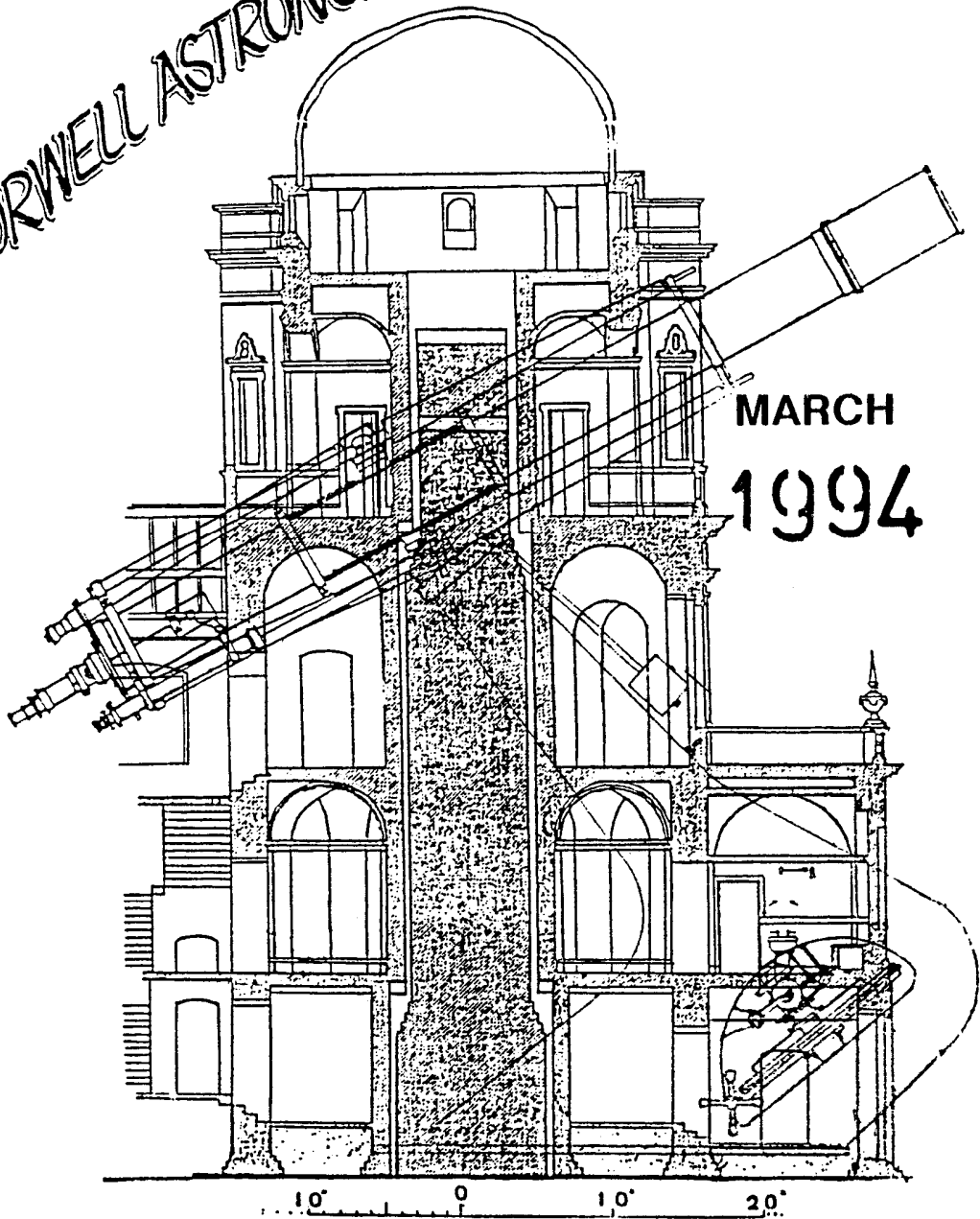


ORWELL ASTRONOMICAL SOCIETY IPSWICH



MARCH
1994



SOCIETY NEWS

1 1994 ANNUAL SUBSCRIPTIONS

The annual subscriptions are due on January 1st 1994. The rates for the new year will remain at the 1993 levels.

Rates for 1993-

JUNIOR & OAP	£7.50	(under 18 or in full time education)
ADULT	£10.50	
FAMILY	£12.00	

Cheques & P.O.'s made payable to the ORWELL ASTRONOMICAL SOCIETY (IPSWICH) together with this form to Membership Secretary:-

Mr. R. Gooding
[Redacted]
Ipswich.

2 Committee Meeting

The next committee meeting will be on Saturday 21st May, from 7.30. As usual this is an open meeting and any member is welcome to attend.

3 March Lecture Meeting

* The March lecture meeting will be held on Friday *
* 11th at 8.00 pm, at the Friends Meeting House *
* Fonnereau Road. *
* *
* This meeting will be a film evening *
* *

4 List of Events For 1994

- | | | | |
|-----|---------------------------------|---|----------|
| i) | Lecture Meeting Fonnereau Road | Film Night | 11-3-94 |
| ii) | BAA Winchester Weekend | | 25-3-94 |
| ii) | Lecture Meeting Fonnereau Road. | Mr.Ron McArthur Talk on Radio Astronomy | 6th May? |
| iv) | Oxford Weekend | | 13-5-94 |
| v) | Trip to Greenwich in May ? | | |
| vi) | Parents Day | | 18-6-94 |

- vii) FAS Convention Cambridge 24-9-94
- viii) The annual Open Weekend will be held in the autumn to coincide with the BBC's Astronomy series. Dates are not yet known.
- ix) Bury Star Party. We have been asked to help organise a star party as part of the Bury St Edmunds Time & Motion Festival.
Probable date Saturday 10-12-94
- x) Christmas meal. Sometime in December 14-12-94

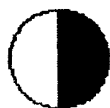
NIGHT SKY

All times GMT

SUN

Rises approximately at 06.47 to 05.37
Sets approximately at 17.38 to 18.32

MOON



4 th



12 th



20 th



27 th

MERCURY Mercury will be at greatest western elongation (28°) on the 19th. It remains very low in the eastern sky before sunrise.

VENUS Venus will be visible low in the western sky after sunset. It will be setting about two hours after sunset at the end of the month. Mag. -3.9

MARS Mars will be too close to the sun this month, and remains within the sun's glare.

JUPITER Jupiter will be rising at about 22.30 in mid month. Mag. -2.3

SATURN Saturn will be visible low down in the morning sky. It will be rising less than an hour before the sun at the end of the month. Mag. 1.0

URANUS Uranus will be rising at about 04.00 in the mid month. Mag. 2.8

NEPTUNE Neptune will be rising at about 04.00 in mid month. Mag. 7.9

R. Gooding

ANALYSIS OF ZETA TAURI OCCULTATION TIMINGS

by James Appleton

On 28th December 1993, the magnitude 3.0 star Zeta Tauri was occulted by the Moon. Zeta Tauri is the 14th brightest star which can be occulted by the Moon, and it provided the brightest occultation visible from East Anglia for some years.

The occultation was predicted to be visible as a graze from North Norfolk, so considerable interest was aroused among the graze observers of OASI. Unfortunately, as so often during 1993, thick clouds meant that no observing trip took place.

In Suffolk, the occultation occurred as a full occultation, not a graze. Despite the exceedingly cloudy sky, two members of OASI, Dave Payne and Mike Harlow, did manage to observe and time the disappearance and reappearance of the star from their home locations.

The estimated reappearance times appear somewhat inaccurate, and have not been analysed. Reappearance times are notoriously difficult to estimate accurately, and in this instance, matters were even more difficult than usual due to the considerable glare from the Moon which was very nearly Full.

However, the observers were reasonably confident of their estimates of the disappearance time. Because the two observers were sited at different locations, they experienced different Earth-Moon-star geometries which in turn resulted in disappearance times which differed by over a minute. Table 1 lists the predicted and observed disappearance times.

Observer	Timings (UT)	
	Predicted	Observed
Dave	00:02:16.2	00:02:22
Mike	00:01:06.9	00:01:13

Table 1. Comparison of predicted and observed timings.

It is interesting that the two observers, making completely independent observations, both recorded disappearance times approximately six seconds later than predicted. This prompted an investigation of possible causes.

The most likely causes of the discrepancy would seem to be:

- Error in observer's reaction time. This is unlikely to be as great as a second, and can therefore only explain at most a small part of the discrepancy.

- Error in position of the star. This is unlikely since Zeta Tauri is bright, and its position has therefore been measured with great accuracy. The Zodiacal Catalog and Bright Star Catalog, both for epoch J2000.0, differ in the position of Zeta Tauri only by 20 milli-arcseconds in RA and 60 milli-arcseconds in declination.
- Error in position of Moon. This was investigated by comparing the position of the Moon used in calculating the circumstances of the occultation with that given by a high precision reference ephemeris. The two positions agree to the nearest kilometre in radial distance, to the nearest milli-arcsecond in RA and differ by only one milli-arcsecond in declination. The reference ephemeris used was the NASA JPL (Jet Propulsion Laboratories) ephemeris. An error in the position of the Moon is therefore unlikely.
- Figure of Moon or local selenographic feature. This seems to be the most likely cause, since the occultation predictions are based on an assumed smooth, circular, mean lunar disc, whereas the figure of the real disc is much more complex.

The most likely cause is explored further below.

It is possible to calculate the deviation in the local lunar limb necessary to explain the observed discrepancy between predicted and observed occultation times. The geometry is illustrated in figure 1.

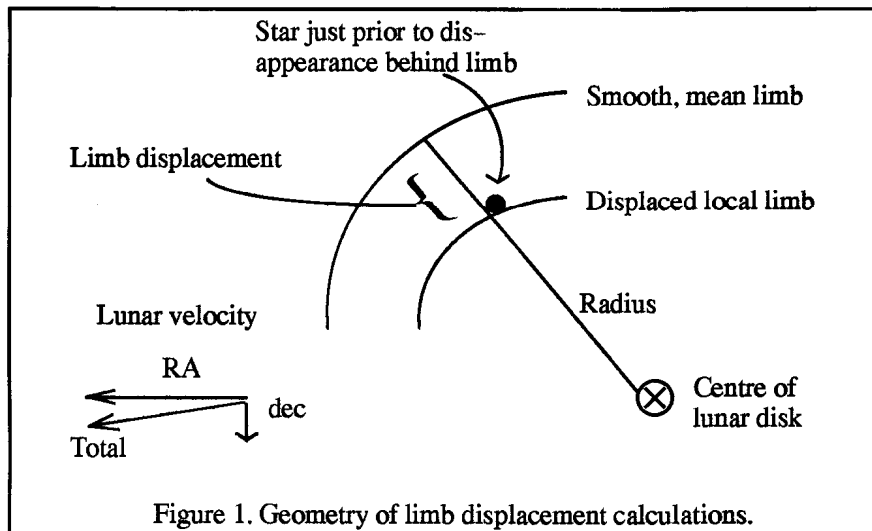


Figure 1. Geometry of limb displacement calculations.

The calculations are somewhat involved. The main determinants of the limb displacement are the Position Angle (PA) of the star, and the velocity of the Moon at right angles to the line of sight.

The PA of the star is produced as part of the process of predicting the circumstances of the occultation.

The velocity of the Moon is determined from the NASA JPL ephemeris using the following technique. The positions of the Moon at one minute before and one minute after the predicted occultation time are evaluated and differenced, to give the angular velocity components in RA and declination; these are 1.17×10^{-4} degrees/second (increasing) in RA and -1.04×10^{-5} degrees/second (decreasing) in declination. By using the radial distance of the Moon, the angular velocity com-

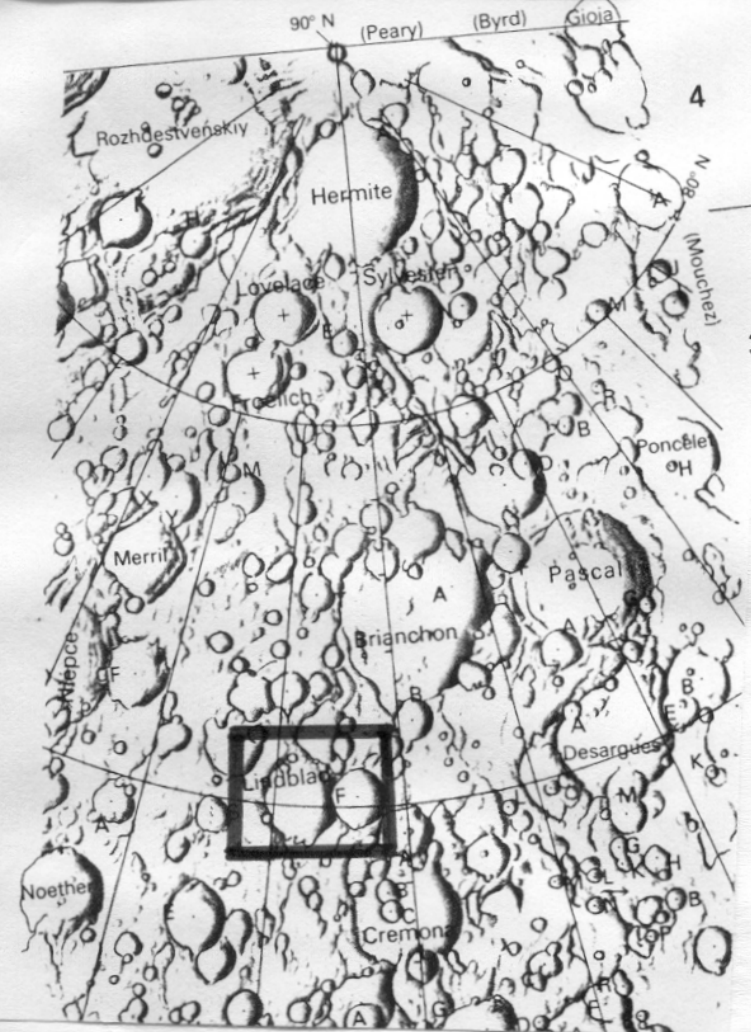


Figure 2. Lunar surface surrounding points of contact.

ponents are converted into linear components at right angles to the line of sight, and the total (resultant) linear velocity is calculated as the vector sum of the components. The resultant velocity is 789m/s at 5.09° below the arc of constant declination.

Eventually, the deviation in the local limb is calculated as an indentation of depth 1370m. That is, the observed lateness of occultation of Zeta Tauri corresponds to a displacement of the lunar limb at the point of contact 1370m inside the mean, smooth, lunar limb. This seems entirely plausible.

By considering the lunar librations at the time of occultation, and knowing the PA of the star, it is possible to identify the selenographic feature at the point of contact of the star and lunar limb. Because of their differing geometries, the two observers see points of contact which differ by approximately 55km. The points of contact are both in the neighbourhood of 71°N, 95°W, where the craters Lindblad and Lindblad F meet (see figure 2). Note that Lindblad lies in the Western libration zone, and appeared on the lunar limb because of the favourable libration at the time of occultation.

There is no evidence of a large scale indentation of depth 1370m near the points of contact of the star and lunar limb. However, a general distortion of the lunar figure from the assumed smooth sphere could result in a sufficient net indentation, without revealing itself except to very precise measuring equipment.

5 Open University TV Programmes

The Open University is running an astronomy course this year, and BBC2 will be showing a series of programmes for this:-

BBC2 08.45	BBC2 24.00
1st showing	Repeat
Sunday	Thursday

TV1	20-2-94	3-3-94	Our Invisible Sun
TV2	20-3-94	24-3-94	Good Seeing
TV3	24-4-94	28-4-94	Cosmic Cycling
TV4	22-5-94	26-5-94	Venus Unveiled
TV5	19-6-94	23-6-94	Design for an Alien World
TV6	17-7-94	21-7-94	Mapping the Milky Way
TV7	14-8-94	18-8-94	Jets & Black Holes
TV8	11-9-94	15-9-94	Cosmology on Trial

The 1994 committee will be :-

Dave Payne	Chairman	One place remains to be filled
Roy Gooding	Secretary / Membership Secretary (New)	
Mike Nicholl	Treasurer	
Martin Cook	Maintenance / Membership Secretary (Existing)	
Eric Sims	Newsletter Co-Ordinator	
Pete Richards	Publicity, Visit & Special event Co-ordinator	
Mike Harlow	Equipment Curator	
James Appleton	Librarian & Computer Software	

PROGRAMME FOR MARCH

DAYS & DATES	DIRECTORS	SECTION & ADDRESSES	PHONE INC. STD CODE
Mondays	from 7.30pm	GENERAL OBSERVATION SECTION	
7-14-21 28	Mr J King	[REDACTED], Felixstowe, IP11 9LQ	[REDACTED]
Tuesdays	form 7.30pm	GENERAL OBSERVATION SECTION	
1-8-15 22-29	Mr D Barnard Mr J King	[REDACTED] IP3 BRN (Address above.)	(Number above)
Wednesdays	from 8.00pm	NEBULA & FAINT OBJECTS SECTION	
2-9-16 23-30	Mr M Cook Mr D Payne	[REDACTED], Ipswich, IP4 5PZ [REDACTED], Wickham Market, IP13 0SD	[REDACTED]
Thursdays	from 7.30pm	OBSERVATORY VISITS FROM OUTSIDE GROUPS	
3-10-17 24-31	Mr P Richards	[REDACTED], Nacton, Ipswich, IP10 0HS	[REDACTED]
Fridays	from 7.30pm (may be postponed to Saturday)	PLANETARY & LUNAR SECTION	
4-11-18 25	Mr P Richards Mr G Marriott	(Address above.) [REDACTED] Ipswich IP4 4JB	(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:

The March lecture meeting will be held on Friday 11th March at 8.00 pm, at the Friends Meeting House Fonnereau Road.

VISITS 1st March 7.30 pm St Johns U/R Church ladys
21st March 7.30pm Suffolk Federation of Young Farmers Club

1994 COMMITTEE

		Home Phone:	Work Phone:
CHAIRMAN	D Payne (Address above)	[REDACTED]	[REDACTED]
MEMBERSHIP RENEWALS	M.Cook (Address above)	[REDACTED]	[REDACTED]
MEMBERSHIP SECRETARY	R.Gooding	[REDACTED]	[REDACTED]
SECRETARY	R Gooding [REDACTED], Ipswich, IP1 6AE	[REDACTED]	[REDACTED]
TREASURER	M Nicholls [REDACTED], Capel St Mary, Ipswich, IP9 2EX	[REDACTED]	[REDACTED]
MAINTENANCE CO-ORD	M Cook (Address above)	[REDACTED]	[REDACTED]
JOURNAL CO-ORDINATOR	E Sims [REDACTED], Ipswich, IP1 4HA	[REDACTED]	[REDACTED]
PUBLICITY & VISIT CO-ORDP	Richards (Address above)	[REDACTED]	[REDACTED]
EQUIPMENT CURATOR	M.Harlow [REDACTED] Trimley [REDACTED]	[REDACTED]	[REDACTED]
SPECIAL EVENTS CO-ORD	P.Richards	[REDACTED]	[REDACTED]
LIBRARIAN & COMP SOFTWARE	J.Appleton [REDACTED] Ipswich IP3 0QJ	[REDACTED]	[REDACTED]