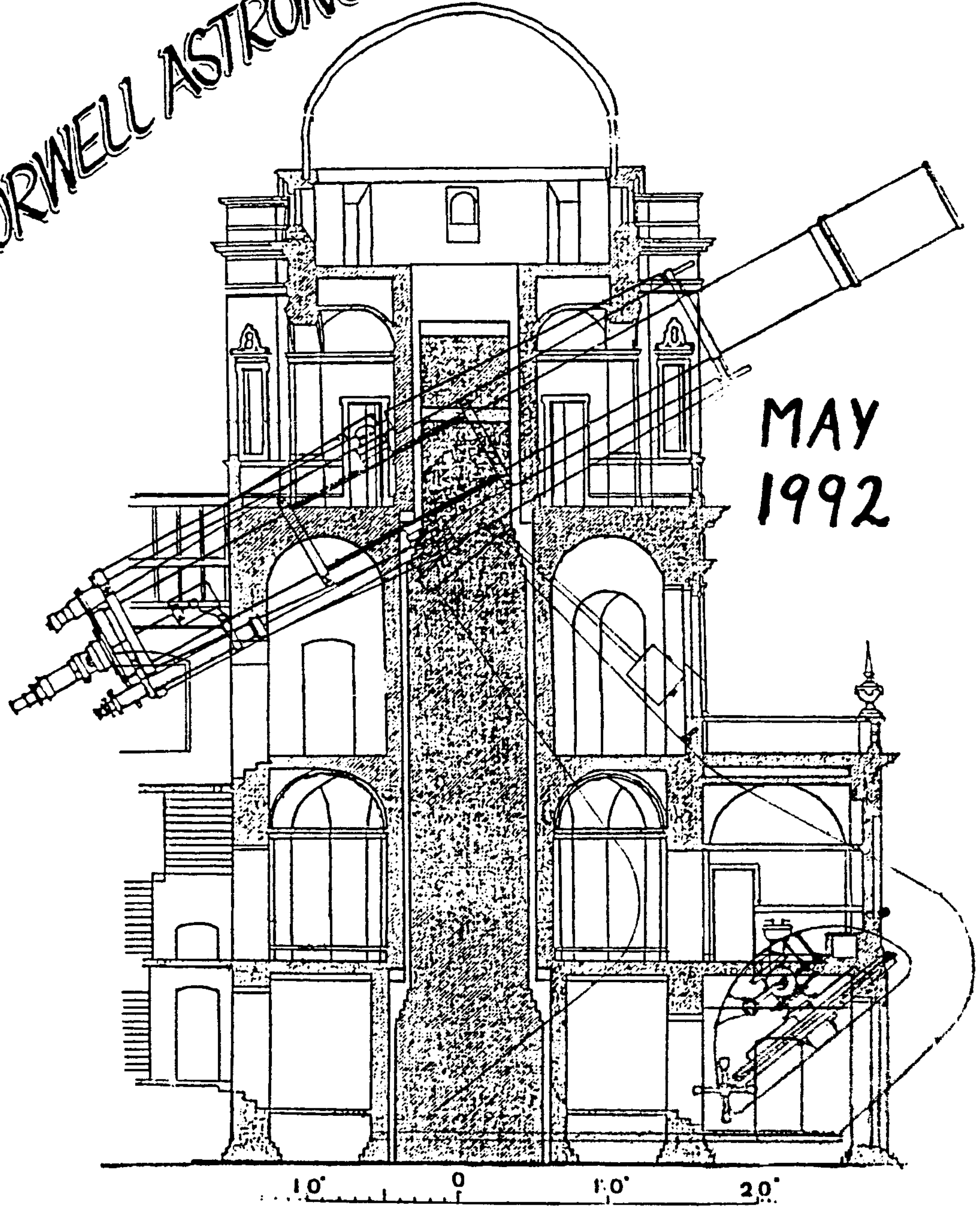
ORWELL ASTRONOMICAL SOCIETY IPSWICH



MAY
1992

SOCIETY NEWS

1 Events

Society Lecture Meetings

Friday June 12th

Lecture by Dr. David Dewhirst

At the Friends Meeting House Fonnereau Road
As usual this will be an 8.00pm start

3 Committee Meeting

The next meeting will be held at the observatory on May 9th. The meeting starts at 7.30pm and is open to all members.

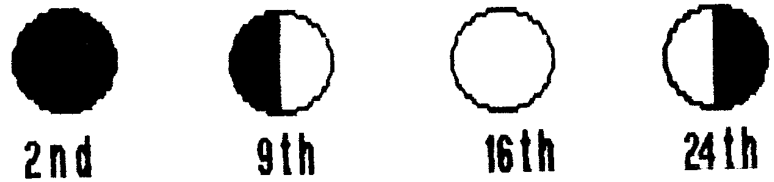
NIGHT SKY

All times GMT

SUN

Rises approximately at 04.30 to 03.50
Sets approximately at 19.30 to 12.10

MOON



MERCURY Mercury will be a morning sky object through out May. It will be a difficult object to see this month.

VENUS Venus rises only a few minutes before the sun this month, and will probably be almost immpossible to see.

MARS Mars will be rising about 2 hours before the sun by the end of the month. Mag.1.0

JUPITER Jupiter will be visible for most of the night, setting at 01.00 by the end of the month. Magnitude -1.9

SATURN Saturn rises after midnight by the end of the month.

URANUS Uranus will be rising at about 22.30 by the end of the month. Magnitude 5.6

NEPTUNE Neptune will be rising at a similar time as Uranus. Magnitude 7.9

OPEN WEEKEND

All pre-planned astronomical events are normally plagued with inclement weather. Just occasionally something goes wrong with the climate with the unexpected occurrence of five evenings of clear skies. In case their are any members who were not aware of the open evenings this year, they were held on April 10th to 12th, These being a Friday, Saturday and Sunday. The two preceding evenings were also clear.

It was estimated that 150 to 160 visitors attended over the three evenings. The event had been advertised in the "Whats on Columns" of the local press, the local libraries and on BBC Radio Suffolk. On the preceding Thursday morning the BBC broadcasted a 20 to 30 minute interview with myself, Dave Payne and Peter Richards,that had been recorded at the observatory a fortnight before.

Even though the skies were clear only the Moon and Jupiter could be seen well. A layer of haze was present every night, with the limiting magitude as low as 2 on some occasions.

R.Gooding

PREDICTING STELLAR OCCULTATIONS

James Appleton

1. INTRODUCTION

A stellar occultation occurs when the Moon passes in front of a star. A modern microcomputer (such as the IBM PC or compatible) is capable of running programs to predict stellar occultations to a high degree of accuracy (eg. to within a few seconds). Such programs have been obtained by members of OASI, and can be used to predict occultations for all stars down to magnitude 9.9. This article describes in general terms how predictions of occultations are made. A companion article to appear later will describe observational studies aimed at checking the accuracy of predictions.

2. GENERAL CONSIDERATIONS FOR A STELLAR OCCULTATION

Each day, the Moon covers approximately 13° of its orbit, moving from West to East. When an occultation occurs, a star disappears behind the eastern limb of the Moon and reappears later on the western limb. Because the Moon has no atmosphere, disappearance happens suddenly, without any initial fading; reappearance is equally sudden.

The stars which the Moon may occult lie in a band limited to approximately ±8° of the ecliptic. There are approximately 1000 stars visible to the naked eye which the Moon may occult.

3. CRITERIA FOR OCCURRENCE OF A STELLAR OCCULTATION

Figure 1 illustrates the geometry of an occultation, showing the situation when the Moon is close in the sky to a star S.
Light rays from S arrive at the Moon in a parallel beam. The Moon casts a shadow in the light from S; this shadow moves across the Earth as the Moon moves through the sky. An observer at site O will see an occultation of S if O lies within the shadow cast by the Moon. Three cases are distinguished:

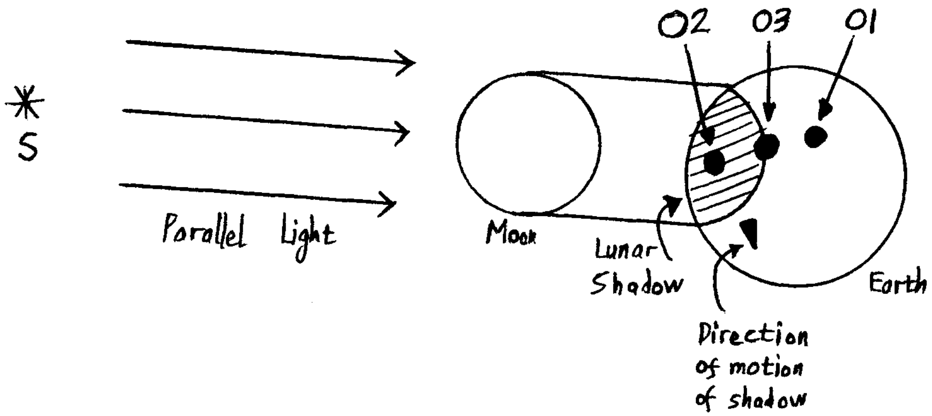


Figure 1. Geometry of an occultation.

(1) O lies outside the shadow: no occultation (position O1 in figure 1).
(2) O lies inside the shadow: occultation (position O2).
(3) The edge of the shadow just brushes O as it moves across the Earth: grazing occultation (position O3).

As figure 1 illustrates, the position of the observer partly determines whether an occultation will be witnessed. This is particularly so in grazing occultations, where a difference in observing position of a few hundred metres may make the difference between a graze and a "miss".

To determine whether an occultation occurs, it therefore suffices to determine the position on the Earth's surface of the Moon's shadow.

4. THE FUNDAMENTAL PLANE

Consider figure 1 again and define the plane through the centre of the Earth perpendicular to the light rays from S; this plane is called the fundamental plane.

Standard formulae are available to convert positions expressed in geocentric coordinates (ie. coordinates with respect to the Earth) into positions expressed in coordinates appropriate to the fundamental plane. If the position of the Moon with respect to the centre of the Earth is known, it is therefore possible to map the Moon's shadow and the observer's position O onto the fundamental plane. This typically results in a diagram analogous to figure 2. An occultation occurs if the mapping of O onto the fundamental plane lies within the mapping of the Moon's shadow onto the fundamental plane.

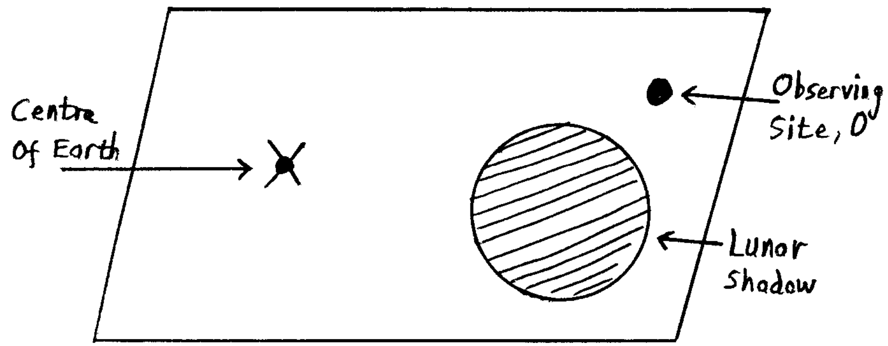


Fig 2. Positions in the fundamental plane.

Any accurate computer program for predicting the Moon's position with respect to the centre of the Earth may be used, together with the standard formulae mentioned above, to predict an occultation by examining the situation in the fundamental plane.

Most such programs calculate the position of the Moon's centre, and assume a spherical profile for the lunar circumference. (This yields a spherical shadow in the fundamental plane.) This approach, which ignores the hills and valleys on the lunar limb (the Watts profile) is generally accurate enough to predict a "normal" occultation, but may not be accurate enough to predict a grazing occultation.

Typically, a program is first run to give the position of the Moon's shadow every 15 minutes or so, enabling a rough search for possible occultations. (A possible occultation is manifest when the lunar shadow is close to O in the fundamental plane.) The program can then be re-run with finer time granularity (say 1 minute) around the time of a possible occultation. It is then possible (by using interpolation to estimate the position of the lunar shadow at intermediate times) to obtain precise estimates of the times of occultation and of the positions on the Moon's surface at which the star disappears and reappears.

5. PRACTICAL ASPECTS

In order for predictions of stellar occultations to be made, it is necessary to have access to a star catalogue such as "ZC" or "SAO". These contain details of stars close to the ecliptic, and include estimates of the proper motion of each star so that stellar positions may be obtained for any date.

A stellar occultation is visible only when the Moon and the star are sufficiently above the horizon and the Sun is sufficiently below it. A practical program for predicting occultations therefore first uses approximate formulae to pre-select stars from the star catalogue which are visible during a specified observing time, and then uses more accurate formulae to determine, for each of the pre-selected stars, whether an occultation will occur.

An advanced program will take account of aberration of starlight due to the Earth's motion in space, refraction due to the Earth's atmosphere, and have a very detailed representation of the Moon's motion.

Unfortunately, a detailed representation of the Moon's motion requires a formula containing thousands of correction terms; this inevitably results in a computer program which takes appreciable time to execute, but this approach may be unavoidable if it is required to make very accurate predictions, eg. of potential grazing occultations.

From this month I will be writing a series of articles covering the lives and times of some of our famous astronomers. This month we will cover the life and times of Galileo Galilei.

J.P.W.

Galileo Galilei 1564 - 1642

By J.Walsh.

Galileo Galilei was born in Pisa, Italy in 1564, he did well at school studying Medicine and Aristotelian Philosophy. He entered the University of Pisa in 1581. And it was while he was there that he made the important discovery that Oscillations were of equal time, which led him many years later to greatly improve clocks and other timekeeping equipment in the form of the Pendulum.

As Professor of Mathematics at Pisa he propounded the novel theory that all falling bodies large or small descend with equal velocity this, it is said to have been demonstrated from the top of the Tower of Pisa itself.

In 1591 Galileo resigned his chair and moved to Florence. In the following year he was nominated Professor of Mathematics at the University of Padua. This was very successful, and his lectures attracted students from all over Europe. During this time he made several discoveries and Inventions. Among them were a type of Thermometer, the Proportional or Sector Compass, but most of all he greatly improved the design of the Refracting Telescope and in 1610 began serious astronomical investigations with his new Telescopes, the most powerful of which was X 32. Among his findings it was discovered that the Moon, instead of being self illuminating and smooth, the surface was unequal and diversified with hills, valleys and mountains all casting shadows from the direction of the Sun. This was conclusive proof that the Moon shone from reflective light from the Sun. The Milky Way he could see as countless billions of seperate stars. He also began a series of observations which led to the discovery of Jupiters four satellites still called the Galileans today, after him. Galileo first discovered Sunspots on the surface of the Sun by the timing of these spots across the face of the Sun he estimated that the rotation period of the Sun was about twenty seven Days.

It was though these discoveries that he believed in the Heliocentric or Copernican view that the Sun was at the centre of the Solar System, especially when observing the planet Venus. She showed phases like our Moon, impossible with the Ptolmiac or Geocentric view that the Earth was at the centre of the Solar System.

All this enraged the Ecclesiastical Authorities who had always supported the view that the Earth was the centre of all things. On the 26th February 1616 Galileo was made to obey Pope Paul V injuction of not to hold,teach or defend his theories. In 1632 he was in hot water again by publishing another paper supporting his theories This time he had to abjure on oath on his knees in front of an Ecclesiastical Tribunal his theories.

Galileo was not imprisoned, for by then he was in his late sixties and not a well man. But he had to live the remaining nine years of his life in retreat at a tiny village called Arcerti near Florence. He died in 1642 and is buried at the church of Santa Croce in Florence.

A NIGHT AT THE OBSERVATORY.

On wednesday 1st April it was a clear night but because the open week-end is only just over a week away,it was all hands on clearing up, sweeping and moving any thing that could be moved out of the way to make room for all the visitors we hope will be turning up to take advantage of the chance to look round a real observatory and with any luck use the 10inch reflector or one of the smaller telescopes that will be on the balconies on the club room level.

At about 2100 B.S.T. enough clearing up had been done so it was time to open up the shutter on the big telescope and take advantage of one of the clearest nights that we had seen on a wednesday for a long time.We started with Jupiter but could only see three moons until we took a closer look and realised that two of the moons were close together. The diagram shows the rough positions of the moons (not to scale) and only as remembered the next day also the markings on Jupiter. I must add that the seeing was very good with little or no shimmer at all. The bands although clear and sharp had hardly any shape , mainly straight lines and a dark spot bottom right.

Next David Payne took over the guiding of the telescope and went to M81 which is a spiral galaxy in Ursa Major shown face on. The atmosphere was so steady that a lot of nebulosity around the main nucleus was easy to define as spirals. Next was M 82 here again crystal clear, although a spiral galaxy it is presented side on so appears cigar shaped with a dark band slightly off centre.

Next was M 101 another spiral galaxy which took a long time to find although it is supposed to be about the same mag as M82, it didnt appear to be as bright but some of the spiral arm was visible a long way out from the nucleus.

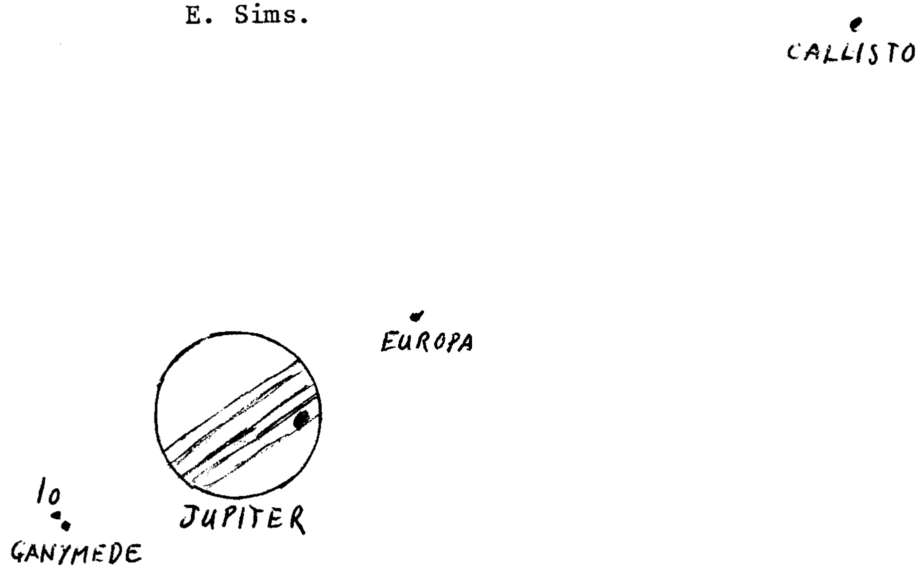
Still around Ursa Major we went for fainter objects,the next was M97 the "Owl" nebula here again it was very hard to find. David was just about to give up but when scanning across the general area he spotted what was like a puff of smoke and that was it. By looking directly at it there was nothing there but if you used averted vision and scanned around it became very clear.

The last target was M108 another spiral galaxy but much fainter than the others.Although it was found only the nucleus could be seen and this was with averted vision again.

It was now nearly 2300 and the sky was starting to haze over so we all decided that we had had a good nights viewing and went home.

This is the sort of night any member can expect every so often. All you have to do is turn up, maybe help with a little bit of clearing up, or just sit around and talk. Nothing too strenuous, so heres hoping to see more of you in the future.

E. Sims.



PROGRAMME FOR MAY-1992

DAYS & DATES	DIRECTORS	SECTION & ADDRESSES	PHONE INC. STD CODE
Mondays	**from 7.30pm**	**GENERAL OBSERVATION SECTION**	
4,11,18,25	Mr R Newman	, Felixstowe, IP11 9DY	
	Mr J King	, Felixstowe, IP11 9LQ	
Tuesdays	**form 7.30pm**	**GENERAL OBSERVATION SECTION**	
5,12,19,26	Mr R Newman	(Address above.)	(Number above)
	Mr J King	(Address above.)	(Number above)
Wednesdays	**from 8.00pm**	**NEBULA & FAINT OBJECTS SECTION**	
6,13,20,27	Mr M Cook	, Ipswich, IP4 5PZ	
	Mr D Payne	, Wickham Market, IP13 0SD	
Thursdays	**from 7.30pm**	**OBSERVATORY VISITS FROM OUTSIDE GROUPS**	
7,14,21,28	Mr P Richards	, Nacton, Ipswich, IP10 0HS	
	Mr G Marriott	, Ipswich, IP4 4JB	
Fridays	**from 7.30pm (may be postponed to Saturday)**	**PLANETARY & LUNAR SECTION**	
1,8,15,22,29	Mr P Richards	(Address above.)	(Number above)
	Mr R A Lobbett	, Felixstowe, IP11 8UJ	
	Mr G Marriott	(Address above.)	(Number above)

All members are welcome to come but, on nights other than Wednesdays please check with directors that the observatory will be open. Directors will also be able to tell you if a group visit is taking place. All of the sections observe anything of interest but the title of each section suggests a popular subject.

Lectures and other events:

COMMITTEE MEETING

The next committee meeting will be on Saturday 9th May at the observatory starting at 2000. As usual this will be an open meeting and any member may attend if they wish.

1992 COMMITTEE

			Home Phone:	Work Phone:
CHAIRMAN	D Payne	(Address above.)		
VICE CHAIRMAN & MEMBERSHIP SECRETARY	D Barnard	Ipswich, IP3 8RN.		
SECRETARY	R Gooding	Ipswich, IP1 6AE.		
TREASURER	M Nicholls	, Capel St Mary, Ipswich, IP9 2EX.		
MAINTENANCE CO-ORDINATOR	M Cook	(Address above.)		
JOURNAL CO-ORDINATOR	E Sims	Ipswich, IP1 4HA		
PUBLICITY & VISIT CO-ORDINATOR	P Richards	(Address above.)		
EQUIPMENT CURATOR	J King	(Address above.)		
SPECIAL EVENTS CO-ORDINATOR	A Smith	Ipswich, IP4 5RZ		