ORWELL ASTRONOMICAL SOCIETY, IPSWICH.

O.A.S.I.

SOCIETY NEWS

ANNUAL GENERAL MEETING

1. 8.00 p.m. January 10th 1987.
All members are invited to attend the 1987 A.G.M. This will be held in the school library on Saturday 10th January, starting at 8.00 p.m.

2. Nomination Form
A vacancy will exist on the 1987 committee. A nomination form is included with this newsletter for anyone interested in filling the position. This should be returned to Roy Gooding before 31st December.

3. Subscriptions
Annual subscriptions are due on January 1st. The rates for 1987 are:-

Junior and O.A.P.	£4.00
Adult	£6.50
Family	£7.50

plus £1.60 for newsletter postage if you do not wish to collect it from the dome. Payment can either be sent to David Barnard, or payed at the A.G.M.
The rates have been raised in order to cover society running costs. This is the first increase since January 1985.

4. B.A.A. Award
One of our senior members, Mr. E. Collinson has recently been the recipient of the B.A.A. Stevenson award. This award is made yearly to B.A.A. members who have made a significant contribution to observational astronomy. Mr. Collinson received it for his variable star work. His prize was the 1986 edition of Variable Stars by Hoffmeister. Mr. Collinson's observational career spans many decades. He used the Orwell Park telescope in the 1930's to observe Mars.

5. Lecture Meetings
The following talks have been booked for the new year. The venue is in the Collinson Room at The Friends' Meeting House, Fonnereau Road.
(a) Friday, March 13th at 8.00 p.m.
A second chance to hear the account of Roy and Alan's Australian trip.
(b) Friday, April 10th at 8.00 p.m.
A talk by Bob.Markham on solar system geology.
Both meetings will be a joint function with the Ipswich Geological Group.

MEASURING THE EARTH USING QUASARS

by Mike Harlow

It may seem remarkable but by observing radio signals from the most distant objects in the universe it is possible to learn about the internal structure of the Earth. Using observations of the stars to study the Earth is called Geodetic Astronomy and the subject has a long history. Measuring accurate positions of the sun and stars through telescopes over the last few hundred years has revealed a great deal about our planet, for example, that it is not spherical, that it does not rotate at a constant rate and that it's spin axis wobbles.

These measurements all assumed that the stars were fixed. Over the last few decades however optical astronomy has run up against two fundamental limits to it's measuring accuracy. Firstly, the atmosphere refracts starlight so that a stars position cannot be fixed precisely, and secondly, the stars themselves move so that the so called "fixed" reference frame is gradually changing. To make extremely precise measurements of the Earth an absolutely fixed referance frame was needed, and this is where the quasars and radio astronomy come in.

The Methods...

Over the last few decades radio astronomers have used Very Long Baseline Interferometry (VLBI) to look at radio sources in very fine detail; indeed, much better than optical telescope can achieve. VLBI uses an array of 2 or more radio telescopes separated by hundreds or thousands of miles to simulate one enormous instrument. The result is extremely accurate measures of position, for example, of quasars. What the Geodetic astronomers have done is to turn the observations around. By assuming that the quasars form a fixed referance frame (as they do because of their immense distances) the relative positions of the individual radio telescopes in the array can be accurately measured.

The idea is quite simple. Consider just two radio dishes looking at the same quasar. The incoming signals are recorded along with timing "tags" from an atomic clock; comparing the arrival times of the signals gives the astronomers an accurate measure of the separation of the two dishes. By looking at a minimum of three quasars in different parts of the sky the absolute separation and direction of the two dishes is known, and because the timing is with an atomic clock the separation can be worked out to within a few centimeters over maybe 6000 miles!

There is another important measurement. As the Earth rotates the time delay between the signals changes. When this delay returns to its initial value the Earth has turned once; in this way the length of the day can be determined to 1/10000 second!

The Results and Implications...

A lot can be learned from these accurate measures of time and distance, for example:

1. How viscous is the Earth's interior?

Between 1899 and 1982 optical measurements suggested that the Earth's pole was gradually drifting in position. The VLBI data over just 5 years has confirmed this and shown it to be moving by 11 centimeters per year. The reason for this is probably a gradual displacement of mass in the Earth's mantle. During the ice ages the weight of the polar caps depressed the Earth's crust squeezing material towards the equator; when the ice melted this material started to flow back towards the poles. It is still doing so and is slowly changing the Earth's symmetry axis as it moves leading to the polar motion. The amount of polar drift is determined by the rate of flow of the mantle which in turn is determined by the mantles viscosity which because of the VLBI data can now be worked out.

2. How long is a day?

From the 1930's onwards, with the invention of more accurate clocks, it became known that the length of the day was not constant. For example, days in January are a few milliseconds longer than days in July. Variations with periods of a month and a fortnight were also discovered and linked with the motions of the Moon; these gave changes of a few tenths of milliseconds per day. Where VLBI is useful is that it can monitor the length of the day every day and thus look at irregular changes in it's length.

Back in 1960 it was suggested that the winds in the atmosphere may alter the length of the day. Recently it has become possible to check this. Between July 1981 and July 1985 VLBI was used to make accurate timings of the days length. Over the same period the energy in the Earth's atmosphere, based on wind speeds and directions, was calculated. Comparing the results showed that over 90% of the variation in the days length could be accounted for assuming exchange of energy between the atmosphere and solid earth! This was dramatically illustrated in early 1983. At that time the winds in the Pacific changed direction (as they do every 2 to 6 years) so that they blew east to west effectively opposing the Earth's rotation. In the same period the length of the day increased by up to 3 milliseconds per day!

3. Is the Atlantic getting wider?

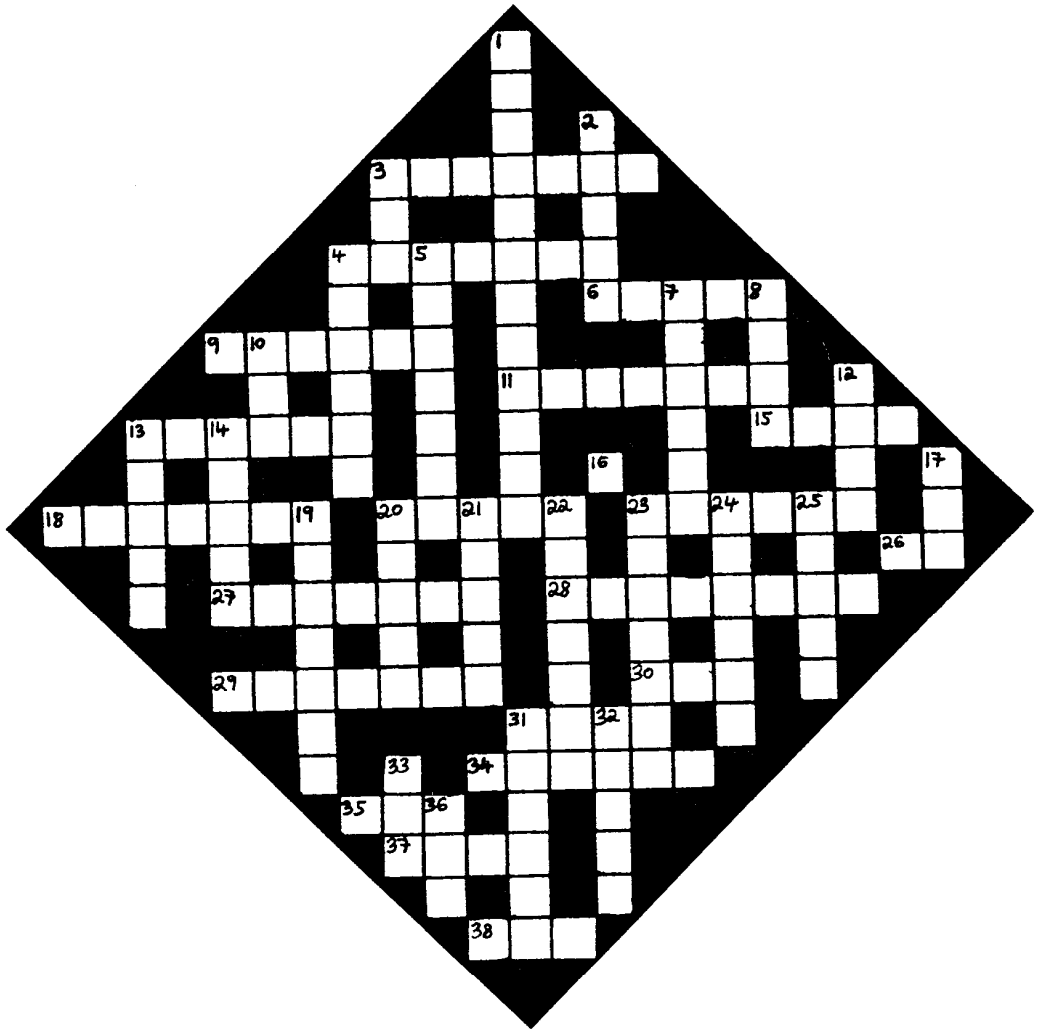
The idea that the continental plates of the Earth move about over millions of years has up till recently only been inferred from geological evidence. The VLBI results can directly measure this continental drift and indeed the Atlantic is widening--by just over 1 centimeter per year! Larger drifts have been seen however; Hawaii and Japan are moving closer together by over 11 centimeters per year

And a final comment...

This article has been adapted from a report by W E Carter and D S Robertson that appeared on page 44 of the November issue of Scientific American which should be referred to for more detailed information.

Astronomy is often criticised and poorly funded because it is considered that studying object millions of light years away is irrelevant. Carter and Robertson's article shows that, in this particular case, this is far from true--it can in fact tell us a great deal about the planet we live on.

XWORD No 5



R.A. LOBBETT

ACROSS

3 "the eyebrows" - 4th magnitude star in Leonis. (7)
4 Assigned to identify astronomical values or celestial bodies. (7)
6 Table of sacrifice of centaur - constellation (5)
9 Pieces of transparent material so shaped as to concentrate or disperse light rays. (6)
11 Control centre of Nasa's manned space flights. (7)
13 Astronomer who deduced a velocity - distance relationship from large red shifts of receding galaxies. (6)
15 Bird of paradise - constellation. (4)
16 Completes hidden Christmas greeting. (1)
18 First man to be killed in space - Cosmonaut. (7)
20 Satellite of Uranus discovered in 1851. (5)
23 Positions of two celestial bodies with respect to one another. (6)
26 Satellite of Jupiter. (2)
27 Star "bringing good tidings" within Capricornus. (7)
28 Stage during an eclipse when moon or part of the Earth is in Umbra. (8)
29 Dense clouds of gas & dust which are either dark or luminous. (7)
30 Latin name of constellation given in clue 6. (3)
31 Lepus. (4)
34 Calender established by Julius Caesar in 46 B.C. (6)
35 Colour of an oval spot 30,000 miles long & 7,000 miles wide on the planet Jupiter. (3)
37 Where the sun rises. (4)
38 A period of time. (3)

DOWN

1 Layer of atmosphere above the troposphere. (12)
2 Faint southern constellation, requires a high IQ. (5)
3 A line of light. (3)
4 Solar ..... (6)
5 French astronomer who compiled the first catalogue of nebulae & clusters. (7)
7 Satellite of Saturn. (6)
8 4th magnitude star in Eridanus. (4)
10 Back flow of tide. (3)
12 Fine particles on surface of the moon. (4)
13 "lucky star" in Pegasus. (5)
14 Caelum, the chisel - southern constellation. (5)
17 One of the longest recognised of the constellations. (3)
19 Part of the universe which we can see. (7)
20 Planet does this type of rotation. (5)
21 The eye will see this whilst looking through a telescope. (5)
22 Component of a star's motion at right angles to the line of sight. (7)
23 Classically Virgo was this Goddess of justice. (7)
24 Could be a rotating neutron star. (6)
25 The whale - constellation. (5)
31 Orion is one. (6)
32 Narrow furrows on the floors of some craters on the moon. (5)
33 More than one in M44's hive. (3)
36 An interval between two successive meridian transits of a star. (3)

Solution to crossword number 4

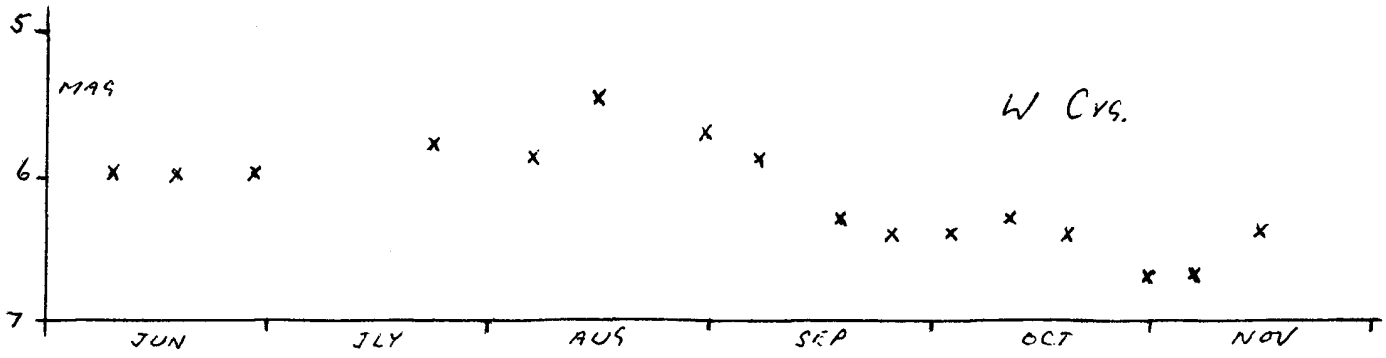
Across - 1 Planetarium, 9 Lyra, 10 Arcturus, 11 Alkes, 12 Multiple, 13 Icarus, 15 Hyades, 17 Capella, 21 Sirius, 22 Bull, 23 Novae, 24 Sadr, 25 Ganymede.

Down - 1 Polaris, 2 Aurorae, 3 Thales, 4 Rigel, 5 Mercury, 6 Latitude, 7 Pisces, 8 Propus, 14 Uranus, 15 Halley, 16 Spica, 18 Libra, 19 Brahe, 20 Node.

VARIABLE STAR OBSERVATIONS

by Mike Nicholls

This light curve shows the semi-regular variable star W Cygni, from June to November this year. As can be seen there is not a great deal of variation during this time. However, this type of variable does not normally exhibit large changes in brightness. Two magnitudes is generally the largest change seen. The variations in this class is due to pulsations in the stars themselves, the semi-regular nature being partly due to more than one mode of oscillation operating at the same time. W Cygni is thought to have at least four modes. W Cygni like most of the class, is an old red giant. This accounts for the large spread in results of observations for this star; a spread of one whole magnitude is quite normal. Despite this, the star has been observed almost continuously since 1927.
Observations were made with 10x50 binoculars.



PROGRAMME FOR DECEMBER

MONDAYS from 8pm — DOUBLE STAR & PLANETS SECTION
1, 8, 15, 22, 29 — Mr N Taylor, Farelands Trimley Tel: [redacted]
Mr T Gillan, Bardwell Bury St.Edmunds. Tel: [redacted]
Miss M Edwards, Felixstowe Tel: [redacted]

TUESDAYS from 8pm — GENERAL OBSERVATION SECTION
2, 9, 16, 23, 30 — 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
3, 17, — Mr M Cook, Ipswich Tel: Ips.
Mr D Payne, Wickham Market. Tel:W.Mkt

FRIDAYS from 8pm — GENERAL OBSERVATION SECTION
5, 19 — 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.

NIGHT SKY

(all times G.M.T.)

Sun Rises at about 8.10
Sets at about 15.50

Moon ● 1st ◑ 8th ○ 16th ◐ 24th ● 31st

Mercury visible before sunrise in the eastern sky, best seen at the beginning of the month. Mag.-0.5.

Venus Prominent object in morning sky before sunrise Mag.-4.7. Rises about 4 hours before sun in mid month.

Mars Prominent in evening sky, sets at about 23.00 in mid month Mag. 0.4

Jupiter Prominent in evening sky, sets at about 23.00 in mid month. Near to Mars on the 19th, Mag.-2.4.

Saturn Conjunction on the 4th.

Uranus Conjunction on the 14th.

Neptune Conjunction on the 27th.

R. Gooding.