British Astronomical Association

VARIABLE STAR SECTION CIRCULAR

No 114, December 2002

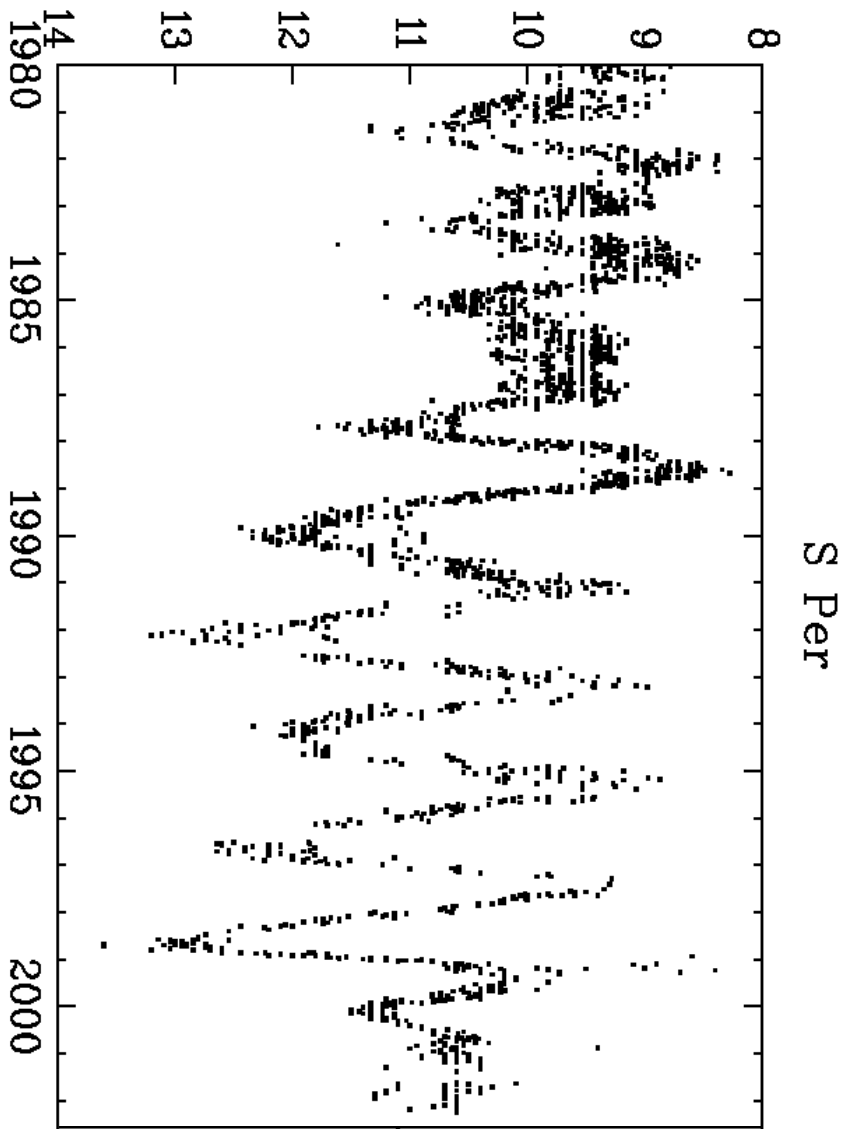
Contents

ISSN 0267-9272

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

LIGHT CURVES

JOHN SAXTON



S Per Observers, 1980 to 2002: S W Albrighton, A R Baransky, B H Granslo, R H Chambers, R C Dryden, J W Ells, E G D Youngs, D J Ells, R B I Fraser, M J Gainsford, G M Hurst, A J Hollis, J E Isles, S J Kay, N S Kiernan, J Lashley,T Laban, Tosh Lubek, R J Livesey, M Gill, I A Middlemist, M J Nicholls, I P Nartowicz, D H Roberts, S Hoste, J J Howarth, R D Pickard, P J Charleton, R A H Paterson, G Ramsey, R J Bouma, J D Shanklin, T Tanti, T G Saville, P J Wheeler, E J W West, G Poyner, M R Bell, M A Brookes

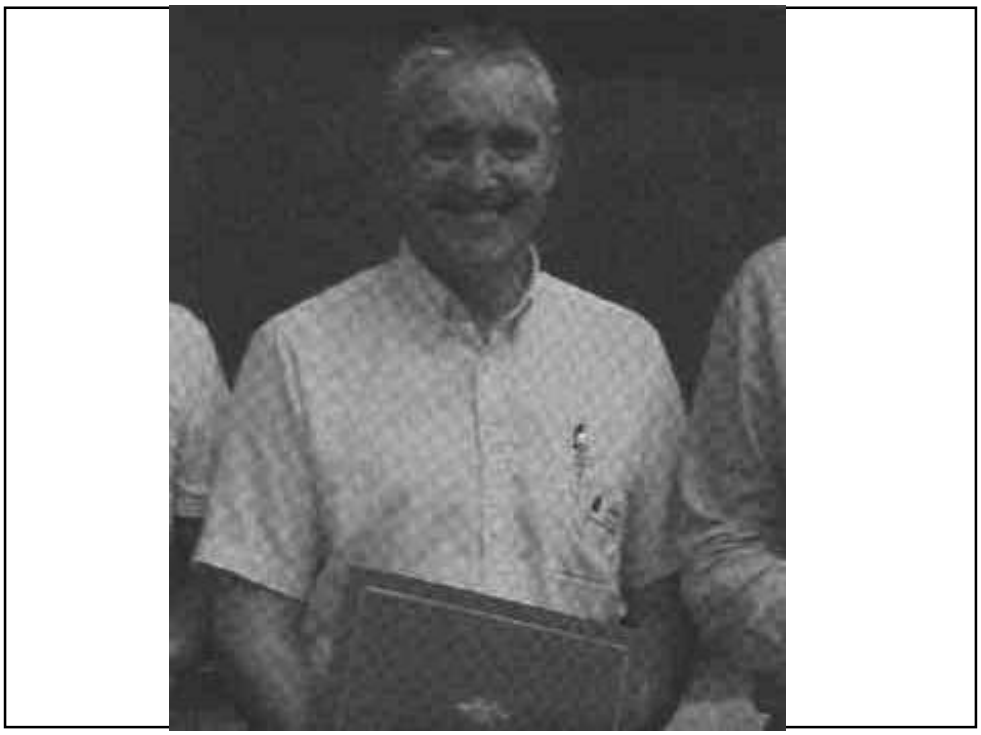
FROM THE DIRECTOR

ROGER PICKARD

The BAA Steavenson Award to Kevin West

It is with delight that I'm able to advise that the BAA Council agreed to give this year's Steavenson Award to Kevin West for his excellent record in observing with his SSP-3 solid state photometer. Kevin uses this, together with a Johnson V filter, on his 20 cm telescope and I quote in part from his nomination:-

Kevin is acknowledged as being the most prolific observer of this type in the UK, and he is recognised internationally for his outstanding work. His observations have been made from a light-polluted site on the Isle-of-Wight, and have been limited to objects of brighter than about 7.5 magnitude, but this hasn't prevented him from consistently achieving an accuracy of better than 0.02 magnitudes on his measurements, and also discovering a new variable star. He is an example to us all, and a reminder of the exceptional results that can be obtained under difficult conditions, given determination and perseverance.



Kevin West with his Steavenson Medal

Kevin was presented with this award at the BAA Exhibition Meeting. Well done Kevin and thank you.

BAA Exhibition Meeting

I'm delighted to inform you, that this meeting was a great success and my thanks go to all those who sent in contributions, or helped in other ways, especially the Section Officers. The new venue at Cambridge allowed much more room for all the exhibits.

Unlike previous meetings, there were a number of short presentations by Section Directors in the Morning/Lunchtime period, and, following my own presentation, it was most gratifying to have further offers of help with the Section's backlog of observations. In addition, we also have another CCD observer in our ranks.

During the afternoon I was approached by a BAA Member (but not a VS observer) who advised me that he had some of the observing records of the late J Friends, which he gave me there and then. I'm currently searching our records to see if any of Mr Friends observations are missing, which I believe they are. If anybody else, perhaps whilst at their local astronomical society, might like to make enquiries as to old observing records lying around, it may be they could help to fill in some holes in our records. Please advise me if you ever come across any such records.

See below a photo of some of the VS section members who visited or assisted at the exhibition meeting.

Exhibition meeting attendees, from the left, Roger Pickard, Melvyn Taylor, Gary Poyner, Simon Pinnick, John Day and Karen Holland.

The 91st Spring Meeting of the AAVSO and the 2nd High-Energy Astrophysics Workshop for Amateur Astronomers; June 30 - July 6, 2002, Hawaii.

A few Brits were persuaded to brave the time difference by this exotic location, and in all nine of us did so; Albert Zijlstra (OK, he was regarded as an honorary Brit, especially as his charming wife, Kate, is English) Dick Chambers, Tim Hoare, Hazel McGee, Michael Poxon, John Toone and my wife and I.

British attendees of the workshop, from the back left they are: Albert Zijlstra, Mike Poxon, Tim Hoare, John Toone, Dick Chambers, and from the front left: Roger Pickard, Marian Pickard, Hazel McGee, and Kate Zijlstra.

Many details of these meetings can be found on the AAVSO web site at **http://www.aavso.org/** and I suggest you give them a read, but I pen below a few thoughts.

I've heard this particular AAVSO meeting described as "of mixed standard" and I think this adequately sums it up. There were some exceedingly good presentations of the highest standard, and some that left a little to be desired. Amongst the good ones, of course, was

that by Albert Zijlstra, but as he knows, I'd heard it before!

The 2nd High-Energy Astrophysics Workshop was also a little disappointing, especially as the first in Huntsville (see Circular No. 104) was so exceptional. I guess we can blame it on the Gamma-ray bursters themselves, of which there had been so few between the meetings, that there hadn't been the opportunity for any new discoveries. What a shame it was, that the recent burst on October 4th of this year didn't happen earlier! That said, as with the AAVSO meeting, there were some excellent presentations, and none better than that by the Director of the Keck Telescope, Frederic Chaffee, who presented a bewildering array of "Highlights from the Keck Telescope". However, personally, I found the "Review of Cataclysmic Variables and Related Objects" by Makoto Uemura to be the most informative, but perhaps I'm biased? Again, look at the AAVSO web site for further details of many of the presentations.

Thanks go to the Curry Foundation for kindly providing grants to assist with the travelling.

AFOEV Meeting 26th to 28th August 2002, France

This international meeting on VS was set in the delightful town of Bourbon-Lancy in the Burgundy area of France. The attendance was a little down on what had been expected, due to the recent floods in Germany. All the same, around 50 delegates attended, including four from England (and all from the Crayford Manor House AS). The weather at this time of year in this region of France is usually in the mid to high twenties, so it was particularly disappointing that it was cool and wet - or in other words, typically English. So much so, that Dick Chambers was forced to buy a light coat and I bought a small umbrella!

The Meeting was split into several sessions: Observing Techniques and Methods, Long Period Variables, Novae, Related objects and X-ray sources, and Bright and Short Period Variables. The highlights for me though, were the invited talks: *Variable Stars, The Stars that Talk to us* by Janet Mattei (AAVSO Director), which was a review of modern amateur variable star observing; *Red Giant and Supergiant Variables, Dust in the Wind* by Philippe Sivagnanam, a professional astronomer, whose talk was about how little we understand of these particular variables; and finally, *Supernovae, Candles in the Dark* by Dominique Proust, another professional astronomer, whose title speaks for itself.

The meeting gave plenty of opportunity for discussion with astronomers from many lands, mostly European, including Russia but also Egypt. It was nice to be able to put faces to people I'd previously only had e-mail dealings with, such as Laszlo Kiss, Emile Schweitzer and Petr Sobotka.

I chaired a session on Charts and Sequences and so had the opportunity to present the preliminary conclusions of the ICWG (International Charts Working Group) meeting in Hawaii. See Chart News on page 9 by John Toone, for the first sequence to be produced by this group. There was plenty of discussion, rather as there had been at the Alston Hall meeting, but I believe most thought that the proposals could only benefit variable star observing.

Charts and Sequences

Whilst we were in Hawaii, John Toone and I chatted quite a lot with Mike Simonsen of the AAVSO who has been instrumental in formulating the International Chart Working Group proposals on future charts (see Chart News for the first sequence produced by this group). I'm delighted to advise that Mike has now agreed to assist John Toone in the preparation of new charts for stars on the Recurrent Objects programme, and has already prepared several.

ICWG Project

Please see John Toone's Chart News, on page 9 of this circular, for details of the first sequence to be revised as part of the International Chart Working Group Project (ICWG).

Book Review

Variable Stars - Visual Light Curves, editors: Eric Broens, Alfons Diepvens and Johan Van Der Looy; published by the Vereniging Voor Sterrenkunde v.z.w., Brieversweg 147, B-8310 Brugge, Belgium.

This publication, by the variable star branch of the VVS, contains light curves of five main categories of star, as observed by the group, in many cases from about 1968 to the present date.

Following a brief introduction and history of the VVS, a page on why we observe variables and a general overview of the types of variable stars, the book launches into the main part, visual light curves, which comprises over 200 pages and over 240 light curves. These are sub-divided into pulsating, eruptive, cataclysmic and peculiar variables, with each sub-divided in turn. Each section also commences with a description of the type of variable featured. The book closes with a list of the VVS observers whose work contributed to the light curves, and an object index.

This is an excellent reference for those wishing to have a *quick-look* guide to quite a large number of variables, and I'd be surprised if you didn't find your favourite variable amongst them.

RECURRENT OBJECTS NEWS

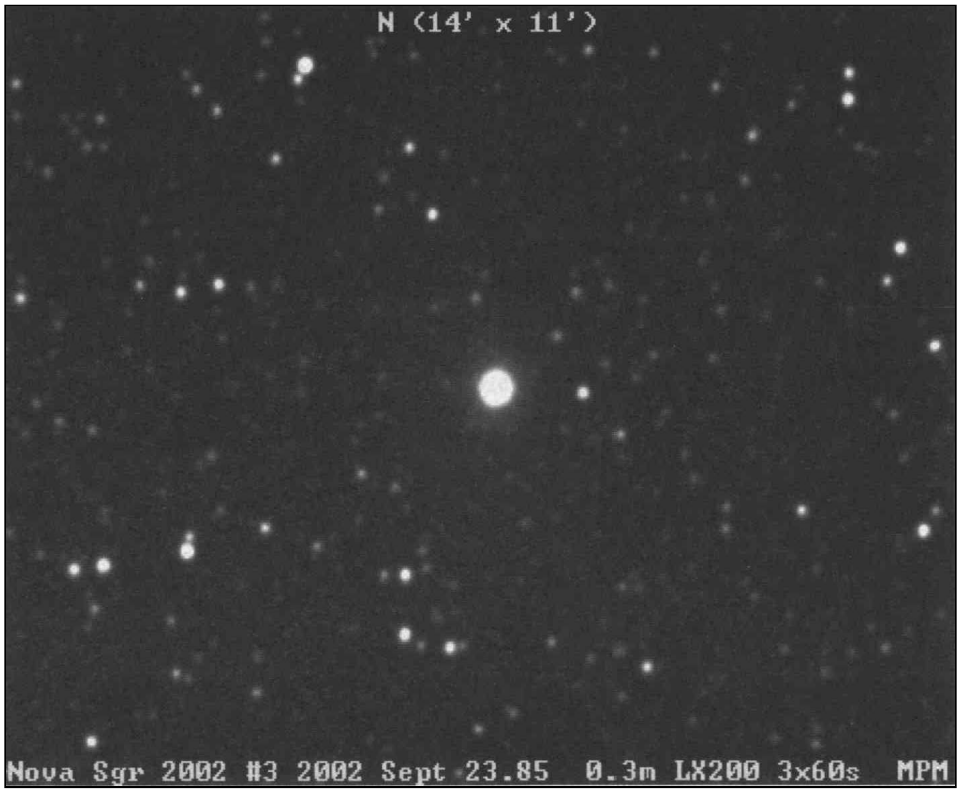
GARY POYNER

V4743 Sgr (Nova Sagittarii 2002 No.3)

The second Nova to be discovered in Sagittarius in under 10 days (Nova Sgr 2002 #2, was discovered by Bill Liller on September 15th) was discovered by Katsumi Haseda, Aichi Japan on a single film on September 20.431 UT at magnitude 5.0. The Nova was confirmed visually by Jaime Garcia, Argentina on September 21.15 UT with an 80cm refractor.

Spectroscopic confirmation was obtained by Mitsugi Fujii, Okayama, Japan on September 21.44 UT. His report stated that strong Balmer and Fe II emission lines were present, which confirmed that the object was an FeII class nova, shortly after maximum. Maurice Gavin also obtained a Spectrum on September 21st.

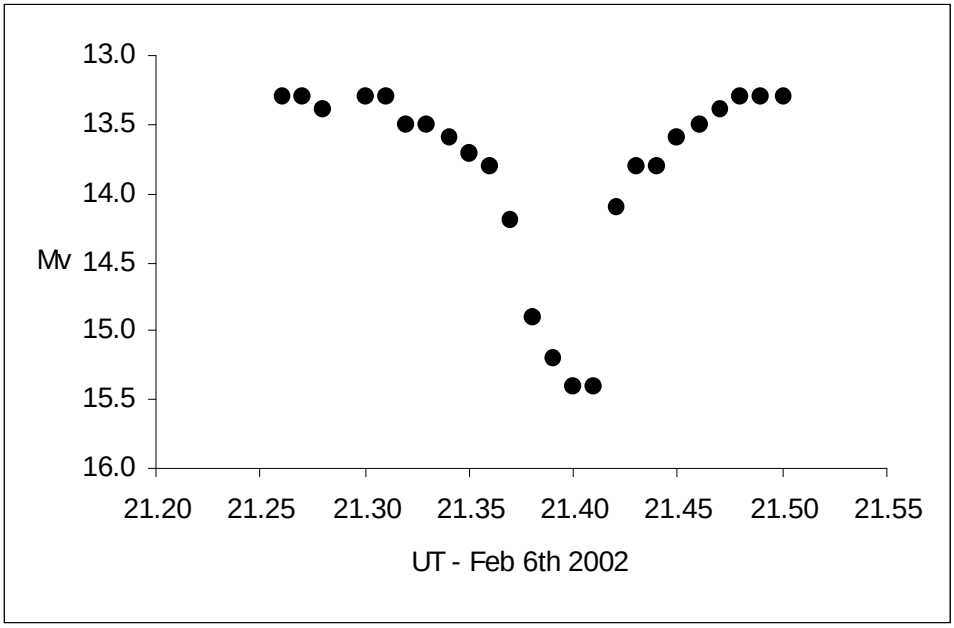
The Nova had faded to visual magnitude 9.1 by the end of October.



The image above, of Nova Sagittarii 2002 no3, was taken by Martin Mobberley on September 23.85 UT with a 30cm LX200 & ST7 CCD, 3x60 second exposures

HT Cas

This eclipsing system was observed in outburst on February 5th 2002 by P. Dubovsky (Slovakia) and E. Muyllaert (Bel) at magnitude 13.6. The outburst was a normal one, and by February 9th, HT Cas had faded to <15.5.



Eclipse observations of HT Cas obtained visually by G. Poyner on February 6th

V**589 Her**

The first outburst since July 2001 was observed by Mike Simonsen on April 4.344 at magnitude 14.7, and confirmed by Maciej Reszelski on Apr 5.089 at 14.6. CCD photometry by Tonny Vanmunster and Jerry Foote (CBA, Utah) revealed a superhump period of 0.0947 +/- 0.0005 d, using the PDM technique. Tonny comments that 'this turns V589 Her into a UGSU type dwarf nova inside the so-called *period gap*'.

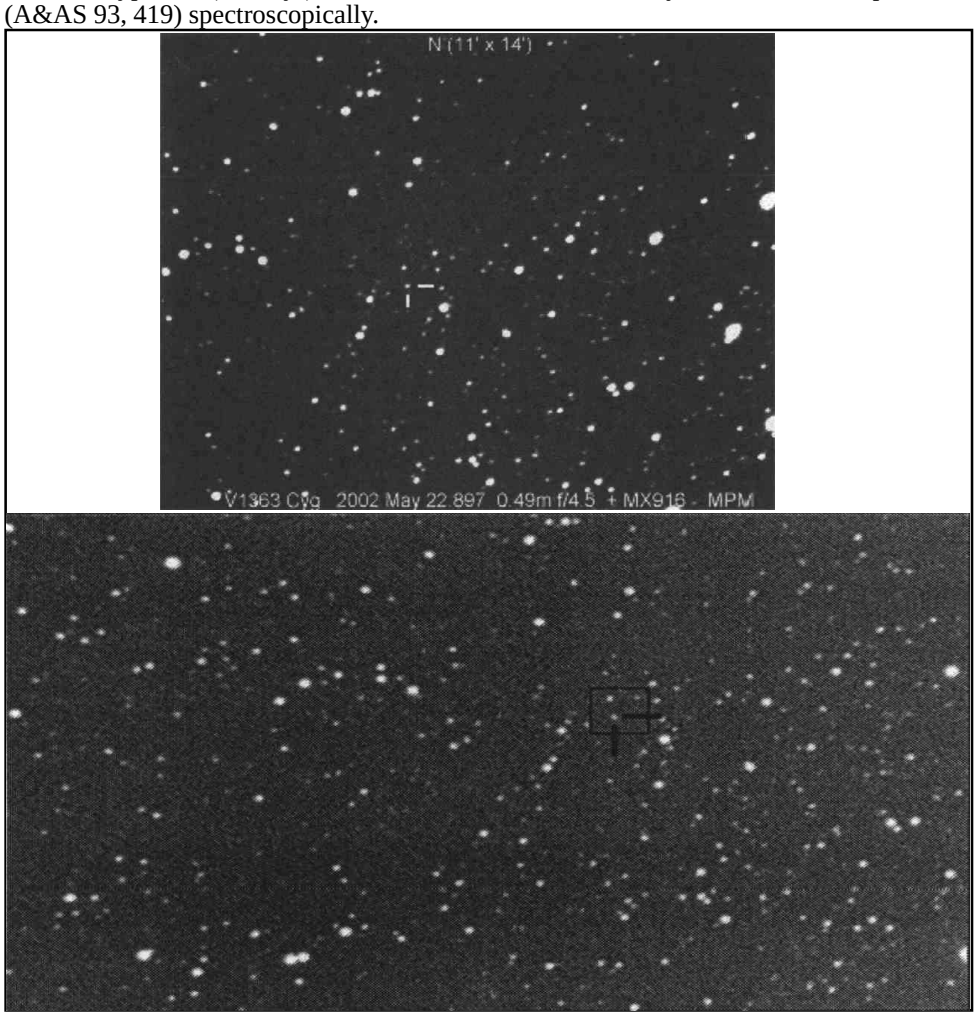
V1363 Cyg

This object was observed in outburst by Mike Simonsen (USA) on May 21.332 at 14.8mv, and confirmed by Maciej Reszelski (Pol) on May 21.949 at 14.7mv. This constituted the first visual detection above magnitude 15.5 ever seen in this system. The previous visual sighting was made by Poyner on September 12th, 1996 at magnitude 15.9. This was confirmed by Tonny Vanmunster with a CCD image on the same evening. This object is on the new CCD target list (see page 10 for details).

In response to an e-mail alert, Nick James and Martin Mobberley obtained the following CCD

images of V1363 Cyg in outburst on May 22nd 2002. Nick James also reported a CCD run between 2452417.41 to 2452417.51 which revealed a periodic variation of more than 0.2mag with a period about 0.06day. Unfortunately this was all the data received during the outburst.

The discovery paper (Ric. Astr. Vol. 8, No. 10) gives details of previous activity in V1363 Cyg. These include ~JD2432400 observed at magnitude 13-14 for around 40d, then faded slowly; JD2433000-33200 rise to mag 14-15, then slowly fade to mag 17 ~JD2433600; JD2433980 start to brighten, reaching a maximum of 13.5 at ~JD2434000. Other 'high states' include ~JD2434150, 13.5 and JD34230 mag 14 (VSNET). Tachi Kato commented on VSNET in September 1996 that from the variations time scale, V1363 Cyg may resemble a VY Scl type star (MV Lyr). It's CV nature was confirmed by Bruch and Schimpke 1992 (A&AS 93, 419) spectroscopically.



Images taken of V1363 Cygin outburst by Martin Mobberly (top) and Nick James (bottom)

CHART NEWS

JOHN TOONE

The following new charts are now available from the Chart Secretary:

239.02 V402 And
Formally 239.01 and previously designated VAR 62 And. The sequence has been completely overhauled with Henden V measurements introduced.

269.01 RS Cnc
Formally MDT 1984 Apr 12. Stars A and J are dropped. A is the same magnitude (5.2) as E, which is closer to the variable. J is the same magnitude (6.46 according to Tycho 2) as K, and has caused problems to visual observers in the past. R (SAO 61296) has been introduced to extend the sequence at the faint end.

268.01 GY Cnc
Formally designated RXJ 0909.8+1849, there was no previous BAA VSS chart in existence. A 15' field is introduced complete with a Henden V sequence.

118.03 V452 Cas
Formally 118.02. The sequence has been completely overhauled with Henden V measurements introduced.

041.03 R CrB
Formally 041.02. This is the first sequence to be revised as part of the *International Chart Working Group (ICWG) project*. Agreement has been reached with the AAVSO to standardise to a common sequence. Above magnitude 10.7 (comparison S) Tycho 2 (vj) magnitudes have been adopted. The most significant changes are that G, H and J are now 0.2 magnitudes fainter than listed on the previous chart. The fainter part of the sequence is relatively unchanged.

263.01 DV Dra
No previous BAA VSS existed for this star. A 15' field is introduced complete with a Henden V sequence.

042.02 IR Gem
Formally 042.01. An ICWG sequence based on Tycho 2 (vj) and Henden V measurements is introduced. The previous sequence had major discrepancies with the AAVSO sequence, and was 1 magnitude too bright at the faint end.

015.03 TZ Per
Formally 015.02. An ICWG sequence based on Tycho 2 (vj) and Henden V measurements is introduced. The previous sequence was inaccurate at the faint end, with S and T both listed as magnitude 14.8 when in fact S is 0.9 magnitude fainter than T. TZ was also difficult to identify when at minimum on the old chart.

016.04 UV Per
Formally 016.03. An ICWG sequence based on Tycho 2 (vj) and Henden V measurements is introduced. The previous sequence by Bailey was poorly calibrated at both the bright and faint ends.

Thanks are due to Mike Simonsen who drew the charts for V402 And, V452 Cas and DV Dra.

THE NEW VS CCD TARGET LIST

KAREN HOLLAND

The new Variable Star Section CCD Target List has been formed to encourage CCD observers to begin to contribute to specific projects of interest, and to provide a common set of targets as a focus for discussion, as we learn. The CCD list will be updated at intervals to reflect the interests of section members, and to take account of feedback received during this initial period. The projects have been deliberately divided to fall into four categories, of increasing difficulty. It is suggested that new observers might wish to begin work on projects in the Basic CCD Data category, and progress to the subsequent levels as they become confident in each level. Note that the VS section has a CCD advisor (see the Officer list on the back cover of this circular), who is happy to assist with queries. The four categories of data are described below:

Basic CCD Data (B)

Projects in this category are designed for CCD observers who want to use their CCD cameras to do useful work, but who are not ready to use filters, or to do transformations to convert their magnitudes to a standard system. This means that projects in this category are aimed primarily at the detection of changes, which will alert other observers.

Precision Timing Data (PT)

For projects listed in this category, the emphasis is on obtaining measurements with accurate recording of the time at which the measurement was made. It would also be good practice, and useful in the analysis of the data, if an estimation of the error on the time can be made. No filter is required for these projects.

Approximate Differential Photometry (ADP)

This category of projects is for those CCD observers who are able to use an appropriate V filter which, when combined with their CCD camera response, puts the derived magnitudes approximately on the standard Kron-Cousins system, without transformations being necessary. Potential observers who would like advice on filter/CCD camera combinations should contact the section CCD advisor. Data from this category, can be combined with that of other observers to build up a useful set of data for analysis. It would be good practice to attempt to estimate the errors of the magnitude and time measurement.

Precision Differential Photometry (PDP)

This category of work is aimed at the experienced CCD observer, who is not only happy to use a filter, but who is also confident at applying the correct transformations to his reduced magnitudes, in order to precisely transform those magnitudes to that of the standard Kron-Cousins system. It would be good practice to include error bars on all measured quantities.

All Sky Photometry (AP)

No projects have been suggested for this category yet, as all-sky photometry is the most challenging to do, and it is uncertain how many observers will be interested in pursuing photometry at this level. Projects can be developed if there is sufficient interest in a future version of the list.

Comparison Sequences

Comparison star sequences suitable for CCD photometry, will be provided by the Variable Star Section for all of these projects, and will be placed on the VS web page for easy access, together with more information about these projects.

Submission of Data to the new VS CCD Database

It is hoped that the data that is obtained from these projects will help the VS in its formation of a CCD database, but the formation of such a database needs great care and consultation, and will necessarily take some time. In the first instance, please inform the Director, Roger Pickard, of the acquisition of data, in order that a simple log may be kept of data taken. More guidance regarding standard image formats and standard observing logs will be provided in due course. Additionally, any comments, suggestions or ideas regarding the new CCD database, should be passed on to Karen Holland who will collate them for discussion at the next CCD Database Working Party meeting (see page 12 for a summary of the first meeting of this group), in order that all interested members may be kept informed of the development process and may contribute.

The CCD Target List

There is a wide variety of targets on this list initially, and some are very challenging, to see what kind of projects observers are most keen to pursue. Articles in future circulars will look at some of these projects in more detail. The first of these is Bill Worraker's article on page 16 of this circular which provides detailed information on the GY Cancri project. More information on all of these projects is on the VS web page at
http://www.britastro.org/vss/variable_star_section_ccd_target.htm

Basic CCD Data (B)
V1363Cyg (see page 7 for recent outburst information), **V1454Cyg**, **CGDra**,**V650Ori** are all very under-studied stars, for which more observations are required. If any of these stars are detected at brighter than approximately magnitude 15.5, then Gary Poyner should be notified immediately.

Precision Timing Data (PT)
ES Dra (13.6), **KU Cas** (13.3p-18p), **LL Lyr** (12.8-17.1), **TZ Per** (12.3-15.6)

Approximate Differential Photometry (ADP)
NSV2249 (11-<15) this is a Mike Collin's discovery that is a bit of an enigma.
Eclipse time measurements of **HU Aqr (**15.3-20.0) and **HT Cas** (10.8-18.4)
Eclipsing binary ephemeridesof two eclipsing binaries, **NSV4441Cnc** (GO Cnc, mag 8.3-8.8) and **NSV 4031 Lyn** (8.0-8.8)

Precision Differential Photometry (PDP)
Theoreticians need **SS Cyg** observations
GY Cnc (see article on page 16)
Albert and Tim's Period-Luminosity Relationship, photometry is required to derive periods for the following three Hipparcos variables:
VZ Cam is around V magnitude 4.9, with a variation of < 0.2 magnitudes
CO UMa is around V magnitude 5.8, with a variation of > 0.2 magnitudes
AT Dra is around V magnitude 5.5, with a variation of > 0.2 magnitudes

SUMMARY OF THE MEETING OF THE CCD DATABASE WORKING PARTY

KAREN HOLLAND

At the exhibition meeting in Cambridge in September, David Boyd, Karen Holland, Richard Miles, Peter Moreton and Roger Pickard had a short meeting to discuss how the VS section should start to think about the archiving of CCD data.

What all members agreed upon, was that it was key, that any future CCD database should provide the highest quality data; this did not mean that the data must be of high precision, but simply that the data should be exactly of the quality that it professes to be (even if that is +/- 0.5 magnitudes), and that any consumers of the data should have confidence in the data, and be able to re-reduce the data at a later date if they wished to do so. In the UK, there are very few CCD observers, and it is unlikely that there will ever be huge numbers; with this in mind, observers should be given the opportunity to contribute to a few well-selected projects (see the article on the New CCD target list on page 10), where combined data from several observers should make it more valuable. Observers will, however, be free to contribute data to the future database on any object, whether on the target list or not.

Looking to the way in which professionals archive their data, it is clear, that whilst it is a daunting task, archiving of all raw images seems essential if we are to construct a high quality database. Professionals are currently grappling with the prospect of archiving petabytes of data from the wide-field surveys that will image the entire night sky several times each night. So, the group came up with a provisional plan to work on an archiving system, that can be implemented in the short term by individuals, with the possibility of developing a central archive at a later date, if it is thought to be desirable.

It was agreed that a standard format for image storage would be defined. This will be a standard FITS format image, with a standard set of headers that will be agreed upon. In the first instance, observers will be required to store their own raw data. As they collect the data, they will also need to compile a personal observing log, which will list the details of every image taken in a given evening's observing run, and will contain the derived reduced data. A great deal of work has already been done on a standard template for this observing log; David Boyd, who had already developed such a log for his own use, circulated this log to the other members of the group, and it has already undergone much development, particularly by Richard Miles and David himself. An exported file of reduced magnitudes and times can be produced for consumers of the data, and to produce light curves for the web pages; eventually, a centralised observing log, will keep a record of the details of every image taken and held by the VSS. If a user of the data requires the original data for re-reduction or examination, then it will need to be requested from the original observer.

It is hoped, that if the CCD data is shown to be of value, and of interest to professionals, then it may be possible to use the publication record of the section to seek funding for the development of a central archive, where all raw data could be stored for retrieval.

The next meeting of the group has not yet been set, but future developments will be reported in the circular. Comments or suggestions regarding the database can be directed to Karen Holland, who will forward them to the whole group for consideration.

THE NEW VSS MENTOR SCHEME

KAREN HOLLAND

The VSS Mentor Scheme has been set up to provide assistance to VS members or to observers who would like to have a go at variable star observing. Mentors can provide guidance, support and encouragement either by e-mail, or by providing observing assistance in real-life. 15 experienced members have volunteered to become the first VS mentors. 13 of these mentors are based around the UK; one is in Saudi Arabia, and one is in South Australia, who would be ideal for short-term advice for anyone who is thinking of visiting the Southern hemisphere who would like advice on suitable targets.

See the mentormap on the VS web page (URL on the back of this circular) for details of mentors and locations. If you would like to be allocated a mentor, please contact Karen Holland, who maintains the central records for the scheme, or another officer of the VS section, so that a suitable mentor can be selected for you. Please do not contact mentors directly; a central log of mentors and mentees is being kept to ensure even distribution of mentees. There will be increased publicity regarding this scheme over the next few months, and mentors can only assist a few mentees at any given time, so if you are keen to benefit from this scheme then contact the VSS now!

LETTERS

Digicams for stars, from Maurice Gavin

I read your item in VSSC#113 (see Richard Mile's article Photometric Experiments with a Canon EOS D30 Digital Camera on page 12) about the Canon D30, but didn't appreciate your interest in this field so hadn't informed you of experiments over the last 12 months with digicams.

Jim Weightman has recently bought the same D30 camera and preliminary stellar tests were similarly disappointing. His wide-angle results via a non-interchangeable Casio QV3600EX and mine mostly at full zoom [50mm fl] via Minolta D7 [14mm aperture] are posted/linked at http://home.freeuk.net/m.gavin/digsky2.htm . My magnitude penetration seems colour dependent - I'm reaching mag[v] 11 for spectral class K/M in 30s according to PPM catalogue in Megastar but unsure of its accuracy - see my recent shots of Pallas.

regards

Maurice Gavin - Worcester Park Observatory-UK
www.astroman.fsnet.co.uk m.gavin@freeuk.com

Following Richard's .. 'Where to go from here? an offer', In which he encourages digital camera users to test their digital camera, and offers to assist with the analysis of the resulting data, Maurice later wrote...

I presume you've seen the current S&T article on digital still cameras and in particular experiments by readers to minimise noise via forced air cooling into the camera [voiding

the warranty!] or switching the camera off for a while before the exposure to allow it to 'cool'.

Your simple request for slightly defocused images [to aid photometry] would be a challenge [for me] as digital cameras with full manual override have foibles. For example my Minolta D7 manually set at infinity, drifts off-focus in extended [astro] exposures to produce spiral stars! I discovered I had to focus in auto-mode which by default locks onto infinity for the full duration of the exposure if there's nothing for it to focus upon [stars don't count as focusable].

*It took me some frustrating months to sort this one and various experts at digicam shows and even Minolta UK, and could not supply an explanation for the *manual focus drift* as it was beyond their ken.*

regards

Maurice Gavin - Worcester Park Observatory-UK
www.astroman.fsnet.co.uk m.gavin@freeuk.com

VARIABLE STARS AND VERMIN

JOHN TOONE

Asteroids have not always been popular with astronomers, particularly those involved with plate photography during the first half of the 20th Century. Many plates exposed for quite different astronomical research reasons were often found to be swarming with the short tracks of asteroids. This complicated star counts and other research to such an extent, that some German astronomers referred to them as *Kleineplanetenplage* (minor planet pest), and Walter Baade of Mt Wilson and Palomar Observatories even labelled them as *Vermin of the Skies*.

Asteroids can also be picked up visually, when they stray into areas of sky that are frequently monitored such as the fields of deep sky objects, and to a greater extent, variable stars. Being stellar and apparently stationary in appearance the visual observer can be forgiven for thinking (when they are encountered); 'have I found a nova?' This has happened to me on three occasions:

On the 31 July 1984, I did my nightly check on **RS Oph,** which was then quite active, as it led up to its last outburst some 5 months later. Approximately 1' south preceding of RS I noticed an uncharted star of magnitude 12.0. It was immediately apparent because, as with most eruptive variables, the field is looked at very frequently, and the variable star observer is trained to detect change. I contacted Denis Buczynski on the TA hotline and he took an image of the field. Denis came back to me the following day to confirm that it was the asteroid 216 Kleopatra.

Denis got another call from me nearly eight years later on 7 April 1992, when I saw a new 10.6 magnitude star 12' south following **U Gem**. Being a much brighter object than Kleopatra Denis was able to advise within an hour that it was 44 Nysa.

Finally on the 13 February 1995, I saw a new 6.9 magnitude star with binoculars, just 1 degree

south following **RS Cnc**. I did not need to phone Denis this time because a quick check of the BAA Handbook revealed it to be 1 Ceres.

Both Gary Poyner and Peter Williams have advised me that they have had similar experiences with respect to unexpectedly finding asteroids whilst observing variable stars. So my experiences are by no means unique.

Because of my involvement in producing charts for the BAA ARPS (Asteroids and Remote Planets Section) I have made planned observations of asteroids making close approaches to variable stars as well.

On the 9 May 1987, asteroid 2 Pallas was inseparable in 12x50 binoculars with **SX Her**. Their combined light made the variable appear to flare from magnitude 8.4 to 7.7 just on this night. Nine days later, Pallas had moved to within 8' of **T CrB**. The appearance of the field was significantly altered with the asteroid being 2 magnitudes brighter than this famous recurrent nova.

On the 15 April 1989, asteroid 3 Juno passed 20'south following **R Leo**. R Leo was having a bright maximum at magnitude 5.6, and Juno was some 4 magnitudes fainter. A week later Juno had moved even closer to **X Leo**, which was at minimum and presumably some 7 magnitudes fainter than the asteroid.

There have been other close approaches in the last 20 years that I have missed due to cloud, notable events include:

- 129 Antigone actually occulted S Sct on the 5 June 1981
- 3 Juno passed 10' north preceding of Mira on the 20 October 1983
- 4 Vesta passed 15' south of CE Tau on the 5 December 1983
- 20 Massalia passed 45' north of V Cnc on the 11 January 1992

All of the above illustrates the frequency of asteroids approaching bright variable stars. Unlike major planets asteroids are not confined to zodiac constellations as many have highly inclined orbits. 3 Pallas for instance, is inclined at 34 degrees and can appear in constellations such as Cetus and Coma Berenices and (as we have seen) Hercules and Corona Borealis too. 6 Hebe that is inclined at 15 degrees, spent the whole of its 1980 opposition in Eridanus.

Asteroids can vary in brightness over short and long timescales, and make interesting objects for CCD observers (and in some cases visual observers too) to monitor. Most asteroids have an irregular shape, or some variability in reflectivity over their surfaces (or both), so that as they rotate the amount of light that they reflect to Earth varies. Other variations depend upon the Sun-Asteroid-Earth distances. The aspect of the asteroid is also important; this is the orientation of the spin axis as seen from the Earth. If the pole is inclined by about 90 degrees as in the case of Uranus, then variations from one opposition to the next can be significantly different.

So if you locate a suspect star whilst observing variable stars, it is most likely to be an asteroid, particularly if it is in or relatively near the zodiac. Once confirmed as an asteroid, please don't get angry at it and consider it *vermin*. Instead, I would encourage you to use the variable star sequence to hand and make a light estimate. The BAA ARPS still like to receive such observations.

GY CANCRI: CATCH A RISING STAR . . .

BILL WORRAKER

GY Cancri was discovered via the Hamburg Quasar Survey, and being an X-ray source was also recorded by the X-ray satellite ROSAT; hence its previous designations of HS 0907+1902 and RX J0909.8+1849. It was first seen in outburst by Patrick Schmeer on 2000 February 7, and subsequent visual observations by Patrick, and CCD observations by Tonny Vanmunster (CBA Belgium) and others, showed it to be a deeply-eclipsing dwarf nova with an orbital period of 4.21 hours.

Eclipsing dwarf novae provide a valuable window into the details of accretion discs, and the changes they undergo during dwarf nova outbursts. However, relatively few are known with periods above the *period gap*, the 2-3 hour gap in the orbital period distribution of non-magnetic cataclysmic variables. Of these, **BD Pavonis** and **V729 Sagittarii** are southern objects while **U Geminorum** and **EM Cygni** undergo relatively shallow eclipses, in which the white dwarf primary star is not eclipsed. Of the remainder, **EX Draconis** is an SS Cyg star which undergoes fairly frequent outbursts following an approximately 20-day cycle. Professional observations of eclipses in EX Dra have determined that outbursts start with a rise in temperature at the outer edge of the accretion disc, thus triggering a heating front which traverses the disc in the inward direction.

Another eclipsing dwarf nova in this category is **IP Pegasi**, an SS Cyg star with an orbital period of 3.8 hours. Combined Pro-Am observations of IP Peg during its 1997 September outburst have shown that this was an inside-out outburst, in which accretion disc heating started from the inside. This outburst had a relatively long rise-time (it took about 3 days to reach maximum light), in accordance with currently-accepted disc instability theory, which predicts that long rise times are associated with inside-out outbursts, while outside-in outbursts should develop more rapidly. However all eclipse observations of IP Peg currently on record are consistent with inside-out outbursts, even when the rise time was short, though sufficient observations of a short-rise outburst to establish the direction of development beyond doubt has yet to be achieved. Hence IP Peg is still a high-priority target for critical observations of the start of an outburst[1].

So far two 'live' outbursts of GY Cnc have been observed, in 2000 February as noted above and also in 2001 November. In their comments on the first of these outbursts, Gaensicke et al[2] note that the shape of the eclipse minimum changed from rounded to flat-bottomed between the first and second eclipses observed on 2000 February 7, which was probably quite close to the start of outburst. They deduce that the uneclipsed part of the disc had brightened between eclipses, which suggests that this was an inside-out outburst, yet it was clearly shorter (<8 days long) than typical outbursts of IP Peg (~10-14 days long), and Kato et al[3] note that no long-rise outbursts of GY Cnc have been observed. Thus both IP Peg and GY Cnc may contradict theoretical predictions that inside-out outbursts must start with a slow rise. To demonstrate this conclusively for GY Cnc demands that a fast-rise outburst should be detected very early and covered photometrically through as many eclipses as possible during the rise. Inside-out outbursts are characterised by initially deep, narrow eclipses (with the same width as quiescent eclipses), which later become shallower and wider.

This is the impetus behind this new observing campaign. Visual observers are asked to check GY Cnc as frequently as possible and to report immediately if it is seen nearer to mag 15 than mag 16 (the quiescent V magnitude variation is approximately 16-17.5 through the eclipse

cycle; the orbital hump is less prominent than in IP Peg). Once an outburst alert has been issued, CCD observers should aim to cover all available eclipses as a priority, and entire orbital cycles whenever possible. In quiescence, eclipses last about 15 minutes, increasing to a maximum of about 25 minutes during outburst. Thus a fairly high rate of data acquisition (say 1 frame/minute) is desirable for these observations. At its brightest GY Cnc reaches about V=12.5, and the eclipse depth in V can exceed 2 magnitudes. For photometric control ,V-band filtering should be used, but if two or more observers have agreed to work simultaneously the V-band data can usefully be supplemented by parallel R-band or I-band data.

For initial alerts please telephone Gary Poyner +44 (0)121 605 3716, Chris Jones +44 (0)1268 414542 (both available all night), or myself +44 (0)1235 211315 (up to 10:30pm British Time daily). We will then try to contact other observers by telephone and by e-mail as soon as possible. As for follow-up, I am happy to receive CCD photometric data in Excel or (preferably) text files as a temporary measure. However standards for recording and archiving such data are currently being developed in the BAA, and in due course CCD observers will be asked to submit their data in a standard format.

A chart and comparison sequence for GY Cnc (reproduced on page 19) have recently been produced by John Toone (ref. JT 22-09-02), and visual observers are encouraged to use these when reporting estimates. If predictions of eclipse timings are needed in order to plan observing sessions, the recommended ephemeris is that provided by Kato et al[3], which gives

BJD(min) = 2451586.21271(8) + 0.17544251(5)*E

where E is the eclipse number and the figures in brackets refer to the uncertainties in the last digit of the starting epoch and period repectively. BJD(min) refers to the Julian Date of minimum light in the Barycentric Dynamical Time system [see Appendix C of Coel Hellier's book *Cataclysmic Variable Stars: How and Why They Vary*, Springer 2001, for an explanation of this system]. This ephemeris has recently been checked by Arto Oksanen and colleagues at Nyrola Observatory (CBA Finland), who observed a quiescent eclipse of GY Cnc at the beginning of 2002 October using an unfiltered CCD camera on their 40cm telescope. The light curve they obtained is shown overleaf; this confirms the above ephemeris to within a few seconds. An eclipse ephemeris based on Kato et al's formula but expressed in UT is being placed on the BAAVSS website at **http://www.britastro.org/vss/variable_star_section_ccd_target/gycnc.htm**. Professional astronomers who have indicated interest in this project include Tim Naylor, Tom Marsh, Boris Gaensicke, Warren Skidmore and Emilios Harlaftis. In particular, Dr Harlaftis has indicated that over the next few months the 1.2m telescope in Athens can be made available for observations of GY Cancri.

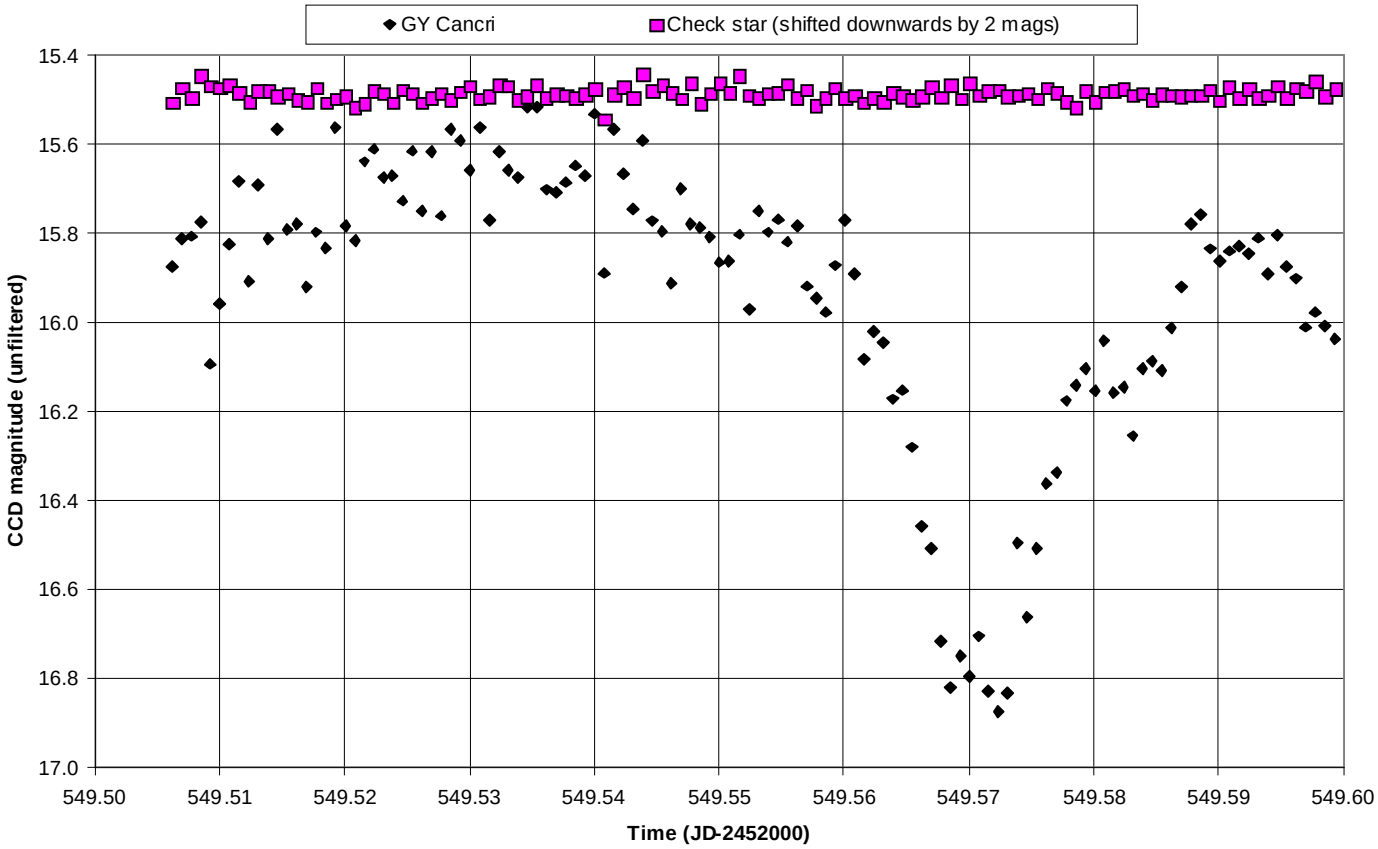
Let's go and catch a rising star, and move the science of astrophysics another step forward!

65 Wantage Road, Didcot, Oxon. OX11 0AE, e-mail: w.worraker@ntlworld.com or bill.worraker@aspentech.com

References

1 Worraker, W.J. - "IP Pegasi - outbursts and eclipses", JBAA 110, No. 2, p.104, 2000.
2 Gaensicke, B.T., Fried, R.E., Hagen, H.-J., Beuermann, K., Engels, D., Hessman, F.V., Nogami, D. and Reinsch, K. "HS 0907+1902: a new 4.2hr eclipsing dwarf nova", A&A 356, pp.L79-L82, 2000.
3 Kato, T., Ishioka, I. and Uemura, M. "Outburst Photometry of th Eclipsing Dwarf Nova GY Cancri", to be published in PASJ, 2002; for a preprint see ftp://vsnet.kusastro.kyoto-u.ac.jp/pub/vsnet/preprints/GY_Cnc/.

Fig. 1: Eclipse of GY Cancri, Nyrola Observatory (CBA Finland), 2002 October 01/02



268·01 30′ FIELD INVERTED

GY CANCRI 09h 09m 50·6s +18°49′47″(2000)

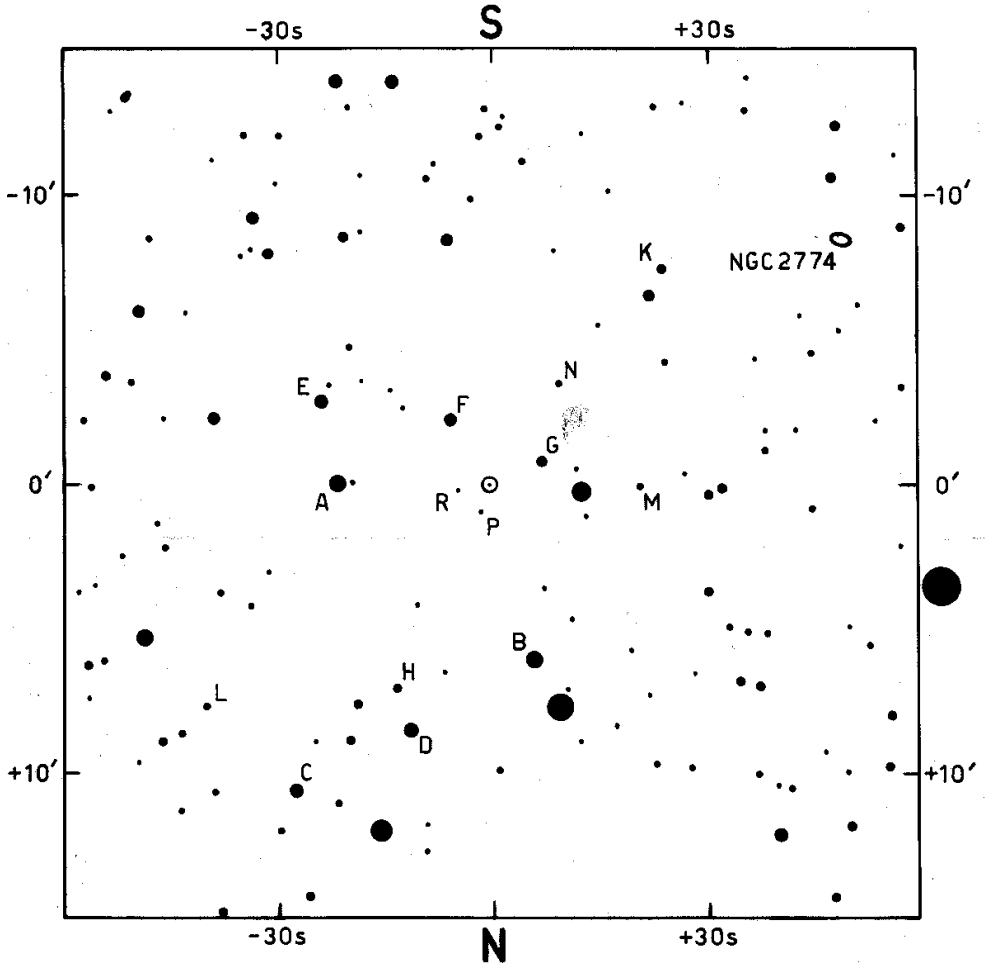


CHART:
GUIDE 8 & USNO A2·

SEQUENCE:
A HENDEN

A 11·2	H 14·1	
B 11·5	K 14·5	
C 12·1	L 14·8	
D 12·4	M 15·4	
E 12·8	N 16·0	
F 13·5	P 16·6	
G 13·7	R 16·9	

BAA VSS
EPOCH: 2000
DRAWN: JT 22-09-02
APPROVED: RDP

MINIMA OF LONG PERIOD ECLIPSING VARIABLES

TONY MARKHAM

Although most known eclipsing variables have short periods which are measured in hours, days or weeks, there are some with much longer periods. The following table lists some eclipsing variables with catalogued periods in excess of 180 days.

Star	RA	Dec	Mag Range	Period(days)
eps Aur	05 01 58	+43 49 24	2.92-3.83 V	9892
zeta Aur	05 02 28	+41 04 34	3.70-3.97 V	972.16
AZ Cas	01 42 17	+61 25 13	9.26-9.50 V	3402
BM Cas	00 54 46	+64 05 05	8.78-9.31 V	197.27185
V748 Cen	14 59 37	-33 25 07	11.5-13.6 V	566.5
VV Cep	21 56 39	+67 37 33	4.80-5.36 V	7430
EE Cep	22 09 23	+55 45 22	10.8-12.4 V	2049.94
KL Cep	22 10 23	+54 09 12	11.3-12.5 p	256.1
W Cru	12 11 59	-58 46 59	9.04-10.4 B	198.537
V1488 Cyg	20 15 28	+47 42 52	3.90-4.14 V	1147.4
V695 Cyg	20 13 38	+46 44 29	3.73-3.89 V	3784.3
OW Gem	06 31 42	+17 04 56	9.00-10.9 B	1258.59
eta Gem	06 14 53	+22 30 25	3.15-3.90 V	2983.49
RZ Oph	18 45 46	+07 13 14	9.65-10.4 V	261.9277
mu Sgr	18 13 46	-21 03 31	3.79-3.92 V	180.45
V381 Sco	17 47 03	-35 47 07	12.3-16.0 p	6545
V383 Sco	17 53 34	-38 05 00	11.7-14.1 p	4900
BL Tel	19 06 38	-51 25 03	7.09-9.41 V	778.6

The table which follows gives the calculated dates of eclipses up to 2006

Star	Eclipse Mid Date	Eclipse Duration	Star	Eclipse Mid Date	Eclipse Duration
W Cru	2003 Jan 04	Dec 15 - Jan 23	KL Cep	Sep 25	
KL Cep	Jan 12		RZ Oph	Oct 30	Oct 21 - Nov 08
V748 Cen	Feb 09	Dec 31 - Mar 21	zeta Aur	Nov 25	Nov 05 - Dec 14
RZ Oph	Feb 10	Feb 01 - Feb 19	BM Cas	Dec 22	Dec 03 - Jan 10
mu Sgr	Feb 19	Feb 09 - Feb 28	W Cru	2004 Feb 05	Jan 16 - Feb 24
V1488 Cyg	Apr 01	Mar 21 - Apr 11	mu Sgr	Feb 15	Feb 05 - Feb 24
EE Cep	Jun 03	May 21 - Jun 15	KL Cep	Jun 07	
BM Cas	Jun 08	May 19 - Jun 27	BM Cas	Jly 07	Jun 17 - Jly 25
V695 Cyg	Jly 02	May 30 - Aug 03	RZ Oph	Jly 18	Jly 09 - Jly 27
W Cru	Jly 22	Jly 02 - Aug 10	eta Gem	Aug 02	Jly 18 - Aug 16
mu Sgr	Aug 18	Aug 08 - Aug 28	mu Sgr	Aug 13	Aug 03 - Aug 23
AZ Cas	Sep 12	Jly 19 - Nov 05	W Cru	Aug 22	Aug 02 - Sep 10

Star	Eclipse Mid Date	Eclipse Duration
V748 Cen	Aug 29	Jly 20 - Oct 07
BL Tel	2005 Jan 08	Nov 30 - Feb 15
BM Cas	Jan 20	Dec 31 - Feb 08
mu Sgr	Feb 10	Jan 31 - Feb 19
W Cru	Mar 09	Feb 16 - Mar 28
RZ Oph	Apr 06	Mar 28 - Apr 14
OW Gem	Jun 15	Jun 08 - Jun 21
BM Cas	Aug 05	Jly 16 - Aug 24
mu Sgr	Aug 09	Jly 30 - Aug 18
W Cru	Sep 23	Sep 03 - Oct 12
KL Cep	Nov 01	

Star	Eclipse Mid Date	Eclipse Duration
RZ Oph	Dec 23	Dec 14 - Dec 31
mu Sgr	2006 Feb 06	Jan 27 - Feb 15
BM Cas	Feb 18	Jan 30 - Mar 01
V748 Cen	Mar 18	Feb 06 - Apr 27
W Cru	Apr 10	Mar 21 - Apr 29
V1488 Cyg	May 22	May 11 - Jun 02
KL Cep	Jly 15	
zeta Aur	Jly 24	Jly 04 - Aug 12
mu Sgr	Aug 05	Jly 27 - Aug 14
BM Cas	Sep 04	Aug 16 - Sep 22
RZ Oph	Sep 12	Sep 03 - Sep 21
W Cru	Oct 25	Oct 10 - Nov 13

Since periods are often only given to the nearest day (and some may be even more uncertain), the dates given may also be slightly uncertain. Eclipse durations can be even less accurately known, especially in those cases where the constituent stars are themselves variable. For **W Cru a**nd **BM Cas**, which are Beta Lyrae type variables, an eclipse duration of 20% of the period was used in the calculations. The eclipse duration for **KL Cep** was not reported in the catalogue.

Not all of the above eclipses are favourable - for example, **Eta Gem** will be in the morning twilight for its 2004 eclipse and the 2005 eclipse of **OW Gem** occurs near conjunction.

In some cases it is necessary to wait longer for favourable eclipses (or indeed for the next eclipse)

Star	Eclipse Mid Date	Eclipse Duration
V383 Sco	2008 Jly 02	2008 Jun 26 - 2008 Jly 07
OW Gem	2008 Nov 24	2008 Nov 18 - 2008 Nov 30
eps Aur	2010 Aug 04	2009 Jly 05 - 2011 Sep 02
eta Gem	2012 Oct 02	2012 Sep 17 - 2012 Oct 17
V381 Sco	2015 Oct 03	2015 Aug 13 - 2015 Nov 22
VV Cep	2018 Apr 12	2017 Aug 10 - 2018 Dec 12

Several other stars have been listed as possible eclipsing variables. For example, **V532 Oph** has a suggested period in excess of 6000 days, **BU Gem** has a suggested period of around 32 years (although I haven't been able to track down the year of previously reported eclipse) and **V644 Cen** has a suggested period of over 200 years. In some cases, no period has been suggested, but comments have been made that previous (sometimes one-off) deep fades of known variables could have been due to eclipses. Examples of such stars include **Rho Cas**, **XX Cam**, **BM Eri** and **CH Cyg.** A suggestion was also made that, based on spectral changes, that **WY Gem** was in eclipse between 1960 and 1976.

Addendum to MEASURING TIMES OF MINIMUM OF ECLIPSING BINARIES USING A CCD CAMERA in BAAVSS Circular No 112, June 2002

DAVID BOYD

I've just bought a USB interface to replace the port accelerator that I previously used with my HX516 camera. Its timing behaviour is significantly different from the old interface, and I've repeated some of the tests I carried out before, which were reported in my original article (see Measuring Times of Minimum of EBs using a CCD camera in VSSC 112). I'm pleased to say that the USB interface has substantially better timing performance.

The mid-exposure time recorded in the FITS file header via the autosave option of the PixH5 software is now about 2 seconds later than the correct mid-exposure time for all the exposure times I tested (up to 60 sec); this is a considerable improvement on the 8 seconds measured before. During readout, the PC clock no longer freezes, but appears to continue running normally. Over a run of 300 exposures, the PC clock loses 3 seconds, representing a time loss of only 0.01 sec per exposure, much less than the 0.23 seconds that was measured before. And it is also very pleasing to note that interaction with the PC at any point during either the exposure or readout no longer seems to interfere with correct timing of the PC clock.

These timing errors are now at a level where I no longer need to correct for them explicitly in order to achieve the sort of EB minimum timing accuracy I'm aiming for. So, in summary, the USB interface is a significant improvement for anyone wanting to make accurate timing measurements based on the time recorded in the FITS header using the HX516/PixH5 combination.

EPSILON AURIGAE

ALEX VINCENT

The long-period eclipsing binary star **Epsilon Aurigae** has a period of 9,892 days (27.1 years). Its last minimum was in July 1983, and the next is due in August, 2010. The duration of eclipse is 700 days, of which about 371 are total. The star is magnitude 2.9 at maximum, and drops to 3.8 at minimum. The primary star is a luminous supergiant star, which exhibits an F0 spectrum. During eclipses some of the light from the primary has been noted to shine through the eclipsing component.

It is not known what the nature of the eclipsing component (the secondary) is, as no trace of it could be found visually or spectroscopically. There are a few ideas regarding its nature; suggestions are that it could be a young star condensing; a flattened disc, a sharp-edged thick disc which is parallel to the orbital plane, a black hole; or a hot blue star surrounded by a huge shell of gas and dust. The black hole theory now seems to be discredited. More may be known at the next minimum in 2010, when it again passes in front of the primary.

However, we may not have to wait for eclipses in order to discover what the secondary is. If the orbit is circular , then secondary minima will occur halfway between primary minima and the last one was in February, 1997. Halfway between primary and seconary minima are greatest elongations where both components are furthest apart. Could observations of some sort be made either on Earth or in space at elongations?

The next elongation takes place in November 2004. Perhaps observations could be made by large detectors using the appropriate instruments from prime observing sites, including the Hubble telescope, to gather enough data to establish the true nature of the secondary component of the Epsilon Aurigae system. Also observations could be photoelectrically made at elongations.

IBVS'S 5240-5300

GARY POYNER

5240 BV (RI)c observations of some Dwarf Novae (Spogli et al, 2002)
5241 Infrared light curves of the binary system **HY Vir** (Arevalo et al, 2002)
5242 Variability of **GSC 3151.0633** (Hajek et al, 2002)
5243 Unusual outbursting state of a Z Cam type star **HL CMa** (Kato, 2002)
5244 **HD 275525, GSC 02866-01866** and **GSC 03429-01645**: Three new Delta Scuti-type variables (Kim et al, 2002)
5245 Minima of **SV Cam** from January 2002-February 2002 (Zboril, 2002)
5246 Missed Nova Aquila 1985 on Moscow and Sonneberg plates (Antipin et al, 2002)
5247 A new short period variable star in Cygnus (Stark & Taylor, 2002)
5248 On the period of the high amplitude Delta Scuti variable **DW Psc** (VanCauteren et al, 2002)
5249 **NSV 786** is not a cataclysmic variable (Stanishev, 2002)
5250 The flare activity of **UV Ceti** 1982-1984 (Panov & Dimitrov, 2002)
5251 Times of minima of eclipsing binaries (Lacy et al, 2002)
5252 Observations of outside-eclipse brightness variations of **CM Dra** (Kozhevnikov & Kozhevnikova, 2002)
5253 BV (RI)c observations of **FY Vul** (Spogli et al, 2002)
5254 Variable stars in field A of NGC 6822 (Antonello et al, 2002)
5255 New V(RI)c photometry of **SW Lacertae** and **AB Andromedae** (Derekas et al, 2002)
5256 Observations of the flare star **EV Lac** in 2000-2001 (Zalinian et al, 2002)
5257 **GSC 4686 2315**: A short period Algol (Koff et al, 2002)
5258 The first ground based photometry of contact binaries **FN Cam** and **EX Leo** (Pribulla et al, 2002)
5259 Errata for issues 4997 and 5145
5260 **GSC 1377-0969 (Brh V65), GSC 0477-0889 (Brh V100)** and **GSC 0669-0674 (Brh V102)** are new W UMa variables (Lloyd et al, 2002)
5261 Emission-line flare of **ES 560B** (Sil'chenko & Moiseev, 2002)
5262 **V893 Sco** is not an ER UMa type star (Kato et al, 2002)
5263 CCD times of minima of faint eclipsing binaries III (Safar & Zejda, 2002)
5264 UBVRI photometry of **SN 2002ap** in M74 (Borisov et al, 2002)

5265 A new 7 day classical cepheid in Cassiopeia (Antipin, 2002)
5266 Recovery of **AS Psc** at minimum light. (Thorstensen, 2002)
5267 Multiperiodicity in the Delta Scuti variable **GSC 2899-00521** (Wils et al, 2002)
5268 Outburst photometry of **EY Cyg**. (kato et al, 2002)
5269 CCD light curves of ROTSE1 variables XIV: **GSC 1996:437 Com, GSC 2004:784 CVn, GSC 2001:300 Boo** and **GSC 3026:1046 CVn.** (Blattler & Diethelm, 2002)
5270 **GSC 1609.00690**, A new classified Cepheid. (Sorokin et al, 2002)
5271 The reddened W UMa system: **GSC 1851-0320**. (Koff et al, 2002)
5272 Observations of flare stars **V577 Mon** and **AD Leo**. (Zalinian et al, 2002)
5273 Light maxima of the RRab variable **TU UMa** in early 2002. (Donley et al, 2002)
5274 Ten new semi-regular variables in Sagittarius. (Gieles et al, 2002)
5275 **OP Aql** and **V926 Aql**, (Hazen et al, 2002)
5276 BVRI observations of **AH Her** in the years 2000-2001. (Spogli et al, 2002)
5277 The new short period EB eclipsing binary system **GSC 01343-02414.** (Gomez-Forrellad et al, 2002)
5278 The new classical Cepheid **NSV 02852**. (Garcia-Melendo & Juan-Samso, 2002)
5279 Short period variability of the Algol system **AI Dra**. (Narusawa et al, 2002)
5280 **V357**: Another W UMa type eclipsing binary misclassified as HADS. (Branicki & Pigulski, 2002)
5281 **EUVE J2244-15.9**: A new spectroscopic binary. (Christian et al, 2002)
5282 Erratum to IBVS 4855 and times of minima of the **EB V357 Pegasi**. (Alis et al, 2002)
5283 BVRI photometry of the type Ic hypernova **SN 2002ap**. (Cook et al, 2002)
5284 New SU Uma type dwarf nova **DM Dra.** (Kato et al, 2002)
5285 The contact binary **GSC 3551-1708**: Light curve analysis. (Nelson et al, 2002)
5286 Has **AY Dra** increased amplitude? (Pejcha et al, 2002)
5287 CCD times of minima of faint eclipsing binaries in 2000. (Zejda, 2002)
5288 **NSV 12364**: A semiregular variable. (Bedient, 2002)
5289 Discovery of four close binary stars in Sagittarius. (Gieles et al, 2002)
5290 The double lined spectroscopic binary **AV Scl**. (Wahlgren et al, 2002)
5291 Optical monitoring of **GM Sgr** and discovery of a Mira and short period pulsator. (Gieles et al, 2002)
5292 **GSC 2038-1730**: A new variable star. (Zhang XB & Zhang RX, 2002)
5293 A possible periodic term in the period of the eclipsing binary **V701 Sco.** (Mayer & Wolf, 2002)
5294 UBVR photometry of the eclipsing binary star **V443 Cygni.** (Eshankulova & Zakirov, 2002)
5295 CCD light curves of ROTSE1 variables, XV: **GSC 2040:1361 CrB, ROTSE1 GSC 2579:1125 CrB, GSC 2035:175 Ser** & **GSC 2580:2086 CrB.** (Blattler & Diethelm, 2002)
5296 Photoelectric minima of selected eclipsing binaries and maxima of pulsating stars. (Agerer & Hubscher, 2002)
5297 The RR Lyrae variable **CH Oph** and a new Mira in its field. (Pastukhova et al, 2002)
5298 Coordinates and identifications of Harvard Variables. (Webbink et al, 2002)
5299 **GSC 00279-00321:** A new W UMa eclipsing binary. (Koppelman & Terrell, 2002)
5300 Photoelectric minima of some eclipsing binaries. (Albayrak et al, 2002)

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**

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

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 parentheses, with the start and end times of visibility on either side. The times are hours GMAT (UT-12h). D indicates that the eclipse starts/end in daylight, and L indicates low altitude at the start/end of the visibility.

Thus, for example, on Jan 3, **ST Per** D05(09)13 indicates that an eclipse of ST Per starts in daylight, but can be observed between approx 05h and 13h GMAT (Jan 3 17h UT and Jan 4 01h UT), with mid-eclipse at about 09h GMAT (Jan 3 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.

2003 Jan 1 Wed
TW Dra D05(02)07
TV Cas D05(08)12
TX UMa L05(03)08
U Cep 11(15)19D
X Tri 12(15)15L
SW Cyg 16(22)19D

2003 Jan 2 Thu
RW Tau D05(03)08
HU Tau 10(13)16L
X Tri 12(14)15L
Z Per 13(18)17L
RW Gem 13(19)18L

2003 Jan 3 Fri
TV Cas D05(03)07
Y Psc D05(07)10L
ST Per D05(09)13
Z Dra 08(10)12
X Tri 11(13)14L
TW Dra 16(21)19D
U Sge L18(19)19D

2003 Jan 4 Sat
U Cep D05(03)08
TX UMa D05(05)09
Z Vul 06(11)08L
X Tri 10(13)14L
HU Tau 11(15)16L
Z Dra 16(19)19D
TV Cas 18(23)19D

2003 Jan 5 Sun
X Tri 10(12)14L
RW Gem 10(15)18L
Z Per 15(20)17L

2003 Jan 6 Mon
Z Dra D05(03)06
SW Cyg 05(12)12L
X Tri 09(11)14
U Cep 10(15)19D
TW Dra 11(16)19D
HU Tau 12(16)16L
SW Cyg L14(12)18
TV Cas 14(18)19D
Z Vul L17(22)19D

2003 Jan 7 Tue
Y Psc D05(02)06
U Sge D05(04)07L
TX UMa D05(06)11
S Equ D05(10)07L
X Tri 08(11)13
Z Dra 09(12)14
RW Tau 11(16)16L

2003 Jan 8 Wed
RW Gem 07(12)17
X Tri 08(10)13
TV Cas 09(14)18
ST Per 12(16)17L
HU Tau 14(17)16L
Z Per 16(21)17L
Z Dra 18(20)19D

2003 Jan 9 Thu
U Cep D05(03)08
Z Vul D05(09)07L
TW Dra 07(12)17
X Tri 07(09)12

2003 Jan 10 Fri
Z Dra D05(05)07
TX UMa D05(08)12
TV Cas D05(09)13
RW Tau 05(10)15
X Tri 06(09)11
HU Tau 15(19)16L
U Sge L17(13)19D

2003 Jan 11 Sat
SW Cyg D05(01)07
ST Per D05(07)11
RW Gem D05(09)14
X Tri 06(08)11
U Cep 10(15)19D
Z Dra 11(13)16
Z Vul L17(20)19D

2003 Jan 12 Sun
TV Cas D05(05)09
TW Dra D05(07)12
X Tri D05(07)10

2003 Jan 13 Mon
RW Tau D05(05)09
X Tri D05(07)09
TX UMa D05(09)14
U Sge L17(22)19D

2003 Jan 14 Tue
U Cep D05(03)07
RW Gem D05(06)11
X Tri D05(06)08
S Equ D05(07)07L
Z Dra D05(07)09
Z Vul D05(07)07L

2003 Jan 15 Wed
TW Dra D05(03)08
X Tri D05(05)08
SW Cyg 09(15)11L
Z Dra 13(15)18
SW Cyg L13(15)19D
TV Cas 15(20)19D

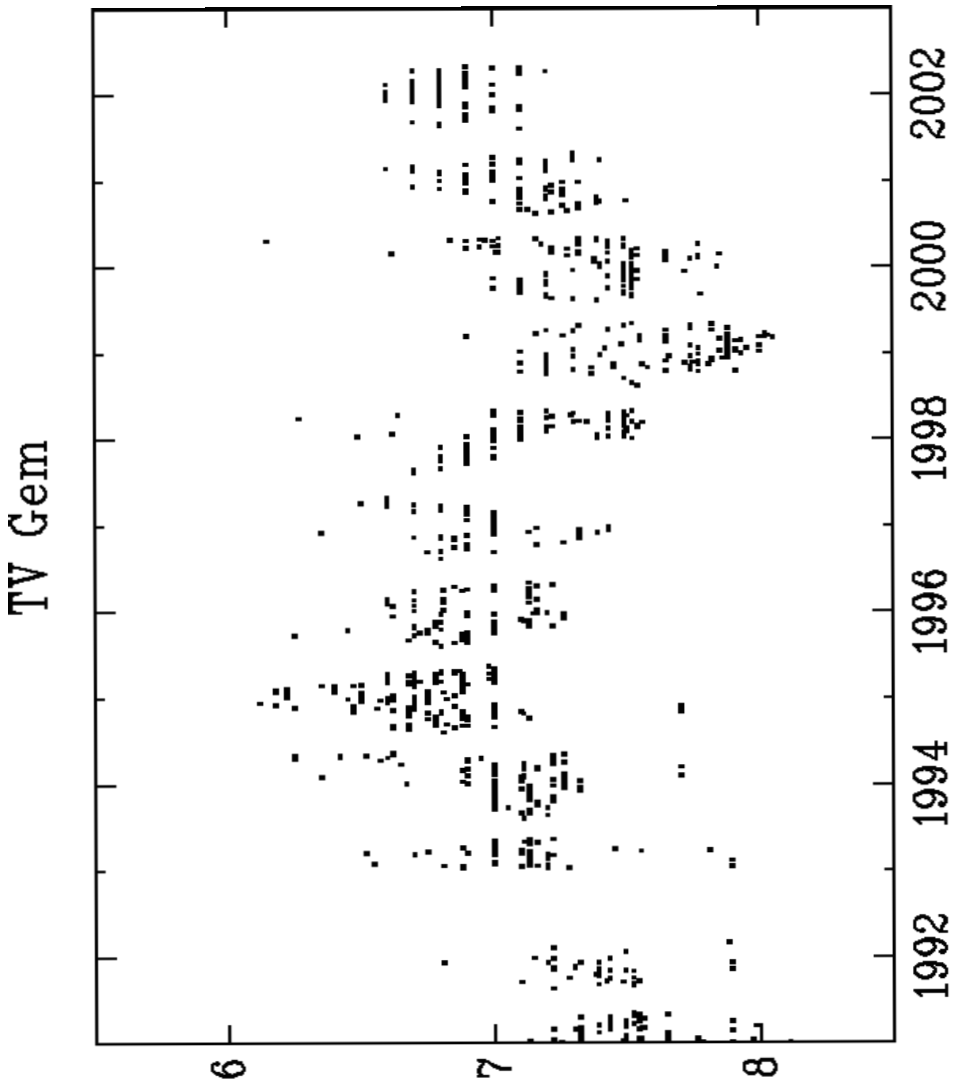
2003 Jan 16 Thu
X Tri D05(05)07
TX UMa 06(11)15
U Cep 10(14)19D
ST Per 10(14)16L
Z Vul L16(18)19D

2003 Jan 17 Fri
RW Gem D05(02)08
X Tri D05(04)06
U Sge D05(08)06L
TV Cas 11(15)19D
TW Dra 17(22)19D

2003 Jan 18 Sat
X Tri D05(03)06
Y Psc D05(09)09L
Z Dra 06(08)11
RW Tau 13(18)16L

2003 Jan 19 Sun
U Cep D05(02)07
Z Vul D05(05)07L
ST Per D05(06)10
TV Cas 06(11)15
TX UMa 07(12)17
Z Dra 15(17)19D
2003 Jan 20 Mon
SW Cyg D05(05)11
TW Dra 12(17)19D
U Sge L17(17)19D
2003 Jan 21 Tue
Z Per D05(02)07
S Equ D05(04)06L
TV Cas D05(06)10
V640 Ori L06(04)06
RW Tau 07(12)15L
U Cep 09(14)19D
Z Vul L16(15)19D
2003 Jan 22 Wed
Y Psc D05(03)08
Z Dra 08(10)13
TX UMa 09(14)18
RW Gem 15(20)17L
2003 Jan 23 Thu
HU Tau D05(03)07
V640 Ori L06(04)07
TW Dra 08(13)18
Z Dra 16(19)19D
2003 Jan 24 Fri
U Cep D05(02)07
U Sge D05(02)06L
Z Vul D05(02)06L
Z Per D05(04)08
RW Tau D05(06)11
ST Per 09(13)16L
SW Cyg L13(19)19D
TV Cas 17(21)19D
2003 Jan 25 Sat
Z Dra D05(03)06
HU Tau D05(04)08
V640 Ori L06(05)07
TX UMa 10(15)19D
RW Gem 12(17)17L
2003 Jan 26 Sun
TW Dra D06(08)13
U Cep 09(14)18
Z Dra 09(12)14
TV Cas 12(17)19D
Z Vul L16(13)19
2003 Jan 27 Mon
ST Per D06(05)09
Z Per D06(05)10
V640 Ori D06(05)08
HU Tau D06(06)09
U Sge L16(11)17
2003 Jan 28 Tue
TV Cas 08(12)16
RW Gem 08(14)16L
TX UMa 12(17)19D
2003 Jan 29 Wed
TW Dra D06(03)08
Z Dra D06(05)07
V640 Ori D06(06)08
HU Tau D06(07)11
SW Cyg D06(08)10L
SW Cyg L12(08)14
2003 Jan 30 Thu
Z Per D06(06)11
TV Cas D06(08)12
Z Dra 11(14)16
U Sge L16(20)19D
2003 Jan 31 Fri
V640 Ori D06(06)09
HU Tau D06(08)12
RW Gem D06(10)15
U Cep 09(13)18
TX UMa 14(18)19D
Z Vul L15(11)16
2003 Feb 1 Sat
TV Cas D06(03)07
ST Per 08(12)15L
RW Tau 09(14)15L
2003 Feb 2 Sun
V640 Ori D06(07)09
Z Dra D06(07)09
Z Per D06(08)12
HU Tau 06(10)14
Y Psc 06(10)08L
SW Cyg 16(22)18D
Z Vul 17(22)18D
2003 Feb 3 Mon
RW Gem D06(07)12
Z Dra 13(15)18
TW Dra 13(18)18D
TX UMa 15(20)18D
2003 Feb 4 Tue
ST Per D06(03)07
V640 Ori D06(07)10
RW Tau D06(08)13
HU Tau 07(11)14L
TV Cas 14(18)18D
2003 Feb 5 Wed
Z Per D06(09)14
U Cep 08(13)18
X Tri 12(14)12L
2003 Feb 6 Thu
RW Gem D06(04)09
Y Psc D06(05)08L
V640 Ori D06(08)10
Z Dra 06(08)11
TW Dra 08(13)18D
HU Tau 09(12)14L
TV Cas 10(14)18
X Tri 11(14)12L
U Sge L15(14)18D
TX UMa 17(21)18D
2003 Feb 7 Fri
RW Tau D06(03)07
SW Cyg D06(12)10L
X Tri 10(13)12L
SW Cyg L12(12)18
Z Dra 15(17)18D
Z Vul L15(20)18D
2003 Feb 8 Sat
V640 Ori D06(08)11
TV Cas D06(09)13
Z Per D06(10)15L
X Tri 10(12)12L
HU Tau 10(14)14L
2003 Feb 9 Sun
TW Dra D06(09)14
ST Per 06(10)15L
X Tri 09(12)12L
2003 Feb 10 Mon
TV Cas D06(05)09
V640 Ori D06(09)11
Z Dra 08(10)13
U Cep 08(13)17
X Tri 08(11)12L
HU Tau 11(15)14L
2003 Feb 11 Tue
Z Per 07(12)15L
X Tri 08(10)12L
Z Dra 16(19)18D
2003 Feb 12 Wed
SW Cyg D06(02)08
TW Dra D06(04)09
V640 Ori 06(09)12
X Tri 07(09)12L
RW Tau 11(16)14L
HU Tau 13(16)14L
Z Vul L14(18)18D
2003 Feb 13 Thu
X Tri 06(09)11
TV Cas 16(20)18D
2003 Feb 14 Fri
X Tri D06(08)11
V640 Ori 07(10)12L
Z Per 08(13)14L
Z Dra 10(12)14
RW Gem 13(18)15L
ST Per 13(18)14L
2003 Feb 15 Sat
X Tri D06(07)10
RW Tau D06(10)14L
U Cep 08(12)17
TV Cas 11(15)18D
2003 Feb 16 Sun
TX UMa D06(02)07
X Tri D06(07)09
V640 Ori 07(10)12L
SW Cyg 09(15)09L
SW Cyg L11(15)18D
U Sge L15(18)18D
2003 Feb 17 Mon
Z Dra D06(05)07
X Tri D06(06)09
ST Per D06(09)13
TV Cas 07(11)15
Z Per 10(14)14L
RW Gem 10(15)15L
TW Dra 14(19)18D
Z Vul L14(16)18D
2003 Feb 18 Tue
RW Tau D06(04)09
X Tri D06(05)08
V640 Ori 08(11)12L
Z Dra 11(14)16
2003 Feb 19 Wed
TX UMa D06(03)08
X Tri D06(05)07
TV Cas D06(06)10
2003 Feb 20 Thu
RW Gem 07(12)15L
U Cep 07(12)17
V640 Ori 08(11)12L
TW Dra 09(14)18D
Z Per 11(16)14L
2003 Feb 21 Fri

SW Cyg D06(05)09L
Y Psc D06(06)07L
Z Dra D06(07)09
2003 Feb 22 Sat
TX UMa D06(05)10
V640 Ori 09(12)12L
SS Cet 10(14)10L
ST Per 12(16)14L
Z Dra 13(15)18
Z Vul L14(13)18D
TV Cas 17(21)18D
2003 Feb 23 Sun
RW Gem D06(08)14
TW Dra D06(10)15
Z Per 12(17)14L
RW Tau 13(17)13L
U Sge L14(12)18
2003 Feb 24 Mon
V640 Ori 09(12)11L
TV Cas 13(17)18D
S Equ L17(12)18
2003 Feb 25 Tue
TX UMa D06(06)11
ST Per D06(08)12
Z Dra D06(09)11
U Cep 07(12)16
SS Cet 09(14)09L
SW Cyg 13(19)18D
2003 Feb 26 Wed
TW Dra D06(05)10
RW Gem D06(05)10
RW Tau 07(12)13L
TV Cas 08(12)16
V640 Ori 10(13)11L
Z Per 14(18)14L
Z Dra 15(17)18D
U Sge 16(21)18D
2003 Feb 27 Thu
Z Vul L14(11)17
S Equ 17(23)18D
2003 Feb 28 Fri
TV Cas D06(08)12
TX UMa D06(08)13
SS Cet 08(13)09L
V640 Ori 10(13)11L
2003 Mar 1 Sat
RW Tau D07(06)11
Z Dra 08(10)13
Z Vul 17(22)18D
2003 Mar 2 Sun
SW Cyg D07(09)08L
U Cep 07(11)16
SW Cyg L10(09)15
ST Per 11(15)13L
V640 Ori 11(14)11L
Z Dra 16(19)18D
2003 Mar 3 Mon
HU Tau D07(05)08
TX UMa D07(09)14
SS Cet 08(12)09L
TW Dra 15(20)18D
2003 Mar 4 Tue
Z Vul L13(09)14
2003 Mar 5 Wed
HU Tau D07(06)10
ST Per D07(07)11
Z Dra 10(12)14
U Sge L14(16)17D
TV Cas 14(18)17D
2003 Mar 6 Thu
TX UMa D07(11)16
SS Cet 07(12)09L
TW Dra 10(15)17D
Z Vul 15(20)17D
SW Cyg 16(22)17D
2003 Mar 7 Fri
HU Tau D07(07)11
U Cep D07(11)16
TV Cas 10(14)17D
2003 Mar 8 Sat
Z Dra D07(05)08
2003 Mar 9 Sun
HU Tau D07(09)12L
TV Cas D07(09)13
TW Dra D07(10)16
SS Cet D07(11)09L
TX UMa 08(12)17
RW Tau 09(14)12L
RW Gem 11(16)14L
Z Dra 11(14)16
2003 Mar 10 Mon
ST Per 10(14)13L
2003 Mar 11 Tue
TV Cas D07(05)09
HU Tau D07(10)12L
SW Cyg D07(12)08L
SW Cyg L10(12)17D
Z Vul L13(18)17D
2003 Mar 12 Wed
TW Dra D07(06)11
Z Dra D07(07)09
RW Tau D07(08)12L
SS Cet D07(10)08L
U Cep D07(11)16
RW Gem 08(13)14L
TX UMa 09(14)17D
U Sge L13(10)15
2003 Mar 13 Thu
ST Per D07(05)09
HU Tau 08(11)12L
Z Dra 13(16)17D
S Equ L16(17)17D
2003 Mar 14 Fri
X Tri 10(12)10L
TV Cas 16(20)17D
2003 Mar 15 Sat
SS Cet D07(10)08L
RW Gem D07(10)13L
HU Tau 09(13)12L
X Tri 09(12)10L
TX UMa 11(15)17D
U Sge 13(19)17D
2003 Mar 16 Sun
Z Dra D07(09)11
X Tri 08(11)10L
TV Cas 11(15)17D
Z Vul L12(16)17D
2003 Mar 17 Mon
U Cep D07(10)15
X Tri 08(10)10L
HU Tau 10(14)12L
Z Dra 15(17)17D
TW Dra 15(21)17D
2003 Mar 18 Tue
RW Gem D07(07)12
SS Cet D07(09)08L
TV Cas D07(11)15
X Tri 07(10)10L
ST Per 08(12)12L
TX UMa 12(17)17D
2003 Mar 19 Wed
X Tri D07(09)10L
2003 Mar 20 Thu
Z Per D07(04)09
TV Cas D07(06)10
X Tri D07(08)09L
Z Dra 08(10)13
SW Cyg 10(16)17D
RW Tau 11(15)12L
TW Dra 11(16)17D
S Equ L16(13)17D
2003 Mar 21 Fri
RW Gem D07(03)09
ST Per D07(04)08
X Tri D07(07)09L
SS Cet D07(09)08L
Z Vul L12(13)17D
TX UMa 14(19)17D
2003 Mar 22 Sat
X Tri D07(07)09
U Cep D07(10)15
U Sge L13(13)17D
2003 Mar 23 Sun
Z Per D07(05)10
X Tri D07(06)09
RW Tau D07(10)11L
TW Dra D07(11)16
2003 Mar 24 Mon
X Tri D07(05)08
SS Cet D07(08)08L
Z Dra 10(12)15
TX UMa 15(20)17D
2003 Mar 25 Tue
X Tri D07(05)07
SW Cyg L09(05)11
TV Cas 13(17)17D
2003 Mar 26 Wed
RW Tau D07(04)09
TW Dra D07(07)12
Z Per D07(07)11
ST Per D07(11)12L
Z Vul L12(11)17
2003 Mar 27 Thu
Z Dra D07(05)08
SS Cet D07(07)07L
U Cep D07(10)14
TV Cas 08(12)16
S Equ L15(10)16
2003 Mar 28 Fri
Z Dra 11(14)16
2003 Mar 29 Sat
TV Cas D07(08)12
Z Per D07(08)12L
U Sge L12(07)13
SW Cyg 13(19)17D
2003 Mar 31 Mon
Z Dra D07(07)09
Z Vul L11(09)14



TV Gem Observers 1980 to 2002: S W Albrighton, B H Granslo, D K Lloyd, E Yusuf, M Fadda, R B I Fraser, G M Hurst, I A Middlemist, M J Nicholls, I P Nartowicz, P J Charleton, G Pointer, T Markham, G Ramsey, R Billington, S Johnston, J Toone, M D Taylor

The deadline for contributions to the 115th issue of VSSC will be February 7th. All articles should be sent to the editor (details are given on the back of this issue)

Printed by RAMPrint 01604 233677

SECTION OFFICERS

Director Roger D Pickard
28 Appletons, Hadlow, Kent TN11 0DT
T:01732 850663 E:rdp@star.ukc.ac.uk

Secretary John Saxton
11 Highfield Road, Lymm,
Cheshire, WA13 0DS T:01925 758009
E:lymmobservatory@hotmail.com

Chart Secretary John Toone
Hillside View, 17 Ashdale Road,
Cressage, Shrewsbury, SY5 6DT.
T:01952 510794 E:john.toone@dial.pipex.com

Binocular Secretary Melvyn D. Taylor
17 Cross Lane, Wakefield, West Yorks,WF2 8DA
T:01924374651E:melvyn.taylor@breathemail.net

Nova/Supernova Secretary Guy M Hurst
16 Westminster Close, Basingstoke,
Hants, RG22 4PP .
T& F:01256 471074 E:Guy@tahq.demon.co.uk

Eclipsing Binary Secretary TonyMarkham
20 Hillside Drive, Leek, Staffs, ST13 8JQ
T: 01538 381174
E: tonymarkham@compuserve.com

Recurrent Objects Co-ordinator Gary Poyner
67 Ellerton Road, Kingstanding,
Birmingham, B44 0QE.
T:0121 6053716
E:gp@star.sr.bham.ac.uk

Pro-am Liaison Committee Secretary & Photoelectric Photometry Advisor - as Director

CCD Advisor Richard Miles
Grange Cottage, Golden Hill, Stourton Caundle,
Dorset, DT10 2JP
T:01963 364651
E:rmiles@baa.u-net.com

Circulars Editor Karen Holland
136 Northampton Lane North, Moulton,
Northampton, NN3 7QW
T: 01604 671373 Fax: 01604 671570
E: kho@star.le.ac.uk

Webmaster Peter Moreton
Engaynes Lodge, Manor Gardens, Pytchley,
Northants, NN14 1HB
E:Peter.Moreton@ril.org.uk

TELEPHONE ALERT NUMBERS

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

Charges for Section Publications

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

	UK	Europe	Rest of World
BAA Members	£3.00	£4.00	£6.50
Non-Members	£5.00	£6.00	£8.50

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

	Order From	**Charge**
Telescopic Charts	Chart Secretary	30p
Binocular Charts	Chart Secretary	10p
Eclipsing Binary Charts	Eclipsing Binary Secretary	10p
Observation Report Forms	Director or Binocular Secretary	Free
Guide to Making Visual Observations	Director or Binocular Secretary	40p
Chart Catalogue	Director	60p
Sample Charts for NE and Binoculars	Director or Binocular Secretary	40p
Sample Charts for Smaller Telescopes	Director or Binocular Secretary	40p
Sample Charts for Larger Telescopes	Director or Binocular Secretary	40p