. James also intends to scan electronically the entire Newsletter archive as .gif files and store on CD-ROM for the benefit of any member who wants a copy.

As always, fresh material for the Web site is most welcome.

The Web site is accessible at <http://www.ast.cam.ac.uk/~ipswich>.

## **EQUIPMENT & MAINTENANCE – NEIL MORLEY**

Neil Morley took over as Equipment Curator from Paddy O’Sullivan at the 2004 AGM. The committee unanimously expressed appreciation of the work done by Paddy O’Sullivan last year on equipment & maintenance.

The front has come off the eyepiece storage drawer in the Computer Room. Neil will investigate options for repair.

The dome shutter proved very stiff when being shut recently, although subsequent operation did not repeat the problem. Neil & Martin Cook will investigate.

Neil will investigate fitting a finder on the 4.5” reflector (constructed by Mike Harlow).

Neil will investigate the price of collimation tools which could be used to align the Millennium Telescope and also for general use by members of OASI.

The committee agreed to dispose of the old library cabinet before the Open Weekend (27-28 March).

## **SECURITY & SAFETY – MONICA LUSTIG**

With health and safety matters highlighted by the recent fall on the Observatory premises of a member of OASI, Monica carried out a brief inspection of the internal space of Orwell Park over which the Society has control. She will instigate regular inspections and will create a standard reporting form for such purposes.

Monica will introduce a COSHH manual for Orwell Park. This will be a simple collection of data sheets for each hazardous substance brought to the Observatory for maintenance or any other purpose. Anyone purchasing such a substance for use in the Observatory should ask for the appropriate datasheet when purchasing the goods and place the latter in the COSHH manual.

The floodlamp which illuminates the dome internally gets extremely hot and could injure someone. The committee agreed a policy to use the dome floodlamp only for maintenance and emergency purposes, and specifically not for visits.

There are currently several unlabelled bottles stored in the observatory. Neil Morley and Ken Goward will investigate and make them safe.

Ted Sampson raised concerns about the safety of access to the new mezzanine floor. The committee will discuss this at a subsequent meeting.

Orwell Park School will be examining the issue of a handrail for the spiral staircase as part of overall consideration of the state of the fabric of the Observatory Tower.

## **LIBRARY – MIKE WHYBRAY**

Ken will re-start work on renovation of the Observatory library on Wednesday 10 March. Renovations need to be complete by Fri 14 May, in time for the official opening.

Peter Hingley, RAS Librarian, is visiting OASI on Fri 14 May to lecture on *Transits of Venus*. Peter will open the refurbished Observatory library on Sat 15 May – the press has been invited.

## **VISITS – PAUL WHITING**

No report.

## **LECTURES – PETE RICHARDS**

Pete has arranged a lecture by Nik Szymanek for 22 October 2004. Nik will talk on observations from Mauna Kea.

Pete hopes to arrange a members lecture night later in the year. He will also investigate whether it is possible to arrange an external speaker to talk about the Cassini mission (reaches Saturn in mid-2004).

At the AGM there was discussion of alternative venues to Fonnereau Road (which has problems with parking). Peter will ask members of OASI for suggestions for alternative venues.

## **OBSERVING STRATEGY**

James Appleton has received 11 returns to his Gemini Observing Project. James hopes to report on the project in the Newsletter soon.

The committee agreed that such projects were useful. James will canvass for ideas for future projects in the Newsletter.

## **DARK SKIES**

Pete Richards has organised a petition against the *East Light* submission to the Landmark East project. East Light threatens to hugely increase light pollution in East Anglia. Members of OASI and visitors are encouraged to sign the petition.

## OASI EVENTS

Roy Gooding will try to arrange a visit to Breckland AS.

## OPEN WEEKEND

The Open Weekend will be held Saturday – Sunday, 27 – 28 March 2004. On display will be: first quarter Moon, Mercury, Venus, Mars, Jupiter and Saturn (weather permitting). The event will be relatively low key this year, and visitors will be restricted to the Observatory Tower and field at the rear of the School. The reception desk will be at the entrance to the Observatory Tower (on the landing).

The committee agreed not to hold an outing in 2004, and instead to concentrate on the summer BBQ.

Following the success of the 2003 Xmas meal, the 2004 Xmas meal will probably be at the Red Lion, Martlesham, again.

## AOB

The committee will discuss the role of Observing Directors at its next meeting.

## DATE OF NEXT MEETING

Saturday 05 June 2004 starting at 7:30pm. All members of OASI are invited to attend.

## FURTHER INFORMATION

Full minutes of all committee meetings are posted on the noticeboard in Orwell Park Observatory. Please contact any member of the committee if you require any further information about the above committee meeting or any other aspect of the running of OASI.

James Appleton

2004 March 14

## VENUS IN TRANSIT – AND A SHORT LIVED GENIUS

After a gap of 122 years since the last such spectacle as seen from Earth, the planet Venus will cross (Transit) the disk of the Sun on 2004 Tuesday 8<sup>th</sup> June. The phenomena will be visible from Suffolk for most of the morning and our Observatory will be open to members for the whole of the Transit period. A very rare event to look forward to and it is a sobering thought that nobody alive in the world today has ever observed a Transit of Venus (ToV). The next Transit will take place in 2012 and not again for another 122 years thereafter, so if we are clouded out – *we'll have time to get it right for those occasions!*

More details will appear in the next newsletter but, for now, let us look at a young Lancashire man who secured his place in Astronomical history by predicting a ToV and then making the first ever-scientific observation of the phenomena.

Jeremiah Horrocks (Horrox, as he later signed himself) lived from around 1619 (his exact birth date is unclear) until 1641 and within his all-too short life span made an indelible mark on the science of Astronomy and of whom even the irascible Sir Isaac Newton was to credit for his contribution. He was born in Toxteth, Liverpool of a farming and watch making ancestral background, which gave his family a reasonable standing locally. Little is known of his education, but we do know that he entered Emmanuel College, Cambridge as a Sizar (Poor working/servant student) at the age of 13. Horrocks' evident Mathematical ability was largely unsatisfied by the regime at Emmanuel and in his own time he became well read of the movement away from Ptolemaic astronomy through the works of Continental thinkers such as Copernicus, Tycho Brahe, Kepler, Galileo and others. Tycho Brahe's observations and Kepler's subsequent refinement of Tycho's work he held in especially high esteem. In 1635 at age 16 he left Emmanuel without taking a degree, which is not to say that he 'dropped out' – merely that he had acquired a broad knowledge base and that he did not require formal qualifications. Moreover, in those days there was a financial obligation to the College in the taking of a formal degree those Sizar students like Horrocks would not have been able to meet.

Back home at Toxteth, Horrocks began to correspond (a correspondence that was to last the whole of the few remaining years of his life) with a self-educated Manchester based clothing trader, William Crabtree (1610 – 1644), who shared Horrocks' interest in the work of the aforementioned European scientists. At the time the astronomical ephemerides most commonly in use were the tables of Belgian mathematician, Philip Lansberg, but both Horrocks and Crabtree had begun to realise there were many errors in the tables when compared to their observations of the planets. They were much in awe of Kepler's discovery of the elliptical nature of the orbit of Mars and Horrocks was spurred on to try and crack the enigma of the erratic nature of the Moon's orbit around Earth. Eventually he suggested that the Sun caused perturbations in the Moon's orbit and correctly described its elliptical nature, work (as already touched upon) that would later be mentioned by Newton when he formulated his gravitational theories. Other work, discussed in correspondence with Crabtree, included the study of planetary

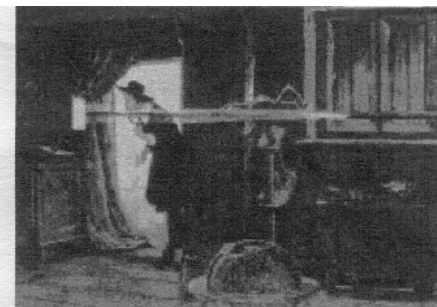
motions – particularly Jupiter and Saturn. That Comets moved in elliptical orbits and were natural objects – not harbingers of doom, as expounded by astrologers! He also tried to measure the diameters of stars using measured different sized pinholes in cardboard to frame them. By those methods, both men came to realise that there was no satisfactory way to measure the apparent diameters as stars were but points of light. Confirmation came to them in 1637 when they jointly observed a lunar occultation of the Pleiades, they realised the starlight was snuffed out instantaneously.

A change in Horrocks' domestic circumstances came in 1639, when he went to live in the village of Hoole, a few miles NW of Preston for a year or so. Folklore has it that Horrocks was appointed Curate there, but no evidence exists to substantiate that notion and Victorian 'sanitization' of popular historic figures probably accounts for this.

Kepler had predicted transits of Venus for 1631 and again in 1761. However, the 1631 event would not be visible from Europe and was consequently unobserved. Horrocks, after studying the positions of Venus in the sky and comparing them with the previously mentioned tables, came to realise a mistake in Kepler's calculations insofar as transits of Venus come in pairs separated by an eight year gap – and consequently another transit would occur that year (1639). His realisation came barely a month before the event and he hastily despatched a letter to Crabtree, telling him of his discovery and imploring him to observe the Sun on the predicted date (24<sup>th</sup> November).

1639 24<sup>th</sup> November was a Sunday and Horrocks was much engaged in the rituals of Sunday worship (he is thought to have either been or at least have had puritanical leanings – but not ordained), although he was able to spend over four hours observing. He had purchased a small telescope (likely a refractor of around 2") and set up an arrangement whereby the telescope projected the Sun's image into a darkened room and onto a 6" diameter circle on paper, upon which he had carefully marked all 360°. He saw nothing until about half an hour before sunset and then had the supreme moment of triumph when he saw a jet black, albeit relatively tiny to the Sun's diameter, disk of Venus. In the next half hour he made three very careful measurements and was later able to calculate the ingress and egress of the transit, the radial velocity of Venus and by trigonometry, arrive at value for the distance of the Sun from the Earth. Crabtree, meanwhile, was horribly clouded out further south near Manchester, but just before sunset the clouds parted sufficiently for him to discern, in a state of great excitement, the disk of Venus on his projected image of the Sun. His joy was articulated thus; "*rap't in contemplation he stood, motionless, scarce trusting his senses, through excess of joy*"<sup>1</sup> Horrocks had observed a phenomena never previously seen and Crabtree was able to verify the discovery, which could not again be witnessed for 122 years.

For some weeks following the transit, Horrocks made meticulous measurements of the angle of separation of Venus from the Sun in the pre dawn sky and subsequently wrote a treatise on his observations entitled VENUS IN SOL VISA (Venus in Transit Across the Sun) but it was not published for another 23 years – and then by the Danzig Astronomer, Johannes Hevelius, who had somehow come by the manuscript. One might observe that nothing changes – British achievement left unsung until foreign hands become involved!



A popular image of Horrocks observing the transit, although much embellished by Victorian sentiment. Horrocks is depicted 'wearing the cloth'. No actual portrait of him is known to exist.

Horrocks died suddenly in 1641, January 3<sup>rd</sup> at the unbelievably young age of 22 years, but we do not know the cause of his death. Crabtree, too, died young at 34 years in July 1644.

An outstanding achievement by any measure and Horrocks' half hour observation of Venus against the Sun's disk surely ranks as one of the seminal moments in Britain's Astronomical history.

Further information on next month's event will hopefully appear within the June edition of this newsletter and the BBC's June Sky at Night programme will be devoted to the ToV with our Hon. President Professor Allan Chapman, as Sir Patrick Moore's guest. Don't forget, too, the **OASI lecture meeting at the Friends Meeting House, Fonnereau Road, Ipswich on Friday 14<sup>th</sup> May (8PM) at which RAS Librarian Peter Hingley will present a fascinating insight into Venus Transits past and to come...**

Kenneth J Goward FRAS

#### Sources:

- Jeremiah Horrocks, the Transit of Venus, and the New Astronomy in early 17<sup>th</sup> century England. Allan Chapman. Quarterly Journal of the RAS, (1990) 31. 333-337.
- Three North Country Astronomers. Allan Chapman. Published by Neil Richardson 1982.
- Transit. When Planets Cross the Sun. Michael Maunder & Sir Patrick Moore. Published by Springer Verlag 1999 – **AVAILABLE FROM THE OASI LIBRARY.**
- Notes on Jeremiah Horrocks, University of Central Lancashire [www.uclan.ac.uk/facs/science/physatr/misc/horrocks.html](http://www.uclan.ac.uk/facs/science/physatr/misc/horrocks.html)
- Course notes from the History of Astronomy Diploma Course, University of Central Lancashire.

<sup>1</sup> Quoted in Allan Chapman's 'Three North Country Astronomers' page 13

**OASI COMMITTEE RESPONSIBILITIES**

Kenneth J Goward	Chairman	Press Publicity with the Secretary. Open Weekend.
Roy Gooding	Secretary	Main point of Society Contact. Press Publicity with the Chairman. Observatory Decoration. Visits by potential new members.
Garry Coleman	Treasurer	Finance. Supervision of Grant Applications.
James Appleton	Committee	Committee Meeting Minutes. Web sites.
Martin Cook	Committee	Membership. Tomline Refractor Maintenance.
Neil Morley	Committee	Equipment Curator.
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Eric Sims	Committee	Newsletter
Mike Whybray	Committee	Librarian.
Paul Whiting	Committee	Visits by outside groups.
Monica Lustig	Committee	Safety & Security
Peter Richards	Working under Committee direction but not Co-opted	Lecture meetings.

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**DIARY FOR 2004 MAY**

<b>WEDNESDAY</b>	<p style="text-align: center;"><b>OBSERVATORY CLUB NIGHTS</b> 5<sup>th</sup> 12<sup>th</sup> 19<sup>th</sup> 26<sup>th</sup> from 8pm ☎ Martin Cook</p> <p style="text-align: center;"><b>ASTRONOMY WORKSHOP</b> 5<sup>th</sup> Commencing 7.45pm Science Classroom <b>THE RADIO UNIVERSE - A LOOK AT RADIO ASTRONOMY</b> By Paul Whiting FRAS ☎ Ted Sampson</p>
<b>FRIDAY</b>	<p style="text-align: center;"><b>LECTURE MEETING</b> 14<sup>th</sup> 8pm Friends meeting House, Fonnereau Road, Ipswich. <b>'TRANSITS OF VENUS'</b> By Peter Hingley ☎ Ken Goward</p>
<b>SATURDAY</b> 15 <sup>th</sup>	<p style="text-align: center;"><b>FORMAL OPENING OF THE OASI LIBRARY</b> 11.45am Gather in Observatory for light refreshments. 12.30pm Peter Hingley will formally open the Library and dedicate the room in John Isaac Plummer's memory. 12.45pm Peter will then present a lecture in the school Music Room; <b>'ASTRONOMERS AND ODDITIES, THE TREASURES OF THE ROYAL ASTRONOMICAL SOCIETY LIBRARY'</b> ☎ Ken Goward</p>

**SOCIETY PRIMARY CONTACTS**

CHAIRMAN Kenneth J Goward FRAS ☎ (daytime & evenings)  
 SECRETARY Roy Gooding ☎ (daytime) (evenings)  
 E-MAIL QUERIES [ipswich@ast.cam.ac.uk](mailto:ipswich@ast.cam.ac.uk)  
 WEB SITE [www.ast.cam.ac.uk/~ipswich](http://www.ast.cam.ac.uk/~ipswich)  
 Contact details for the full Committee may be found on the inside back page

Registered Charity No 271313  
 Society Trustees  
 Roy Adams David Brown David Payne  
 Hon President  
 Professor Allan Chapman D.Phil MA FRAS

*NB. Small Telescope Observing Nights (STONs) and visits by outside groups will recommence in the autumn. Occasional stons may be organised on an Ad Hoc basis.*

**All members are welcome to come to the Library Opening & Lectures!**