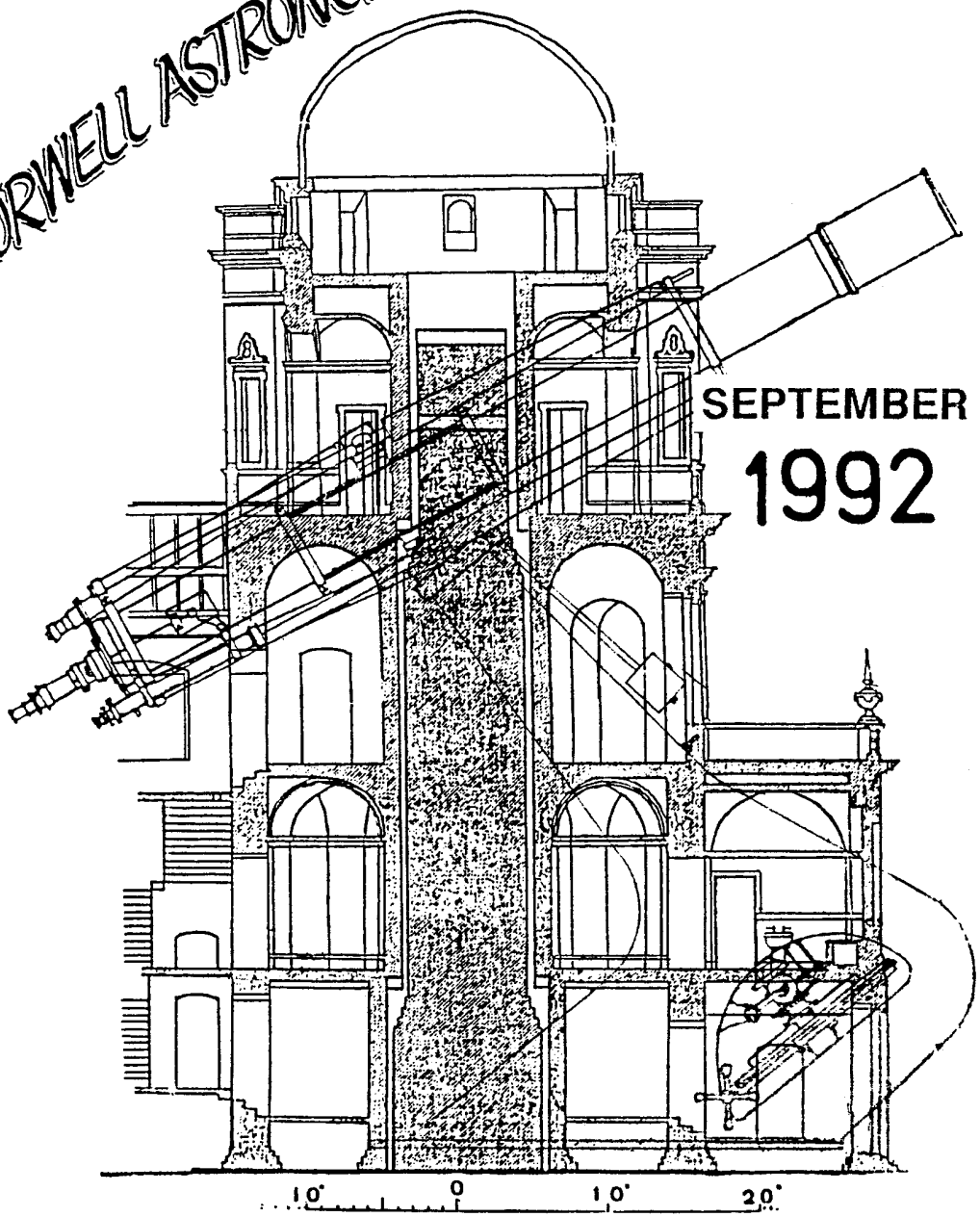
ORWELL ASTRONOMICAL SOCIETY IPSWICH



SEPTEMBER

1992

SOCIETY NEWS

1 FAS CAMBRIDGE CONVENTION

This meeting is on Saturday 26th September.
Pippard Lecture Theatre
Cavendish Laboratory
Madingley Road
Cambridge.

Tickets cost £3.50. Any member interested please contact Roy Gooding.

At the time of writing only part of the days programme has been arranged:-

Dr. Paul Murdin "Supernovae"

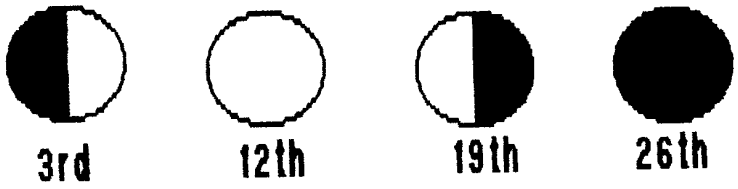
Dr. Rodney Buckland "The International Space year and the Amateur Astronomer"

All times GMT

SUN

Rises approximately at from 05.10 to 06.00
Sets approximately at from 19.00 to 18.10

MOON



MERCURY At the beginning of the month Mercury will be visible in the morning sky, Mag -1.2. Superior conjuction is on 15th of the month.

VENUS Venus will still be low down in the western sky, setting less then one hour after the sun at the end of the month. Mag.-3.9

MARS Mars will be rising at about 22.00 at the end of the month. Mag. 0.3

JUPITER Jupiter is conjuction with the sun on 17th, and will not be visible this month.

SATURN Saturn will be setting by 01.00 at the end of the month. It is still low down the southern part of the sky.Mag. 0.4

URANUS Uranus will be setting at about 22.30 by the end of the month. It is low down in Sagittarius. Mag 5.6.

NEPTUNE Neptune is near to Uranus, in the sky. A little to north east. Mag. 7.9

R.Gooding

Help wanted to fill spaces in your monthly journal. Even half a page will help. Any subject you like, as long as you think it will be of interest to other readers.

This publication is the only contact with most of our members so there are bound to be a lot of people who have something of interest to pass-on, or express an opinion on or even to ask for help in some way.

Hoping to hear from a few more of you in the near future.

E. Sims (Journal Co-ord Address on back Page)

Famous Astronomers (3)
Johann Kepler 1571-1630
By J.Walsh.

Johann Kepler was born at Weil-der-Stadt, Wurttemburg and entered university at Tubingen where he studied Mathematics, Astronomy and Theology, and was appointed Professor of Mathematics at Gratz in 1594. It was about this time he began writing to fellow astronomer Tycho Brahe, and in 1598 went to work with Tycho Brahe after being dismissed from his post at Gratz. Tycho Brahe died in 1601 and Kepler was appointed Mathematician to Emperor Rudolph II in his place. But Kepler received no salary and lived a life of poverty, even after gaining other appointments at Lintz and and as Astrologer to Wallenstein.

Keplers most important contribution to history was his discovery of the laws of planetary motion. The first two laws were published in 1609 in an article from a book Astronomia Nova - Commentaries on the Motions of Mars. The third law ten years later, appeared in another publication called Harmonices Mundi. The three laws can be described thus -

(1) Every planet moves in an ellipse with the Sun at one focus.
(2) The line joining the planet to the Sun sweeps out equal areas in equal times.
(3) The squares of the periodic times of orbital motion are proportional to the cubes of the planets.

Kepler wrote other books. In 1621 he published The Epitome of the Copernican Astronomer. In this book he detailed the movements of the Planets and Moon in great depth. His last book published in 1627, The Rudophine Tables, gave the positions of the Sun, Planets and Moon based on his work and that of Tycho Brahe. So accurate for that time was the work, It was used for the next one hundred years as standard astronomical tables.

Johann Kepler's laws of planetary motion set the groundwork for Isaac Newton's discovery of Gravity which he published in his book Philosophiae Naturalis Principia Mathematica in 1687.

Five Messier Objects for a September Evening

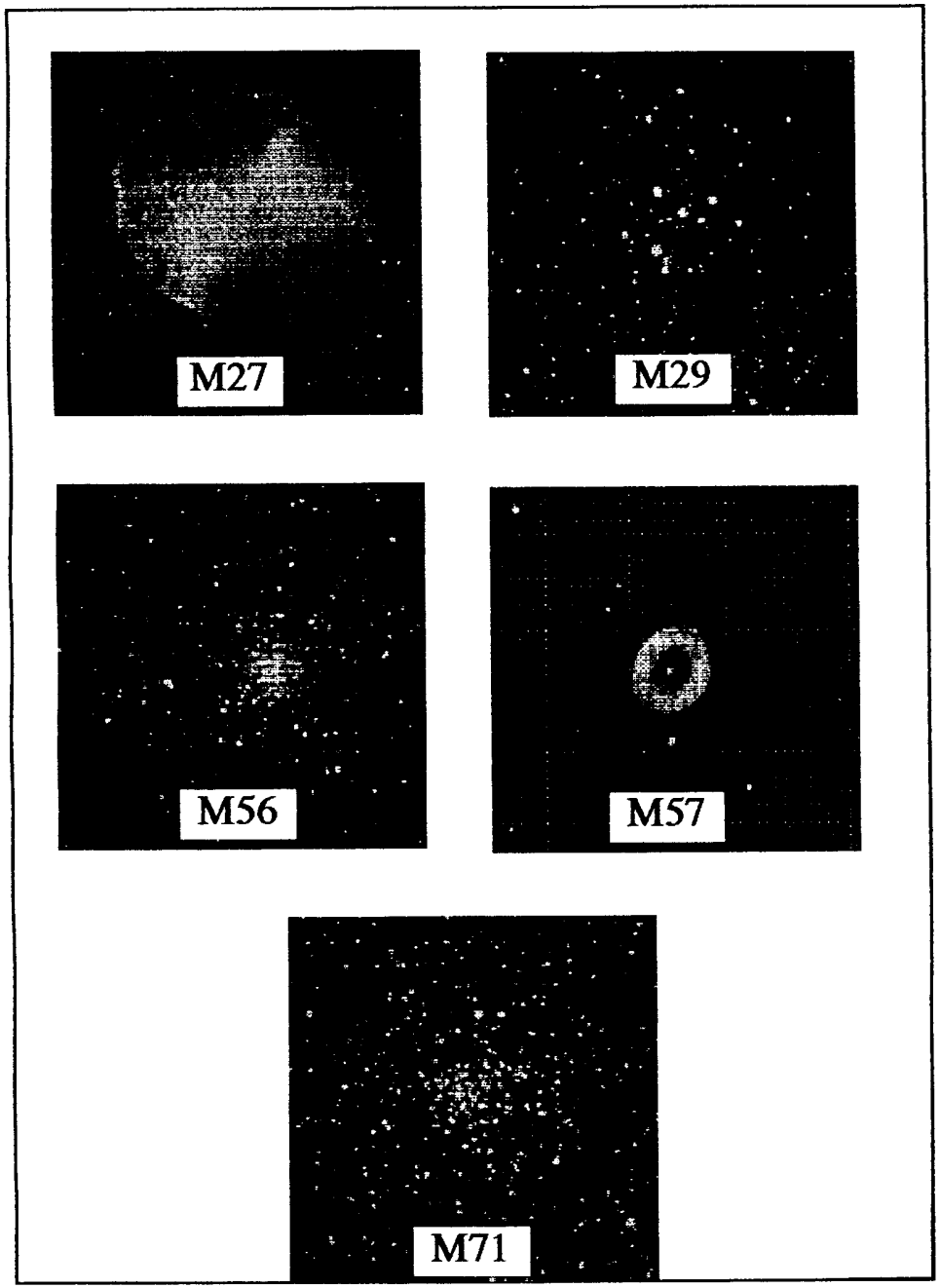
David Payne

The 'Summer Triangle' defined by Vega in Lyra, Deneb in Cygnus and Altair in Aquila is still high overhead during September evenings. Within the Triangle are five Messier objects: a large planetary nebula M27 also known as "The Dumbell Nebula" a loose galactic cluster M29, A compact globular cluster M56, the famous planetary nebula M57 known by all as the "Ring Nebula" and a second rather open globular cluster M71. There is (or was) some dispute about the status of M71 as a globular cluster. It is very open with no real condensed nucleus usually associated with globular clusters and the distribution of the spectra of the stars contained within the cluster is not the same as typical globulars. However the spectra are closer to a globular than typical galactic clusters so it is now generally classified as a globular cluster.

All the objects are fairly easy to find (see chart) and are all visible in small telescopes. M27 lies in the constellation Vulpecula and can be found with good binoculars. In a telescope the elongated 'dumbell' shape can be seen and is a spectacular sight in larger telescopes. The object is large 8' in diameter with the waist region 5' across with a fairly low surface brightness. It is therefore best observed with fairly low magnification when dark clear skies are available.

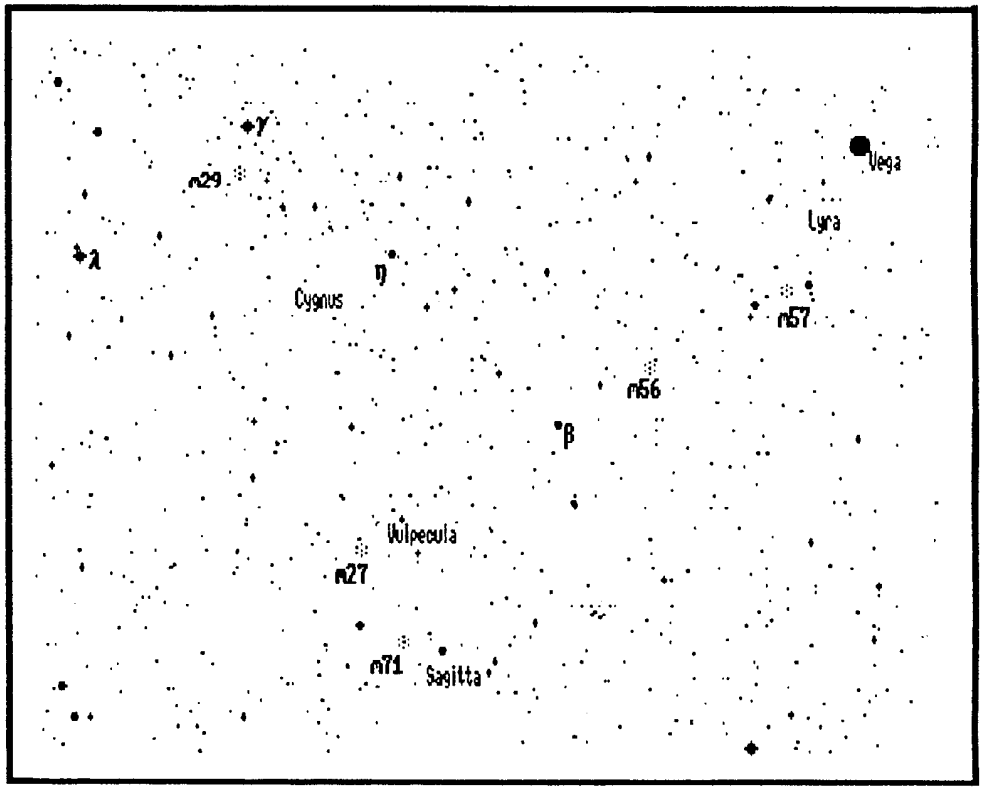
The loose cluster M29 is rather small and inconspicuous galactic cluster around 7' across containing about a dozen stars in the magnitude range 8 to 9 and somewhat resembles a miniature Pleiades. It lies 1.7 degrees SSE of Gamma Cygni and can be easily found with binoculars.

M56 is a globular cluster in the south east corner of Lyra. It is an 8th magnitude object about 5' diameter and requiring a 6inch telescope to begin to resolve it. It is estimated to be 40,000 to 50,000 light years away and has a diameter about 60 light years.

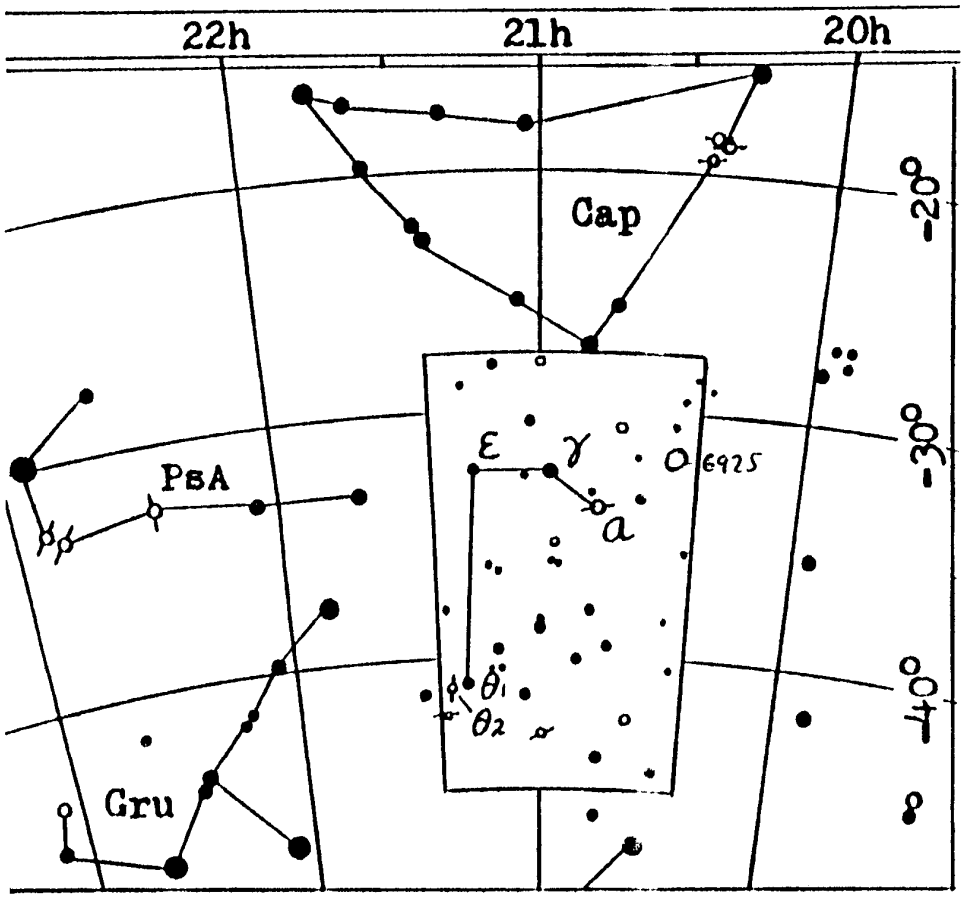


The "Ring Nebula" M57 is easily found lying nearly midway between and slightly below Beta and Gamma Lyrae. This is the most famous of all planetary nebula about 1' in diameter and shining at magnitude 9. Easily visible in small telescopes this object is always worth searching out.

The globular cluster M71 lies in the arrow of Sagitta. It appears as a slightly triangular misty patch in small telescopes but begins to be resolved into a beautiful rich cluster in telescopes of 6 inches and greater. It lies at a distance around 18,000 light years and with an angular diameter of about 6' it is around 30 light years across.



MICROSCOPIUM



Double Stars

Pos.	1 m 2	d"	P A	No.
204633	5.0-10.	20.6	166	α
5843	6.5-6.9	57.8	73	
212141	6.3-7.0	0.7	287	θ2
2342	5.7-8.5	3.1	148	

MICROSCOPIUM

Microscopium is a small constellation in the southern hemisphere of the sky just below Capricornus. Its brightest stars are only 5th mag so not of much interest to owners of small telescopes. There are a few double stars that can be seperated with the larger telescope, also a spiral galaxy seen almost edge on which is described as being elongated with a bright middle and light diffuse arms.

JEAN MEEUS AND GRAZING LUNAR OCCULTATIONS

by James Appleton

Computer programs to predict grazing lunar occultations have recently been obtained from the famous Belgian astronomer Jean Meeus. This note describes the programs and their use.

BACKGROUND

A grazing lunar occultation ("graze") occurs when the Moon passes in front of a star such that the limb of the Moon just grazes the star. Observations of grazes can yield information on the shapes of mountain ranges on the limb of the Moon, and on the orbital motion of the Moon. One of the first serious observations of a graze was made by Jean Meeus. On 20th November 1959, Meeus observed the graze of Lambda Geminorium from Kessel-Lo, near his home in Brussels. Since then, Meeus has developed very accurate computer programs for predicting grazes; his predictions are used in several publications on the continent.

OVERVIEW OF PROGRAMS

Accurate prediction of a graze relies on accurate prediction of the Moon's orbital motion. Unfortunately, it is computationally intensive to predict the Moon's orbital motion with great accuracy. Meeus's programs use a

two-stage approach to alleviate this difficulty. First, an approximate calculation of the Moon's orbit (which can be performed rapidly) is used to identify potential grazes. Only the potential grazes which occur under favourable circumstances are then examined in greater detail using accurate predictions of the Moon's orbit. Details are as follows.

Stage 1. An approximate calculation is made of the Moon's motion through the sky in a given period of time (typically a year). This is used to identify those stars which, at some point in the given time period, appear close to the limb of the Moon. For each star thus identified, the circumstances of the close approach of the Moon's limb are examined. The circumstances are favourable if a number of criteria are satisfied, typically: Moon is a waxing crescent, star is well above horizon, etc. A list is compiled of stars which undergo a close approach from the Moon's limb under favourable conditions.

Stage 2. For each star on the list compiled under Stage 1, further extremely accurate calculations of the Moon's orbital motion are made. These calculations are used to predict the graze track on the Earth (assuming that the approach of the Moon's limb is close enough to the star to appear as a graze somewhere on the Earth). The accurate predictions have a mean error of only 0.01 arcsecond in the Moon's position!

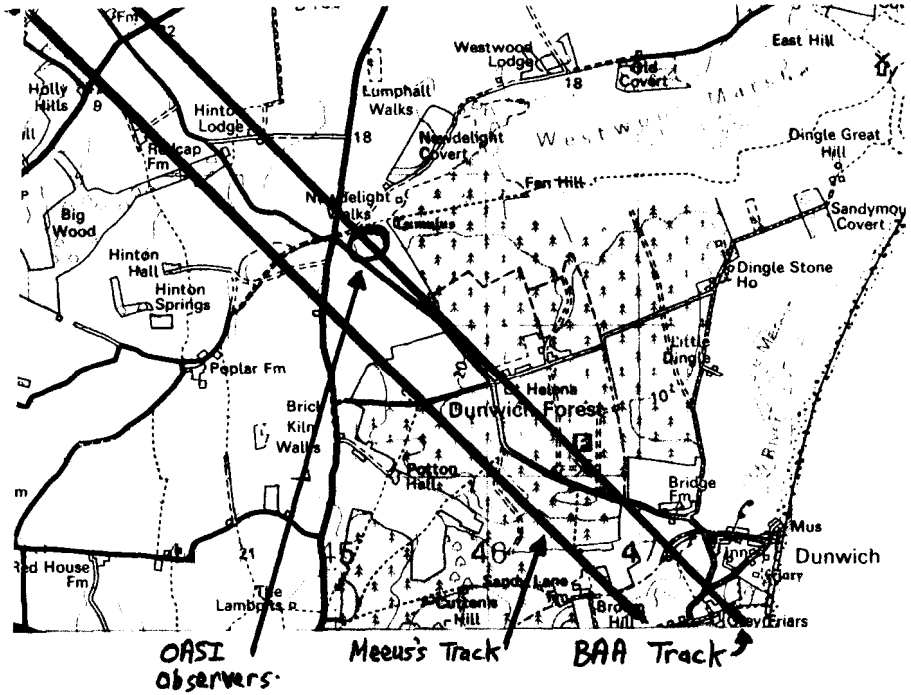
STAR CATALOGS

The programs originally obtained from Meeus used the Zodiacal Catalog for epoch J2000.0, which contains details of 2496 stars down to magnitude 7.5. However, modifications now permit also use of the SAO catalog for epoch B1950.0, which contains details of 25138 stars down to magnitude 9.9. The programs take account of the effect of proper motion, precession, nutation and annual aberration on the apparent position of the stars.

VERIFICATION OF PREDICTIONS

Meeus's programs were used to calculate retrospectively the track of the graze of the star 5 Geminorium on 16th May 1991. The track passes close to Dunwich. This graze was observed by members of OASI. The figure below illustrates the track predicted by the BAA and that calculated by Meeus's programs.

The position of the OASI observers is indicated by the small circle. The observers were situated on the track predicted by the BAA; they concluded that the true graze track was slightly south of their position. The track predicted by Meeus's programs therefore appears usefully accurate.



Comparisons have been made between graze tracks calculated by Meeus's programs and predicted by the BAA for several other grazes in 1991. In all cases examined, differences in the two tracks typically amount to half a minute in latitude for any given longitude.

USE OF THE PROGRAMS

Meeus's programs were originally written in HP FORTRAN and HP BASIC. For technical reasons, they have been converted to Pascal. Source code, in ASCII format, can be made available to anyone with a Pascal compiler. Executable code is available for the IBM PC only.

Stage 1 of the calculations, covering a period of a year ahead, need to be run overnight on an IBM PC. Stage 2 of the calculations can be performed for one star in about three minutes on an IBM PC. Coordinates of graze tracks can be output directly in Northings and Eastings to ease the task of plotting the tracks on a OS map.

FURTHER WORK

The main item of work required at present is to obtain a good set of observations of various grazes so as to test thoroughly the accuracy of the predictions. Future grazes will be notified in the OASI journal.

PROGRAMME FOR SEPTEMBER-1992

DAYS &DATES	DIRECTORS	SECTION & ADDRESSES	PHONE INC. STD CODE
Mondays	from 7.30pm	GENERAL OBSERVATION SECTION	
7,14,21,28	Mr R Newman	, Felixstowe, IP11 9DY	
	Mr J King	, Felixstowe, IP11 9LQ	
Tuesdays	form 7.30pm	GENERAL OBSERVATION SECTION	
1,8,15,22,29	Mr R Newman	(Address above.)	(Number above)
	Mr J King	(Address above.)	(Number above)
Wednesdays	from 8.00pm	NEBULA & FAINT OBJECTS SECTION	
2,9,16,23,30	Mr M Cook	, Ipswich, IP4 5PZ	
	Mr D Payne	, Wickham Market, IP13 0SD	
Thursdays	from 7.30pm	OBSERVATORY VISITS FROM OUTSIDE GROUPS	
3,10,17,24	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	
4,11,18,25	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:

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-ORD	M Cook	(Address above)		
JOURNAL CO-ORDINATOR	E Sims	, Ipswich, IP1 4HA		
PUBLICITY & VISIT CO-ORD	P Richards	(Address above)		
EQUIPMENT CURATOR	J King	(Address above)		
SPECIAL EVENTS CO-ORD	A Smith	, Ipswich, IP4 5RZ		