British Astronomical Association

VARIABLE STAR SECTION CIRCULAR

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Contents

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GR ORIONIS - OLD NOVA NOW THOUGHT MORE LIKELY A CATACLYSMIC.

DENIS BUCZYNSKI

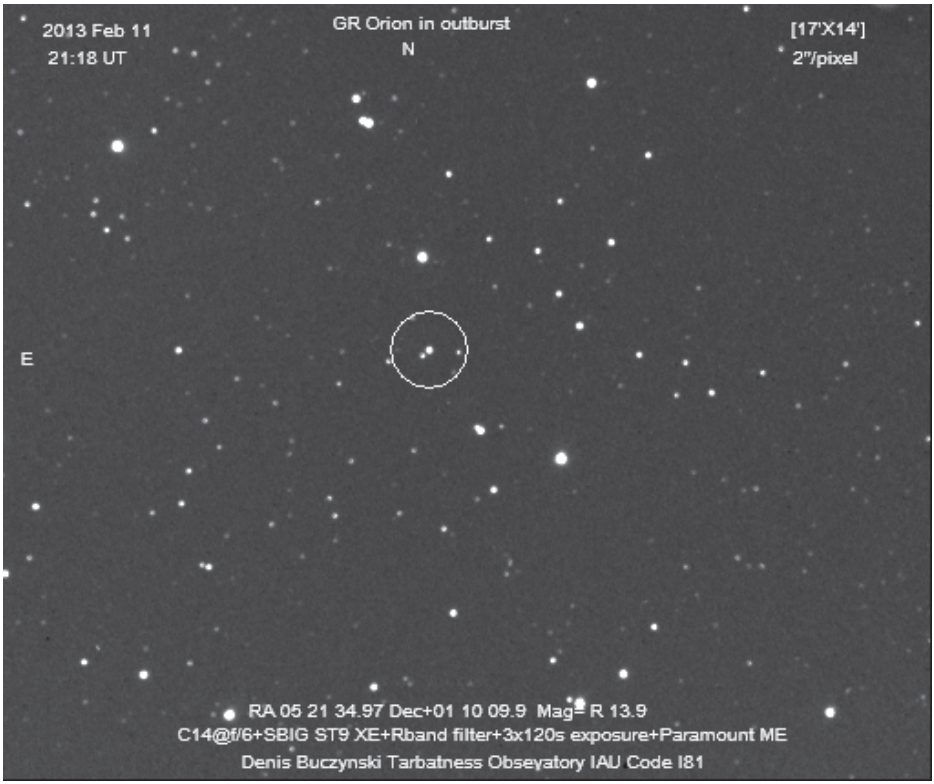

Photo - D. Buczynski

GR Orionis in outburst.

The image above is of an old nova, GR Orionis, which is currently in outburst. My image was captured the same day as the announcement from Rod Stubbins in Australia who discovered it in outburst on February 11th 2013, at 11.424 UT. It is the first documented outburst of this star since its discovery in early 1916 when it was thought to be a nova.

Early multicolour observations during this outburst (including my own), show that this star is more likely to be a cataclysmic in outburst rather than an old nova. Subsequent observations have revealed the presence of well developed superhumps and the classification of this star is now thought to be a WZ Sagittae type.

Photograph details: 20130211 21:18-21:28 UT C14+SBIG ST9XE+bvri Astrodon photometric filters +3x120s exposures+Paramount ME b 13.120, v 13.172, r 13.092, i 13.08920130212 19:22-19:35 UT C14+SBIG ST9XE+bvri Astrodon photometric filters+3x120s exposures+Paramount MEb 13.376, v 13.347, r 13.292, i 13.2936 AAVSO stars on chart 10635AG.Tarbatness Observatory IAU Code I81

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A Reminder

EUROVS 2013 - THE 2ND EUROPEAN VARIABLE STAR OBSERVERS' MEETING: 26 - 27 April 2013

Arto Oksanen

Originally planned for 7 - 9 September 2012(VSSC No 153), EuroVS 2013 – the 2nd European Variable Star Observers' Meeting will now take place on 26th - 28th April 2013 in Helsinki, Finland. The meeting is a continuation from the first European meeting in Groningen, the Netherlands in October 2010. (The 2012 meeting was cancelled.)

The local organiser is the Variable Star Group 'Ursa Astronomical Association'. The meeting will be held in Helsinki Observatory. The old observatory has been renovated, and is now used as a public visitor centre and museum of astronomy. It also houses the premises of Ursa Astronomical Association. It is in the city centre area, about 1 km from the Helsinki Railway Station. The address is Kopernikuksentie 1.

The web-site '*http://www.ursa.fi/eurovs*' contains more information and registration form.

Talks and poster presentations are very welcome. Please contact me(see below) as soon as possible to reserve your place in the program, or if you need any help concerning the meeting.

Welcome to Helsinki! Arto Oksanen - *arto.oksanen@jklsirius.fi*

FROM THE DIRECTOR

Roger Pickard

Sir Patrick Moore

Too late to be included in the last Circular we had the sad announcement that Sir Patrick Moore had passed away on December 9th. I am sure you must have seen the many tributes to him on the TV or in the news or in the latest astronomical magazines, so I will not dwell on it here. Suffice to say I thought I would have a look at our online database to see how many observations of variable stars he might have made. I know, of course, that this is not an area for which he was famed but nonetheless, I knew he had made a number of observations of our favourite objects over the years. It turns out he made over five and a half thousand variable star estimates between 1967 and 1994, mostly of the brighter stars. He also made many more before this but sadly the observations are not (yet) in the database. His favourite, it would seem, was George Alcock's nova in Delphinus, HR Delphini, as he made over 700 observations of it between 1967 and 1984. It would seem almost definitely that it was this star which switched him (back) on to variable star observing as the dates coincide exactly*. [For light curve of HR Del see p.2]

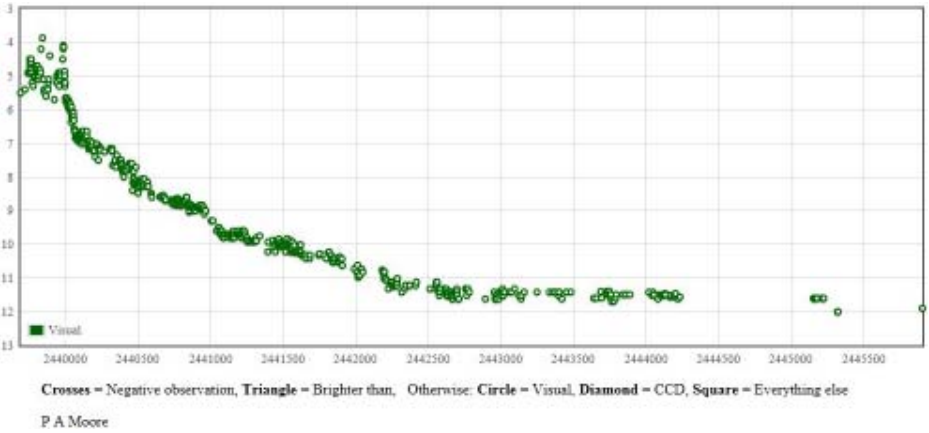
Richard (Dick) Chambers

Shortly before Patrick's passing my good friend from the Crayford Manor House AS, Dick Chambers also passed away after battling cancer for over a year. I recall one occasion, possibly at a BAA Exhibition Meeting, when Dick very proudly pointed at an

*George Alcock discovered his nova on July 8th 1967.

isolated dot on a light curve showing a particular CV in outburst and advising me that that was his observation! Whilst Dick did not help me make my first few variable star estimates (that was Jack Ells) he was instrumental in ensuring I followed this particular activity and without his help and support I doubt I would ever have become your Director let alone have been President of the BAA. I owe him a great deal.

Light curve of HR Delphini [See Sir Patrick Moore p.1]



Applets

In December we added a couple of applet links to the website for the use of observers. The first one can be found at the bottom of the BAA VSS website's page of 'Mid-Eclipse predictions for Eclipsing Binaries and Cataclysmic Variables' < *http://www.britastro.org/vss/dpredict.html* >. It is a 'BAA calculator for the time between successive eclipses of your chosen object' < *http://britastro.org/computing/applets_datetime.html* >.

For the second applet go to < *http://www.britastro.org/vss/* >. Run down the side bar to 'Other Information' and click 'JD Calculator' < *http://britastro.org/computing/applets_jd.html* >.

My thanks to Graham Relf of the Computing Section for adding these.

Unknown observations

The VSS database contains a number of observations by "unknown observers". It would obviously be nice to track down who they may have been, or, for the more recent observations, who they are. To this end I append below some observations of Y Lyncis that appear under 'Unknown Observer'. If you feel you may have been observing this star on the dates shown, could I ask you to check your records to see if it was you and if so, let me know.

Star	JD	UT Calc	instr	class	method
YLYN	2447833.392	02/11/1989	B10X50	1	Visual
YLYN	2447839.462	08/11/1989	B10X50	1	Visual

Star	JD	UT Calc	instr	class	method
YLYN	2447856.372	25/11/1989	B10X50	1	Visual
YLYN	2447864.372	03/12/1989	B10X50	2	Visual
YLYN	2447872.431	11/12/1989	B10X50	2	Visual
YLYN	2447886.444	25/12/1989	B10X50	1	Visual

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REDUCING ERRORS BEFORE SUBMITTING YOUR OBSERVATIONS

BOB DRYDEN

Hopefully, most of you will know that I am now the VSS secretary and as such I receive your observations, which I then process ready for inclusion into the database. To help me in that process, it is important that the data you send is as free from errors as possible, and is in the correct format.

Unfortunately, the software programme for processing your observations is very particular on what it will, and will not, accept, so you need to be careful when entering your data.

Note that it is quite important that you are using the most up to date finder charts available, so please check you have the latest issues.

Many of you are now using the new spreadsheet available from the VSS website. On the 'observation entry' page, check columns AA to AF after you have entered your observations. These columns will indicate if there is a problem with your data, and give you a chance to correct it.

Also, before sending me the 'output page', check it over to make sure there are no obvious errors. Please do not assume it is correct, because sometimes it is not.

Some of you are still using the spreadsheet produced by John Saxton (which is perfectly acceptable) but this one does not have any automatic checks and warnings so extra care is needed when entering data

The most common errors for both spreadsheets are:

A) The constellation abbreviations need to be in the correct format. While I know there are other acceptable formats, the easiest way to get it right first time is to make them all upper case (i.e.: UMA, CRB, VUL, etc), or all lower case (i.e.: uma, crb, vul, etc).

B) All Greek letters should be lower case (i.e.: alpha, not Alpha or ALPHA).

C) You always need a constellation abbreviation with the star name. So NSV7373 would not be enough, it should be NSV7373 CRB. Please note there is no gap between NSV and 7373 (and the same applies to NGCs, SNs, etc)

D) Finder chart sequence names and numbers need to be exactly as in the list in the 'sequence' page of the spreadsheet. So, months need a capital letter and two lower case letters (i.e.: Nov, Dec, Jan, etc), no other format is acceptable.
No gaps between numbers and letters (i.e. 1972Nov28, or JEI1980).
If the chart name is not identical to the one in the 'sequence' list then the software cannot check your observations for errors.

E) The date you made the observation needs to be in the format 27-Mar-2013 and no other. The hyphens are vital, as is the dd/mmm/yyyy order, and the month HAS to be capital letter followed by two lower case ones.

I accept errors can be made (and I am as guilty as anyone in that regard), and I will correct any I come across - within reason. However, I do not have the time to re-type all your estimates, or change all your dates, if they are in the wrong format, it takes far too long. So please do your best to get it right before sending me the file.

Buffer Files

Those of you who are sending me buffer files need to check the 'log file' (i.e. the text file the buffer programme produces along with the actual buffer file). This will show you where there are any problems, denoted by the word 'error' or 'warning' in the right hand column of figures. If the line ends with a row of '1's then everything is OK.

Any 'errors' indicated are usually either a miscalculated magnitude, or a typing mistake somewhere in the data (often in the estimate itself). These errors will need to be corrected otherwise the software will automatically delete the observation from the buffer file.
After making corrections, you will need to produce a new buffer file.

The 'warning' observations will go into the database but the aim is to keep them to a minimum. The three most common reasons an observation is given a 'warning' are:

A) The software cannot find the variable star in the sequence file folder (this is denoted by a '0' at the very beginning of the line, on the left). Make sure you have typed the star name correctly. Is it on our observing programme at all? Have you the latest sequence file and Variable syn file installed on your computer (if not, they are available from the home page of the VSS)?

B) The finder chart you have used is not the most up to date one. Check the charts on the website to find out.

C) The finder chart is not in our database at all or you have entered the name in the wrong format. Check in the 'sequences' page of the new spreadsheet for a full list of available sequences and how they should be written (they have to be written in exactly the same format).

Finally

Whichever format you are sending me your observations in, it really does help a lot if all these mistakes are kept to a minimum. If you have any problems, or are unsure of what to do, please feel free to contact me and I will do what I can to help. I would rather spend time helping you to get it right than have to waste time correcting data once I have it.

RECURRENT OBJECTS PROGRAMME - UPDATE JANUARY 2013

GARY POYNER

Three objects have been dropped from the programme, and three new stars added. **Those removed are...**

V337 Cygni: Probably one of the most difficult of objects on the ROP to observe because of the close proximity of at 15th magnitude field star. Despite this, thirteen outbursts have been detected since May 2006 - all CCD. Three of those outbursts occurring in 2012 alone. Analysis of the first superoutburst to be observed appeared in JBAA Vol. 117, No. 4 (Boyd et al).

V478 Herculis: In their paper of 2010 (Optical studies of twenty longer period cataclysmic binaries (John Thorstensen et al, *http://arxiv.org/abs/1009.1265*), it is concluded that the UGSU classification is incompatible with the long orbital period measured - in excess of 15h. A more likely classification is Nova Like. The one 'outburst' reported by Vanmunster in 2001 who reported a 'probable superhump', remains a mystery. ROP data show V478 Her reaching the low 15s on four occasions from 2006,with no indication of DNe type behaviour.

DV Ursae Majoris: Fifteen outbursts are on record since 1995 of this now well studied UGSU+E star, including two each in 2007, 2009, 2011 and 2012. The orbital and superhump periods have been established, and eclipses well covered.

Stars added...

SDSS J093249.57+472523.0: See *http://arxiv.org/abs/1202.0689*
Range 14.9-19.0CV
Jeremy Shears has data on this object, and reports that only one superoutburst has yet been detected. It is an eclipsing UGSU star and shows a very odd lightcurve.

SDSS J112619.45+084650.8:
Range 14.7-21.0CV
Taichi Kato reports on vsnet-alert 15246 that CRTS detected this object as a large amplitude Dwarf Nova on January 6th 2013, and is an excellent UGWZ candidate. CRTS had not detected any previous outbursts.

PNV J21581852+2419246: See *http://arxiv.org/abs/1205.0898*
Range 14.1-19.8CR
Also know as GALEX J215818.5+241924. Again J. Shears has data, and reports that there was only one previous superoutburst detection during October 2011. No outburst period or supercycle length is known.

AAVSO charts/sequences are available for each of these new additions to the ROP.

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ECLIPSING BINARY NEWS

DES LOUGHNEY

Eta Geminorum

At the time of writing (11th February 2013) observations seem to show that the system has resumed its out of eclipse variations between about magnitude 3.2 and magnitude 3.45. The figure below shows some DSLR photometry measurements since the end of August 2012 (about the midpoint of the eclipse). It will be seen how bad observing conditions have been in the last couple of months with only six measurements in a sixty day period.

CQ Cephei - a study using a robotic telescope

In the last Newsletter there was a report of the CAPAS conference including the discussions on Eclipsing Binaries. There had been a call to observe several unusual systems including CQ Cephei. Some details of the system were mentioned in the Newsletter *. It was therefore with some interest that I read the article by Martin Fowler in the latest edition of the JBAA entitled 'CQ Cephei - from robotic observations to computer modelling' (JBAA February 2013 pp 54 -55). It was nice to see robotic telescopes being used to study an eclipsing binary system. I noted that in a two month period last year measurements were successfully made on 44 nights! I had not thought that robotic telescopes could be easily used for the study of eclipsing binaries because of the need to have a sequence of measurements on a particular night. The sequence would be needed to fully catch, for example, a primary eclipse and work out its midpoint. Now it is clear it can be done, which may represent an important step forward for EB observation.

I look forward to reading about the planned studies of two other eclipsing binaries - AO Cephei and OT Lacertae.

RT Lacertae

At the CAPAS conference it was suggested that RT Lac might be an intriguing system for observation. It seems a good target for a range of techniques. It is a Beta Lyrae (EB) class of system which means it is in continuous eclipse. It varies from 8.84 magnitude to 9.89 magnitude with a period of 5.074 days. The primary eclipse is 0.8 magnitude depth and the secondary eclipse 0.7 magnitude.

The system is intriguing because it contains an RS Canum Venaticorum star. The light curve may show variations due to large star spots or flares. Anyone interested in studying this system is urged to get in touch so that we can produce a draft chart.

BH Draconis

This system is an Algol class (EA/SD) eclipsing binary. It is in our Eclipsing Binary Programme and has a chart 285.01 which can be downloaded. It does not seem to have been studied for some time so it is unclear why it is part of the Programme. That may be a good reason for having a look at it again after a gap of decades. With a period of only 1.82 days it is frequently in eclipse. It varies from 8.38 magnitude to 9.27 with a period of totality that is said to last 32 minutes.

*See VSSC No.154, EB News p.13

The apparent variation may not be as indicated above because the system is also part of a non eclipsing binary system. I do not think that this binary will be resolved in binoculars or DSLR photometry. It will need a telescope.

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VARIABLE STARS AND VERMIN II

JOHN TOONE

In VSS Circular No 114 [2002 Dec. "Variable Stars and Vermin"]See p.11*, I reported on three instances in the last Century where I had inadvertently found asteroids that had strayed into the fields of variable stars that I monitored on a regular basis. The instances were:

31 July 1984 – 216 Kleopatra in the field of RS Ophiuchi
7 April 1992 – 44 Nysa in the field of U Geminorum
13 February 1996 – 1 Ceres in the field of RS Cancri

Each time I had to undertake checks to identify the interloper, and in the case of the telescopic asteroids Kleopatra and Nysa I was forced to ring Denis Buczynski, via 'The Astronomer'(TA) hotline, who had quite a task to confirm their identities. Denis in a 2012 BAA VSS Alert posting made the following comment on the Kleopatra identification:

"*There were no MPC asteroid checkers then, I had to go through each asteroid in the Leningrad ephemeris and look at its RA and Dec for the time of your observation. The positions were given in five day intervals. Luckily your observation was on one of the quoted days, otherwise there would have had to have been a degree of interpolation. It was a noteworthy success for me in the TA early warning team as I knew that it would be a real object (the observer was credible!) and I had to find out what it was before it was too late, should it have been a nova. Those were the days! Thank goodness we have moved on since then.*"

Things are so much easier in the 21st Century with planetary software readily available. Between 2003 and 2012 I have picked up Ceres and Nysa again as well as Antiope for the first time, and on each occasion their identification was easily verified by firing up the pc. The only inconveniences were a short break to the observing spell and a loss of night vision in my left eye (the right eye, the one normally used at the telescope, remained covered and protected). The circumstances around these events are summarized below:

On the 23rd March 2003 I turned my C14 onto OJ+287 which had been recorded at magnitude 15.3 on the previous night. I first located the field and then applied high power to render OJ+287 visible. I instantly curtailed the observation because there was a much brighter unidentified object in the field roughly aligned with comparison stars S and T and 1.5 minutes NF** the position of OJ+287. My first thoughts were "could it be

** NF and SF are positional terms used by visual observers, based on the drift of any celestial object across the field of view. NF means North Following which is north east, and SF means South Following or south east. For a fuller explanation see Norton's 2000.0 Star Atlas and Reference Handbook (Eighteenth Edition) page 63.

a Gamma Ray Burst (GRB)?" (GRB's were big news in those days) but then I thought "no, its right on the ecliptic, it has to be an asteroid." I made an estimate of magnitude 14.3 using comparison star S and went inside to check my Guide software. This instantly revealed the object to be 90 Antiope.

On the 12th December 2010 I pointed my C8 at FL21 Leonis as a prelude to locating X Leonis. On low power I thought I saw X Leonis having a magnitude 10 super-outburst because it rarely gets above magnitude 12. Then when I applied high power I found a positional discrepancy with the bright object of 2 minutes NF the position of X Leonis, which was not visible. I temporarily suspended the observing session in order to identify the object fully, expecting it to be an asteroid as it was again positioned right on the ecliptic. The asteroid hunch was proved correct but the real surprise was that it was my old friend 44 Nysa again. I made an estimate of magnitue 10.1 using a combination of stars from the R and X Leo sequences as it was right off the upper (bright) limit of the X Leonis sequence.

On the 15th November 2012 I was undertaking my routine mid-month sweep of the stars on my binocular programme. I had just completed estimates of BU and TV Geminorum with 7x50B and switched to 15x70B to ensure comparison star T was visible in order to make a fractional estimate of WY Geminorum. Straight away I saw that WY Geminorum had an almost identical companion only 8 minutes SF. Although within a MilkyWay field with nova potential it was again right on the ecliptic so I thought it had to be an asteroid, perhaps one of the 'Big Four'on account of its brightness at magnitude 8.0. Ephemerides are given for the brighter asteroids in the BAA Handbook so I considered that consulting the Handbook would be quicker than switching on the pc. No asteroid was listed in the Handbook that matched the position so I was forced to use the pc in the end which confirmed the object was 1 Ceres. I thought "why did the BAA Handbook not list Ceres at magnitude 8" before it dawned on me that Ceres had been reclassified as a dwarf planet and was listed together with Pluto in a separate part of the BAA Handbook. Coincidentally Colin Henshaw also picked up Ceres on the same night and responded to my BAA VSS Alert message with the following:

"*What an amazing coincidence! I was out this morning and one of the image sets I secured was that of the field of BU, TV and WY Geminorum. Looking at one of the images I thought "What's that?" Maybe it was a spurious image, but sure enough it was on all the other images as well, so it was genuine. I thought "Better send a text message to Guy Hurst, but first of all, are there any asteroids in the field?" So I opened up "SkyMapPro 10" and found that the interloper was Ceres. A very welcome surprise, as when I get round to measuring the images, I can look at that too.*"

Please view Page 9 and 10 before returning below.

Having now had half a dozen instances of asteroids ('vermin' as termed by Walter Baade) being seen by chance due to straying into variable star fields, I thought it would be interesting to calculate an average frequency of these events occurring. All of the sightings were within zodiac constellations (ignoring astrologers being in denial with respect to Ophiuchus) and with the exception of RS Oph all were between RA 6 hours and 10 hours (Gemini, Cancer and Leo) not surprisingly in the northern section of the ecliptic. To identify an interloper visually the observer needs to be familiar with the field and then to be looking at it on a regular basis (the sequence actually forces the observer

Continued on page 11

Figure 1:

Taken 14th November 2012, 20.50 UT, 2 second expoure, 1600 ASA, F3.5, with 135 mm Telephoto lens.

Colin Henshaw

The images of Ceres taken by Colin Henshaw on the 14th and 15th November 2012 clearly show the dwarf planet movement over 25 hours with respect to WY, BU and TV Geminorum and other nearby field stars.

Figure 2:

Taken 15th November 2012, 22.35 UT, 2 second exposure, 1600 ASA, F3.5, with 135 mm Telephoto lens.

Colin Henshaw

Also on page 10 is the BAA VSS chart 294.01 for TU, TV, WY and BU Geminorum which was used to estimate the brightness of the Ceres. Identified on this chart is the area of the sky that Colin's images covered.

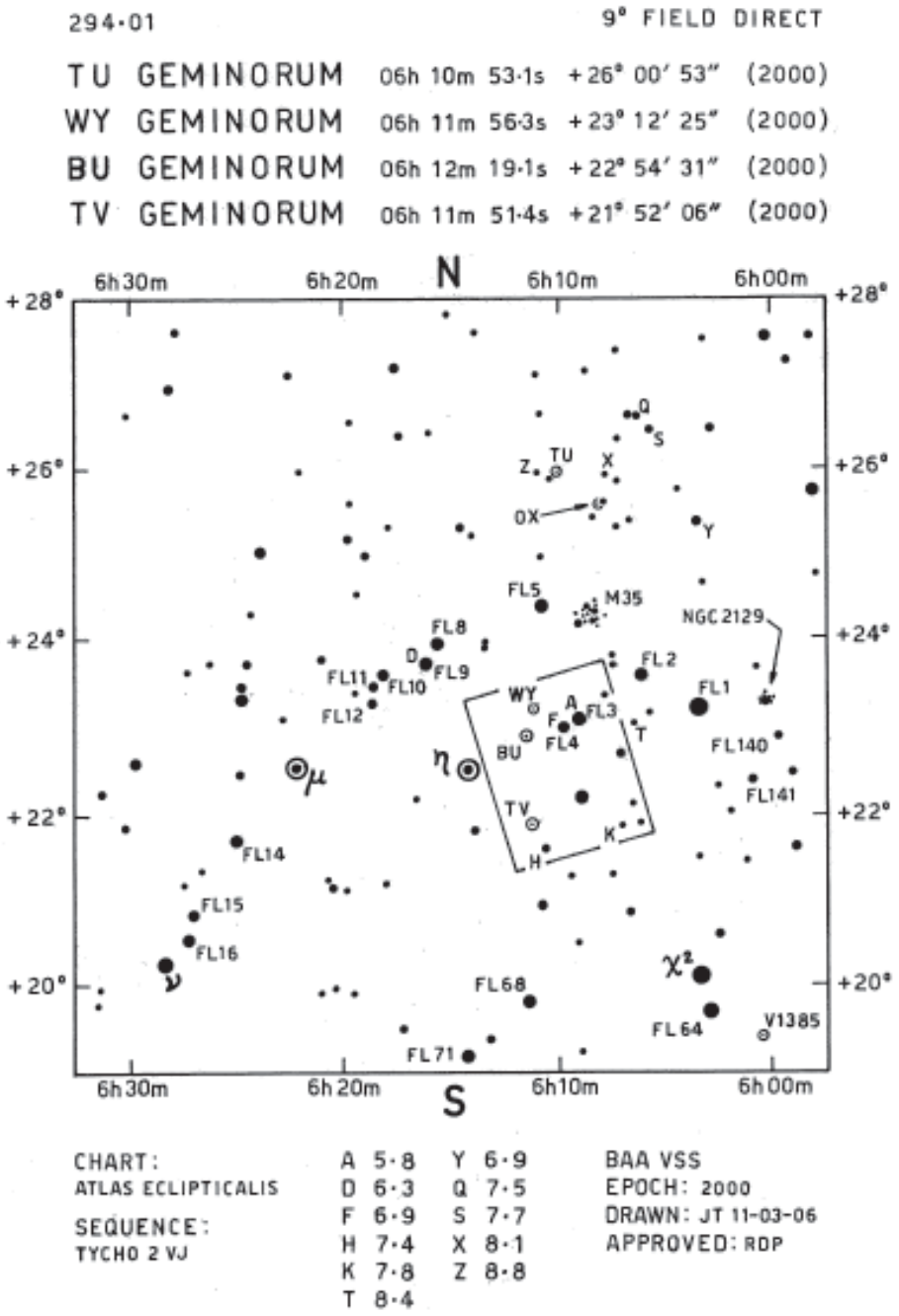

Figure 3: BAA VSS Chart for TU, TV, WY, and BU Geminorum, showing with a rectangle the area covered by the photographs.

to look at the surrounding field in addition to the variable itself) which is classic variable star methodology. A good field chart showing an even distribution of field stars is an advantage and unfortunately some VSS charts in the past have not been consistent in this respect.

I list below each of the variable stars, their proximity to the ecliptic, the years and nights I have observed the variable before spotting an asteroid and the total number of nights I have observed the variable up to the end of 2012.

Variable star	Distance from ecliptic in degrees	Years monitoring before asteroid encounter	Nightly observations before asteroid encounter	Total nightly observations up to end of 2012
RS Ophiuchi	16N	3 (1981-1984)	93	1885
U Geminorum	1N	10 (1981-1992)	327	1790
RS Cancri	14N	18 (1977-1996)	503	905
OJ+287	3N	21 (1982-2003)	196	439
X Leonis	2S	26 (1984-2010)	1245	1371
WY Geminorum	0	33 (1979-2012)	701	706

A binocular field is typically 5 degrees and the telescopic fields are less than 0.5 degree.

My observing programme includes 33 stars that are within 16 degrees of the ecliptic. I have taken the number of my observations of those 33 stars (13,532) listed within the BAA VSS database, and have multiplied it by a factor of 1.8 to compensate for the likely number of observations of these 33 stars which are amongst my 69,000 observations not yet entered in the database. This means that I have looked at variable star fields within 16 degrees of the ecliptic an estimated 24,000 times and have found 6 asteroids in the process. Therefore my current average is one asteroid encounter approximately every 4000 times I look at such a field.

I have no idea whether this is a typical success rate or whether many other asteroids are escaping notice because I am not paying sufficient attention to the entire field of view. In any case I can now appreciate the laborious efforts made by the 'Celestial Police' and other 19th Century astronomers who made it their business to search visually for asteroids within the ecliptic constellations.

It is not just vermin (asteroids and dwarf planets) that can wander into variable star fields, comets can too and they are not confined to the ecliptic region, but that is another story for some other VSS Circular.

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* The original article "Variable Stars and Vermin" can be found on the BAAVSS website under "Articles".

MINIMA OF HL AURIGAE AND EG CEPHEI OBTAINED WITH AN ENTRY LEVEL CCD CAMERA AND 50MM REFRACTOR.

DAVID CONNER

Introduction

Following on from my experience of using the Bradford Robotic Telescope (BRT) for making observations of eclipsing binaries [1] [2], I decided to adapt my observatory in Somerby so that I could try making my own CCD observations of short period systems, leaving the BRT to concentrate on systems with periods of weeks or months. This involved upgrading the telescope drive and acquiring an astronomical CCD camera and the skills to use it. The results, as illustrated by recent observations of minima of HL Aurigae and EG Cephei, are encouraging.

Instrumentation

Most of the eclipsing binaries that I follow lie within the range magnitude 7 to magnitude 12. The 180mm / f2.8 lens and 4.3 degree square field of view of the BRT Cluster Camera were able to image these and include suitable comparison stars in the field of view. However, the BRT is not intended to make many observations over one night of the same object in order to determine the time of a minimum, and it became evident that I needed a system of my own. After investigating many lens / CCD combinations, a suitable (and affordable) pairing was selected; an Atik Titan monochrome CCD camera coupled with a 50mm aperture 180mm focal length (f3.6) objective lens from one of the ubiquitous 9x50 finder scopes sold under a number of different badges. This would provide a field of view of 1.55 degrees x 1.15 degrees, the smaller field not being a problem with many of my program stars, and was acquired in January 2012.

The finder's eyepiece was removed and the hole enlarged to accept a 1 ¼ inch adaptor to which the camera was screwed, the adaptor being superglued to the finder, see figure 1. It was necessary to remove the large lock-nut from the objective lens to enable it to move close enough to the CCD in order to achieve focus. (These finders have a fixed eyepiece position; they are focused by moving the objective lens.) PTFE tape on the objective's screw thread provided sufficient friction for it to remain in position once a suitable focus was found, while still allowing adjustments to be made.

Figure 1: 50mm finder with the Atik Titan replacing the eyepiece.

My main interest is determining the times of minima of eclipsing binaries so, apart from an IR / UV filter, none of the following procedures involved filters. Initial observations were made with the Titan/lens combination piggy-backed on my 10 inch Newtonian mounted on my venerable MkIV Fullerscopes German equatorial mount. Although adequate for visual use and imaging of bright objects with a Meade LPI camera, this mount has a periodic error that produces serious trailing in exposures longer than a few seconds, so some form of autoguiding was required. Fortunately, the homemade synchronous motor drive for this mount was ST-4 compatible. The relays of an off the shelf relay board were wired in parallel with the switches in the hand controller, and were controlled by a laptop running Stark Labs PHD Guiding software [3]. Star tracking input was provided by the LPI through the 10 inch (!), and output from the laptop to the relay board was via a HitecAstro USB Guider [4]. Image capture was with Atik's proprietary software Artemis Capture, and image calibration and reduction was performed with AIP4WIN.

Tuning the system.

Following the guidance in the AIP4WIN Handbook [5], it was possible to obtain recognisable light curves from the outset, and it was apparent that the first real challenge was to reduce the scatter of the light estimates around the mean curve. Although better than +/- 0.1 magnitude from the outset, getting the best out of the system required fine tuning. The theoretical full width half maximum (FWHM) of a stellar image formed with a 50 mm lens is of the order of 2.5 arcseconds, while the resolution of the lens/camera combination is 8.5 arcseconds per pixel. Images therefore need to be defocused in order for the FWHM to be at least 2 pixels across to reduce scatter (i.e. 'noise') due to undersampling, the CCD imaging equivalent of the Nyquist criterion, see figure 2. This is not a hard and fast rule and oversampling by defocusing the images to 3 or 4 pixels across may improve matters even more, which will be the subject of further investigation. Additionally, brighter variables need to be defocused sufficiently (or the aperture reduced by an iris) in order to increase the length of exposures sufficiently to smooth out the effects of scintillation.

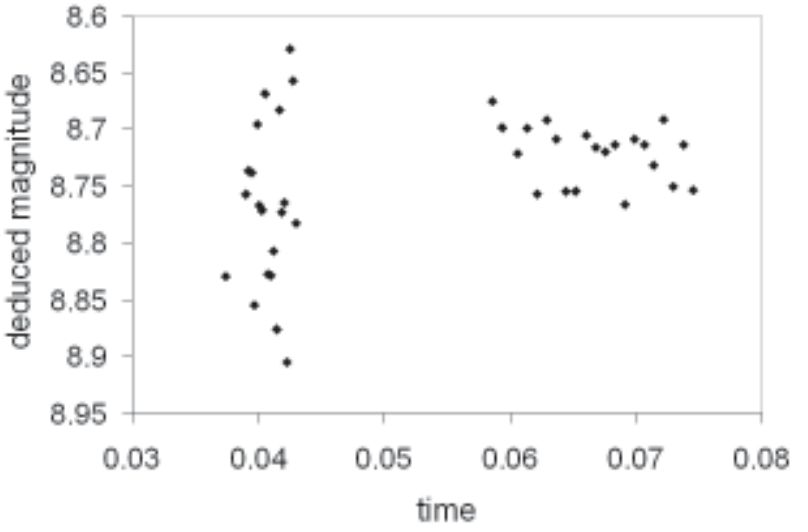

Figure 2: Light estimates of the same non-variable star, illustrating the effects of sampling on scatter. Left – undersampling, right – critical sampling.

A persistent timing error of -1 hour proved difficult to track down. Artemis Capture automatically corrects for British Summer Time when writing the start time of the exposure into its FITs header. Not knowing this, I altered the time on the computer clock to read GMT rather than BST, from which the software subtracted another hour, resulting in a 1 hour overcorrection. Two more unforeseen issues arose. Firstly, condensation on the cooled CCD chip (not the optical window in front of it), easily remedied by putting the camera's internal desiccant tablet in a hot oven for half an hour – once I knew it had one, that is. Secondly, and more intractable, if passing cloud obliterates the guide star then the autoguiding programme wanders off in search of it without limit. By the time the cloud passes, the guide star, variable and any recognisable star patterns can be completely lost. Apart from this issue, which means the system cannot just be abandoned and left to get on with it, it can now successfully operate for four or five hours without intervention and in one session acquired over four hundred images ready for reduction.

Early results.

The above procedures were refined over the summer, and eventually led to the following results; primary minima of HL Aurigae on 2012 November 10 (figure 3), and EG Cephei on 2012 December 9 (figure 4). The observed minimum of HL Aurigae occurred at HJD* 2456242.468 as determined by Peranso [6], which compares favourably with the predicted time of HJD 2456242.467 ref. Kreiner et al.[7]. The observed minimum of EG Cephei occurred on HJD 2456271.484, compared to HJD 2456271.485.

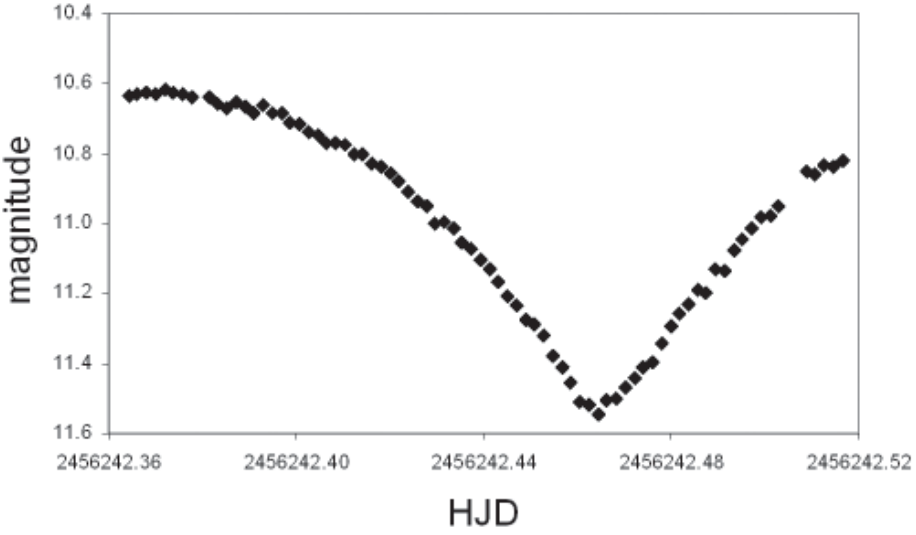

Figure 3: Primary minimum of HL Aurigae on 2012 November 10. The data points are from single images.

* HJD (Heliocentric Julian Date) is JD corrected for differences in the Earth's position with respect to the Sun.

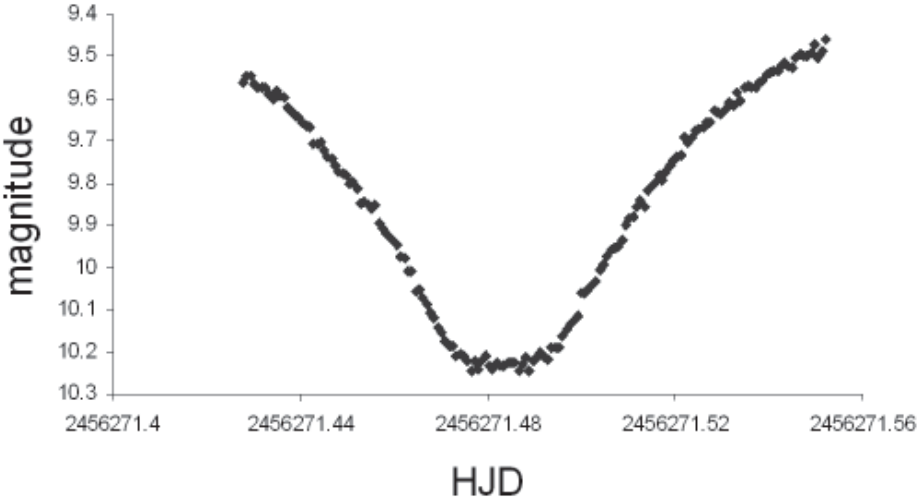

Figure 4: Primary minimum of EG Cephei on 2012 December 9. Data points are from single images.

Conclusion.

Previous experience with the BRT proved invaluable, and provided an insight into the techniques of CCD photometry of eclipsing binaries before deciding to invest finances and time in a system of my own. Although there is still work to be done to reduce scatter, and hence improve the timings, an 'entry level' CCD camera attached to an inexpensive 50mm refractor has been shown capable of producing useful results. I would like to thank Roger Pickard and Des Loughney for their help and encouragement with this project.

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david@somerbyconners.plus.com

LIGHT CURVES

TONY MARKHAM

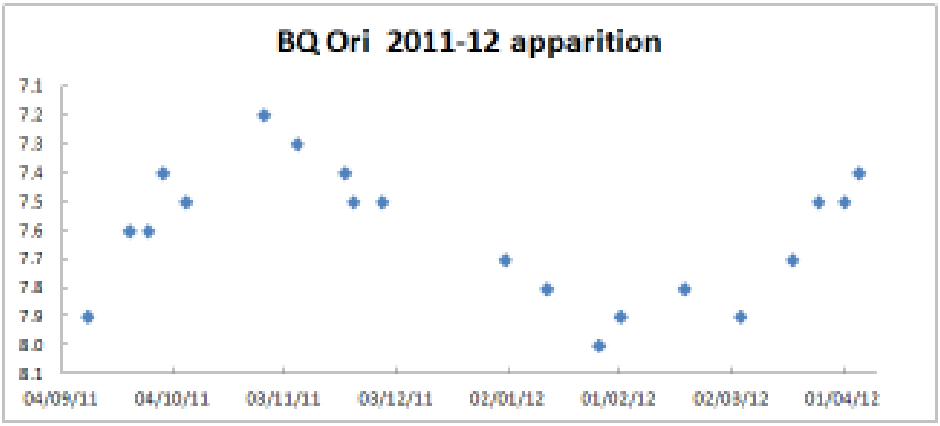

Figure 1: BQ Orionis - semi-regular pulsating

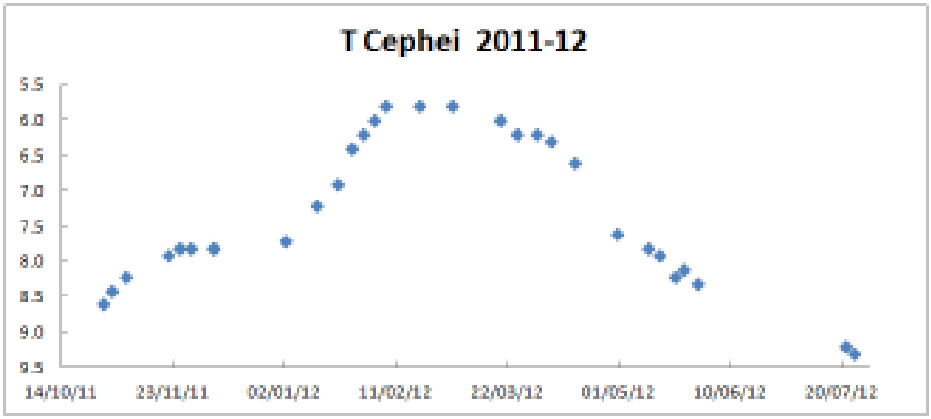

Figure 2: T Cephei - Mira Cet type

tonymarkham832@btinternet.com16

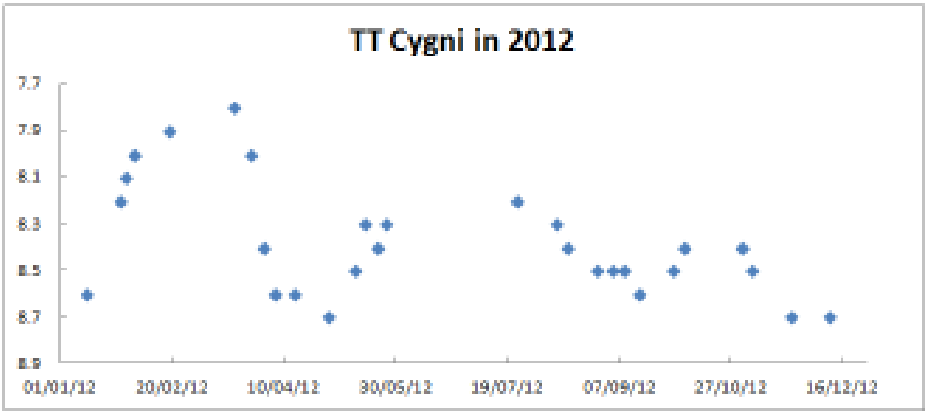

Figure 3: TT Cygni - semi-regular pulsating

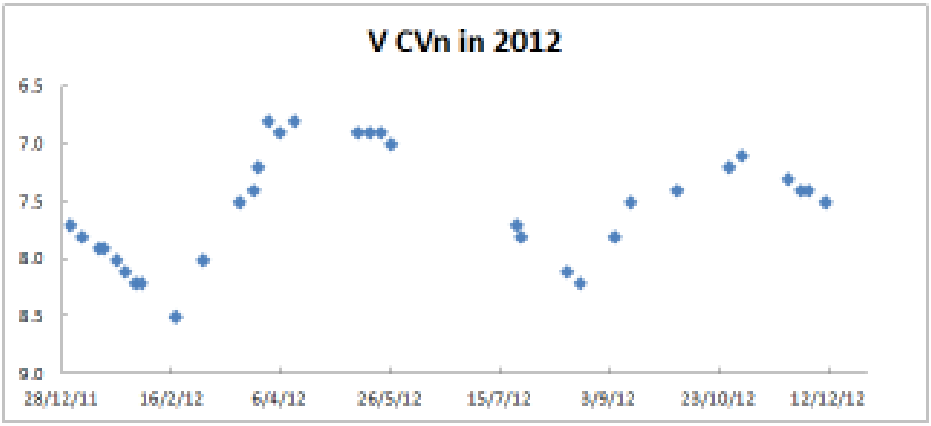

Figure 4: V Canum Venaticorum - semi regular pulsating

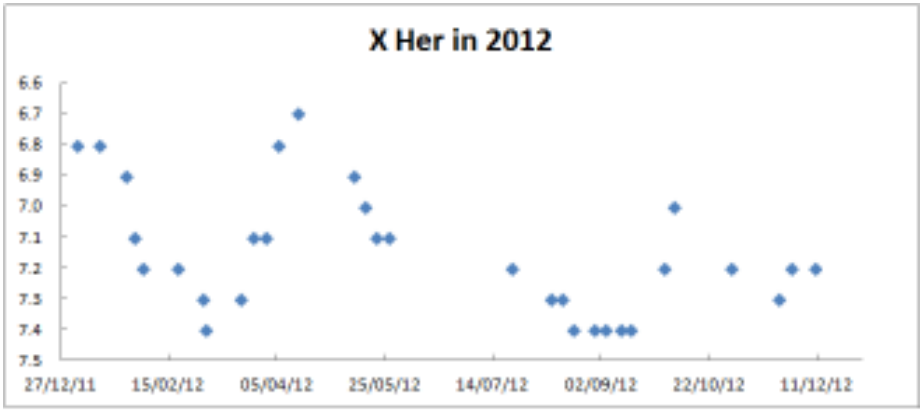

Figure 5: X Herculis - semi-regular pulsating

IBVS 5996 - 6045

JANET SIMPSON

5996 Reference frame and time standard used in INTEGRAL/OMC datasets. (Zejda and Domingo, 2011)
5997 Minima of eclipsing binaries, variability of V840 Her and NSV5740, new ephemerides for V997 Cyg, V1037, V1098, V1100 Her. (Arena et al, 2011)
6000 Just One New Measurement of the B[e] Supergiant Hen-S22. (Sterken, 2011)
6001 New Light Curves and Ephemeris for the Close Eclipsing Binary V963 Persei. (ODELL et al, 2011)
6002 Photometric Analysis of V400 Lyrae. (Marino, 2011)
6003 Implications of the non-detection of X-ray emission from HD 149427. (Stute and Luna, 2011)
6004 Another component in the multiple system eta Mus. (BUTLAND and BUDDING, 2011)
6005 Times of minima of eclipsing binaries and times of maxima of pulsating stars. (Liakos and Niarchos, 2011)
6006 CCD Maxima of Pulsating Stars and Times of Minima of Eclipsing Binaries. (Martignoni, 2011)
6007 Collection of minima. (Zasche et al, 2011)
6008 The 80th Name-List of Variable Stars. Part II - RA 6h to 16h. (Kazarovets et al, 2011)
6009 The GEOS RR Lyr Survey. (Le Borgne, Klotz and Boer, 2012)
6010 BAV-Results of observations - Photoelectric Minima of Selected Eclipsing Binaries and Maxima of Pulsating Stars. (HUBSCHER, Lehmann and Walter, 2012)
6011 Timings of Minima of Eclipsing Binaries. (Diethelm, 2012)
6012 Light curve modeling of short-period W UMa-type stars. (Pilecki and Stepien, 2012)
6013 GSC 03949-00386 is a Double-Mode High-Amplitude delta Scuti Star. (Bernhard, Srdoc and Frank, 2012)
6014 New Times of Minima of Some Eclipsing Variables. (Lacy, 2012)
6015 Photometry of High-Amplitude Delta Scuti Stars. (Wils et al, 2012)
6016 ZZ Cyg - Fundamental Parameters. (Nelson, 2012)
6017 V881 Persei - A Spotted, Detached Eclipsing Binary. (Nelson, 2012)
6018 CCD Minima for Selected Eclipsing Binaries in 2011. (Nelson, 2012)
6019 Magnetic field and spectral variability of the Of ?p star CPD-28 2561. (Hubrig et al, 2012)
6020 Apsidal motion of the eccentric eclipsing binary GSC 4487-0347. (Kozyreva, Kusakin, and Menke, 2012)
6021 PERIOD-AGE CORRELATIONS FOR ECLIPSING BINARIES IN STELLAR CLUS TERS. (Bukowiecki et al, 2012)
6022 Photometric behaviour of V1343 Aquilae (SS 433) in 2011. (Volkov, 2012)
6023 Period analysis of the Halpha line profile variation of the Be binary star pi Aqr. (Pollmann, 2012)

6024 Photometric sequences and astrometric positions of SN 2011fe in M101 and SN 2012aw in M95. (Henden, Krajci and Munari, 2012)
6025 VRcIc optical light curves of V1647 Ori during the continuing second outburst. (Semkov and Peneva, 2012)
6026 BAV-Results of observations - Photoelectric Minima of Selected Eclipsing Bina ries and Maxima of Pulsating Stars. (HUBSCHER and Lehmann, 2012)
6027 Call for observations of the AZ Cas eclipse and periastron passage of 2012-2014. (Galan et al, 2012)
6028 TYC 4031-791-1 - a new eclipsing binary of Algol type. (Galan et al, 2012)
6029 Timings of Minima of Eclipsing Binaries. (Diethelm, 2012)
6030 Photometric Behavior of Eight Be/X-ray Binaries in the SMC. (Sarraj, Sanders and Schmidtke, 2012)
6031 SPECTRAL DETECTION OF A VERY STRONG FLARE ON WX UMa. (MELIKIAN et al, 2012)
6032 Spectral and photometric observations of MWC 560 in 2009 - 2012. (Kondratyeva and Rspaev, 2012)
6033 Minima of eclipsing binaries and new ephemerides for GSC 03881-00579 and EZ Lacertae. (Banfi et al, 2012)
6034 Non-radial Pulsations of zeta Oph. (Pollmann, 2012)
6035 UBVRCIC Photometric Study of the Near Contact Eclipsing Binary Mis V1287. (SAMEC et al, 2012)
6036 First solution of the light curve of the new variable star 3UC 281-203711. (Gorda and Sobolev, 2012)
6037 New Variable Stars in the Globular Cluster NGC 5694. (RODRIGUES DE ANDRADE et al, 2012)
6038 Final classification of the bright variable star WW CMa. (SZABADOS, 2012)
6039 Minima times of some eclipsing binary stars. (GOKAY et al, 2012)
6040 A new variable star: GSC 02936-00267. (Zhang et al, 2012)
6041 Times of Minima of some eclipsing binary stars. (DEMIRCAN, et al, 2012)
6042 Timings of minima of eclipsing binaries. (Diethelm, 2013)
6043 The GEOS RR Lyr Survey. (Le Borgne, Klotz and Boer, 2013)
6044 Minima Times of Selected Eclipsing Binaries. (Parimucha, Dubovsky and Vanko, 2013)
6045 The detection of a 3.486 hour photometric period in the classical nova V2468 Cygni. (CHOCHOL et al, 2013)

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

(Includes *XX Cam*, *Mira*, *R CrB*, and *R Hya* which are also on the telescopic programme)

Variable		RA (2000) Dec	Range	Type	Period	Chart	Prog
AQ	***And***	00 28 +35 35	8.0-8.9	SR	346d	303.01	
EG	***And***	00 45 +40 41	7.1-7.8	ZAnd		072.02	
V	***Aql***	19 04 -05 41	6.6-8.4	SRb	353d	026.04	
UU	***Aur***	06 37 +38 27	5.1-6.8	SRb	234d	230.02	
AB	***Aur***	04 56 +30 33	6.7-8.4	Ina		301.01	
V	***Boo***	14 30 +38 52	7-12	Sra	258d	037.01	
RW	***Boo***	14 41 +31 34	7.4-8.9	SRb	209d	104.01	
RX	***Boo***	14 24 +25 42	6.9-9.1	SRb	160d	219.01	
ST	***Cam***	04 51 +68 10	6.0-8.0	SRb	300d?	111.02	
XX	***Cam***	04 09 +53 22	7.3-9.7	RCB		068.01	T/B
X	***Cnc***	08 55 +17 04	5.6-7.5	SRb	195d	231.01	
RS	***Cnc***	09 11 +30 58	5.1-7.0	SRc	120d?	269.01	
V	***CVn***	13 20 +45 32	6.5-8.6	SRa	192d	214.02	
WZ	***Cas***	00 01 +60 21	6.9-8.5	SRb	186d	1982Aug16	
V465	***Cas***	01 18 +57 48	6.2-7.8	SRb	60d	233.01	
γ	***Cas***	00 57 +60 43	1.6-3.0	GCAS		064.01	
Rho	***Cas***	23 54 +57 29	4.1-6.2	SRd	320d	064.01	
W	***Cep***	22 37 +58 26	7.0-9.2	SRc		312.01	
AR	***Cep***	22 52 +85 03	7.0-7.9	SRb		1985May06	
Mu	***Cep***	21 44 +58 47	3.4-5.1	SRc	730d	112.01	
O	***Cet***	02 19 -02 59	2.0-10.1	M	332d	039.02	T/B
R	***CrB***	15 48 +28 09	5.7-14.8	RCB		041.04	T/B
W	***Cyg***	21 36 +45 22	5.0-7.6	SRb	131d	062.03	
AF	***Cyg***	19 30 +46 09	6.4-8.4	SRb	92d	232.01	
CH	***Cyg***	19 25 +50 15	5.6-10.5	ZAnd+SR	97	089.03	
U	***Del***	20 46 +18 06	5.6-7.9	SRb	110d?	228.01	
EU	***Del***	20 38 +18 16	5.8-6.9	SRb	60d	228.01	
TX	***Dra***	16 35 +60 28	6.6-8.4	SRb	78d?	106.02	
AH	***Dra***	16 48 +57 49	7.0-8.7	SRb	158d	106.02	
NQ	***Gem***	07 32 +24 30	7.4-8.0	SR+ZAnd	70d?	077.01	
X	***Her***	16 03 +47 14	6.1-7.5	SRb	95d	223.01	
SX	***Her***	16 08 +24 55	8.0-9.2	SRd	103d	113.01	
UW	***Her***	17 14 +36 22	7.0-8.8	SRb	104d	107.01	
AC	***Her***	18 30 +21 52	6.8-9.0	RVA	75d	048.03	
IQ	***Her***	18 18 +17 59	7.0-7.5	SRb	75d	048.03	
OP	***Her***	17 57 +45 21	5.9-7.2	SRb	120d	1984Apr12	
R	***Hya***	13 30 -23 17	3.5-10.9	M	389d	049.02	T/B
RX	***Lep***	05 11 -11 51	5.0-7.4	SRb	60d?	110.01	
Y	***Lyn***	07 28 +45 59	6.5-8.4	SRc	110d	229.01	
SV	***Lyn***	08 84 +36 21	6.6-7.9	SRb	70d?	108.03	
U	***Mon***	07 31 -09 47	5.9-7.9	RVB	91d	029.03	
X	***Oph***	18 38 +08 50	5.9-9.2	M	328d	099.01	
BQ	***Ori***	05 57 +22 50	6.9-8.9	SR	110d	295.01	

Variable		RA (2000) Dec	Range	Type	Period	Chart	Prog
AG	***Peg***	21 51 +12 38	6.0-9.4	Nc		094.02	
X	***Per***	03 55 +31 03	6.0-7.0	GCas+Xp		277.01	
R	***Sct***	18 48 -05 42	4.2-8.6	RVA	146d	026.04	
Y	***Tau***	05 46 +20 42	6.5-9.2	SRb	242d	295.01	
W	***Tri***	02 42 +34 31	7.5-8.8	SRc	108d	114.01	
Z	***UMa***	11 57 +57 52	6.2-9.4	SRb	196d	217.02	
ST	***UMa***	11 28 +45 11	6.0-7.6	SRb	110d?	102.02	
VY	***UMa***	10 45 +67 25	5.9-7.0	Lb		226.01	
V	***UMi***	13 39 +74 19	7.2-9.1	SRb	72d	101.02	
SS	***Vir***	12 25 +00 48	6.9-9.6	SRa	364d	097.01	
SW	***Vir***	13 14 -02 48	6.4-8.5	SRb	150d?	098.01	

Last updated 7th February 2010. To be changed, and re-updated soon. M.T.

* ***** *

ECLIPSING BINARY PREDICTIONS

DES LOUGHNEY

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 UT, with a value greater than '24' indicating a time after midnight. 'D' indicates that the eclipse starts/ends in daylight; 'L' indicates low altitude at the start/end of the visibility, and '<<' indicates that mid eclipse occurred on an earlier date/time.

Please contact the EB secretary if you require any further explanation of the format.

The variables covered by these predictions are :

RS CVn	7.9 - 9.1V	AI Dra	7.2 - 8.2	U Sge	6.45 - 9.28V
TV Cas	7.2 - 8.2V	Z Vul	7.25 - 8.90V	RW Tau	7.98 - 11.59V
U Cep	6.8 - 9.4	Z Dra	10.8 - 14.1p	HU Tau	5.92 - 6.70V
U CrB	7.7 - 8.8V	TW Dra	8.0 - 10.5v	X Tri	8.88 - 11.27V
SW Cyg	9.24 - 11.83V	S Equ	8.0 - 10.08V	TX Uma	7.06 - 8.80V
V367 Cyg	6.7 - 7.6V	Z Per	9.7 - 12.4p	Del Lib	4.9 - 5.9
Y Psc	10.1 - 13.1	SS Cet	9.4 - 13.0	RZ Cas	6.3 - 7.9

Note that predictions for Beta Per and Lambda Tau can be found in the BAA Handbook.

For information on other eclipsing binaries see the website:
http://www.as.ap.krakow.pl/o-c/index.php3

Again please contact the EB secretary if you have any queries about the information on this site and how it should be interpreted.

April

2013 Apr 1 Mon
U Cep.....03(07)04D
Z Per.....L04(03)04D
TV Cas.....D20(20)24
TX UMa....D20(22)27
Z Dra.....21(24)26
del Lib.....L22(24)28D

2013 Apr 2 Tue
TW Dra.....D20(22)27
RW Tau....D20(23)23L

2013 Apr 3 Wed
Z Vul.....01(07)04D
U CrB.....D20(18)24
U Cep.....D20(19)24
AI Dra.....D20(19)21
RZ Cas.....D20(20)22
RS CVn.....22(28)28D
Z Per.....23(28)23L

2013 Apr 4 Thu
del Lib.....01(08)04D
Z Per.....L04(04)04D
TX UMa.D20(24)28D
SW Cyg.....L20(17)23
RZ Cas.....22(25)27
AI Dra.....23(24)26

2013 Apr 5 Fri
TW Dra.....D20(17)22
RW Tau.....D20(18)22
Z Dra.....23(25)28

2013 Apr 6 Sat
U Cep.....02(07)04D
RZ Cas.....03(05)04D
AI Dra.....04(05)04D
U CrB.....23(29)28D
U Sge.....L24(25)28D

2013 Apr 7 Sun
TV Cas.....02(06)04D
Z Per.....L04(05)04D
TX UMa....21(25)28D
Z Vul.....23(28)28D

2013 Apr 8 Mon
HU Tau.....D20(17)21
Z Dra.....D20(19)21
U Cep.....D20(19)24
RS CVn...D20(23)28D
TV Cas.....21(26)28D
del Lib.....L22(23)28D

2013 Apr 9 Tue
SW Cyg.....01(07)04D
AI Dra.....D20(19)21
RZ Cas.....D20(19)22

2013 Apr 10 Wed
Z Dra.....01(03)04D
S Equ.....L02(07)04D
Z Per.....L04(07)04D
U CrB.....D20(16)22
HU Tau.....D20(18)22
TV Cas.....D20(21)25
RZ Cas.....22(24)26
TX UMa....22(27)28D
AI Dra.....23(24)25

2013 Apr 11 Thu
del Lib.....01(07)04D
U Cep.....02(07)04D
TW Dra.....03(08)04D

2013 Apr 12 Fri
RZ Cas.....02(05)04D
AI Dra.....04(05)04D
TV Cas.....D20(17)21
HU Tau....D20(19)22L
Z Dra.....D20(20)23
V367Cyg...23(67)28D
Z Vul.....L23(26)28D

2013 Apr 13 Sat
Z Per.....L04(08)04D
RS CVn.....D20(18)25
U Cep.....D20(19)23
SW Cyg.....D20(20)26
RW Tau.....20(25)22L
U CrB.....21(27)28D
V367Cyg.L22(43)28D
TW Dra.....22(27)28D
U Sge.....L23(19)25
TX UMa....24(28)28D

2013 Apr 14 Sun
Z Dra.....02(05)04D
HU Tau...D20(21)22L
V367Cyg.L22(19)28D

2013 Apr 15 Mon
RZ Cas.....D20(19)21
AI Dra.....D20(19)20
del Lib.....L21(23)28D
V367Cyg.L22(<<)28D

2013 Apr 16 Tue
U Cep.....02(06)04D
TV Cas.....04(08)04D
RW Tau..D20(19)22L
Z Dra.....D20(22)24
HU Tau..D20(22)22L
TW Dra.D20(23)28D
RZ Cas.....21(23)26
AI Dra.....23(24)25
U Sge.....L23(28)28D

2013 Apr 17 Wed
TX UMa..01(06)04D
S Equ.....L02(04)04D
Z Vul.....L22(24)28D
TV Cas.....23(27)28D

2013 Apr 18 Thu
del Lib.....00(07)04D
RZ Cas.....02(04)04D
AI Dra.....03(05)04D
U Cep.....D20(18)23
HU Tau..D20(23)21L

2013 Apr 19 Fri
TW Dra....D20(18)23
TV Cas.....D20(23)27

2013 Apr 20 Sat
TX UMa..03(07)04D
U CrB...D20(24)28D
del Lib.....L21(15)21
HU Tau.....21(25)21L
Z Dra.....21(24)26

2013 Apr 21 Sun
U Cep.....01(06)04D
TV Cas.....D20(18)22
RZ Cas.....D20(18)21
AI Dra.....D20(19)20

2013 Apr 22 Mon
SW Cyg.D20(24)27D
RZ Cas.....20(23)25
del Lib....L21(22)27D
Z Vul.....L22(22)27
AI Dra.....22(24)25

2013 Apr 23 Tue
RS CVn....02(08)03D
U Cep.....D20(18)23
U Sge.....L22(22)27D

2013 Apr 24 Wed
RZ Cas.....01(04)03D
S Equ.....L01(01)03D
AI Dra.....03(05)03D
Z Dra.....23(25)27D
del Lib.....24(30)27D

2013 Apr 26 Fri
U Cep.....01(06)03D

2013 Apr 27 Sat
TV Cas.....01(05)03D
U Sge.....02(08)03D
Z Dra.....D20(19)21
RW Tau...D20(21)21L
U CrB.....D20(22)27D
del Lib.....L20(14)21
RS CVn.....21(28)27D
Z Vul.....L22(20)25
TW Dra.....23(28)27D

2013 Apr 28 Sun
U Cep.....D20(18)22
RZ Cas.....D20(22)25
TV Cas...D20(24)27D
AI Dra.....22(24)25

2013 Apr 29 Mon
Z Dra.....01(03)03D
del Lib....D21(22)27D

2013 Apr 30 Tue
RZ Cas.....01(03)03D
Z Vul.....01(07)03D
AI Dra.....03(04)03D
TV Cas.....D21(20)24
TW Dra..D21(24)27D
U Sge.....L22(17)22

May

2013 May 1 Wed
U Cep.....01(05)03D
S Equ.....L01(<<)03
U CrB.....03(09)03D
Z Per.....D21(16)21
Z Dra.....D21(20)23
V367Cyg.L21(58)27D
SW Cyg.....21(27)27D
del Lib.....23(30)27D

2013 May 2 Thu
RS CVn D21(23)27D
V367Cyg.L21(34)27D
Z Vul.....L21(18)23

2013 May 3 Fri
Z Dra.....03(05)03D
U Cep.....D21(17)22
TW Dra.....D21(19)24
V367Cyg.L21(10)27D
U Sge.....L22(26)27D

2013 May 4 Sat
S Equ.....03(08)03D
Z Per.....D21(17)21L
U CrB.....D21(20)26
RZ Cas.....D21(22)24
V367Cyg.L21(<<)27D
AI Dra.....22(23)25
Z Vul.....23(29)27D

2013 May 5 Sun
Z Dra.....D21(22)24

2013 May 6 Mon
RZ Cas.....00(02)03D
U Cep.....00(05)03D
TV Cas.....02(06)03D
SW Cyg.....D21(17)23
del Lib.....D21(22)27D

2013 May 7 Tue
RS CVn.....D21(18)24
Z Per.....D21(19)21L
TV Cas.....22(26)27D

2013 May 8 Wed
U CrB.....01(07)03D
TX UMa....D21(17)21
U Cep.....D21(17)22
del Lib.....23(29)27D

2013 May 9 Thu
TV Cas.....D21(21)25
Z Vul.....21(26)27D
Z Dra.....21(24)26

2013 May 10 Fri
RZ Cas.....D21(21)24
U Sge.....L21(20)26
AI Dra.....22(23)25
U Cep.....24(29)27D

2013 May 11 Sat
S Equ.....L00(05)03D
SW Cyg.....01(07)03D
U CrB.....D21(17)23
TX UMa...D21(18)23
RZ Cas.....23(26)27D

2013 May 12 Sun
TW Dra.....00(05)03D

2013 May 13 Mon
U Cep.....D21(17)21
del Lib.....D21(21)27D
Z Dra.....23(26)27D
U Sge.....24(29)27D

2013 May 14 Tue
Z Per.....L01(<<)02
TX UMa...D21(20)24
Z Vul.....D21(24)27D
TW Dra..D21(24)27D
U CrB.....22(28)27D

2013 May 15 Wed
SW Cyg..D21(21)27D
del Lib.....23(29)27D
U Cep.....24(28)27D

2013 May 16 Thu
RZ Cas.....D21(21)23
AI Dra.....22(23)25
TV Cas.....23(27)26D

2013 May 17 Fri
Z Per.....L01(<<)02D
RS CVn.....02(08)02D
TW Dra.....D21(20)25
TX UMa...D21(21)26
RZ Cas.....23(25)26D
S Equ.....L24(26)26D

2013 May 18 Sat
Z Dra.....01(03)02D
TV Cas...D21(23)26D

2013 May 19 Sun
Y Psc.....L02(05)02D
Z Vul.....D21(22)26D

2013 May 20 Mon
Z Per.....L01(00)02D
TV Cas.....D21(18)22
Z Dra.....D21(20)23
del Lib.....D21(21)26D
TX UMa.D21(23)26D
U Sge.....D21(23)26D
V367Cyg.D21(48)26D
U Cep.....23(28)26D

2013 May 21 Tue
V367Cyg.D21(24)26D
U CrB.....D21(26)26D
RS CVn...D21(27)26D

2013 May 22 Wed
V367Cyg.D21(00)26D
RZ Cas.....D21(20)22
AI Dra.....22(23)24
del Lib.....22(29)26D

2013 May 23 Thu
Z Per.....L01(02)02D
Y Psc.....L02(<<)02D
TX UMa.D21(24)26D
RZ Cas.....22(25)26D

2013 May 24 Fri
Z Vul.....D21(20)25
Z Dra.....D21(22)25
SW Cyg..D21(24)26D
S Equ.....L23(23)26D

2013 May 25 Sat
U Cep.....23(28)26D

2013 May 26 Sun
TV Cas.....01(05)02D
Z Per.....L01(03)02D
TW Dra.....01(06)02D
RS CVn...D22(22)26D
TX UMa.D22(26)26D

2013 May 27 Mon
Z Vul.....01(07)02D
U Sge.....D22(18)23
del Lib.....D22(20)26D
TV Cas...D22(24)26D

2013 May 28 Tue
RZ Cas.....D22(19)22
U CrB.....D22(24)26D
Z Dra.....D22(24)26D
TW Dra..D22(25)26D
AI Dra.....22(23)24

2013 May 29 Wed
Z Per.....L00(04)02D
Z Vul.....D22(18)23
TV Cas.....D22(20)24
RZ Cas.....22(24)26D
del Lib.....22(28)26D
TX UMa...22(27)26D

2013 May 30 Thu
U Sge.....D22(27)26D
U Cep.....23(27)26D

2013 May 31 Fri
RS CVn.....D22(18)24
TW Dra.....D22(21)26
S Equ.....L23(20)25
Z Vul.....23(29)26D

June

2013 Jun 1 Sat
Z Per.....01(06)02D
Z Dra.....23(26)26D
TX UMa...24(29)26D

2013 Jun 2 Sun
SW Cyg..D22(28)26D

2013 Jun 3 Mon
Y Psc.....02(06)02D
del Lib...D22(20)26D
AI Dra.....D22(23)24

2013 Jun 4 Tue
S Equ.....01(06)02D
U CrB...D22(21)26D
RZ Cas.D22(24)26D
U Cep.....22(27)26D

2013 Jun 5 Wed
TX UMa.02(06)02D
TV Cas.D22(26)26D
Z Vul....D22(26)26D
del Lib..D22(28)26D

2013 Jun 6 Thu
Z Dra.....01(03)02D
RZ Cas....02(04)02D
U Sge....D22(21)26D

2013 Jun 7 Fri
Y Psc.....L01(01)02D
SW Cyg....D22(17)23
TV Cas.....D22(21)25
V367Cyg.D22(62)26D

2013 Jun 8 Sat
Z Dra.....D22(21)23
V367Cyg.D22(38)26D

2013 Jun 9 Sun
TW Dra...02(07)02D
V367Cyg.D22(14)26D
AI Dra.....D22(23)24
U Cep.....22(27)26D

2013 Jun 10 Mon
U Sge.....01(06)02D
RS CVn....02(08)02D
V367Cyg.D22(<<)26D
del Lib....D22(19)26L
RZ Cas.....D22(23)25
Z Vul.....D22(24)26D
S Equ.....L22(27)26D

2013 Jun 11 Tue
U CrB.....D22(19)25
TW Dra.D22(26)26D

2013 Jun 12 Wed
SW Cyg...01(07)02D
RZ Cas....01(04)02D
Z Dra.....D22(22)25
del Lib...D22(27)26L

2013 Jun 14 Fri
TW Dra.D22(21)26D
U Cep....D22(26)26D
RS CVn.D22(27)26D
TV Cas.....23(27)26D

2013 Jun 15 Sat
U CrB.....00(06)02D
Z Vul.....D22(22)26D
AI Dra.....D22(23)24

2013 Jun 16 Sun
SW Cyg.D22(21)26D
RZ Cas.....D22(22)25
TV Cas..D22(23)26D
Z Dra.....D22(24)26D
U Sge.....D22(25)26D

2013 Jun 17 Mon
del Lib....D22(19)25L
S Equ.....D22(24)26D

2013 Jun 18 Tue
RZ Cas.....01(03)02D
X Tri.....02(04)02D
U CrB.....D22(17)23
TV Cas.....D22(18)22

2013 Jun 19 Wed
X Tri.....01(03)02D
RS CVn.D22(22)26D
U Cep...D22(26)26D
del Lib...D22(27)25L

2013 Jun 20 Thu
X Tri.....L01(03)02D
Z Vul.....D22(20)25
Z Dra.....23(26)26D

2013 Jun 21 Fri
X Tri.....L00(02)02D
AI Dra.....D22(22)24
U CrB...D22(28)26D
Y Psc.....L24(26)26D

2013 Jun 22 Sat
X Tri.....L00(01)02D
RZ Cas....D22(22)24

2013 Jun 23 Sun
X Tri.....L00(01)02D
Z Vul.....02(07)02D
U Sge.....D22(19)25

2013 Jun 24 Mon
RZ Cas.....00(03)02D
X Tri.....L00(00)02D
TV Cas.....01(05)02D
RS CVn.....D22(17)24
del Lib.....D22(19)25L
S Equ.....D22(21)26D
U Cep.....D22(26)26D

2013 Jun 25 Tue
X Tri.....L00(<<)02D
Z Dra.....01(03)02D
Z Vul.....D22(18)23
TV Cas...D22(24)26D
SW Cyg..D22(24)26D
TW Dra..D22(27)26D
Y Psc.....L24(20)25

2013 Jun 26 Wed
X Tri.....L00(<<)01
del Lib.....D22(26)25L
V367Cyg.D22(52)26D
U Sge.....22(28)26D

2013 Jun 27 Thu
X Tri.....L00(<<)00
TV Cas.....D22(20)24
Z Dra.....D22(21)23
AI Dra.....D22(22)24
V367Cyg.D22(28)26D
Z Vul.....23(29)26D

2013 Jun 28 Fri
V367Cyg.D22(04)26D
RZ Cas.....D22(21)24
TW Dra...D22(22)26D
U CrB.....D22(25)26D
Z Per.....L22(18)23

2013 Jun 29 Sat
AI Dra.....02(03)02D
V367Cyg...D22(<<)25
TX UMa....D22(18)23
U Cep.....D22(25)26D
RZ Cas.....24(26)26D

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The **deadline for contributions** to the next issue of VSSC (number 156) will be 7th May, 2013. All articles should be sent to the editor (details are given on the back of this issue).

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