British Astronomical Association

VARIABLE STAR SECTION CIRCULAR

No 95, March 1998

Contents

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Office: Burlington House, Piccadilly, London, W1V 9AG

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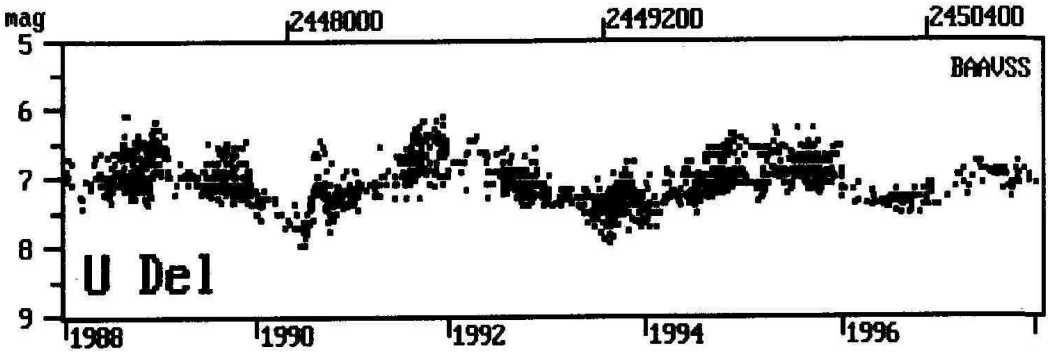
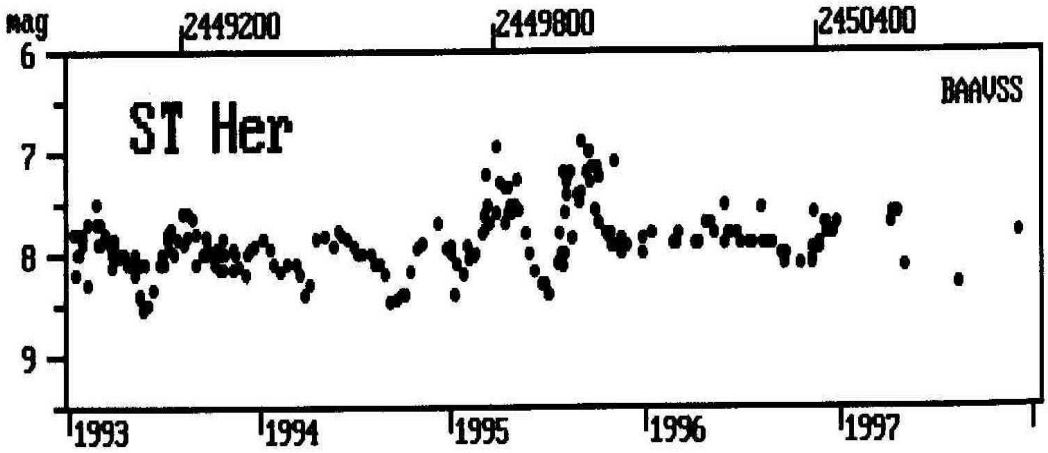
DAVE MCADAM



U Del 1988 to 1997**.** 1877 observations by;- M A Adamson, S W Albrighton, P Bibbings, R Billington, N M Bone, N Britton, R H Chambers, A Chapman, D S Conner, J S Day, R C Dryden, S J Evans, R W Fleet, D Gavine, M Gill, B H Granslo, L Green, M Harris, C Henshaw, J E Isles, R E Kelly, S Koushiappas, R Livingstone, Tosh Lubek, J W Macvey, T Markham, K P Marshall, A O Miller, B R M Munden, I P Nartowicz, M J Nicholls, B O'Halloran, R D Pickard, G Pointer, G J Privett, G Ramsey, S G Ridley, A Smeaton, J S Smith, S R Srinivasan, D M Swain, T Tanti, M D Taylor, J Toone, S T Wanstall, K West, W J Worraker, K Xylaris, Erol Yusuf.



ST Her 1993 to 1997. 225 observations by;- S W Albrighton, J S Day, S J Evans, R B I Fraser, T Markham, G Pointer, M D Taylor, J Toone.

BAAVSS home pages; http://www.telf-ast.demon.co.uk/

NEWS

GARY POYNER

IMPORTANT NOTICE - CHANGE IN OFFICER DUTIES

At a recently held officers meeting, one of the many items discussed was the submission of observations - both paper and electronic. It was agreed that all observations should now be reported to Dave McAdam only, who becomes the sole VSS secretary. This takes effect immediately. Observers who report six monthly using the paper report forms should therefore send their first half 1998 observations to Dave in July. Those who submit observations by disk or e-mail should continue with their present arrangements. I guess this is as good time as any to remind those observers who have not yet reported their second half 1997 observations to do so as soon as possible please.

After many years as VSS secretary, Melvyn will now become more involved with binocular observers and observations, under the title Assistant Director. Hopefully this move will help highlight the excellent work being undertaken by the section's binocular observers, and provide a greater feedback to observers, which some may have felt has been lacking in past years.

RAS GRANT

The Royal Astronomical Society have decided to continue their financial support to the VSS, with a further grant for 300 pounds from the RAS Stillhammer fund for 1998. It is also highly likely that this much appreciated support will continue in the forseable future. The officers of the RAS have also passed on to me their appreciation for the work being undertaken by the section and it's observers. I think it's generally accepted that the VSS provides more data to the professional astronomical community than any other section within the BAA, and it's nice to see this appreciation in writing from the RAS themselves, and a pleasure for me to pass this on to you.

BAA CIRCULARS

It will be plainly obvious to those who subscribe to the BAA Circulars (BAAC), that generally the VS observations which are listed are always made by the same observers. This is simply due to the fact that these observers either report their observations to the secretary monthly or bi-monthly, which makes it very easy for me to extract this data from the archive, or send me brief details of their observations by e-mail or telephone. I would very much like to include as many VSS observers as possible in the BAAC, so if any one detects unusual behaviour in a variable star (fade of an RCB star, or rare outburst of a DNe), I am very happy to receive details of your observation so that they can be included in future circulars. These can either be sent by mail, e-mail or telephone, and would of course be in addition to the usual report to the secretary. Short term activity, like the recent fade and rise of the binocular star AB Aur (mentioned elsewhere in this circular), does not really make good material for a BAAC, because of the quarterly release of the circular. However possible long term activity such as RCB fades, brightenings or fades of symbiotic stars etc. are excellent subjects for the circular (the recent BAAC which included information on OJ287, SV Sge, SU Tau & DY Per is a good case in point).

COMPUTERISATION 1997

DAVE MCADAM

Database entries for 1997 totalled over 163,000, bringing the grand total to 1,162,546 by December 31st. Phil Barnard continued his terrific onslaught on the 1925-34 papers, adding more than 78,000. Dennis Gill completed several stars to around 1974. Terry Miles and others at Crayford A.S. tackled the very early section records so that the database now holds observations made in the 1890's and even a couple of U Mon estimates by E E Markwicke made in 1888! I also entered some early records but the current results now demand quite a bit of my time each month.

Electronic observer reports were provided during 1997 by; Gary Poyner (leading with 15,872), Tony Markham, Mike Gainsford, John Day, Guy Hurst, Dennis Gill, Graham Salmon, Chris Newman, Jonathan Shanklin, Bill Worraker, John Thorpe, Mike Gill, and Gene Hanson.

In addition nearly 7,700 e-mail estimates were logged from international TA contributors. Tony Markham entered and e-mailed 4,500+ observations by SPA members, and Mike Collins forwarded Lennart Dahlmark observations of V1990 Cyg. (their joint independent discovery = LD 135 = TAV 1941+34).

I know of at least two further observers who are almost at the stage of providing regular reports by computer. The response to my appeals has been very encouraging and I quite understand the learning-curves facing observers who have not used a computer much before. In some cases I have been able to offer a little advice, however, machines bought now actually surpass the ones used for holding the database (P75+win3.1 and 386+DOS5) so I occasionally need to call on the expertise of those conversant with win95 systems.

WWW

Despite the increasing pace of computer development, the two machines are adequate for keeping the BAAVSS web pages up to date. Details of variables are now listed in RA hours as well as by constellation and links to available lightcurves, articles, and charts are included. Over 240 short to long term lightcurves are updated and added to every couple of weeks or so, articles are placed as available. Plans are underway to scan more charts for download.Point your browser at;

http://www.telf-ast.demon.co.uk/
Dave McAdam dave@telf-ast.demon.co.uk BAAVSS Computer Secretary

EF PEG

GARY POYNER

A rare superoutburst of this UGSU star was detected by Tom Burrows (AAVSO) and Patrick Schmeer on November 2nd. The previous outburst occured in January 1995. The outburst lasted 13 days and reached magnitude 10.8. A post-superoutburst rebrightening occured on November 21st, when EF Peg briefly reached magnitude 13.9. The popularity of these long period DNe with amateurs around the world has resulted in increased detections of these post superoutburst phenomenon over the past few years.

MORE SUPERNOVA SUCCESS!

GARY POYNER

Tom Boles, of Wellingborough in Northamptonshire, becomes the third UK Supernova Patroller to make a discovery in just over a year, with his detection of SN 1997dn in NGC 3451. The discovery was made on October 29th with a 25cm SCT+CCD at around magnitude 16.0. Precise photometry was obtained by Nick James from Tom's image. SN 1997dn proved to be type II supernova, discovered just after maximum brightness. Our congratulations go out to Tom on his discovery. Hopefully the three discoveries from Mark Armstrong, Stephen Laurie and now Tom, will inspire other CCD owners to make further discoveries. A visual discovery would be a real bonus!

The image of SN 1997dn shown above is taken from '*The Astronomer'* web page.

WHY OBSERVE V BOOTIS?

TRISTRAM BRELSTAFF

At first glance, V Bootis might seem to be 'just another boring semiregular variable'. Indeed, the GCVS details for it (type = SRa, range = 7.0-12.0v, period = 258d, spectrum = M6e) suggest that it is a fairly typical example of the large-amplitude red semiregular variables, of which many hundreds are known. Even the note at the back of the GCVS to the effect that both the period and amplitude vary (the latter 'strongly') is not untypical for this type of star (indeed, it is why they are called 'semiregular' in the first place).

However, over the past decade there have been several detailed studies of the long-term light-curve of V Boo and these have revealed that something rather unusual might be going on. These studies are summarised by *Szatmary, Gal and Kiss in Stobie & Whitelock (eds), 'Astrophysical Applications of Stellar Pulsation', ASP Conference Series, Vol 83, 417-418, 1995*, a paper which unfortunately includes no references.

Visual observations by the AAVSO, BAA and other organisations going back to 1900 have been used and searches have been made for multiple periods, period changes, amplitude changes, and for chaotic behaviour. Whilst no good evidence has been found for systematic changes in the 258 day period, nor for chaos, clear evidence has been found for a secondary period, and, more importantly, for a systematic decrease in the amplitude of the 258 day period.

The secondary period is about 137 day, and has a full (ie: max to min) amplitude of about 0.5 mag. Both period and amplitude have remained more or less unchanged throughout the past 80 years. However, the amplitude of the 258 day period averaged 2.8 mags in 1913-1930, 2.0 mags in 1930-1970, and after 1970 decreased from 2.0 mag to only about 0.5 mag in 1994. This means that now the 258 day and 137 day periods have about the same amplitude and interact to produce a rather complicated light-curve with an extreme range of only about 1.0 mag. This is very different from the almost Mira-type behaviour exhibited by the star in the first few decades of this century.

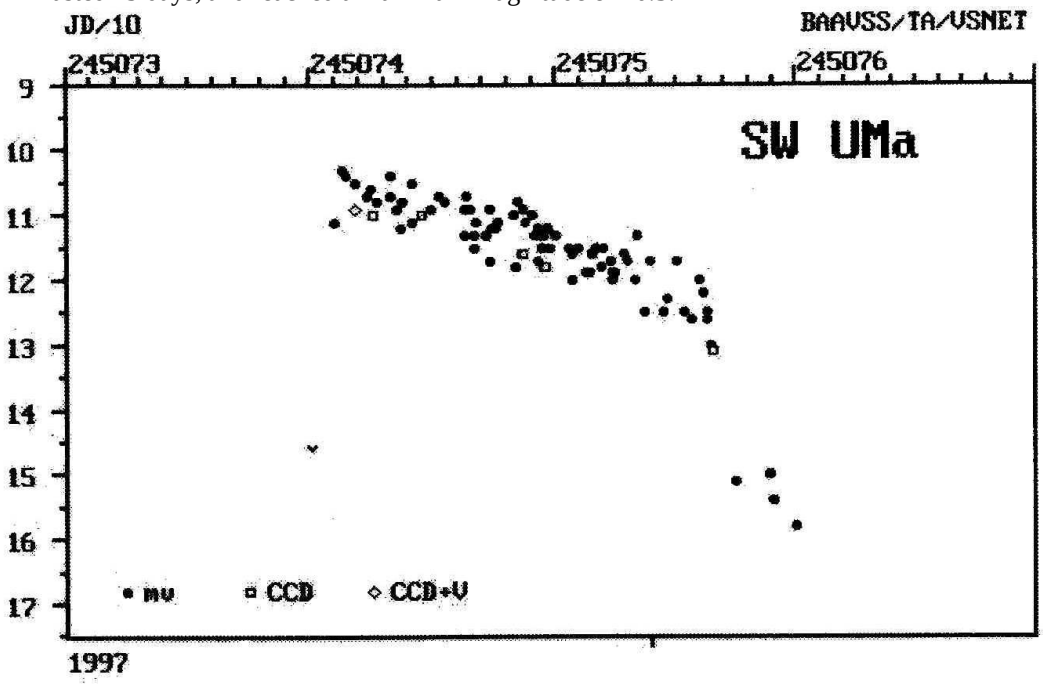
So, on the face of it, V Boo has 'evolved' from a Mira-like SRa star into an SRb star in less than a hundred years. If this is due to actual long-term evolutionary changes in the star then this is of considerable importance for testing the theories of stellar evolution and pulsation.

Further visual observations are very important in order to extend the light-curve into the next century and to check whether the amplitude of the 258 day period goes to zero as the current trend suggests.

SW UMA

GARY POYNER

Further to the note included in VSSC 94 (Dec '97) regarding the outburst of SW UMa, the following light curve resulted in observations reported to the VSS and VSNET. The outburst lasted 19 days, and reached a maximum magnitude of 10.3.



MIKE COLLINS' SUSPECTED VARIABLE STARS

Charts supplied by John Toone and Information by Mike Collins

On the next two pages are given charts for two of Mike Collins discoveries.

TAV 0216+48 is a carbon star, so this is very red and difficult to estimate visually. This star is probably irregular; the photovisual (PV) range is 9.5-11.4. There were some visual observations reported in 1990, but nothing since then. This star has not been brighter than 10.1 since early 1992.

TAV 0033+59 is the only non-red star that Mike has discovered (apart from a couple of eclipsing binaries). It's a known Be (emission-line B-type) star. Most of the time it's quite stable but it may have a shell episode at any moment. The shell eventually cools and condenses into soot and hides the star for a few months before dissipating and letting the light through once more. The magnitude drop can be quite spectacular! This year this star has been flickering between 10.5 and 10.9 visually, but the last deep fade was as long ago as 1990. **If it goes fainter than 11.0 please alert Mike Collins and Gary Poyner as soon as possible.**

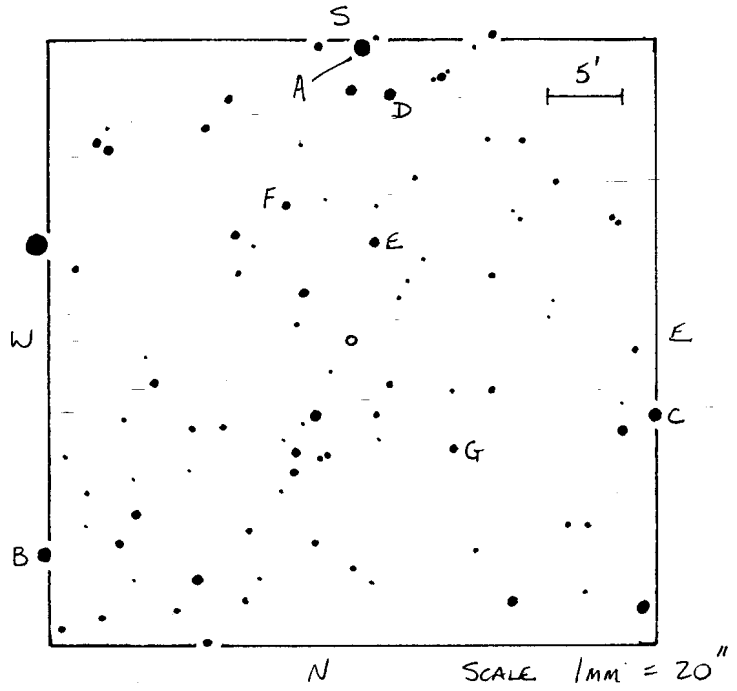
(B)

TAV 0216+48

RA $02^{h}16^{m}.9$ DEC $+48^{\circ}01'$ (1950)

MAGN: 9.5 – 10.5 TYPE: Sp: C

DISCOVERED BY MIKE J. COLLINS ON UK NOVA PATROL PHOTOS
3 NOVEMBER 1989



SEQUENCE:
pv trf from AAVSO (b) W AND

A	8.6
B	9.3
C	9.5
D	10.1
E	10.4
F	10.6
G	11.2

CHART: From TVMPSA
by M.J. COLLINS
Adopted 891126

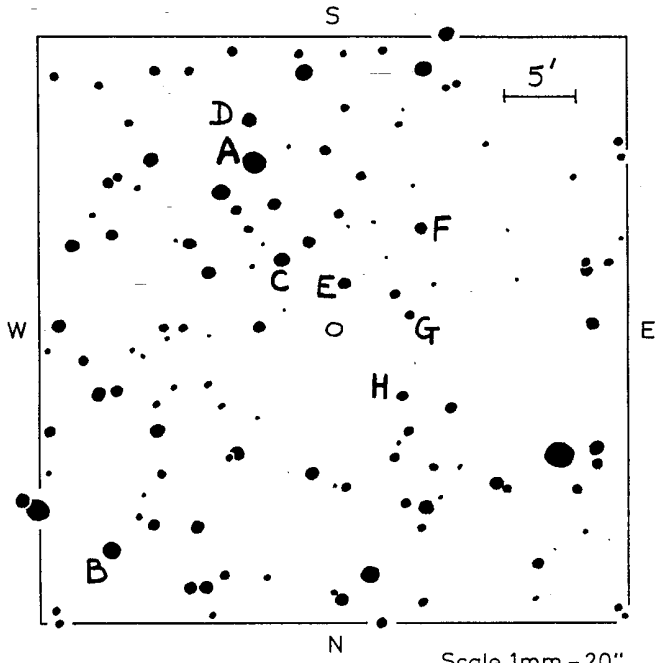
(B) # TAV 0033+59

(Please alert Mike Collins and Gary Poyner if this star should drop below mag 11.0)

RA 00^{H} 33^{M}·9 Dec. +59° 24′ (1950)
00 36·8 +59 41 (2000)

Magn.: 10·3 — 11·0 Type: Sp: B0e

Discovered by Mike Collins on UK Nova Patrol photos 28 Oct 199(



Scale 1mm = 20″

Sequence: Guide Star Catalog

A	8·8	= SAO 21548
B	9·9	
C	10·4	
D	10·7	
E	10·8	
F	11·1	
G	11·7	
H	11·9	

Chart: From TVMPSA
by M.J.Collins

Adopted 901114

 November 1990

S CORONÆ BOREALIS, A FIRST LOOK

J GREAVES

The BAAVSS data for this Mira variable was examined at the behest of the Section Director. The data is a little bitty but two good runs exist dating from 1905 – 1924 and 1973 – 1993 respectively, as shown by lightcurves given in figures 1 and 2.

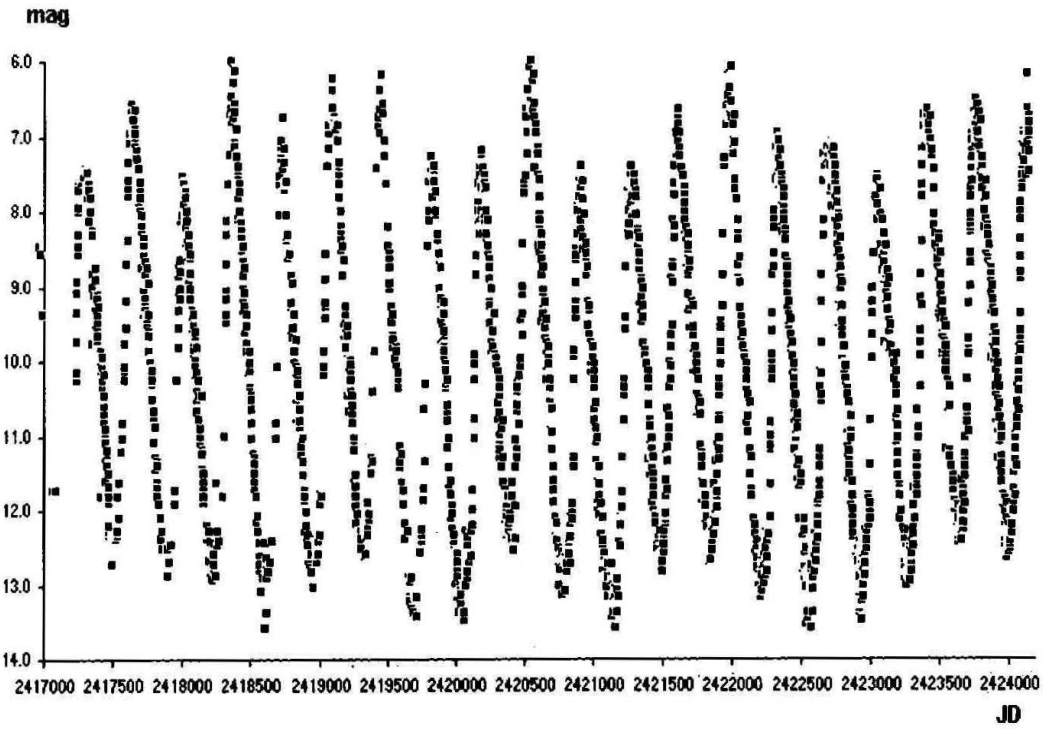


Figure 1: S Coronæ Borealis 1905 to 1924 from BAAVSS data

Average periods were derived for each of these subsets using software based on the Phase Dispersion Method. The 1905 – 1924 subset had an average period of 361.2 days and the 1973 – 1993 subset an average period of 360.2 days (the GCVS 4th ed. c.1985 gives a value of 360.26 days). Base epochs were found for each subset, maxima *calculated* using a arbitrarily chosen period of 361 days throughout, and times of *observed* maxima derived. The results for each subset were plotted independently on an O–C chart. Although the "random walk" effect common to many O–C diagrams causes the data to be better fitted by a polynomial rather than a linear best fit line, it can be seen that both data subsets are fairly evenly distributed above and below O–C = 0 days, and that the test period used is not significantly far from the average period. Therefore, in this instance at least, BAAVSS data help to confirm the published period.

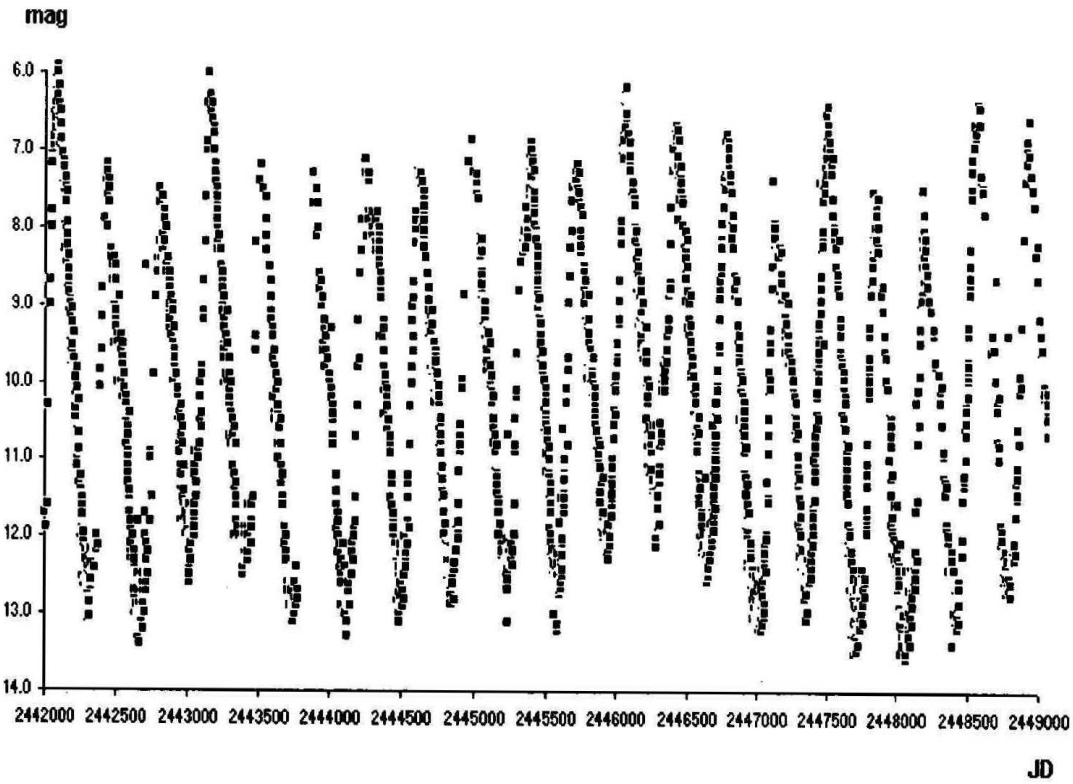


Figure 2: S Coronæ Borealis 1973 to 1993 from BAAVSS data

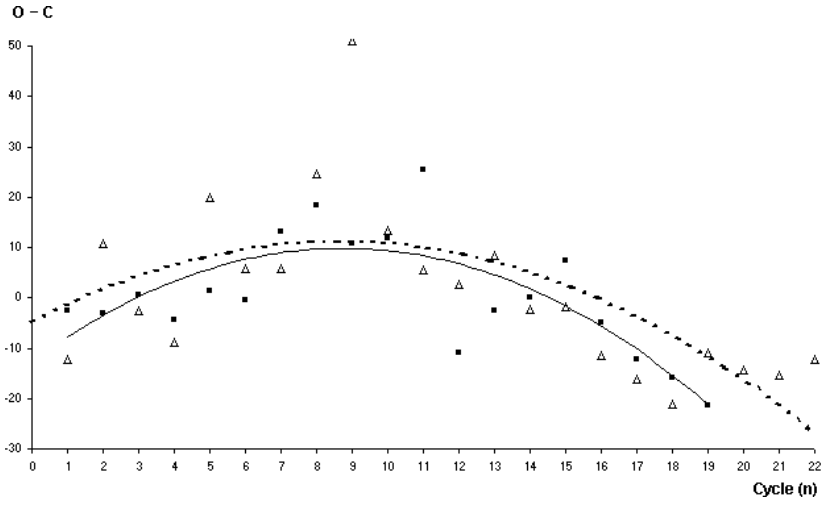


Figure 3: O–C chart for S Coronæ Borealis. The solid line represents the best fit for the 1905 – 24 data (solid black dots), the dotted line the 1973 – 1993 data (open triangles).

V CORONÆ BOREALIS, A PRELIMINARY VIEW

J GREAVES

This Mira star was investigated at the behest of the Section Director. It is a relatively new addition to the BAAVSS list, with good coverage only going back to the mid seventies. Even a cursory visual inspection of the lightcurve reveals a change in maximum magnitudes attained around nine cycles into the data shown here.

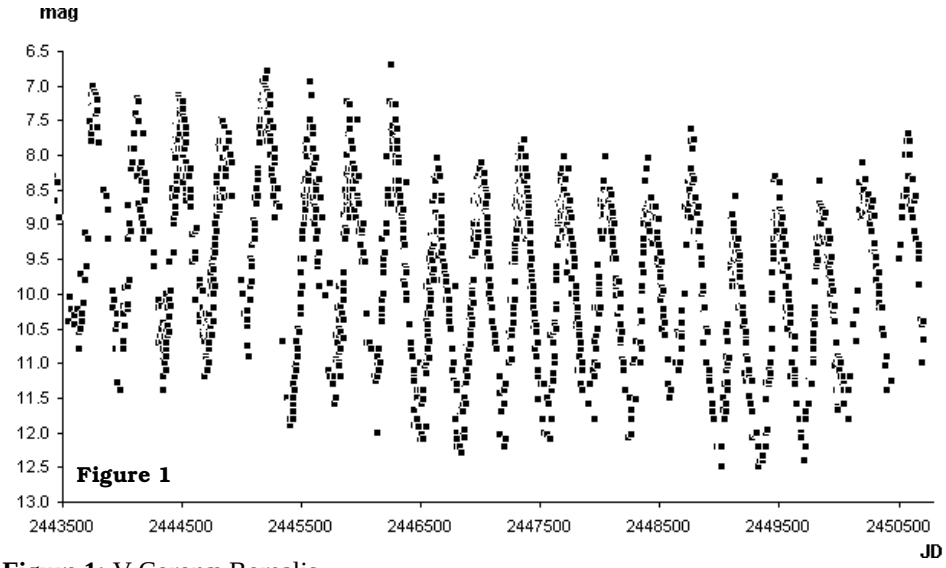


Figure 1: V Coronæ Borealis

An O-C Chart generated from this lightcurve (see figure 2) suggests a change in period around 10 cycles in this data run. Prior to that point the scatter in O-C is well fitted by a line based on a period of 355.7 days. Posterior to that point the data suggests a distinct lengthening of the period.

In O-C charts an upward trending line means that the period used for interpolation is of too small a value, ie the real period is longer, and a downward trending line that it is too long, ie the real period is shorter. An horizontal line means that the assumed period is correct. To flatten the second half of the above curve a period of 360.9 days has to be used (see figure 3). From this it can be *assumed* that the average period for this Mira variable abruptly lengthened from 355.7 to 360.9 days on or around its August 1988 maximum.

However, it should be noted that apparent changes in Mira star period can be little more than a reflection of the fact that the variables used in an O–C plot are not truly independent. Cumulative errors related to the nature of the derivation of maxima can lead to random walk variations in the plot that emulate period changes. Future investigations should utilise all of the usual methods employed to test this, ie Isles' span length method (which unfortunately tends to be insensitive to small changes and/or changes that repeatedly change direction, only

really showing good evidence for period variation in objects where it is already fairly apparent, eg R Aquilæ), the lag correlation method and Sterne's χ^2 method. See Lloyd, C. JBAA **101**, 1 (1991) for an overview of these methods.

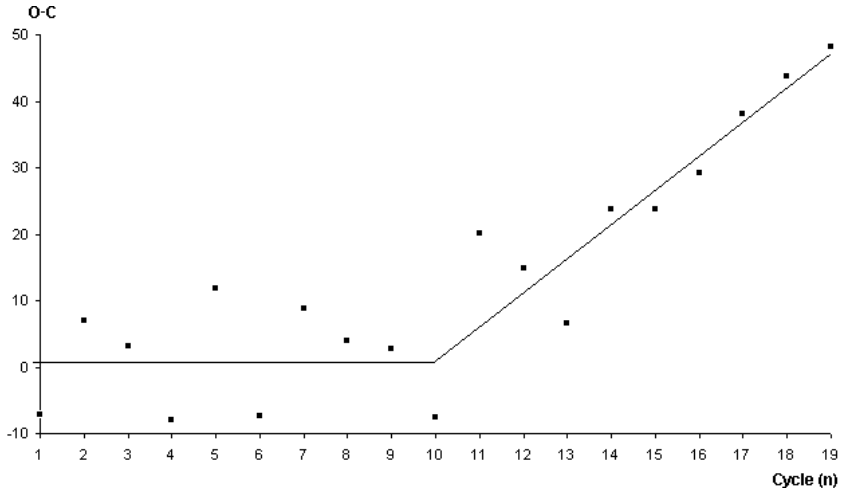


Figure 2: V Coronæ Borealis O–C diagram using a test period of 355.7 days.

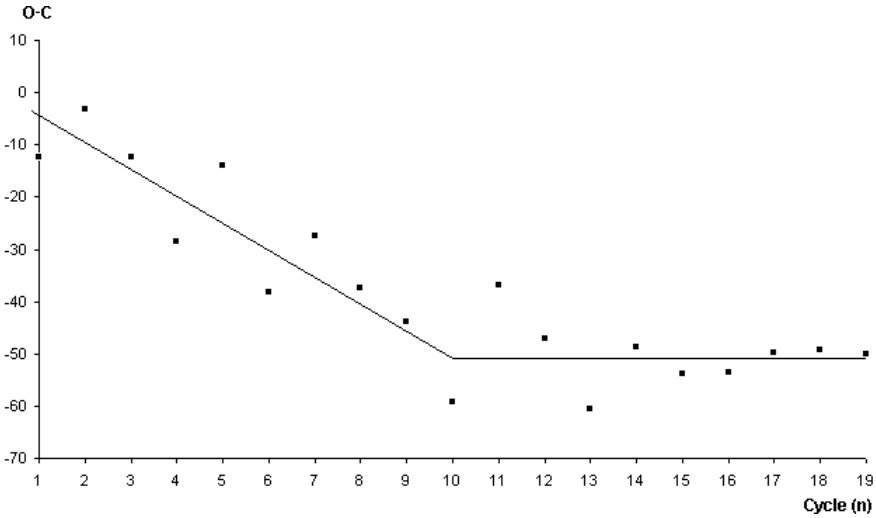


Figure 3: V Coronæ Borealis O–C diagram using a test period of 360.9 days. This fit also suggests a change in epoch such that maximal phase occurs around 50 days on average earlier in the second half of the lightcurve.

THE DEEP FADES OF AB AURIGÆ

JOHN TOONE

AB Aur is classified as a type Ina variable star with a spectral class of B9 IV and ordinarily hovers around mag 6.7 - 6.9 with occasional fades to mag 7.1 or 7.2. However, in 1975 and 1997 rapid deep fades to below mag 8.0 were observed. The 1975 fade was reported by Colin Henshaw and Ian Middlemist, and the 1997 fade by Melvyn Taylor and myself. The following is an extract from a report by Colin Henshaw on the 1975 fade reprinted with permission from Light Curve 1 No 2 (March 1976):

Over the past five years this star has been observed fairly intensively but my observations have shown that it has done very little. In fact I considered this star so boring that for some time I was seriously considering dropping it from my programme; it never seemed to do anything. However, on November 29th 1975, these years of patient observation paid off. During a routine observing session I was due to observe AB Aurigæ, since I had not observed it for 19 days. To my amazement the configuration of the stars in that field had changed; AB Aurigæ had faded to mag 8.4 and was no longer easy to see. In fact it formed a close double system with the well known irregular star SU Aurigæ. The faintness of AB Aurigæ made SUAurigæ much easier to see. Confirmation came two days later when Ian Middlemist telephoned me to say he had seen the star at mag 8.4 on November 30th. He commented that the fade bore similarities to those of R Cr B stars. Further examination of the observations that were received, have revealed that the fade did in fact occur on November 29th and that it occurred very rapidly. My observation at mag 8.4 was made at 1505 GMAT, but Ian observed it at 7.8 at 0830 GMAT. By December 2nd the star was back to normal again. Because of the bad weather that prevailed over Europe at the end of November we were the only observers who recorded the fade.

I first started serious variable star work in May 1976 upon joining the NWAVSO for whom Colin Henshaw was director at that time. I recall asking his advice on which binocular variable stars would be worth following by a beginner. Along with a dozen or so other stars he recommended AB Aur but warned me that it may be several years before I see anything as dramatic as what he saw a few months earlier. I followed his advice but the extreme variation recorded was never more than 6.7 - 7.1; most of the time the star was equal to comparison B at mag 6.8. There were occasional hints of fades when the star dropped to 7.1 but it soon returned shortly afterwards back to 6.8, that is until 1997.

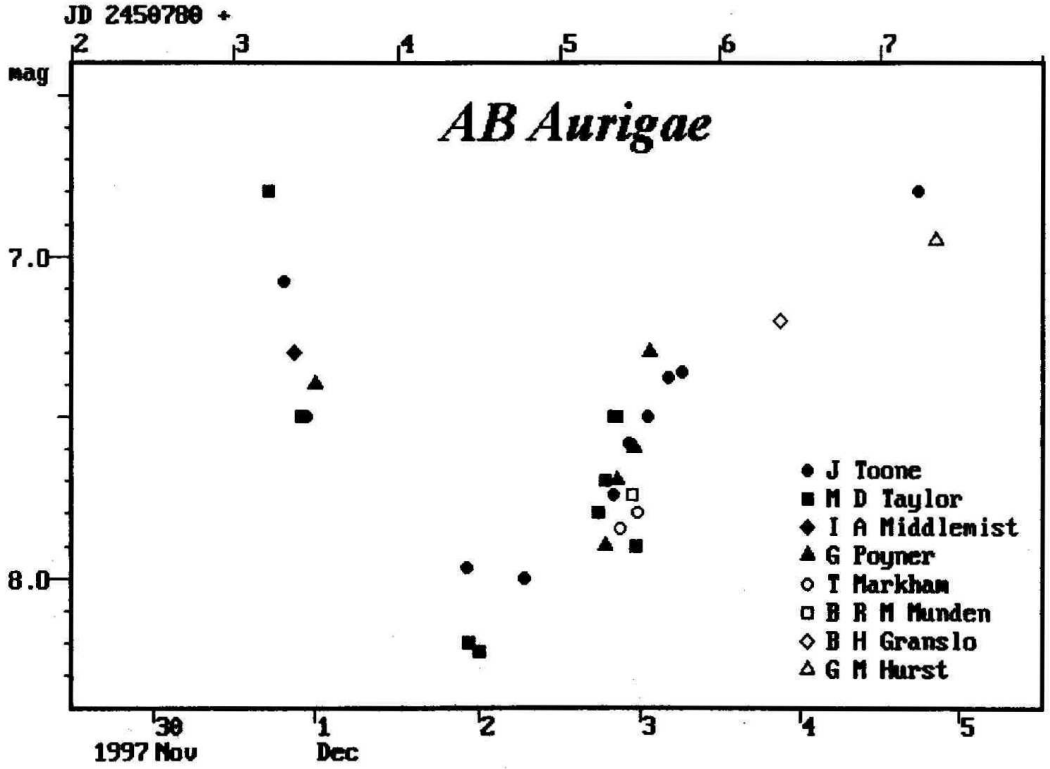
On the evening of November 30th at 0721 GMAT I saw AB Aur at mag 7.1. I immediately thought 'that's equal to the faintest that I have previously seen it, so it's worthwhile coming back to recheck the star later in the evening'. At 1040 GMAT I observed it at mag 7.5, it had faded a further 0.4 mag in just over 3 hours! After alerting Gary Poyner I telephoned Melvyn Taylor who responded in a sleepy voice “you're going to tell me AB Aur is fading”. Melvyn advised me that he had also seen a rapid fade from its normal brightness of 6.8 at 0508 GMAT to 7.5 at 0958 GMAT, corresponding to a fade of 0.7 mag in just under 5 hours! Unfortunately the sky clouded over shortly afterwards and no one was able to secure observations into the morning.

The following night (December 1st) was partly clear and it was apparent that AB Aur had reached its minimum. Melvyn made it mag 8.2 in the late evening whilst I saw it at mag 8.0 in both the evening and morning. I concede however, that it may have been slightly fainter,

because with the low power binoculars that I was using I was probably estimating the total combined light of both AB Aur and the nearby type Inb variable star SU Aur. Subsequent observations with a telescope indicate that SU Aur was probably about mag 9.5, therefore effectively brightening AB Aur by around 0.2 mag. This then ties in neatly with Melvyn's observations at mag 8.2.

Fortunately, the night of December 2nd was completely clear, and as soon as darkness fell it was obvious that AB Aur was already starting to recover. In the early evening at 0533 GMAT Melvyn made it mag 7.8 whilst by the late morning I saw it at mag 7.4 at 1821 GMAT. It seemed to me that the recovery had significantly slowed down during the morning hours. The rate of rise was slow compared to the fall observed on November 30th, but nevertheless a rate of change of 0.4 mag in 12 hours is still quite rapid for this class of variable.

Unfortunately the whole of the UK was clouded out on the night of December 3rd. As darkness fell on the evening of December 4th though, Guy Hurst and I secured estimates of 6.9 and 6.8 respectively. This signaled the end of the event, although in reality it had probably actually ended around 24 hours earlier



Since the end of the 1997 fade there has been more activity seen in AB Aur than usual. During the middle part of December several observers reported the star to have dropped back to mag 7.1. Maybe the deep fade has unsettled the normal system of the star for a while. The following rates of change have been calculated from both the 1975 and1997 fades:

Rate of fade				
Observer(s)	**Date**	**Mag change**	**Time**	**Change 0.1mag (rate)**
Middlemist/Henshaw	29-11-75	7.8 - 8.4	0625	64 minutes
Taylor	30-11-97	6.8 - 7.5	0450	41 minutes
Toone	30-11-97	7.1 - 7.5	0319	50 minutes
Rate of rise				
Observer	**Date**	**Mag change**	**Time**	**Change 0.1 mag (rate)**
Taylor	2-12-97	7.8 - 7.5	0251	57 minutes
Toone	2-12-97	7.74 - 7.36	1031	166 minutes
Poyner	2-12-97	7.9 - 7.3	0637	66 minutes

The similarity of the two deep fades is striking. They occurred almost exactly at the same time of year (22 years apart) with most of Europe clouded out. The depth and width of each fade was roughly measured as the same at 1.2 magnitudes and 70 hours respectively.

These sudden fades of AB Aur are quite extraordinary and difficult to explain. Are we dealing with eclipses with a period of 22 years or some fraction thereof, or is the light output from the star being interfered with by the star's associated nebula? These are questions for professional astronomers to answer. In the meantime we amateurs need to monitor this star closely to establish exactly how frequently these deep fades occur. I would recommend that this star is treated in the same way that eruptive variables are with observations on every clear night. If the star appears fainter than the nearby comparison E (7.5) then an alert should go out. Remember though the star may not vary much for many years so try not to lose patience. This long term inactivity certainly contributes to the excitement when you see it fading rapidly for the first time as our vigilant observers found both in 1975 and 1997.

SAO 28567

ROGER PICKARD - CRAYFORD MANOR HOUSE ASTRONOMICAL SOCIETY

In VSSC No. 90 for December 1996, Dave Storey of Carterton, Oxon, reported variations in SAO 28567 whilst observing comet Tabur, making it around magnitude 6.5 on the morning of 17th October 1996 and 7.1 in the evening. It was decided that the Jack Ells Automatic Photoelectric Telescope would make an ideal instrument to attempt to see if these variations could be substantiated. Observations were carried out (principally by Malcolm Gough) on 10 nights during the early Spring of 1997 when SAO 28567 was high in the sky. The comparison was SAO 28572, which has a magnitude of 5.84 in Johnson V, and the check star SAO 28531 at magnitude 7.18. The observations totalled 57 hours producing 804 individual magnitude determinations with an average accuracy of better than 0.03 magnitudes. However, no variation was detected beyond a scatter of around ±0.05 magnitudes. See Figure 1 for an example of one night's observations. However, just in case there was something lurking in the data, we asked John Howarth to perform a Fourier analysis on it, but as expected, no periodicity was detected of any significance (See Figure 2). This does not mean, of course, that the star does not vary, only that we didn't detect any variation within the limits stated above. However, given the spectral type of A0, it would seem unlikely that the star varies greatly and therefore another reason must be found for Dave's observation. However, it is interesting to note the discrepancies in the information given for this star in the various catalogues! For example, in VSSC No. 90, it was quoted as of magnitude 7.9 in the SAO, 7.6 in the PPM and 7.15+/-0.4 in the GSC; now Hipparcos gives a value in Johnson V of 6.78 (based on 136 observations,

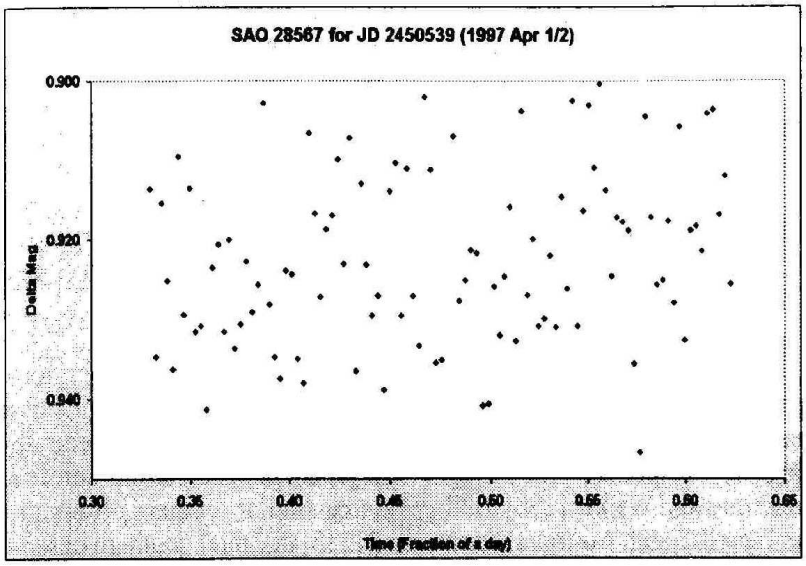
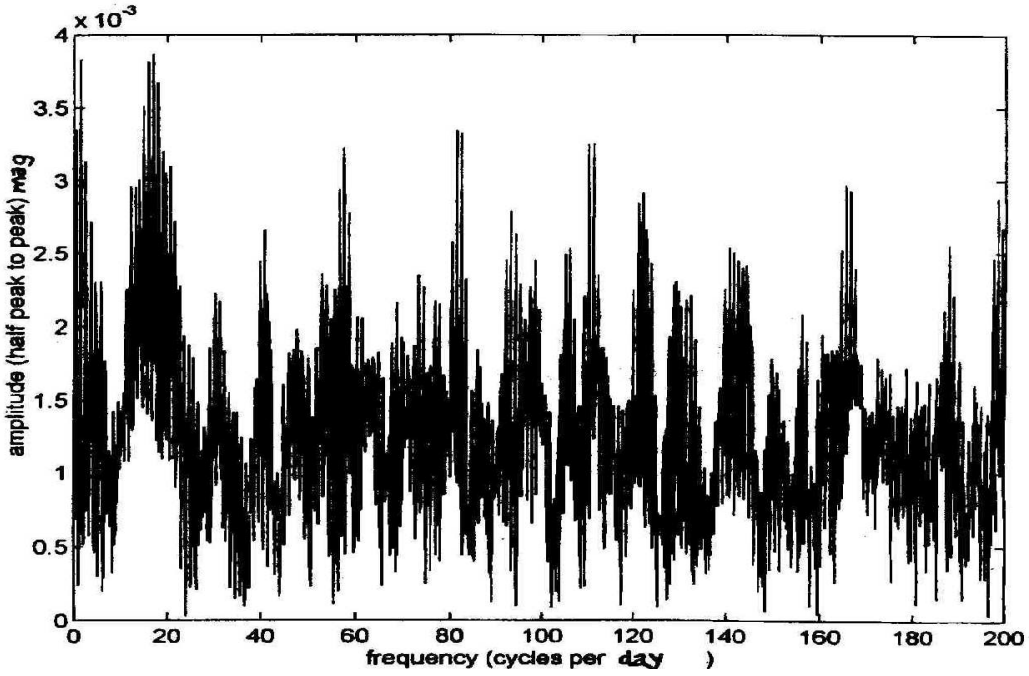


Figure 1.
An example of one night's data on SAO 28567. Note the range covered is little more than 0.04 mags. in over eight hours of observation.

although the time scale is not given) which just about fits within the error range given in the GSC! Fortunately, the quoted magnitudes for the comparison star show a much smaller spread, clustering around 5.84, so taking this as the standard, we have determined the magnitude of SAO 28567 as 6.75+/-0.03, which just comes within the Hipparcos limits. (Note:- No allowance for transformation to the Johnson UBV system has been made as we did not observe the star in B).

Figure 2. Fourier analysis of all the data on SAO 28567 reveals no significant periodicity.



MIRA'S 'CLOSED SEASON'

DAVE MCADAM

On April 16th Taichi Kato noted on VSNET that the Northern observing season of Mira (omicron Ceti) had ended with a relatively bright maximum and asked if Southern observers could follow the star closer to solar conjunction. This brought a series of electronic messages on the subject from all over the world (A 'thread' in internet language). Mira is perhaps the most famous variable being discovered in 1596 by David Fabricius in Germany, the first observed maximum was June 25th of that year.

Kato's message was No 221 in 'vsnet-chat' - an extra section then recently started for informal discussion of variable stars. In No 226, Stan Walker (New Zealand) noted that Mira is practically equatorial at -3 degrees declination, whereas the current RASNZ programmes concentrate on objects south of -30deg. Kato responded [228] with a list of japanese observations before and after the last 20 conjunctions and Walker [230] tried extracting similar southern observations for comparison. Fraser Farrell (South Australia) commented [233] that most southern observers probably nowadays mostly follow far south eruptive variables which cannot be seen from northern latitudes.

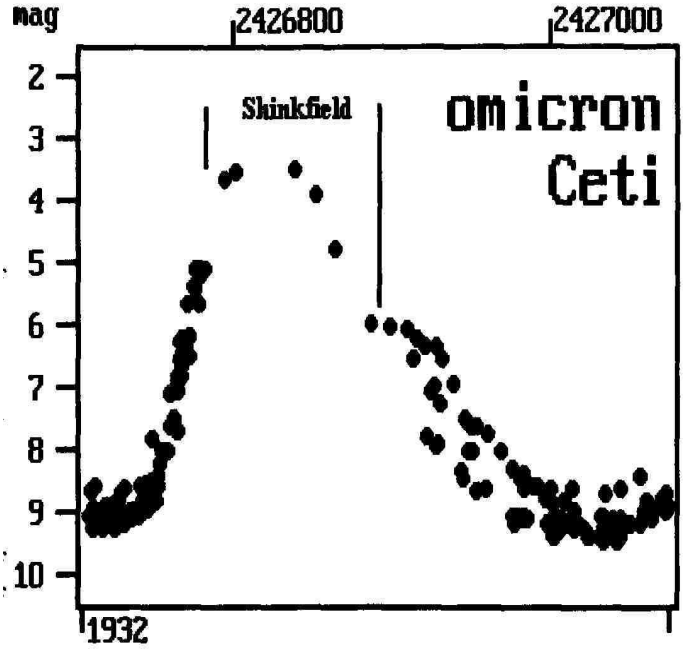
Bjorn Granslo (Norway) pointed out [241] that the celestial latitude of Mira, -16deg, was more important than declination. He gave calculated figures for theoretical visibility from latitudes +82 to -88 with an optimum at -54.5. Emile Schweitzer (France) presented tables of seasonal visibility of Mira observations from the AFOEV database [255], together with names and locations of the observers. Farrell noted [258] that there was not much land surface at -54.5 latitude, and probably not many clear skies either! Charles Scovil (USA) said [161] that the AAVSO had a very long series of observations in electronic format from which maxima back over 130 years had been published in a book by Leo Campbell.

In the meantime, I had checked that our BAAVSS database only needed a dozen more years for completing the Mira record from 1905 to the present. Phil Barnard was already working on the 1925-1929 memoirs so I asked if he might do Mira next while I tackled 1930-34 plus other remaining years. This was done, a program written to extract observations adjacent to conjunction, and the results posted to VSNET on 26 Apr [265]. Although Northern observers naturally had last/first observations in recent decades, the early published memoirs contained results from all over the world. The two observations in our database closest to conjunction were;

latest... 1913 Apr 15 C J Westland New Zealand
earliest... 1932 May 11 R C Shinkfield South Australia

Giving a possible minimum gap of 26 days. There were a couple more exchanges in regard to AAVSO data and then Fraser Farrell posted May 2nd [276];

"G'day Dave (and vsnetters...),
And here are the full details of that early observation from the late Reg Shinkfield's actual notebook:
1932 May 12 05:35
local time (UT+9.5hours)
1932 May 11
08:05 GMT (=UT)
JD 2426839.
instrument = binoculars (I think Reg used 8x42s ?); mag 3.5; sky = 1 (good);class = 1 (good)



Reg's written comment is "low". He was observing from home (inner suburb of Adelaide) during an era when the streetlights were turned off after midnight. Adelaide had a population well below 300,000 in those days; the high cost of electricity and the stringencies of the Depression would have kept early morning light pollution well down.

According to GUIDE 5.1, Mira was at an altitude of 6.1 degrees and azimuth of 89.7 degrees. The corresponding values for the Sun are -17.7 and 80.1 degrees, so Mira was above the Sun in an almost astronomically dark sky.

However, local geography - the Adelaide Hills - would have helped darken the sky a bit more. From Reg Shinkfield's suburb they dominate the eastern view and rise to an average 4-5 degrees above the theoretical horizon. A maximum at the time of conjunction definitely helped, but having a 600 metre high wall of rock to hide the rising Sun for those few extra moments seems to make the difference!

An opportunity exists to beat Reg's record during the next couple of weeks - when a bright Mira emerges from conjunction. Those of you who have a well-positioned mountain to the east are favoured to win this contest (go for it, Michael! :)

cheers,
Fraser Farrell"

I did not hear if anyone took up Fraser's challenge. Mira's period of around 332 days means that the phase advances each year so the next opportunity of a maximum occurring near conjunction will be 2006 or 2007.

The VSNET mail archive index can be accessed at:
http://www.kusastro.kyoto-u.ac.jp/vsnet/Mail/index.html
and individual messages mentioned above at;
http://www.kusastro.kyoto-u.ac.jp/vsnet/Mail/vsnet-chat/msgNNNNN.html
where NNNNN represents the sequential number (e.g. 00221).
OR by ftp at; ftp://ftp.kusastro.kyoto-u.ac.jp/pub/vsnet/Mail

A 'pixel' light-curve of Mira (currently of 14686 observations 1891 to 1997) is on the BAAVSS home pages; http://www.telf-ast.demon.co.uk/

LETTERS

Following requests by several of our readers, a letters page will be included in the circular. If you should have any comments that you would like to be included, please send them to the editor (address and e-mail are given on the back of this circular). Please state if you *do not* want your address to be published.

Comparison star magnitudes

I'd like to comment on John Toone's "Chart News" in VSSC 94. When the binocular programme was first set up by the Binocular Sky Society in the 1960s, accurate magnitudes were not available for most stars fainter than sixth magnitude. The preliminary charts originally prepared usually included a comparison-star sequence based on catalogue magnitudes that (it turned out) could in some cases be in error by a magnitude or more. These crude sequences were corrected from visual estimates by one or two observers, and we felt we had done reasonably well if we managed to get the comparison stars in the right order of brightness. Even this was difficult to achieve sometimes, because of disagreement between observers. The work on charts and sequences done over the years by many members of the BSS and BAA has enabled us to accumulate three decades of observations for a large number of bright variable stars that had previously been neglected.These sequences have served their purpose, and now it is time to overhaul them. Following the Hipparcos mission, all these old sequences can and should be replaced with accurate photometric measurements. According to Brian Skiff, the Hipparcos/Tycho catalogues can be interrogated by using the CDS-Strasbourg "VizieR" catalogue look-up utility on the Web at:http://vizier.u-strasbg.fr/cgi-bin/VizieR. Ask for catalogue I/239. Stars can be searched by any name in SIMBAD, or by position at any desired equinox. All the information from the ESA CDs can be found using this facility (I haven't tried this yet myself). The new sequences should still be checked visually for suitability, for example to eliminate wide doubles from consideration as comparison stars,but I think the era of establishing comparison-star magnitudes by eye is ended, at least for binocular stars. If any problems remain that could be resolved by photoelectric photometry, I'd be glad to help. The BAA is fortunate in having a computer system that will enable all the observations made using the old comparison-star magnitudes to be reduced afresh using the new values. Overhauling the binocular charts using Hipparcos magnitudes will be a big job, but not as difficult as the one we faced when no charts existed for thebinocular variables!

John Isles.
11105 Tremont Lane, Plymouth, Michigan 48170-6149E-mail: jisles@voyager.net or 2032694@mcimail.com

Errata in 'Appeal for help for Observations' (VSSC 94)

At the end of the first paragraph of this article the last line should read 'probable accuracy of plus or minus .02 in V' .

Kevin West, 5 Edward Street, Ryde, Isle of Wight, PO33 2SH.
E-mail:kwest@ryde.prestel.co.uk

Inclusion of Photometry with Visual Data

In 1993 after 3 years of visual (binocular) observing of variable stars, I moved across to photoelectric photometry (PEP) to begin a programme of the long term monitoring of bright (> 7.0) Northern variables. Nearly all of my stars are on the VSS visual programme and many are the subject of articles usually showing light curves and observer lists.

My question is: *would it be possible and indeed desirable to combine photometry data with visual data in the database, light curves, observer lists etc?*

I can think of 3 or 4 factors in the debate but would welcome the contributions from other interested parties.

•*Can it be done?*
I have spoken with Dave McAdam on this and he assures me that it can, although it would be a lengthy business writing in the necessary routines to handle PEP records (and CCD).

•*Are the results compatible?*
I have carried out comparisons of my PEP with any coincident visual observations and there is a surprisingly good match although with very red stars visual observers on average under estimated relative to my PEP. I stress my PEP, because different PEP systems most notably via the filters have different responses (See item 4) so that any statements made below strictly apply to my system although in practice, comparisons with other photometrists show the differences are minimal. My comparisons are summarised below. Most span a period of several months, hence the range.

Star	Redness(B-V)	Visual	Photometry (KW)	Difference
RZ Cas	0.6	7.66	7.68	0.02
Gamma Cas	-0.15	2.2	2.20	-
Mu Cep	2.35	4.05-4.40	3.60-4.16	0.35 (Av)
Zeta Gem	0.79	3.67-4.15	3.70-4.12	0.03
R Lyr	1.59	3.9-4.4 4.6-4.9[1]	3.93-4.25	0.36 (Av)
Eta Aqu	0.89	3.59-4.28	3.62-4.31	0.03

[1] 2 sources of visual data

Perhaps a more comprehensive comparison has been done before or needs doing, but in a sense the differences are kind of irrelevant. They are just “instrumental” differences that astronomers are quite used to living with.

•*Would the combination be a disincentive to visual observers?*
I believe that visual observers are well aware of the strengths and weaknesses of their observations, and although photometry is more accurate, it is slower and limited to bright stars (at least mine is).

•*Would it influence visual observers?*
Would an observer who perhaps estimated a star consistently fainter than PEP start to compensate. I don't believe this would happen. The differences between visual observers has existed since observations began. In fact to a lesser degree, this problem occurs in photometry, as all systems respond differently to incoming light and where necessary small transformations must be made to the Johnson system based on a set of "standard stars".

To finish on couple of personal comments, I am noticing an increasing number of reports, light curves etc. using visual data on stars that are on my programme. I do find it surprising and slightly galling that no mention is made of coincident photometry. Whilst publication of my work in the circular is one way to disseminate the information, I do think that this separation misses out on the mutual enhancement of combined publication. I have asked these questions in the interest of improving the quality of BAA data and asking questions is the easy part. The problems of implementing any changes falls on the shoulders of our over worked section officers whom I have discussed this issue with over the last couple of months. I thought that it would be constructive to open up the debate.

Kevin West (address given on page 19)

Call for Observations

Comparison star K in the BAA's sequence for T Coronæ Borealis is in fact the suspected RV Tauri variable NSV 7378, listed as being of V 9.1-9.9 range. Reverse engineering of BAAVSS T Coronæ Borealis estimates reveals that this star does in fact vary, with at least one instance of a roughly one magnitude sharp dip amongst other vagaries of up to half a magnitude. This star is not confirmed as variable and yet could be proven as such with as little as one season's campaign, given enough interest. Preliminary analysis suggests that there may (or may not be) activity on timescales of either 115 or 330 days, however the data is as yet so thin that his result could be totally spurious.

John Greaves

Note from our director, Gary Poyner, on this letter:
It would be useful if observers of T Coronæ Borealis could make an estimate of comparison star K during the coming season, and report their results to the secretary in the usual way.

Chart director e-mail address

Please note that I may now be contacted by e-mail at: john.toone@dial.pipex.com
John Toone (other details on back cover)

RECENT PAPERS ON VARIABLE STARS

TRISTRAM BRELSTAFF

Increasing X-ray Emissions and Periodic Outbursts from the Massive Star Eta Carinae (Corcoran et al., Nature, 390, 587-589, 1997)

Corcoran et al report the results of 1.5 years monitoring of the hard X-ray emission from this highly luminous star. They find a slow increase in the flux over this period with small superimposed 'outbursts' at 85 day intervals. It is suggested that the hard X-ray emission is produced by colliding stellar winds in a binary system. The slow rise in flux could be due to motion in the 5.5 year binary system that has recently been proposed. If so then the flux would be expected to increase until January 1998, when the 5.5 year binary is expected to reach periastron. The 85 day periodicity may be due to pulsation or rotation in one of the components, or even to one of the components being an 85 day binary itself. Further X-ray observations should help elucidate the structure of Eta Carinae

Discovery of a Supernova Explosion at Half the Age of the Universe (Perlmutter et al., Nature, 391, 51-54, 1998)

Perlmutter et al report observations of the magnitude 24 (R-band) supernova SN1997ap. This was detected on 1997 March 5th by the Supernova Cosmology Project at Cerro Tololo (along with 15 others found during the same two-night run). This is the most distant spectroscopically confirmed SN. The spectrum is consistent with that of a type Ia SN at redshift z = 0.83. The light-curve (derived from HST and ground-based follow-up observations) is again that of a type Ia SN but dilated (stretched out) by a factor of about 1.86. As this is very close to the value of 1.83 predicted from the redshift (ie: 1 + z), this provides strong confirming evidence for the cosmological nature of the redshifts. In addition to this, the apparent magnitudes of distant SNe at maximum can be used to test models of the universe. The data for SN1997ap (when compared with that for nearer SNe) suggests that the universe will expand forever. However, further observations of high redshift SNe are needed to get a statistically significant sample and there are several possible sources of systematic bias that need to be eliminated before firm conclusions can be drawn on this subject.

IBVS's

GARY POYNER

4501	V1472 Aql: A most unusual eclipser? (Samus, 1997)
4502	Photometric observations of the primary minimum of the active Algol binary RZ Cassiopeiæ. (Shin-Ya Narusawa et al, 1997)
4503	Photometry of the eclipsing binary V1481 Cyg in the open cluster NGC 7128. (Zakirov, 1997)
4504	Observations of the GSC 3505_677 field. (Robb et al, 1997)
4505	New Variables in the fields of V1413 Aquilæ and AU Herculis. (Brown & Benson, 1997)
4506	A new peculiar Be object MWC 657. (Miroshnichenko et al, 1997)
4507	HD 213637 is a rapidly rotating oscillating Ap star. (Martinez et al, 1997)
4508	A new position and period for CY Draconis. (Sawyer & Benson, 1997)
4509	BVRI observations of an eclipse of RZ Cas. (Hill & Osborn, 1997)

4510 Photometric and Polarimetric observations of 17 double and multiple stars. (Docobo et al, 1997)
4511 Photometric observations of VW Cephei in 1996. (Jay & Guinan, 1997)
4512 Optical detection of the intense 1995 November flare in UX Arietis. (Hendry & Hall, 1997)
4513 True and possible contact binaries in the Hipparcos catalogue. (Duerbeck, 1997)
4514 New bright flare star in the solar vicinity, COU 14 = SAO 107425. (Melikian et al, 1997)
4515 1991 BVRcIc light curves and period study for the very short period, active W UMa system, V743 Saggitarii. (Samec et al, 1997)
4516 UBV precision light curves of the near or shallow contact binary HW Persei. (Samec et al, 1997)
4517 New light curves and period study of the contact binary W Ursa Majoris. (Morgan et al, 1997)
4518 Has the delta Scuti star BS Aqr a companion? (Fu Jian-Ning et al, 1997)
4519 The drop in brightness of MWC 560 = V694 Mon. (Mikolajewski et al, 1997)
4520 AC Vel, a triple system. A call for observations of minima and spectra. (Johansen et al, 1997)
4521 Photometry of NQ Gem: A quiescent symbiotic star? (Dalmeri et al, 1997)
4522 Radii of low amplitude Cepheids and their pulsation mode. (Sachkov, 1997)
4523 Photometric and polarimetric observations of the post-AGB star SAO124414. (Melikian et al, 1997)
4524 Photometric and polarimetric observations of Mira's. (Magnan et al, 1997)
4525 GSC 3639.01081: A new variable in the field of GK Andromedæ. (Diethelm, 1997)
4526 The eclipsing binary star NSV 03999 in Camelopardalis. (Vidal-Sainz, 1997)
4527 New M-Type variables in dark cloud regions. (Magnan et al, 1997)
4528 BY Apodis: A new Mira variable. (Cieslinski et al, 1997)
4529 GG Vel: More times of minima and period study. (Angel-Cerruti, 1997)
4530 V829 Aquilæ is a pulsating star with a variable light curve. (Diethelm, 1997)
4531 New elements for BW Cassiopeiæ. (Diethelm, 1997)
4532 Confirmation of the SU UMa nature of V1504 Cyg. (Nogami & Masuda, 1997)
4533 Times of minimum for AR Aur and Beta Aur, and a new period determination for Beta Aurigæ. (Johansen & Sorensen, 1997)
4534 Photoelectric minima of eclipsing binaries. (Ogloza, 1997)
4535 NSV 04493: An RR Lyræ star in Leo Minor. (Henden & Vidal-Sainz, 1997)
4536 The variability type and period of HD 143213. (Bastian & Born, 1997)
4537 Optical properties of HD 154791 during X-ray outbursts. (Tomasella et al, 1997)
4538 Photospheric and chromospheric activity of the bright and single G5 dwarf HR4864 = HD 111396. (Strassmeier et al, 1997)
4539 PG 2337+300: A new cataclysmic variable. (Koen & Orosz, 1997)
4540 Variability of GSC 1062-33 and GSC 1062-92. (Bernhard et al, 1997)
4541 On the variability of early A-type supergiants. (Adelman & Albayrak, 1997)
4542 Eccentric eclipsing binary stars as test of general relativity: The case of EW Orionis. (Wolf et al, 1997)

ECLIPSING BINARY PREDICTIONS

TRISTRAM BRELSTAFF

The following predictions are calculated for an observer at 53 degrees north, 1.5 degrees west but should be usable for observers throughout the British Isles. The times of mid-eclipse appear in parentheses with the start and end times of visibility on either side. The times are hours GMAT, that is UT-12h. D' and 'L' are used to indicate where daylight and low altitude, respectively, prevent part of the eclipse from being visible. Charts for all of the stars included in these predictions (17 in all - see VSSC 90 for a list) are available from the Eclipsing Binary Secretary at 10p each (please enclose a large SAE). Some predictions for the last two days of March were inadvertently omitted from VSSC 94 and so they have been included here.

1998 Mar 30 Mon
RW Tau D07(08)11L
ST Per D07(09)11L
RW Gem D07(10)12L
TW Dra 10(15)17D
RZ Cas 14(17)17D
Z Per L16(18)17D

1998 Mar 31 Tue
TX UMa D07(06)10
SW Cyg L08(04)10
Z Dra 11(13)16

1998 Apr 2 Thu
RW Gem D08(07)12
U Cep D08(10)15
TW Dra D08(10)15
Z Vul L11(09)14
Z Per L16(19)16D

1998 Apr 3 Fri
Z Dra D08(07)09
RZ Cas D08(07)09
TX UMa D08(07)12
X Tri 08(11)09L

1998 Apr 4 Sat
X Tri D08(10)08L
RZ Cas 09(11)14
SW Cyg 12(18)16D
Z Dra 13(15)16D
Z Vul 15(20)16D
S Equ L15(17)16D

1998 Apr 5 Sun
RW Gem D08(04)09
TW Dra D08(06)11
X Tri D08(09)08L
U Sge L12(13)16D
RZ Cas 14(16)16D
Z Per L16(21)16D

1998 Apr 6 Mon
TX UMa D08(09)13
X Tri D08(09)08L

1998 Apr 7 Tue
V640 Ori D08(05)08
ST Per D08(07)11L
X Tri D08(08)08L
Z Dra D08(08)11
U Cep D08(10)15
Z Vul L11(07)12

1998 Apr 8 Wed
X Tri D08(07)08L
Z Dra 14(17)16D

1998 Apr 9 Thu
V640 Ori D08(06)08
RZ Cas D08(06)08
X Tri D08(07)08L
SW Cyg D08(07)13
TX UMa D08(10)15
Z Vul 12(18)16D

1998 Apr 10 Fri
X Tri D08(06)08L
RW Tau D08(10)10L
RZ Cas 08(11)13
TW Dra 15(20)16D

1998 Apr 11 Sat
V640 Ori D08(06)08L
Z Dra D08(10)12
RZ Cas 13(15)16D
S Equ L14(14)16D

1998 Apr 12 Sun
U Cep D08(10)15
TX UMa D08(12)16D
ST Per 11(15)11L
U Sge L11(07)13

1998 Apr 13 Mon
RW Tau D08(04)09
V640 Ori D08(07)08L
TW Dra 11(16)16D
SW Cyg 15(21)16D

1998 Apr 14 Tue
Z Vul L11(16)16D

1998 Apr 15 Wed
ST Per D08(06)10
V640 Ori D08(07)08L
TX UMa 08(13)16D
Z Dra 09(12)14
U Sge L11(16)16D

1998 Apr 16 Thu
RZ Cas D08(10)13
TW Dra D08(11)16D
RW Gem 09(15)11L

1998 Apr 17 Fri
U Cep D08(09)14
RZ Cas 12(15)16D

1998 Apr 18 Sat
SW Cyg D08(11)16D
TX UMa 10(15)16D
S Equ L14(11)16D

1998 Apr 19 Sun
TW Dra D08(07)12
RW Gem D08(11)11L
Z Vul L10(13)16D
Z Dra 11(13)16D

1998 Apr 20 Mon
ST Per 09(13)10L

1998 Apr 21 Tue
RW Tau D08(12)09L
TX UMa 11(16)16D

1998 Apr 22 Wed
Z Dra D08(07)09
RW Gem D08(08)11L
U Cep D08(09)14
RZ Cas D08(10)12
U Sge L11(11)16D

1998 Apr 23 Thu
ST Per D08(05)09
RZ Cas 12(14)15D
Z Dra 13(15)15D

1998 Apr 24 Fri
Z Per D08(05)09
RW Tau D08(06)09L
Z Vul L10(11)15D
TX UMa 13(18)15D

1998 Apr 25 Sat
RW Gem D08(05)10
S Equ L13(08)13
U Sge 14(20)15D

1998 Apr 26 Sun
Z Dra D08(08)11

1998 Apr 27 Mon
Z Per D08(06)10L
U Cep D08(09)14
SW Cyg D08(14)15D
TW Dra 12(17)15D
TX UMa 14(19)15D
Z Dra 15(17)15D

1998 Apr 28 Tue
RZ Cas D08(09)11
ST Per D08(12)09L
S Equ 13(19)15D

1998 Apr 29 Wed
Z Vul L10(09)14
U Sge L10(05)11
RZ Cas 11(14)15D

1998 Apr 30 Thu
Z Per D09(07)10L
Z Dra D09(10)13
TW Dra D09(12)15D

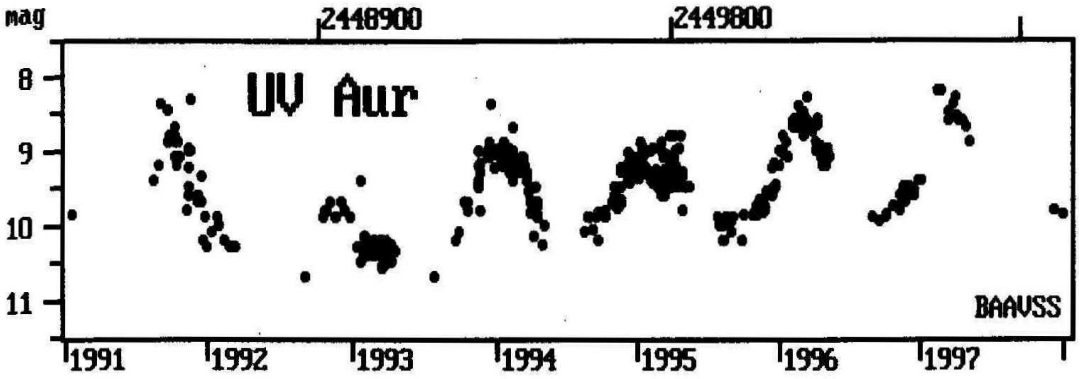
1998 May 1 Fri
Z Vul 15(20)15D

1998 May 2 Sat
SW Cyg D09(04)10
U Cep D09(08)13
U Sge L10(14)15D

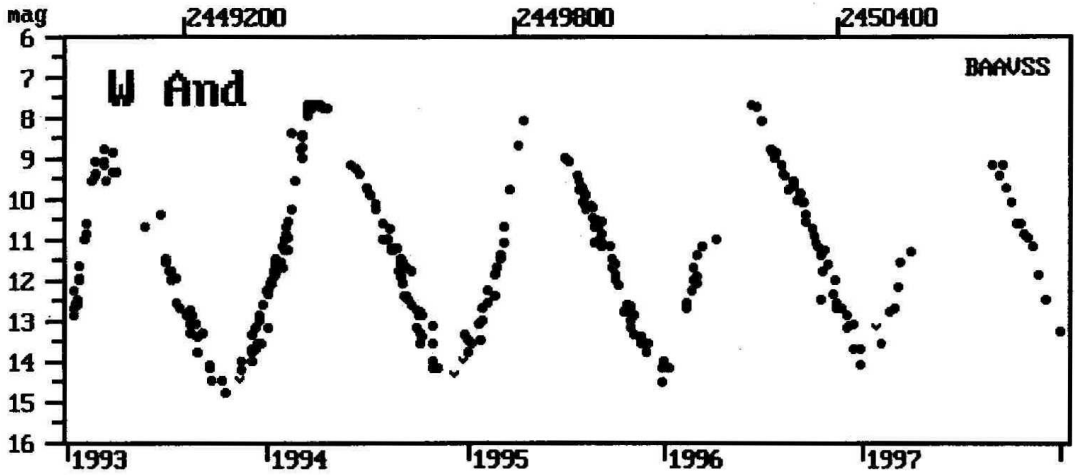
1998 May 3 Sun
TW Dra D09(07)12
Z Per D09(09)09L

1998 May 4 Mon
RZ Cas D09(08)11

Z Vul L09(07)12
Z Dra 09(12)14
1998 May 5 Tue
RZ Cas 11(13)15D
S Equ L13(16)15D
1998 May 6 Wed
Z Per D09(10)09L
ST Per D09(11)09L
SW Cyg 12(18)15D
Z Vul 13(18)15D
Z Per L14(10)15
1998 May 7 Thu
U Cep D09(08)13
1998 May 8 Fri
Z Dra 11(14)15D
1998 May 9 Sat
Z Vul D09(05)10
Z Per D09(11)09L
RW Gem D09(13)10L
U Sge L09(08)14
Z Per L14(11)15D
1998 May 10 Sun
RZ Cas D09(08)10
1998 May 11 Mon
Z Dra D09(07)09
SW Cyg D09(08)14
RZ Cas 10(13)15D
Z Vul 10(16)15D
TW Dra 12(18)15D
ST Per L15(18)15D
1998 May 12 Tue
U Cep D09(08)13
RW Gem D09(10)10L
U Sge 12(17)15D
S Equ L12(12)15D
Z Dra 13(15)15D
Z Per L14(13)15D
1998 May 14 Thu
TW Dra D09(13)15D
Y Psc L14(17)15D
1998 May 15 Fri
RW Gem D09(06)09L
Z Dra D09(08)11
Z Per L13(14)15D
1998 May 16 Sat
RZ Cas D09(07)10
Z Vul D09(14)15D
1998 May 17 Sun
U Cep D09(07)12
TW Dra D09(08)13
RZ Cas 10(12)14
1998 May 18 Mon
Z Per L13(15)14D
Y Psc L14(11)14D
RZ Cas 14(17)14D
1998 May 19 Tue
TX UMa D09(06)11
Z Dra D09(10)13
U Sge D09(12)14D
S Equ L12(09)14D
ST Per L14(16)14D
1998 May 20 Wed
SW Cyg D09(11)14D
1998 May 21 Thu
Z Vul D09(11)14D
Z Per L13(17)14D
1998 May 22 Fri
U Cep D09(07)12
TX UMa D09(07)12
1998 May 23 Sat
RZ Cas D09(11)14
Z Dra 10(12)14D
1998 May 24 Sun
Z Per 13(18)14D
RZ Cas 14(16)14D
U Cep 14(19)14D
1998 May 25 Mon
TX UMa D10(09)14
TW Dra 13(18)14D
1998 May 26 Tue
U Sge D10(06)12
Z Vul D10(09)14D
S Equ L11(06)12
1998 May 27 Wed
U Cep D10(07)12
Z Dra 11(14)14D
ST Per L14(15)14D
1998 May 28 Thu
TX UMa D10(10)14D
TW Dra D10(14)14D
1998 May 29 Fri
RZ Cas D10(11)13
SW Cyg D10(15)14D
U Sge D10(15)14D
S Equ 11(17)14D
U Cep 14(19)14D
1998 May 30 Sat
RZ Cas 13(16)14D
1998 May 31 Sun
Z Vul D10(07)12
TW Dra D10(09)14D
TX UMa D10(12)14D
Z Dra 13(15)14D
1998 Jun 1 Mon
U Cep D10(06)11
1998 Jun 2 Tue
Z Vul 13(18)14D
Y Psc L13(13)14D
X Tri 14(16)14D
1998 Jun 3 Wed
SW Cyg D10(04)11
Z Dra D10(09)11
TX UMa D10(13)14D
U Cep 13(18)14D
X Tri L14(16)14D
1998 Jun 4 Thu
RZ Cas D10(10)13
ST Per L13(14)14D
X Tri L14(15)14D
1998 Jun 5 Fri
Z Vul D10(05)10
U Sge D10(09)14D
S Equ L11(14)14D
RZ Cas 13(15)14D
X Tri L13(14)14D
1998 Jun 6 Sat
U Cep D10(06)11
TX UMa 10(15)14D
X Tri L13(14)14D
1998 Jun 7 Sun
Z Dra D10(10)13
Z Vul 10(16)14D
SW Cyg 12(18)14D
X Tri L13(13)14D
1998 Jun 8 Mon
U Sge 13(19)14D
U Cep 13(18)14D
X Tri L13(12)14D
1998 Jun 9 Tue
TX UMa 12(16)14D
X Tri L13(11)14D
1998 Jun 10 Wed
RZ Cas D10(10)12
X Tri L13(11)13
1998 Jun 11 Thu
U Cep D10(06)11
Z Dra D10(12)14D
TW Dra D10(15)14D
RZ Cas 12(14)14D
1998 Jun 12 Fri
SW Cyg D10(08)14D
Z Vul D10(14)14D
S Equ L10(11)14D
ST Per L12(13)14D
TX UMa 13(18)14D
1998 Jun 13 Sat
U Cep 13(18)14D
1998 Jun 14 Sun
TW Dra D10(10)14D
1998 Jun 15 Mon
U Sge D10(13)14D
Z Dra 11(14)14D
1998 Jun 16 Tue
U Cep D10(05)10
RZ Cas D10(09)12
1998 Jun 17 Wed
TW Dra D10(05)10
Z Vul D10(11)14D
RZ Cas 11(14)14D
Y Psc L12(15)14D
1998 Jun 18 Thu
U Cep 12(17)14D
1998 Jun 19 Fri
S Equ D10(08)13
Z Dra 13(16)14D
1998 Jun 20 Sat
ST Per L12(11)14D
1998 Jun 21 Sun
SW Cyg D10(11)14D
Z Per L11(06)11
Y Psc L12(09)13
1998 Jun 22 Mon
U Sge D10(07)13
RZ Cas D10(09)11
Z Dra D10(09)11
Z Vul D10(09)14D
S Equ 13(18)14D
1998 Jun 23 Tue
RZ Cas 11(13)14D
U Cep 12(17)14D
1998 Jun 24 Wed
Z Per L11(08)12
1998 Jun 25 Thu
TW Dra 10(15)14D
U Sge 11(16)14D
1998 Jun 26 Fri
Z Dra D10(10)13
1998 Jun 27 Sat
Z Vul D10(07)12
Z Per L11(09)14
1998 Jun 28 Sun
RZ Cas D10(08)10
TW Dra D10(11)14D
ST Per L11(10)14D
U Cep 12(17)14D
1998 Jun 29 Mon
S Equ D10(15)14D
RZ Cas 10(13)14D
Z Vul 13(18)14D
1998 Jun 30 Tue
Z Dra D10(12)14D
SW Cyg D10(15)14D
Z Per L10(10)14D



UV Aur 1991 to 1997. 397 observations by;- S W Albrighton, A R Baransky, L K Brundle, D S Conner, H J Davies, J S Day, R C Dryden, M Gill, R E Kelly, S Koushiappas, R W Middleton, Roy Mitchell, G Poyner, G Ramsey, M D Taylor, C Washington, P J Wheeler, W J Worraker.



W And 1993 to 1997. **3**53 observations by;- S W Albrighton, R J Bouma, G A V Coady, R C Dryden, M J Gainsford, R A H Paterson, G Poyner, J Toone.

The deadline for contributions to the June 1998 issue of VSSC will be 7th May, 1998. All articles should be sent to the editor (details are given on the back of this issue)

Whilst every effort is made to ensure that information in this circular is correct.....

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SECTION OFFICERS

Director Gary Poyner
67 Ellerton Road, Kingstanding, Birmingham, B44 0QJ.
Tel: 0121 6053716 Internet:gp@star.sr.bham.ac.uk
Assistant Director Melvyn D. Taylor
17 Cross Lane, Wakefield, West Yorks., WF2. 8DA. Tel: 01924 374651
Chart Secretary John Toone
Hillside View, 17 Ashdale Road, Cressage, Shrewsbury, SY5 6DT.
Tel 01952 510794 Internet john.toone@dial.pipex.com
Secretary Dave McAdam
33 Wrekin View, Madeley, Telford, Shropshire, TF7 5HZ.
Tel 01952 432048 Internet dave@telf-ast.demon.co.uk
Nova/Supernova Secretary Guy M Hurst
16 Westminster Close, Basingstoke, Hants, RG22 4PP .
Tel & Fax 01256-471074 Internet Guy@tahq.demon.co.uk
Pro-am Liaison Committee Secretary & Photoelectric Photometry Advisor
Roger D Pickard, 28 Appletons, Hadlow, Kent TN11 0DT
Tel 01732-850663 Internet rdp@star.ukc.ac.uk
Eclipsing Binary Secretary Tristram Brelstaff,
3 Malvern Court, Addington Road, Reading, Berks, RG1 5PL Tel 0118-9268981
Circulars Editor and CCD Advisor Karen Holland
136 Northampton Lane North, Moulton, Northampton, NN3 7QW
Tel 01604 671373 Internet kho@star.le.ac.uk
Recurrent Objects Co-ordinator - as Director

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