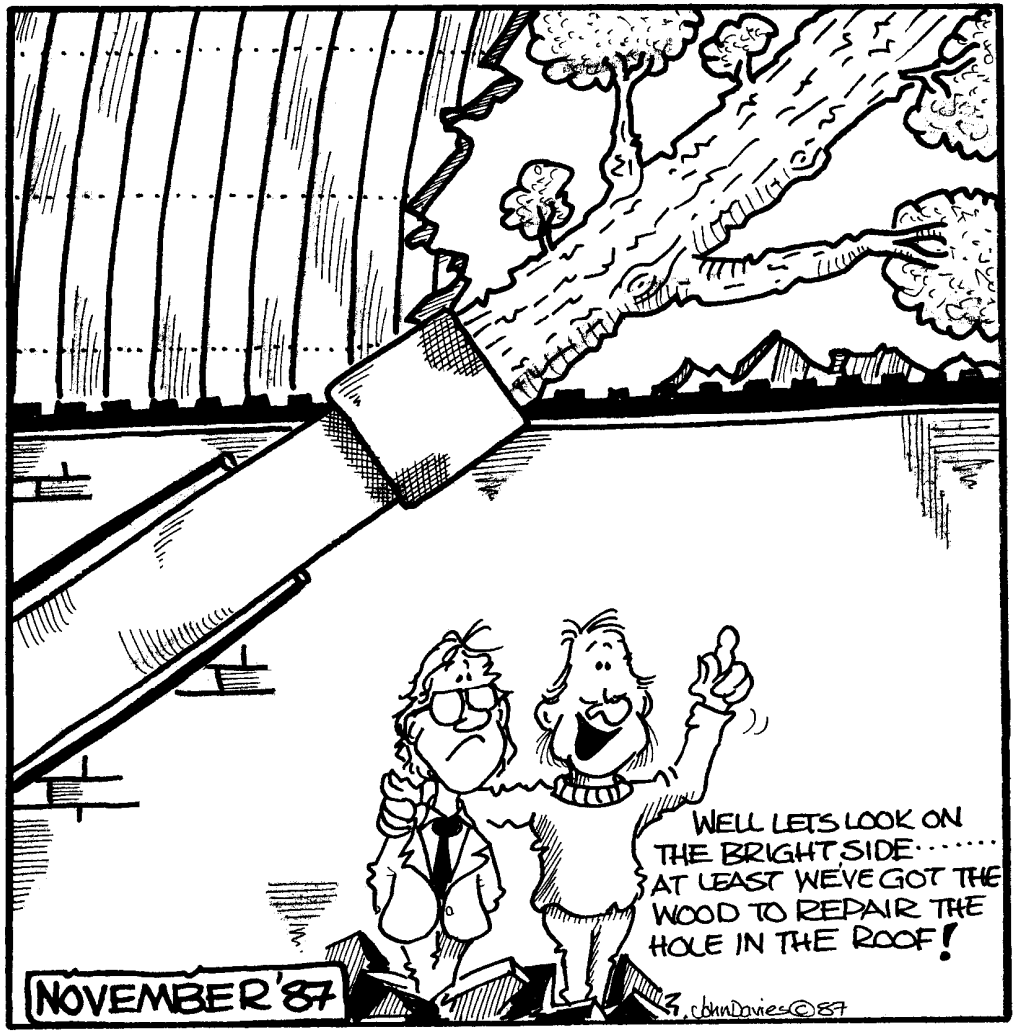


SOCIETY NEWS

1. Dome Closure
   The new floor in the transit room and the dome floor will be prepared for staining and varnishing over the week-end of 31st October/1st November. To enable the floor to dry the observatory will be out of use from between 1 and 2 weeks.
2. Open Weekend
   An estimated 100 visitors attended over the 4 evenings. The weather was very good with clear skies on 3 nights. Society funds were strengthened by nearly £120.
3. Congratulations to Linda and David Payne on the birth of their second daughter on 27th September.
4. A limited number of places exist for our annual Christmas meal. The venue has yet to be decided upon. First come first served, please contact any committee member.
5. Next committee meeting will be on December 5th, 7.30 p.m. start in club room.
6. 21st Anniversary Convention, 9th July 1988 (only 9 months away)
   If you have any ideas on exhibits, models, games etc. which you can organize or build, please contact any committee member.
7. That storm!
   The observatory suffered no major structural damage.

NIGHT SKY

(all times G.M.T.)

Sun Rises approximately between 07.00 - 07.50
Sets approximately between 16.30 - 15.50

Moon ○ 5th ◑ 13th ● 21st ◐ 28th

Mercury	Visible in morning sky. Rises about 2 hours before sun in mid month. Greatest western elongation on 13th (19°) Mag. -0.6
Venus	Sets within 1 hour of the sun. Not easily seen at beginning of month.
Mars	Rises between 04.00 and 05.00 during month. Mag. 1.8.
Jupiter	Visible until about 03.00. Mag. -2.9.
Saturn	Sets within 1 hour of the sun. Difficult to see this month.
Uranus	Not observable this month.
Neptune	Unobservable this month.

R. Gooding

CONSTRUCTION OF ORWELL PARK OBSERVATORY

First published in 'Engineering' October 2nd, 1874

PART 4

There are two methods of mounting equatorial telescopes in common use, which are known as the English and German methods respectively. According to the English method, the polar axis frame is carried by two powerful standards, placed at the north and south sides of the observatory respectively, and the telescope is slung midway between them. The advantages of this arrangement are, that the long polar axis admits of very accurate adjustment of the instrument, the telescope is easily accessible in all ordinary positions, and the floor of the observatory is not hampered by a central pier, as in the case of the German method of mounting. The disadvantages are, first, that however stiff the polar axis frame may be made, yet the weight of the telescope will cause a sensible deflection of the polar axis; secondly, that the north standard sometimes obstructs the view of an object in the north; and thirdly, that the total weight of the instrument and the polar axis frame is considerable. According to the German method of mounting, the polar axis is much shorter than according to the English method, and it is carried entirely by a single standard, which is commonly vertical, and placed in the centre of the observatory, the telescope being carried on the upper end of the polar axis. The advantages of this method are the compactness, steadiness and ease of motion which it admits of. The disadvantages are the shortness of the polar axis, the small size of the hour circle, and the inconvenience of the central pier, which brings up the telescope when following a star within 20 deg. or 30 deg. of the pole, and so compels a readjustment of the telescope. In the case of the Orwell Park instrument the writer adopted an arrangement which he thinks secures all the advantages of the German method, and avoids the disadvantages of the English method above referred to. The standard is a very powerful casting, and is cast in a bent form so as to permit the telescope to clear the standard when following any star whatever; the polar axis is produced to the floor, and its pivot end is carried by a solid bracket which forms part of the standard casting; this arrangement admits of a 3-foot hour circle. The telescope is carried on the north end of the polar axis, as in the German method. The weight of the standard casting is rather more than two tons.

When the object glass is determined upon (and if possible procured before proceeding further), and the general design of the instrument is got out, it remains to make fit choice

of a manufacturer to construct the instrument and carry out the details in the best manner. In making this selection it is necessary to have regard not only to the personal skill and experience of the maker himself, but also to his means of carrying out the work effectually. This precaution need not apply in the case of small instruments, as any good instrument maker has the means of constructing them with the utmost accuracy, but for large instruments, when the parts are ponderous and yet require the utmost accuracy of finish, it is very necessary to put the work in the hands of an instrument maker who is provided with large and powerful lathes and other tools of the best and most modern construction. The instruments for the Orwell Park Observatory were constructed throughout, and the details designed by Mr. James Simms (Messrs Troughton and Simms), with great skill and beauty of workmanship.

(To be continued)

F.A.S. CONVENTION MEETING

The annual F.A.S. convention at the R.G.O. at Herstmonceux was held on Saturday 3rd October. Attendance at this event has become a society tradition ever since the first convention in 1981. This year 11 members met at Alan Smith's for a start as soon as possible after 8.00 a.m. In previous years Alan has been able to obtain the hired minibus on the Friday evening. Unfortunately the hire arrangements had been changed this year and the minibus could not be picked up until after 8.00 a.m. on Saturday. Our party left for Herstmonceux at 8.25. This year was the first time we were able to take advantage of the new by-pass round Chelmsford. We arrived at Herstmonceux in record time, having taken only 145 minutes.

The procedure on arrival at Herstmonceux followed a similar pattern as in previous years. Parking on the grass in front of the castle, registration at the west entrance, followed by a coffee in the castle dining room. A short time after sitting down with our coffee, Roy Cheesman and R. Bayley arrived, thus completing our party.

The first lecture was scheduled to start at 11.30. In the intervening time our group purused the various trade stands. The first lecture was on "Gravitational Lens" by Dr. K. Subramanian. Those who attended returned a verdict of interest.

At 1.00 p.m. we adjourned to the minibus for a packed lunch on the grass. The weather was not quite as warm as

last year but it was sunny with only a gentle breeze. The afternoon programme at Herstmonceux always involves:- a walk round the grounds to include the annual circuit round the former dome of the Isaac Newton telescope, with much philosophical talk on the future of the structure; visits to the domes and R.G.O. exhibition at the equatorial group to be concluded with the yearly clamber over the laser ranging facility.

The incident that caused the most interest had nothing to do with any astronomy. A brightly coloured hairy caterpillar was discovered crawling across the approach road to the equatorial group. The caterpillar species was not identified, though I suspected it may belong to the hawk moth family as it had a horn like structure at its tail end. The caterpillar was returned to the cover of the nearby sweet chestnut trees.

During the afternoon two more lectures were held. One on "Chemically Peculiar Stars" and the second entitled "And God Created Newton" - A scientific genius at work. As our party tended to fragment and every one went his separate way, I am not sure whether any one attended any of the talks. Towards the end of the afternoon we all met up again in the R.G.O. cafe, before walking over to the laser ranging facility, and a short walk round the grounds. The afternoon was concluded with a final perusal of the trade stands before they closed for the day. Four were approached with an invitation to attend our 21st Anniversary Convention on 9th July next year.

Our party left Herstmonceux a little after 6.00 p.m. The journey home was interrupted twice; first at a fish and chip shop in Robertsbridge, and secondly at The Cross Keys public house at Hurst Green, that in recent years we have adopted as our 'local' whenever we are returning from the F.A.S. Convention.

The remaining journey home was uneventful except for two events occurring after our re-emergence out of the Dartford Tunnel. Unusual and amusing incidents have always been recorded in previous reports on excursions to Herstmonceux. Observing the moon is a familiar sight to all of us, but the bare faced cheek of an unknown occupant in an overtaking car presented the hilarious spectical of his bare behind being displayed through the open rear window. Having passed, the car's hazard warning lights were switched on as it sped away from us. It was several seconds before the oddity of the apparition that had presented itself was appreciated by every one. The minibus filled with loud laughter.

The final incident before we arrived home a little after 22.00 concerned a near graze with a speeding car that had refused to slow down on the M25/A12 interchange slip road.

Members on the excursion were: David Payne, Darren Payne, Martin Payne, Martin Cook, Eric Sims, Peter Richards, Michael Harlow, David Barnard, Alan Smith, Paul Beaumont and myself.

R. Gooding

It's a Moony Xword

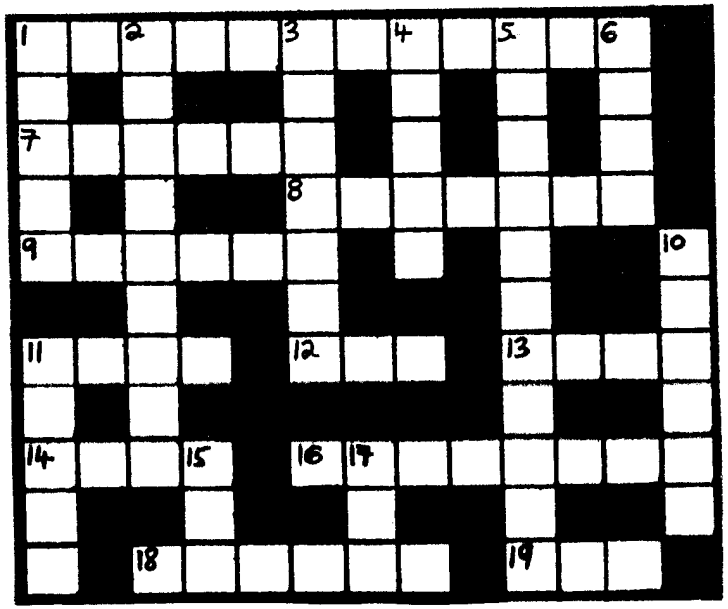
Across

1 Topographic description & charting of the surface of the moon (12)
7 American lunar probes which crash-landed on the lunar surface & sent back close-range TV pictures of the moon during last few minutes of flight (6)
8 Far side lunar crater 4°N 102°E (7)
9 Nearside crater 46°N 10°W (6)
11 Latin for moon Goddess (4)
12 The moon can rise twice within this period (3)
13 A point or horn of the moon when it is between new & full (4)
14 Right hand side of the moon when viewed through an astronomical telescope (4)
16 Alternative type of crater to answer of question ten (8)
18 Point in orbit where the moon is at it's greatest distance from the Earth (6)
19 Low tide (3)

Down

1 Period of 18 Yrs 11 days (5)
2 In 1645 this person was one of the first to attempt mapping of the lunar surface (9)
3 Nearside crater 43°N 47°E (7)
4 Nearside crater 25°N 37°E named after the Danish astronomer who determined the velocity of light by using the satellites of Jupiter (5)
5 White lunar rock which is the main component of the so called "Genesis rock" brought back by Apollo 15 (11)
6 This lunar period spans about 354 mean solar days (4)
10 One way of forming a crater (6)
11 In 1611 this Astronomer made drawings of the moon & described the moon as "A tart which his cook had made" (5)
15 Abreviation for short lived glows & obscurations which are associated with moonquakes (3)
17 Metal bearing, mineral substance (3)

XWORD No 10



Solution to Xword number 9

Across - 1 Asteroids, 6 Saturn, 9 Arm, 10 Annular, 12 Echo,
13 OmegaCentauri, 15 Eridanus, 18 Mercury, 20 Atmosphere,
24 Anubis, 25 Giraffe, 27 Earth, 28 Net, 29 Hyades.

Down - 1 Andromeda, 2 Trapezium, 3 Ram, 4 Image, 5 Sun, 6 Sol,
7 Tureis, 8 Roche, 11 Uranometry, 14 Canopus, 16 Ara,
17 Dubhe, 19 Yerkes, 21 Tania, 22 Orbit, 23 Eagle, 26 Fly

Computing Sidereal Time

David Payne

For any astronomer wishing to predict the aspect of a celestial object from his local observing position it is necessary to know the local Sidereal Time. However calculating Sidereal Time at any longitude, date and Universal Time instant is not usually carried out by amateurs without recourse to tables of Greenwich Sidereal Time as published in the Astronomical Emphemeris. Many amateurs do not have ready access to such tables and with the availability of home computers it is now possible to compute local sidereal time to a high degree of accuracy without the use of tables.

Sidereal Time (ST) is one of the four different time systems used in astronomy. The other time sytems are Universal Time (UT), Ephemeris Time (ET) and Atomic Time (AT). Universal Time is based on the Earths rotation with respect to the sun and is an out growth of Greenwich Mean Time. Sidereal Time is based on the rotation of the Earth with respect to the stars and because of the rotatoin of the Earth about the Sun a Sidereal day is approximately 4 seconds shorter than a solar day. Because of irregularities in the rotation period of the Earth UT and ST are not best suited to very accurate calculations in celestial mechanics (eg. the accurate predictions of the position of a space probe). Such calculations need a rigourous uniform time scale and for these purposes Emphemeris Time was invented. Empemeris Time is based on the observations of moving bodies against the stellar back ground and because the moon has the largest apparent motion, observations of the position of the moon (occultation measurments) are used to determine Emphemeris Time. Currently Emphemeris Time is appoximately 50 seconds different from UT.

The advent of the ultra accurate atomic clock has led to a further time system - Atomic Time based on the time taken for an energy level transition in cesium 133. The difference between Atomic time and Emphemeris Time is 32.18 seconds and the duration of 1 second of Atomic Time is within 2 parts in 10^9 of the duration of 1 second of Emphemeris Time.

All these four time systems share common concepts of hours, minutes, seconds and also the idea of the Julian century of exactly 36,525 days. Of course because the time systems are based on different fundemental time measurement systems the duration of these time units are different in each system.

For the remainder of this article I will be only considering UT and ST. Both these time systems are measured relative to the rotation of the Earth and therefore are rigourously related by the following equation:

$$UT + 12^h = \text{Greenwich Mean Sidereal Time (GMST)} - A_{FMS}$$

The term A_{FMS} is the position of the fictitious mean sun on the celestial equator for the instant of UT being considered and is given by the equation:

$$A_{FMS} = 18^h38^m45^s.832 + 8640184^s.628tu + 0^s.0929tu^2$$

The parameter tu is the number of Julian centuries of 36525 mean solar days since the fundamental epoch of 12^h Jan 0^d 1900.

GMST is the Sidereal Time on the Greenwich Meridian and is also the Right Ascension of the Central Meridian (the north-south meridian on the celestial sphere) on the Greenwhich Meridian. To obtain local sidereal time (ie the sidereal time at your observing site) the GMST needs to be corrected for the local longitude ie. Local ST = GMST - L

Where l is the observatory longitude measured westwards.

The above three equations form the basis for the calculation of Local Sidereal Time which is also the Right Ascension of the local central meridian.

The program listing shown below is a BASIC program that requires as input the UT instant of interest, the date and the local observatory longitude. If your version of BASIC requires line numbers then just add them as required also call the appropriate line number for the subroutines if your BASIC does not support name calls.

What follows is a brief description of the program. The first line defines all variables to be double precision again if your Basic only supports single precision then ignore this line.

The next two lines inputs the time and converts it into seconds giving it the variable name tt. The next line inputs the date into three variables for the days, month and year. The next line just initialises the variables ts,dy and day. The following line calculates tu the number of Julian centuries since 12^h Jan 0^d 1900 including any leap years (note 1900 was not a leap year hence the -1). Ignore the & and £ symbols they are put into my version of BASIC to signify long integers and double precision real numbers. A_{FMS} is then calculated (note every term has been converted to seconds). The call to the subroutine numdays calculates the number of days from Jan 0 to the day of interest. GMST is then calculated in seconds (ts) and converted before print out to hours minutes and seconds by the subroutine hms. Finally the observatory longitude is input, converted into time seconds and subtracted from ts to give the local sidereal time. Again suroutine hms is used to convert to hours, minutes and seconds before print out.

The only line not fully explained is the calculation of ts after the call to numdays. Sidereal time gains on ut at the rate of 236.55536 seconds per day A_{FMS} gives the sidereal time at 0^h Jan of the year of interest and therefore it is necessary to multiply the number of days from 0^h Jan to the day of interest by the acceleration factor 236.55536 and add it to A_{FMS} The final correction is to take into account the difference between a sidereal second and a UT second. One sidereal second equals 1.002737909265414 UT seconds. The number of UT seconds to the time of interest needs to be correcter by this factor and added to the previous term to give the final GMST in seconds.

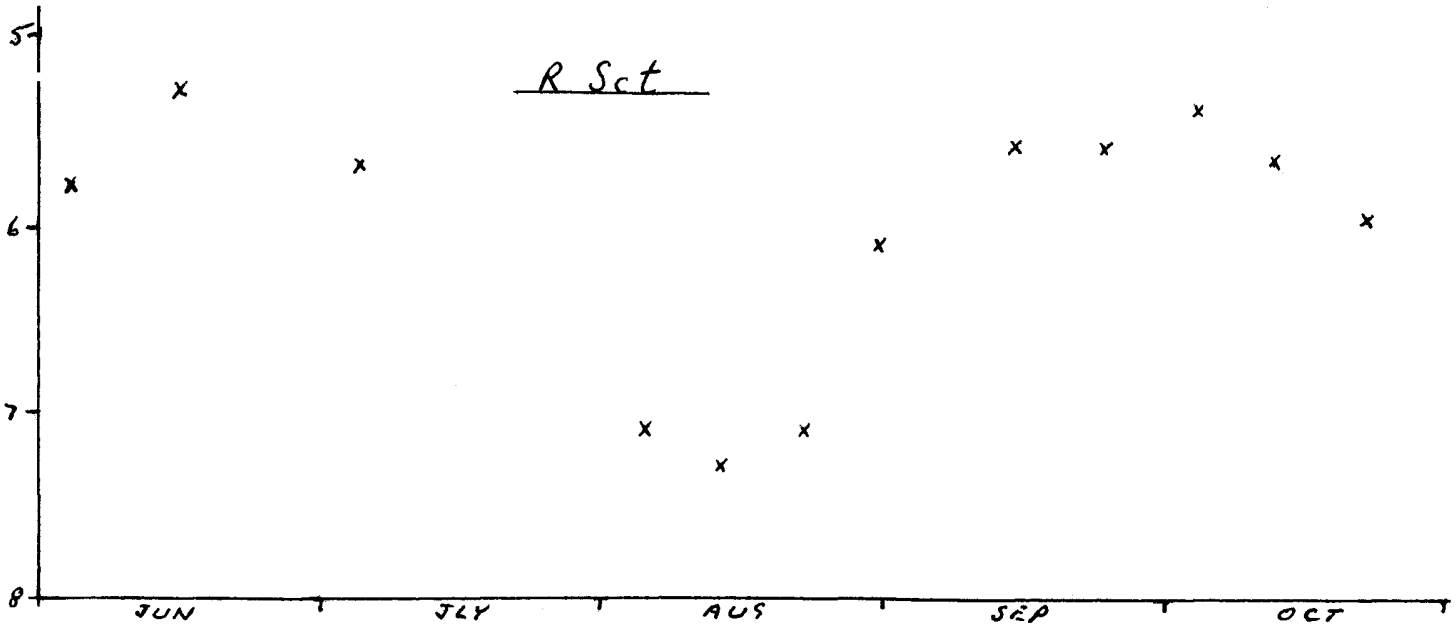

```
DEFDBL a-z

INPUT "Time (U.T.) - hrs,mins,secs", hrs,min,sec

tt=3600*hrs + 60*min + sec

INPUT "Date - day,mth,year", dd,mth,yr

   ts = 0 : dy = 0 : day = dd
   tu = (.5+(yr-1900)*365+INT((yr-1900-1)/4))/36525&
   afms = 23925.832£ + 8640184.628£*tu + .0929*tu*tu

   GOSUB numdays
   ts = 236.55536£*day+afms + 1.002737909265414£*tt

   GOSUB hms
   PRINT "Greenwhich Mean Sidereal Time =  "¦sh¦sm¦ss
```

```
   INPUT "Observatory Longitude - degrees,mins,secs ", ld,lm,ls

     lo = 24*(ld*3600+lm*60+ls)/360
     ts =ts-lo
   GOSUB hms
      PRINT "local sidereal time =   "¦sh¦sm¦ss
      END

   hms:
      sh = ts/3600
      sm = sh - INT(sh)
      sh = INT(24*(sh/24-INT(sh/24)))
      sm = sm*60
      ss = sm-INT(sm) : sm=INT(sm)
      ss = ss*60
      RETURN

   numdays:
      FOR m = 1 TO mth -1 STEP 1
         READ sd
         dy = dy + sd
         NEXT m
      day = dy +day - 1
      IF yr/4 - INT(yr/4) = 0 AND day > 59 THEN day = day + 1
      RESTORE monthdays
      RETURN
   monthdays:
      DATA 31,28,31,30,31,30,31,31,30,31,30
```

VARIABLE STAR OBSERVATIONS

by Mike Nicholls

This light curve shows R Scuti from June to October this year. It is a member of the RV Tauri class of variables. This type have a mixture of deep and shallow minima. Here we see two maxima separated by a deep minimum.
All these observations were made using 10x50 binoculars, making this a very easy star to observe.



PROGRAMME FOR NOVEMBER

MONDAYS from 8pm DOUBLE STAR & PLANETS SECTION
2-9-16-23-30
Mr N Taylor, Farmlands, Trimley Tel:Fel.
Mr T Gillan, Bardwell Tel:
Miss M Edwards, Bury St.Edmunds, Felixstowe Tel:Fel.

TUESDAYS from 8pm GENERAL OBSERVATION SECTION
3-10-17-24
Mr N Gage, Trimley Tel: Fel.
Mr R Newman, Felixstowe Tel: Fel.
Mr J King, Felixstowe Tel: Fel.

WEDNESDAYS from 8pm NEBULEA & FAINT OBJECTS SECTION
4-11-18-25
Mr M Cook, Ipswich Tel: Ips.
Mr D Payne, Wickham Market. Tel:W.Mkt

FRIDAYS from 8pm GENERAL OBSERVATION SECTION
12-26
Mr R A Lobbett, Felixstowe. Tel:Fel.
Mr J Hood, Ipswich. Tel:Ips.
Mr M Harlow, Felixstowe Tel:Fel.

On nights other than Wednesday please contact directors to confirm dates.

1987 COMMITTEE

CHAIRMAN	D Payne	Work:
	Wickham Market, IP13 0SD	Home:
VICE CHAIRMAN /P.R.O	D Barnard	Home:
	Ipswich, IP4 5PP	Work:
	Essex SS17 9BU	Extn
SECRETARY	R Gooding, Ipswich	Home:
	IP1 6AE	
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	Ipswich, IP9 2EX	Home:
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