British Astronomical Association

VARIABLE STAR SECTION CIRCULAR

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Contents

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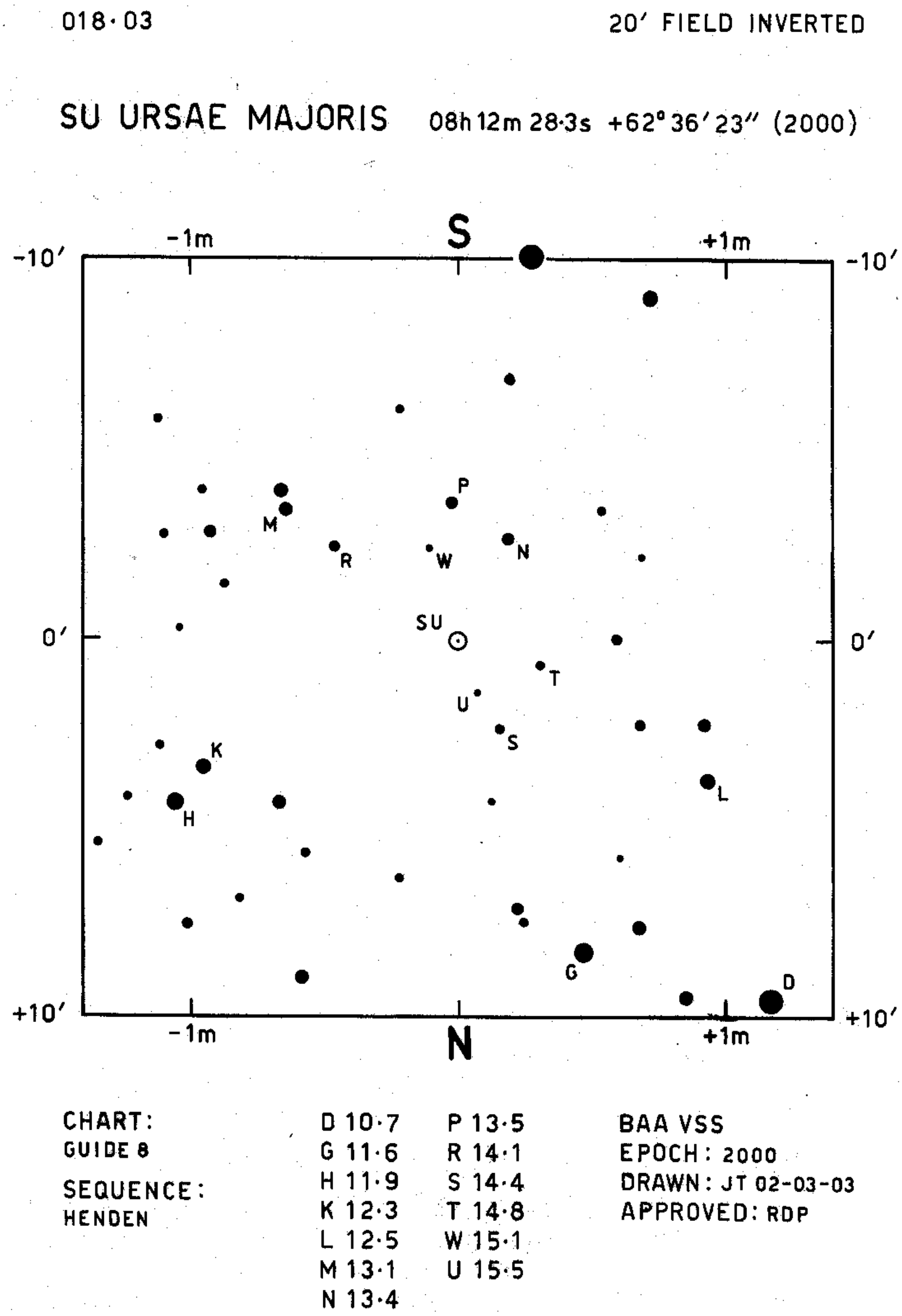
Office: Burlington House, Piccadilly, London, W1V 9AG

NEW CHARTS

John Toone



FROM THE DIRECTOR

ROGER PICKARD

Circulars Available in PDF Format

All Variable Star Circulars from number 88 (June 1996) to number 118 (December 2003) are now available on a CD-ROM for the ridiculous price of only 2.50, including packing and postage. Please send your request for a copy to Karen Holland (with your cheque made out to the BAA).

Forthcoming Meetings

Pro-Am CCD Photometry Symposium

A PRO-AM CCD Photometry Symposium will be held on Saturday and Sunday May 15th and 16th 2004, at the Humfrey Rooms, Castilian Terrace, Northampton. This meeting is being organised jointly by the Variable Star and Instruments and Imaging Sections, and is also being supported by the RAS. This will be a meeting designed for all those who are interested in conducting CCD photometry, and is aimed at encouraging discussion and collaboration in this field. Speakers already booked are noted below

Saturday Programme

Professor Tim Naylor, who is the Norman Lockyer Professor of Astrophysics at Exeter University has supported amateur work on cataclysmic variable stars for many years; he will talk about ***New CCD Projects for Amateur Telescopes***.
Dr Peter Wheatley is a lecturer at Leicester University, and is one of the instigators of the Wasp Project; he will update us on this project, and will also talk about ***Robotic Telescopes: a Threat to Amateur Observers?***
Tonny Vannmunster is CBA Belgium (Centre for Backyard Astrophysics), and as such, he has, for many years, conducted publishable, unfiltered, time-series photometry on targets of interest. He will be talking about ***CCD Photometry of Transient Objects.***
Dr Richard Beare is the Faulkes Telescope Project Director of Education, based at the University of Warwick. He will talk about ***Photometric Projects using the Faulkes Telescopes*** using the free software (DS9) and a spreadsheet to measure and analyse surface brightness profiles of galaxies, along with other techniques that are being used on Faulkes telescope data.

Workshop sessions, include ***Nick James*** on ***Cometary Photometry***, with a live demonstration, and ***Richard Miles*** on ***Asteroid Photometry***. It is hoped that there will be time for a **Discussion Session** in which representatives of the VS will briefly mention initiatives that are being set up to assist the new observer, and you have the opportunity to tell us how you would like more assistance.

All day software try-out sessions
PCs will be available in a side room providing the opportunity to try out popular photometry software including the widely-used AIP4Win. This software is being updated regularly; give

us your feedback so that we can collate all comments to feed back to the authors. Try out the VS Section Data Template, being designed to help you to organise and check out your reduced photometry; feedback on this is welcomed.

Poster Displays of current work

There will be poster displays of the VS CCD Target list (the new CCD charts will be available on the day, too), and of real science already being done by amateurs; come along to find out, and join existing collaborations, or set up new ones. Bring along posters showing any work that you are doing, to encourage discussion and collaboration.

CCD Linearity Testing

John Saxton has kindly agreed to bring along equipment for testing the linearity of CCD cameras, so if you would like to know exactly how well your camera performs then, bring it for testing. You will need to bring along all that you need to operate your camera and save images for analysis; if you are in any doubt, or need the use of a PC, please let the meeting organisers know in advance.

Sunday Programme

There will now also be a Sunday session at which amateurs will talk about their work, and discuss the finer points of good photometry. This will hopefully be a more relaxed session, at which all are encouraged to attend and contribute, even very short items. Attendees who are already planning on speaking at this session include: ***David Boyd, Richard Miles, Steve Parkinson, Roger Pickard, John Saxton, Stan Waterman***

If you would like to speak at this session, it would be appreciated if you could inform the organisers, although it is hoped that there will be plenty of time for unscheduled talks on the day. So do turn up with your slides/OHP transparencies/laptop, if you have something to talk about.

If you require accommodation for the Saturday night, we will endeavour to recommend a reasonably-priced local hotel that can accommodate as many people as possible, so that the discussions can continue into the Saturday evening. Please contact us, for more details. Once a suitable hotel has been found, it will be posted on the Instruments and Imaging section web page (http://www.britastro.org/iandi/), together with details of this meeting.

Meeting Organisers: Karen Holland, Bob Marriott and Roger Pickard

Two-Day Alston Hall Variable Star Section Meeting October 22nd to 24th 2004

This Meeting, as with the highly successful previous two day Section meeting, will be held at Alston Hall, Preston. The star attraction, if I may refer to him like that, will be that great US observer Mike Simonsen. Indeed, Mike has already promised us at least two talks (although in my experience it is difficult to get him to stop talking anyway!).

It is probable that the meeting will commence Friday afternoon and finish immediately after lunch on the Sunday. Many people will probably need to take the Friday off work, and it is considered better to commence the meeting earlier on the Friday than we did last time.

However, finishing earlier on the Sunday will allow people more time to travel home afterwards. I hope this arrangement will meet everyone's approval.

Watch out for the announcement of when you can book, as after a certain date the meeting will be open to all BAA members and not just VSS members.

Also, please consider bringing along a poster display of any interesting work you have been doing over the last couple of years or so. If you are not able to attend the meeting you can always send me your poster for display.

Pro-Am Liason Committee (PALC) - VS

This committee has not met since its 21st meeting on May 8, 2000, and it has therefore been agreed that it is far easier to continue discussions via email, rather than trying to arrange a suitable time when everyone can meet up. In addition, there has not been the amount of matter that has demanded PALC's attention since that time, and therefore it has been unanimously agreed that we should terminate PALC-VS forthwith. PALC met on 21 occasions, following its formation in 1988 and a short history was given in VSSC 100, page 8.

New BAAVSS Alert Group

Following on from the note which appeared in the last VSS Circular (VSSC 118, pg 2) regarding a discussion group relating to Variable Star alerts, this group has now been set up.

The aims of the group are to distribute information on Variable Star activity currently observed by BAAVSS members. This could be anything from a faint or bright min/max of a Mira star, a recovery or fade of an RCB star, an outburst of a UG star, or simply a query on an observation of a binocular object - anything which may be of interest to others. The group will also enable
the VSS to pass on information of chart updates, meetings etc.

To join the group, simply send an e-mail with the subject 'subscribe'
to...

baavss-alert-subscribe@yahoogroups.com

or you can visit the web page and subscribe through there if you wish...

http://groups.yahoo.com/group/baavss-alert/

This group is not intended to replace TA E-circulars. You should continue to subscribe to these for rapid discovery information. Also lists of nightly observations will not appear here. These are well provided for by vsnet-obs, and those wishing to report nightly should continue with VSNET.

If you encounter any problems subscribing or unsubscribing, please contact the BAAVSS-Alert administrator, Gary Poyner at garypoyner@blueyonder.co.uk.

V426 OPHIUCHI - A PROFESSIONAL REQUEST FOR OBSERVATIONS

ROBERT SMITH

From 20-23 July 2004 my student Alex Dunford and I will be observing two bright cataclysmic variables, **RU Pegasi** and **V426 Ophiuchi**, with the William Herschel Telescope (WHT) on La Palma. We are aiming to get spectra at high time and spectral resolution, so that we can map the intensity variations over the cool secondary stars in these systems, looking for patches of irradiation and possibly for starspots. (You can find a paper on this topic, by our collaborators Vik Dhillon and Chris Watson from Sheffield, in the astro-ph archive at **http://xxx.soton.ac.uk/list/astro-ph/0302?100/** - look for abstract 0302115.)

Both stars are believed to be dwarf novae, although the status of V426 Oph is uncertain. Because most of the light in dwarf novae comes from the accretion disc rather than from the cool star, we are keen to catch both systems between outbursts. However, our observing dates are fixed, so the next best thing is to discover, either during or after the observations, what state the systems were in at the time of the observations; this is not easy to determine directly from the spectroscopy, so we should very much like some monitoring of these objects in the period leading up to and covering the observations, and preferably for the whole of June, July and August 2004, in order to get a complete picture of the context of our observations. RU Peg is already on the VSS observing list, so I would just ask for special attention to it during these months. However, V426 Oph is not currently a VSS target object, so I would be grateful if some of you would take it on, at least for these three months.

According to the catalogue of Ritter & Kolb (http://physics.open.ac.uk/RKcat/), V426 Oph is a Z Cam object, with a V magnitude range of 11.5 to 13.4. However, the Downes et al catalogue (http://icarus.stsci.edu/~downes/cvcat/) gives it as ugz/dq:, which means that it may be a Z Cam object but may also be a DQ Her object (otherwise known as an intermediate polar, which is a novalike object with a magnetic white dwarf). The AAVSO data suggest that the Z Cam classification is more likely, but the scatter is too large to be conclusive, so photoelectric/CCD observations would be particularly valuable; use of a V filter is preferred, but if you are aware that another observer will be monitoring with a V filter at the same time, then use of an R or B filter might provide additional information. Our own, much earlier observations (spectra from March 1987) show the spectrum of the cool star clearly, so we are optimistic that we can get useful observations this time, but we would certainly like to know the status of the system. All VSS observations will be fully acknowledged in our (eventual) paper on the data.

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DATABASE NEWS

JOHN SAXTON

Change to Input Procedure

Following discussions with other members of the VSS committee, I intend to make some changes to the way in which data are entered into the database. The aim is to make the operation as automatic as possible, and to require as little intervention as possible on my part.

The largest change is that I would like observers to process their data through my software, before it is sent to me. I can supply the software on CD-ROM, together with instructions for its use. In particular, I now require observers who use the Excel input format to process their data prior to submission. Pre-processing of the old format files would also be very much appreciated, but in this case, this is not an absolute requirement since I don't want to put off beginners. In fact, I understand that this is something similar to the process adopted by the AAVSO, who also have some input software.

I have arranged things so that once you have installed the software on your computer, and saved the data from Excel or otherwise prepared the data file, pre-processing is as easy as 1-2-3. Specifically: you edit input1.txt, which should contain a list of the files to be processed; run input2.exe which creates a batch file of things to do next; then run input3.bat which starts the processing. That's it. Full instructions are provided with the software.

Data Processing

If you are curious as to what goes on during the input processing, here's a brief description of what the software does.

- Converts the file to the original (Dave McAdam) format, if necessary.
- Looks up the star to see if it is on our programme; each star on our programme has an ID number.
- Attempts to read the observer's estimate (if what you have entered is unintelligible, you get an error message!).
- If the star is on our programme, the software looks up our sequence files.
- It attempts to match the observer's sequence with that on disc.
- If there is a match, it checks the observer's derived magnitude.
- One of the sequences in our files is flagged as the *best* one; the software also works out a *best magnitude*.

So if all goes well, we end up with three magnitudes: the *observer's magnitude*, the *check magnitude* (which should be the same as the observers!) and a *best magnitude*.

The software writes all the processed and checked observations to a *buffer file*, which has the file type .BUF. This is an ascii file, with 21 data fields on each line. The fields are separated with a backslash, and are shown on the next page:

column	*quantity*	*notes*
1	**JD**	
2	**Year, Month, Day, Hour**	
3	**UTC/GMAT Flag**	
4	**Object Name**	
5	**Object Number**	
6	**Sequence Number**	(for software use only)
7	**Sequence i.d.**	e.g. 073.01 or TA930722
8	**Estimate**	
9	**Qualifier for Next Column**	qualifier is <, >, [, or]
10	**Magnitude Deduced by Observer**	obsmag
11	**Qualifier for Next Column**	
12	**Magnitude Deduced by me**	ckmag
13	**Qualifier for next Column**	
14	**Deduced Magnitude (Best)**	bsmag
15	**Instrument**	maximum 10 instruments, 20 characters each
16	**Class**	
17	**Comment**	maximum 30 characters
18	**Observer name**	
19	**Observer code**	
20	**Location (latitude, longitude)**	
21	**Input file**	e.g. ABCMAR01

If the star is not on our programme, then it can't do all this checking, and the star ID number is just set to zero. In this case there are no check and best magnitudes. It may also happen that it can't match the sequence, in which case there will also be no check or best magnitudes. These are not great problems, since in principle, software could be written to deal with these cases later on, after the buffer file has been created. However, I would hope that failure to identify the star or sequence might prompt observers to check their input data against the appropriate index files from the CD.

The buffer file format is practically the same as the database proper. Briefly, the database files are now organised into years (with the exception that year 2000 actually contains all data entered by Dave McAdam, i.e. all data up to and including year 2000); and for each year there is one file for each programme star. So going from the buffer files to the database itself is really just a large sorting operation. (They are called *buffer files* since they are an intermediate step between what the observer types in and the actual database).

Pre-processing of data offers the following advantages:

- Data are guaranteed to be in a standard computer readable format.
- Errors are corrected at the observer's end before they arrive in Lymm.
- The easier that processing is at my end, the less likely files (and observations) are to go missing. Sorry, I'm only human!
- I will be able to do more useful database tasks, such as improving the input and interrogation software.

Problems with the input software

I freely admit that the current input software has some shortcomings. The most serious two are that it cannot cope with old archive data that has more than one observer in one file, and it also cannot cope with Greek letters. Additionally, it cannot handle filenames of more than 8 letters, and the total estimate must be no more than 30 characters long. These problems largely concern archive and naked eye data. I hope to address these problems this year. Files containing these features cannot presently be processed. In the meantime, I ask that people entering data adhere to the following guidelines:

- Use three letter abbreviations for Greek letters (i.e. the first three letters). These can be all upper case, or all lower case, but not mixed. (OK, pi and xi have only got two letters). I realise there are some data with full names of the Greek letters; don't panic, I'll try and take this into account when I update the software.
- Use three letter abbreviations for the constellations. These can be all upper case, or first letter upper case and next two lower case, but not any other combination.
- If there is more than one estimate for one observation, then the estimates must be separated by commas. (The last estimate does not have a comma after it).
- Spaces do not matter; so Alp Cas is the same as ALPCAS.
- The numbers for the fractional estimates go in parentheses.
- If you are entering data with Greek letters and the estimate comes to more than 30 characters, just enter the full estimate anyway - the revised software will be able to cope with longer estimates.

In due course, I hope to issue a full, formal, definition of the database format, but there isn't much point actually doing this until the software has been modified. Just in case you were wondering, the input software presently consists of well over 4000 lines of Fortran code.

Input File Names

One small change, which would make database operation much simpler, concerns data file names. I should probably have issued a decree on this subject some time ago (that's my fault!). File names should (1) be unique on my computer (2) identify from whom the data came (and if they submit regularly, which period of time is covered) (3) Be valid with my software. Since the input software is DOS-based, that means no more than 8 characters. So, supposing your observer code is ABC:

- If you submit data (usually) monthly: ABCJAN04.BUF, ABCFEB04.BUF etc...
- If you submit one, or a few files, per year, then: ABC01Y04.BUF, ABC02Y04.BUF for the first and second files submitted in 2004, etc...
- If you are entering archive data, then as (2) above, but ABC01A04.BUF, ABC02A04.BUF etc... If you do not have a three letter code, then I will assign you one.

Filenames are not case sensitive.

And finally... many thanks to all the data contributors for your continued support of the VSS database. If you adhere to the above guidelines, it will be very much appreciated by me, and will help to make the data available to other astronomers more quickly.

RECURRENT OBJECT PROGRAMME NEWS

GARY POYNER

DK Cas

An outburst of this star was detected by Chris Jones on Aug 22.974 at 15.4, and confirmed by Mike Simonsen on Aug 24.359 at 15.3.

A further outburst was detected by G. Poyner on Nov 23.989 at 16.1, although this remains unconfirmed.

V1316 Cyg

Possibly the first ever recorded outburst of this star was detected by Mike Simonsen on September 21.169 at 14.6. By September 23.046 it had faded to visual magnitude 15.8, as observed by Canadian observer Dan Taylor. A re-brightening to magnitude 15.0 was detected on Sep 20.235 again by Simonsen. By October 13th the star had faded below magnitude 17.0. Following an e-mail request to various observers, David Boyd responded with a 107 minute CCD V band photometric run (10" Newtonian f/3.6 with HX516 and V-filter) on October 4th, with the resulting light curve shown below. Could this be a small amplitude hump? David's was the only photometry received, so we'll have to wait until the next outburst for a more detailed coverage.

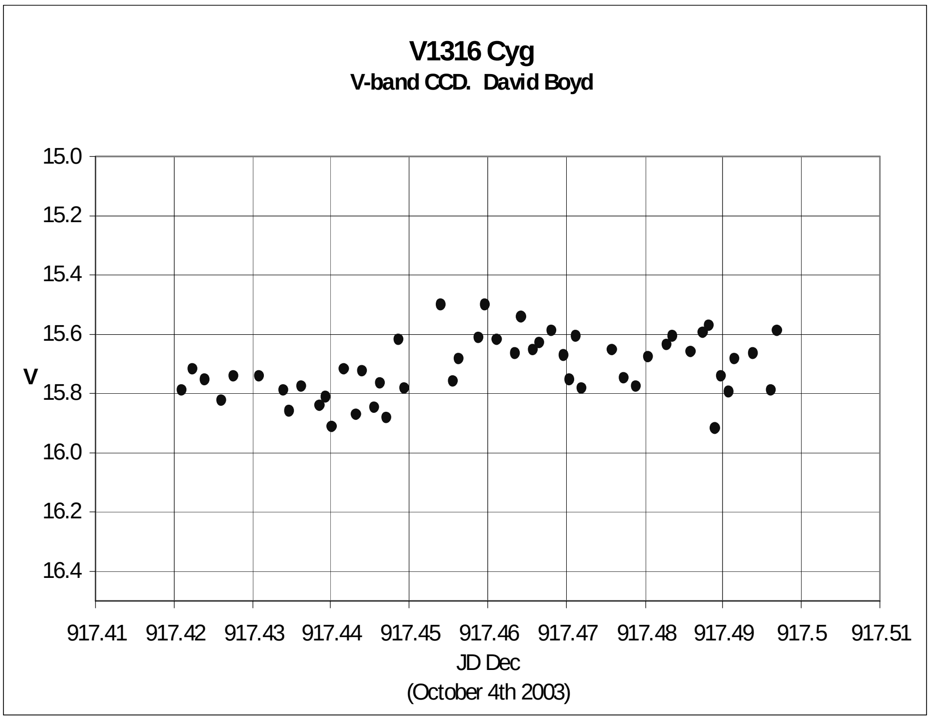


Figure 1. V1316 Cyg CCD Observations by David Boyd

Figure 2: Image of V1316 Cyg taken on Oct 4.924 by D. Boyd

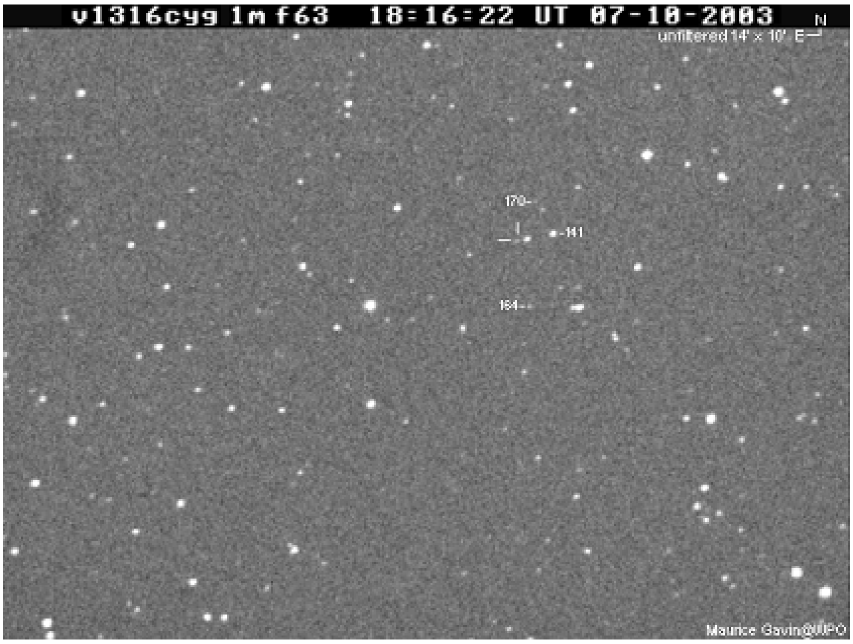


Figure 3: Image of V1316 Cyg taken on Oct 7.761 by Maurice Gavin

The position of V1316 Cyg is incorrectly shown in Downes & Shara (PASP 1993). This was noted by Bruce Summner in September 2000 (vsnet-id 263), following reports to VSNET of an ongoing outburst.

CP Dra
This was detected in outburst by G. Poyner on Nov 24.058 at 14.8, and subsequently confirmed by P. Schmeer on CCD images taken earlier on Nov 20.505 (14.7R) remotely from Germany, although it was not checked until after the outburst announcement. The previous outburst occurred in January 2003.

EI Psc (1RXSJ232953.9+062814)
The first visual outburst of this recent addition to the ROP was detected independently by Dubovsky (Nov 27.723, 12.3); H. McGee (Nov 27.817, 12.8) and C. Jones (Nov 27.826, 12.4). The outburst proved to be a short one, and by Nov 29.843 it had faded to 15.4.

TY Vul
A rare outburst of this object was detected on a remotely taken CCD image with the University of Iowa, Rigel Telescope (0.37-m Cassegrain) by P. Schmeer on Dec 02.063 at 14.9R. This was the first recorded outburst detected since September 1999. Superhumps with an amplitude of 0.3-0.4 magmitude were detected, with an evolving superhump period of between 0.0798d and 0.0801d observed between December 7th and 9th respectively (vsnet-collaboration and CBA). TY Vul has therefore been confirmed to be a new UGSU star.

UZ Boo
An extremely rare outburst of UZ Boo was detected by Pavel Dubovsky on December 5.184 at magnitude 12.8, and confirmed by Arto Oksanen on Dec 6.0 at 12.9V - the first outburst detected since that marvellous event back in August 1994. Early superhumps (amplitude 0.11 magnitude) were detected by Tonny Vanmunster on Dec 9th following a 1.7 hour CCD run. These early superhumps had grown to 0.19 magnitude by Dec 10th following a further 1.9 hour CCD run by Tonny. Following further photometric runs by the Kyoto team and other observers who had reported to vsnet-collaboration, a final true superhump period of 0.06198d has been established, thus confirming observations made in 1994 (Kato et al. 2001, PASJ 53, 1191; also Kato et al. 2003, PASJ 55, 989). A rapid fading was reported on Dec 18th, with an appeal to monitor for a rebrightening (as with other WZ Sge stars). This indeed occurred on Dec 20.79 at ~13.9R, as reported on VSNET by Katsura Matsumoto. A second rebrightening occurred on Dec 23 (Kyoto team, Nakajima and Dubovsky), a third on Dec 28th (Itoh), and a fourth on Dec 31.8 (Matsumoto). Arto Oksanen reported UZ Boo at 15.1V on Jan 02.1

Visual coverage of this outburst has been sparse compared to the 1994 outburst (see VSSC 82 Dec 1994, pg 5) which occurred in the more favourable month of August, although excellent time-series photometry has been achieved by CCD observers worldwide, interspersed with visual observations from observers who made important morning observations of the outburst.

V725 Aql
An outburst of this star was reported by Chris Jones on Dec 28.731 at 13.7, the first seen since August 2000. Unfortunately the observation was not confirmed due to the low position of the field in the western sky in the evening during December.

LETTERS

Tony Markham sent this reply to Alex Vincent's interesting letter about eclipsing binary nebulae, published on page 10 of VS118:

It's quite a while since I was at university, but I recall that in HII regions like the Orion nebula, the luminous stars emit ultra violet light which then ionises the atoms in the nebula. The visible light that we see from the nebula is the result of electrons recombining with these atoms. The timescale for these recombinations is presumably somewhat longer than the eclipse duration and therefore I wouldn't expect to see any brightness variation in the nebula itself.

I also doubt that we would see variations in reflection nebulae at times of eclipses as the range of distances of the atoms of the nebula from the stars will presumably be such that the range of light travel times is considerably longer than the duration of the eclipse.

Its probably worth checking the above with someone who has more day-to-day experience with the physics involved, but my conclusion would be that we wouldn't see nebula brightness variations as a result of eclipses.

Tony Markham

REDUCTION IN THE SIZE OF THE ECLIPSING BINARY PROGRAMME

TONY MARKHAM

The Eclipsing Binary programme contained approx 140 stars as of the end of 2003. In most years, however, observations are reported for only about a third of the stars on the programme, and it tends to be mostly the same stars each year.

A further issue is that most of the charts for the variables on the programme do not meet the current defined chart standards. Hence the VSS is faced with the prospect of needing to redraw large numbers of charts, with a significantly risk that observations may not subsequently be received for many of the stars involved.

It would be more manageable to cut the Eclipsing Binary programme to about half of its current size.

Following discussions with the previous Eclipsing Binary Secretary, Melvyn Taylor, the following transitional list of 95 stars has been compiled. Only those stars highlighted in bold have been observed in recent years. The aim is to revise this list in early 2005 in order to reduce it to about 70 stars. Priority will be given to those stars that have been observed in eclipse, so if you want to to ensure that a particular star retains its place on the programme, make a point of observing it in 2004!

	RA 2000	Dec	Max	MinII	Min I	Period d	D h	Chart
TW And	**00 03.3**	**+32 51**	**8.8**	**8.9**	**10.9**	**4.12**	**13**	**1984Dec22**
AB And	23 11.5	+36 54	9.5	10.2	10.3	0.33	EW	1984Dec22
AD And	**23 36.7**	**+48 40**	**10.9**	**11.6**	**11.6p**	**0.99**	**EB**	**1984Dec22**
BX And	02 09.0	+40 48	8.9	9.2	9.6p	0.61	EW	1984Dec22
ST Aqr	22 21.0	-06 58	9.2	9.4	9.7	0.78	EB	1984Dec23
OO Aql	**11 19.8**	**+09 18**	**9.2**	**9.8**	**9.9**	**0.51**	**EW**	**1984Dec23**
V346 Aql	20 10.0	+10 21	9.0	9.1	10.1p	1.11	5	1984Dec23
V822 Aql	19 31.3	-02 07	6.9	7.1	7.4	5.29	EB	1972Feb06
SX Aur	05 11.7	+42 10	8.4	8.9	9.1	1.21	EB	1984Dec23
TT Aur	05 09.5	+39 36	8.6	9.0	9.5p	1.33	EB	1984Dec24
WW Aur	**06 32.5**	**+32 27**	**5.8**	**6.4**	**6.5**	**2.53**	**6**	**ISGem**
AR Aur	**05 18.3**	**+33 46**	**6.2**	**6.7**	**6.8**	**4.13**	**7**	**1984Dec24**
BF Aur	05 05.0	+41 18	8.8	9.5	9.5	1.58	EB	1984Dec23
EO Aur	**05 18.3**	**+36 38**	**7.6**	**7.9**	**8.1**	**4.07**	**12**	**ARAur**
HL Aur	**06 19.2**	**+49 43**	**10.8**	**11.0**	**11.9p**	**0.62**	**EB**	**1984Dec23**
IM Aur	**05 15.5**	**+46 25**	**7.9**	**8.1**	**8.5**	**1.25**	**6**	**1972Feb04**
IU Aur	**05 27.8**	**+34 47**	**8.2**	**8.7**	**8.8**	**1.81**	**EB**	**1984Dec24**
LY Aur	**05 29.7**	**+35 23**	**6.7**	**7.3**	**7.4**	**4.00**	**EB**	**ARAur**
ZZ Boo	**13 56.1**	**+25 55**	**6.8**	**7.4**	**7.4**	**4.99**	**7**	**252.01**
AC Boo	14 56.5	+46 22	10.0	10.6	10.6	0.35	EW	1984Dec24
AD Boo	14 35.2	+24 38	9.8	9.9	10.4p	1.03	EB	1984Dec23
UU Cnc	08 02.5	+15 11	8.7	9.2	9.4	96.71	EB	1985Jun08
WY Cnc	09 01.9	+26 41	9.5	9.6	10.1	0.83	3	1985Jun08
XZ Cnc	08 29.3	+13 13	9.8	10.2	10.2p	1.11	EB	TWCnc
GO Cnc	09 17.6	+16 55	8.3		8.8p			1984Jun08
RS CVn	**12 13.2**	**+35 56**	**7.9**	**8.2**	**9.1**	**4.8**	**13**	**253.01**
UW CMa	07 18.7	-24 34	4.8	5.3	5.3	4.39	EB	1985Jun08
RX Cas	23 03.1	+67 35	8.6	9.5	9.5	32.31	EB	1985Jun08
RZ Cas	**02 48.9**	**+69 38**	**6.2**	**6.3**	**7.7**	**1.2**	**5**	**246.01**
TV Cas	**00 19.3**	**+59 08**	**7.2**	**7.3**	**8.2**	**1.81**	**8**	**WZCas**
TW Cas	**02 45.9**	**+65 44**	**8.3**	**8.4**	**9.0**	**1.43**	**5**	**1985Jun08**
TX Cas	02 52.2	+62 47	9.2	9.6	9.8	2.93	EB	1985Jun08
AB Cas	**02 37.5**	**+71 18**	**10.1**	**10.3**	**11.9**	**1.37**	**6**	**1986Jul05**
BM Cas	**00 54.8**	**+64 05**	**8.8**	**9.0**	**9.3**	**197.28**	**EB**	**1986Jul05**
DO Cas	**02 41.4**	**+60 33**	**8.4**	**8.6**	**9.0**	**0.68**	**EB**	**1986Jul05**
U Cep	**01 02.3**	**+81 53**	**6.8**	**6.9**	**9.4**	**2.49**	**9**	**1994Mar13**
VW Cep	**20 37.4**	**+75 36**	**7.2**	**7.6**	**17.7**	**0.28**	**EW**	**1972Mar21**
EG Cep	**20 16.0**	**+76 49**	**9.3**	**9.6**	**10.2**	**0.54**	**EB**	**1986Jul05**
EI Cep	**21 28.5**	**+76 24**	**7.5**	**8.0**	**8.1**	**8.44**	**12**	**VWCep**
GK Cep	**21 31.0**	**+70 49**	**6.9**	**7.4**	**7.4**	**0.94**	**EB**	**1971Dec02**
SS Cet	02 48.6	+01 46	9.4		13.0	2.97	9	1982Jun08
U CrB	**15 18.2**	**+31 39**	**7.7**	**7.7**	**8.8**	**3.45**	**12**	**254.01**
Y Cyg	**20 52.1**	**+34 39**	**7.3**	**7.8**	**7.9**	**3.00**	**7**	**1986Jul06**
SW Cyg	**20 07.0**	**+46 18**	**9.2**	**9.3**	**11.8**	**4.57**	**13**	**1986Jul06**
BR Cyg	19 40.9	+46 47	9.4	9.6	10.6	1.33	6	1986Jul06
V367 Cyg	**20 48.0**	**+39 17**	**6.7**	**7.2**	**7.6**	**18.60**	**EB**	**Y Cyg**
V448 Cyg	20 06.2	+35 23	7.9	8.4	8.7	6.52	EB	1986Jul06

	RA 2000	Dec	Max	MinII	Min I	Period d	D h	Chart
V477 Cyg	20 05.5	+31 58	8.5	8.7	9.3	2.35	4	1972Feb05
V1143 Cyg	19 38.7	+54 58	5.9	6.1	6.4	7.64	4	1986Jul06
Z Dra	11 45.5	+72 15	10.8	11.0	14.1p	1.36	5	1993Jan10
TW Dra	**15 33.8**	**+63 54**	**7.3**	**7.4**	**8.9**	**2.81**	**11**	**1993Oct23**
AI Dra	**16 56.3**	**+52 42**	**7.1**	**7.2**	**8.1**	**1.20**	**5**	**1971Jul17**
BH Dra	**19 03.7**	**+57 27**	**8.0**	**8.1**	**8.6**	**1.82**	**5**	**1972Apr10**
S Equ	**20 57.2**	**+05 05**	**8.0**	**8.1**	**10.1**	**3.44**	**11**	**1972Jun10**
68u Her	**17 17.3**	**+33 06**	**4.7**	**4.9**	**5.4**	**2.05**	**14**	**1971Aug27**
Z Her	17 58.1	+15 08	7.3	8.2	8.2	3.99	11	1972Feb06
RX Her	18 30.7	+12 37	7.3	7.7	7.9	1.78	6	V451Oph
TX Her	17 18.6	+41 53	8.5	9.0	9.3	2.06	4	1986Jul06
SW Lac	**22 53.7**	**+37 56**	**8.5**	**9.3**	**9.4**	**0.32**	**EW**	**1987Nov**
VX Lac	22 41.0	+38 19	10.9		13.0p	1.07	4	1987Nov
AR Lac	**22 08.7**	**+45 45**	**6.1**	**6.4**	**6.8**	**1.98**	**7**	**1971Feb13**
AW Lac	22 18.0	+54 28	10.6	11.2	11.3p	1.14	EB	1987Nov
CM Lac	**22 00.1**	**+44 33**	**8.2**	**8.5**	**9.2**	**1.60**	**4**	**1987Nov**
UV Leo	10 38.4	+14 16	8.9	9.5	9.6	0.60	3	1987Nov
UZ Leo	10 40.6	+13 34	9.6	10.1	10.2	0.62	EW	UVLeo
Delta Lib	**15 01.0**	**-08 31**	**4.9**	**5.0**	**5.9**	**2.33**	**13**	**1987Nov**
NSV4031 Lyn	**08 23.0**	**+45 28**	**8.0**		**8.8**			**1987Nov**
Beta Lyr	**18 50.0**	**+33 22**	**3.3**	**3.9**	**4.4**	**12.91**	**EB**	**1993Dec03**
TT Lyr	19 27.6	+41 30	9.3	9.4	11.4	5.24	18	1987Nov
TZ Lyr	**18 15.8**	**+41 07**	**10.6**	**10.8**	**11.3**	**0.53**	**EB**	**1987Nov**
V505 Mon	06 45.8	+02 30	7.2	7.6	7.7	53.78	EB	1971Aug22
U Oph	17 16.5	+01 13	5.8	6.5	6.6	1.68	6	1971Dec12
V451 Oph	18 29.2	+10 53	7.9	8.3	8.5p	2.20	6	1972Jun12
V566 Oph	17 56.9	+04 59	7.5	7.9	8.0	0.41	EW	1972Jun11
ER Ori	**05 11.2**	**-08 33**	**9.3**	**10.0**	**10.0**	**0.42**	**EW**	**1987Nov**
V643 Ori	06 07.0	-02 55	10.7		11.5p	52.42	126	1987Nov
EE Peg	**21 40.0**	**+09 11**	**6.9**	**7.1**	**7.5**	**2.63**	**6**	**245.**
Beta Per	**03 08.2**	**+40 57**	**2.1**	**2.2**	**3.4**	**2.87**	**10**	**1971Jul17**
Z Per	02 40.0	+42 12	9.7	9.8	12.4p	3.06	10	1994Mar12
ST Per	03 00.1	+39 12	9.4	9.5	10.9	2.65	8	1994Mar12
DM Per	**02 26.0**	**+56 06**	**7.9**	**8.0**	**8.6**	**2.73**	**11**	**1972Apr09**
IQ Per	**03 59.7**	**+48 09**	**7.7**	**7.9**	**8.7**	**1.74**	**5**	**246.01**
IZ Per	**01 32.1**	**+54 01**	**7.8**	**8.3**	**9.0**	**3.69**	**11**	**1972Feb14**
Y Psc	23 34.4	+07 56	10.1		13.1p	3.77	9	1994Mar12
SZ Psc	**23 13.4**	**+02 41**	**7.2**	**7.4**	**7.7**	**3.97**	**10**	**1972Jun11**
U Sge	19 18.8	+19 37	6.5	6.7	9.3	3.38	14	1993Jan24
Lambda Tau	**04 00.7**	**+12 29**	**3.4**	**3.5**	**3.9**	**3.95**	**14**	**1993Oct22**
RW Tau	**04 03.9**	**+28 08**	**8.0**	**8.1**	**11.2**	**2.77**	**9**	**1984Dec18**
HU Tau	**04 38.3**	**+20 41**	**5.9**	**5.9**	**6.7**	**2.06**	**7**	**247.01**
BV Tau	**05 38.6**	**+22 55**	**11.7**	**11.9**	**12.4p**	**0.93**	**EB**	**1985Jan31**
CD Tau	**05 17.5**	**+20 08**	**6.8**	**7.3**	**7.3**	**3.44**	**7**	**1972Feb04**
X Tri	**02 00.6**	**+27 53**	**8.9**	**9.1**	**11.3**	**0.97**	**4**	**1982Jan01**
W UMa	**09 43.7**	**+55 57**	**7.8**	**8.4**	**8.5**	**0.33**	**EW**	**248.01**
TX UMa	**10 45.3**	**+45 34**	**7.1**	**7.1**	**8.8**	**3.06**	**9**	**1993Jan10**
Z Vul	**19 21.7**	**+25 34**	**7.3**	**7.6**	**8.9**	**2.45**	**11**	**255.01**

THE APPARENT M31 NOVA OF DECEMBER 18TH 2003

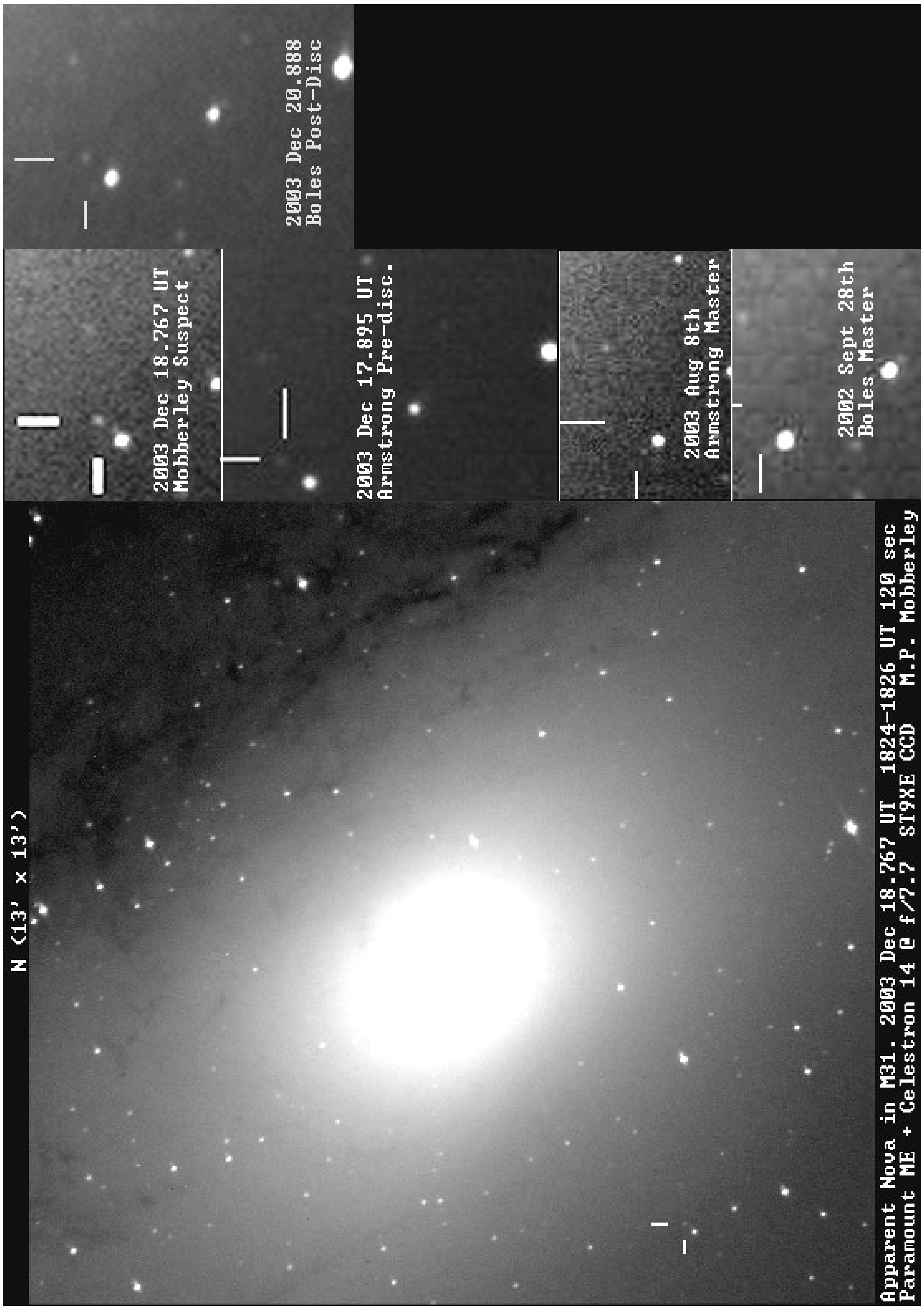
MARTIN MOBBERLEY

On December 18th 2003, after taking a set of six images of M31, on a whim, with the Celestron 14/Paramount ME at Cockfield (IAU 480), I spotted a new magnitude 16.7 object not far from a fading Nova in M31 that had been discovered two weeks earlier on an H-Alpha patrol by Marco Fiaschi. Initially I was reluctant to report it to anyone, as experience had told me there's no such thing as a free lunch, especially in the astro-discovery field and, to be honest, I'd rather miss a discovery than risk claiming a false one. However, after checking for asteroids, the DSS red and blue plates, existing M31 novae, and objects on the SIMBAD database, I phoned Tom Boles, who was sure it was a nova. There was a huge boost when Mark Armstrong reported a fainter (mag 18) image on one of his patrol shots from the night before. Guy Hurst trawled through a GCVS catalogue of 1,200 M31 variables for me, and none coincided with the object's position. At this point, December 20th, Guy e-mailed CBAT with the discovery details. On the same night, Tom managed to snatch a post-discovery image with his dome-based Paramount-C14 (useful in a howling gale). The object had already faded since the 18th. Unfortunately, due to Christmas, even hardened astronomers seemed to fade away at this point, and there was no feedback until the New Year. Guy announced the discovery on Jan 1st on The Astronomer E-Circular 1958, and CBAT finally announced it on IAUC 8262 on January 6th. I was the first discoverer: Fiaschi and his team had picked it up on their H-Alpha patrol some two nights later, and other professionals had been able to carry out photometry. Fiaschi's astrometry on December 20th gave a precise position of 0 43 04.77 +41 12 20.8, close to my own result, using a handful of stars clustered on one side of my image!

IAUC 8262 gave the following description, along with notes on two later novae in M31 discovered by Fiaschi:

The first object above was reported by M. Mobberley (Cockfield, England, from unfiltered CCD images; via G. M. Hurst), whose data are tabulated; by O. Smirnova (from blue photographs taken by A. Barzdis on 2003 Dec. 19.696 and 19.726 UT with the Schmidt telescope of the Astrophysical Observatory at Baldone; via A. Alksnis, University of Latvia; position end figures 04s.8, 23"); and by K. Hornoch (cf. IAUC 8248; R-band CCD frames taken on Dec.23.695 and 23.985; position end figures 04s.77, 23".0; offset 231" east and 226" south of the galaxy center). Further magnitudes for the first object (unfiltered CCD, with A = M. Armstrong, Rolvenden, England, except H = Hornoch, R-band; and S = Smirnova et al., blue photo): 2002 Sept. 28, [20.0 (T. Boles, Coddenham, England); 2003 Aug. 8, [20.0 (A); Dec. 9.732, [19.7 (H); 12, [19.5 (S); 17.895, 18 (A); 19.696, 18.6 (S); 23.695, 17.8 (H); 23.985, 17.9 (H); 24.825, 19.0 (H).

It was the 16th apparent nova in M31, discovered in 2003 (most are never confirmed spectroscopically). I am greatly indebted to Guy, Mark and Tom for their considerable help in validating the object, and providing additional pre and post-discovery images. There can be few professional observatories in the world that could call upon such an experienced, efficient and totally dedicated trio to validate their discovery.


2003 Dec 20.888
Boles Post-Disc
2003 Dec 18.767 UT
Mobberley Suspect
2003 Dec 17.895 UT
Armstrong Pre-disc.
2003 Aug 8th
Armstrong Master
2002 Sept 28th
Boles Master
N (13' x 13')
Apparent Nova in M31. 2003 Dec 18.767 UT 1824-1826 UT 120 sec
Paramount ME + Celestron 14 @ f/7.7 ST9XE CCD M.P. Mobberley

V1329 CYG

GARY POYNER

When symbiotic stars are discussed, we generally think of an object which might spend long periods in quiescence, interrupted by the odd occasion when something might be seen to happen, only for this activity to cease and normality is resumed. Then every once in while, the star will undergo a sudden brightening or *outburst*, and spend several months in this highly active state before returning to minimum. One need look no further than Z And, CI Cyg and YY Her for examples of this behaviour. There are exceptions to the rule of course, with V1329 Cyg being a perfect example of this. Discovered in 1969 by Kohoutek (as HBV 475) through its peculiar emission spectrum; a search of plate archives revealed the star had undergone a Nova-like outburst in 1964, and was still at maximum brightness at the time of discovery - leading to it (and a few others, including AG Peg) to be termed a Symbiotic Nova.

Various plate searches revealed that the outburst detected in 1969 actually began in 1956, as the photographic magnitude rose from 15.5 to 14.2 in seven years. The outburst then followed the dramatic rise to mpg 12.5 in 1964, followed by a gradual fading [1]. Close monitoring of the star revealed a one magnitude periodic oscillation, with a period of 950-960 days. This was interpreted as an eclipse of the outbursting star by its M-type companion.

Only one spectrum was available before the 1964 outburst. This revealed an M-type star with no emission lines present [2]. However spectra obtained after 1964 display strong H I and weak He I emission. The line profiles in the spectra are extremely complex, and may be caused by an expanding gas cloud, or perhaps dust shells as observed in classical novae [3].

Figure. 1 shows the visual light curve of V1329 Cyg plotted from 728 observations made between 1990 and 2003. Its plain to see that the star is very active, with 6 *outbursts* detected

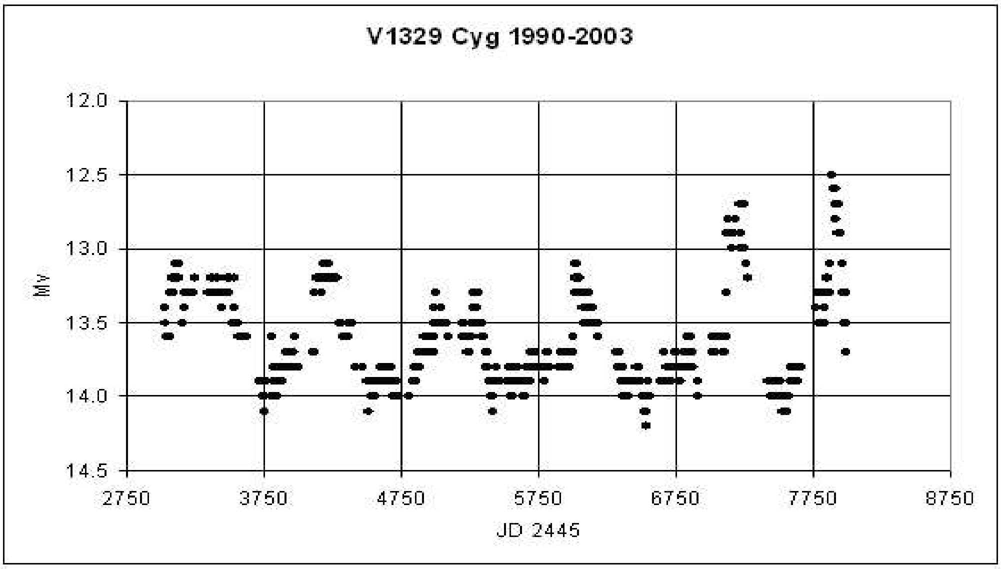
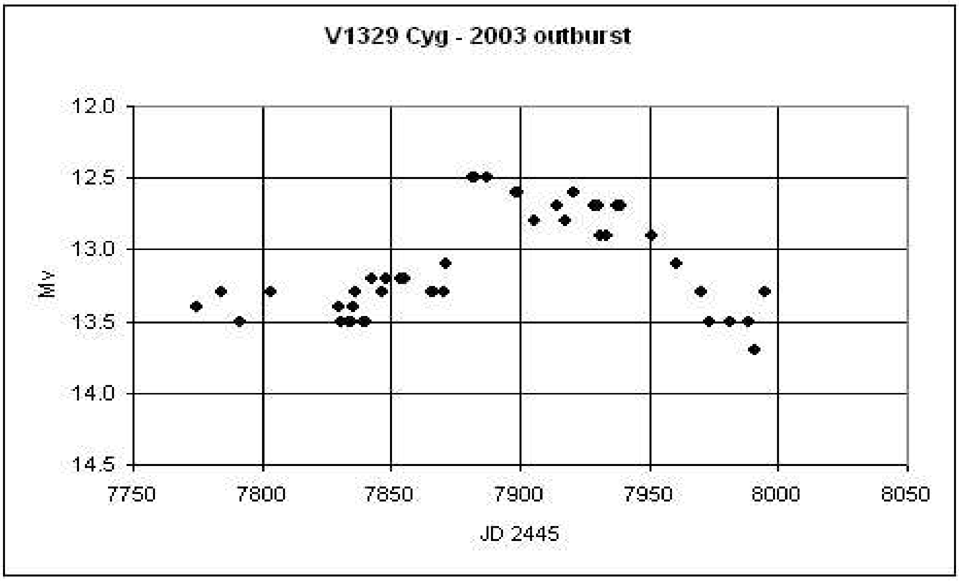


Fig 1. Visual light curve 1990-2003: Poyner

within this relatively short period. The eclipses mentioned above are also evident in the plot, and fall in line with the 950-960 day orbital period. From this light curve, it can be determined that the outburst interval had been increasing from 1991 through to the 2001 outburst - 1991-93 350d, 1993-95/6 448d, 1996-98 625d, 1998-01 777d. However the 2003 outburst came 558 days after V1329 Cyg had returned to quiescence in 2001 (here quiescence is regarded as visual magnitude 13.7). Can we expect this trend to continue in the future?

The 2003 outburst is shown in more detail in Fig. 2. The outburst lasted approximately 133 days, and peaked at magnitude 12.5 - one magnitude above minimum. This is similar to the previous outburst in 2001, which lasted 156 days, but peaked at a slightly fainter magnitude at 12.7. When the outbursts are examined in more detail however, it is seen that the duration of the outburst (time spent above magnitude 13.7) has been decreasing since 1990, yet the intensity of the outburst has been increasing with brighter magnitudes being reached! The 1990 outburst appeared to be double-peaked and of some 356 days duration. The 1993 outburst lasted 195d and was followed by another *double* outburst of some 349 days duration in 1995/6. The 1998 outburst lasted for 180 days. Is this also a repeating trend? Only further observations will determine these interesting points.

Fig 2 Visual light curve of the 2003 outburst: Poyner



As one of the least observed, but more interesting of symbiotic stars observable through amateur telescopes, V1329 Cygni is a prime target for further study by visual observers. Telescopes of 20-25cm aperture will reveal the star at minimum, whilst a 15cm will show it when it is bright. Continued study of the star's behaviour will reveal the interesting features of the outbursts described above, and help to determine whether these trends are real. How can you not observe it?

References:

1: Kohoutek L & Bossen H. 1970, Astrophys lett. 6, 157
2: Steinon, F. M., Chartrand M. R. & Shao C. Y, 1974 AJ, 79, 47
3: Tamura, S 1977 Astrophys lett. 19, 57

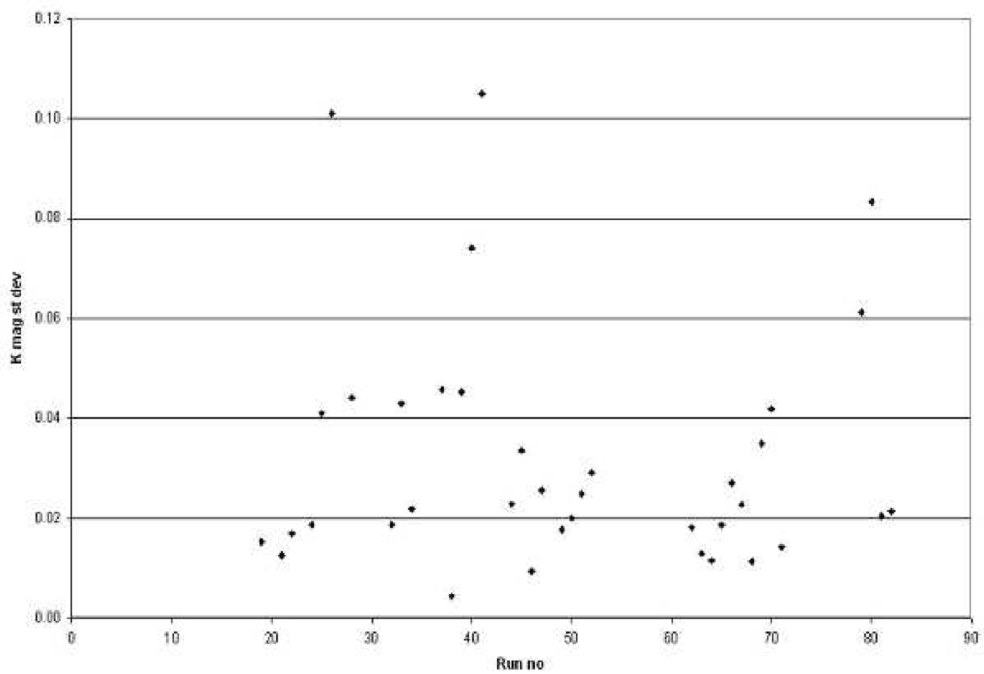
WHAT PHOTOMETRIC PRECISION CAN I ACHIEVE?

DAVID BOYD

If you start using a CCD camera to carry out photometry on variable stars, this is a question that sooner or later you will ask yourself. Prompted by discussions at the recent VSS meeting at Northampton, I decided to investigate the precision I've been able to achieve in time-series differential photometry measurements on variable stars over the past couple of years. I use a 250mm f/3.6 Newtonian reflector with a Starlight Express HX516 CCD camera, and, for wide field photometry, I use the HX516 with a 35mm focal length SLR camera lens. I normally attach a V-band filter in a custom-made holder to the front of the camera for variable star measurements, and I analyse the data using the multi-image photometry routine in AIP4WIN. 37 observing runs formed the basis for this analysis. Runs on objects other than variable stars are not included.

I based my assessment of achieved photometric precision on measurements of the magnitude of the check star (K) in each of these runs. The differential magnitude of the K star relative to the comparison star (C) should be constant over a run. The variation of the measured differential magnitude of K relative to C over a run therefore gives a measure of the photometric precision achieved in that run. I calculated the standard deviation of the measured differential K magnitude (hereafter just called the K standard deviation) for each run, and Fig 1 shows this for all the runs analysed.

Fig 1: Distribution of K standard deviation over all 37 runs



About a year ago, after run 44, I replaced the original parallel port interface for the HX516 with a USB interface. Results following the change seem to be better and more consistent, though this could be due at least in part, to a learning effect, as I became more proficient at taking and analysing data. To concentrate on the quality of the results I'm getting now, I've restricted the rest of this analysis to the 21 variable star runs carried out since I changed over to the USB interface.

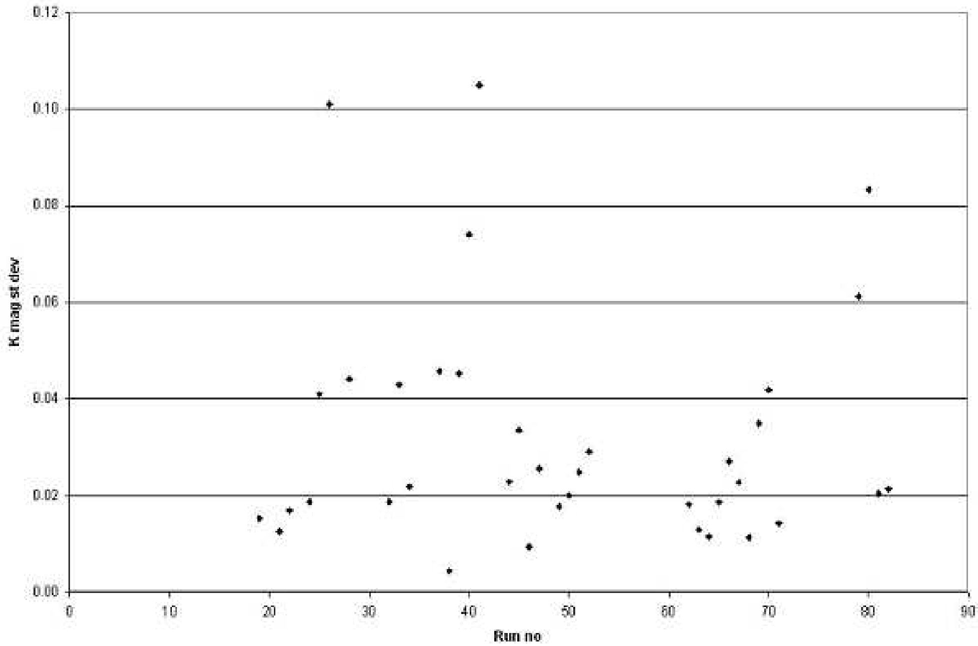


Fig 2: K standard deviation vs mean K magnitude for USB-based runs only

Figure 2 shows the distribution of the K standard deviation against the mean K magnitude for all the USB-based runs. The magnitudes of the K stars that were used ranged from 10.8 to 14.4. There is a slight trend of increasing standard deviation (=decreasing precision) at fainter magnitudes. However, this is not a large effect, presumably because I normally increase exposure times when measuring fainter stars to maximise the count rate, and maintain as high precision as possible. Increasing exposure times also increases my sensitivity to tracking errors, which potentially increases the scatter in the magnitude estimates, so this may be a contributing factor to the trend. For increasingly fainter stars, the counts obtained within reasonable exposure times will reduce, and the achievable precision will decrease more rapidly.

A major factor affecting the precision achieved is the photometric quality of the night sky. To assess this for each run, I looked at the variation of the calculated V, C and K instrumental magnitudes over the run. If these were essentially flat (apart from the effect of real stellar variation and possibly changing altitude) as in Figure 3 (overleaf), then I classified the night as good. In other circumstances as in Figure 4 (overleaf), I called it poor.

The distribution of K standard deviation for the 12 good nights is shown in Figure 5 and for the 9 poor nights in Figure 6.

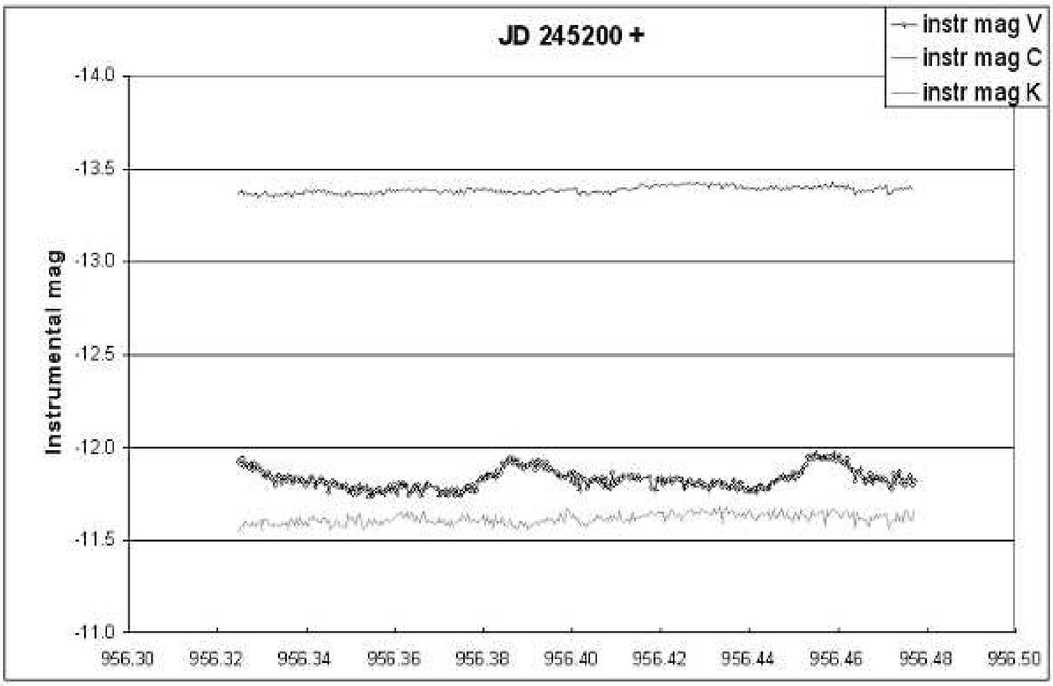


Fig 3: A good night

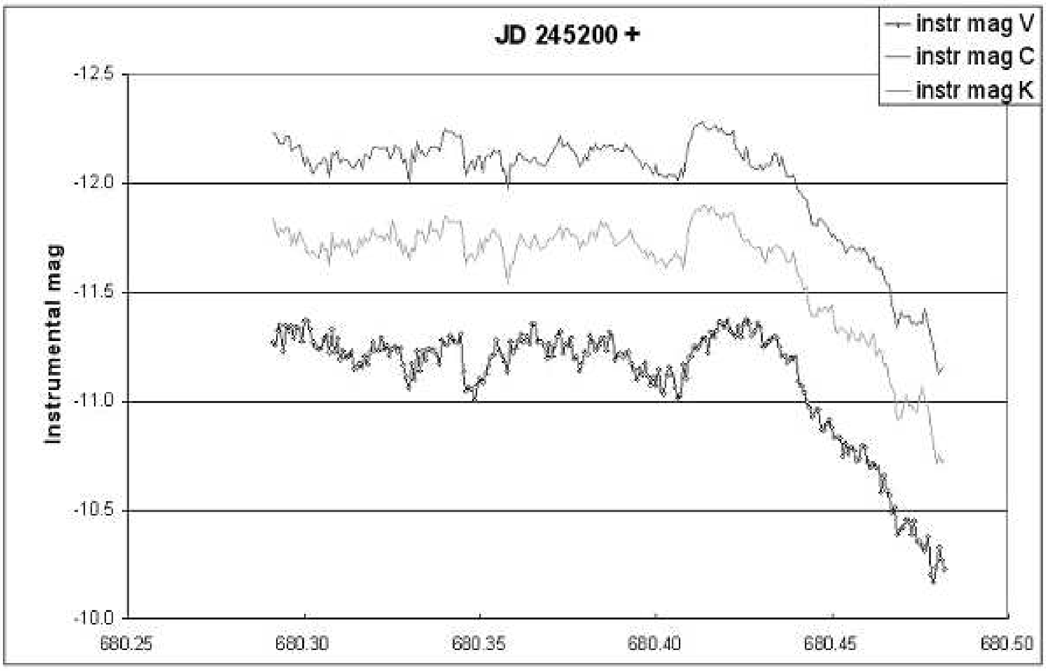


Fig 4: A poor night

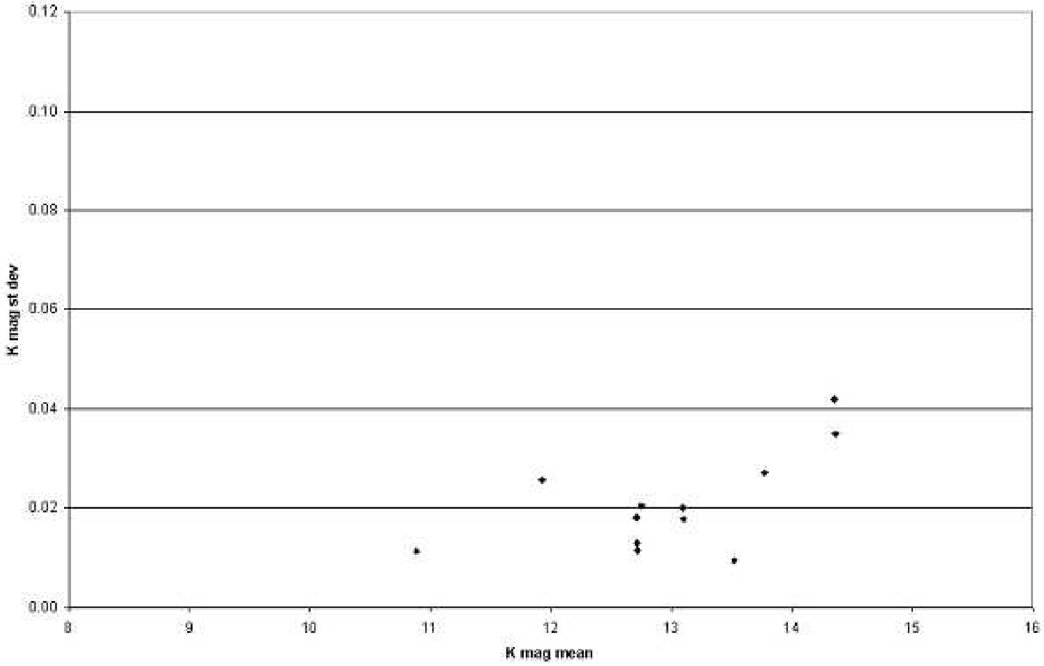


Fig 5: K standard deviation on good nights

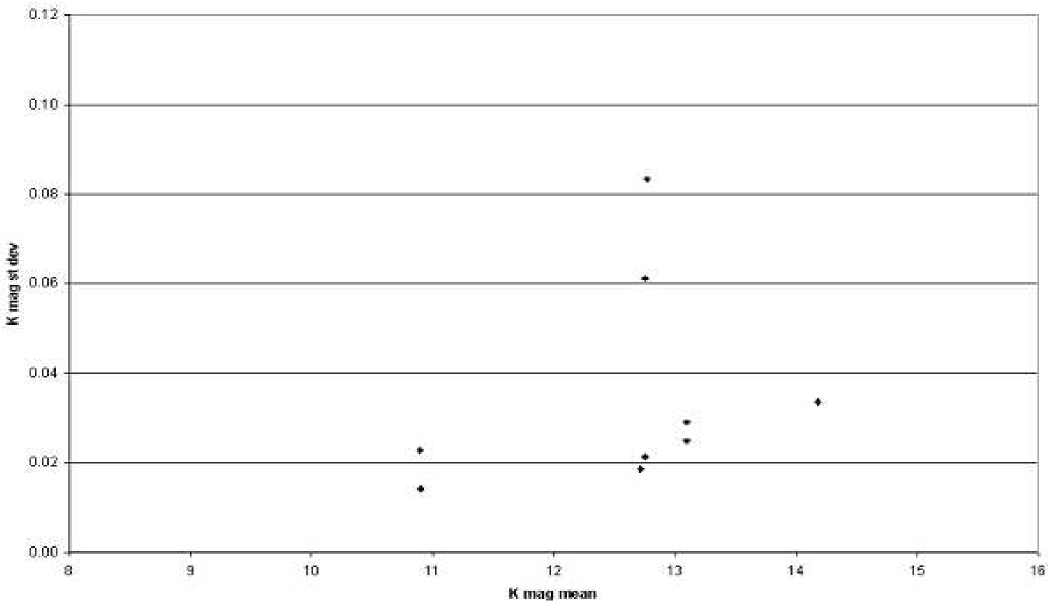


Fig 6: K standard deviation on poor nights

For good nights the average K standard deviation, which I am adopting as a measure of the precision achieved, is 0.021 magnitude, and for poor nights it is 0.034 magnitude. It's interesting to observe that there is only one run with a precision smaller than 0.01 magnitude. Although in theory, it should be possible to achieve precision better than this if the ADU counts are high enough, in practice this is rarely achieved, as it would require both the K and C stars to be comparable in brightness, and the exposure to be set so they both had the maximum possible peak count (subject of course to avoiding saturation and any effects of anti-blooming). Circumstances are rarely this cooperative.

I've also analysed 12 runs of one field taken at intervals throughout this period using a 35mm focal length camera lens set to f/4 attached to the HX516. The magnitude of the K star in these runs is 7.2. The average K standard deviation for these runs is 0.040 magnitude, somewhat larger than when using the telescope. These were all good nights.

The conclusion I draw from this analysis is that, on good nights, I can carry out time-series differential photometry using a 250mm telescope and CCD camera with an average precision of about 0.021 magnitudes, while on poor nights this drops to 0.034 magnitudes. These results span a magnitude range from 10.8 to 14.4. With a 35mm camera lens and CCD, the average precision is 0.040 magnitudes at magnitude 7. Precision better than 0.01 magnitude with this equipment is not realistically achievable. I hope this exercise will encourage others starting out in CCD photometry to investigate the precision they are able to achieve as this is helpful in deciding what projects to attempt.

Addendum

A separate but related question is whether it is possible to make a reliable estimate of the precision of an individual photometric measurement. I have, for over a year, been calculating a value for the error on my measured instrumental V, C and K star magnitudes in each image using the error formula given by Steve Howell in his book *Handbook of CCD Astronomy*. This incorporates Poisson errors on the star and sky ADU counts, the measurement aperture pixel counts, and various instrumental parameters. Adding the errors on the K and C star magnitudes in quadrature gives the calculated error on the K-C differential magnitude for each image in a run. Using the data I had now gathered together, I thought it would be interesting to compare this calculated error for the K star with the standard deviation of the measured magnitude of K used in the analysis described above. I therefore computed the mean calculated error for the K differential magnitude for each run and compared this with the standard deviation of the measured K magnitude for the same run.

Figure 7 shows the mean calculated error for the K magnitude from Howell's formula, plotted against the standard deviation of the measured K magnitude for each of the USB-based runs. Also plotted is a linear fit to the data. The parameters of this linear fit indicate that the two error values are related by a simple scale factor with the calculated error being about 84% of the measured error. The distribution of the residuals of the calculated errors from the linear fit has a standard deviation of 0.003 magnitude, indicating that the linear fit represents the data quite well. Although obtained for the K star, this relationship between the calculated and measured errors should be true for all stars measured in these images, at least within the magnitude range covered here.

This leads me to the conclusion that I can make a reasonable estimate of the error in the

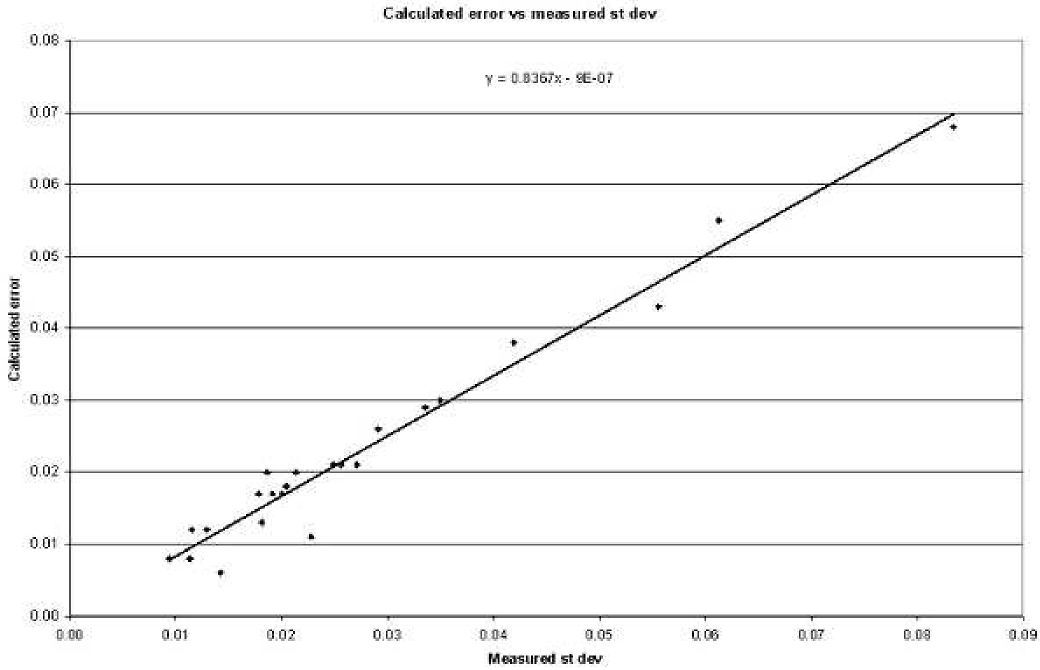


Fig 7: Calculated error vs standard deviation of measured K magnitude

photometric measurement of the magnitude of any star in an image by calculating the error using Howell's formula and multiplying it by a factor 1.2.

Howell S. B., Handbook of CCD Astronomy, pp 53-58, Cambridge University Press (2000)

CCD OBSERVING METHODS - A PERSONAL ACCOUNT

GRAHAM SALMON

As many observers work on their own, I suspect that the methods they develop are quite individual, adapted to their own circumstances and particular interests. In the following outline of my own methods, you may react with *Of course* or *Why on earth does he do that - there is a much easier way!*, but in case some of it may be helpful, here goes.

We live in an ex-vicarage, c1840, and my observatory is at roof level as the garden is surrounded by tall trees. Its roof rolls back which impresses visitors. When I started observing variable stars nine years ago, the first difficulty I encountered was in finding the star. I have a great admiration for those who can navigate around the night sky because they know it in detail so well. For the rest of us other methods can help.

I had bought a Meade LX200 10" f10 equipped with the GCVS catalogue, and found that I first had to convert the star name to the special number required for entering on the handset. On pressing GOTO, the telescope moved to the 1950 co-ordinate position. This was usually a little way away from the right position so I had to correct it to the 2000 co-ordinates. Even then, when I attempted to locate the object from the BAA charts, I frequently got lost as the charts are printed with South at the top, and the view through the eyepiece was mirror image with North at the top. I found it best to print out my own chart from GSC Sky, a computer sky atlas, although I now use Megastar. I have a standard format which limits the magnitude of the stars shown to the faintest that I can see (mag 13.3), mirror image with North up. The computer prints on it the circle of the field of view. This is a great help in finding the star once you have got fairly close. I print a second copy, not mirror image but with the magnitude limit increased to mag 16 and with the CCD field outlined, for use afterwards at the computer when I have taken an image. Some comparison stars are in an unusual order as they are borrowed from a neighbouring variable star. I find it helpful to give them my own temporary lower case letters in order to remember in which order they come. I mark the chart with the type, outburst period, orbital period, range of magnitude and other details. A ring-binder is cumbersome, so I thread *treasury tags* through the holes, and have an A4 card on the back so that the bundle is easy to handle. There is now an established computer procedure for reporting the returns at the end of each month or any other period, and a spreadsheet can be downloaded from the BAAVSS website which ensures that data is entered in the standard format.

However, once my list of objects for observing became longer, then Megastar enabled me to manage this efficiently. Megastar has some files with a *.lbx* suffix which can be edited with Word Pad. Each line has the details of a separate star or object including its name, a few details and the coordinates. As there are hidden characters in the file, I copied an existing sample file, renamed it and deleted the contents except for the first object which I kept temporarily to provide a pattern for entering in the objects I required. When I use this list at the telescope, I recall it, select the next object and pressing F12 moves the telescope to the new position. This has greatly helped productivity, but I have to confess that I do not know exactly where SS Cygnus is even now! Productivity has also been assisted by my *Clear Sky Detector* which lets me know when I am watching TV that it is time to go!

I use a 26 mm eyepiece to give me a 30' field of view. To ensure that the CCD is correctly centered, I went looking for a suitable graticle. The only one available seemed to be a 26mm CCD framing eyepiece, which may or may not be appropriate for the size and shape of the CCD (they are not custom made) and may not be in the right position if the CCD chip is not on the same optical axis as the eyepiece. This may be the fault of the CCD or the diagonal mirror. The alternative is a reticle eyepiece with cross-wires, but this has a 12 mm focal length and a much narrower field of view. I therefore adapted my own eyepiece, by drilling small holes around it and threading through fine platinum wire to make the cross wire - a bit wonky but serviceable - and illuminated it with an LED light wired to the socket provided on the LX200. I mark on the charts the point on which to centre the eyepiece. Even though Cornwall, as usual, is having a warmer winter than most of the UK, I have been feeling the cold (a sign of age perhaps!!) so I have implemented the PCAnywhere remote control I installed a couple of years ago, but have not yet used. I can now sit by the fire in the armchair with the laptop, and keep going much longer. The system relies on getting spot on first time for each object or at least reasonably close, so that a small adjustment gets the image I want. Mostly that works quite well, although occasionally I am left wondering where the telescope has landed up as nothing seems to match the chart! Short of getting out of the armchair and staggering up to the roof again, the only thing to do is to move on to the next object! The CCD results are not suitable to mix in with the visual estimates in the BAA archive, but are now accepted by the Astronomer Magazine.

I have found these nine years immensely challenging and satisfying. The combination of observing, contributing the results to a useful archive, understanding the nature of variable stars, and the exercise of electronic and computer skills has added up to much more than a past time.

SOURCES OF SCATTER AND ERROR (PART 2)

TONY MARKHAM

Defects in the focussing of the eye lens

The lens in the eye can be subject to the same defects as any other lens. Some of these can be corrected for by adjusting the focus of the telescope or binoculars, whereas some of the others can only be corrected by wearing spectacles. In *short-sightedness (myopia)*, and *long-sightedness (hyperomia),* the eye is unable to focus distant objects on to the retina. These can be compensated for by adjusting the focus of the telescope or binoculars. In *presbyopia,* the lens cannot be adjusted sufficiently to focus nearby objects. This does not affect observation of stars, but can obviously affect the readability of variable star charts. *Astigmatism* occurs if the eye lens is not radially symmetric. It has the consequence that light from a star passing through the outer part of the lens is focussed to a different point on the retina from that passing through the centre of the lens. This leads to blurred, distorted, or multiple images. *Chromatic aberration* occurs because the eye lens refracts blue light more than red light. Hence when a red star is focussed on the retina, a blue star will be slightly out of focus, and vice versa. *Spherical aberration* occurs when the outer part of the lens has a different focal length to the central part of the lens. The brain does, to some extent, compensate for the effects of spherical aberration, but spherical aberration does become more significant when the eye is dark adapted, and the increased pupil diameter allows light to pass through parts of the lens that are *shielded* during daylight.

Other eye defects

Various other factors come into play as we age: the transparency of the cornea and lens changes, letting through less blue light, cataracts may form in the lens, and retinal cells decrease in number and become less responsive.

Colour sensitivity of the Observer

Colour vision is provided by the cone cells in the retina. These are spread over the whole of the retina, but are most numerous around the centre of the retina. There are actually three types of cone cell, each containing a pigment sensitive to a different colour of light (the peak wavelengths being 430nm, 530nm and 560nm - actually violet, blue-green and yellow-green, although they are more commonly referred to as blue, green and red). Observers who are colour blind are missing one of these types of cone cell. Even among observers who are not colour blind, the response of the eye to each colour of visible light will vary from one observer to another. The differences are generally most significant at the limits of the visible spectrum. This is unfortunate because so many variable stars are red. The result is that some observers will see a particular red variable systematically brighter or systematically fainter than will another observer. In some cases, these systematic differences may be half a magnitude or more. However, although this is generally regarded as an issue affecting red variables, it should be noted that systematic differences do sometimes also show up in the observations of non-red variables. Fortunately, corrections can be made for systematic differences when analysing observations. In any case, it should be remembered that when we observe variable stars, we are usually more interested in identifying when the variable is brightest or fainter, than in the actual magnitude during the maximum or minimum. The dates/times of maxima and minima seen by individual observers should therefore usually agree even though the reported magnitudes at these times may not.............................**to be continued in the next circular**

BINOCULAR PRIORITY LIST

MELVYN TAYLOR

Variable	Range	Type	Period	Chart	Variable	Range	Type	Period	Chart
AQ And	8.0-8.9	SRC	346d	82/08/16	***AH Dra***	7.1-7.9	SRB	158d?	106.01
EG And	7.1-7.8	ZA		072.01	***NQ Gem***	7.4-8.0	SR+ZA	70d?	077.01
V Aql	6.6-8.4	SRB	353d	026.03	***X Her***	6.3-7.4	SRB	95d?	223.01
UU Aur	5.1-6.8	SRB	234d	230.01.	***SX Her***	8.0-9.2	SRD	103d	113.01
AB Aur	7.2-8.4	INA		83/10/01	***UW Her***	7.8-8.7	SRB	104d	107.01
V Boo	7-12	SRA	258d	037.01	***AC Her***	6.8-9.0	RVA	75d	048.03
RW Boo	6.4-7.9	SRB	209d	104.01	***IQ Her***	7.0-7.5	SRB	75d	048.03
RX Boo	6.9-9.1	SRB	160d	219.01	***OP Her***	5.9-6.7	SRB	120d	84/04/12
ST Cam	6.0-8.0	SRB	300d?	111.01	***R Hya***	3.5-10.9	M	389d	049.01
XX Cam	7.3-9.7?	RCB?		068.01	***RX Lep***	5.0-7.4	SRB	60d?	110.01
X Cnc	5.6-7.5	SRB	195d	231.01	***SS Lep***	4.8-5.1	ZA		075.01
RS Cnc	5.1-7.0	SRC	120d?	84/04/12	***Y Lyn***	6.9-8.0	SRC	110d	229.01
V CVn	6.5-8.6	SRA	192d	214.01	***SV Lyn***	6.6-7.5	SRB	70d?	108.01
WZ Cas	6.9-8.5	SRB	186d	82/08/16	***U Mon***	5.9-7.8	RVB	91d	029.03
V465 Cas	6.2-7.2	SRB	60d	233.01	***X Oph***	5.9-9.2	M	328d	099.01
γ Cas	1.6-3.0	GC		064.01	***BQ Ori***	6.9-8.9	SR	110d	84/04/12
rho Cas	4.1-6.2	SRD	320d	064.01	***AG Peg***	6.0-9.4	NC		094.01.
W Cep	7.0-9.2	SRC		83/10/01	***X Per***	6.0-7.0	GC+XP		84/04/08
AR Cep	7.0-7.9	SRB		85/05/06	***R Sct***	4.2-8.6	RVA	146d	026.03
mu Cep	3.4-5.1	SRC	730d	112.01	***Y Tau***	6.5-9.2	SRB	242d	84/04/12
O Cet	2.0-10.1	M	332d	039.02	***W Tri***	7.5-8.8	SRC	108d	114.01
R CrB	5.7-14.8	RCB		041.02	***Z UMa***	6.2-9.4	SRB	196d	217.01
W Cyg	5.0-7.6	SRB	131d	062.1	***ST UMa***	6.0-7.6	SRB	110d?	102.01
AF Cyg	6.4-8.4	SRB	92d	232.01	***VY UMa***	5.9-7.0	LB		226.01
CH Cyg	5.6-10.0	ZA+SR		089.02	***V UMi***	7.2-9.1	SRB	72d	101.01
U Del	5.6-7.5	SRB	110d?	228.01	***SS Vir***	6.9-9.6	SRA	364d	097.01
EU Del	5.8-6.9	SRB	60d?	228.01	***SW Vir***	6.4-7.9	SRB	150d?	098.01
TX Dra	6.8-8.3	SRB	78d?	106.01					

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 parantheses, with the start and end times of visibility on either side. The times are hours UT, with a value greater than 24 indicating a time after midnight. D indicates that the eclipse starts/end in daylight, L indicates low altitude at the start/end of the visibility and << indicates that mid eclipse occurred on an earlier date. Thus, for example, on Apr 5, TW Dra D20(21)27 indicates that an eclipse of TW Dra starts in daylight, but can be observed between approx 20h UT and Apr 06d03h UT , with mid eclipse occurring at approx 21h UT. Please contact the EB secretary if you require any further explanation of the format. Note that predictions for RZ Cas, Beta Per and Lambda Tau can be found in the BAA Handbook. The variables covered by these predictions are :

RS CVn	7.9-9.1V	**TW Dra**	8.0-10.5v	**U Sge**	6.45-9.28V
TV Cas	7.2-8.2V	**S Equ**	8.0-10.08V	**RW Tau**	7.98-11.59V
U Cep	6.75-9.24V	**delta Lib**	4.9-5.9V	**HU Tau**	5.92-6.70V
SS Cet	9.4-13.0v	**Z Per**	9.7-12.4p	**X Tri**	8.88-11.27V
SW Cyg	9.24-11.83V	**ST Per**	9.52-11.40V	**TX UMa**	7.06-8.80V
Z Dra	10.8-14.1p	**Y Psc**	9.44-12.23V	**Z Vul**	7.25-8.90V

2004 Apr 1 Thu
X Tri D19(18)21L
TX UMa 21(25)28D
2004 Apr 2 Fri
S Equ L03(01)04D
TW Dra 21(26)28D
del Lib 22(29)28D
Z Vul L23(27)28D
2004 Apr 3 Sat
SW Cyg L20(17)23
Z Dra 22(24)27
2004 Apr 4 Sun
RS CVn D20(17)23
U Cep D20(21)26
TX UMa 22(27)28D
2004 Apr 5 Mon
TW Dra D20(21)27
ST Per 21(25)23L
2004 Apr 6 Tue
TV Cas 01(05)04D
2004 Apr 7 Wed
TV Cas 21(25)28D
del Lib L22(21)27
Z Vul L23(25)28D
U Sge L23(25)28D
Z Dra 23(26)28D
TX UMa 24(29)28D
2004 Apr 8 Thu
SW Cyg 01(07)04D
TW Dra D20(17)22
Z Per D20(18)23
RW Tau D20(24)22L
2004 Apr 9 Fri
TV Cas D20(20)24
U Cep D20(21)25
del Lib 22(28)28D
2004 Apr 10 Sat
Z Dra D20(19)21
2004 Apr 11 Sun
TX UMa 01(06)04D
RW Tau D20(18)22L
HU Tau D20(19)22L
Z Per D20(19)23L
2004 Apr 12 Mon
Z Dra 01(04)04D
SW Cyg D20(21)27
Z Vul L23(23)28
2004 Apr 13 Tue
HU Tau D20(20)22L
ST Per D20(23)22L
2004 Apr 14 Wed
RS CVn 01(07)04D
U Cep D20(20)25
Z Per D20(21)23L
Z Dra D20(21)23
del Lib L21(20)26
U Sge L23(20)25
2004 Apr 16 Fri
Z Dra 03(05)04D
del Lib 22(28)28D
TW Dra 22(27)28D
TV Cas 22(26)28D
2004 Apr 17 Sat
U Cep 03(08)04D
Z Per D20(22)22L
HU Tau D20(23)21L
Z Vul L22(20)26
U Sge 23(29)28D
2004 Apr 18 Sun
TV Cas D20(22)26
RS CVn D20(26)28D
Z Dra 20(23)25
2004 Apr 19 Mon
S Equ L02(05)04D
U Cep D20(20)25
TW Dra D20(22)27
HU Tau 20(24)21L
RW Tau 21(26)22L
2004 Apr 20 Tue
Z Vul 02(07)04D
TV Cas D20(17)21
Z Per D20(23)22L
2004 Apr 21 Wed
Z Per L03(<<)04D
ST Per D20(22)22L
SW Cyg D20(24)28D
del Lib L21(20)26
2004 Apr 22 Thu
U Cep 03(08)04D
TW Dra D20(18)23
RW Tau D20(20)21L
Z Dra 22(24)27
Z Vul L22(18)24
2004 Apr 23 Fri
RS CVn D20(21)27D
Z Per D20(25)22L
del Lib 21(28)27D
2004 Apr 24 Sat
U Cep D20(20)24
U Sge L22(23)27D
Z Vul 24(29)27D
2004 Apr 25 Sun
TV Cas 24(28)27D
2004 Apr 26 Mon
S Equ L01(02)03D
Z Per 21(26)22L
Z Dra 24(26)27D
2004 Apr 27 Tue
TV Cas D20(23)27D
2004 Apr 28 Wed
RS CVn D20(16)23
del Lib D20(19)26
2004 Apr 29 Thu
TV Cas D20(19)23
Z Dra D20(19)22
U Cep D20(19)24
Z Vul 22(27)27D
2004 Apr 30 Fri
del Lib 21(27)27D
SW Cyg 21(28)27D

TW Dra 23(28)27D

2004 May 1 Sat

Z Dra 01(04)03D
U Sge L22(17)23

2004 May 2 Sun

U Cep 02(07)03D

2004 May 3 Mon

Z Per L02(05)03D
Z Dra D21(21)23
TW Dra D21(23)27D

2004 May 4 Tue

U Cep D21(19)24
Z Vul L21(25)27D
U Sge L22(26)27D

2004 May 5 Wed

TV Cas 01(05)03D
SW Cyg D21(17)23
TX UMa D21(18)23
del Lib D21(19)25

2004 May 6 Thu

TW Dra D21(18)24
TV Cas D21(25)27D

2004 May 7 Fri

U Cep 02(07)03D
Z Dra D21(23)25
del Lib D21(27)27D

2004 May 8 Sat

RS CVn 00(07)03D
TX UMa D21(20)24
TV Cas D21(20)24

2004 May 9 Sun

U Cep D21(19)23
Z Vul D21(23)27D

2004 May 10 Mon

SW Cyg 01(07)03D

2004 May 11 Tue

TX UMa D21(21)26
U Sge L21(21)26
Z Dra 22(24)27D

2004 May 12 Wed

U Cep 02(06)03D
del Lib D21(18)25
RS CVn D21(26)27D

2004 May 13 Thu

S Equ 01(06)03D
ST Per L02(03)03D

2004 May 14 Fri

U Cep D21(18)23
Z Vul D21(20)26
SW Cyg D21(21)27D
TX UMa D21(23)27D
del Lib D21(26)27D
TW Dra 24(29)27D

2004 May 15 Sat

U Sge 00(06)03D
TV Cas 22(26)26D
Z Dra 24(26)26D

2004 May 17 Mon

U Cep 01(06)02D
RS CVn D21(21)26D
TV Cas D21(22)26
TW Dra D21(24)26D
TX UMa D21(24)26D

2004 May 18 Tue

Z Dra D21(19)22

2004 May 19 Wed

U Cep D21(18)23
del Lib D21(18)24
Z Vul D21(18)24
S Equ L24(27)26D

2004 May 20 Thu

Z Dra 01(04)02D
TW Dra D21(19)24
TX UMa D21(26)26D

2004 May 21 Fri

U Sge D21(24)26D
del Lib D21(26)26D
Z Vul 24(29)26D

2004 May 22 Sat

U Cep 01(06)02D
RS CVn D21(16)22
Z Dra D21(21)23

2004 May 23 Sun

SW Cyg D21(24)26D
TX UMa 23(27)26D

2004 May 24 Mon

U Cep D21(18)22
TV Cas 24(28)26D

2004 May 26 Wed

del Lib D22(18)24
Z Dra D22(23)25
TV Cas D22(23)26D
Z Vul 22(27)26D
S Equ L23(24)26D

2004 May 27 Thu

TX UMa 00(05)02D
U Cep 01(05)02D

2004 May 28 Fri

U Sge D22(18)24
TV Cas D22(19)23
del Lib D22(25)26D

2004 May 29 Sat

TW Dra 00(05)02D
ST Per L01(00)02D

2004 May 30 Sun

Z Dra 22(24)26D

2004 May 31 Mon

TW Dra D22(25)26D
Z Vul D22(25)26D
U Sge 22(28)26D

2004 Jun 1 Tue

RS CVn 00(06)02D
U Cep 00(05)02D
SW Cyg 22(28)26D

2004 Jun 2 Wed

del Lib D22(17)23
S Equ L23(21)26D

2004 Jun 3 Thu

TV Cas 01(05)02D
TW Dra D22(20)25
Z Dra 24(26)26D

2004 Jun 4 Fri

TV Cas D22(25)26D
del Lib D22(25)26D

2004 Jun 5 Sat

Z Vul D22(23)26D
RS CVn D22(26)26D
U Cep 24(29)26D

2004 Jun 6 Sun

SW Cyg D22(18)24
TV Cas D22(20)24

2004 Jun 7 Mon

U Sge D22(22)26D

2004 Jun 8 Tue

Z Per L24(21)26D

2004 Jun 9 Wed

del Lib D22(17)23
S Equ L22(18)24

2004 Jun 10 Thu

Z Vul D22(21)26D
RS CVn D22(21)26D
Z Dra D22(21)23
U Cep 24(28)26D

2004 Jun 11 Fri

del Lib D22(25)26L
Z Per L24(22)26D

2004 Jun 12 Sat

TW Dra 01(06)02D
S Equ 23(29)26D

2004 Jun 13 Sun

TV Cas 22(26)26D

2004 Jun 14 Mon

Y Psc L00(01)02D
Z Dra D22(23)25
TW Dra D22(26)26D
Z Per L23(24)26D

2004 Jun 15 Tue

Z Vul D22(18)24
SW Cyg D22(21)26D
TV Cas D22(22)26D
U Cep 23(28)26D

2004 Jun 17 Thu

TW Dra D22(21)26D
U Sge D22(25)26D
Z Per L23(25)26D

2004 Jun 18 Fri

Z Vul 00(05)02D
del Lib D22(24)25L
Z Dra 22(25)26D

2004 Jun 19 Sat

ST Per 00(04)02D
S Equ D22(26)26D

2004 Jun 20 Sun

U Cep 23(28)26D
Z Per L23(26)26D

2004 Jun 22 Tue

Z Vul D22(27)26D
TV Cas 24(28)26D
Z Dra 24(26)26D

2004 Jun 23 Wed

Z Per 23(28)26D

2004 Jun 24 Thu

U Sge D22(20)25
TV Cas D22(23)26D
SW Cyg D22(25)26D
RS CVn 24(30)26D

2004 Jun 25 Fri

del Lib D22(24)25L
U Cep 23(27)26D

2004 Jun 26 Sat

TX UMa D22(20)25
S Equ D22(23)26D
ST Per L23(27)26D

2004 Jun 27 Sun

Z Per 00(05)02D
Z Vul D22(25)26D
U Sge 23(29)26D

2004 Jun 28 Mon

TW Dra D22(26)26D
Y Psc L23(26)26D

2004 Jun 29 Tue

Z Dra D22(21)24
TX UMa D22(22)26D
RS CVn D22(25)26D

2004 Jun 30 Wed

X Tri 01(04)02D
U Cep 22(27)26D

036·02 1° FIELD INVERTED

U BOOTIS 14h 54m 20·0s +17°41′44″ (2000)

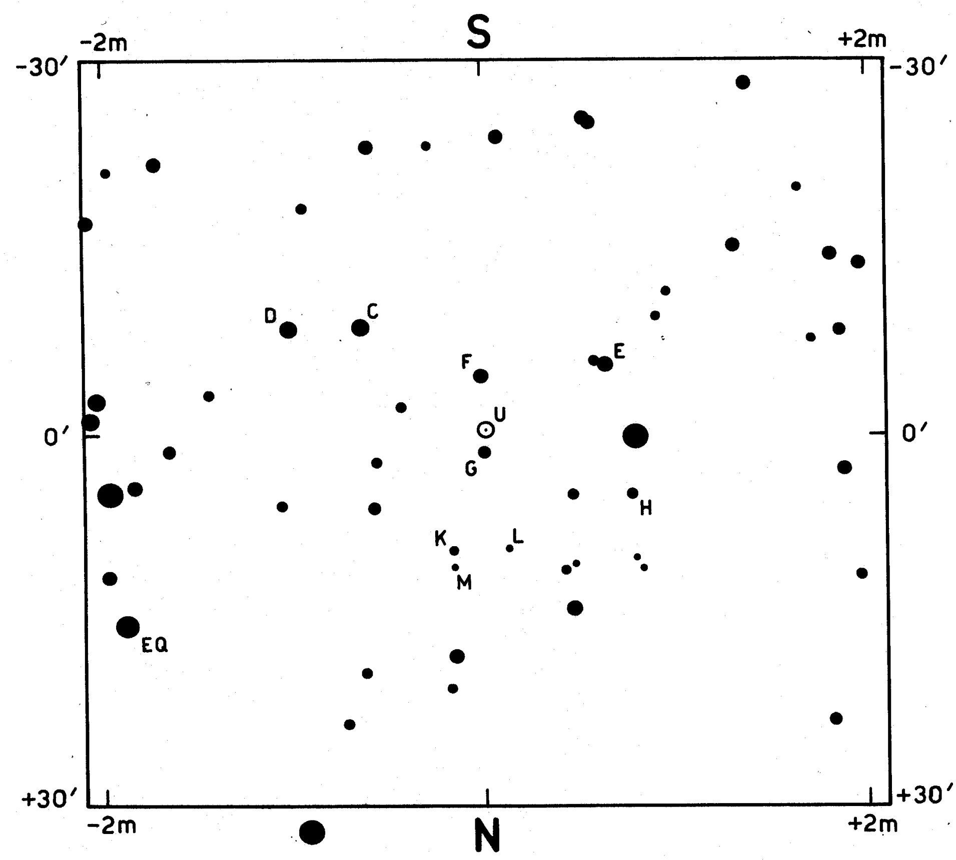


CHART:
GUIDE 8

SEQUENCE:
RLL 1981 FEB

C 10·0	H 12·3
D 10·2	K 12·8
E 10·5	L 13·2
F 11·0	M 13·6
G 12·0	

BAA VSS
EPOCH: 2000
DRAWN: JT 23-02-03
APPROVED: RDP

The deadline for contributions to the 120th issue of VSSC will be May 7th. All articles should be sent to the editor (details are given on the back of this issue)

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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 01284 828431.

Variable Star Alerts Telephone Gary Poyner (see above for number)

BAAVSS web pages:http://www.britastro.org/vss

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Non-Members	£6.00	£7.00	£9.50

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Binocular Charts	Chart Secretary	10p
Eclipsing Binary Charts	Eclipsing Binary Secretary	10p
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Chart Catalogue	Director	60p
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Sample Charts for Smaller Telescopes	Director or Binocular Secretary	40p
Sample Charts for Larger Telescopes	Director or Binocular Secretary	40p