ORWELL ASTRONOMICAL SOCIETY IPSWICH

Charity No 271313

AUGUST 1999

Society News

1 Next Committee Meeting

The next committee meeting will be held on Saturday 18th September from 19:30 in the clubroom. As usual this is an open meeting and any one who is interested is invited to attend.

2 Observatory Decorating

The observatory stair well walls have been given a first coat of paint. This is a lengthy process, and as much help as possible would be appreciated. So far all painting has been done on a Wednesday evening. If you are able to help please come along and give a hand.

Events for 1999

Event	Details	Date
Eclipse	Members to make own arrangements	11th August
Astro Camp	Mid August	
Lecture meeting	Eclipse results Friends Meeting House 20:00	10th September
Summer Excursion	Will be to Greenwich. Names to Roy Gooding as soon as possible, to enable a suitable sized coach can be booked	11th September
Leighton Sky Camp	Phone Mike Cook [redacted] Venue is near Thetford	10th to 19th September
FAS meeting Cambridge		2nd October
Open Weekend	To be arranged	16th 17th October
Christmas Meal	To be arranged	8th December

Other events will be added to this list throughout the year

Other Telescopes Night

Due to members being away observing the eclipse, there will be no Monday opening of the observatory for the above night in August. The next opening will therefore be on Monday September 13th from 7.30 p.m.

Night Sky

All times GMT

Sun

The sun will be rising approximately between 04:20 to 05:20
The sun will be setting approximately between 20:00 to 19:00

Moon

3rd Quarter	New Moon	1st Quarter	Full Moon
4th	11th	19th	27th

Mercury Mercury will be at greatest western elongation on the 14th (19 °). By mid month it can be seen low down in the morning twilight

Venus Venus will be at inferior conjunction on the 20th. It will be very low in the morning sky at the end of the month.

Mars Mars will be setting at 21:00 by the middle of the month.

Jupiter Jupiter will be rising by 21:30 in mid month. Magnitude –2.6

Saturn Saturn will be rising at 22:00 in mid month. Magnitude 0.2

Uranus Uranus will be at opposition on the 7th. Uranus will be setting at 03:30 in mid month. Magnitude 5.7

Neptune Neptune will be setting at 02:30 in mid month. Magnitude 7.8

Meteor Showers

Shower	Maximum	Limits	ZHR
α Cygnids	July 21st to August. 21st	July to August	5
Capricornids	July 8th July 15th July 26th	July to August	5
δ Aquards	July 29th August6th	July 15th to August 20th	20 10
α Capricornids	August 2nd	July 15th to August 20th	5
ι Aquarids	August 6th	July to August	8
Perseids	August 13th	July 23rd to August 20th	80

Meteor source is the BAA Handbook

Roy Gooding

How new is new?

After nearly three years of interest in the wonderful subject, and almost two years a member of the society, how long can a person continue to think and say they are "new to astronomy"? Maybe the answer has something to do with the frequency a person is required to revise and re-think previous knowledge.

The moon for example is one sky objects familiar to all. But it was not until it was necessary to check its phase to see if it was going to be around for the first other telescopes night on April 19th, that a revision of my previously held understanding was required. Probably everyone knows this, but it came to my notice that in any one lunar month, the amount of time the moon is above the horizon from rise to set, varies widely between approximately fifteen hours at max, and eight hours at minimum. Also the max and min occur at different phases in a gradual change throughout the year. Equally well known probably, is the fact that the moon is not conveniently available for viewing in sociable hours throughout its cycle. When new, day one, it is not visible at all, as it lies directly between earth and sun, and its side towards the earth is dark. During the first few days up towards first quarter, it can be seen in the west in the evening, setting about an hour after the sun, and progressively later by the day.But it can be seen during the day, with difficulty on days two and three, and is available for between eight and fifteen hours, according to the season as described earlier.A full moon lies due south at midnight, and is above the horizon in equal time before and after. During the last quarter of the cycle you need to stay up late to catch its rise, but can spend up to approx midday the following day viewing it.

Being now aware of the inconvenience of its appearances for the observer, it seemed reasonable to try and construct a device to predict, if only approximately, the times of its rise and set throughout any one cycle. After several hours of cutting out of paper, circular shapes and pointers, calibrating the circles, and connecting them with pins and clips to rotate as required, a "moonisphere" mark 1 was created.

At the most recent other telescopes night on June 21st, as it was cloudy, a discussion of the movement and appearance times of the moon took place, using information from the BAA handbook, and from the astronomy press. Graphs were drawn to represent the differing periods throughout the year when the moon is above the horizon, and a consensus was reached that the variation in appearance time was probably due to the five degrees difference in the moons orbital plane to that of the earth. The "moonisphere" was

given its first public showing. Meanwhile, one member of the company had found in our library a copy of 'Practical Astronomy' by W. Schroder published in 1955, which was described as "a new approach to an old science" In chapter 12 covering the movement of the moon, was a description of with pictures, a device made of different sized circles which could be rotated around a central pivot.Its function was to predict the moon's phase and position on any day of its cycle throughout the year. Not called a "Moonisphere", but a "Volvelle",and invented around1600A.D.When considering later the possibility of having, as a subject for one of the next workshops, the movement of the moon, it was thought that constructing a "moonisphere" might be of interest. One member of the group helpfully suggested that it would then be possible for the presenter to say,"Here is one I made 400 years earlier". Ted Sampson.

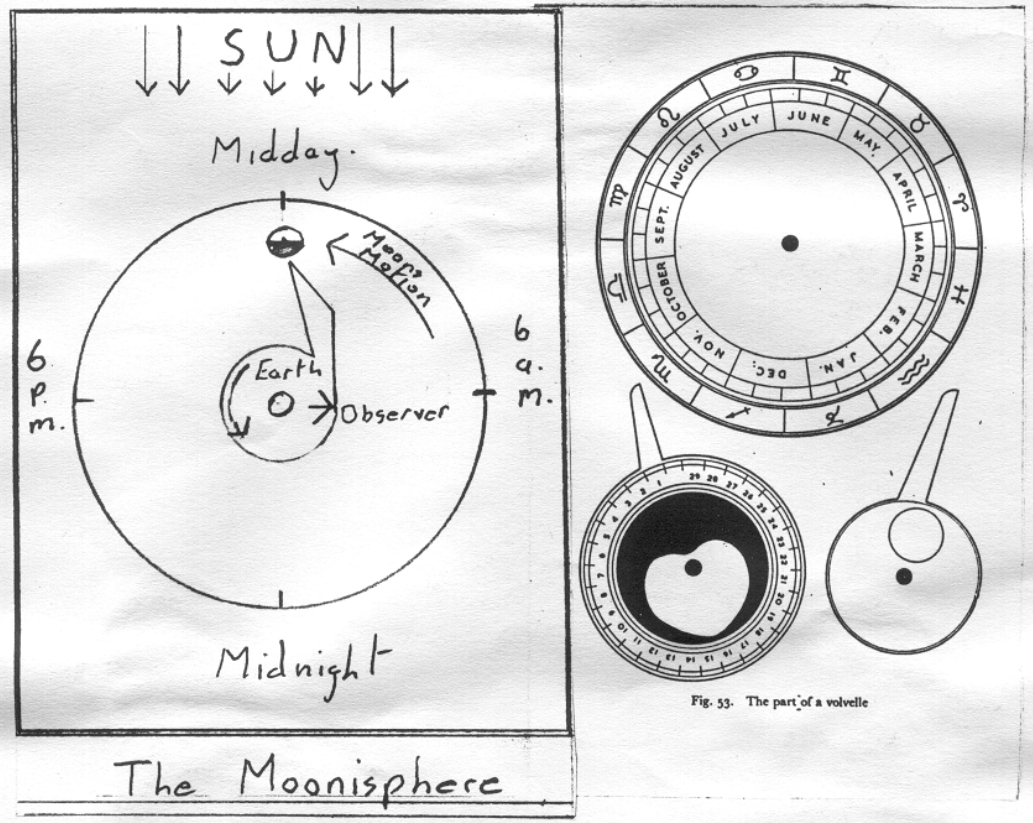


Fig. 53. The part of a volvelle

Long Ago and Far Away.....

"*How far can you see with your telescope?*". Most amateur astronomers have been asked this question at one time or another. I've been asked the question several times. It's always difficult to give a reply which captures the true extent of the astronomical distance scale and avoids being, well, glib.

Dr Frank Flynn, in his lecture to OASI in April, gave an approach to the question of distances in astronomy. Frank's approach was to divide the universe into four zones of increasing distance from the earth, and to use a different unit in each zone.

Zone 1 comprises the domain of familiar things on the earth. It contains all the objects that we deal with in everyday life. The moon is the furthest object in the universe that humans have yet been able to set foot on, and it therefore defines the natural limit of this zone. The familiar units of metres and kilometres are adequate to measure objects within zone 1. In these units, the moon lies at a mean distance of some 350,000 km from the earth.

Figure 1 is a seminal image from zone 1. It is the first good image of the earth and moon taken together from the vicinity of the moon. Lunar Orbiter 1 obtained the image on 23rd August 1966, at 16:36 UT, while approaching the crater Pasteur (centre image)[¶] . The image shows a crescent Earth, some 380,000km distant, with sunset terminator running through Odessa, Istanbul and slightly west of Capetown.

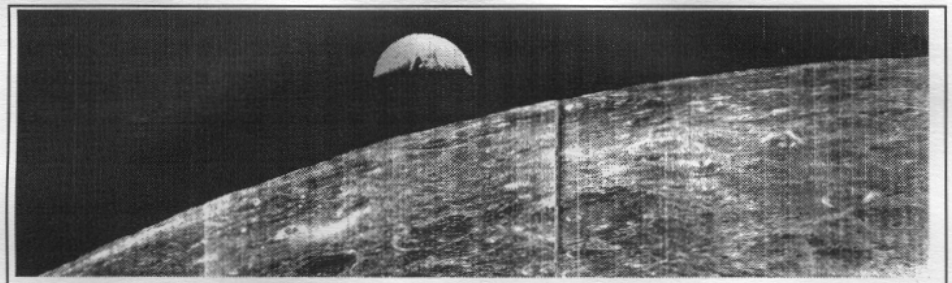


Figure 1. First ever view of the earth seen from the vicinity of the moon.

The Solar System represents zone 2. Within this zone, the appropriate measure of distance is the astronomical unit or AU. One AU is the mean

[¶] The high angle of the sun in figure 1 makes it difficult to discern particular craters.

distance between the earth and sun, or approximately 150 million km (149,597,870.66 km to be precise). Venus is the nearest planet to earth within the solar system, and at closest approach has a distance of some 0.26AU. Mars, the next nearest planet, can approach to within 0.38AU of earth. Pluto, the most distant planet of the solar system, has a mean distance from the earth of 39.5AU, and a distance of only 38.4AU at closest approach. However, Pluto lies at the edge of the solar system, where orbits are very lengthy, and although the last closest approach occurred in 1974, the next will not occur for another 248 years! Within the scale of zone 2, the earth-moon distance (limits of zone 1) is reduced to an insignificant dot in comparison.

Figure 2 illustrates Venus, Mars and Pluto. The Galileo probe took the image of Venus from a distance of 0.015AU on 14th Feb 1990 - it is based primarily on ultra-violet wavelengths, enhanced to show features in the cloud deck. The Hubble Space Telescope (HST) took the image of Mars on 25th February 1995 at a distance of 0.69AU. The dark "shark's fin" feature left of centre is Syrtis Major. The North polar cap is to the top of the image. The HST took the image of Pluto on June 1994. It is the first image to allow resolution of features on the planet's surface. The variations in brightness may be due to topographic features, surface composition, frost layers or interactions with Pluto's nitrogen-methane atmosphere.

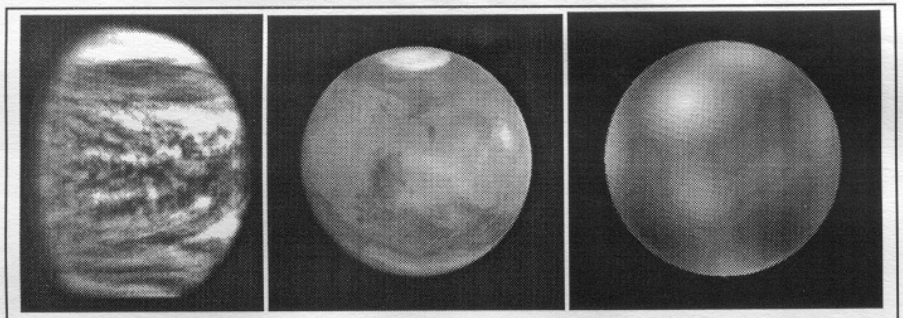


Figure 2: Venus, Mars and Pluto (in that order, left to right).

Zone 3 is the next zone outwards. This zone encompasses the local galactic group. The local group comprises our own galaxy, the Milky Way, together with some 35 other galaxies. In zone 3, the unit of measurement is the distance that light travels in a year, the light year, or approximately 10 million million km (10,000,000,000,000 km).

The closest galaxies in the local group, and also the smallest, are the Magellanic clouds (visible from the Southern hemisphere), at a distance of

almost 200,000 light years. The largest member of the group is the Andromeda galaxy, visible to the naked eye as a small fuzzy patch of light: it lies at a distance of 2.2 million light years. The most distant member of the group is the galaxy M33 in Triangulum, visible in small telscopes, lying at a distance of almost 3 million light years. Figure 3 illustrates these members of the local group.

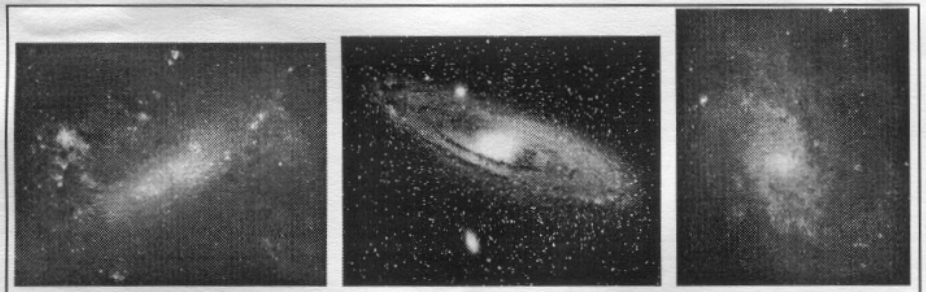


Fig 3. The LMC, M31 and M33.

Zone 4, the final and largest zone, encompasses all of the universe outside the local galactic group. In this zone, the unit of measurement used by cosmologists is the megaparsec or Mpc. One Mpc is equivalent to approximately 3.26 million light years, or 32,600,000,000,000,000,000 km. Zone 4 contains all the galaxies, matter and objects outside the local group. The nearer of these objects are visible in small telescopes - one good example is the giant elliptical galaxy M87 in Virgo, lying at a distance of 20 Mpc (see figure 4). M87 is a member of the famous Virgo group of galaxies. It has a mass of some 10 million million times that of the sun, and is noteable in that it is surrounded by some 100,000 globular clusters.

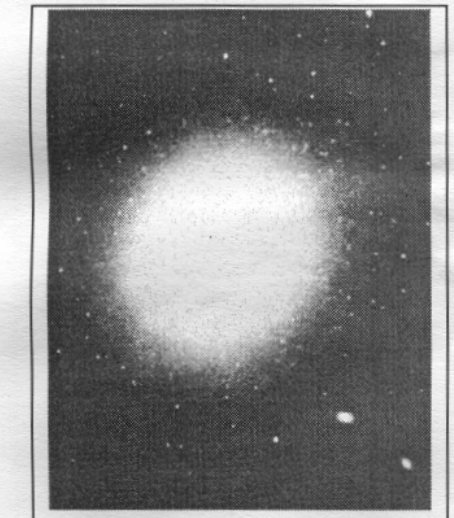


Fig 4. The giant galaxy M87.

Well then, given all the above background, what's the answer to our original question - *how far can you see with your telescope?* Zone 4 contains the furthest objects that we can

see. Within zone 4, the furthest objects themselves are the enigmatic quasars[†].

Radio astronomers discovered quasars in 1960. Early radio maps of the sky were not very accurate, so it was not possible to find the optical counterparts immediately. When, eventually, astronomers did find the optical counterparts of the first quasars, they appeared as unimpressive faint "stars". However, the optical spectra of the first quasars appeared anomalous. In 1963, Maarten Schmidt at Palomar observatory was able to identify and analyse the spectrum of the quasar designated 3C273 (object 273 in the *Third Cambridge Catalogue*); the spectrum showed a large redshift, implying that the object was extremely remote. The spectra of other quasars could also be interpreted in terms of large redshifts.

In fact, 3C273 exhibits a redshift of 16%, implying a velocity of recession of 15% of the speed of light and a distance of 600 Mpc. Telescopically, 3C273 appears as a faint "star" of magnitude 12.9. In order to explain its apparent brightness given its vast distance, 3C273 must emit as much light as 300 giant galaxies, or 30 million million suns.

The only object capable of generating such prodigous amounts of energy is a black hole. Current theories suggest that the nucleus of a quasar consists of a supermassive black hole (with mass equivalent to 1,000,000,000 suns). Matter spiralling into the black hole emits energy over a wide spectrum, which can include radio emissions and visual wavelengths.

At magnitude 12.9, 3C273 is within range of the larger amateur telescope, and is certainly within range of the 10" refractor at Orwell Park. 3C273 lies within Virgo (in fact it is only approximately 10° away from M87) and so is best placed for observation during late Spring and early Summer.

I first searched for 3C273 last April, from my home location, using a 10" reflector, and relying on the excellent finder chart in Burnhams's *Celestial Handbook* to identify the object by the surrounding star field. High level haze thwarted several of my attempts to locate 3C273 during 1998, and by the time the weather had improved sufficiently, the year was too well advanced and the evening twilight persisted too late to make the search worthwhile.

[†] Quasar is a contraction of *quasi-stellar object*. Another abbreviation sometimes found is QSO.

I resumed searching for 3C273 this April. On the evening of 9th April, sky conditions were steady, although a little hazy. Venus presented a beautiful spectacle in the western sky, shining prominently after sunset. It was definitely a night for observing! Around 23:00UT, once the moon had set and Virgo was rising in the south-east, I began searching for 3C273.

Figure 5 illustrates the general position of 3C273 within Virgo. The easiest approach to finding it is start by locating (with the naked eye) the triangle formed by Porrima, eta Virgo and 16 Virgo. Then search telescopically the midway point between Porrima and 16 Virgo – the excellent finder map in Burnham's *Celestial Handbook* provides reference stars down to approx magnitude 16, and facilitates positive identification of 3C273 itself.

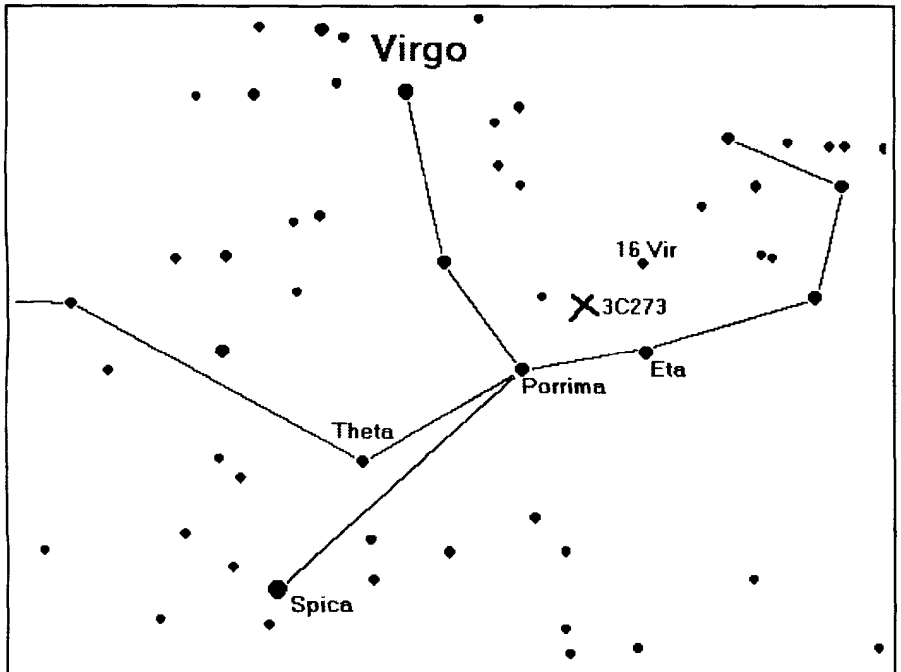


Fig 5. Position of 3C273 in Virgo.

I found it necessary to use averted vision to discern 3C273 in the first instance, but once I had positively located the object (using Burnham's finder chart), it became possible to use direct vision.

The limiting magnitude of the Orwell Park 10" refractor is approximately 14.5. This means that it is potentially able to observe several other quasars, some of them considerably more remote even than 3C273. Table 1 lists the most remote quasars visible from northern latitudes with magnitudes not

fainter than 15. The table is based on data in the NASA catalogue *Quasars and Active Nuclei*, 7th edition, by Veron-Cetty et al, 1996, available on the NASA ADC CD-ROM *Selected Astronomical Catalogs* Vol 3, Dec 1996, file 7188.

Object	RA h	RA m	RA s	Dec d	Dec m	Dec s	Const	Mag	Dist (Mpc)
3C 273.0	12	29	7	2	3	8	Vir	12.9	600
KUV 18217+6419	18	21	57	64	20	36	Dra	14.2	1,000
4C 29.45	11	59	32	29	14	45	UMa	14.4	2,000
HS 0624+6907	6	30	2	69	5	4	Cam	14.4	1,200
PG 1718+481	17	19	38	48	4	13	Her	14.6	2,500
PG 1634+706	16	34	29	70	31	33	Dra	14.7	2,800
PG 1116+215	11	19	9	21	19	18	Leo	14.7	650

Table 1. Remote quasars brighter than mag 15 visible from northern latitudes.

Table 1 shows that quasar PG1634+706 in Draco is the most distant object that could, in theory, be glimpsed under exceptional conditions from the Orwell Park 10" refractor. The point of observing a quasar with amateur equipment is not to make out any detail – all that is visible is a faint dot which one struggles very hard to discern at all. Instead, the challenge lies in positively identifying the object, and in marvelling at its huge distance and at the amazing physics and prodigous energy consumption involved in rendering it visible at all.

So, in answer to the opening question, a telescope such as the OASI 10" refractor can see at least as far as 3C273 - a distance of some 600Mpc. The light that we observe as 3C273 began its journey almost 2 billion years ago. When the light left 3C273 on its journey to Earth, the entire Solar System was only half its current age: many of the formative processes which resulted in the planets that we now see were only beginning. Truly, the amateur observer can see objects as they were long ago and far away!

James Appleton

S J Robinson beginning the grinding of the rear face of the blank to achieve a flat surface
Photo by Ken Goward

NEW SOCIETY TELESCOPE

To celebrate the Millenium (whenever it comes), the society is building a new telescope. It will be a Newtonian reflector, with a main mirror of 48cm (19") diameter . The design aim is for a focal length of approximately 2.12metres (85"), and focal ratio F4.5. The definitive figures will only be known when the mirror has been tested. More on that later.

The first stage is to make the mirror.

The starting point is a piece of Pyrex low expansion glass 48cm diameter by 4cm thick weighing 16Kg (35lb). One side, the back, has to be ground flat to facilitate mounting and aligning in the telescope. The other side has to be ground to a concave paraboloidal shape to a depth in the centre of the disc of 6.6mm. This involves the removal of about 1.5Kg of glass by hand grinding. This is a muscle building exercise no member of the society should miss. Currently approximately 2mm of glass has been ground away so there is still plenty to do.

An album is being assembled, photos of members grinding away at the mirror, with short profiles of their particular interests, and it is intended that this album will become a time capsule preserved with the telescope for future generations of astronomers to enjoy.

HOW A MIRROR IS GROUND

The mirror blank is fixed firmly to a horizontal bench and another disc, this time of ordinary plate glass, about 30 cm diameter by 25mm thick , and known as the tool , is placed on top of it A thick slurry of coarse 80 grit. Silicon Carbide and water is the grinding medium between the two, and with long strokes, a lot of time and much patience glass is slowly abraded away until the desired shape is achieved.
Garry Coleman.

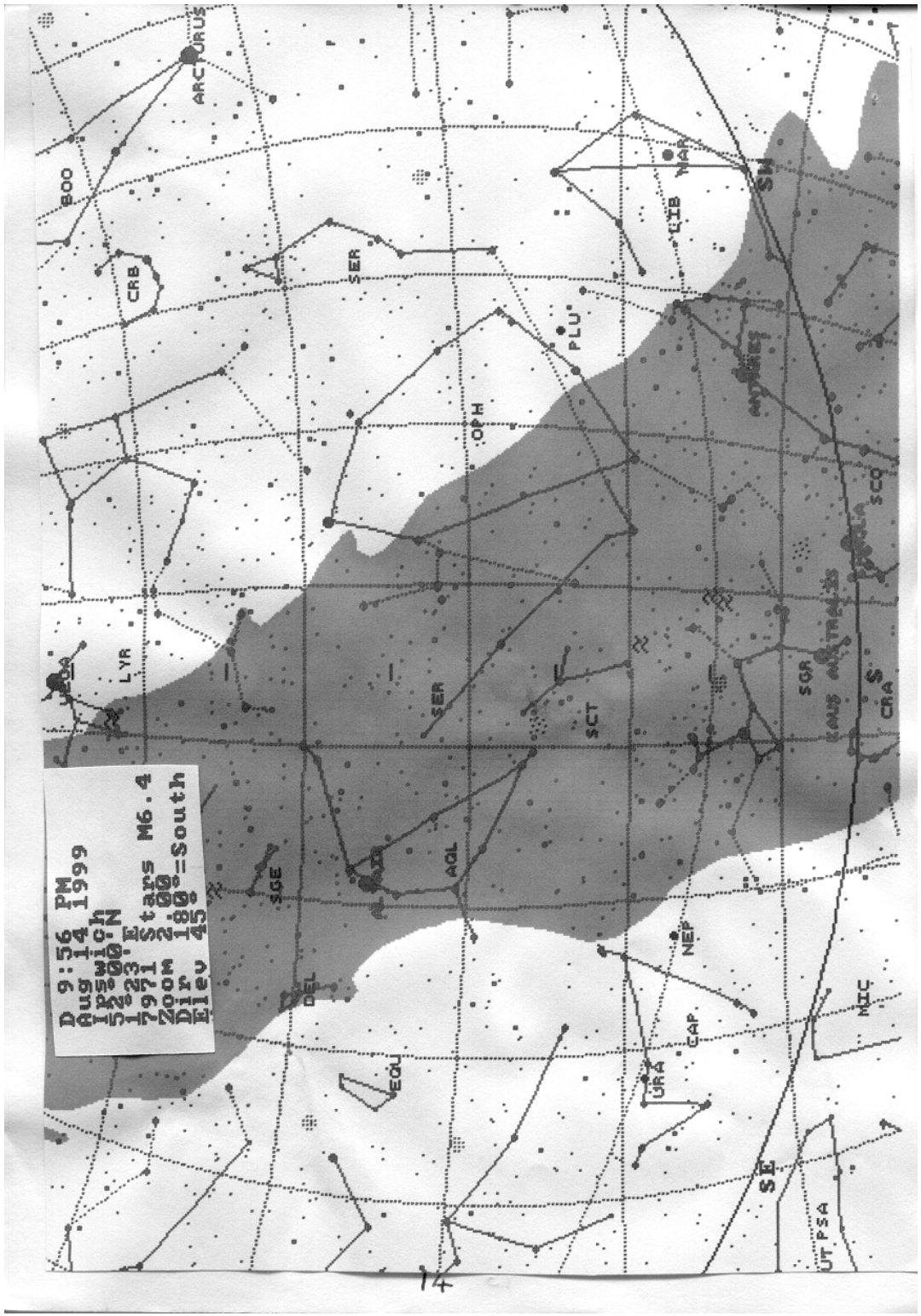
OCCULTATIONS DURING AUGUST 1999

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

D or R	Date & Time (UT)	Lunar Phase	Sun Alt (d)	Star Alt (d)	Min Dist (rad)	Star	Mag
R	04 Aug 23:51	.47-	-21	7	.81N	ZC 444	5.9
D	06 Aug 03:39	.34-	-7	35	.06S	ZC 608	6.0

Of course, there is one other significant occultation event this month, namely the total solar eclipse of 11th August! Details of this event are already well known and do not need to be repeated here.

James Appleton



11th August Eclipse day

Last month I asked if anyone was going to be free to open the observatory on eclipse day. From the response I received I have to believe that every one will be off chasing the eclipse. Most of the members that come to the observatory on a regular basis have informed me that they will chasing the Sun and praying for clear skies. Some people are going to Cornwall either staying for the week or just going by train just for the day. Others are going to France by car bus and train and making the best of an experience that we will not get in our part of the world for a very long time to come. I will be going to Devon just for the duration of the eclipse and then coming strait back home.

Next month I will be expecting to be inundated with articles for the news letter of every ones experiences of the eclipse, where you went, how you got there what you saw and how you felt.

Wishing you all clear skies Eric Sims .

1999 COMMITTEE

		Home Phone	Work Phone
CHAIRMAN	D Payne		
SECRETARY & WORK PARTY ORGANISER	R Gooding		
TREASURER	M Harlow		
MECHANICS	M Cook		
NEWSLETTER CO-ORDINATOR	E Sims		
BEGINNERS MEETING CO-ORD	T Sampson		
DARK SKIES & VISIT CO-ORD	G Coleman		
EQUIPMENT CURATOR	J Walsh		
LIBRARIAN	J Appleton		
CO-OPTED MEMBER			
LECTURE CO-ORDINATOR	P Richards		

JOURNAL ARTICLES TO E Sims Ipswich Suffolk IP1 4HA

CORRESPONDENCE ADDRESS R Gooding OASI Secretary Ipswich Suffolk IP1 6AE

MEMBERSHIP M. Cook Ipswich IP4 5PZ

Observing Programme For August

Dates	Observing Director	Activities
Mondays from 7.30pm	T Sampson	General Observation
Tuesdays from 7.30pm	G Coleman	Group Visits
Wednesdays from 8.00pm	M Cook D Payne	Nebular & Faint Objects
Thursdays from 7.30pm	G Coleman	Group Visits
Fridays from 7.30pm		Double Stars

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

Special Events

1. Committee Meeting
The next committee meeting is going to be held on Saturday 18th September in the club room at the observatory at 7.30pm. All members are welcome to attend.

2.

Society Contact Details

		Home Phone	Work Phone
Chairman	**D Payne**		
Secretary	**R Gooding**		

Contact details for the full committee are on the inside back page.

e-mail queries: **oasienq@btbcs.bt.co.uk**
WWW address: **http://www.ast.cam.ac.uk:80/~ipswich/**