British Astronomical Association

VARIABLE STAR SECTION CIRCULAR

No 106, December 2000

Contents

ISSN 0267-9272

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

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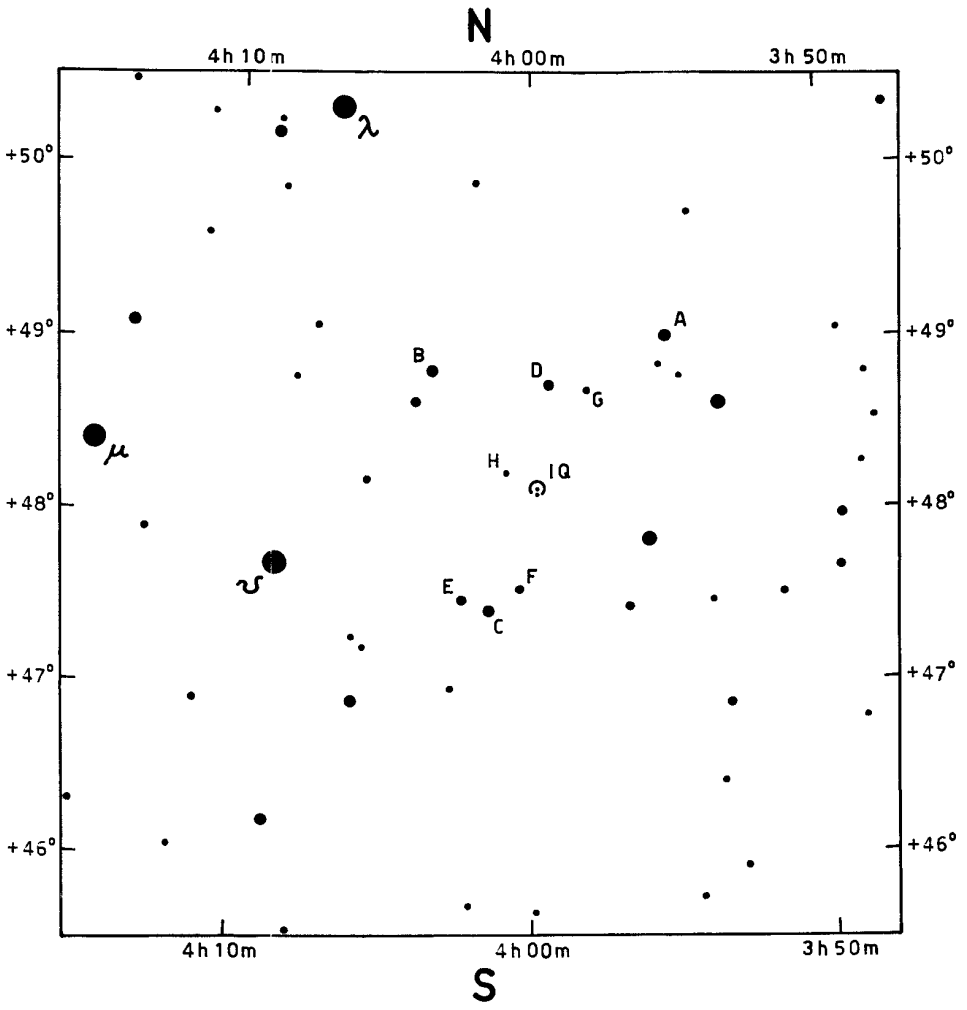


CHART: MILLENNIUM SA	A 6·8	E 7·9	BAA VSS
	B 6·9	F 8·3	EPOCH: 2000
SEQUENCE: USNO XXI, HA54, PPD, WEP, TYCHO	C 7·1	G 8·5	DRAWN: JT 21-05-00
	D 7·4	H 8·7	APPROVED: RDP

New Charts, supplied by Chart Secretary, John Toone (see also inside back cover).

FROM THE DIRECTOR

ROGER PICKARD

VSS Meeting, Northampton 2000

For those of you who were unable to attend the VSS Meeting on October 14th at Northampton, I'm delighted to advise that it was excellent. The first part of a report made by Tristram Brelstaff appears later in this Circular.

I'm much indebted to all the speakers; to Bob Marriott for undertaking all the local arrangements; and to Tristram for compiling the report. It turned out to be an international meeting with representatives from Belgium, Holland, France and Northern Ireland as well as England, of course!

VSS Meeting, Preston 2001

Possibly for the first time ever, and certainly for a very long time, the Section will be having a meeting less than one year after the last one! This is being organised by Denis Buczynski, and will take place at Alston Hall, Preston. It will be the first one for 10 years to be held over more than one day. It is anticipated that it will commence on the evening of Friday 5th October and close after lunch on Sunday 7th October. In addition, rather than just a meeting where people listen to lectures it is also proposed that it will take the form of a workshop, but more details on this and other aspects of the meeting will appear in a future Circular.

SAF/AFOEV Meeting, France August 2001

Information regarding this meeting was initially emailed to the Director by J. Minois on behalf of the above organisations during the summer, so I took the opportunity to invite him to the Northampton Meeting to give a short presentation about the SAF/AFOEV meeting which he duly did. This will be an international 3 day workshop with, potentially, participants from as far away as Japan and the US. Further details on this meeting will appear in the next Circular.

Pro-Am Collaboration

Finally, members may be interested to know that at least two observers have had, or are about to have, their names in print in professional journals.

Gary Poyner is listed as a co-author on a paper to appear in Astronomy and Astrophysics on the *Intensive Monitoring of **OJ 287***. Gary is co-ordinator of the UK part of this programme, and he reports that UK observations which he submitted on behalf of TA have played a small but important role in producing extensive light curves for OJ287.

Denis Buczynski was also listed as a co-author for the observations he submitted on the x-ray transient **XTE J1118+480** in the Proceedings of the Astronomical Society of Japan Vol. 52 pages 15-20. Similarly, he was a co-author on the paper on the dwarf nova **TX J0909.8+1849** which appeared as IBVS 4873.

Assistance Required

I have recently received the sad news that our Computer Secretary, Dave McAdam wishes to retire from his role as Computer Secretary for the section, as soon as a replacement can be found. Dave has for many years now, served the section admirably, maintaining and logging the section's observational records; transferring observational records from paper to computer; developing the logging system; dealing with professional requests for data, and constructing the section web pages, amongst many other tasks - the list is endless! If there is anyone who feels that they might be able to consider taking on this role (or a part of it, perhaps), would they please contact me for more details.

RECURRENT OBJECTS NEWS

GARY POYNER

BZ UMa
Independently detected in outburst by Polish observer Maciej Reszelski (10.8) and Gene Hanson (11.0) from the USA on May 13.016 and May 13.166, this was the first outburst detected since March 1999. As with all previous outbursts of BZ UMa, superhumps were absent!

V660 Her
Caught in outburst on CCD images by German observer Jochen Pietz on June 2.000 (14.3), and confirmed visually by Slovakian observer P. Dubovsky on June 4.910 (13.9), Pietz reported his detection of superhumps with an amplitude of 0.2 magnitudes, and period of 0.075 days in vsnet-alert 3162. These were the first superhumps to be detected in this system, confirming it as a type UGSU.

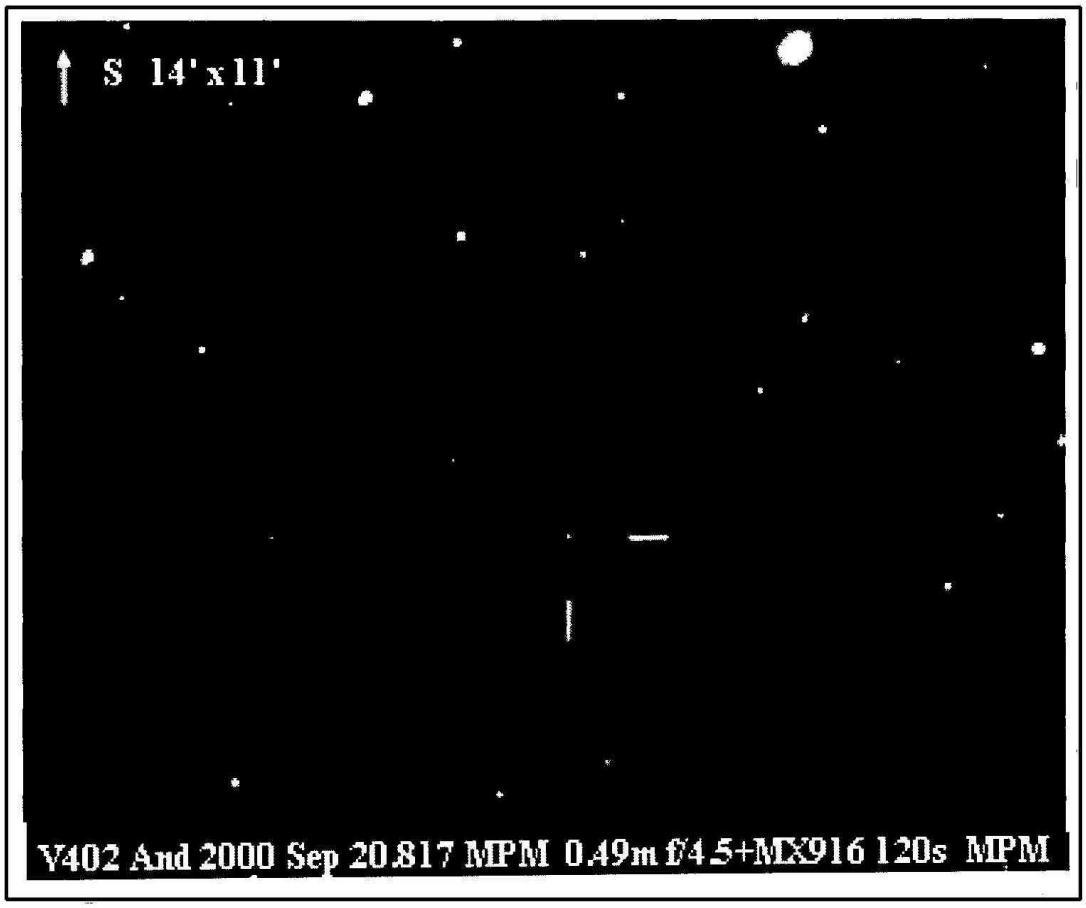
V493 Lyr
This was detected in outburst on Jun 3 6.993 at 14.2 by G. Poyner, and confirmed by Gene Hanson (USA) on June 7.208 at 14.3. The previous outburst occurred during August 1999.

AW Sge
An extremely rare outburst of this suspected UGSU type star was detected by Australian observer Rod Stubbings on July 11.565 at magnitude 14.0, and confirmed by G. Poyner on July 12.030 at 14.7. The previous outburst had been recorded in August 1996. Both appeared to be normal type outbursts!

V1008 Her : (formally Var 61 Her)
This was observed in outburst on July 29.931 by Chris Jones at magnitude 13.0, and confirmed by Belgian observer Eddy Muylleart on July 29.983 at 13.5. CCD observations were made by Tonny Vanmunster, but as in previous outbursts, no superhumps were detected, confirming earlier statements that V1008 Her is a type UGSS star.

V725 Aql
This was detected in outburst by Mike Simonsen (USA) on Aug 08.164 at magnitude 14.0, and confirmed by Chris Jones on Aug 08.893 at 14.3. The previous outburst occurred during September 1999. CCD photometry during this outburst indicated that the orbital period of V725 Aql put it right in the middle of the period gap at 2.5 hours, thus making V725 Aql one of the most important objects of its type.

V635 Cas
This X-ray source was detected bright visually by G. Poyner on Aug 29.012 at magnitude 14.7 (its normal state is 15.2-15.5). The "outburst" was confirmed by Finnish observer Timo Kinnunen on Aug 29.890 at 14.6. IAUC 7487 also reported that the RXTE all sky monitor had detected an X-ray outburst in this system, which may have just preceded the optical outburst.



Above Image of V402 And taken by Martin Mobberley

V402 And: (formally Var 62 And)
A rare outburst of this star was detected by Martin Mobberley using a CCD on Sep 20.817 at magnitude 15.7 (see image above), and confirmed visually by G. Poyner on Sep 20.869 at 15.4. This followed a false alarm report by an observer in the USA 2 days earlier, which Martin had checked out. Fortunately he continued to image the field, and detected the outburst. Combined CCD photometric results from Jochen Pietz and the Kyoto team in Japan, revealed a superhump period of 0.06336d (vsnet-campaign-dn 164). An extremely faint outburst (16.5) was reported in November 1999.

V452 Cas
Observed by Chris Jones on Set 20.928 at 15.1, and confirmed by G. Poyner on Sep 20.951 at 15.2. A superoutburst had been observed during November 1999.

THE 2000 MEETING OF THE VARIABLE STAR SECTION (PART ONE)

TRISTRAM BRELSTAFF

The 2000 Meeting of the BAA Variable Star Section was held at the Humphrey Rooms in Northampton on Saturday the 14th of October. Bob Marriott opened the meeting by welcoming the Section on behalf of the hosts, the Northampton Natural History Society, and then handed over to the BAA VSS Director, Roger Pickard. Roger said that there was a particularly packed programme, because everyone who he had asked to speak had eventually said yes. He then introduced the first speaker of the day.

Alex Vincent's talk, ***Maxima and Minima of Eclipsing Binaries*** consisted of a series of slides of various eclipsing binaries at maximum and minimum. These included naked-eye stars such as **Beta Per, Beta Lyr, W UMa, Epsilon** and **Zeta Aur**, and **Lamba Tau**, and also fainter ones such as **RZ** and **TV Cas, Z Vul, RW Tau**, and **V1016 Ori**. The naked-eye stars were captured on 30 second undriven exposures with a 50mm lens and the fainter ones on 1-2 minute exposures with a 135mm lens. V1016 Ori showed no visible difference between maximum and minimum because it is part of a multiple system (the Trapezium) but for all the other stars the eclipses showed up clearly (even Zeta Aur).

In answer to a question from John Toone, Alex said the film he used was Fujichrome 400 and to another from Nick James he said he had not yet 'blinked' his slides for new variables, but was going to try it.

The second speaker was **Tony Markham,** and his talk was entitled ***The Times they are a-changin,*** a reference to the times of minimum of eclipsing binary stars. Tony is the BAA VSS Eclipsing Binary Secretary and the Director of the Variable Star Section of the Society for Popular Astronomy (SPA VSS). He started off by asking why eclipsing binaries are not more popular amongst variable star observers. The answers, he suggested, were that eclipsing binaries have a reputation for predictability (and presumably are therefore unexciting); that several hours of observations are required each evening to get useful results; and that you really need to use predictions to plan your observations of them.

Tony went on to explain the light elements of eclipsing binaries. These are often expressed as

$$\text{Min} = \text{JD} + \text{P}\times\text{E}$$

where JD is the Julian date of an eclipse observed in the past, P is the period between eclipses, and E is the number of periods elapsed since the observed eclipse. The General Catalogue of Variable Stars (GCVS) lists values of JD and P for each eclipsing binary and these can be used to predict the times of future eclipses, or to determine the phase of a given observation. The calculations involved are easy using a PC. Tony said he uses a spreadsheet program to do them.

Tony then showed a phase diagram (a plot of magnitude against phase) of visual observations of **u Her.** This showed rather large scatter, but taking means reveals the shape of the light-curve much better. He went on to show phase diagrams for **RZ Cas, U Cep** and **Beta Lyr.** Diagrams for different years show clear systematic changes in the phase of mid-eclipse relative to the GCVS light elements (these are the times that are *a-changin*). For example, in 1996 the

eclipse of **U Cep** was at phase 0.035 (ie, 2 hours later than predicted) but in 1999 it was at phase 0.045 (2.5 hours late).

Tony went on to explain why eclipses might not occur at the predicted phase (phase 0.00). Firstly, the GCVS elements might be wrong: the JD part of the light elements could be in error, which would give a constant error in the predictions; the P part could be slightly wrong, giving a systematically varying error in the predictions; the P part could be a multiple of the true period; or the P part could be completely wrong due to a transcription error. Secondly, the period of the star could be truly changing. This might be due to mass-transfer within or mass-loss from the system. It might also be due to the gravitational effect of a third star in the system.

To be useful, predictions should be based on the latest available light elements. The GCVS elements are often rather old, but a good source of recent light elements is the Krakow Yearbook (SAC). Tony uses these as the basis for the predictions in the BAA VSS Circulars and the BAA VSS web pages. The predictions in the Circulars only cover a small number of large-amplitude stars, but the web pages include predictions for many more. Charts are available for around 130 stars on the BAA VSS Eclipsing Binary Program, and 20 are down-loadable from the web pages. Observations should be submitted to Dave McAdam in the same way as Main Programme observations.

In the discussion, Norman Walker pointed out the need for fairly frequent timings of minimum, in order to distinguish between smooth and discontinuous period changes. Andy Hollis also stressed the need for continuity in observational coverage. Norman Walker said that the timing of eclipsing binary minima was still of scientific value, for example, in the Wolf-Rayet eclipsing binaries, whose periods are not changing in the way expected from the mass-loss known to be occurring in these stars. Gary Poyner said that the SPA VSS produce lots of eclipsing binary observations and asked what can be done to get BAA VSS members to do more. Albert Zijlstra mentioned the possibility of period changes due to relativistic effects and pointed out that the planet Mercury had once had a 'period problem'.

The next speaker was **Guy Hurst**, the Editor of The Astronomer magazine, whose subject was ***Is Astronomical Bias the Enemy of the Modern Variable Star Observer?*** He started off by reviewing various sources of error in variable star observing. Misidentification of the variable or comparison stars is a common problem, especially with fainter stars, and there is even a need for astrometry of some cataclysmic variables at maximum, to allow them to be unambiguously identified at minimum. The Purkinje effect is another common source of error because we often have to compare a red variable with white comparison stars. This effect varies with the instrument, and with the part of the eye used to make the estimates. Transcription errors during recording or reduction are also probably fairly common, and the former are more likely if you are recording from distant memory. Cold, tiredness and other distractions also make errors more likely. Comparison star sequences can encourage errors if they are labelled in the wrong order, and the use of Johnson V magnitudes can introduce small errors because they do not match visual magnitudes precisely. Guy went on to mention position-angle error (ideally you should have the variable and comparison horizontal in your field of view when you compare them), dark adaption (allow at least 15 minutes and use only a dim red light), and averted vision (you should bring the variable and comparison in turn to the middle of your field of view when estimating).

He then talked about bias and the influence of observer expectations. As an example he

mentioned that **R CrB** can fade as far as magnitude 7.0, before some people stop recording it at magnitude 6.0. Observing too frequently can lead to errors because the memory of previous observations is still fresh in the mind; so can hearing of other people's results over the telephone or internet. Guy said he was especially aware of this, as he is often asked to confirm other people's discoveries.

Chart quality can also influence errors. The older BAA VSS charts tend to show the comparison star magnitudes, which can encourage bias, but the newer ones don't. As mentioned above, if the comparison star sequence is labelled in the wrong order, it can result in observers *forcing* their estimates to *fit* the sequence. Inadequate plotting of faint stars (Guy mentioned over-reliance on Guide Star Catalog) can also lead to mistakes when the variable is faint. The presence of *secondary variable stars* on charts drawn up for other variables can also introduce errors as these often have poor identifications and poor comparison stars.

The way you record and reduce your observations can also influence errors. Observations should preferably be recorded as soon as they are made. However, some observers apparently wait until end of the observing session before recording them. Guy also warned against the habit of recording the *usual estimate*. Also, if you reduce your observations on the same night then there is the possibility of introducing bias.

Over the past few years the internet has had a big effect on the quality of variable star observations. Observations presented on the internet tend to contain lots of errors. They often appear to be inadequately checked and most lack details, such as the instrument used, that can be used to assess their quality. Guy also mentioned what he called the *trigger effect* in which one observer reports a change in a particular star on the internet, and then the observations of other observers tend to follow suit. He showed a light-curve of **V705 Cas (Nova 1993)** in which a long interval of constancy was followed by a sudden drop of about 1.0 magnitude, which he thought might be a result of this *trigger effect*. He also suspected that some of the spikes on the fade of **V723 Cas (Nova 1995)** might be of similar origin.

Discoveries of novae, supernovae and other variable stars are often announced on inadequate evidence. There have even been cases of *discoveries* being submitted to the GCVS on the basis of only 2 photos. There is also a widespread tendency to accept small-amplitude changes too readily. Confirmations of discoveries are often made and reported without due care, for instance, several people *confirmed* a *nova* which turned out to be Mars! Also, some people seem to believe that any star near a galaxy must be a supernova.

In the discussion, Bill Worraker said that he had had a particularly galling experience when he recently made a negative observation of a particular cataclysmic only to have Gary Poyner telephone an hour later to say that someone had discovered it in outburst. Norman Walker said the visual observations have errors (rms) as large as 0.5 magnitude, and that some people are trying to use them to detect variations that are just too small. However, Gary Poyner pointed out that Bjorn Granslo had detected 0.2 magnitude superhumps, and that this had been confirmed by CCD photometry. Nick James was worried that bias invalidates our ability to take averages of observations, which is a basic assumption of collaborative variable star observing. Andy Hollis said that W Cyg is regarded as a beginners object, but Doug Saw said the observations of it show so much scatter, that he could summarise each year's observations by drawing a straight line through them. Mike Peel added that we really need a long series of observations for each star but that this is difficult to get for novae.

Don Pollacco (Queen's University Belfast) then got up to speak on ***Highly Evolved Low/ Intermediate Mass Stars***. He started off by asking *What is an R CrB star?*. There is the spectroscopic definition: a hydrogen-deficient supergiant star, and there is the photometric definition: a star which shows long intervals of stability with occasional steep declines followed by slower recoveries. While these definitions are good for **R CrB** itself, they are not so good for some other R CrB stars. For example, **V854 Cen**, a star that was only named as a variable star in 1983, is magnitude 7 at maximum, but has spent most of the last century at magnitude 14 or fainter. It also shows hydrogen lines in its spectrum.

Don then asked *What is going on in R CrB stars?* He showed some images of **UW Cen**, a very active R CrB star that is surrounded by a nebula, the structure of which has changed significantly in just 6 years. This is probably due to dust clouds close to the star moving and casting shadows on the nebula. The current physical model has R CrB stars as unstable stars that eject *puffs* of material, 3 or 4 at a time. When a puff is ejected in our line of sight we see the star *eclipsed*. We even see the equivalent of the solar corona spectrum.

There are currently two competing evolutionary models for R CrB stars and both are difficult to test. The first model has them as merged white dwarfs, but the only real evidence in favour of this is that no R CrB stars are known to be binaries. The second has them as highly evolved single stars, almost white dwarfs, that undergo instabilities similar to nova explosions. These instabilities may be similar to those seen in the outbursts of **Sakurai's Object** and in **Nova 1918 No2 Aql.**

Sakurai's Object (V4334 Sgr) underwent a nova-like outburst in 1995, reaching magnitude 10 in 1996. It is currently at magnitude 25, but is somewhat brighter in the infra-red. At first it was thought to be a nova, but then it was shown to be hydrogen-deficient, like an R CrB star. In 1995 its spectrum was like that of a nova with Teff=7000K but it cooled rapidly to 3500K within only a few months. During this time the star expanded and its outer layers were ejected obscuring our line of sight. It is also surrounded by an ionisation nebula, but the star has been too cool during the recent outburst to produce such ionisation. It must therefore have been much hotter in the past, probably something like a white dwarf. So, in just 7 years Sakurai's Object appears to have evolved from something close to a white dwarf into something close to a red supergiant.

Nova 1918 No2 Aql (V605 Aql) was a distinctly odd nova, showing no emission lines in its spectrum at maximum. Instead, it looked just like a late-type star. In the early 1970s the nova remnant was identified with the central star of the planetary nebula **Abell 58**. It is now magnitude 22, shows Wolf-Rayet features in its spectrum, and is hot enough to ionise the nebula. The nebula itself is hydrogen-deficient.

A thermal pulse mechanism similar to that used to explain **Sakurai's Object** and **Nova 1918 No2 Aql** is probably at work in R CrB stars. In Don's opinion this explanation is preferable to the merged white dwarf scenario, which he regards as *trendy*.

In the discussion, Gary Poyner pointed out that the R CrB stars **V482 Cyg** and **DY Per** had both been proposed as possible binaries. Don answered that neither star had been confirmed as a binary, and that V482 Cyg might not even be R CrB star. He went on to explain that R CrB stars are not very well defined as a class, and are rather heterogeneous. For example, most are cool stars but some are hot. In all, only about 30 are known, and only 5 of those have been well studied. They are rarer than supernovae.

To be continued...

BINOCULAR COMPARISON STAR SEQUENCES

ROGER PICKARD AND KEVIN WEST

Introduction

At the end of 1997, John Toone suggested to Kevin West (hereafter KW) that it would be very useful if he could check out a number of suspect binocular sequences using photoelectric photometry. He also copied his letter to Roger Pickard (hereafter RP), who had just brought his own photometric equipment back into operation.

It was felt that, should the amateur photometry confirm the magnitudes given in the new Hipparcos catalogue, then it should be safe to use other magnitudes from that catalogue to replace any dubious or doubtful magnitudes within the Section's binocular sequences. Around this time, one of us (RP) entered into much discussion on the Hipparcos and Tycho catalogues with John Greaves, who pointed out a number of possible pitfalls in using the Catalogues should insufficient care be taken. He also advised using the Tycho catalogue rather than the Hipparcos, because it contains more stars to a fainter magnitude limit and because the magnitudes are derived directly from the satellite measurements. One example of the necessity to take care, is that double stars may well have been resolved by Tycho, and hence give incorrect magnitudes as far as the visual observer is concerned, who will see combined and hence brighter magnitudes (See also John Greaves article in JBAA 110.1.20).

The Tycho magnitudes have all been taken from the Guide7 CD-ROM from Project Pluto, where Bill Gray, who produces it, has already taken into account the corrections necessary to convert Tycho data to standard V (Johnson).

During the course of the next 18 months or so, a number of sequences were measured by both authors and the details have been summarised below. However, it should be noted that the observations by RP were NOT of the highest accuracy, it being felt that a lower quality of precision would suffice to check visual magnitudes. Regrettably, it also transpired that the power supply to his photometer was on the verge of breaking down over the earlier part of the period during which these observations were being made. Nonetheless, it is hoped that something meaningful can be obtained from them, especially in conjunction with the higher precision work, albeit on brighter stars, by KW. The faulty power supply has now been replaced! In each case the photometry has been reduced using the Tycho magnitude for the comparison star.

The Observations

ST Cam (RP)
Comparison star HD 29949 (VSS chart 111.01 Star D)
1998 Feb 17 JD 2450862

Star	VSS Mag	V	J(T)V	HD	Spectrum
D	7.0	6.99	6.99	29949	F0
F	7.4	7.25	7.12	30530	K0
K	7.5	7.51	7.61	30555	F2
L	8.0	7.96	7.82	30751	K5

XX Cam (KW)

Comparison star HD 26512 (VSS chart 068.01 Star F)
1998 Jan 16 (JD 2450830)
Comment: Star H is fainter than limiting magnitude of equipment.

Star	VSS Mag	V	J(T)V	HD	Spectrum
A	5.1	5.19	5.20	26764	A2
B	6.3	6.26	6.26	25948	F5
C	6.4	6.34	6.32	25602	K0
D	6.6	6.56	6.57	25362	F5
E	7.0	7.06	7.04	24733	A0 =DD Cam 7.03-7.22 P=1.76d
F	7.1	7.35	7.35	26512	A0
G	7.4	7.06	7.05	25056	G5
H	7.9	7.77	7.82	25292	F8 See comment

TU CVn (RP)
Comparison star HD 112570 (VSS chart 215.01 Star D)
1998 Apr 20 JD 2450924 and 1998 Apr 25 JD 2450929

Star	VSS Mag	V	J(T)V	HD	Spectrum
C	5.7	5.72	5.64	113847	K0
D	6.2	6.11	6.11	112570	K0
E	6.3	6.36	6.34	110834	F5
F	6.2	6.26	6.25	111421	A3
G	6.8	6.84	6.82	111306	F0

TU CVn (KW)
Comparison star HD 112570 (VSS chart 215.01 Star D)
Comment: Stars D and E have been used by KW as comparison and check stars respectively. The measurement shown is the mean of 68 separate observations taken from 1995 and 1998. The standard deviation of this data was 0.016.

Star	VSS Mag	V	J(T)V	HD	Spectrum
D	6.2	6.11	6.11	112570	K0
E	6.3	6.335	6.34	110834	F5

U Ori (RP)
Comparison star HD 39286 (VSS chart 059.01 Star E)
2000 Feb 11 JD 2451586

Star	VSS Mag	V	J(T)V	HD	Spectrum
E	6.01	6.00	6.00	39286	B9
F	6.3	6.60	6.70	39417	B9
G	7.17	7.68	7.67	39785	K5
H	7.61	7.73	7.70	39305	K0
J	7.88	8.32	8.42	39727	F2
HD 39227	-	7.23	7.31	39227	B9
HD 249092	-	8.14	8.16	249092	K0

Comment: Because of the discrepancies in the magnitudes of stars F, J and HD 39227, it was decided to re-measure them and the results are given below.

2000 Feb 19 JD 2451594

Star	VSS Mag	V	J(T)V	HD	Spectrum
F	6.3	6.61	6.7	39417	B9
J	7.88	8.31	8.42	39727	F2
HD 39227	-	7.22	7.31	39227	B9

As the magnitudes of these three stars agreed to within 0.012 on the two dates on which they were measured it is felt that they are correct.

Z Psc (RP)
Comparison star HD 7615 (VSS chart JEI 10.11.69 Star F)
1998 Oct 25 JD 2451112 and 1998 Nov 10 JD 2451128

Star	VSS Mag	V	J(T)V	HD	Spectrum
A	7.5	7.70	7.54	7426	K0 = NSV 448
D	6.2	6.07	5.80	6953	K5
E	6.8	6.69	6.68	6886	F0
F	6.8	6.69	6.69	7615	A0
G	7.8	7.84	7.61	7308	K2
H	7.9	8.17	7.80	7300	K0
K	7.9	8.16	8.07	7802	A3
L	8.5	8.57	8.34	7352	G5

TX Psc (KW)
Comparison star HD 221950 (VSS chart MDT 72.05.14 Star D)
Comment: Observed at altitude of 30 degrees. Uncorrected for colour differences. I suspect that secondary (colour) correction factors are needed here for such a low altitude.
1998 Jan 14 (JD 2450828) and Jan 15 (JD 2450829)

Star	VSS Mag	V	J(T)V	HD	Spectrum
A	4.28	4.08	4.14	222368	F8 = NSV 14657 See Comment
B	4.61	4.50	4.50	222603	A5 See Comment
C	4.94	4.98	4.93	220825	A2
D	5.65	5.70	5.70	221950	F5
E	5.77	5.78	5.77	223438	A2
F	5.85	5.57	5.58	223719	K2
G	6.24	6.28	6.30	223855	A0
H	6.44	6.30	6.26	220858	K0 = NSV 14568

Z UMa (RP)
Comparison star HD 102956 mag (VSS chart 217.01 Star D)
1998 Apr 26 JD 2450930

Star	VSS Mag	V	J(T)V	HD	Spectrum
D	8.0	7.86	7.86	102956	G5
E	8.3	8.35	8.37	103810	F2
F	8.6	8.32	8.30	103643	K2
G	8.7	8.38	8.45	103828	G0
H	8.8	8.50	8.67	103675	F8

Conclusions

These results reveal that it is generally safe to use the Tycho magnitudes but great care must be exercised to ensure that stars are not double, suspected variables, extremely red etc., otherwise matters could be made worse rather than better.

Finally, it should be stressed that ONLY those comparison stars which have been proved to be troublesome should be changed. ALL others which observers are happy with should remain as they are.

Acknowledgements
RP wishes to express his thanks to John Greaves for many reams of paper providing a great deal of useful information on the Hipparcos and Tycho data. Also, we wish to thank John Toone for suggesting this in the first place and to Bill Gray of Project Pluto for writing such a splendid piece of software.

Roger Pickard (Details on back cover)
Kevin West 5, Edward St., Ryde, Isle of Wight. PO33 2SH Tel: 01983 614591

CCD PHOTOMETRY

WOLFGANG QUESTER

Triggered by John Saxton's article in VSSC 104 [1], I thought I would summarise my experiences with CCD photometry, for the comparison and exchange of knowledge.

Since 1955 I have been a member of the BAV. I live in Esslingen in the German state of Baden-Wurttemberg, Southwest Germany. The location is at E 9°21'12" N 48°43'42", 280 m above sea level. My instrumentation consists of a Vixen 20 cm Cassegrain VC200L, plus an SBIG ST-7E with FW-8 filter wheel. The wheel is equipped with BVRI filters (5 mm) according to BESSELL [2]. The No. 1 position of the wheel holds a clear glass of 5 mm thickness. This filter is used for focussing and fine adjustment of the field of view, to include both the variable and comparison stars. The original focal length of the telescope (180 cm, f/9) is shortened with a focal reducer to f/6.4. This gives a field of view of about 12' X 18'.

The telescope rests on a Vixen GP-DX German mount. It is not permanently installed on the mount, but must be fixed to it before a nightly observation. The mount is adjusted to north with the built-in polar finder scope. This alignment is sufficiently good to allow exposure

times of 2 minutes maximum.

The camera has pixels of 9 X 9 microns square. For photometry I use it in the 2 X 2 binning mode, giving pixels of 3" X 3". Although this is just on the border for undersampling, I have had no adverse experiences so far. The ST-7 has a second CCD intended for sending pulses to the mount to control tracking. Up to now I have not used this facility. The mount does not track precisely, but I find it useful that stellar images do not fall on the same pixels during a night. I have to adjust the telescope a few times during the night to prevent stars from drifting out of the field of view.

My observing programme consists of eclipsing variables and RR Lyrae stars included in the BAV programme. Most of these stars are in the range between 11th magnitude and 13th magnitude. My standard exposure time is 60 seconds with the V filter. The time between exposures varies from 30 seconds to several minutes depending on type of light variation. Single observations have an rms error of ±0.01 to ±0.03 magnitude, depending on the local weather and the faintness of the stars. On a few occasions, I observed the Mira **BP Gem** at V ~ 15. Adding up several exposures, the total exposure times amounted to 4 to 5 minutes, and the rms error was about ±0.1 mag thus equalling visual estimates.

Frames are fed from the camera to a laptop computer working with SBIG's CCDOPS in DOS mode. Using the parallel port, the download time is 7 seconds. Prior to photometric measurements all frames are dark and flat-field corrected .

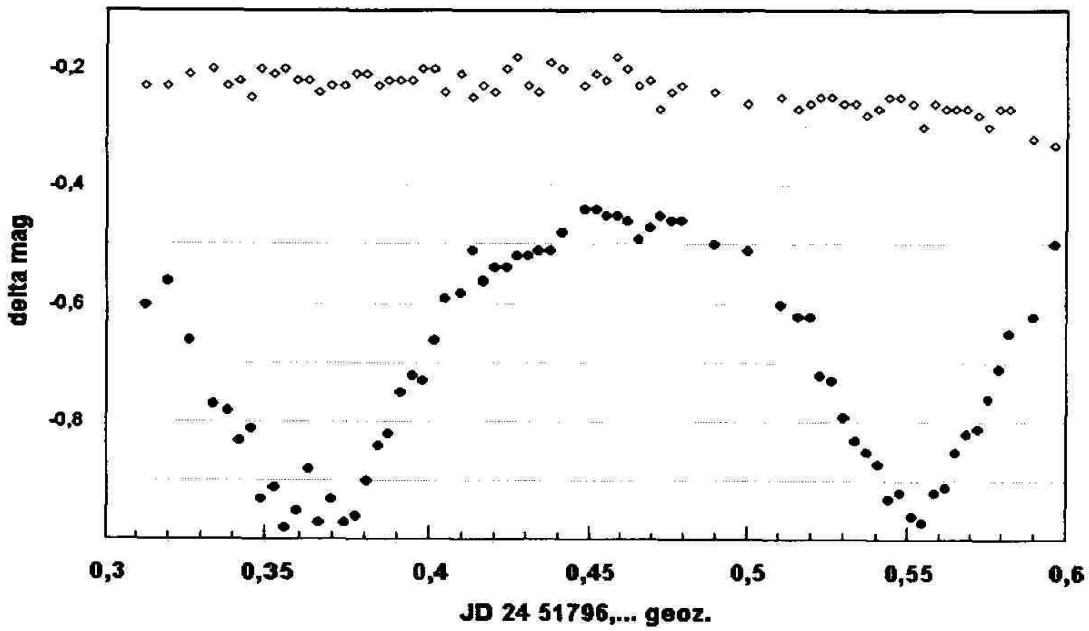
For photometry, I use a programme developed by BAV member Herbert Achterberg. The programme expects an input of pixel coordinates for the variable and comparison stars, as well as the pixel size of the square measuring box. This data must be given for the first frame of a series. The sky background can be selected as a single box at a suitable position, or as a *square ring* around the measuring box for each star. The programme then writes an ASCII table with the mid-time of exposure (UT and Julian date), raw magnitudes of all marked stars including rms errors calculated from the noise in the boxes, delta magnitudes between the variable and the major comparison star, and the pixel coordinates of marked stars.

A second programme uses this table to draw a light curve, and fit data points with a polynomial, the grade of which can be freely selected. Maximum/minimum times can be calculated from the polynomial or using Pogson's cutting curve. My experience is that selection of the *right* polynomial/time depends on subjective criteria. This selection is a continuing item for discussion among BAV observers.

For calibration of my photometric system I take frames of M67 or Selected Areas [3].

V979 Cygni
V979 Cygni is a W UMa-type eclipsing binary that varies between 14.2 to 14.7 in B. Its period is 0.3737 days. To keep my usual exposure time of 1 minute, instead of a filter I used the clear glass which is mainly intended for focussing or centering the star field. The diamonds at delta mag -0.2 show differences between comparison and check star. The difference is not constant supposedly due to atmospheric effects on the very broad bandwidth of the CCD. The time of each minimum however can be derived to ± 1/2 minute.

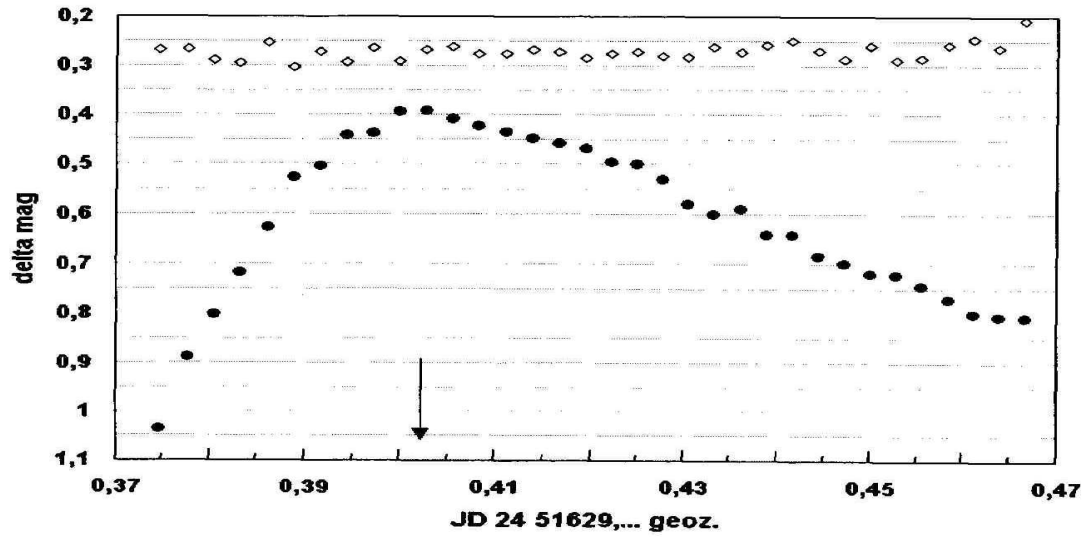
V979 Cyg 8/9. Sept. 2000

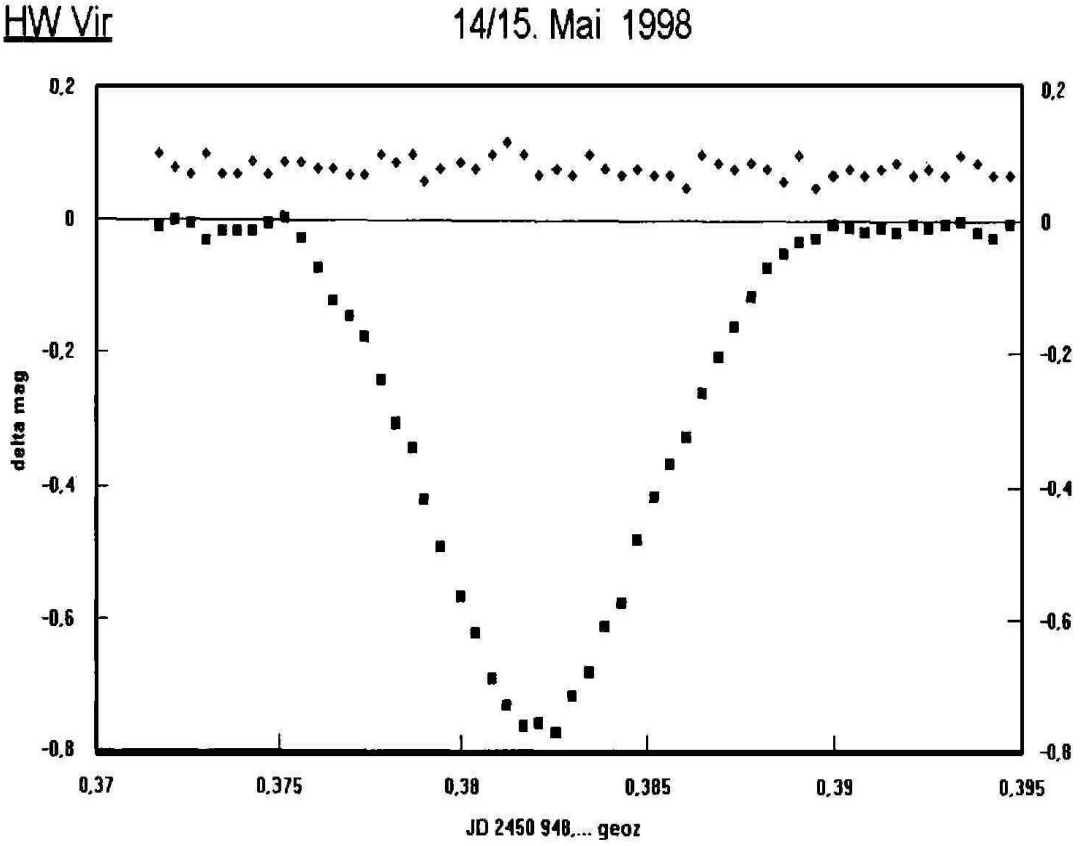


SZ Geminorum

SZ Gem is an RR Lyrae-type variable without peculiarities. Its light varies between 11.0 and 12.2 in V with a period of 0.501 days. The period has remained constant for decades. Exposures were 1 minute through a V filter. Diamonds at delta magnitude 0.3 show the differences between comparison and check star.

SZ Gem 25/26. März 2000





HW Virginis

HW Virginis is called an eclipsing pre-cataclysmic variable. The primary is a B-subdwarf. The period is only 0.233 days which is 2h 48 m. During primary minimum, depicted above, the light drops from magnitude 10.5 to 11.2. The minimum lasts only 20 minutes, thus continuous observation is necessary. For this series an infrared-blocking filter was used. Exposure times were 30 seconds. Single frames were separated only by 7 seconds download time. As usual, diamonds at delta mag 0.1 show the difference between comparison and check star.
I aim for a series that covers the whole period, but weather in central Europe together with HW Vir's southern position [(2000) 12h 44m 20.2s -8°40'16"] so far prevented any success.

References:
SAXTON J., ST LMi: the first CCD photometry from Lymm, VSSC 104.
BESSELL M. S., UBVRI Filters for CCD Photometry, CCD Astronomy, Fall 1995, p. 20
QUESTER W., UBV(RI)c-Fotometrie und Standardfelder, BAV Newsletter no. 15

NEW ECLIPSING VARIABLES

TONY MARKHAM

VSSC 85 included an article on the suspected variable **+22 0743 Tau**, also known as **NSV1702**, which included a comment that it might be an eclipsing variable. Since then it has acquired the permanent designation of **V1081 Tau**. It is listed as an eclipsing variable of range 6.9-7.3 V, but no epoch or period are given.

The 75th Name List of Variable Stars published last year includes many new eclipsing variables. Many are faint or of low amplitude. However, some of the brighter examples are :

Name	**RA 1950** **h m s**	**Decl** **o ‘ “**	**Max** **m**	**Min** **m**	**Type**
V600 Per	03 15 55.3	+32 30 24	7.62	8.06 V	EB
V1403 Ori	05 37 31.8	-01 21 16	10.60	11.62 V	EA
HQ Cam	06 15 22.9	+67 16 42	12.1	14.3 P	EA
BX CMi	07 08 03.7	+07 58 50	10.81	11.48 V	EA
KM UMa	11 45 12.8	+35 30 16	11.0	11.6 P	EW:
LL Com	13 15 39.0	+30 23 48	12.3	13.0 P	EB
V335 Ser	15 56 32.7	+00 44 14	7.6	8.3 V	EA
V871 Ara	16 33 38.8	-48 36 09	11.0	13.4 V	EA
V559 Lyr	18 26 29.6	+31 19 34	11.3	13.1 P	E
V1011 Her	18 27 25.3	+22 32 21	10.4	11.6 P	EA
KK Dra	19 07 10.7	+59 19 01	11.8	14.8 V	EA
V1490 Aql	19 51 16.1	+09 15 58	10.5	11.0 V	EA
V4639 Sgr	19 52 25.2	-24 35 39	12.3	14.3 P	EA
KP Dra	20 04 43.6	+63 16 17	12.0	14.4 V	E
V2197 Cyg	20 48 21.0	+37 45 30	10.9	12.4 P	E
V413 And	23 51 31.8	+39 00 15	7.61	8.46 U	EA/RS

Note that positions are given for epoch 1950.0 rather than 2000.0.
Note also that V413 And = SAO 073597 , V600 Per = SAO 056342 and V335 Ser = SAO 121294.

IBVS’s 4900-4950

GARY POYNER

4900 Discovery of delta Scuti pulsastions in **HD 98851**. (Joshi etal, 2000)
4901 New photoelectric minima and light elements of **MM Herculis**. (Tas,G 2000)
4902 CCD photometry of the 1999 superoutburst of **V844 Her.** (Kato & Uemura, 2000)
4903 The new bright RR Lyr star **NSV 01470.** (Vidal-Sainz et al, 2000)
4905 Coordinates and identifications for Sonneberg variables on MVS 301-308. (Kinnunen & Skiff, 2000)
4906 Coordinates and identifications for Sonneberg variables on MVS 308-316. (Kinnunen & Skiff, 2000)
4907 **S 4902 IZ Carinae - V336 Carinae.** (Morel, 2000)

4908 **GSC 01887-01240**: A new eclipsing binary. (Han, et al 2000)
4909 **PT Andromedae**: The recent outburst and earlier ones. (Alksnis & Zharova, 2000)
4910 **NSV 223**: A new eclipsing binary. (Verror & Van Cauteren, 2000)
4911 The Hipparcos variable **CD Lyncis**. (Baldwin et al, 2000)
4912 Photoelectric minima of selected eclipsing binaries and maxima of pulsating stars. (Agerer & Hubscher, 2000)
4913 A new Beta Cephei star in the RX J0136.7+6125 field: **BD +60.282** (Robb et al, 2000)
4914 A new eclipsing binary in the field of LHS 2176 and 2178. (Robb et al, 2000)
4915 **V803 Cen** - the second helium ER UMa star. (Kato et al, 2000)
4916 **VW Peg**: First photoelectric observations and revised elements. (Achterberg et al, 2000)
4917 Photoelectric observations of the flare star **YZ CMi** in 1999-2000.(Panov et al, 2000)
4918 Supersoft source activity as a possible interpretation of temporary fadings of **CH Cyg.** (Kato, 2000)
4919 The population II Cepheid in the galactic globular cluster Palomar 3. (Borissova et al, 2000)
4920 New variables on the edge of the Northern Milky Way, paper 1: BeV1-30. (Bernhard & Lloyd, 2000)
4921 The optical spectrum of Luytens variable **GM Sagittarii.** (Orosz, 2000)
4922 B Photometry of Romano's star in M33. (Kurtev et al, 2000)
4923 **BD +62.2167**: A new eclipsing binary in the field of CW Cep.(Gomez-Forrellad, 2000)
4924 **SAO 23170**, a new beta Cep in the stellar cluster H VI 33. (Gomez-Forrellad, 2000)
4925 New outburst of **V1118 Ori** (1997-98). (Garcia Garcia & Parsamian, 2000)
4926 A study of the variability of **LD 345**. (Guilbault et al, 2000)
4927 The delta Scuti star **QS Geminorum**. (Hintz et al, 2000)
4928 New eclipsing variable in the field of QS Geminorum. (Carroll & Hintz, 2000)
4929 **GSC 03822.01056** is a close eclipsing binary. (Biro, 2000)
4930 **GSC 4847.1513 (FASTT 448)** - A new eclipsing variable. (Hager & Guilbault, 2000)
4931 **HD 218179**: A new long period bright EB in Cepheus. (Gomet-Forrellad, 2000)
4932 Detection of supercycles in **SS UMi:** Normal SU UMa type dwarf nova with the shortest supercycle. (Kato et al, 2000)
4933 **MT Pegasi (=HD 217813)** - A young sun with starspots. (Depasquale et al, 2000)
4934 A probable variation in the polarisation of the early type eclipsing binary system **XZ Cep.** (Kondoh & Yasuhisa, 2000)
4935 BV Photometry of **lambda And**. (Zang Zhousheng et al, 2000)
4936 Photometry of **LX Pup** and **XX Pup**. (Henden & Lund, 2000)
4937 New times of minima and revised ephemeris of **BC Eridani**. (Nagi & Kiyota, 2000)
4938 A new classical Cepheid in Cassiopeia. (Antipin, 2000)
4939 A new high amplitude short period variable star in Cassiopeia. (Antipin, 2000)
4940 CCD Photometry of the May 2000 outburst of the cataclysmic variable **RXJ 1450.5+6403**. (Vanmunster et al, 2000)
4941 Photoelectric minima of some eclipsing binary stars. (Albayrak et al, 2000)
4942 The false nova in 1999 in the nearby galaxy IC 1613. (Fugazza et al, 2000)
4943 Times of minimum light for **XY Ursa Majoris**. (Yeates et al, 2000)
4944 BVRI observations of **V503 Cygni** in superoutburst. (Spogli et al, 2000)
4945 **GSC 05178.01376:** A new W UMa variable. (Dvorak, 2000)
4946 On the variability of O and B supergiants. (Adelman et al, 2000)
4947 On the variability of A6 to F9 supergiants. (Adelman et al, 2000)
4948 The orbital period changes of **YY Eri.** (Karube et al, 2000)

4949 HD 77191: Another variable solar twin. (Lebzelter, 2000)
4950 Period variation of **XX Cygni** revisited. (Kiss & Derekas, 2000)

Note
Since the Spring 2000, the Information Bulletin on Variable Stars (IBVS) can be accessed through the WWW in HTML format at the following URL....

http://www.konkoly.hu/IBVS/IBVS.html

ECLIPSING BINARY PREDICTIONS

TONY MARKHAM

The following predictions, based on the latest Krakow elements, 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 (UT-12h). D and L are used to indicate where daylight and low altitude respectively prevent part of the eclipse from being visible.
The variables covered by these predictions are :

Star	Mag Range	Star	Mag Range
RZ Cas	6.18 - 7.72 V	Z Per	9.7 - 12.4 p
U Cep	6.75 - 9.24 V	ST Per	9.52 - 11.40 V
SS Cet	9.4 - 13.0 v	Y Psc	9.44 - 12.23 V
SW Cyg	9.24 - 11.83 V	U Sge	6.45 - 9.28 V
Z Dra	10.8 - 14.1 p	RW Tau	7.98 - 11.59 V
TW Dra	8.0 - 10.5 v	X Tri	8.88 - 11.27 V
S Equ	8.0 - 10.08 V	TX UMa	7.06 - 8.80 V
RW Gem	9.53 - 11.76 V	Z Vul	7.25 - 8.90 V
V640 Ori	11.2 - 13.5 p		

Charts for most of these variables can be downloaded from the BAA VSS web pages.

2000 Oct 1 Sun
RZ Cas D06(06)09
S Equ D06(07)12
Z Dra 09(11)14
SS Cet L09(06)11
Z Vul 09(15)14L
ST Per 13(17)17D
RW Tau 14(19)17D
X Tri 15(17)17D

2000 Oct 2 Mon
TX UMa D06(04)09L
RZ Cas 09(11)14
Z Per 10(15)17D
RW Gem L10(09)14
V640 Ori L13(13)16
X Tri 14(16)17D

2000 Oct 3 Tue
U Cep D06(10)14
TW Dra D06(11)16
X Tri 13(16)17D
RZ Cas 13(16)17D

2000 Oct 4 Wed
Z Vul D06(02)07
Z Dra D06(04)07
U Sge D06(07)13L
ST Per D06(09)13
Y Psc D06(09)13
SS Cet L09(06)10
RW Tau 09(14)17D
S Equ 12(18)13L
X Tri 12(15)17D
V640 Ori L13(14)16

2000 Oct 5 Thu
TX UMa D06(05)08L
SW Cyg D06(08)14
RW Gem L10(06)11
Z Dra 11(13)15
Z Per 11(16)17D
X Tri 12(14)17
U Cep 17(21)17D

2000 Oct 6 Fri
TW Dra D06(07)12
Z Vul 07(12)13L
X Tri 11(14)16
V640 Ori L13(14)17

2000 Oct 7 Sat
RZ Cas D06(06)08
RW Tau L07(08)13
SS Cet L09(05)10
X Tri 10(13)15
U Sge 11(16)13L

2000 Oct 8 Sun

Y Psc D06(03)08
S Equ D06(04)09
Z Dra D06(06)09
TX UMa D06(07)08L
U Cep D06(09)14
RZ Cas 08(11)13
X Tri 10(12)15
TX UMa L11(07)12
Z Per 13(17)17D
V640 Ori L13(15)17D

2000 Oct 9 Mon

TW Dra D06(02)07
X Tri 09(12)14
ST Per 12(16)17D
Z Dra 12(15)17
RZ Cas 13(15)17D
SW Cyg 16(22)17D

2000 Oct 10 Tue

RW Tau L07(02)07
SS Cet L08(04)09
X Tri 08(11)13
V640 Ori L13(15)17D
U Cep 16(21)17D

2000 Oct 11 Wed

U Sge D06(02)07
TX UMa D06(09)08L
Z Vul D06(10)13L
X Tri 08(10)13
S Equ 09(15)13L
TX UMa L11(09)13
Z Per 14(19)17D
TW Dra 16(21)17D

2000 Oct 12 Thu

ST Per D06(07)11
Z Dra D06(08)10
X Tri 07(10)12
V640 Ori 13(16)17D
RW Tau 16(21)17D

2000 Oct 13 Fri

RZ Cas D06(05)08
U Cep D06(09)14
X Tri 06(09)11
SS Cet L08(04)08
Z Dra 14(16)17D
RW Gem 15(20)17D

2000 Oct 14 Sat

X Tri D06(08)11
TX UMa D06(10)08L
U Sge D06(11)12L
SW Cyg D06(12)17D
RZ Cas 08(10)12
TX UMa L10(10)15
TW Dra 12(17)17D
V640 Ori 13(16)17D
Z Per 15(20)17D

2000 Oct 15 Sun

S Equ D06(01)06
X Tri D06(07)10
RW Tau 11(15)17D
Y Psc 12(16)15L
RZ Cas 12(15)17
U Cep 16(21)17D

2000 Oct 16 Mon

X Tri D06(07)09
Z Vul D06(08)13L
Z Dra 07(10)12
RW Gem 12(17)17D
V640 Ori 14(17)17D
RZ Cas 17(19)17D

2000 Oct 17 Tue

X Tri D06(06)09
TX UMa 07(12)08L
TW Dra 07(12)17
TX UMa L10(12)16
ST Per 10(14)17D
Z Dra 16(18)17D
Z Per 17(21)17D

2000 Oct 18 Wed

X Tri D06(05)08
U Cep D06(09)13
S Equ 06(11)12L
RW Tau L07(10)14
V640 Ori 14(17)17D

2000 Oct 19 Thu

SW Cyg D06(01)07
RZ Cas D06(05)07
X Tri D06(05)07
Y Psc 06(10)15
RW Gem L09(14)17D

2000 Oct 20 Fri

X Tri D06(04)07
ST Per D06(06)10
TW Dra D06(07)12
RZ Cas 07(09)12
Z Dra 09(11)14
TX UMa L10(13)17D
V640 Ori 15(18)17D
U Cep 16(20)17D

2000 Oct 21 Sat

X Tri D06(03)06
U Sge D06(05)11
Z Vul D06(06)11
RW Tau L06(04)09
RZ Cas 12(14)16

2000 Oct 22 Sun

RW Gem L09(10)16
V640 Ori 15(18)18D
RZ Cas 16(19)18D
ST Per 17(22)18D

2000 Oct 23 Mon

TW Dra D06(03)08
Z Dra D06(05)07
Y Psc D06(05)09
U Cep D06(08)13
SW Cyg 09(15)17L
TX UMa 10(15)18D
Z Vul 12(17)12L

2000 Oct 24 Tue

U Sge 08(14)12L
Z Dra 11(13)16
V640 Ori 16(19)18D

2000 Oct 25 Wed

RZ Cas D06(04)07
S Equ D06(08)12L
RW Gem L09(07)12
ST Per 09(13)17
U Cep 15(20)18D
TW Dra 17(22)18D

2000 Oct 26 Thu

Z Vul D06(04)09
RZ Cas 06(09)11
TX UMa 11(16)18D
RW Tau 12(17)18D
V640 Ori 16(19)18D

2000 Oct 27 Fri

Z Per D06(01)06
Z Dra D06(06)09
RZ Cas 11(14)16

2000 Oct 28 Sat

ST Per D05(05)09
SW Cyg D05(05)11
U Cep D05(08)13
RW Gem L08(04)09
Z Vul 09(15)12L
Z Dra 12(15)17
TW Dra 12(18)18D
RZ Cas 16(18)18D
V640 Ori 17(20)18D

2000 Oct 29 Sun

RW Tau 07(12)16
TX UMa 13(18)18D

2000 Oct 30 Mon

Z Per D05(03)08
Y Psc 13(18)14L
U Cep 15(20)18D
ST Per 16(20)18D
V640 Ori 17(20)18D

2000 Oct 31 Tue

Z Vul D05(02)07
RZ Cas D05(04)06
U Sge D05(08)11L
Z Dra 06(08)10
TW Dra 08(13)18D
X Tri 17(20)18D

2000 Nov 1 Wed

S Equ D05(05)11
RW Tau L06(06)11
RZ Cas 06(08)11
SW Cyg 13(19)16L
Z Dra 14(17)18D
TX UMa 14(19)18D
X Tri 17(19)18D

2000 Nov 2 Thu

Z Per D05(04)09
U Cep D05(08)12
Z Vul 07(13)12L
ST Per 08(12)16
RZ Cas 11(13)15
X Tri 16(18)18D
RW Gem 16(22)18D

2000 Nov 3 Fri

TW Dra D05(08)13
Y Psc 07(12)14L
RZ Cas 15(18)18D
X Tri 15(18)18D

2000 Nov 4 Sat

Z Dra 07(10)12
S Equ 10(16)11L
X Tri 15(17)18D
U Cep 15(19)18D
TX UMa 16(21)18D

2000 Nov 5 Sun

ST Per D05(03)07
Z Per D05(06)10
RW Gem 13(18)18D
X Tri 14(16)18D
Z Dra 16(18)18D

2000 Nov 6 Mon

RZ Cas D05(03)05
TW Dra D05(04)09

SW Cyg D05(08)14
X Tri 13(16)18D
RW Tau 14(19)18D

2000 Nov 7 Tue

U Sge D05(03)08
Z Dra D05(03)05
Y Psc D05(06)11
U Cep D05(07)12
Z Vul D05(10)11L
RZ Cas 05(08)10
X Tri 13(15)18
ST Per 15(19)18D
TX UMa 17(22)18D

2000 Nov 8 Wed

S Equ D05(02)08
Z Per D05(07)12
Z Dra 09(11)14
RW Gem 10(15)18D
RZ Cas 10(12)15
X Tri 12(14)17
TW Dra 18(23)18D

2000 Nov 9 Thu

RW Tau 09(13)18D
X Tri 11(14)16
U Cep 14(19)18D
RZ Cas 15(17)18D
Z Dra 18(20)18D

2000 Nov 10 Fri

U Sge 06(12)10L
ST Per 06(10)15
X Tri 10(13)15
SW Cyg L18(22)18D

2000 Nov 11 Sat

Y Psc D05(01)05
Z Dra D05(05)07
Z Per D05(08)13
S Equ 07(13)11L
RW Gem L07(12)17
X Tri 10(12)15
TW Dra 13(18)18D

2000 Nov 12 Sun

U Cep D05(07)12
RW Tau D05(08)13
Z Vul D05(08)11L
X Tri 09(12)14
Z Dra 11(13)16

2000 Nov 13 Mon

ST Per D05(02)06
RZ Cas D05(07)10
X Tri 08(11)13

2000 Nov 14 Tue

TX UMa D05(01)06L
Z Per D05(10)14
RW Gem L07(09)14
X Tri 08(10)13
TW Dra 09(14)18D
RZ Cas 09(12)14
U Cep 14(19)18D

2000 Nov 15 Wed

RW Tau D05(02)07
Z Dra D05(06)09
SW Cyg 06(12)15L
X Tri 07(10)12
ST Per 13(18)18D
RZ Cas 14(16)18D
SW Cyg L17(12)18

2000 Nov 16 Thu

X Tri 06(09)11
Z Dra 13(15)17

2000 Nov 17 Fri

TX UMa D05(03)06L
Z Vul D05(06)11L
U Sge D05(06)10L
U Cep D05(07)11
TW Dra D05(09)14
X Tri 06(08)11
Z Per 06(11)16
RW Gem L07(05)11
SS Cet 16(20)16L
RW Tau 16(21)18D

2000 Nov 18 Sat

S Equ D05(10)10L
ST Per 05(09)13
X Tri 05(08)10
Y Psc 09(13)13L

2000 Nov 19 Sun

RZ Cas D05(07)09
X Tri D05(07)09
Z Dra 06(08)11
U Cep 14(18)18D

2000 Nov 20 Mon

SW Cyg D05(02)08
TX UMa D05(04)05L
TW Dra D05(04)10
X Tri D05(06)09
RW Gem L07(02)07
Z Per 07(12)17
TX UMa L08(04)09
RZ Cas 09(11)14
U Sge 10(15)10L
RW Tau 10(15)18D
Z Dra 14(17)18D
SS Cet 15(20)16L

2000 Nov 21 Tue

X Tri D05(05)08
RZ Cas 14(16)18

2000 Nov 22 Wed

Z Vul D05(04)09
X Tri D05(05)07
U Cep D05(06)11
Y Psc D05(08)12
RW Gem 18(23)18D
RZ Cas 18(21)18D

2000 Nov 23 Thu

X Tri D05(04)07
TX UMa D05(06)05L
RW Tau 05(10)14
Z Dra 07(10)12
TX UMa L08(06)11
Z Per 09(14)18D
ST Per 12(16)18D
SS Cet 14(19)15L

2000 Nov 24 Fri

U Sge D05(00)06
X Tri D05(03)06
SW Cyg 09(15)15L
Z Vul 10(15)10L
U Cep 13(18)18D
Z Dra 16(18)18D
SW Cyg L17(15)18D

2000 Nov 25 Sat

X Tri D05(03)05
RZ Cas D05(06)08
S Equ D05(07)10L
TW Dra 14(19)18D
RW Gem 15(20)18D

2000 Nov 26 Sun

Y Psc D05(02)07
Z Dra D05(03)05
RW Tau D05(04)09
TX UMa D05(07)05L
ST Per D05(08)12
TX UMa L08(07)12
RZ Cas 08(11)13
Z Per 10(15)18D
SS Cet 14(18)15L

2000 Nov 27 Mon

Z Vul D05(02)07
U Cep D05(06)11
U Sge D05(10)09L
Z Dra 09(12)14
RZ Cas 13(15)18

2000 Nov 28 Tue

TW Dra 09(15)19D
RW Gem 11(16)19D
RZ Cas 18(20)19D
Z Dra 18(20)19D
RW Tau 18(23)19D

2000 Nov 29 Wed

SW Cyg D05(05)11
TX UMa L07(09)14
Z Vul 07(13)10L
Z Per 12(16)19D
U Cep 13(18)19D
SS Cet 13(18)15L

2000 Nov 30 Thu

Z Dra D05(05)07

2000 Dec 1 Fri

RZ Cas D05(05)08
TW Dra 05(10)15
RW Gem 08(13)18
ST Per 11(15)19D
Z Dra 11(13)16
RW Tau 12(17)19D

2000 Dec 2 Sat

Z Vul D05(00)05
S Equ D05(04)09
U Cep D05(06)10
TX UMa L07(10)15
RZ Cas 08(10)13
SS Cet 12(17)15L
Z Per 13(18)19D

2000 Dec 3 Sun

Y Psc 10(15)12L
RZ Cas 12(15)17
SW Cyg 13(19)14L
SW Cyg L16(19)19D

2000 Dec 4 Mon

U Sge D05(04)09L
TW Dra D05(05)10
Z Dra D05(06)09
ST Per D05(07)11
Z Vul 05(10)10L
RW Gem L06(10)15
RW Tau 07(11)16
U Cep 13(17)19D
RZ Cas 17(19)19D

2000 Dec 5 Tue

TX UMa 07(12)17
S Equ 09(14)09L

SS Cet 12(16)15L
Z Dra 13(15)17
Z Per 14(19)19D
2000 Dec 6 Wed
X Tri 16(19)16L
ST Per 18(22)19D
2000 Dec 7 Thu
TW Dra D05(01)06
RZ Cas D05(05)07
U Cep D05(05)10
RW Tau D05(06)11
Y Psc 05(09)12L
RW Gem L06(07)12
U Sge 07(13)09L
X Tri 15(18)16L
2000 Dec 8 Fri
SW Cyg D05(09)14L
Z Dra 06(08)11
RZ Cas 07(10)12
TX UMa 09(13)18
SS Cet 11(16)14L
X Tri 15(17)16L
Z Per 16(20)19D
2000 Dec 9 Sat
S Equ D05(00)06
Z Vul D05(08)09L
ST Per 10(14)18
RZ Cas 12(14)17
U Cep 12(17)19D
X Tri 14(16)16L
Z Dra 14(17)19D
TW Dra 15(20)19D
2000 Dec 10 Sun
RW Tau D05(00)05
RW Gem L06(04)09
V640 Ori L08(06)09
X Tri 13(16)16L
RZ Cas 17(19)19D
2000 Dec 11 Mon
Y Psc D05(04)08
TX UMa 10(15)19D
SS Cet 11(15)14L
X Tri 13(15)16L
Z Per 17(22)19L
Z Vul L19(19)19D
2000 Dec 12 Tue
U Cep D05(05)10
ST Per D05(05)09
S Equ 06(11)09L
Z Dra 08(10)12
V640 Ori L08(07)09
TW Dra 10(15)19D
X Tri 12(14)16L
RW Tau 14(19)18L
SW Cyg 16(22)19D
2000 Dec 13 Wed
RZ Cas D05(04)07
RW Gem L05(00)05
X Tri 11(14)16L
Z Dra 16(19)19D
2000 Dec 14 Thu
Z Vul D05(06)09L
U Sge D05(07)08L
RZ Cas 07(09)11
V640 Ori L08(07)10
SS Cet 10(15)14L
X Tri 11(13)16
TX UMa 12(16)19D
U Cep 12(17)19D
ST Per 17(21)18L
Z Per 18(23)19L
2000 Dec 15 Fri
Z Dra D05(03)05
TW Dra 06(11)16
RW Tau 09(13)18L
X Tri 10(12)15
RZ Cas 11(14)16
RW Gem 16(21)19D
2000 Dec 16 Sat
V640 Ori L08(07)10
X Tri 09(12)14
Z Dra 09(12)14
RZ Cas 16(18)19D
Z Vul L18(17)19D
2000 Dec 17 Sun
U Cep D05(05)09
SW Cyg 06(12)13L
ST Per 08(12)16
X Tri 09(11)14
SS Cet 09(14)14L
TX UMa 13(18)19D
SW Cyg L15(12)18
Z Dra 18(20)19D
U Sge L19(16)19D
2000 Dec 18 Mon
Z Per D05(00)05
TW Dra D05(06)11
RW Tau D05(08)12
X Tri 08(10)13
V640 Ori L08(08)11
RW Gem 13(18)19D
2000 Dec 19 Tue
RZ Cas D05(04)06
Z Vul D05(04)09L
Z Dra D05(05)07
S Equ D05(08)08L
X Tri 07(10)12
U Cep 12(16)19D
2000 Dec 20 Wed
ST Per D05(04)08
RZ Cas 06(08)11
X Tri 06(09)11
V640 Ori L08(08)11
SS Cet 09(13)14L
Z Dra 11(13)16
TX UMa 15(19)19D
2000 Dec 21 Thu
TW Dra D05(01)07
U Sge D05(01)07
Z Per D05(02)07
RW Tau D05(02)07
X Tri 06(08)11
RW Gem 09(15)19L
RZ Cas 11(13)15
Z Vul L18(15)19D
2000 Dec 22 Fri
SW Cyg D05(02)08
U Cep D05(04)09
X Tri 05(08)10
Y Psc 06(11)11L
V640 Ori L08(09)12
ST Per 15(19)18L
RZ Cas 15(18)19D
2000 Dec 23 Sat
Z Dra D05(07)09
X Tri D05(07)09
SS Cet 08(13)14L
TW Dra 16(21)19D
RW Tau 16(21)17L
TX UMa 16(21)19D
2000 Dec 24 Sun
Z Vul D05(02)07
Z Per D05(03)08
X Tri D05(06)09
U Sge 05(11)08L
RW Gem 06(11)17
V640 Ori L08(09)12
U Cep 11(16)19D
Z Dra 13(15)18
2000 Dec 25 Mon
RZ Cas D05(03)06
X Tri D05(06)08
ST Per 07(11)15
2000 Dec 26 Tue
S Equ D05(05)08L
X Tri D05(05)07
Y Psc D05(05)10
RZ Cas 05(08)10
SS Cet 07(12)13L
V640 Ori L07(10)13
Z Vul 07(13)08L
SW Cyg 10(16)13L
RW Tau 10(15)17L
TW Dra 11(16)19D
SW Cyg L15(16)19D
Z Vul L18(13)18
TX UMa 18(23)19D
2000 Dec 27 Wed
U Cep D05(04)09
X Tri D05(04)07
Z Per D05(04)09
RW Gem D05(08)13
Z Dra 06(08)11
RZ Cas 10(13)15
U Sge L18(20)19D
2000 Dec 28 Thu
ST Per D05(03)07
X Tri D05(04)06
V640 Ori 08(10)13
Z Dra 14(17)19D
RZ Cas 15(17)19D
Z Vul 18(24)19D
2000 Dec 29 Fri
Z Vul D05(00)05
X Tri D05(03)05
RW Tau D05(10)14
TW Dra 07(12)17
SS Cet 07(11)13L
U Cep 11(16)19D
2000 Dec 30 Sat
RW Gem D05(05)10
Z Per D05(06)11
V640 Ori 08(11)14
ST Per 14(18)17L
2000 Dec 31 Sun
RZ Cas D05(03)05
U Sge D05(05)07L
SW Cyg D05(05)11
Z Vul 05(11)08L
Z Dra 08(10)12

247·01 9° FIELD DIRECT

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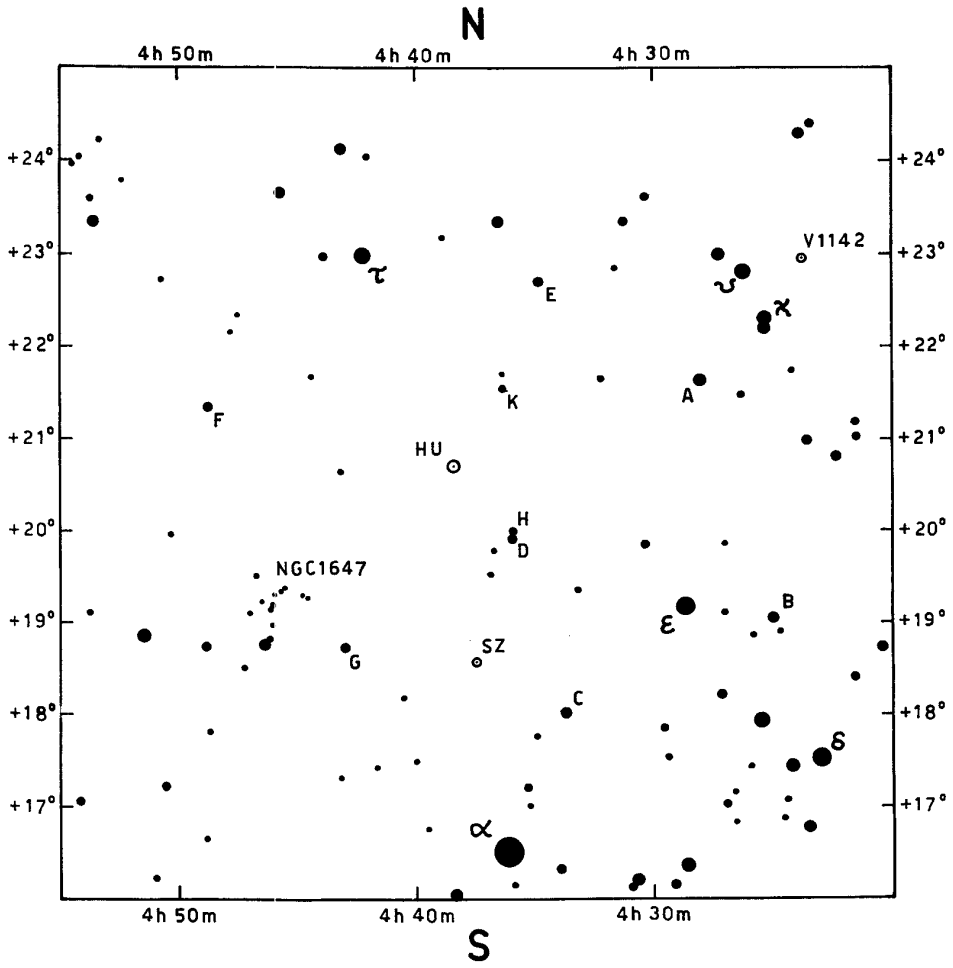

CHART	A 5·7	F 6·9	BAA VSS
ATLAS ECLIPTICALIS	B 6·0	G 7·1	EPOCH: 2000
	C 6·2	H 7·2	DRAWN: JT 20-05-00
SEQUENCE	D 6·6	K 7·4	APPROVED: RDP
HARVARD	E 6·8		

The deadline for contributions to the March issue of VSSC will be Feb 7th, 2001. 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, the Editor and Officers of the BAA cannot be held responsible for errors that may occur.

Printed by RAMPrint 01604 233677

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Nova and Supernova discoveries

First telephone the Nova/Supernova Secretary. If only answering machine response, leave a message and then try the following: Denis Buczynski 01524 68530, Glyn Marsh 01772 690502, or Martin Mobberley 01245 475297 (weekdays) 01284 828431 (weekends).

Variable Star Alerts

Telephone Gary Poyner (see above for number)

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

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