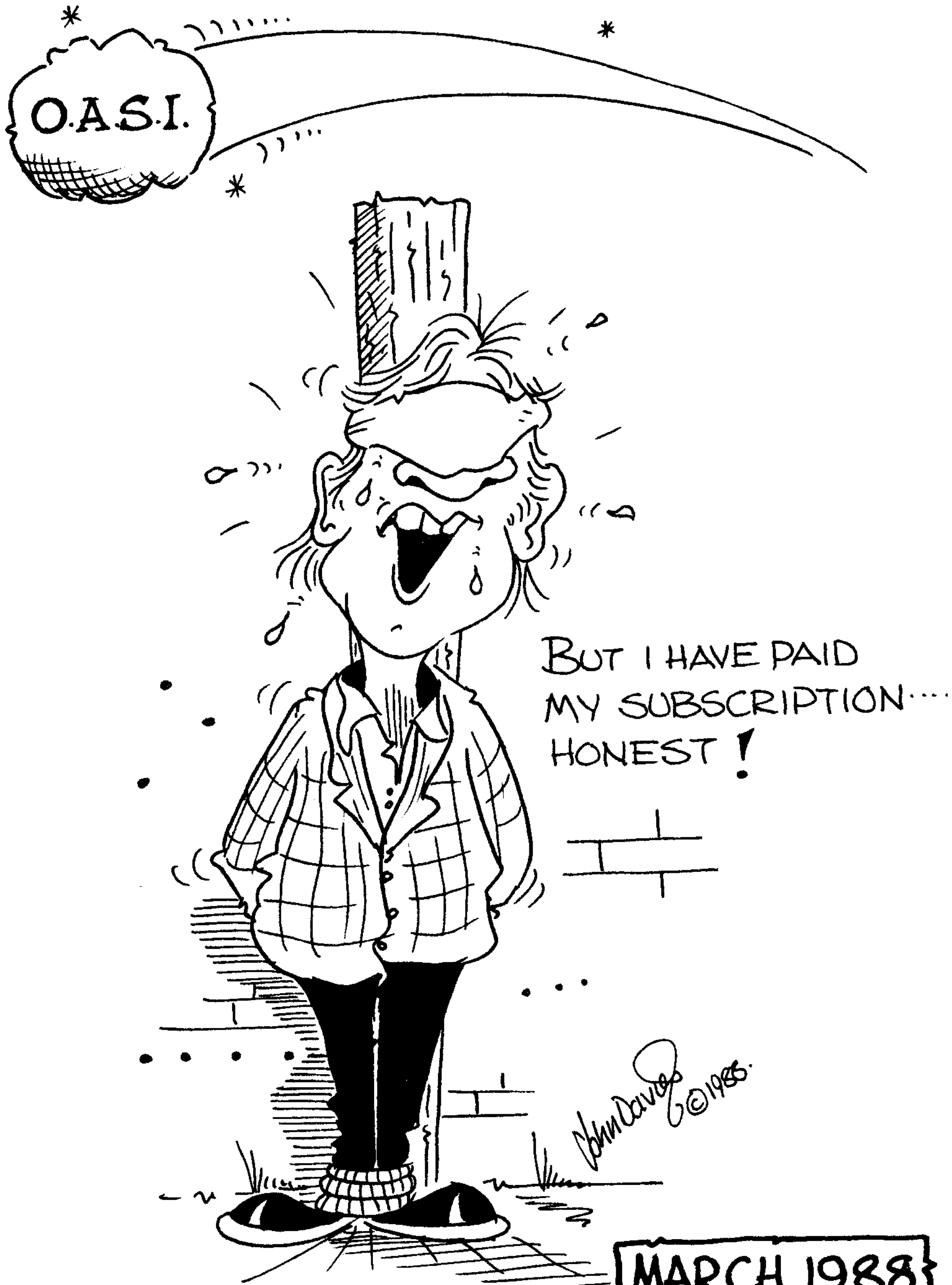
ORWELL ASTRONOMICAL SOCIETY IPSWICH



MARCH 1988

SOCIETY NEWS

1. Subscriptions
   These were due on January 1st.
   Rates for 1988 are :

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

Members wishing to receive their newsletter by post, please add an additional £2.00 to cover postage and stationery costs.
This will be the last newsletter sent to unpaid up members.

2 Decoration Of The Observatory
  Much help is still required on ALL WEDNESDAY EVENINGS.

NIGHT SKY

Sun Rises approximately between 07.00 - 06.40
Sets approximately between 17.30 - 18 30

Moon 3rd 11th 18th 25th

Mercury Visible in the morning sky,rises less than onehour before the sun.Greatest elongation on the 8th (27°)
Venus Well placed for observation in the evening sky.Sets at 22.30 in mid month. Mag. -4.2
Mars Visible in the morning sky.Rises at about 03.30 in mid month.Mag.0.8
Jupiter Visible in evening sky. sets at about 21.30 in mid month.Mag. -2.1
Saturn Rises at 02.30 in mid month.Mag. 0.5
Uranus Rises at 02.30 in mid month.Mag. 5.8
Neptune Rises at 02.00 in mid month.Mag. 7.7

GRAZING OCCULTATIONS

If the moon passes in front of a distant star then an "Occultation" occurs.Obviously,there are occaisions when,instead of the moon passing completely in front of the star,the star appears to just miss the edge of the moon and "dodges" between the mountains and valleys of the lunar surface. This is called a "Grazing Occultation",and can only be observed from a very narrow strip of the Earths surface.(A shift of observing position by only a few tens of meters will mean either a complete occultation or a complete "miss".)

In an "average" year there will be about a dozen or so "Grazes" that can be observed from the British Isles,with usually,only one or perhaps two at the most,being favourably positioned for observers located in East Anglia.

For 1988 there were,exceptionally,two graze tracks crossing our region,and amazingly they were on consectutive nights late in January.

In order to get data that is as usefull as possible,a method of timing each disappearance and reappearance has to be timed to an accuracy of one tenth of one second.This is usually achieved by using a portable cassette tape recorder,the nearest public telephone box and a lot of rushing about.Once the observing site has been reached and the gear set up,a member of the party goes to the nearest phone box,dials the speaking clock and starts the tape recorder (on record).Leaving the recorder running the party dashes back to the observing site,completes the observation (all relevant comments stored on the still recording tape) dashes back to the telephone box and records the speaking clock again and finally switching off the recorder.Each event can timed at leisure once the party has returned home simply by playing back the tape and using a stop watch.

For this year,I have been fortunate in obtaining an MSF Rugby Radio clock (this is a radio reciever that uses an encoded and very accurate signal from Rugby to set and display the time on a digital display)so all the dashing to and from a phone box is now unnecessary.

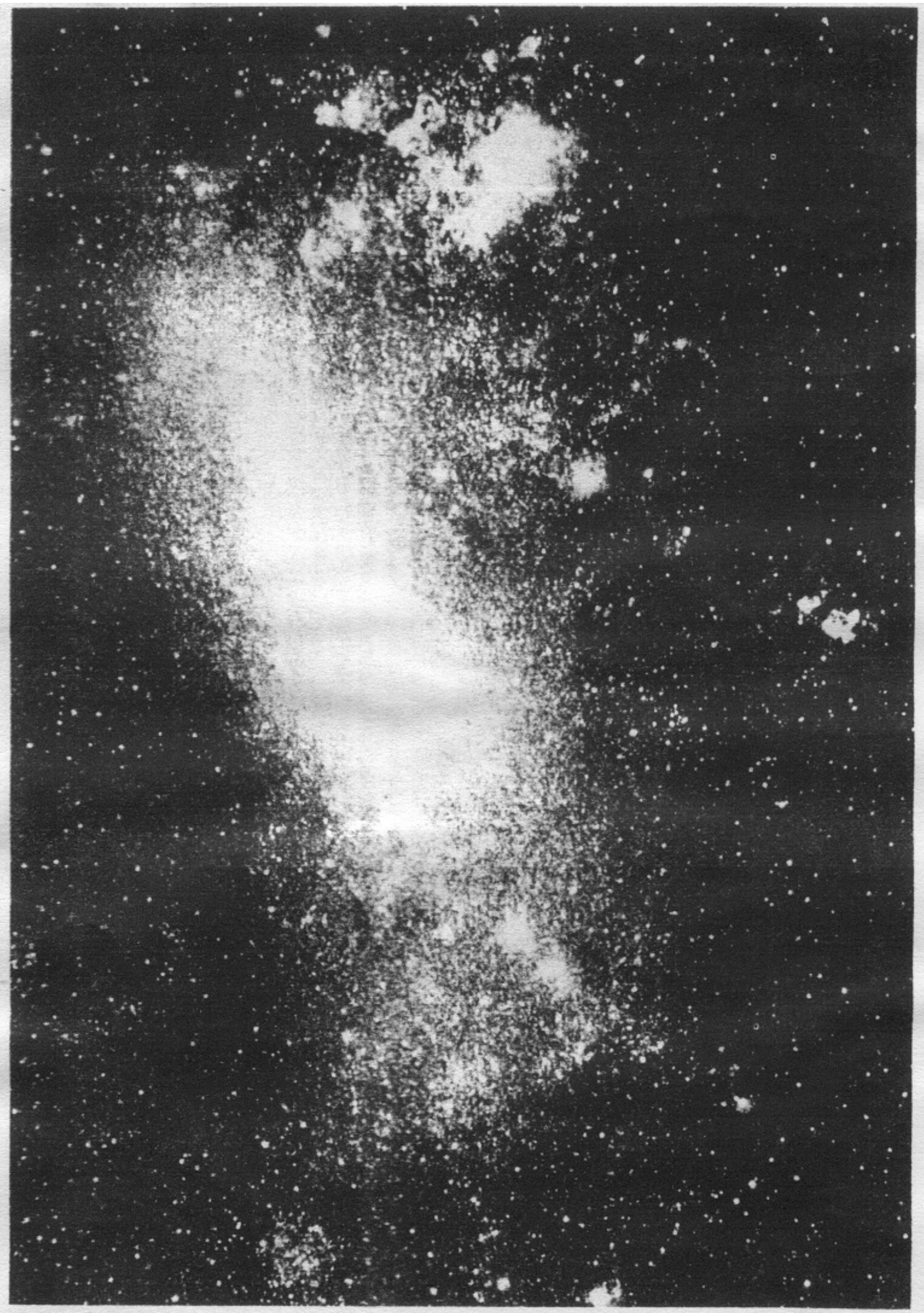
As usual,the data charts showing the predicted tracks were obtained from the BAA and the tracks were plotted on large scale maps.Observing sites were chosen from the maps (with due regard to the location of terrestial lights,eg Airfields,large towns etc) and observing parties arranged.

The first graze occurred on the evening of the 24th Jan,with the observing track passing to the North of Wroxham in Norfolk,a round trip of about 150 miles being involved.As was usual,the day started off clear and bright but gradually became more and more overcast,with the observing trip being called off late in the afternoon (fortunately before the parties had set off).

Graze number 2,the next evening, followed the more usual pattern.The track,unually, passed quite close to Ipswich,with a round trip of only about 40 miles being involved so a late start for the observing teams was contemplated.Periods of cloudless sky were interspersed with periods of complete cloud cover, the observing parties set out and the rendezvous along the A12 to Colchester was reached just in time to cancel the session because of impending rain.Everyone returned home,unpacked equipment and went to bed pondering on yet another British Astronomical event.

The OASI has been chasing grazes for 15 years and so far only 2 events have been observable ! (One of which was a spectactualar event involving a graze of Venus in the late 70's) Still there is always next year !

A.J.Smith.



THE LARGE MAGELLANIC CLOUD.

THE SANDULIAC-69202 ADVENTURE -

DISCOVERY OF AND RESEARCH INTO A SUPERNOVA

From 'Horizon', 1988 January 11 (BBC 2).

'The Death of a Star'

as retold by Roy Adams

The early stages of a supernova explosion are very rarely seen. The astronomical world had never seen with modern instruments and infrastructure, anything really like it.

True, the Crab Nebula in Taurus is something that centuries ago was doubtless awesome to stargazers. That supernova remnant which in somewhat more modern times was according to literature, first seen in 1731 by Bevis, forgotten and then rediscovered by Messier, inspiring him to make his catalogue of over 100 nebulae after 1758, is now 60 000 000 000 000 miles across. The Crab Nebula exploded in 1054.

'Horizon' quoted the energy involved in the collapse of the star that formed the Crab Nebula to be about 10^{53} ergs, or the equivalent of the energy dissipation of the whole Universe (as far as we know it) for one second. ((It appears to have been much larger than a typical supernova explosion, which could be only 1/100th that of 'The Crab'.* By comparison, the kinetic energy of the meteorite that made the Arizona Crater was only approaching 10^{23} ergs,* which is also about the order of magnitude of a 1 megaton explosion.* One kWh unit of electricity is 3.6×10^{13} ergs;* a six-hit at cricket 10^{10} ergs*.)) Here in the centre of what is now the Crab Nebula, 100 times the life of 'our own' star, the Sun, in energy, was expended in just one second.

Briefly, the energy of a dying star gets less and less, and the mass so high that gravitational forces of the whole overcome the structural forces within the atoms of highly compressed metals of the star and when the iron core collapses, an enormous shock wave travels back out through the envelope of the star. The star collapses in about 1/5 second, and the outward shock wave moves back out in about 1/50 second.

This is also, apparently, the sort of thing that happened to one of the components of the 12th magnitude star in Doradus, in a region of the Magellanic Cloud, Sanduliac -69 202, at R.A. 05h 35.1m, Dec. -69°16'50".

It is best to start our little story with two astronomers at Las Companos, Chile. One, Oscar du Halde, settled down after checking the controls of the 40-inch telescope, to a routine programme of observation, with his favourite music as audible back-up. Further down the hill, Ian Shelton, a young Canadian astronomer from Toronto, struggled with the old ten-inch. Its roof had jammed, and he was having to see to it by hand.

In spite of this, Ian carried on and made his test plate, of the nearest galaxy to our own, a faint patch of stars called the Large Magellanic Cloud. For this, he had to hand-guide the telescope for three hours.

At 2 a.m., Oscar decided to take a break, during which the Magellanic Cloud took his attention also. There was a new object there! But he had to go back to continue the current work of the 40-inch, became involved with that, and temporarily forgot about the new object.

Meanwhile, Ian had been forced to stop for the night - the roof had slammed shut and the telescope blown over in the wind. To see if his photograph would still be all right, he anxiously developed the plate. By then it was gone 4 a.m. He had intended going to bed afterwards. But it appeared from looking at his fresh plate, that the star 30 Doradus was accompanied. He checked on another plate from the

previous night's work. There was no new bright companion star on that plate. Ian went outside, to see if he could 'meet' the star in person. Yes, it was there and it was quite spectacular. He realised he must be seeing a new supernova, and rushed to tell Oscar. They had to act quickly, to alert the world and claim their discovery.

Ian had no idea how to do this to best effect, and looked for the necessary information in a popular astronomy magazine. It was daybreak before Bill Kunkle, the scientist in charge at the office in La Serena, 150 miles away, received news of the supernova. How to get this message out? The local Telex was unreliable. So he took it to the one machine he felt he could trust, and could get feedback from, in officially registering the discovery. Already it was 10.15 in Chile. In New Zealand the supernova was seeable. But the primary job was done. The news was out. They had managed it!

People who latched-on to the news included veteran supernova theorist, Stirling Colgate, who used to be chief researcher on a hydrogen bomb project many years before. After dealing with the 'H' bomb, he wanted to go on to bigger things, and the field of supernova research was where they were to be found. Next to the possible 'Big Bang' of an initial Creation, he believes, expectedly quite rightly, that there is nothing to touch a supernova explosion. Even if there are so many throughout the Universe that there is about one such explosion every second.

When a supernova is formed, the material involved goes through an enormous nuclear synthesis, making all the new elements and material that go together to make us and our planet, and other stars and star systems. Study of supernovae can therefore be very important. It is a very great and fundamental mechanism in our Universe.

Colgate has built a special telescope from spare parts, which is linked to a computer in New Mexico to continuously search for and to photograph supernovae. He wanted to know how stars blew up and how they kept shining. What the distribution of matter was in the working of all this. Computer calculations showed a different behaviour - simply that they should collapse.

Colgate has been developing computer models with the aid of others, for study of supernova behaviour, using information from observations of distant exploding stars and nearer supernova remnants, for over 20 years. Now, a detailed theory has emerged.

Another theorist, Stan Woodsley, explained the type of star that blows up. Our Sun would never do this, he says, as a star at least eight times the mass of the Sun is needed. Stars much more massive than the Sun spend their energy much more rapidly and so have a life much shorter than our Sun. Brightness, actual, of a potential supernova candidate is much greater than for a star like our Sun, with a life of say, 10 000 000 years compared with 10 000 000 000 years of our Sun.

Normal nuclear processes occur within supernova candidates - hydrogen is burned to become helium; helium becomes carbon and oxygen. But due to the mass of the star, the latter elements go on to form heavier elements such as sulphur, argon, calcium and finally, iron. But then, no more energy is available from nuclear fusion. Layers of successively less energy, and commensurate elements, form within the star and its burning process. An iron core begins to grow. Gravity takes over. The collapse of the core is almost instantaneous. Pressures and temperatures of such a high order are created, they are found nowhere else. An enormous shock wave is formed, and a terrific burst of neutrinos (atomic particles) is given off.

As mentioned earlier, this process is incredibly fast: a fraction of a second, after a lifetime of about 10 000 000 years. The neutrino flux is said to aid the explosion and intensify it, even in some cases bring it about.

Until Supernova 1987A, no test had been made by actual observations, of the theory. Now was the chance. The most recent supernovae of this order of brightness to us - or our forebears - had been one seen by Kepler in 1604, and Tycho Brahe's in 1572.

The first thing to do was to see which star had blown up - its size, age and colour. Graham White was the search leader at the Anglo-Australian 3.9-metre optical telescope at Siding Spring in Australia. He found plates of the area including the nebulous region near 30 Doradus, which out of the billions of stars there, showed one, which was exactly where the supernova now showed. Its name was Sanduliao-69 202.

The difference in position was just 5/100 arc second. It seemed clear that the progenitor star was the major component of this 12th magnitude star. But it was not to be quite as easy as that.

Bob Kirschner was more interested in observing the supernova itself, and studying it in ultraviolet light, using a satellite controlled from Maryland. He himself was from Harvard University. He, too had to find the supernova. The supernova would be very strong in the u.v. region, but now diminishing, since the very hot gas of the early remnant would be cooling. As the u.v. glare faded, with successive days of photographic exposure of the spectrum, following theory, a new signal was gradually revealed by the satellite, indicating from the position that Sanduliac was still there.

The Space Telescope Science Institute in Baltimore solved the problem. Computer enhancement by Barry Laska and Nolan Wellborne found that there was a third star in the Sanduliac system. Superimposing images of like systems indicated a bulge opposite the fainter star of the system, in the larger star image. When the larger image was removed a third image was indicated. Bob Kirschner, who had thought Sanduliac was still there, had actually seen the light from two other stars.

But now the question as to which star had blown up had been answered, part of the theory didn't fit. Sanduliac had blown up even though it had been a blue star and therefore according to theory unable to. It had been too young and too dense. Only giant red stars were supposed to be able to blow up. Maybe if that part of the theory was wrong, other parts may be, too.

Well, the 'onion layer' part of the theory seemed correct, with successive layers of different materials being seen to be coming away as they in their now more rarified form after the explosion each allowed view into the next. Ultimately there should be an almost inconceivably dense star left inside, just 12 miles across. A neutron star in which matter by calculation would weigh about 10 000 000 000 tons per cubic inch (640 000 000 tons per cubic centimetre), because in the gravitational collapse of the atoms, virtually all the space initially relatively vast between them, was 'squeezed out'. The forces allowing particles of atoms to 'keep their distance' were overcome, both inside and outside the atoms. The sheer bulk of the dying star had caused this change of forces to occur.

((Perhaps it would have been prudent of me to read a book or two on nuclear physics before going into conjecture about further detailed explanation of what happens to the orbits of these atoms' particles. We all know that if we swing a bucket of water round on a piece of rope, at several feet from us the circle is wide and revolution round us fairly slow. But shorten the rope, and the bucket wants to revolve faster. It is very likely we would become one with the water (that is, get very wet) and this is one of the things apparently that happens to collapsed atoms. They fuse together, possibly, between themselves and within themselves.

There is a question, however, about how fast rotationally the atomic particles now move. Unthinkably fast before: how much more unthinkably fast now? Or do they fuse so well, they can hardly rotate at all? And what else has to 'give way' in all this change process? Perhaps enough of these comments for us to mull over later, if you are interested; a return to what we have been told on the programme being necessary.)

Electrons and protons fuse to become neutrons, with a burst of sub-atomic particles - neutrinos - being 'given off'. Some aid the explosion, but the rest go into space. Only 1% of the neutrinos or neutrino energy goes to help the rest of the star explode. The other 99% of the binding energy of formation of the neutron star is in neutrinos

that are expelled into space. Even so, only 0.01% appears as radiation energy optically visible to us.

((Going into a brief further analogy, regarding the atoms fusing to become neutrons, with something having to 'give way', it seems the something to give way is neutrinos. When playing 'shove ha'penny', or'shove 2p' - or 'shove 10p'as it may soon have to be, the shoved coin comes to rest with the other coins of the line except the front one which jumps away accordingly. The kinetic energy of the shoved coin is transmitted through the others to the front one free to move. Maybe we might be excused for the sake of simple understanding, for calling a supernova explosion a massive three-dimensional game of 'shove-ha'penny'...))

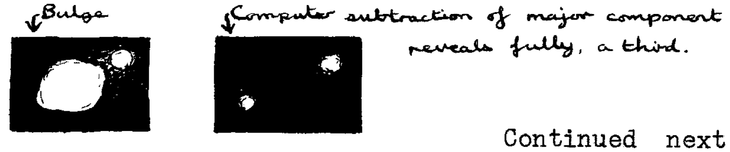
Anyway, if the neutrino-emission theory was correct, the neutrino detectors already built, here on Earth, although few in number, had a chance of picking some up. Such an incidence of neutrinos would be expectedly visible on records made just before the optical display in the sky was noticed first.

*Reference: 'The Elements Rage' Vol. 1, Sphere Books Edition, 1968, Pages 161, 165 and 166. Author, Frank W. Lane. There is some more information about the energy of various events and astronomical bodies, for example, in this book. A fair definition of the erg is also given.

Roy Adams.

DIAGRAMS:

1) How a third component was found from photographs:



Continued next month

SET 1

The search for Extererrestial Intelligence is likened to the Cosmos issueing you with a challenge to listen through the radio spectrum for signs of intelligent life in theuniverse. When Pulsars were first found researchers thought thatthey had discovered signals from "out there". Even when signals are detected who will be able to figure out what they mean?

Why does anyone think that there might be another civilisation out in space whose signals we may hear. Our civilisation arose on a small blue planet circling a yellow sun, so we presume that other civilisations may arise in similar circumstances.

What is so difficult about finding these signals? After all we can read a 1 watt signal from the spacecraft Pioneer beyond the orbit of Pluto. The reason is simple, we know when and where to find Pioneer. Signals from another civilisation are as difficult to locate as a black cat in a darkened room.

The nearest star is 4.3 light years away and we would have an impossible job to recognise emmissions from our own Radar, TV and radio systems at that distance.

Project META has been developed in the USA to search the sky for transmissions of an alien race. It does however presuppose that the civilisation would set up a giant radio beacon away from the rotating surface of whatever planet. If this was not so then the signal would suffer from the Doppler effect and drop in pitch as the rotating planet orbitted. Project META has already completed a search of the sky at 1420 MHz where the background "shash" is very low. Scientists are now combing the sky for frequency emissions at 2840 MHz which is where an intelligent civiliation may advertise its presence to others. However because of financial restraints this search will not really take off until 1992 and completion not before the turn of the century. The NASA project will search the 1000 nearest stars at 1-3 GHz and the entire sky at 1-10 GHz.

The field however is wide open to the amateur observer. Radio receivers are available to the man in the street capable of receiving up to 1.4 GHz. It is thought that this could be the sort of frequency used by a space probe sent out to investigate us. Add a computer which can change modes and frequencies as needed during the search, add a helical aerial and the occasional command to alter the declination and you are in business for perhaps the most exciting find of all time.

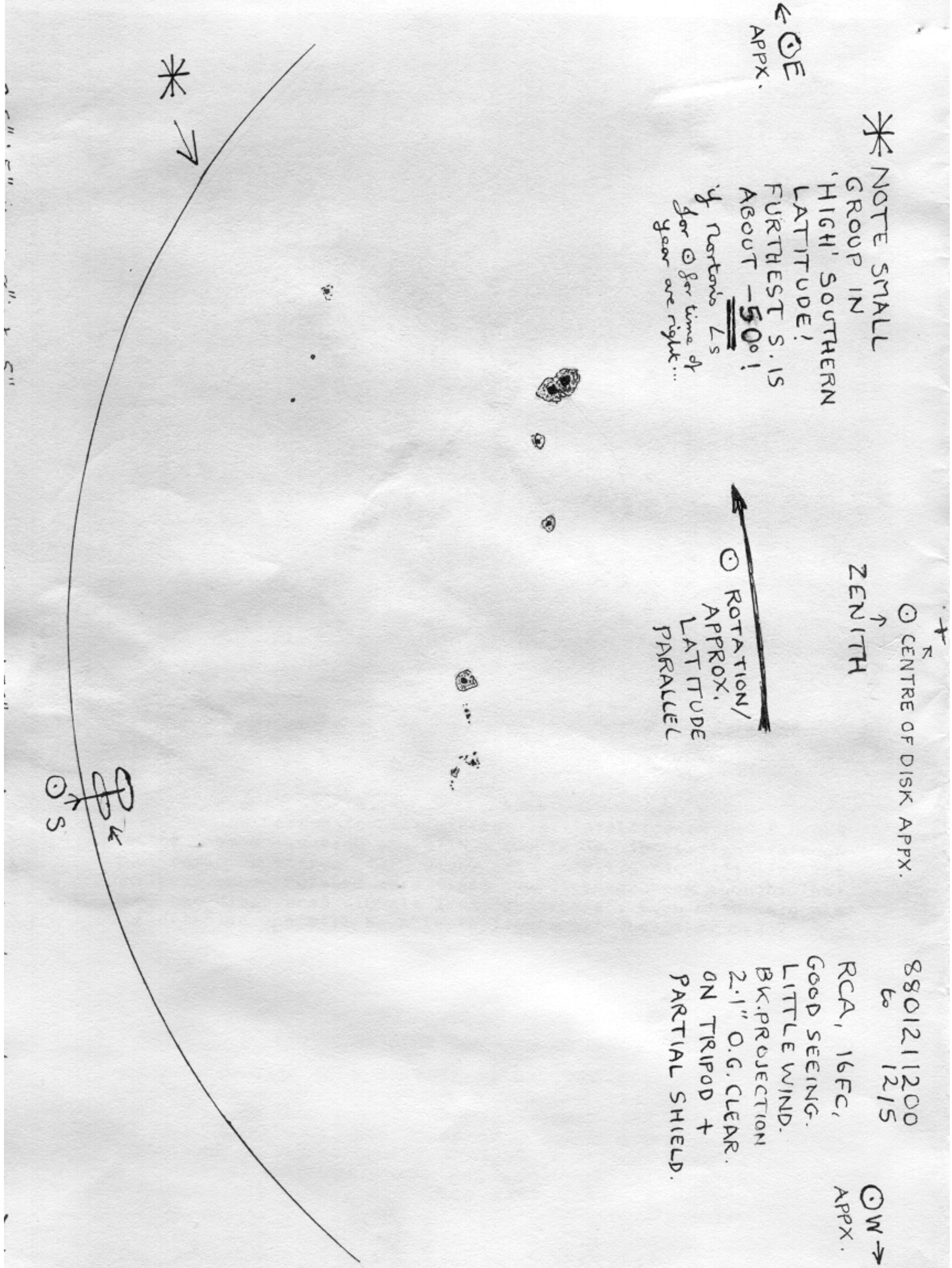
What better way can you think of to spend evenings when the sky is obscured!

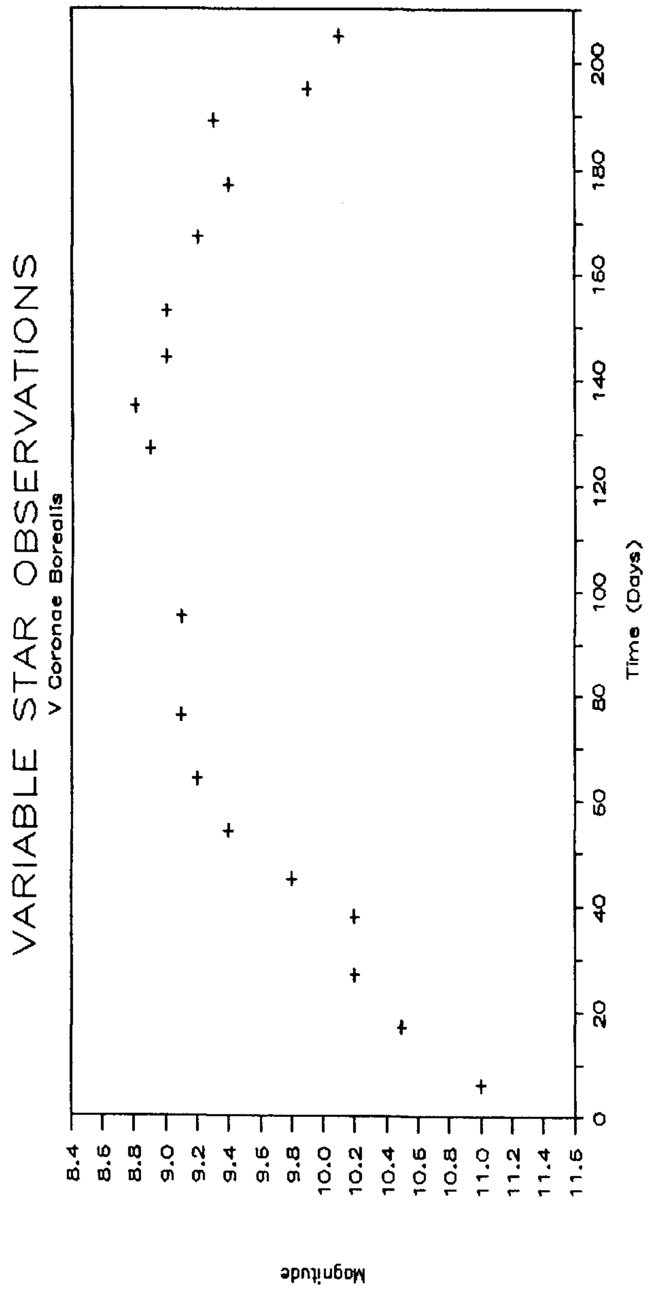
Peter Standridge

WHATS ON IN MARCH

[A GUIDE TO NON-OASI SPECIAL EVENTS]

GIOTTO LECTURE IN IPSWICH :the British Computer Society are hosting a lecture by Mr W Johnson of British Aerospace, entitled 'The European Space Mission to Halley's Comet', on March 8th. The venue will be Lecture Theatre 1, Suffolk College of Higher Education, Rope Walk, Ipswich. The starting time is 7.00pm (coffee) for 7.30pm and 'non-[BCS]members are welcome'.





This light curve shows V Coronae Borealis from April to October 1987. We see here, a maximum of this long period or mira variable. This star has a period of just under one year, and a light range of magnitude 8.5 to 12.8.

PROGRAMME FOR MARCH

Mondays from 8pm GENERAL OBSERVATION SECTION

7-14-21	Mr R Newman	[redacted], Felixstowe IP11 9DY	Tel. Fel.[redacted]
	Mr J King	[redacted], Felixstowe IP11 9LQ	Tel. Fel.[redacted]
-28	Mr N Taylor	[redacted], Trimley IP10 0XY	Tel. Fel.[redacted]

Tuesdays from 8pm GENERAL OBSERVATION SECTION

1-8-15	Mr R Newman	[redacted], Felixstowe IP11 9DY	Tel. Fel.[redacted]
-22-29	Mr J King	[redacted], Felixstowe IP11 9LQ	Tel. Fel.[redacted]

Wednesdays from 8pm NEBULA AND FAINT OBJECTS SECTION / CLUB NIGHT

2-9-16	Mr M Cook	[redacted], Ipswich IP4 5PZ	Tel. [redacted]
-23-30	Mr D Payne	[redacted],Wickham Market IP13 0SD	Tel. [redacted]

Fridays from 8pm GENERAL OBSERVATION SECTION

4-18	Mr P R Richards	[redacted],Ipswich IP1 2HW	Tel. [redacted]
	Mr M Harlow	[redacted],Trimley IP10 0XB	Tel. [redacted]
	Mr R A Lobbett	[redacted],Felixstowe IP11 8UJ	Tel. [redacted]

On nights other than Wednesday ring directors to confirm dates.

1988 COMMITTEE

CHAIRMAN	D Payne	(Address above)	Home: [redacted] Work: [redacted]
VICE CHAIRMAN	D Barnard	(Address above)	Home: [redacted] Work: [redacted]
SECRETARY	R Gooding	[redacted],Ipswich IP1 6AE	Home: [redacted]
TREASURER	M Nicholls	[redacted],Capel St Mary,Ipswich IP9 2EX	Home: [redacted] Work: [redacted]
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SPECIAL EVENTS	N Taylor	(Address above)	Home: [redacted] Work: [redacted]