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Nova and Supernova Discoveries	First phone Nova/Supernova Secretary. If only answering machine response leave message and then try the following: Denis Buczynski 0524-68530 Glyn Marsh 0772-690502 Martin Mobberley 0245-475297 (w'kdays) 0284-828431 (w'kends)
Variable Star Alerts	Gary Poyner 021-6053716 E-mail: GP@UK.AC.BHAM.SR.STAR BHVAD::GP

Charges for VSS Publications

The following charges are made for the Circulars. These cover one year (4 issues). Make cheques out to the BAA. Send to the Director.

	UK	Europe	Rest of World
BAA Members	£2-50	£3-50	£6-00
Non-Members	£4-50	£5-50	£8-00

The charges for other publications are as follows. Make cheques out to the BAA and please enclose a large SAE with your order.

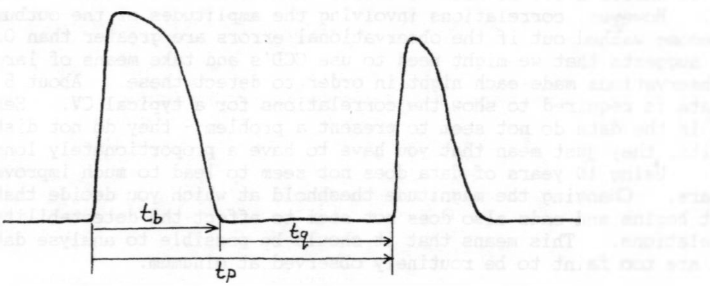
	Order from	Charge
Telescopic Charts	Chart Secretary	30p each
Binocular Charts	Chart Secretary	10p each
Eclipsing Binary Charts	Eclipsing Binary Secretary	10p each
Leaflets	Section Secretary	20p each
Observation Report Forms	Section Secretary	No Charge

The Cambridge Variable Star Meeting (continued from VSSC 79)

The afternoon session was opened by Dr Martin Hendry of Sussex University. Dr Hendry is part of a group at Sussex which includes Robert Smith, Sandi Catalan and Martin Still who are working on the statistical analysis of observations of cataclysmic variables (CV's, also known as dwarf novae). He explained that he was not a true variable star researcher but was theoretical cosmologist who had become interested in CV's when he found that he could apply the same statistical techniques to them that he had been using to analyse galaxy red-shift surveys.

Dr Hendry briefly described what CV's are (stars which undergo explosive outbursts quasi-periodically on timescales of 10's to 100's of days) and how they can be classified on the basis of their light-curves (into U Gem, SU UMa and Z Cam types) or on the basis of spectroscopic observations of their magnetic field (into 'polars' and 'intermediate polars'). He also outlined the current binary model for CV's which involves one of the components being a compact object (white dwarf) surrounded by an accretion disk built up from material drawn off from the other component.

Light-curve studies can be divided into two types. In the first, the properties of each star are averaged over a long time interval and the results for various stars compared. This sort of study has revealed, for example, a relationship between the mean period and the mean amplitude similar to that for recurrent novae. In the second type of study you analyse how the properties change with time within the light-curve of an individual star. It is only through this second type of study can you hope to understand the underlying mechanisms of the outbursts. Dr Hendry went on to describe how the Sussex group abstracted he details of a CV light-curve by measuring 3 parameters for each outburst cycle: t_b, the time in burst; t_q the time in quiescence, and t_p, the period.



There were two questions that they were trying to answer in this work: first, 'is there any evidence for chaotic behaviour in the light-curves?' and second, 'is there any evidence for correlations between t_b and t_q?'. The first question is important because the physical mechanisms causing the outbursts are thought to be inherently non-linear which would lead one to expect them to exhibit chaotic behaviour. One way to look for such behaviour is to plot a 'return map', for example you can plot t_b for each cycle against the t_b of the previous cycle. If the behaviour is chaotic then the points will fall on a distinct curve rather than be scattered at random. Dr Hendry showed such return maps for KT and FO Persei. These showed too much scatter to be purely chaotic. He suggested that they may be the result of a mixture of chaotic and quasi-periodic behaviour.

The second question, the existence of correlations between t_b and t_q is important because it may allow us to distinguish between the two proposed mechanisms for CV outbursts. One mechanism has the outbursts resulting from changes in the rate of flow of material into the disk. This mechanism would suggest that long outbursts (large t_b's) should be followed by long quiescent intervals (large t_q's) as the source of the material would be expected to take longer to be replenished. The other mechanism has the outbursts resulting from changes in the viscosity of the material within the disk. In this case one would expect the length of the outburst correlate with the length of the preceeding quiescent interval as the longer outbursts would require longer time for the viscosity to build up. Attempts have been made before to distinguish between these two mechanisms on the basis of visual observations (eg: Cannizo and Mattei, Astrophys. J., 401, No 2, 642-653, 1992) but the results have been inconclusive.

An analysis of BAA VSS data by the Sussex group was similarly inconclusive, however, they had gone one step further and turned the problem round: assuming that a correlation does exist then would we expect it to be detectable with the observations we have available? Could it be that the observations are just not accurate enough to allow us to distinguish between the two models? To investigate this they had made up sets of simulated observations. For each model they made various assumptions about the properties of the system and then calculated the light-curve that it would be expected to show. They then sampled this light-curve at various frequencies and with varying degrees of 'gappiness' and added random errors to simulated observational error. The resulting synthetic observations were then analysed using the same techniques as had been used on the real observations to see how well the correlations could be recovered. They found that there is a strong tendency to underestimate the correlations and that this tendency increases sharply as the correlation gets weaker.

However, Dr Hendry said that if the correlations between t_b and t_q are good then we should still be able to detect them with the available visual observations. However, correlations involving the amplitudes of the outbursts tend to become washed out if the observational errors are greater than 0.1 mag. This suggests that we might need to use CCD's and take means of large numbers of observations made each night in order to detect these. About 5 effective years of data is required to show the correlations for a typical CV. Seasonal gaps in the data do not seem to present a problem - they do not distort the results, they just mean that you have to have a proportionately longer run of data. Using 10 years of data does not seem to lead to much improvement over 5 years. Changing the magnitude theshhold at which you decide that an outburst begins and ends also does not seem to affect the detectability of the correlations. This means that it should be possible to analyse data on stars that are too faint to be routinely observed at minumum.

Dr Hendry finished off by saying that the Sussex group hope investigate various other areas using this simulated data method. These include the effects of observer bias and misidentification on the correlations, how the above results apply to SU UMa stars (which show occasional super-outbursts), the effects of 'filling in' gaps in the data. Another area is how the relative proportions of chaotic and periodic behaviour affect the return map.

To be continued

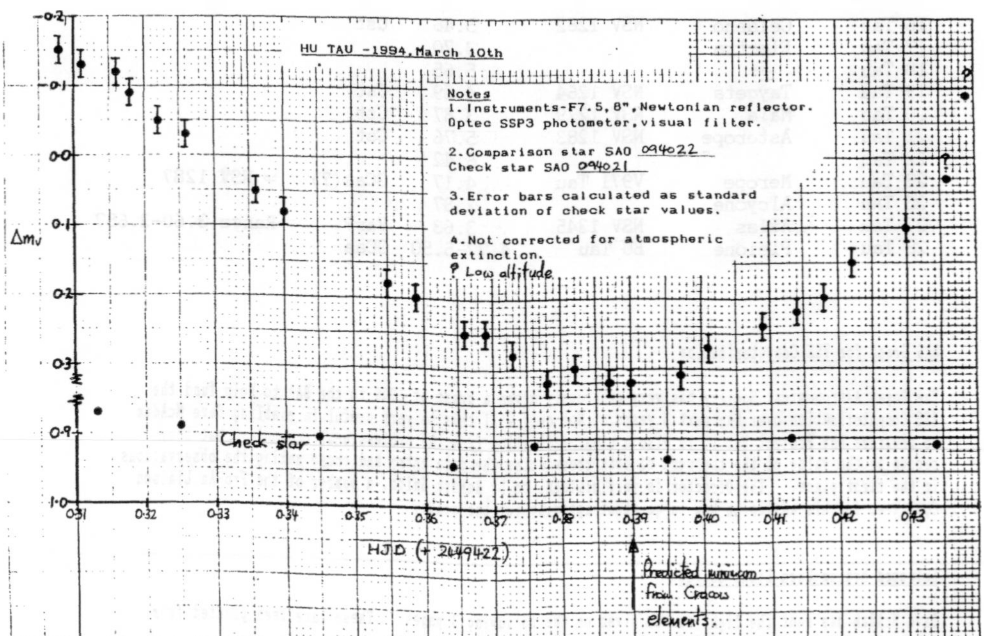
New Variable Star Publications

Gary Poyner fails to mention in his report on the Recurrent Objects Program that he has started issuing a newsletter to observers taking part in that program. The aim is to give feedback to the observers and also to provide a forum for observers coments on the program, sequences and charts. The first issue is dated March and contains some notes by Gary on DI UMa and some comments by Bill Worraker on the DM Lyr sequence. Gary says that the frequency of the newsletter will depend on the amount of material that he receives.

In the first issue Gary also mentions that Paul van Cauteren (Director of the Belgian variable star organisation, the VVS) is preparing a quarterly magazine on variable stars that is to be distributed on computer diskette. Paper copies will also be available for people who don't have a PC. Details are still to be finalised but if you are interested then you can write to Paul at B.L. de Borrekenslaan 54, B-2630 Aartselaar, BELGIUM.

Photoelectric Photometry of HU Tauri

Kevin West has been experimenting with an Optec SSP3 photometer on his 8-inch Newtonian telescope. He writes: 'I was very pleased with this recent capture of a minimum of HU Tau. I've been advised by Roger Pickard to calculate error bars as shown, using the standard deviation of the check star. I was a bit disappointed with the variation between check and comparison for this run - it's usually better (+/- 0.01 mag)' ..... 'I notice in Circular 79 you asked for articles, light-curves, etc. If you think this one is good enough you can include it (as a beginner's work in photometry).'



Photoelectric Photometry of 16 Tauri (Star h on the VSS BU Tau chart)

In a second letter, Kevin also writes: 'After reading VSSC 78 (for the second time) I realised that I had observed (as a check star) star h on the chart for BU Tau. This is one of the stars mentioned in Tony Markham's article on suspected variables. I've listed my observations below'.

JD	BU Tau	Star h (16 Tau)
2449357	5.03	5.45
2449369	5.01	5.45
2449372	5.03	5.45
2449383	5.05	5.45
2449389	5.03	5.46

The measures are V-magnitudes and assume that 23 Tau (Star e) is 4.18V. Kevin continues: 'Star h (16 Tau) shows no sign of variation over 32 days and, perhaps more importantly, its chart magnitude checks out well'.

16 Tau, also known as Celaeno, is listed in the New Suspect Variable Catalogue as NSV 1262 but with an indication that the compilers consider the case for variability to be 'doubtful or erroneous'. Several of the oher stars in the Pleiades are listed in the NSV. Interestingly enough, 23 Tau (Merope) was recently recognised as a 'proper' variable and named V917 Tau. I do not know which type it was assigned to, but I would guess that it is a small-amplitude Gamma Cas variable. Kevin's observations certainly do not indicate any significant variability. The following table lists the variability status of the leading Pleiads:

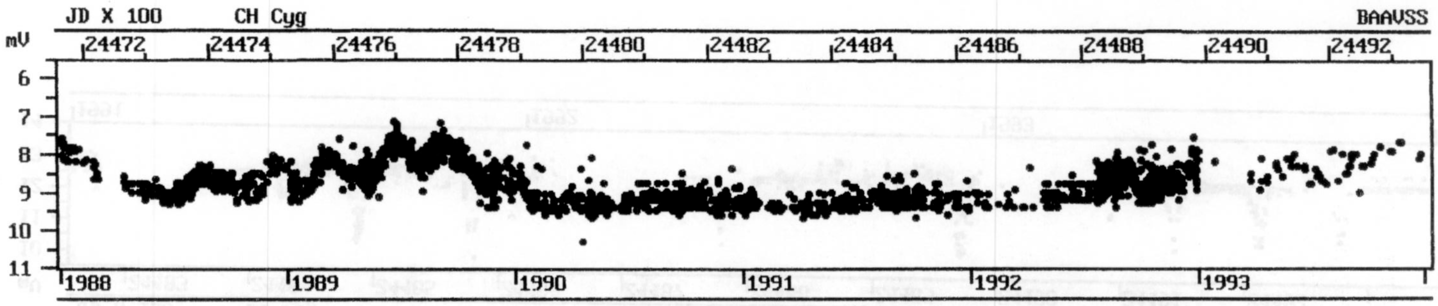
Flamsteed	Name	GCVS	V mag	Type	Notes
16 Tau	Celaeno	NSV 1262	5.46	Cst	
17 Tau	Electra		3.70		
18 Tau			5.65		
19 Tau	Taygeta	NSV 1264	4.29	Cst	
20 Tau	Maia	NSV 1279	3.87	Cst	
21 Tau	Asterope	NSV 1283	5.76	Cst	
22 Tau			6.42		
23 Tau	Merope	V971 Tau	4.17	GCas(?)	= NSV 1287
25 Tau	Alcyone		2.87		
27 Tau	Atlas	NSV 1345	3.63	Var?	Range 3.60-3.65?
28 Tau	Pleione	BU Tau	4.77-5.50	GCas	

RAS Grant for VSS Computerisation

The Royal Astronomical Society has very generously given a grant of £900 to the BAA to help fund the VSS Computerisation over the next 3 years. Not only will this be very useful in enabling Dave McAdam to progress the Project but it is also a clear indication from the professional community that they recognise the value of the the work of both those doing the data entry and those making the observations in the first place. The Director is very grateful to Dr Robert Smith, a member of the Pro-Am Liaison Comittee, for his advice on how to go about applying for the grant.

Selected Medium-Term Light Curves

Dave McAdam has sent the light-curves given on the following 3 pages. These have been plotted from data entered as part of the VSS Computerisation Project.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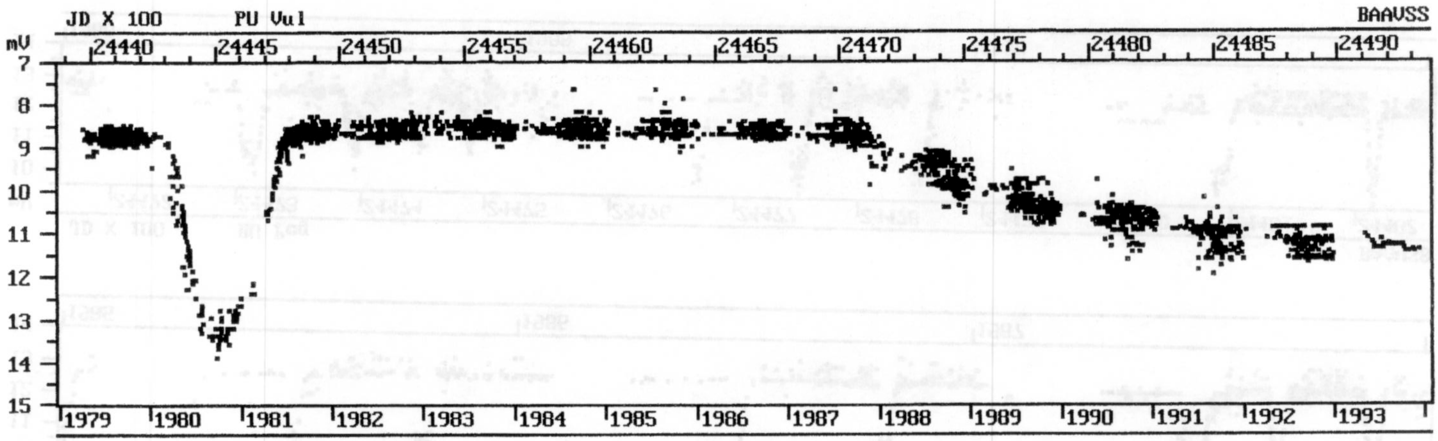
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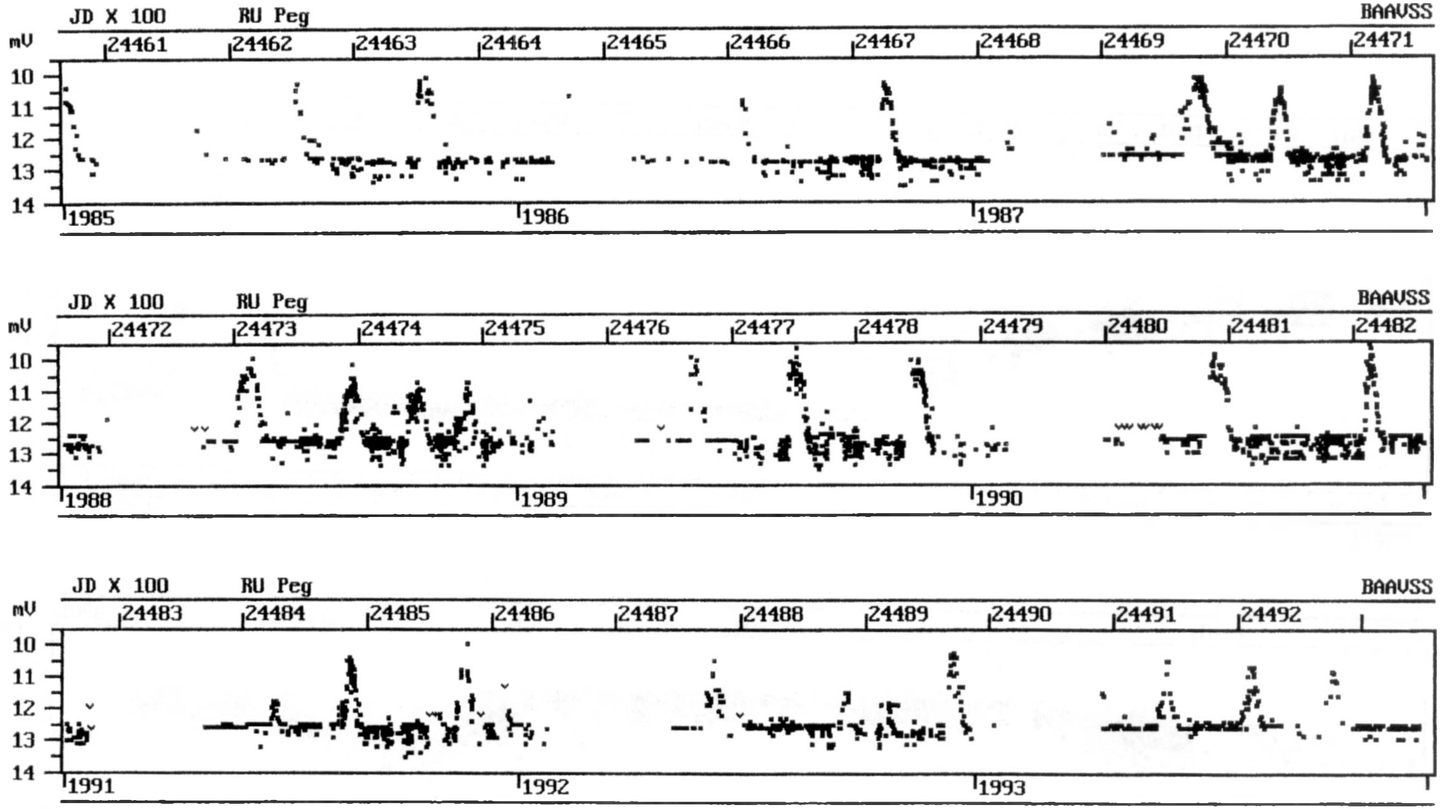
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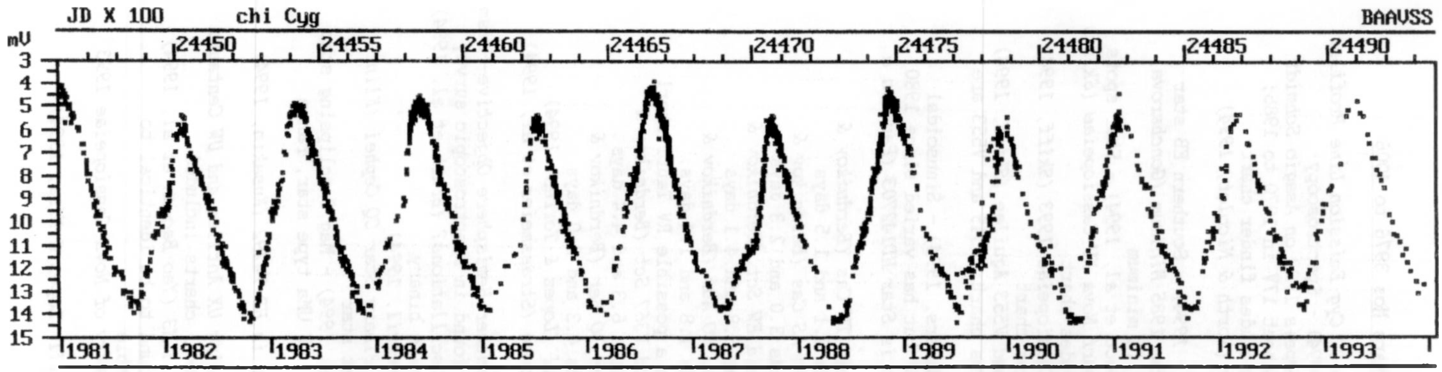
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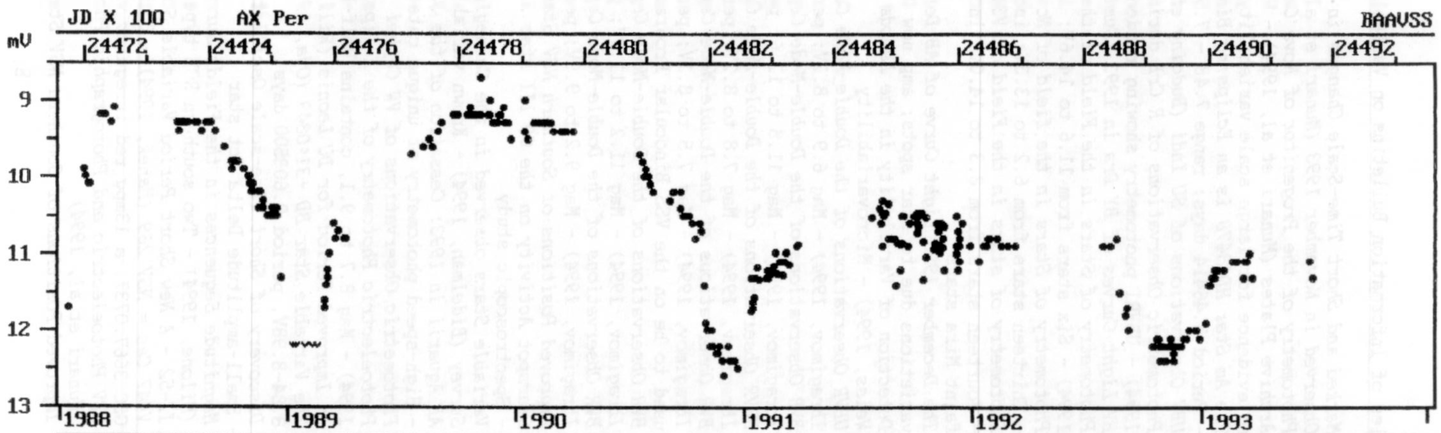
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Summaries of Information Bulletins on Variable Stars Nos 3976 to 4006

3976 *Marked and Short Time-Scale Changes in the CH Cyg Emission Line Profiles Observed in November 1993 (Munari et al, 1994)* - Spectroscopy

3977 *Photometry of the Progenitor of Nova Cassiopeia 1993 on Asagio Schmidt Archive Plates (Munari et al, 1994)* - Was about 17V in 1970 to 1985; no evidence for large scale variability; includes finder chart

3978 *The Am Star HD43478 is an Eclipsing Binary (North & Nicolet, 1994)* - Period 5.46414 days; range 7.48 - 7.58V

3979 *UBV Observations of SU Indi (Budding et al, 1994)* - Southern EB star

3980 *Photometric Observations of R CrB during the 1985 Minimum (Goncharova, 1994)* - UBVRI photometry showing reddening in minimum

3981 *BV Light Curves of BY Dra in 1993 (Dumitrescu et al, 1994)* - Star spots

3982 *Photometry of Stars in the Field of the Dwarf Nova KU Cassiopeiae (Skiff, 1994)* - Six stars from 11.6 to 14.6V; includes chart

3983 *Photometry of Stars in the field of Nova Cassiopeiae 1993 (Skiff, 1994)* - Thirteen stars from 6.2 to 13.3V; includes chart

3984 *Photometry of stars in the Field of V345 and V553 Aquilae (Skiff, 1994)* - Fourteen stars from 8.3 to 14.0V; includes chart; V345 and V553 are faint Mira stars

3985 *The December 1993 Light Curve of AB Dor (Anders, 1994)* - Sinusoidal variations due to star spots; amp now 0.18V but has varied since 1980

3986 *Detection of Variability in the Lambda Bootis Star HD142703 (Paunzen & Weiss, 1994)* - Microvariability

3987 *UBVR Observations of the Double-Mode Cepheid TU Cas (Berdnikov & Ibragimov, 1994)* - Mag 6.9 to 8.2V; periods 2.1 and 1.5 days

3988 *BVR Observations of the Double-Mode Cepheid AS Cas (Berdnikov & Ibragimov, 1994)* - Mag 11.8 to 12.6; periods 3.0 and 2.3 days

3989 *UBVR Observations of the Double-Mode Cepheid EW Sct (Berdnikov & Ibragimov, 1994)* - Mag 7.8 to 8.2V; periods 5.8 and 4.1 days

3990 *BVR Observations of the Double-Mode Cepheid CO Aur (Berdnikov & Ibragimov, 1994)* - Mag 7.5 to 8.1V; periods 1.8 and 1.4 days; used to be on the VSS Binocular Program as a possible RV Tauri star!

3991 *BVR Observations of the Double-Mode Cepheid V367 Sct (Berdnikov & Ibragimov, 1994)* - Mag 11.2 to 11.9V; periods 6.3 and 4.4 days

3992 *BVR Observations of the Double-Mode Cepheid BQ Ser (Berdnikov & Ibragimov, 1994)* - Mag 9.2 to 9.9V; periods 4.3 and 3.0 days

3993 *Improved Positions of Southern NSV Stars II (Lopez & Torres, 1994)*

3994 *Starspot Activity on the G0 III star 31 Comae (Strassmeier et al, 1994)* - Spectroscopic study

3995 *Variable Stars observed in the Carnegie Souther Hemisphere Objective-Prism Survey (Bidelman, 1994)* - Known variables found in spectroscopic survey

3996 *AE Aquarii in 1993: Cessation of the 33s Oscillations? (Bruch et al, 1994)* - High-speed photometry of unique cataclysmic binary

3997 *Photometric Observations of VW Cephei (Navratil, 1994)*

3998 *Photoelectric Photometry of the Eclipsing Binary Star CQ Cephei (Klinc, 1994)* - Mag 8.7 to 9.1, contains Wolf-Rayet star

3999 *An Improved Period for DU Leonis (Williams, 1994)* - Mag 9 eclipsing star

4000 *The Variable Star BD +31°0849 (Oja, 1994)* - W UMa type star, range 8.84-8.98V, period 0.603500 days

4001 *Discovery of Short Time-scale Oscillations in HD 74292 (Kusakin, 1994)* - Small-amplitude Delta Sct star

4002 *Magnitude Sequences in the Fields surrounding UX Antliae and UW Centauri (Milone, 1994)* - Two southern RCB type stars, charts included

4003 *II-52 - A New Short Period Variable Star in M3 (Yao Bao-an et al, 1994)*

4004 *V447 Cas = NSV 269 (Manek, 1994)* - Both found to be identical to GSC 3667.0737, a 13mpg red irregular variable

4005 *UBV Photoelectric and Photographic Photometry of Nova Cassiopeiae 1993 (Munari et al, 1994)*

4006 *Improved Positions of Southern NSV Stars III (Lopez & Mira, 1994)*

Eclipsing Binary Predictions

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 below for a list) are available from the Director at 10p each (please enclose a large SAE).

Stars Included in the Predictions

Star	Range (mags)	Period (days)	Duration of Eclipse (hours)
RZ Cas	6.18 - 7.72V	1.19524892	4.9
U Cep	6.75 - 9.24V	2.49307	9.0
SS Cet	9.4 - 13.0v	2.973967	9.3
SW Cyg	9.24 - 11.83V	4.573011	13
Z Dra	10.8 - 14.1p	1.3574257	4.8
TW Dra	7.3 - 8.9v	2.806842	11
S Equ	8.0 - 10.08V	3.4361291	11
RW Gem	9.53 - 11.76V	2.8654972	10
V640 Ori	11.2 - 13.5p	2.0207326	5.3
Z Per	9.7 - 12.4p	3.0562868	10
ST Per	9.52 - 11.40V	2.6483358	8.3
Y Psc	9.44 - 12.23V	3.765723	9.0
U Sge	6.45 - 9.28V	3.3806129	14
RW Tau	7.98 - 11.59V	2.768780	9.3
X Tri	8.88 - 11.27V	0.9715306	4.2
TX UMa	7.06 - 8.80V	3.063305	8.8
Z Vul	7.25 - 8.90V	2.45492679	11

The Predictions

1994 Aug 1 Mon
Y Psc 11(16)15D
1994 Aug 2 Tue
RZ Cas D09(10)12
U Sge D09(11)15D
TW Dra D09(13)15D
Z Dra 09(12)14
U Cep 10(15)15D
X Tri 15(17)15D
1994 Aug 3 Wed
Z Per D09(05)10
Z Vul D09(10)15D
ST Per L09(13)15D
TX UMa 10(14)13L
S Equ 10(15)15D
RZ Cas 12(14)15D
X Tri 14(16)15D
SW Cyg 14(20)15D
RW Tau 15(19)15D
1994 Aug 4 Thu
X Tri 13(16)15D
1994 Aug 5 Fri
TW Dra D09(09)14
Y Psc D09(10)14
X Tri 12(15)15D
U Sge 14(20)15D
1994 Aug 6 Sat
Z Per D09(07)11
Z Dra 11(13)15D
TX UMa 11(16)12L
RW Tau L11(14)15D
X Tri 12(14)15D
TX UMa L15(16)15D
1994 Aug 7 Sun
U Cep 10(15)15D
X Tri 11(14)15D
1994 Aug 8 Mon
TW Dra D09(04)09
Z Vul D09(08)13
RZ Cas D09(09)11
SW Cyg D09(10)15D
X Tri 10(13)15D
RW Gem 15(20)15D
1994 Aug 9 Tue
Y Psc D09(04)09
U Sge D09(05)10
Z Dra D09(06)09
Z Per D09(08)13
X Tri 10(12)15
RW Tau L11(08)13
RZ Cas 11(14)15D
TX UMa L15(17)15D
1994 Aug 10 Wed
S Equ D09(12)15D
X Tri L09(12)14
Z Dra 13(15)15D
Z Vul 13(19)15D
1994 Aug 11 Thu
ST Per D09(12)15D
X Tri L09(11)13
RW Gem L14(17)15D
1994 Aug 12 Fri
Z Per D09(09)14
U Sge D09(14)15D
X Tri L09(10)13
U Cep 10(15)15D
TX UMa L15(19)15D
1994 Aug 13 Sat
Z Vul D09(06)11
Z Dra D09(08)11
X Tri L09(10)12
TW Dra 14(19)15D
1994 Aug 14 Sun
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X Tri L09(09)11
RW Gem L13(13)15D
Z Dra 14(17)15D
1994 Aug 15 Mon
Z Per D09(11)15D
X Tri L09(08)11
RZ Cas 11(13)15D
Z Vul 11(17)15D
1994 Aug 16 Tue
X Tri L09(07)10
TW Dra 09(14)15D
Y Psc 13(17)15D
ST Per 15(19)15D
RZ Cas 15(18)15D
1994 Aug 17 Wed
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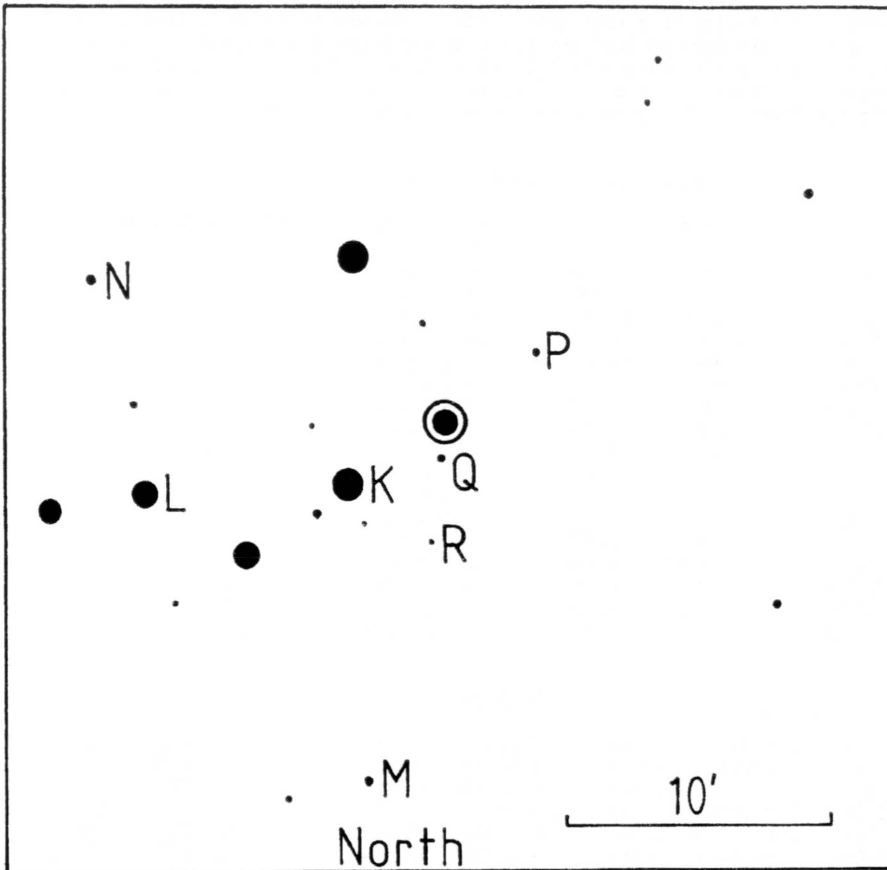
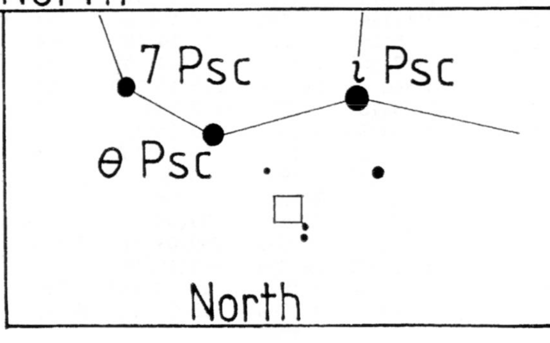
Z Dra D08(10)12
SW Cyg D08(14)15D

Y PISCIUM





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Min = 2445533.559 +
3.765723xE (SAC 60)

(1950) 23h 31.9m +07° 39'
(2000) 23 34.4 +07 56

Preliminary Sequence:

K = 9.4	P = 11.7
L = 10.0	Q = 11.9
M = 10.5	R = 12.6
N = 11.2	

T.Brelstaff 1994 Mar 12

X Tri	L09(07)09
U Cep	09(14)15D
RW Tau	11(16)15D
RW Gem	L13(10)15
1994 Aug 18 Thu	
Z Vul	D08(03)09
Z Per	D08(12)16D
1994 Aug 19 Fri	
U Sge	D08(08)14
TW Dra	D08(09)14
ST Per	D08(10)15
1994 Aug 20 Sat	
RZ Cas	D08(08)10
Y Psc	D08(11)16D
Z Vul	09(14)16D
RW Tau	L11(10)15
S Equ	14(19)16D
1994 Aug 21 Sun	
Z Per	09(13)16D
Z Dra	09(12)14
RZ Cas	10(13)15
1994 Aug 22 Mon	
SW Cyg	D08(03)09
TW Dra	D08(05)10
U Cep	09(14)16D
U Sge	12(17)16D
RZ Cas	15(17)16D
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Z Dra	11(13)16
1994 Aug 26 Fri	
U Sge	D08(02)08
RZ Cas	D08(07)10
SW Cyg	11(17)16D
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SS Cet	16(20)16D
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1994 Aug 28 Sun	
Z Dra	D08(07)09
RW Tau	13(17)16D
RZ Cas	14(17)16D
V640 Ori	L15(17)16D
1994 Aug 29 Mon	
U Sge	D08(12)15L
Z Dra	13(15)16D
SS Cet	15(20)16D
1994 Aug 30 Tue	
Z Vul	D08(10)15
TW Dra	10(15)16D
Z Per	13(17)16D
V640 Ori	15(18)16D
1994 Aug 31 Wed	
S Equ	D08(03)08
TX UMa	D08(04)09
SW Cyg	D08(07)13
RW Tau	L10(12)16D
RW Gem	13(18)16D
Y Psc	14(19)16D
1994 Sep 1 Thu	
RZ Cas	D08(07)09
Z Dra	D08(08)11
U Cep	08(13)16D
ST Per	12(16)16D
SS Cet	14(19)16D
U Sge	15(21)15L
Z Vul	16(21)16L
V640 Ori	16(18)16D
1994 Sep 2 Fri	
TW Dra	D08(10)15
RZ Cas	09(11)14
Z Per	14(19)16D
Z Dra	14(17)16D
1994 Sep 3 Sat	
TX UMa	D08(05)10
S Equ	08(13)15L
RW Tau	L10(06)11
RW Gem	L12(15)16D
RZ Cas	14(16)16D
X Tri	16(18)16D
1994 Sep 4 Sun	
ST Per	D08(08)12
Z Vul	D08(08)13
Y Psc	08(13)16D
SS Cet	14(18)16D
SW Cyg	14(21)16D
X Tri	15(18)16D
1994 Sep 5 Mon	
TW Dra	D08(06)11
U Sge	D08(06)12
Z Dra	D08(10)12
X Tri	15(17)16D
Z Per	15(20)16D
1994 Sep 6 Tue	
TX UMa	D08(07)10L
U Cep	08(13)16D
RW Gem	L12(12)16D
Z Vul	14(19)15L
X Tri	14(16)16D
Z Dra	16(19)16D
1994 Sep 7 Wed	
RZ Cas	D08(06)09
SS Cet	13(18)16D
X Tri	13(16)16D
1994 Sep 8 Thu	
Y Psc	D07(07)12
RZ Cas	08(11)13
U Sge	09(15)15L
X Tri	13(15)16D
RW Tau	15(19)16D
1994 Sep 9 Fri	
Z Vul	D07(06)11
TX UMa	D07(08)10L
SW Cyg	D07(10)16D
Z Dra	09(12)14
ST Per	11(15)16D
RW Gem	L12(08)13
X Tri	12(14)16D
TX UMa	L13(08)13
RZ Cas	13(16)16D
1994 Sep 10 Sat	
S Equ	D07(10)15L
X Tri	11(14)16
SS Cet	13(17)16D
TW Dra	15(20)16D
1994 Sep 11 Sun	
U Cep	08(13)16D
RW Tau	L09(14)16D
X Tri	11(13)16
Z Vul	11(17)15L
1994 Sep 12 Mon	
ST Per	D07(07)11
TX UMa	D07(10)10L
X Tri	10(12)15
TX UMa	L12(10)15
1994 Sep 13 Tue	
RZ Cas	D07(06)08
X Tri	09(12)14
TW Dra	11(16)16D
Z Dra	11(13)16
SS Cet	12(17)16D
1994 Sep 14 Wed	
Z Vul	D07(04)09
RZ Cas	08(10)13
X Tri	08(11)13
RW Tau	L09(08)13
1994 Sep 15 Thu	
U Sge	D07(09)14L
TX UMa	D07(12)10L
X Tri	08(10)13
TX UMa	L12(12)16
RZ Cas	13(15)16D
Y Psc	16(20)16D
1994 Sep 16 Fri	
Z Dra	D07(07)09
X Tri	D07(10)12
TW Dra	D07(11)16
U Cep	07(12)16D
Z Vul	09(14)15L
SS Cet	11(16)16D
1994 Sep 17 Sat	
S Equ	D07(07)13
X Tri	D07(09)11
ST Per	10(14)17D
Z Dra	13(15)17D
1994 Sep 18 Sun	
X Tri	D07(08)11
SW Cyg	08(14)17D
TX UMa	08(13)10L
TX UMa	L12(13)17D
U Sge	13(18)14L
1994 Sep 19 Mon	
RZ Cas	D07(05)07
TW Dra	D07(06)11
X Tri	D07(08)10
Y Psc	10(14)17D
SS Cet	11(15)17D
RW Tau	16(21)17D
1994 Sep 20 Tue	
ST Per	D07(05)09
X Tri	D07(07)09
Z Dra	D07(08)11
RZ Cas	07(10)12
S Equ	12(18)14L
RW Gem	14(19)17D
1994 Sep 21 Wed	
Z Per	D07(03)08
X Tri	D07(06)09
Z Vul	07(12)14L
U Cep	07(12)17D
TX UMa	L12(15)17D
RZ Cas	12(14)17D
Z Dra	15(17)17D
1994 Sep 22 Thu	
U Sge	D07(04)09
X Tri	D07(05)08
SS Cet	10(15)17D
RW Tau	11(16)17D
ST Per	17(21)17D
1994 Sep 23 Fri	
SW Cyg	D07(04)10
X Tri	D07(05)07
Y Psc	D07(09)13
RW Gem	11(16)17D
1994 Sep 24 Sat	
S Equ	D07(04)10
Z Per	D07(04)09
Z Dra	08(10)12
TX UMa	L12(16)17D
TW Dra	16(21)17D
1994 Sep 25 Sun	
RZ Cas	D07(04)07
U Sge	07(13)14L
RW Tau	L08(10)15
ST Per	08(12)16
SS Cet	09(14)17D
Z Dra	16(19)17D
1994 Sep 26 Mon	
Z Vul	D07(10)14L
RZ Cas	07(09)12
U Cep	07(12)16
RW Gem	L11(13)17D
1994 Sep 27 Tue	
Y Psc	D07(03)08
Z Per	D07(06)10
S Equ	09(15)14L
SW Cyg	11(17)17D
RZ Cas	11(14)16
TW Dra	11(17)17D
TX UMa	13(18)17D
1994 Sep 28 Wed	
ST Per	D07(04)08
RW Tau	L08(04)09

SS Cet	L09(13)17D	1994 Sep 29 Thu		Z Per	D07(07)12	ST Per	15(19)17D
Z Dra	09(12)14	RW Gem	L10(10)15	TW Dra	07(12)17D		
RZ Cas	16(19)17D	1994 Sep 30 Fri		TX UMa	14(19)17D		

V409 Persei (= TASV 030645)

Tony Markham's article on suspected variable stars in VSSC 78 prompted R.E.Kelly to send in the accompanying light-curve of TASV 030645 (Figure 1). This star was found to be variable by Guy Hurst on photgraphs taken by R.Mewis in December 1974 (G.M.Hurst, J. Brit. Astron. Assoc., 88, 274 - 276, 1978). From an analysis of visual and photovisual observations made in 1974 to 1976, Hurst concluded that the star was probably a red irregular (type Lb) or semiregular (type SRb) variable with a range of about 10.7 to 12.2v and a possible period of around 330 days. Hurst's light-curve is shown in Figure 2. The dots represent visual observations and the open circles and crosses, photovisual ones. The visual results are systematically about 1.0 magnitude fainter than the photovisual ones. This is probably due to the extreme redness of the star (it is a carbon star with a B-V of 3 or 4 magnitudes). This difference is the reason for the two different scales on the left and right of Figure 2. As can be seen Hurst's visual range of 10.7 to 12.2 corresponds to a photovisual range of 9.7 to 11.2. The comparison stars that were used are shown in in Figure 3.

Kelly used the same comparison stars but found a range of about 9.7 to 10.3v. Kelly's observations are too scattered to give a reliable value for the period but they do seem to be consistent with a period of about one year.

This star appears in the 1985 General Catalogue of Variable Stars as V409 Persei where the following details are given: RA Dec (1950) = 03h 06m 21s +45° 46.7′, Type = Mira, Range = 9.6 - 11.1v, Period = 355d, Spectrum = N, Epoch of Minimum = JD244129, Source = Alksne et al, Issledovanie Solitsa i Krasnikh Zvezd, No 4, 12, 1976. The classification as a Mira star is directly contradicted by both Hurst's and Kelly's light-curves. The star is probably best described as a semiregular variable of type SRb.

Fig 1

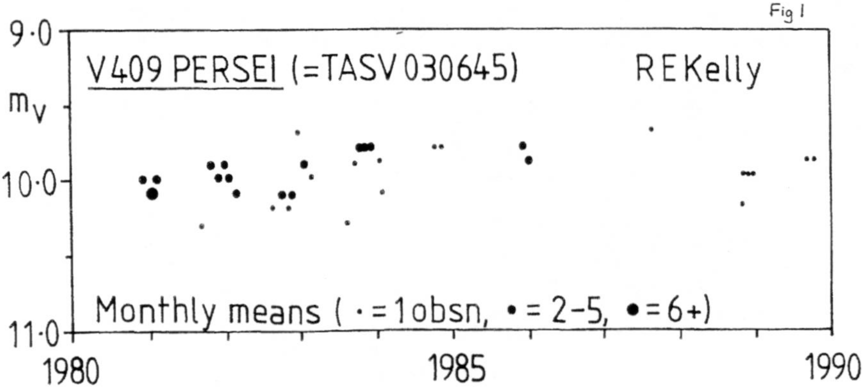


Fig 2

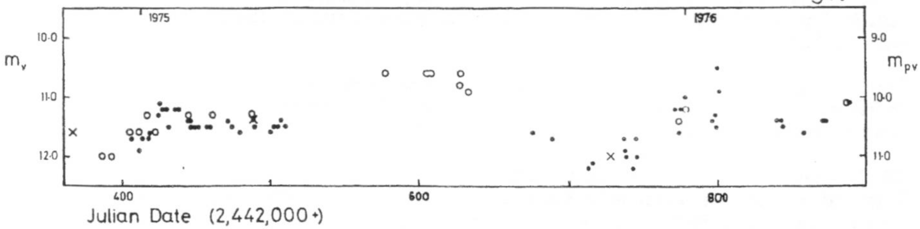
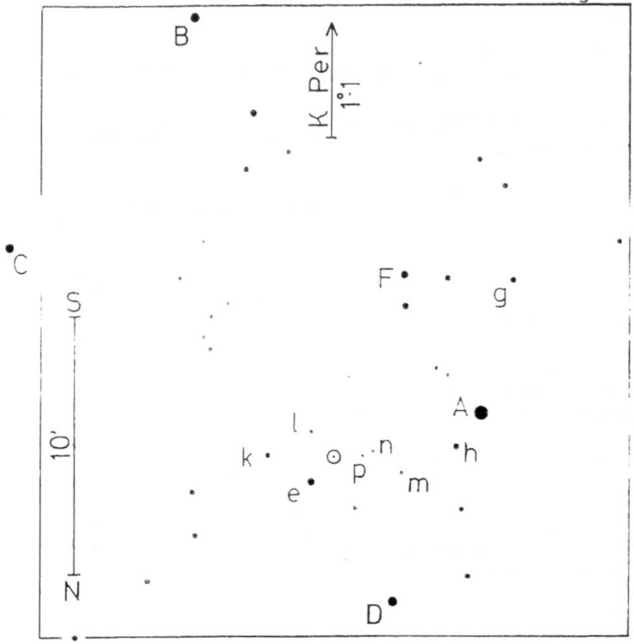


Fig 3



	mpv
A	7.21
B	9.44
C	9.70
D	9.70
e	10.3
F	10.34
g	10.8
h	11.3
k	11.9
l	12.3
m	12.8
n	13.1
p	13.2

Professional-Amateur Exchanges Report No 10 (1993 Jan 1 to Jun 30)

By Guy Hurst

Date	Subject	Professional

930104 T Leo Outburst — Taichi Kato, Japan

Patrick Schmeer, Germany, reported outburst Jan 2.124UT, mag 10.4. Relayed to Kato who, using CCD photometry, found hump structures with amplitude 0.11 mag. Maxima represented by Max UT = Jan 2.806 + 0.05965 E.

930106 NGC 4151 — Mark Kidger, Tenerife

Suggests we relay data on the variation of this galaxy's nucleus to Enrique Perez, Tenerife and Ruggero Stanga, Florence.

930107 NGC 4151 G. Chipman, NASA
K. Yamada, Japan, reports outburst Jan 1.78UT, mag 11.1. Relayed to Chipman as on target list for Compton Gamma Ray Observatory schedule. Response received that project scientists may alter schedule to observe earlier although not due to later.

930115 V635 Cas Diane Roussel-Dupre, Los Alamos Observatory
Professional points out predicted time of next outburst is Jan 25-Feb 16 and asks for recent data. Gary Poyner reports: Jan 9.79UT, 15.2; 12.76, 15.2; 13.94, 15.3 (no brightening).

930117 UV Per Ian Howarth, London
Re unification of sequence, we advise Ian Howarth of the schedule of BAA and AAVSO comparison star values where there are substantial differences which we feel need investigation.

930117 NGC 4151 Enrique Perez, Tenerife
We relay news of brightening to mag 11.0 as detected by Yamada (see also 930106).

930117 1H 0857-242 Heinz Barwig, Germany
We requested finder chart for this new cataclysmic variable (IAU Circular 5689) which was duly supplied to us.

930118 HD37 Chris Lloyd, Rutherford-Appleton Lab
Chris requested details of this suspected variable found in 1970 by Alcock (The Astronomer, 1970 Sep). Copy sent.

930119 NGC 4151 Enrique Perez, Tenerife
At his request, we supply a full data file to Perez following initial report of outburst (see 930117).

930120 V366 Lac and DY Per Andrejs Alksnis, Latvia
Confirms receipt of photographic attempt to record V366 Lac which faded into invisibility some years ago. Martin Mobberley is asked to retry as variable not recorded. Alksnis also submits paper on DY Per for publication in The Astronomer and requests regular monitoring of this suspected R CrB type star.

930123 NGC 4151 Taichi Kato, Japan
Data list of estimates, made 1983 Mar to 1993 Jan by observers in Japan , recirculated to interested parties. 1993 Jan 22 estimate of 11.0 appears to be the brightest recorded since at least 1983.

930124 V635 Cas Diane Roussel-Dupre, Los Alamos Observatory
Further estimates by Gary Poyner relayed but no outburst seen yet: Jan 13.947UT, 51.3; 25.838, 15.2; 26.001, 15.2.

930201 NGC 4151 and NGC 4051 Ruggero Stanga, Florence
We relay details of the outburst of NCG 4151. Stanga also requests data but we note catalogued amplitude only 0.16B which is probably too small for effective visual results.

930206 IP Peg Taichi Kato, Japan
CCD results by Kato received indicating outburst of IP Peg: Feb 2, V=12.8; Feb 5, V=13.9.

930206 Sonneberg Observatory Taichi Kato, Japan
Kato supports effort to avoid closure of Sonneberg and is translating our note into Japanese for publication there!

930207 DY Per Andrejs Alksnis, Latvia
Visual results by Poyner, Westlund and Worraker, from 1992 Apr 28 to 1993 Feb 5, sent to Alksnis.

930208 IP Peg Keith Horne, USA
Relayed to Keith Horne outburst of IP Peg (see 930206). He confirms that the data is useful and asks that we monitor for further outbursts as they may trigger a Hubble Space Telescope target of opportunity.

930218 Supernova Light-Curves Gill Pearce, Oxford
Requests that we supply light-curves and data on supernovae. We make necessary arrangements.

930225 Tombaugh's Star (TV Crv) Steve Howell, USA
Possible outburst recorded by Howell on Feb 16 but Kato has V=17.2 on Feb 20.768UT. We relay back to Howell as steep decline evident.

930308 Nova Net Sumner Starrfield, USA
New E-mail addresses set up for exchanges of messages on nova and supernovae. We agree to participate.

930308 BAA VSS Archives Hilmar Duerbeck, Germany
Requests completion of questionnaire on BAA VSS archive to assist with talk for Nato Advanced Research Workshop.

930311 TASV 1108+55 Adriano Gaspani, Milan
Requested data on this suspected variable near NGC 3556. Visual estimates by Poyner supplied covering 1992 Jan 10 to 1993 Mar 18. Range 12.3-12.8.

930315 TT Crt Bruce Margon, Paula Szkody, USA
We alert Margon to outburst of TT Crt detected by R. Fleet (original discoverer): Mar 14, 13.2. Szkody responds that star is in anti-sun zone but wishes to be advised of future outbursts for possible IUE monitoring.

930328 Atlas of Cataclysmics Mike Shara, USA
Supplies reprint of new atlas to assist us with identification of the more obscure cataclysmic variables.

930401 SU Tau Phil Hill, St Andrews
Requests latest on fade as it is intended to obtain spectra with the Isaac Newton Telescope.

930402 UV Per Brian Marsden, Central Bureau for Astronomical Telegrams, USA
Outburst detected by t. Vanmunster, Belgium Apr 1.805, 12.4 confirmed by Poyner Apr 2.013, 12.9 relayed to CBAT.

930404 SN 1993J in NGC 3031 Brian Marsden, CBAT
Visual estimates by G. Hurst: Mar 30.8, 10.5; Apr 2.88, 12.0 relayed to CBAT.

930406 Cataclysmics Data Martin Still, Sussex
Requests cataclysmic variable data from BAA VSS archives. Referred to Dave McAdam. We supply schedule of 17 stars with ranges of years already on computer.

930406 SU Tau Don Pollacco, St Andrews
Request copy of latest chart. BAA chart supplied.

930407 NSV 1702 Ivan Andronov, Ukraine
Requests information of the above suspected variable. Traced to Binocular Sky Society Report page 52. =BD +22°743 with estimates by G. Alcock. Details supplied to Andronov.

930408 RX Cep Endre Zsoldos, Hungary
Exchange of information with Dave McAdam over paper on RX Cep.

930412 NSV 1671 Ivan Andronov, Ukraine
Paper from Andronov relating to NSV 1671 accepted for publication in the 1993 April issue of The Astronomer.

930412 SN 1993J Gerard de Vaucouleurs, USA
We offer (approx 155) estimates to Vaucouleurs as part of analysis of Pro-Am results on this object. These were warmly welcomed and regular updates requested.

930413 SN 1993J Harold Corwin, USA
Requests our existing sequence for Messier 81 to assist in building reliable sequence for SN1993J. Duly supplied.

930418 S Aps Don Pollacco, St Andrews
We relay news of a fade of this R CrB type variable

930420 SN 1993J Nova Net
We supply full sequence in use by our observers (TA and BAA) for logging into databases on this object being analysed by various professionals.

930422 Cataclysmics Data Martin Hendry, Sussex
We receive lengthy list of stars for which data requested from BAA VSS files. Relayed to D. McAdam.

930425 SN 1993J Roberta Humphreys, USA
We ask for help on fainter comparison stars to assist in analysis of various photos which may show prediscovery data. Humphreys offers sequence to V=21 which is received via fax.

930426 SN 1993J Ralph Wijers, USA
Requests our full database of estimates of this object, which has been sent. Also requests regular updates.

930429 FG Sge Don Pollacco, St Andrews
Data covering 1993 Jan 1 to Apr 25 by Yamada, Kato and Takahashi in Japan relayed to Pollacco. Recovery rate about 0.018 mag/day. Pollacco confirms this.

930430 SN 1993J Gerard de Vaucouleurs, USA
Full update of database (370 observations) supplied.

930510 SN 1993J Nova Net
Daily means report based on 466 visual estimates JD 2449075 to 2449115 supplied tp network. I assess first max as JD..77, first min as ..83 and second max as ..94.

930512 Sonneberg Closure Sonneberg Observatory, Germany
Letter from Pro-Am Liaison Committee sent expressing concern at plans for observatory closure.

930516 Possible Nova in Aquila Nova Net and Brian Marsden, CBAT, USA
Reports from Japan via Nova Net suggest nova discovery in Auila. Mike Collins contacted who finds he photographed the area and recorded the object on May 15.009UT at 7.6pv. Published in IAU Circular 5791.

930519 Possible SN in M63 Nova Net and Brian Marsden, CBAT, USA
Taped message received from unnamed observer in Bavaria claiming supernova in M63. Observation on May 19.9UT by G. Hurst showed star-like object of mag 13.0 but only part of nuclear region. Relayed details to CBAT.

930520 VSS Data Christiaan Sterken, Brussels
We supply index of BAA VSS database for forthcoming NATO Workshop on Variable Stars.

930520 Rho Cas, RX Cep, T CrB Chris Lloyd, Rutherford-Appleton Lab
Data on these three stars supplied for Chris by Dave McAdam.

930521 IP Peg Keith Horne, USA
AAVSO report outburst May 19, 12.5v. Horne circulates details to those monitoring IP, including ourselves.

930523 SN 1993J Alak Ray, Bombay
Message from India requesting background details on those who contributed to the SN 1993J database. We trace original messages and forward them.

930528 Cataclysmics Martin Hendry, Sussex
Dave McAdam supplies extensive data on 13 cataclysmic variables from the BAA VSS files.

930531 Nova Aql 1993 Nova Net
A sequence by G. Hurst is compiled for use of TA/BAA observers and circulated via Nova Net as a guide to the other amateur groups and professionals as to the basis of the estimates entered into our database.

930531 SN 1993J Nova Net
We submit updated list of 652 observations to the professional community via Nova Net.

930601 CCD Filters Ian Howarth, London
Ian provides a reference for filters for CCD photometry: M.S. Bessell, PASP, 102, 1181 (1990). We relay to Martin Mobberley to see if the BAA would wish to finance the purchase of experimental sets.

930602 Sonneberg Closure Peter Kroll and Hans-Juergen Braeuer, Sonneberg
Responds to our letter (see 930502), thanks us for concern over propsed closure and offering guidance for further correspondence and avenues we could pursue.

930526 V344 Lyr Taichi Kato, Japan
We relay to Kato a report of the outburst of this star found by Tony Vanmunster, Belgium May 25.020, 13.8. Kato confirms the outburst by CCD photometry and finds superhumps: Max UT = May 25.602 + 0.09145 E.

930605 Variable Star Data Yuri Efimov, Crimea
Appeal for Efimov seen on Finnish variable star bulletin board. He requests selected data as he needs to control volume charges on his maibox. We offer to send selected files on request, which he welcomes.

930609 Nova Aql 1993 Alan Gilmore, New Zealand
Gilmore supplies a photoelectric sequence at our request.

930620 Cataclysmics Atlas Mike Shara, USA
We recieve newly-published catalogue and atlas of cataclysmic variables which includes many obscure objects for which previous identifications had been doubtful.

930621 RY Sgr Y. Efimov, Crimea; D. Pollacco, St Andrews; R. McNaught, Australia
Message from Colin Henshaw, Botswana, of a fade of this RCB star (Jun 17, 7.2) relayed to the above professionals.

930622 Nova Cyg 1992 Zdenek Urban, Slovak Republic
We offer exchange of data on this nova. Extensive UBV data received to merge with our existing light-curve.

930628 RY Sgr Brian Marsden, CBAT, USA
We relay details of the fade (see 930621). Confirmed by A. Jones, New Zealand. Published in IAU Circular 5827.

930630 SN 1993J Nova Net and Alex Filippenko, USA
In response to our regular report, Filippenko provides a summary of interpretaion of spectra and encourages us to continue intensive coverage, both visually and with CCDs.

UK Nova/Supernova Patrol
Recurrent Objects Programme
Report 1993

Thanks to a team of dedicated observers, this programme continues to be successful in the monitoring of poorly studied eruptive stars of various types.

Of the outbursts detected during the period Jan - Dec 1993, three were seen visually for the first time; V1113 Cyg, LL And & S10930 Lyr.

V1113 Cyg had been recorded only once before on Aug 6th 1964. It was again observed in outburst by the coordinator during September, some 29 years later! Probably many other eruptions have occurred in the past but have been missed, and it is hoped that a more concerted effort on this star in the future will reveal many more.

The outburst of LL And - observed by Tonny Vanmunster - was the first recorded since discovery by P. Wild in 1979. V band CCD photometry from Taichi Kato at Ouda station, Japan revealed that LL And displayed a remarkably short superhump period (0.05714 day), which is actually shorter than WZ Sge itself! This finding, along with the rarity of the outbursts, supports the idea that LL And belongs to the UGWZ class.

S10930 is a new dwarf novae which was added to the programme during 1993. It was discovered by W. Wenzel whilst blinking a pair of Sonneberg astrograph plates, and was reported in IBVS 3883 (May 20 1993). Research uncovered a further 10 eruptions, all photographic. The first visually recorded outburst was detected independently by John Bortle and Paul Van Cauteren, director of the Belgian variable star section. Unfortunately for observers in the UK, a cloudy spell prevented any observations of this rare event being made.

The table below displays the outbursts which have been detected during 1993, along with the observers who made the initial and confirming observations.

1993 OUTBURSTS:

STAR	DATE	VIS.MAG	OBSERVER	CONFIRMED
FN And	Jan 12	14.0	Poyner	Schmeer (Ger)
SW UMa	Feb 17	10.9	Granslo (NAS)	Dahle (NAS)
CY UMa	Feb 24	12.2	Schmeer/Iida (VSOLJ)	Independent detection
SS UMi	Mar 23	14.3	Poyner	Worraker
CR Boo	Mar 19	13.6	Poyner	Vanmunster (VVS)
UV Per	Apr 01	12.4	Vanmunster	Van Lioo (VVS)/Poyner
SS UMi	Apr 14	14.1	Vanmunster	Poyner
DI UMa	Apr 23	15.3	Poyner	Vanmunster
BZ UMa	Apr 29	11.4	Schmeer/Vanmunster/ Dahle	Poyner
VY Aqr	Apr 30	10.0	Albrecht (USA)	Jones (NZ)
SS UMi	May 21	14.4	Vanmunster/Day	
V344 Lyr	May 25	13.8	Vanmunster	Kato(VSOLJ)
SS UMi	Jun 25	14.1	Day	Poyner
V344 Lyr	Jly 09	15.1	Poyner	Day
SS UMi	Jly 24	14.7	Worraker	Poyner
SW UMa	Aug 12	11.9	Schmeer	Worraker/ Hirosawa(VSOLJ)
DX And	Aug 12	14.0	Vanmunster	Poyner/ Van Cauteren (VVS)
V344 Lyr	Sep 10	14.5	Vanmunster/Worraker	Independent detection
UY Vul	Sep 18	14.3	Vanmunster	James (photographic)
V1113 Cyg	Sep 21	14.0	Poyner	Day
V344 Lyr	Oct 18	15.0	Vanmunster	Poyner
S10930	Oct 24	13.9	Bortle/Van Cauteren	Independent detection
BZ UMa	Oct 24	11.5	Pietz/Schmeer	Independent detection
V795 Cyg	Nov 03	13.1	Schmeer	Van Cauteren
AK Cnc	Nov 11	14.0	Worraker	Poyner
DI UMa	Nov 12	15.1	Poyner	Vanmunster
V632 Cyg	Nov 18	13.0	Vanmunster	Diepvens (VVS)
V542 Cyg	Dec 04	13.6	Vanmunster	Poyner
LL And	Dec 07	14.0	Vanmunster	Poyner/Van Cauteren

NAS = Norwegian Astronomical Society
VVS = Belgian Variable Star Section
VSOLJ = Variable Star Observers League of Japan

Outbursts of V1363 Cyg and CY UMa were reported, but confirmation was not achieved.

Three stars have been dropped from the programme during this period; SS UMi, because of it's frequency of outbursts, and UY & UZ Vul. These two stars were recorded in Downes & Shara's "A Catalogue and Atlas of Cataclysmic Variables" as having an 'M' type spectrum, and being non cv. Taichi Kato also advised us that both UY & UZ Vul are IRAS sources, and probably type SR.

A grand total of 5,284 observations from seven observers were reported to the coordinator during 1993. This is an increase on 1992 of 899 observations. Close ties have been made with the VVS in Belgium, with whom there is a regular exchange of data, both by telephone and e-mail. This small but active group have made a significant contribution to the programme during 1993, and I hope that this trend continues in the future. Valuable results have also been produced by Scandinavian observers, and by the VSOLJ in Japan, with whom there is a healthy and friendly exchange of data.

The UK working group remains small, but productive. Only four observers - including the coordinator - have been active within the programme. I would like to thank Bill Worraker, John Day and Graham Pointer for their contributions and invaluable help over the last twelve months.

More observers are needed, especially from the UK. Large telescopes are not necessary, as most objects on the programme are within the reach of a 20cm telescope when in outburst. Active observers who may be interested in this programme are invited to write, telephone or e-mail me at the following address.

G. Poyner
67 Ellerton Rd
Kingstanding
Birmingham, B44 OQE
Tel: 021 605 3716
E-mail: gp@uk.ac.bham.sr.star

Making Visual Observations for the Variable Star Section

The following is the contents of VSS Leaflet L02, one of a set which are given to new members. It is included here for the benefit of those new members who joined just before it was produced. As mentioned in VSSC 79, I would also be interested to hear from experienced observers if they have any comments on it.

Introduction

This leaflet will tell you all that you need to know in order to get started in making visual observations of variable stars. It covers the equipment you will need, how to estimate magnitudes, how to record and submit your observations, how to minimise any errors they contain, and how to maximise their scientific value.

Instruments

You do not necessarily have to have any optical instrument to get started in variable star observing. The naked-eye is perfectly adequate for observing variable stars that are brighter than about magnitude 4. However, as there are only a few such stars, most observers will, sooner or later, want to get themselves some binoculars or a telescope.

Hand-held binoculars can be used to observe stars in the range mag 4 to 8. If they are mounted on a tripod then you should be able to reach down to mag 9. There are several thousand suitable variable stars within this range - far more than a single observer can hope to cover.

To go much fainter than mag 9 you will need a telescope of some sort. The effective magnitude limits for various popular sizes of telescope are as follows (these are only approximate):

Aperture (mm):	60	150	200	300
Brightest (mag):	6.5	8.5	9.0	10.0
Faintest (mag):	11.0	13.0	13.5	14.5

If a variable star appears uncomfortably bright then you should either use a smaller instrument or else place a 'stop' (a cardboard ring) over the front of the telescope to reduce the effective aperture (be sure to make a note of the reduced aperture when recording your observation).

Charts

You will need a chart for each variable star that you plan to observe. The VSS publishes charts for all of the stars on its various programs. See the Sample Chart leaflets (Leaflets L04 to L06) for examples and the Chart Catalogue (Leaflet L03) for a full list.

Each chart shows the positions and the magnitudes of a series of standard comparison stars (the 'sequence') against which you make your magnitude estimates. The chart may also include a 'finder chart' to help you locate the field of the variable star in relation to bright naked-eye stars. If it doesn't then you might have to refer to a star atlas, such as Norton's, to plan your own way of locating the variable, before you go outside. The chart will also give the celestial coordinates of the variable which will be useful if your telescope is equipped with setting circles.

Other Equipment

As well as your instrument (if any) and your charts you will also need the following items:

A notebook to record your observations in. This should be reasonably sturdy, bound (not loose-leaf) and preferably A4 or A5 size to allow easy photocopying.

A pen, preferably black or blue (again, to allow photocopying), with permanent ink (not water-soluble).

A loose-leaf ring-binder or some other means of holding your charts so they don't blow away.

A watch or clock to allow observation times to be recorded to the nearest minute.

A dim red light source to allow you to read and write without losing your dark-adaption. A small torch with the glass painted over with red acrylic paint is one possibility. Be sure to have spare batteries to hand.

A convenient surface to keep all of these items on, and for you to lean on when writing. Using the ground will not do your back any good.

Warm clothing. Cold is the astronomer's greatest enemy. You cannot make reliable observations when you are shivering and longing to get back into the warm indoors.

Estimating Magnitudes

The VSS employs two main methods for estimating magnitudes: the fractional method and the Pogson step method.

With the fractional method you compare the variable against two comparison stars. You look alternately at each each star and try to judge the ratio of the brightness differences between them. This sounds more difficult than it really is. As an example, suppose the variable (usually denoted V) appears to be midway in brightness between comparison stars A and B. You would then record your estimate as A(1)V(1)B. However, if the A-V difference appears to be twice as big as the V-B difference then you would record A(2)V(1)B. The brighter stars should always be written first. If the variable appears to be be clear and permanent. Your observations will, believe it or not, become a potential source of valuable scientific information. In the years to come someone may want to refer back to a particular observation or set of observations that you made. Your observing log will be the original source. If you want people to take your observations seriously (as they surely should) then you have to go about recording them in a professional manner. The lab notebook of a professional scientist should be bound, not loose-leaf, and the ink should be permanent. If any amendments are made at a later date then they should be signed and dated. The entries (observations) should be written one to a line, leaving no room for later insertions. This might all seem a bit extreme for a beginner to variable star observing, but it is just as well to get into good habits right from the start. Many observers apparently have a quite lackadaisical attitude to their original records which is a great pity it means that we must be losing lots of potentially valuable material.

1994 JULY 10 (SUNDAY)

	Star	GMAT	Estimate	Mag	Class	Instrument	Comments
(1145 BST)	X CAM	1045	D-3, E+1	10.1	2	R150x80	T
	SS CYG	1049	B(1)V(2)C	8.9	1	R150x80	T
	β LYR	1055	=μHer	3.4	1	NE	
(0310 AM BST JUL 11)	o CET	1410	<X	<8.6	2	R150x40	LT

1994 JULY 22 (FRIDAY)

	Star	GMAT	Estimate	Mag	Class	Instrument	Comments
(1130 BST)	β LYR	1030	ξHer-1, θHer+1	3.8	1	NE	T
(0302AM BST JUL23)	o CET	1402	Y-3, Z+0	9.2	1	R150x80	T

The accomanying example illustrates a possible layout for an observing log. Most of the details recorded will be explained more fully in the section on submitting report forms. However a few things are worth pointing out here. One of your main aims in recording your observations should be to make everything as explicit, clear and as robust to errors as possible. Along with the date, it is a good idea to record the day of the week, as well, as a check. This is something that will not cause you much trouble at the time and it may become very useful if, at a later date, someone finds that you have made an error in the date. Similarly, as well as recording the GMAT (Greenwich Mean Astronomical Time) for each observation, it can be useful to record the civil time, as copied directly from your digital watch, as well. In the given example the civil time is noted down in the left-hand margin for the first observation in each hour. This would allow the identification and the correction of errors in the conversion from civil time to GMAT which otherwise might be very difficult to track down.

In the front of your log book you should record such things as details of the instruments that you use, the abbreviations you use for them, the longitudes and latitudes of any different observing sites that you have used, and so on.

equal in brightness to one of the comparisons then you would record, for example, =B. It is possible to make extrapolated fractional estimates, such as V(1)A(2)B and A(4)B(1)V, if the variable brighter or fainter than all of the listed comparison stars. However, extrapolated fractional estimates tend to be rather unreliable so you should always try to use one comparison star that is brighter than the variable and one that is fainter, if you can.

In order to derive the magnitude from a written fractional estimate, you form a weighted mean of the magnitudes of the comparison stars used. For example, assume the following comparison star magnitudes:

A = 7.10 B = 7.55 C = 7.83

Then the estimate A(1)V(2)B gives (2x7.10 + 1x7.55)/(1+2) = 7.25. Notice how the difference from A is used to multiply the magnitude of B and vice versa. Extrapolated fractional estimates should first be converted to equivalent interpolated ones involving negative differences before the weighted mean is taken: thus V(1)A(2)B becomes A(-1)V(3)B which gives (3x7.10 + (-1)x7.55)/(-1+3) = 6.875. These sorts of calculations are best carried out with a pocket calculator after you have finished observing, rather than in your head at the telescope.

With the Pogson step method you compare the variable against just one comparison star at a time and you try to judge the brightness difference in units of tenths of a magnitude. This does require some practice but it is not all that difficult. Suppose the variable appears to be two tenths of a magnitude fainter than star A, then you would record the estimate as A-2. If it was one tenth brighter than B then you would record B+1. If it was equal to B then it would be B+0 (B-1 or =B are also acceptable).

To derive the magnitude from a written Pogson estimate you must remember that the magnitude increases as the brightness decreases (the Pogson step unit is really minus one tenth of a magnitude). Assuming the above comparison star magnitudes, B+2 gives 7.55 + 2x(-0.1) = 7.35 and A-1 gives 7.10 - 1x(-0.1) = 7.20.

If the variable star is too faint to be seen then you can still make a useful observation by recording the faintest comparison star visible. For example, if the variable was unseen and the the faintest comparison visible was star C then you would record <C, meaning 'fainter than C' (sometimes the form [C is used instead). Such a negative estimate provides an upper bound on the brightness of the star at the time of the observation. In some circumstances this information can be very useful. The derived magnitude from a negative estimate is simply the magnitude of the comparison star prefixed by '<' (or '['). For example, <C gives <7.83.

A very powerful method for reducing the errors in visual magnitude estimates is to make multiple estimates using different sets of comparison stars and to take the mean of the derived magnitudes. For example, the multiple estimate A(2)V(1)C, =B gives 7.59 and 7.55 which average to 7.57. Similarly, A-4, B+0, C+2 gives 7.50, 7.55 and 7.63 which average to 7.56. Multiple estimates are particularly useful in the Pogson step method because, by using comparison stars that are brighter and fainter than the variable, it can compensate for systematic errors in the Pogson step unit.

Recording Your Observations

As you make your observations you should record them in an observing log book. As mentioned above, this book should be fairly sturdy and the record should

Submitting Your Observations

At half-yearly intervals (beginning of January and July) you should submit your observations to the Section Secretary for incorporation into the Section archives. If you possibly can submit them over electronic mail or on computer disk then please do so. However, first contact the Computer Secretary to check on the required layout. If you are not yet computerised then you will have to manually copy your observations from your log book onto report forms. An example of a completed report form is given here. Blank forms are available from the Section Secretary in return for an A4 stamped addressed envelope. As a guide, an envelope and 10 forms weigh just under 60g, the first weigth limit for UK inland postage, and an envelope and 80 forms weighs just under 400g. Overseas members should write to the Section Secretary for details of the postal rates. In some circumstances, it may be simpler and cheaper to produce your own copies using a single blank and a photocopier.

As with your log book, you should complete the report forms in clear hand-writing using black or blue permanent ink. On the form you should fill out the following fields (see example):

STAR: The name of the star. If possible, please use the standard IAU three-letter abbreviations for the constellations as given in the Chart Catalogue.

Chart Sequence Number: This is a code which identifies the set of comparison star names used to make the magnitude estimates. You can find it on the chart used. On the more modern charts it takes the form NNN.NN (for example 063.01). For older charts, which do not have such a code number, you should instead give the latest date shown (for example: 71.07.17).

YEAR: Give the year in full (not '90). Below, delete '1st' or '2nd', as appropriate to indicate whether the observations cover the first half or second half of the year.

Sheet no _ of _: If your observations for this half-year require two sheets then label the first as 'Sheet 1 of 2' and the second as 'Sheet 2 of 2'.

OBSERVER'S NAME, Address, Post Code: Give your name and full address for correspondence.

Long, Lat: Only need to be accurate to 0.1 degrees. Used to determine the altitudes of the star at the times of observation.

Instrument Code Number: The definitions of the instrument code numbers. The naked-eye is indicated by NE; 10x50mm binoculars by B50x10; a 200mm reflector used at a magnification of 80 times, by R200x80; a 75mm refractor at 100 times magnification by G75x100. It is important that you record for each observation the type of instrument, its aperture and the magnification. Note that the same instrument used at two different magnifications should be recorded as two separate instruments.

DATE: The three-letter abbreviation for the month, followed by the day of the month.

TIME: Hours and minutes GMAT (Greenwich Mean Astronomical Time). GMAT is the standard time system used by the VSS because, in Britain at least, it avoids the date-change at midnight. To convert from UT (alias GMT) to GMAT subtract 12 hours. The GMAT day therefore begins at noon UT on the UT

BAA
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BRITISH ASTRONOMICAL ASSOCIATION:
Burlington House, Piccadilly, London, W1V 9AG.
Variable Star Section: Report Form

FOR OFFICE USE
Rec'd ______
Ack'd ______
Obs'r abbr ______

STAR OMICRON CET
OBSERVER'S NAME WILLIAM HERSCHEL
Chart Sequence Number (at bottom of charts e.g. 053.01) 039.02
Address 19 NEW KING STREET
BATH, AVON
YEAR 1994
Post Code BA1 9QQ Long. 2°.2W Lat. 51°.3N
~~1st.~~/(2nd) half
Instrument Code Number
Sheet no. 1 of 1
1= NE 2= B30x6 3= R150x40 4= R150x80

	DATE m	d	TIME (GMAT) h m	Method	Light Estimate	Deduced Magnitude	Class	Instr. Code no	Standard Comments
1	JUL	10	1410		<X	<8.6	2	3	L T
2		22	1402		Y-3, Z+0	9.2	1	4	T
3	AUG	03	1256		X(2)V(1)Y	8.7	1	3	
4		17	1433		W(1)V(1)Y, =X	8.5	2	3	M
5		26	1502		W(3)V(1)X	8.4	1	3	
6	SEP	07	1209		U(5)V(1)W, W+2	7.9	2	2	
7		11	1030		W+2	7.8	2	2	H
8		14	1019		U(1)V(1)W	7.7	2	2	M
9		21	1258		U-3	7.6	2	2	M
10		30	0947		=U, T-4	7.2	1	2	
11	NOV	01	0817		=R	6.1:	3	2	C Hurried
12		03	0951		P-4, Q-1 R+4	5.8	1	2	
13	DEC	13	0644		L(1)V(1)M	5.0	2	2	H
14		17	0555		J-1, H(1)V(1)L	4.5	2	2	T M
15		25	0612		=H	4.3	2	1	
16		31	0559		F-1 G+3	3.9	1	1	
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

Method: Argelander = A. Fractional = F. Pogson = P. Deduced Magnitude: [= fainter than,] = brighter than. Class (quality of observation): 1 = good, 2 = fair, 3 = poor.
Standard Comments: C = Cloudy, E = Extrafocal, H = Haze (or fog/mist), M = Moon, P = Photographic, T = Twilight/dawn. Other comments labelled X01 = , continue on rear

day with the same number. The best way to remember this is to think of an astronomer waking up at noon UT. He looks at his digital watch, writes down the (UT) date from it into his observing log, and starts counting the hours from then. Further complications arise when BST is in force. To convert from BST to GMAT, subtract thirteen hours.

Method: There is no need to put anything in here as it is possible to identify the method used from the form of the light estimate.

Light Estimate: As described above, in the section on estimating magnitudes.

Deduced Magnitude: Rounded to one decimal place. This is used as a check on the light estimate. Before any analysis the deduced magnitudes are recalculated using a standard (possibly different) set of comparison star magnitudes.

Class: A rough indication of the reliability of the magnitude estimate. A good estimate is indicated by 1, an average one by 2, and a poor one by 3. Class 3 observations are only rarely worth making.

Instr Code no: The code number (defined at the top of the form) for the instrument used for this observation.

Standard Comments: The following single-letter abbreviations can can be used to indicate the presence of other factors which may affect the observation:

C = Cloud (possible patchy obscuration in the field of the variable)
E = Extrafocal (the estimates made with stars out of focus)
H = Haze (or fog or mist evenly obscuring the field of the variable)
M = Moon (brightening the sky around the variable)
P = Photographic (include details of emulsion and filters)
T = Twilight (Sun brightening the sky around the variable)

If you want to add any other comments then it is best to try to fit them into the standard comments space. Comments written on the reverse of the form are likely to be missed when the form is photocopied; those written on separate sheets of paper are likely to become lost.

Minimising the Errors in Your Observations

Visual variable star observations are notorious for the large errors they often show. Sometimes these can be a magnitude or more. However, with a little care, it is possible to keep them to within a few tenths of a magnitude. The following points should help you to minimise the errors in your observations.

Always allow 10 to 15 minutes for your eyes to dark-adapt after coming out of a fully-lit room before starting to observe. The light-adapted eye has a quite different spectral response from the dark-adapted one.

Always take care over identifying the variable and the comparison stars. Misidentification is one of the commonest and most pernicious errors.

Always take care over recording your observations. It can be very easy to mix up the names of comparison stars, especially when you are in a hurry.

Do not plot the light-curves of stars just before you go out to observe them. Subconscious bias will tend to distort your observations to fit the previous trends. This is especially relevant to observers of eclipsing binary stars.

Try to avoid observing when you are very tired, ill, or in a great hurry.

Hold the instrument as steady as possible while you make your estimates.

Bring each star (variable and comparison) to the centre of the field of view of the instrument before estimating it. This will minimise various errors which depend upon the star's position in the field of view.

Try to be as consistent as possible (within reason) in your choice of comparison stars, instruments, and magnifications.

Try to avoid making observations at low altitude (below 20 degrees), through cloud, haze, smoke, strong moonlight, twilight or the glare from street and house lighting.

If you feel that you must observe under these conditions then make a note in the comment column against the observation indicating that it may be unreliable and the reason why.

Maximising the Value of Your Observations

Not all observations are of the same value. Some are more useful than others. The following suggestions will enable you to concentrate on making useful observations.

Avoid observing stars that are already grossly over-observed. You can get an idea of which stars are over-observed from the annual star totals published in the Section Circulars.

At certain times of the year some non-circumpolar stars are only visible in the early morning and so tend to be poorly observed. Observations of these stars at these times are particularly valuable.

If you have a large telescope then concentrate on observing stars which are relatively faint. There will be plenty of other observers to look after the brighter ones.

Observe each star no more frequently than is necessary to show its most rapid variations. The following list gives the recommended minimum interval between observations for the various types of stars on the Section Programs.

Type	Interval (days)	Type	Interval (days)
BLLac	1	QSO	1
E	(see below)	RCB	1
Gal	1	RV	2-5
GCas	5-10	SDor	5-10
In	1	SN	1
L	5-10	SR	5-10
M	5-10	UG	1
N	1	ZAnd	5-10

For eclipsing binary stars (type E) the recommended minimum interval can be as little as 30, 20 or even 10 minutes during eclipse, depending upon the rapidity of the fade and rise.