British Astronomical Association

VARIABLE STAR SECTION CIRCULAR

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Contents

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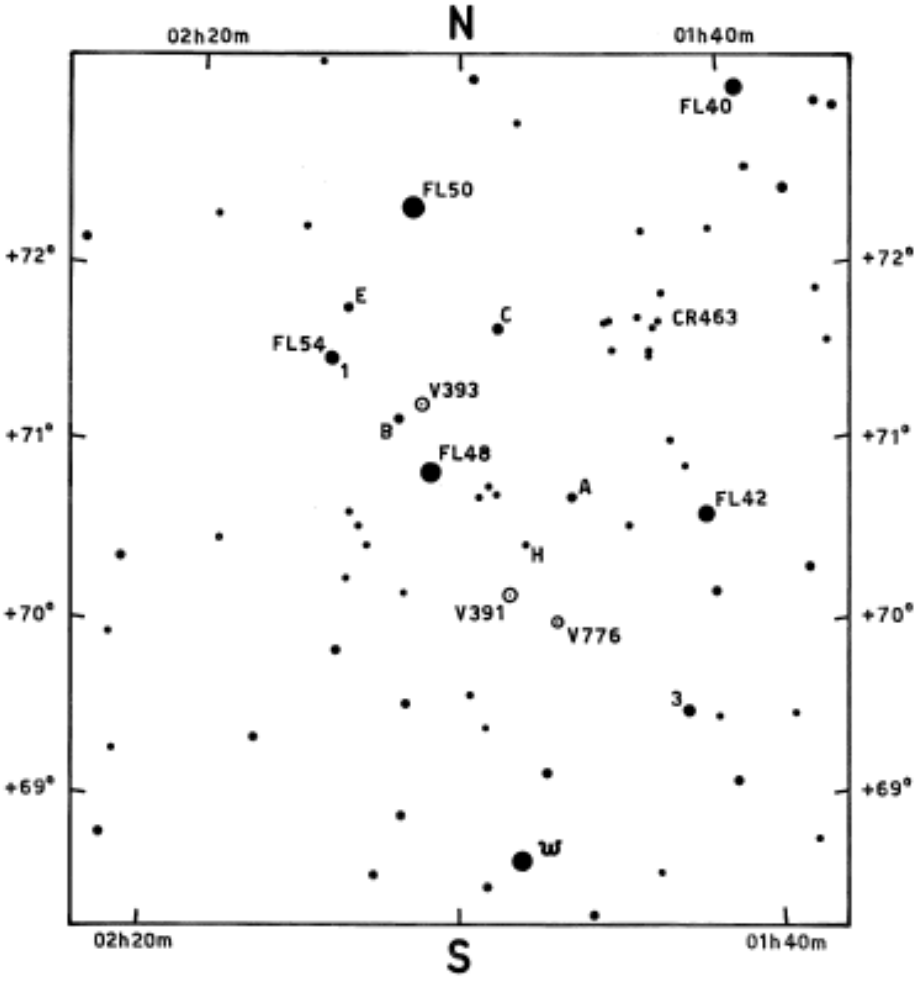
JOHN TOONE



FROM THE DIRECTOR

ROGER PICKARD

New BAAVSS Database

As you will read a little later in this Circular, Andy Wilson has been extremely busy working on the new Section On-line Database, which should be up and running by the time you read this. It has undergone extensive trials with many of the Section Officers testing it and suggesting ways that Andy could improve it further. Most of these suggestions Andy has implemented so I trust you will find accessing the data even better than before.

However, the major thing that Andy has been working on, is to allow both visual and CCD observers to be able to enter their own observations into the database, and so relieve both Bob and Andy himself much onerous checking of observations that we have all been sending them. A lot of work has been put into the checking routines so that errors will be kept to an absolute minimum, if not eliminated altogether.

However if you have difficulty entering your observations on-line, you can still send them to Bob or Andy, though obviously they would much prefer you to stick with it and master the art of on-line data submission.

New BAAVSS Database Update

I am delighted to advise that as of today, 22nd February 2014 the new BAAVSS web pages have gone live < *http://britastro.org/vssdb/* >. The main improvement is to allow observers to enter their own observations - both visual and CCD - but they will need to request a login and password from the Database Secretary, Andy Wilson, first - details of how to do this are on the new web page.

Other improvements can be viewed once you are logged in. There is also a Help page in case you run into any trouble.

Whatever, my heart felt thanks to Andy for all the many hours he has put into this project and for making this happen.

VSS Circulars - Index

I am also delighted to say that Phil Busby has brought the Circulars Index right up to date. This was last done back in 2000, and was published in Circular No. 105. That was again done by Phil, but with assistance from Julie Farrer. This time, and unbeknown to Phil at the time, Richard Miles has also compiled large sections of the Circulars and Phil has combined Richard's work with his own to make one master Index covering all Circulars from 1 to 158. However, the Index has been split into the following sections: 1 - 11; 12 - 71; 72 - 114; 115 - 138 and 139 - 158. It is available in Excel format and as such has been placed on the VSS Website for you to download. It is only 90 KB in size so it should not take a moment to download even on slow connections. However, if you would prefer a paper copy please be advised that it is 76 pages long!

VSS Meeting 2014 at York

There is no further news in view of the Christmas period, but as a reminder there is an outline of the programme on page 4.

VSS Meeting 2014 at York

Date: Saturday 21st June 2014
Location: Priory Street, York.
Doors Open: 10:00 - 10:30
Lunch: 12:30 - 14:00
Break: 15:30 - 15:45
Finish 17:30
Clear by 18:00

Speakers to include Dr Boris Gaensicke, Martin Lunn and David Boyd.

And do not forget the Goodricke plaque and the astronomical clock in York Minster. More details about these and the whole meeting in due course.

NOVA DEL 2013 (V339 DEL) – THE FIRST 100 DAYS.

GARY POYNER

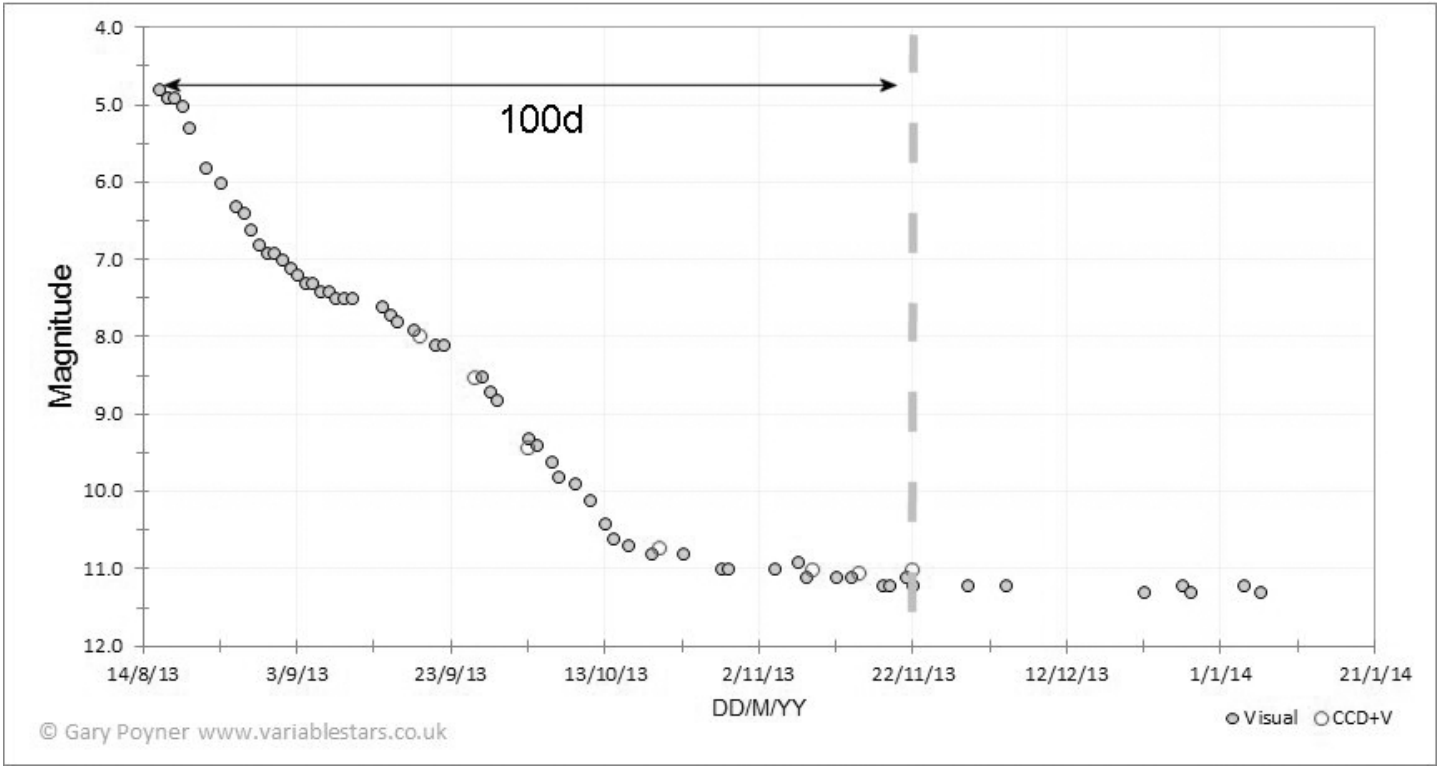
On the evening of August 14th 2013, the brightest Nova to be discovered in the Northern Hemisphere [since Nova Aql 1999#2 (V1494 Aql)] was discovered by Koichi Itagaki of Yamagata Japan, using an 18cm reflector and CCD, at magnitude 6.8C. Just over 2 days later the Nova peaked at magnitude 4.8, becoming the first Northern naked eye Nova since the aforementioned V1494 Aql.

My first observation was delayed by two days due to the weather, so it was the evening of August 16.8 UT that I had my first glimpse of the Nova – a naked eye observation of 4.8 magnitudes. From this time the decline has taken on two distinct phases. The initial fade of 6 magnitudes took 65 days, with the decline averaging 0.5 mag. every 3.2 days. A short plateau was observed from September 7th - September 14th where a 0.2 magnitude decline was observed in 7 days after which the decline rate once again increased to its previous rate. On October 20th (max.+65d) the brightness reached magnitude 10.7 and the decline slowed considerably. For the next 35 days the decrease in brightness was just 0.5 magnitudes, with minor fluctuations of 0.1-0.2 magnitudes in visual and V-band. It was at this time that the Nova entered the 'nebular phase', where the spectrum is almost completely emission based. From purely personal observations the t_3 has been measured at 31 days, making V339 Del a fast Nova on the ambiguous Nova decline scale.

I have been somewhat fortunate with the light curve, making some 63 visual observations in the first 100 days, with four V-band measures from the Bradford Robotic Telescope thrown in for good measure. If only those 63 observing opportunities had meant 63 clear nights in the first 100 days, but alas this was not to be. Most of the observations were made in fortuitous breaks and holes in cloud, where it is a simple task to make quick observations without any preparation with binoculars or a small portable telescope.

At the time of writing (January 9th, 2014) the Nova can still be seen in the early evening sky shining at magnitude 11.2-11.3, resulting in a +80 day plateau of minor variations of the order of 0.2-0.3 magnitude so far. With the field becoming increasingly difficult to observe at this time of year (I suspect this January 9th observation to be my last until the field is visible again in the morning sky from my location), early morning observations in the late Winter/early Spring period will become ever more important.

Nova Del 2013 (V339 Del) Light Curve – the first 100 days.



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SUPERNOVA SN2014J IN M82

David Boyd

At the time of writing (28/02/2014) this type 1a supernova is at V magnitude 10.6 and still brightening. It was discovered serendipitously on 2014 Jan 21.81 UT by Steve Fossey and his students at UCL's Mill Hill Observatory in north London. At that time it was mag. 11.7V. It was subsequently found at mag. 14.4 on an image taken in China as early as January 15.8 UT. Several pre-discovery images have since been reported which is not surprising given the popularity of this galaxy with imagers. A good lesson in checking your images promptly and carefully!

On the night following announcement of the discovery, at Jan 22.96 UT, I obtained photometry and spectroscopy of the supernova. The magnitudes measured were B = 12.78, V = 11.49, R = 10.72, I = 10.31. Figure 1 is a stack of 10 x 10 sec V filter images taken with a 0.35-m SCT. Figure 2 shows the spectrum of the supernova taken with a LISA spectrograph on a C11 and a total integration time of 90 min. The spectrum has a red continuum and a deep dip centred on 6040A due to the Si II line at 6355A broadened and blue-shifted by the supernova expansion velocity of around 15,000 km/s. The strong sodium D absorption lines at 5890A and 5896A are caused by interstellar absorption in the host galaxy.

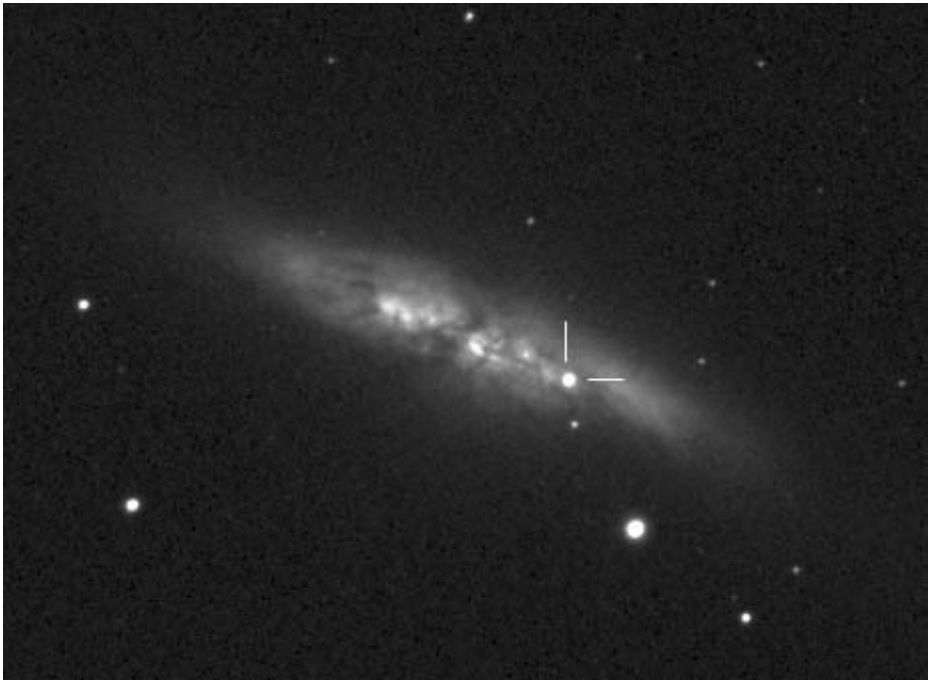
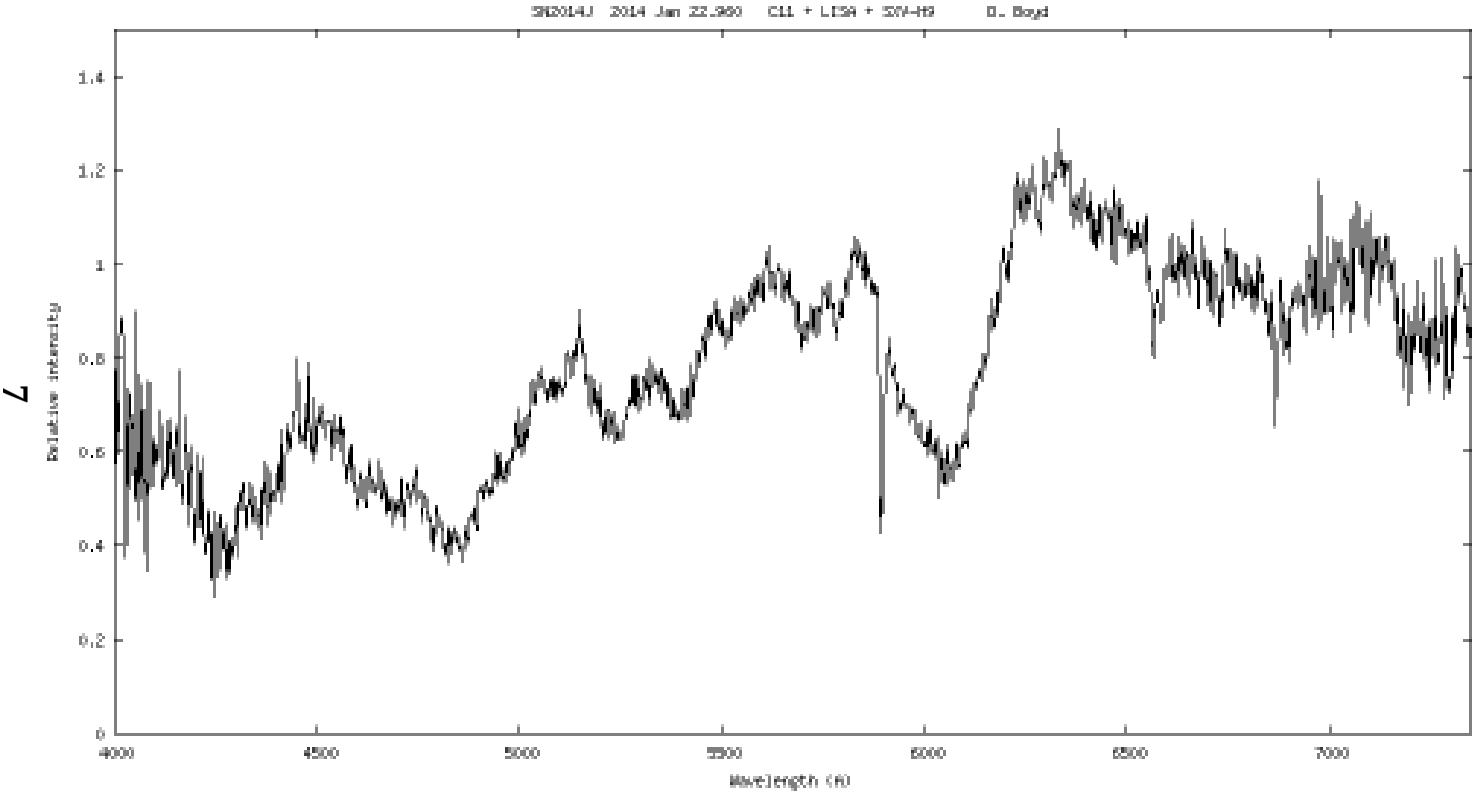


Figure 1 - Spectrum of SN2014J taken on 2014, January 22nd.

Figure 2 - Spectrum of SN2014J taken on 2014, January 22nd .



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ECLIPSING BINARY NEWS - FEBRUARY 2014

DES LOUGHNEY

The period of β Lyrae 2012-2013

β Lyrae is a classic eclipsing binary, and a favourite beginner for everyone starting on variable star observing. It is an active eclipsing binary, of which the period is slowly increasing due to mass transfer. The GCVS database quotes a period for β Lyrae of 12.913834 days, but this was measured in 1881 so is hardly likely to be accurate. The Krakow database states a period of 12.91563 days, but again it was determined in 1881, however it is used to construct an O/C diagram which shows the changes in period since.

According to the Krakow site the latest period is 12.9408 days which was determined in 2002. The Wikipedia entry for β Lyrae states a period of 12.9414 days which is the finding of a paper published in 2008. This paper found that the period is increasing by about 19 seconds a year.*

I decided to try and determine the current period using DSLR photometry to ascertain the magnitude of the system. I wanted to find out if the measurement in 2008 was correct and whether or not the 2008 measurement ought to be the stated current period of the system. The changes in period may not seem significant but they are in terms of predicting the time of minima. If the 2008 measurement is correct then the times of primary minimum, listed on the Krakow website will be now out by around 2 hours. The midpoint of primary minimum will be about two hours later than predicted.

In order to arrive at a good estimate of the current period it is appropriate to do about a 100 measurements of β Lyrae in a couple of months, but this is not possible in the UK climate. As it was, I was able to make 84 magnitude measurements between 5th September 2012 and the 24th December 2013.

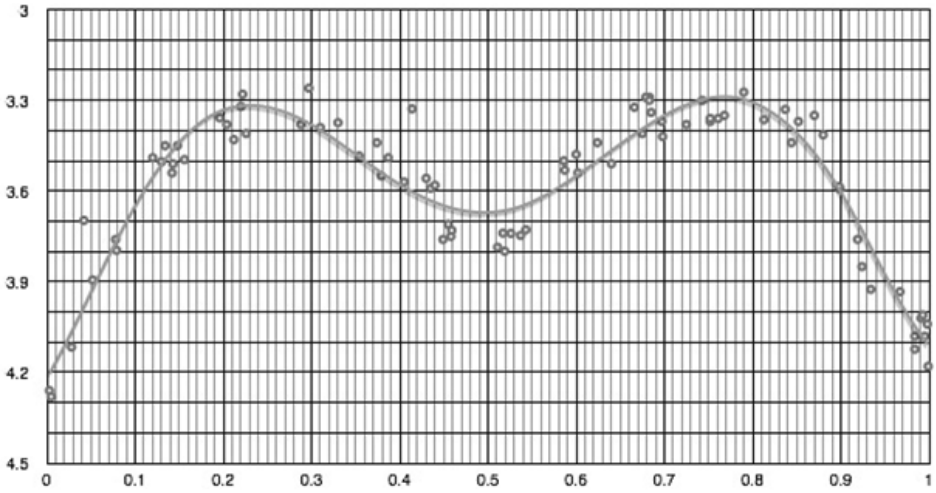
I used one comparison which is 'B' on the BAAVSS chart 328.01. On the chart the magnitude is stated as 3.2. However, I preferred the magnitude of 3.25 which is the Hipparcos V magnitude for γLyrae.

The equipment used was a Canon 550D camera and a 100mm lens. The settings for each image are exposure 5 seconds, ISO 200 and f5. For each measurement 30 images were analysed using AIP4WIN. The magnitude measurements are unfiltered.

On the phase diagram (page 9) the 84 measurements are plotted. The phase diagram was constructed assuming the period of Beta Lyrae is 12.9408 days. The light curve was drawn within my spreadsheet chart function using polynomials. The light curve is the typical shape of the light curve of the β Lyrae class of eclipsing binaries. The β Lyrae class are binary stars that are close enough to each other for the shape of the stars to be gravitationally distorted. A further complication in the β Lyrae light curve is that the secondary star is obscured by an accretion disk. The spread of measurements around the computed light curve may be due to errors but also may be due to real variations in the thickness of the accretion disk.

* "First Resolved Images of the Eclipsing and Interacting Binary β Lyrae" (M. Zao et al, 2008) The Astrophysical Journal, 684: L95–L98

Figure 1: Phase diagram of β Lyrae showing the Primary and Secondary Eclipse.



A glance at the light curve above would suggest that the primary eclipse and the secondary eclipse are occurring on schedule, and that there has not been a significant change in the period of 12.9408 days. However, a careful comparison of the computed light curve on either side of the primary minimum indicate that the minimum is occurring about 0.01 of the period later. This is equivalent to about two hours later and suggests a new period of 12.9412 days. This means that the period measured in 2008 is the current authoritative period though if the period is changing by 19 seconds per annum the period in 2013 should be around 12.9420 days.

The measurements around the primary minimum were separated out and a special phase diagram was constructed (Figure 2, page 10). This diagram illustrates a lack of symmetry around primary minimum which may be related to variations in thickness in the accretion disk.

To check this out it is proposed to carry out intensive measurements of β Lyrae in 2014 around the time of primary minimum. This will fill in the space between 0.95 and 1.05 of the phase diagram (Fig.2, p.10). In other words measurements will be started about 16 hours prior to the predicted minimum and continued for 16 hours after. The present diagram only has ten measurements in the space. I would hope to get at least 20 or 30. A new phase diagram will be constructed on the basis that the period of the system is 12.9414 days.

Consideration will be given to determining a Johnson V magnitude and a more precise magnitude by using up to three comparisons.

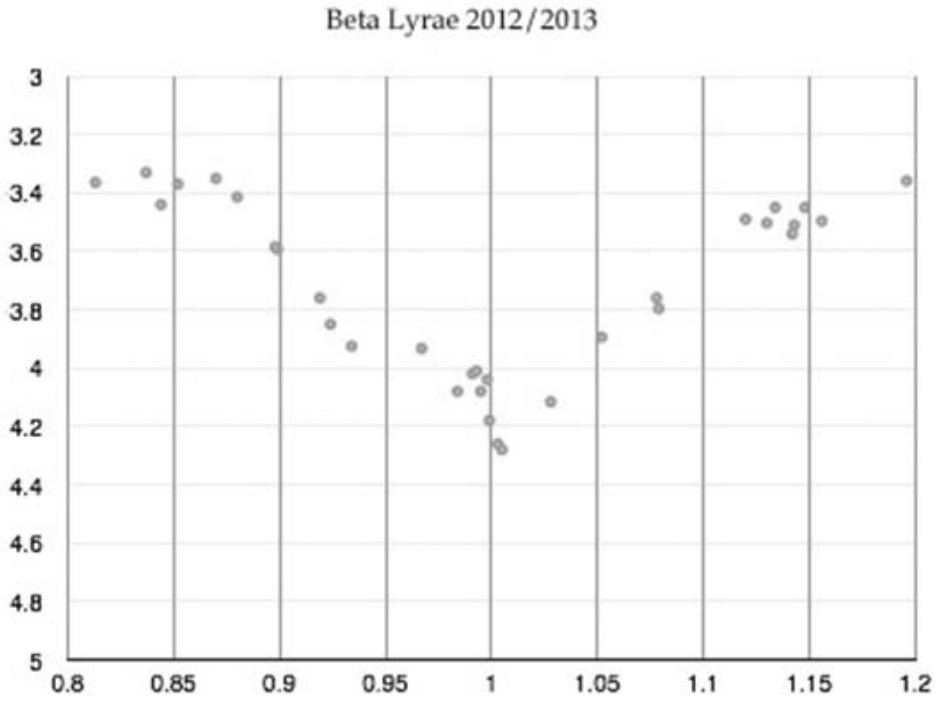


Figure 2: A Phase Diagram showing Measurements made around Primary Minimum of β Lyrae in 2013.

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* ***** *

WHY SHOULD WE CONTINUE OBSERVING THE ECLIPSING BINARY OO AQUILAE?

LAURENT CORP [AAVSO, GEOS, BAA VSS] (Translated from French by Helen Thomas)

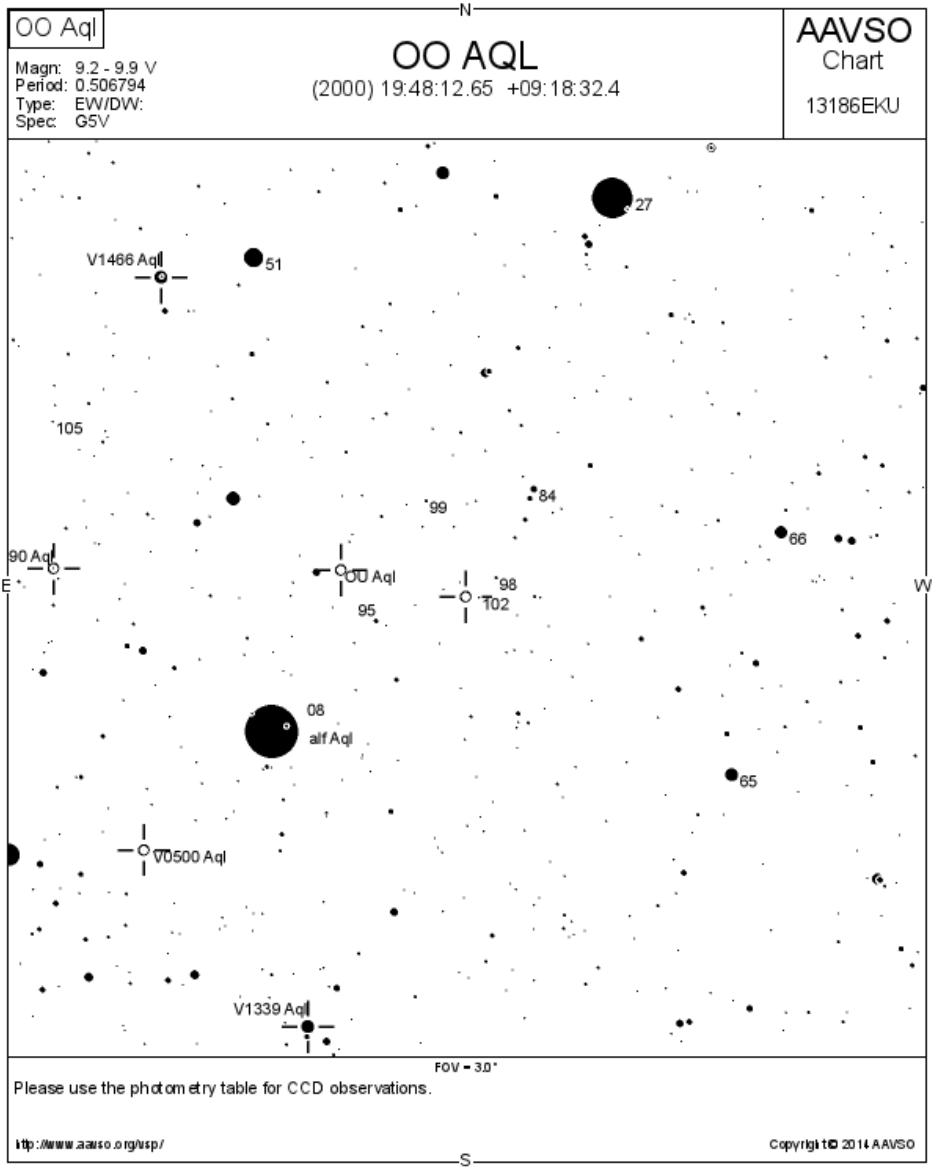
Now that we have started receiving the first measurements from the GAIA satellite we could well ask ourselves if there is any point in amateur astronomers continuing to monitor this star.

OO Aquilae is a WU Ma type eclipsing binary, magnitude 9.2-10.8, spectral type G5V. Here are the details in order to establish the ephemerids:

JD: 54335.37500
Period: 0.5067898 days
Coordinates: RA 19h 48m 13.0s; Dec 9 18' 30 "

Figure 1. Finder chart.

You can obtain the BAA VSS chart on the following link:
<*http://www.britastro.org/vss/chartcat_eb.htm*>
or else you can download the AAVSO chart from here: <*http://www.aavso.org*>.



OO Aql Chart © **AAVSO**

Ensure that during your observations your measurements are not falsified by the bright glare of Altair. Often, when we ask amateurs to measure Binaries, we ask them to measure just the minima, but in fact this is a mistake. Obtaining a complete curve provides us with a wealth of information.

Now let us return to the minima measurements, recordings of observations of minima taken on a monthly basis over years. We notice that nothing becomes predictable.

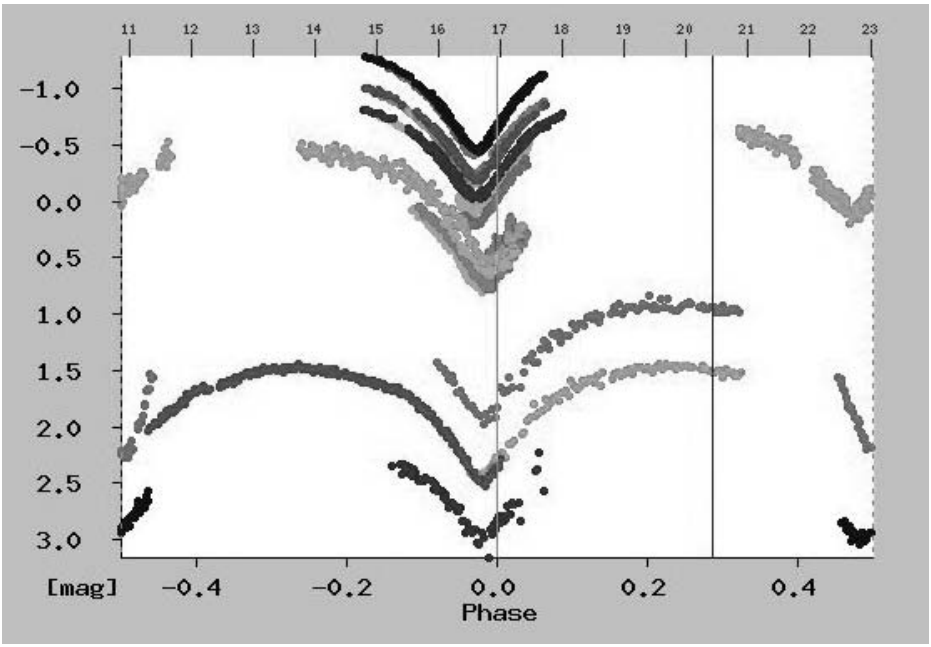
The table below is composed of observation dates, the filter used, exposure time, quality, commentaries, the type of minima and the observer's name (Laurent for my observations).

OO Aql

	night	filter	exposure	box	comments	color	measur.	minima	observer	q	shift	cal.
1 ☐	060718	R	35	9		•	120		valmez	1	0.00	
2 ☐	A70822I	I	40	6		◦	40		valmez	1	0.00	
3 ☐	A70822R	R	40	6		◦	39		valmez	1	0.00	
4 ☐	A70822V	V	50	6		•	39		valmez	1	0.00	
5 ☐	A80727I	I	40	5		•	50	P	valmez	1	0.00	
6 ☐	A80727R	R	40	5		•	43	P	valmez	1	0.00	
7 ☐	A80727V	V	50	5		•	55	P	valmez	1	0.00	
8 ☐	A80828	V				•	43		laurent	1	0.00	
9 ☐	A80829	V				◦	111		laurent	1	0.00	
10 ☐	A80920	V	60			◦	247		laurent	1	0.00	
11 ☐	A81006	V	60			•	49		laurent	1	0.00	
12 ☐	A90807I	I	40	5		•	34	P	valmez	1	0.00	
13 ☐	A90807R	R	40	5		•	31	P	valmez	1	0.00	
14 ☐	A90807V	V	60	5		•	32	P	valmez	1	0.00	
15 ☐	A90906	V	60		Moon and cirrus	•	37		laurent	1	0.00	
16 ☐	A91014	CV	60			◦	75	P	laurent	1	0.00	
17 ☐	B00707R	R	60			◦	99		laurent	1	0.00	
18 ☐	B00707V	V	60			•	99		laurent	1	0.00	
19 ☐	B00713	R			MZ, CCD G2-0402	•	68		beno	1	0.00	
20 ☐	B00719R	R	60			•	245		laurent	1	0.00	
21 ☐	B10529R	R			MZ, RF 2/58	•	50		beno	1	0.00	
22 ☐	B10819R	R	45			•	96		laurent	1	0.00	
23 ☐	B20516R	R	90			◦	43		laurent	1	0.00	
24 ☐	B20730R	R	90			◦	158		laurent	1	0.00	
25 ☐	B31023V	V	60			•	58		laurent	1	0.00	
26 ☐	V060717	I	35	9		•	125		valmez	1	0.00	

Figure 2. © CCD observations of variable stars, at *http://nyx.asu.cas.cz/dbvar* Maintained by the Astronomical Institute, Charles University, Prague, and Ondrejov observatory.

Figure 3. Light curves can be deduced from these observations.



© CCD observations of variable stars, at *http://nyx.asu.cas.cz/dbvar/*
maintained by the Astronomical Institute,
Charles University Prague and Ondrejov observatory

These different light curves indicate several things:

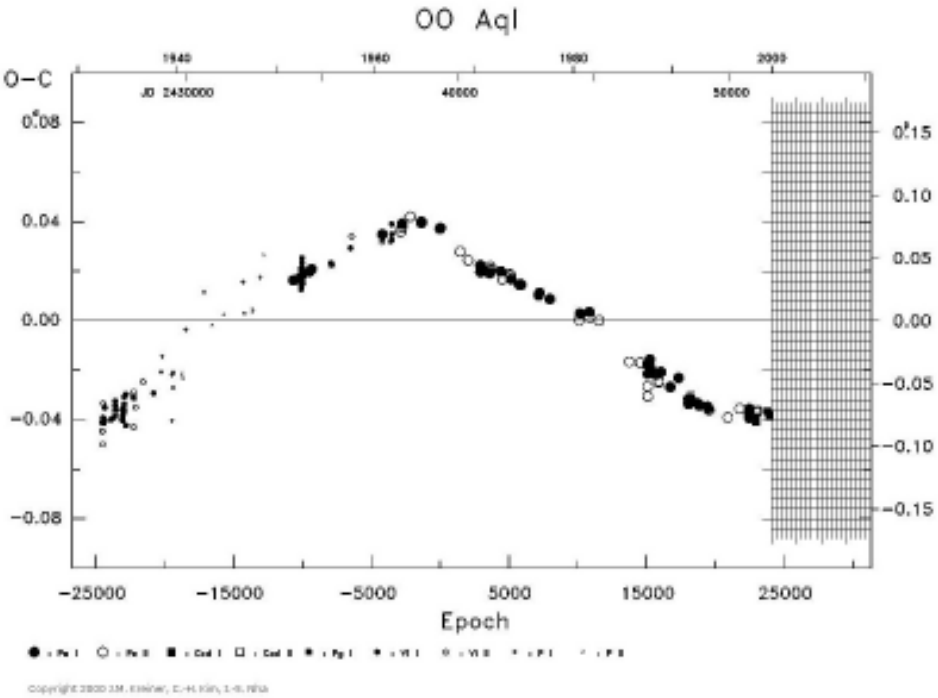
- the curves are not superimposed because observers do not all use the same comparison stars.
- the different filters used cause variations.
- there are marked shifts between the different minima.

Marek Wolf's new calculations of the light period - Astronomical Institute, Charles University in Prague is as follows: Pri.Min. = HJD 55051.4570 + 0.5067920 E.

If we plot all the minima on a curve, we obtain the O-C (Observations-Calculated) so that on abscissa we have the instant of the measurement and on the ordinate, the difference of the measurement.

For more information you can follow this link:
http://vs-compas.belastro.net/bulletin/issue/3/p8

Figure 4. O/C diagram of OO Aquilae



Copyright 2000, J.M. KREINER, C-H KIM, I.S NHA
http://www.as.up.krakow.pl/o-c/diagram_html/aql_oo_small.html
Courtesy J.M. Kreiner

How do we interpret the curve O-C of OO AQL?

Three entirely different studies show that we do not in fact see a double star but instead, a double star with two bodies orbiting it.

The studies:

Eclipsing Binaries with Possible Light Time Effect (Petr Zasche, Miloslav Zejda, Lubos Brat): ref: Astrophys Space Sci (2006) 304:175-177 describes the existence of several bodies without specifying the period.

The low-mass interacting binary system OO Aql revisited: a new quadruple system. (Tugçe Içli, Dolunay Koçak, G. Çisem Boz, Kadri Yakut) *http://arxiv.org:1302.6686* These four authors indicate a period of 52 years for the fourth body and 20 years for the third.

Eclipsing Binaries with Possible Tertiary components (LeRoy F. Snyder) see *http://www.socastrosci.org/images/SAS_2013_Proceedings.pdf* to download the article. The author interprets the curve O-C and finds a period of 19.77 years for the third body.

4.3 OO AQL

OO Aql is a W UMa binary with a combined mass $M_{1,2}$ of 1.5 $M_\odot$ and a period of 0.51 days. The O-C diagram, Figure 5, covers 37 years with 1035 data points. The quadratic equation

$$\int(e) =$$
$$38613.22334\ (\pm 8.7^{-4})$$
$$+ 0.5068\ (\pm 1.5^{-7})E$$
$$+1.31150^{-11}\ (\pm 5.54^{-12})\ E^2 \qquad (3)$$

produced only a 4% improvement over the parabolic fit. The third body period is 19.77 years and requires a minimum mass of 0.155 $M_\odot$ since the mass function is

$$\int(M) = 0.0245\ M_\odot$$

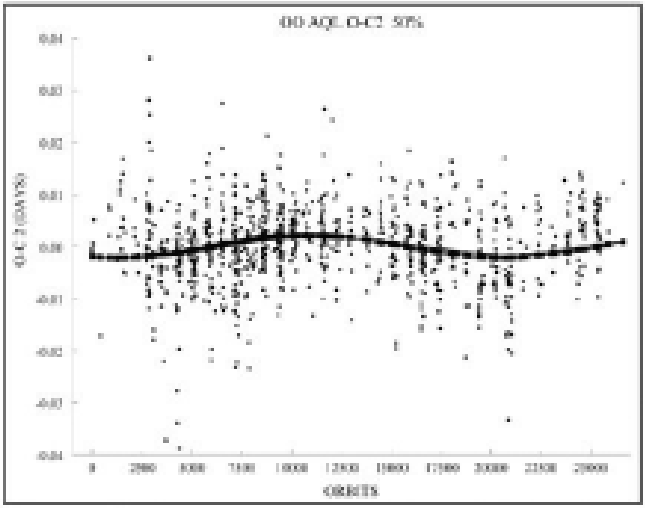


Figure 5. OO AQL.

Conclusion: it is really very important to continue to follow this star on a regular basis as the more observations we have, the easier it will be to determine precisely the periodic variations of the objects orbiting this enigmatic star.

Reference: New Eclipsing Binary Handbook 2011 < *http://britastro.org/vss/* > EB Handbook 11.pdf

ONLINE SUBMISSION OF OBSERVATIONS

ANDY WILSON (BAA VSS DATABASE SECRETARY)

As I write this in mid-January, the new web pages for submitting observations are in the final stages of testing. I thus have reasonable confidence that the system will be live by the time you are reading this! A screen shot of the new database homepage is shown in figure 1 (page 17).

First of all, I will emphasize that submitting your observations online is optional. Anyone who wishes to send their visual observations to the Secretary (Bob Dryden), and CCD observations to the Database Secretary may continue to do so. However, I think you will find that up-loading your own observations is beneficial since you will be able to spot and correct any mistakes yourself, and see your observations online immediately.

The process for obtaining a login is to email the Database Secretary at the email address on the back cover of the circular (and at the end of this article).

The loading of observations is a 2 stage process.

1 – Upload your data file. At this point it is checked by the data loading software, with any "errors" or "warnings" listed. Note that "errors" will prevent the data from being loaded, while "warnings" should be checked, but will not prevent your data from being loaded. Figure 2 is an example screen shot after loading a single file (page 18).

2 – Once you have uploaded your observations they are placed in a temporary storage area where you can review and modify them should you need to do so. If you need to make more than a few corrections, then I would suggest deleting your observations from the temporary area, correcting your file, and then reloading it. Once you are happy with your observations you press the "Commit" button, which will transfer your observations from the temporary location into the live database. They will then immediately appear on light curves.

I will raise the topic of variable star designations, as many different ones are used to identify the same star. If you load an observation for a star that is not recognised, the web pages will flag this up as a new star and ask you to check it. The software will automatically create any new stars when you commit your observations, but this should be used to create genuinely new stars, rather than simply a different spelling such as SS Cyg and SSCYG. The officers will periodically review any "new" stars, as they are flagged as unvalidated in the database. It will make the life of the officers far easier if the new stars are genuine rather than typos or alternative names.

As well as being able to upload observations, there is another new screen for manual entry of 1 to 9 observations at a time. In particular this gives a route for entering "negative" CCD observations, and from now on this method should be used instead of typing them into the visual observation spreadsheet.

Another new page gives you the ability to edit your existing observations, one observation at a time. There is also a "Bulk Edit" page, but this should be used with great care. All changes to the database are recorded, but it would take a lot of effort to undo accidental changes. For any complex changes, or if you prefer not to use the web pages,

then you may still email the Director or Database Secretary with your corrections.

The sequence data is now part of the online database and may be viewed from the standing data pages. This will enable you to find the official name for any sequence you use. You may also view current and historic comparison star magnitudes via the "Sequence Data" screen.

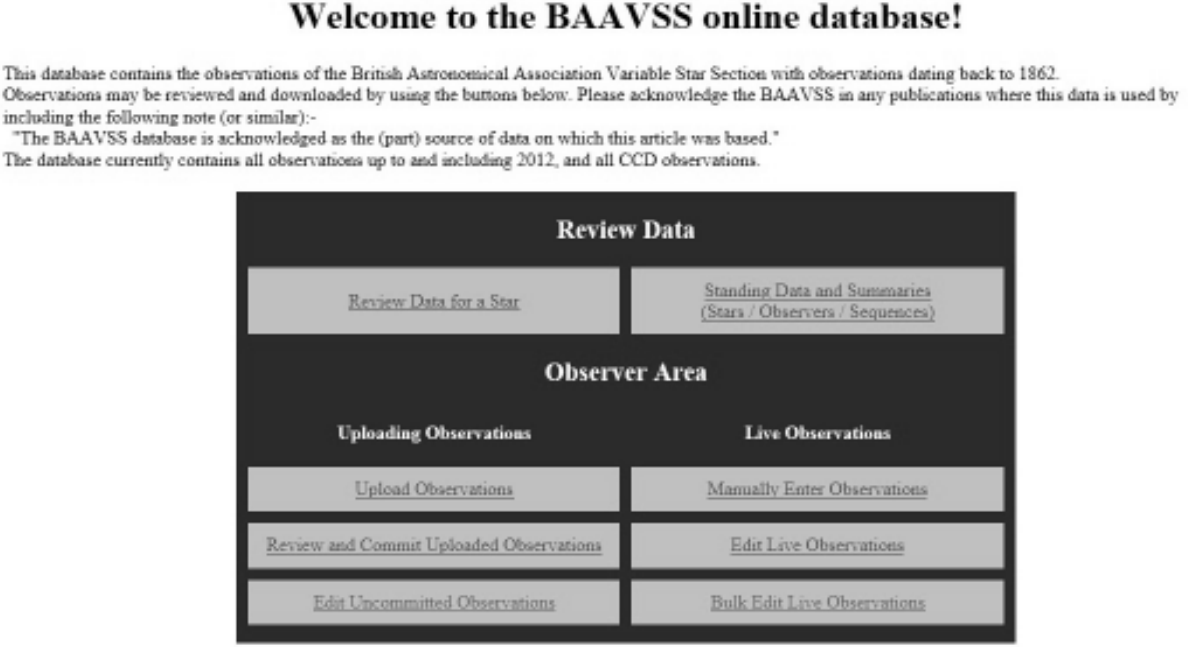


Figure 1: A screen shot of the new database homepage.

I shall end with a brief explanation of the magnitude recalculation that the website undertakes. Where feasible, the web pages will recalculate the magnitudes you provide using the comparison stars and sequences from your file. This is only possible where the sequence is recognised and the estimate for visual observations or the instrumental magnitudes for CCD observations are provided. However, where it is possible, it is expected that values will agree to 0.1 magnitudes. It may prove necessary to tweak this value, but as it stands values outside this tolerance will be rejected. In a future release, the web pages will permit recalculation of all magnitudes to the latest sequence. Part of this capability is already built into the web software, but it may be a few months or a year before this is completed.

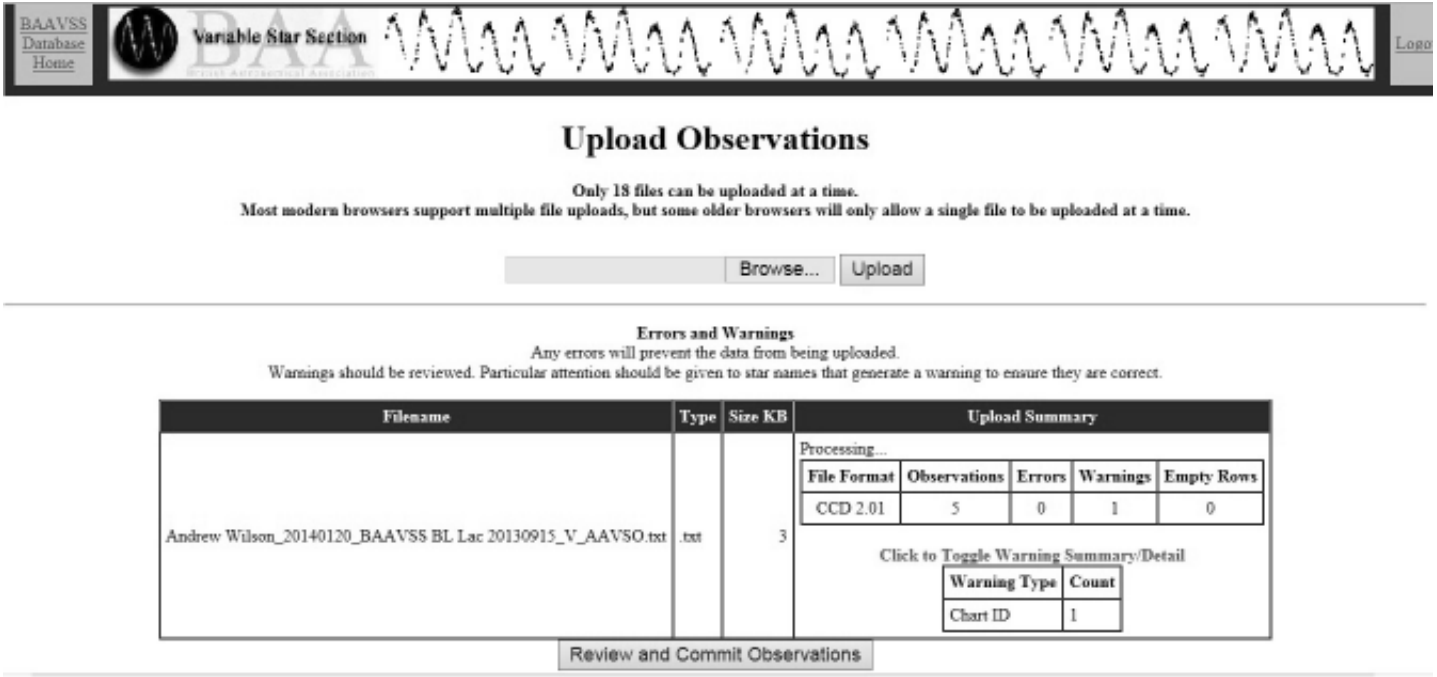


Figure 2: An example screen shot after loading a single file.

Andy Wilson (BAA VSS Database Secretary) < *andyjwilson_uk@hotmail.com* >
Bob Dryden (Secretary) < *visual.variables@britastro.org* >

SS CEPHEI

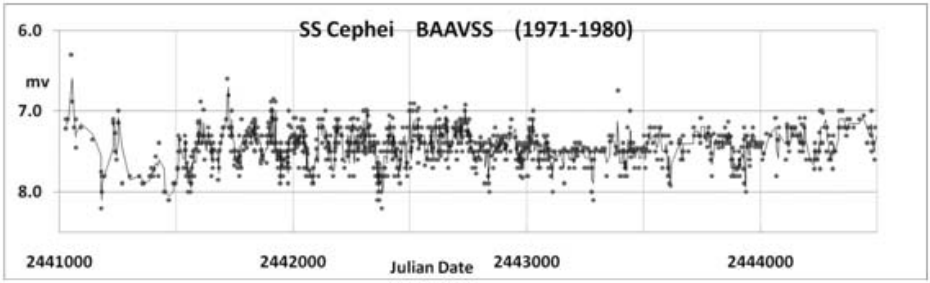
MELVYN TAYLOR

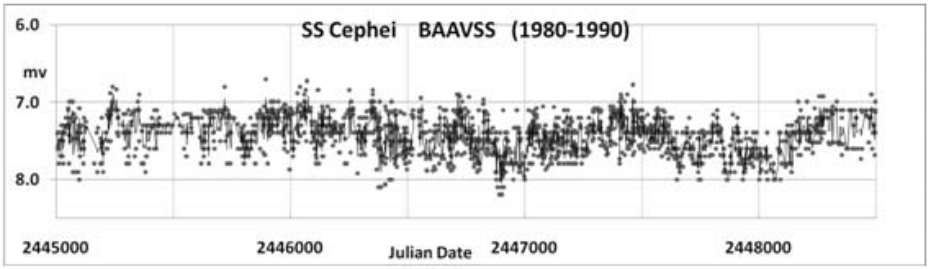
RA 03h 49.5m Dec. +80 19.35', SRB, 8.0 to 9.1p, period 90d, M5IIIvar. (GCVS)

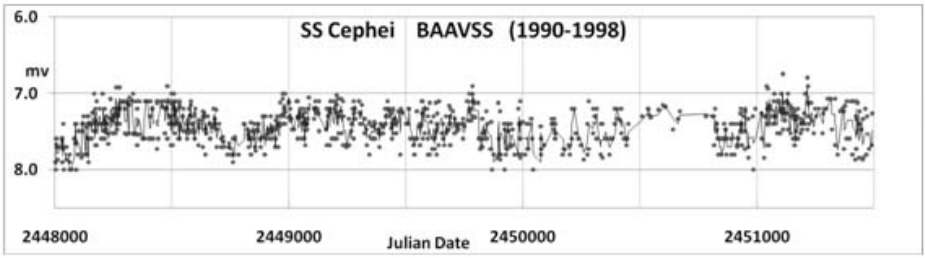
The visual mean range is 6.6 to 8.0 magnitude, based on the four light curves from 1971 to 2006, assisted by about 2800 estimates used from the database and 71 observers listed below. The light curve's mean magnitude is 7.39 with a s.d. of 0.25m. The two point moving trend line, used in the MS excel programme, helps to delineate the variability. Maxima range from 6.6 to 7.5, average value 7.22, minima vary 7.4 to 8.0, average 7.58m. Well defined maxima have a mean period of 102d (s.d. 9d) and there appears a longer period around 1240d with an amplitude of 0.3m. The chart, reference 315.0, is a 6° version and identification relative to Polaris or Errai (gamma Cep) and nearby stars is not too challenging with binoculars and a 5° field of view.

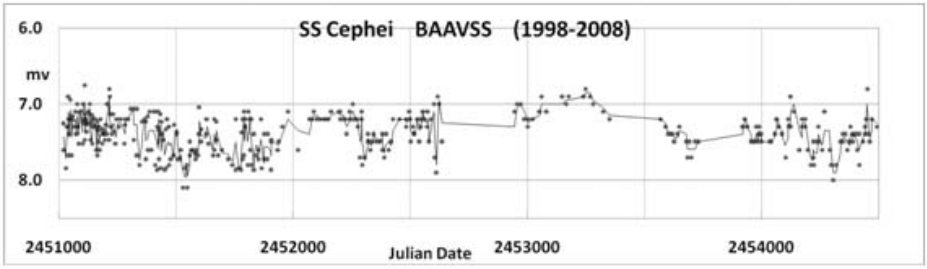
Contributors:

Albrighton, Allen, Allmand, Anderson, Barry, Beesley, Beveridge, Burch, Chapman, Clayton, Collinson, Currie, Dunlop, Fleet, J.Fraser, R.Fraser, Freeman, Gardner, Gough, Granslo, Henshaw, Higgs, Hollis, Hornby, Howarth, Hufton, Hurst, Hutchings, Isles, Jackson, Jobson, Johnston, Keenan, Kendall, Kiernan, Kirby, Koushiappas, Mann, Maris, Markham, Marriott, Mason, McCalman, McGenity, McNaught, Middlemist, Miller, Munden, Nartowicz, O'Halloran, Parkinson, Pickup, Pointer, Porter,Poxon, Pratt, Quadt, Ramsey, Robinson, Rothery, Smeaton,A.Smith, J.Smith, Stefanopoulos, Swain, Taylor, Toone, West, Wilson, Wise, Woodbridge.









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A "SECONDARY" CHALLENGE FOR OBSERVERS OF ECLIPSING BINARIES.

TONY MARKHAM

Have you ever timed the midpoint of the secondary eclipse of an Algol type variable?

Maybe you have assumed that secondary eclipses are too shallow to be easily timed. It is easy to get that mistaken impression given that the secondary eclipses of the two most popular Algol type variables (beta Persei and RZ Cassiopeiae) are indeed less than 0.1 magnitude in depth.

In reality, the secondary eclipses of some Algol type variables are quite deep, in some cases almost as deep as the primary eclipse.

A potential problem is that of knowing when a star is due to be in a secondary eclipse, since there seems to be a paucity of published elements for secondary eclipses*. If the orbits are circular, then secondary eclipses should occur midway between primary eclipses. For elliptical orbits, however, the secondary eclipse could be displaced to somewhat earlier or later phases.

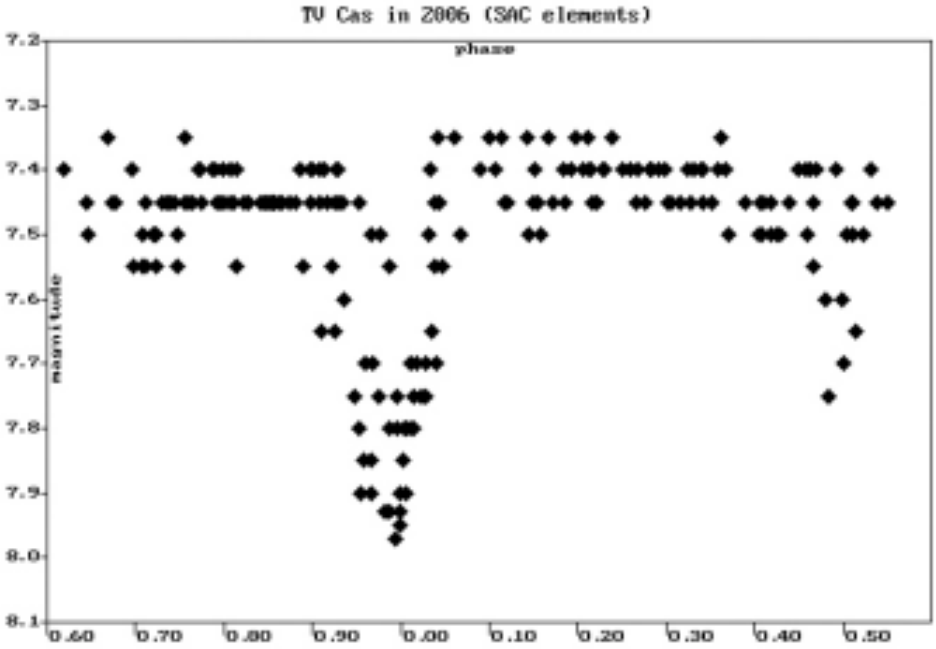
During 2005-2006, I investigated whether I could detect secondary eclipses without having prior knowledge of when they were due. I simply observed the eclipsing variables involved on most clear nights and plotted a phase light curve at the end of each

* Perhaps the first place to look is the Atlas of O - C Diagrams of Eclipsing inary Stars: *http://www.as.up.krakow.pl/o-c/cont.html*

year. Sky conditions (haze, moonlight, etc) inevitably varied somewhat from night to night and this will have increased the scatter in the light curves. Nevertheless, secondary eclipses were detected visually. The discrepancies between the catalogued and observed secondary eclipse depths could be due to scatter in my estimates, or be due to the quality of the comparison star sequences (which are in some cases rather old), or could be genuine.

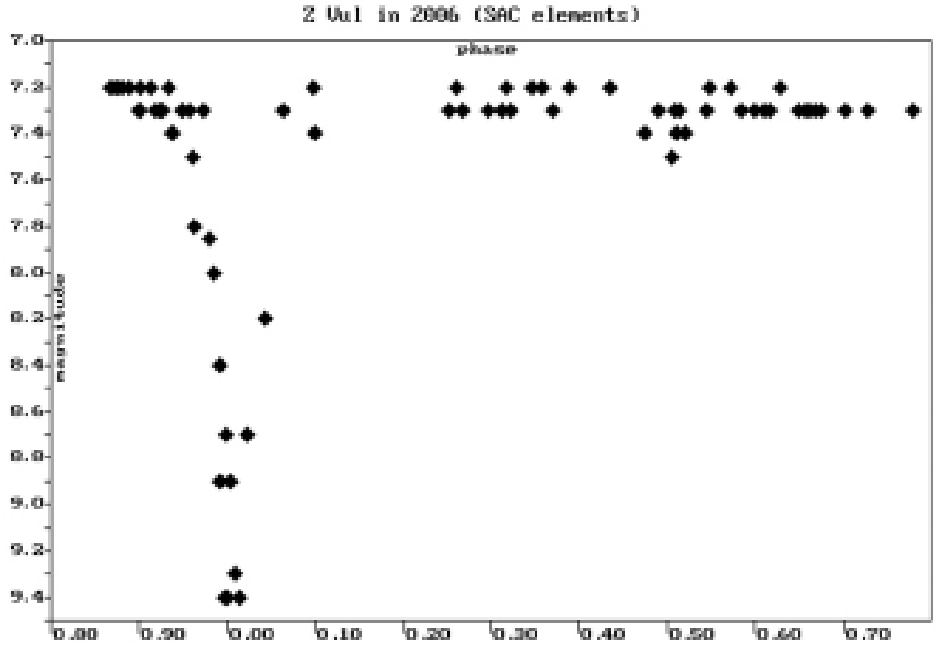
Three such light curves are shown below:

TV Cassiopeiae



The secondary eclipse is clearly seen approximately midway between primary eclipses. The observed depth looks to be deeper than the 0.1 magnitude quoted on the web-site: *http://www.as.up.krakow.pl/o-c/data/getdata.php3?TV%20cas*

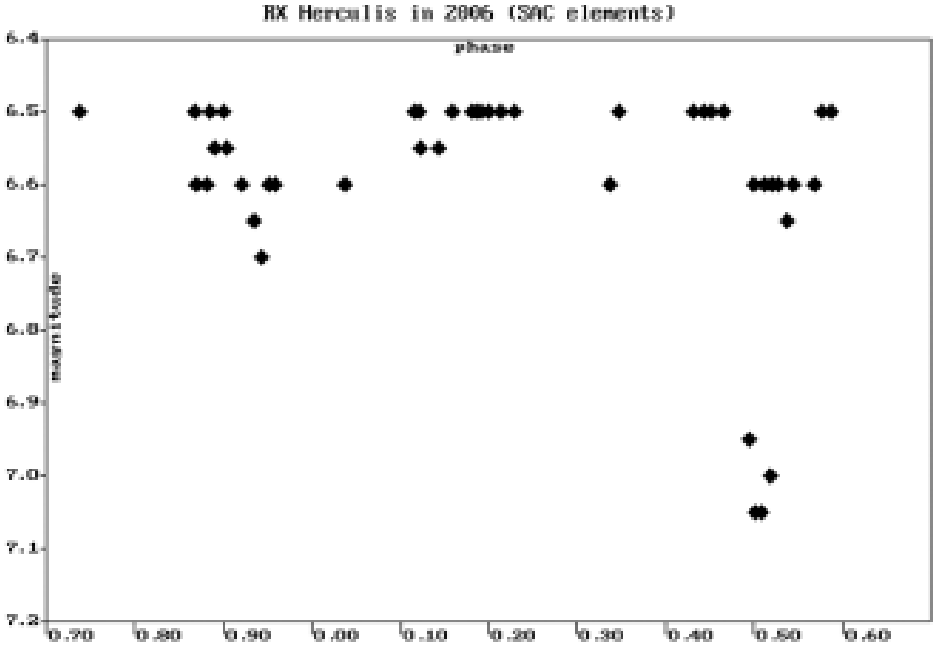
Z Vulpeculae



There is a hint of a shallow secondary eclipse midway between primary eclipses that would be roughly in line with the 0.3 magnitude depth given on the website:
http://www.as.up.krakow.pl/o-c/data/getdata.php3?Z%20vul

RX Herculis (Page 23)

In this case, the secondary eclipse was well seen but there was a lack of observations around the time of primary eclipse. The observed secondary eclipse depth is roughly in line with the 0.48 mag secondary eclipse depth that was being quoted by the Krakow website at the time, although the current Krakow website has, rather surprisingly, reduced the quoted value to 0.1 magnitude:
http://www.as.up.krakow.pl/o-c/data/getdata.php3?RX%20her



What next ?

Obviously it is one thing to detect a secondary eclipse visually, but it would be another to accurately measure the time of mid eclipse. Secondary eclipse monitoring could however be a good project for CCD/DSLR observers who have the capability to monitor the brightness changes more precisely and therefore could investigate several secondary eclipse properties:

- Do the secondary eclipses occur midway between primary eclipses?
- Do secondary eclipses show the same changes in O-C values as seen in the primary eclipses?
- Are the catalogued secondary eclipse depths accurate?
- Do the eclipse profiles indicate that the eclipses are partial, total or transits?

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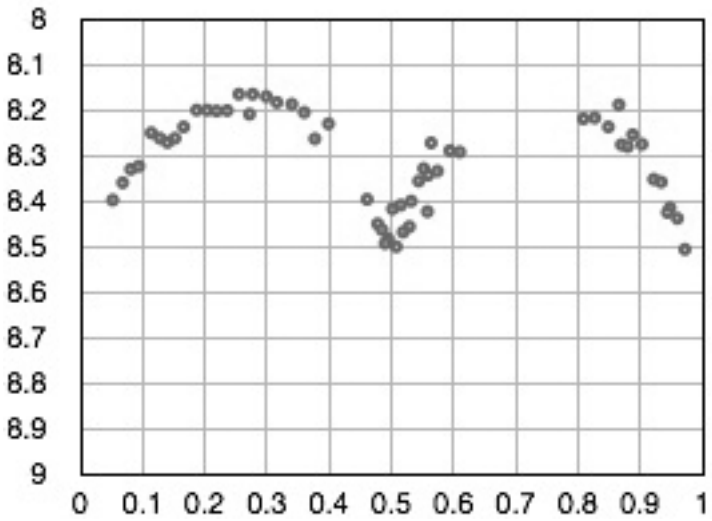
When questioned by Tony, Des Loughney added that DSLR/CCD measurements can also determine reasonably accurately the depth of the secondary eclipse. This is a point of study which he is currently carrying out on IU Aur. (see VSSC No. 158, p.10).

Des said in very good conditions (such as the conditions on La Palma) DSLR photometry can detect secondary eclipses of 0.1 magnitude quite easily. However in the UK conditions he would say it is very difficult. He has a good light curve, though, of AO Cassiopeiae, where the eclipses are 0.2 magnitude in depth.

Des Loughney's light curve which includes his latest data of IU Aurigae, and shows the secondary eclipse of 0.3 magnitude.



Des has been waiting for months without success for good weather to coincide with a primary eclipse of IU Aurigae.

SPECTRUM OF THE T TAURI STAR BP TAURI

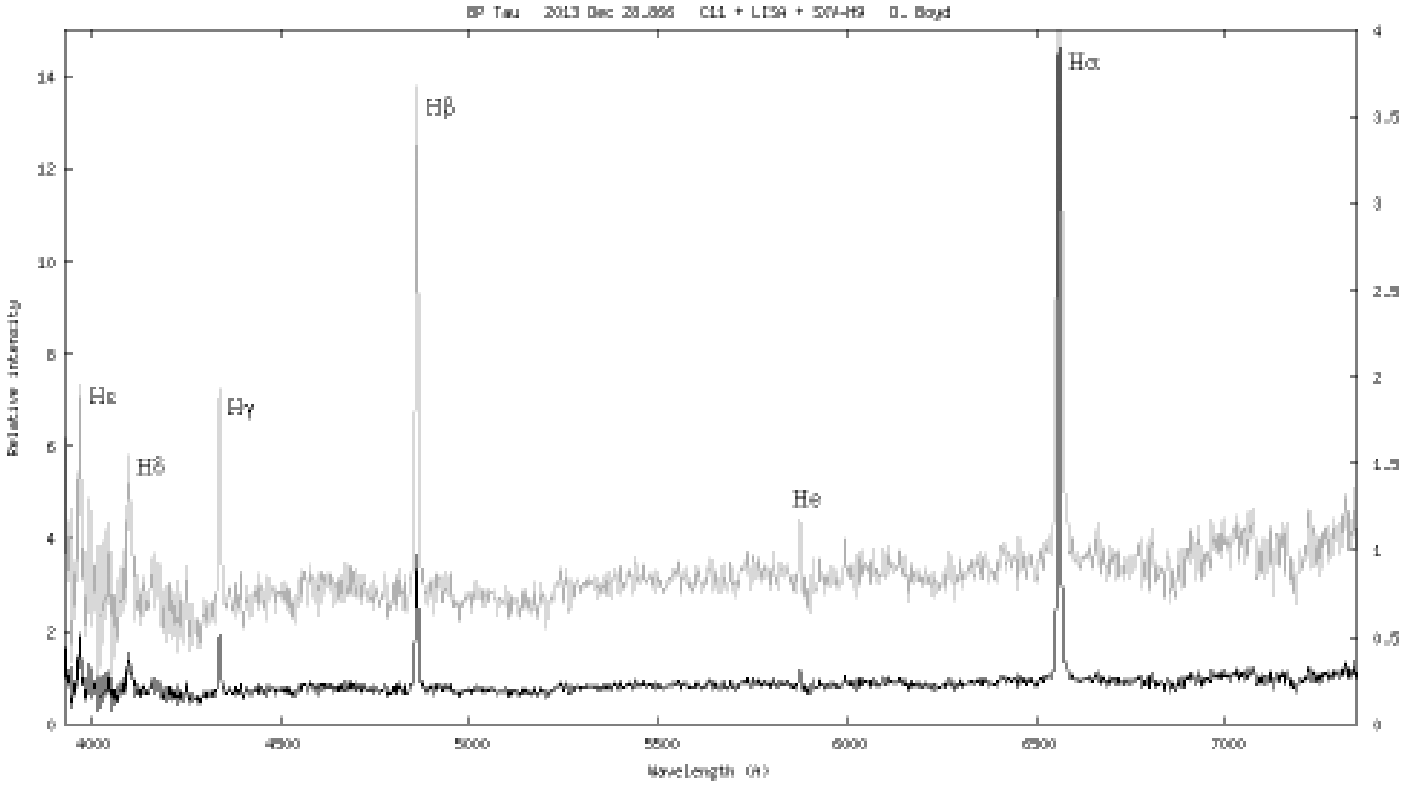
David Boyd

BP Tau has recently been the subject of an AAVSO observing campaign in support of Dr Moritz Guenther of the Harvard-Smithsonian Center for Astrophysics who was observing the star with the Chandra X-ray satellite. More information about the campaign is available on the VSS website at:
http://www.britastro.org/vss/BP_Tau_Campaign_2013_14.htm

BP Tau is a classical T Tauri star, a young pre-main-sequence star surrounded by a thick accretion disk which is depositing matter onto the surface of the star. The surrounding hydrogen-rich environment is being ionised by radiation from the star and this produces strong hydrogen emission lines in the stellar spectrum.

I took this spectrum on 2013 Dec 28.866 UT with a LISA spectrograph attached to a C11 scope. Total integration time was 75 min. The main emission lines of the hydrogen Balmer series are prominent plus a weak emission line of helium at 5876A. The grey spectrum is an amplified version of the black one. The star was approximately 12th magnitude at the time.

Figure 1 - Spectrum of T Tauri star BP Tauri, taken on 2013, December 28th .



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RECENT OBSERVATIONS OF SOME ECLIPSING BINARIES WITH THE BRADFORD ROBOTIC TELESCOPE.

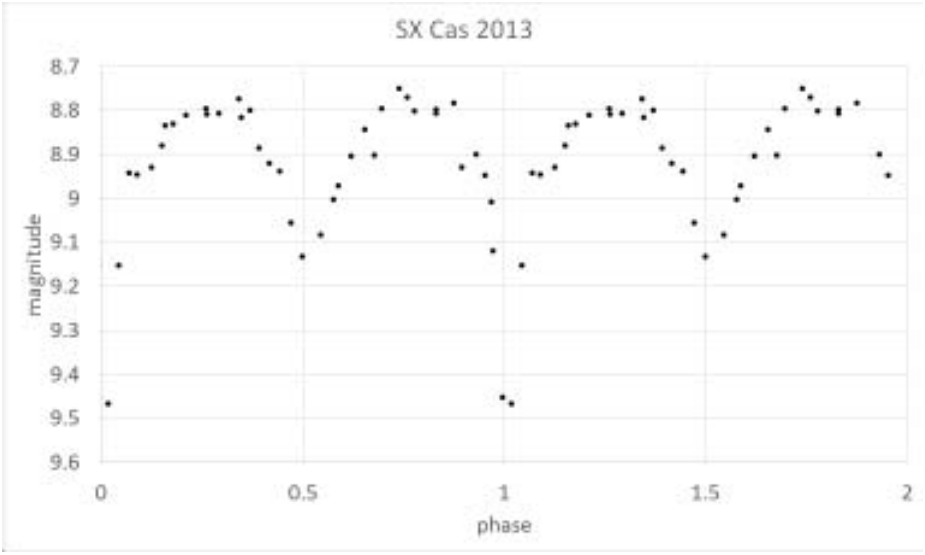
DAVID CONNER

My ongoing program of observations of eclipsing binaries with the Bradford Robotic Telescope continues, in the face of persistent technical problems and poor weather at the site in Tenerife. The resulting gaps in the data are not helpful, but none the less the results are still informative. These are some examples from 2013. All images are unfiltered. Photometry was with AIP4WIN.

SX Cassiopeiae

This is a long period EA variable, where observations over a number of months enable a complete light curve to be constructed with Peranso. This method suits long period variables particularly well. The curve in figure 1 is derived from 39 images taken between July and December 2013.

Figure 1. Light curve for SX Cassiopeiae, (BRT Cluster Camera).

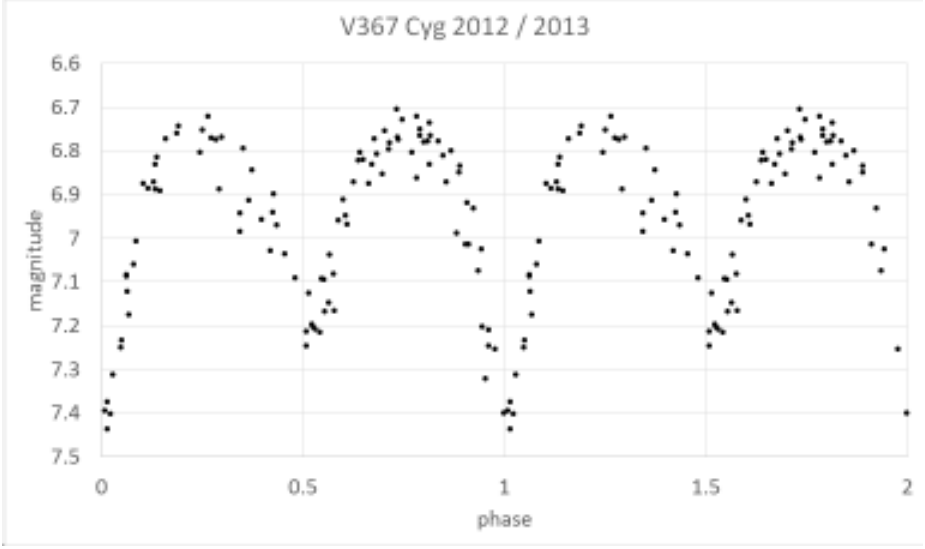


Peranso/ANOVA calculated the best fit period to be 36.62 days, which compares favourably with the General Catalogue of Variable Stars' (GCVS) value of 36.56375d. The depths of the minima are also consistent with the GCVS, but Min I is shallower and Min II is deeper than suggested by Kreiner. The irregularities near the primary minimum might be caused by a disc of material around the hotter component (Ho-Il et al). There is also some dependence on colour, so future observations will be filtered. The system has a changing o-c (Kreiner et al, plus private correspondence), so future work will include deriving times of minima to try to detect these changes.

V367 Cygni

This is another long period binary, EB type, which I previously observed in 2012 (see article in VSS circular 156 June 2013). When the 2013 results observations are combined with the 2012 observations, as shown in figure 2, then a more accurate value for the period can be derived.

Figure 2. Light curve for V367 Cygni, 2012 and 2013 observations combined. (BRT Cluster Camera).

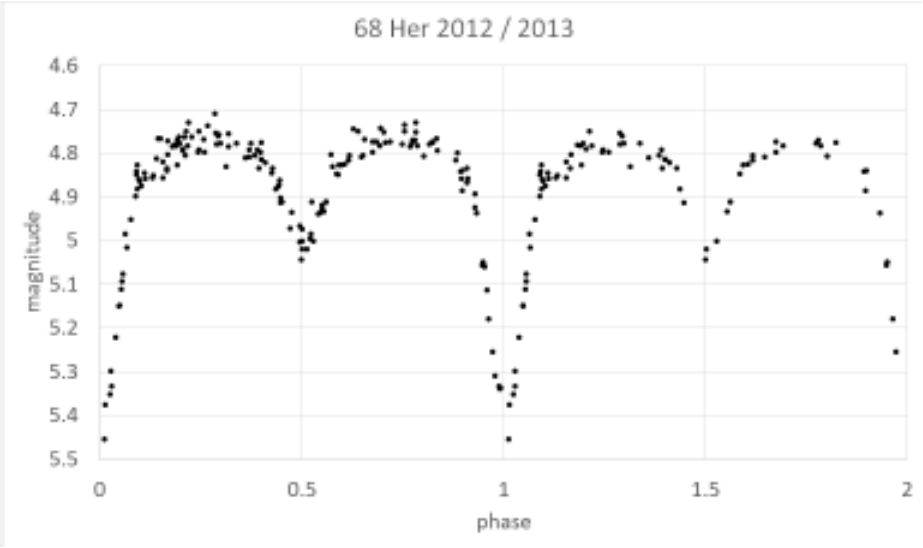


The derived period is 18.5995d, comparing well with the GCVS value of 18.59773d. The depths of the two minima plotted from these observations are consistent with the catalogues.

68 Herculis (= u Herculis)

A naked eye eclipsing binary, which I have never observed visually! The light curve in figure 3[(p.28)] is distinctly 'EB' shape, although the type is stated as EA in the GCVS. Different authors variously refer to it as EA or EB. My understanding from correspondence is that the label regarding the shape of the light curve is less important than the physical characteristics of the system itself and hence is a bit flexible.

Figure 3. Light curve for 68 Herculis, 2012 and 2013 observations combined. (BRT Constellation Camera).



The derived period from the combined results from 2012 and 2013 is 2.05102d, comparing well to the GCVS value of 2.0510270d and Kreiner's value of 2.0510258d. The depths of the minima are again consistent with the catalogues.

Other results.

Two results that are of particular interest are GO Cancri and NSV 4031. GO Cnc is in the GCVS as an EA type with a Min I of 0.26 magnitudes, and the AAVSO finder chart states the period is 3.6502d. Figure 4[(p.29)] is a plot of my results, using the Peranso derived period of 3.6574d. This is a prime example of 'more observations needed'!

The other is NSV4031. I have not included a plot because my results, both with the BRT Cluster Camera and from my own observatory in Somerby (using a 2" refractor, similar to Cluster Camera), show it fairly constant at about magnitude 9.17. Interestingly, the GCVS shows it as an EA type with a range of magnitude 8 to 8.8 with an unspecified period. It should be said that my results are at odds with those obtained by the director of the VSS. Again, more observations definitely needed.

References

Bradford Robotic Telescope: http://www.telescope.org/Peranso,

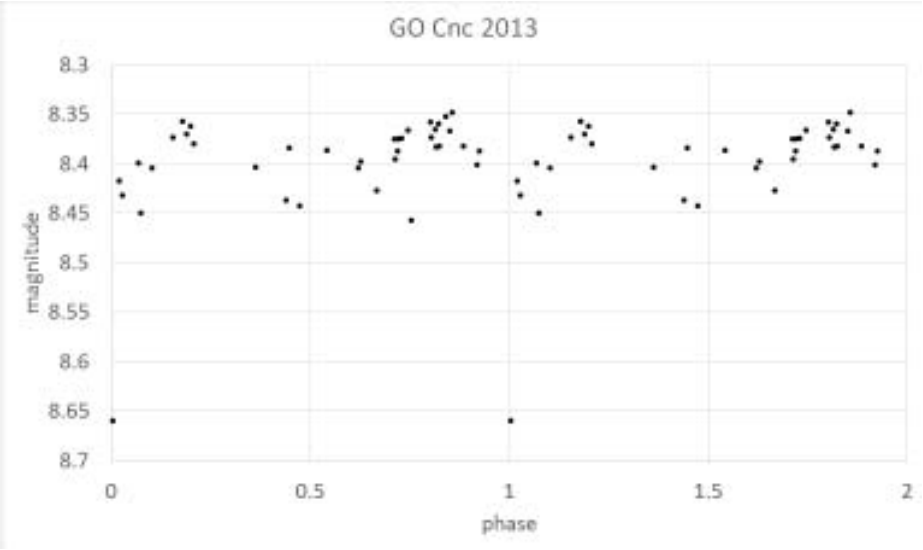
Tonny Vanmunster, http://www.peranso.com/

General catalogue of Variable Stars, http://www.sai.msu.su/gcvs/cgi-bin/search.htm

An Atlas of O-C Diagrams of Eclipsing Binary Stars / by Jerzy M. Kreiner, Chun-Hwey Kim, Il-Seong Nha. Cracow, Poland: Wydawnictwo Naukowe Akademii Pedagogicznej. 2001. http://www.as.up.krakow.pl/ephem/

Ho-Il Kim, Il-Seong Nha and Kam-Chim Leung, http://articles.adsabs.harvard.edu//full/1993ASPC...38..315K/0000315.000.html

Figure 4. GO Cancri, BRT Cluster Camera. Is it an EA, or an anomalous data point?



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2013 THE YEAR THAT R SCUTI SWITCHED TO MIRA MODE.

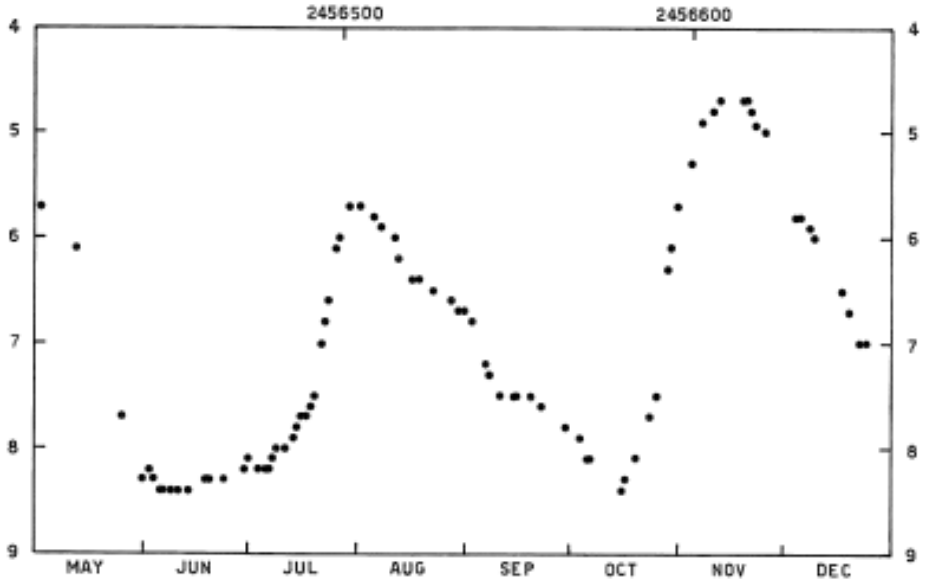
JOHN TOONE

R Scuti is catalogued as the brightest RVa star but the classical RV Tauri behaviour of alternating primary and secondary maxima and minima are not always evident in the light curve. For most of the 2013 apparition the light curve (see page 30) resembled more that of a Mira type variable. The unusual behaviour began in late May when R Scuti dipped below magnitude 8.0 which normally signals an abnormally faint minimum. This minimum would prove to be the longest deep minimum on record, lasting 42 days at or below 8.0 magnitude. As it approached and emerged from minimum R Scuti seemed to be unstable briefly and jumped about by 0.1 magnitude. The following maximum was much fainter than usual peaking only at magnitude 5.7 before fading back to a second consecutive abnormally faint minimum. The descending branch included two humps that might have been suppressed attempts to have the secondary maxima. The interval between the consecutive deep minima was 125 days which is not far short from the

catalogue period of 141 days. The rise from the second deep minima at the end of October was very rapid and peaked at a rate of 0.4 magnitudes per day. The primary maximum in November was then very bright at magnitude 4.7.

The jury is still out on a concise theory explaining R Scuti's variation, but most consider that it is due to multiple overlapping pulsation modes. A crucial element in resolving this puzzle will be precision photometry but up to now only visual data has been available over a sustained timescale. The imprecise nature of visual data together with the scatter caused by personal equation (especially from non systematic observers) means we only get to see the overall variation in the light curve. The personal equation effect can be eliminated by analysing only the systematic observer's data and applying individual adjustments. Then we might get to see the fine detail exhibited in the accompanying light curve. This fine detail is what I predict will be picked up by CCD/DSLR observers when they finally decide to direct their cameras towards R Scuti.

Light curve of R Scuti 2013



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BINOCULAR PROGRAMME

MELVYN TAYLOR

Do I

Priority level 1:

This list is as existing and as previously published, but it should be noted that V Boo, XX Cam, gamma Cas, R CrB, omicron Cet and R Hya are not shown as they are on the telescopic programme.

Star	RA (2000)	Dec	Type	Range	Period	Chart
AQ And	00 28	+35 35	SR	8.0 - 8.9	346d	303.01
EG And	00 45	+40 41	ZAnd	7.1 - 7.8		72.02
V Aql	19 04	-05 41	SRb	6.6 - 8.4	353d	26.04
UU Aur	06 37	+38 27	SRb	5.1 - 6.8	234d	230.02
AB Aur	04 56	+30 33	Ina	6.7 - 8.4		301.01
RW Boo	14 41	+31 34	SRb	7.4 - 8.9	209d	104.02
RX Boo	14 24	+25 42	SRb	6.9 - 9.1	160d	219.02
ST Cam	04 51	+68 10	SRb	6.0 - 8.0	300d?	111.02
X Cnc	08 55	+17 04	SRb	5.6 - 7.5	195d	231.02
RS Cnc	09 11	+30 58	SRc	5.1 - 7.0	120d?	269.01
V CVn	13 20	+45 32	SRa	6.5 - 8.6	192d	214.02
WZ Cas	00 01	+60 21	SRb	6.9 - 8.5	186d	323.01
V465 Cas	01 18	+57 48	SRb	6.2 - 7.8	60d	233.02
Rho Cas	23 54	+57 29	SRd	4.1 - 6.2	320d	64.01
W Cep	22 37	+58 26	SRc	7.0 - 9.2		312.02
AR Cep	22 52	+85 03	SRb	7.0 - 7.9		332.02
Mu Cep	21 44	+58 47	SRc	3.4 - 5.1	730d	112.02
RS CrB	15 59	+36 01	SRa	7.0 - 10.2	332d	220.02
W Cyg	21 36	+45 22	SRb	5.0 - 7.6	131d	62.03
AF Cyg	19 30	+46 09	SRb	6.4 - 8.4	92d	232.02
CH Cyg	19 25	+50 15	ZAnd+SR	5.6 - 11.0	97d	089.03
P Cyg	20 18	+38 02	SDor	3.0 - 6.0	6d	1972Jul29
U Del	20 46	+18 06	SRb	5.6 - 7.9	110d?	228.02
EU Del	20 38	+18 16	SRb	5.8 - 6.9	60d	228.02
TX Dra	16 35	+60 28	SRb	6.6 - 8.4	78d?	106.03
AH Dra	16 48	+57 49	SRb	7.0 - 8.7	158d	106.03
X Her	16 03	+47 14	SRb	6.1 - 7.5	95d	223.02
SX Her	16 08	+24 55	SRd	8.0 - 9.2	103d	113.02
UWHer	17 14	36 22	SRb	7.0 - 8.8	104d	107.02
AC Her	18 30	+21 52	RVA	6.8 - 9.0	75d	048.04
IQ Her	18 18	+17 59	SRb	7.0 - 7.5	75d	048.04
OP Her	17 57	+45 21	SRb	5.9 - 7.2	120d	324.01
RX Lep	05 11	-11 51	SRb	5.0 - 7.4	60d?	110.01
SV Lyn	08 04	+36 21	SRb	6.6 - 7.9	70d?	108.03
Y Lyn	07 28	+45 59	SRc	6.5 - 8.4	110d	229.02
U Mon	07 31	-09 47	RVB	5.9 - 7.9	91d	029.04
X Oph	18 38	+08 50	M	5.9 - 9.2	328d	099.02
BQ Ori	05 57	+22 50	SR	6.9 - 8.9	110d	295.01
AG Peg	21 51	+12 38	Nc	6.0 - 9.4		094.02
X Per	03 55	+31 03	GCas+Xp	6.0 - 7.0		277.01

R Sct	18 48	-05 42	RVA	4.2 - 8.6	146d	026.04
Y Tau	05 46	+20 42	SRb	6.5 - 9.2	242d	295.01
W Tri	02 42	+34 31	SRc	7.5 - 8.8	108d	114.02
Z UMa	11 57	+57 52	SRb	6.2 - 9.4	196d	217.02
ST UMa	11 28	+45 11	SRb	6.0 - 7.6	110d?	102.02
V UMi	13 39	+74 19	SRb	7.2 - 9.1	72d	101.02
SS Vir	12 25	+00 48	SRa	6 0 - 9.6	364d	097.02
SW Vir	13 14	-02 48	SRb	6.4 - 8.5	150d?	098.02

Priority level 2:

The following are regarded (in the main) as under-observed or having poor continuity, and several objects come to conjunction with the Sun so the light-curve is broken.

Star	**RA(2000)**	**Dec**	**Type**	**Range**	**Period**	**Chart**
RS And	23 55	+48 38	SRa	7.0 - 9.1	136d	1977Sep10
TZ And	23 51	+47 31	SRb	7.6 - 9.0		1977Sep10
V450 Aql	19 34	+05 28	SRb	6.3 - 6.7	64d	70.02
RV Boo	14 39	+32 32	SRb	7.5 - 8.8	137d	104.02
U Cam	03 42	+62 39	SRb	7.7 - 8.8		100.02
RY Cam	04 31	+64 26	SRb	7.3 - 9.4	136d	1972Jul29
Y CVn	12 45	+45 26	SRb	5.2 - 6.6	157d	215.02
TU CVn	12 55	+47 12	SRb	5.6 - 6.6	50d	215.02
V393 Cas	02 03	+71 18	SRa	7.0 - 8.0	393d	1978May15
RU Cep	01 21	+85 08	SRd	8.2 - 9.8	109d	332.02
RW Cep	22 23	+55 58	SRd	6.2 - 7.6	346d?	312.02
SS Cep	03 50	+80 19	SRb	6.7 - 7.8	90d	315.01
FZ Cep	21 20	+55 27	SR	7.0 - 7.6		302.01
RR CrB	15 41	+38 33	SRb	7.1 - 8.6	61d	220.02
RU Cyg	21 41	+54 19	SRa	8.0 - 9.4	233d	302.01
RV Cyg	21 43	+38 01	SRb	7.1 - 9.3	263d	1983Sep18
TT Cyg	19 41	+32 37	SRb	7.4 - 8.7	118d	227.01
RY Dra	12 56	+66 00	SRb?	6.0 - 8.2	200?	225.02
TU Gem	06 11	+26 01	SRb	7.4 - 8.3	230d	294.01
TV Gem	06 12	+21 52	SRc	6.6 - 8.0	42d	294.01
WY Gem	06 12	+23 12	Lc+E?	7.2 - 7.9		294.01
ST Her	15 51	+48 29	SRb	7.0 - 8.7	148d	223.02
V566 Her	18 08	+41 43	SRb	7.1 - 7.8	137	324.01
g(30) Her	16 29	+41 53	SRb	4.3 - 6.3	89	224.02
SX Lac	22 56	+35 12	SRd	7.7 - 8.7	190	235.01
CE Lyn	07 44	+38 50	SR	7.8 - 8.7	?	108.03
R Lyr	18 55	+43 57	SRb	3.9 - 5.0	46?	330.01
RV Mon	06 58	+06 10	SRb	6.8 - 8.6	132	292.01
SX Mon	06 52	+04 46	SR	7.3 - 8.5	100	292.01
W Ori	05 05	+01 11	SRb	5.9 - 7.7	212	105.02
GO Peg	22 55	+19 34	Lb	7.1 - 8.3		103.01
SU Per	02 22	+56 36	SRc	7.0 - 8.5	533	1974Jan13
AD Per	02 21	+57 00	SRc	7.7 - 8.4	362	1974Jan13
Z Psc	01 16	+25 46	SRb	7.0 - 7.9	144	278.01
TV Psc	00 28	+17 54	SR	4.7 - 5.6	49	1972Sep09
S Sct	18 50	-07 54	SRb	7.0 - 8.2	148	26.04

t4 Ser	15 36	+15 05	SRb	5.9 - 7.4	100	209.01
TT Tau	04 52	+28 32	SRb	8.1 - 8.8	166	301.01
BU Tau	03 49	+24 08	GCas	4.8 - 5.5		1983Oct03
RY UMa	12 21	+61 19	SRb	6.7 - 8.3	310?	217.02
TV UMa	11 46	+35 54	SRb	6.8 - 7.3	42	271.01
VW UMa	10 59	+69 59	SR	6.9 - 7.7	610	226.01
BK Vir	12 30	+04 25	SRb	7.3 - 8.8	150?	270.01

Priority level 3:

Stars that have been queried by period and/or type.

Star	**RA(2000)**	**Dec**	**Type**	**Range**	**Period**	**Chart**
V Ari	02 15	+12 14	SRb	7.8 - 8.8	77?	1984Oct26
W Boo	14 43	+26 32	SRb?	4.7 - 5.4	450?	Undated
UV Cam	04 06	+61 48	SRb	7.5 - 8.1	294?	1972Jul29
RT Cnc	08 58	+10 51	SRb	7.1 - 8.6	60?	311.01
V460 Cyg	21 42	+35 31	SRb	5.6 - 7.0	180?	1983Sep18
V973 Cyg	19 45	+40 43	SRb	6.2 - 7.0	40?	232.02
UX Dra	19 22	+76 34	SRa?	5.9 - 7.1	168	1982Nov07
U Hya	10 38	-13 23	SRb	4.3 - 6.5	450?	109.01
RX Vir	12 05	-05 46	SRd?	8.0 - 8.6	200?	317.01

Priority level 4:

Not all the 'red-irregulars' are included here. These are considered unlikely to reveal further relevant data other than a trend of the variation and the overall mean range. Many of these stars would make a suitable longer term project for observers with a DSLR camera.

Star	**RA(2000)**	**Dec**	**Type**	**Range**	**Chart**
SU And	00 05	+43 33	Lc	8.0 - 8.5	1977Sep10
BZ And	00 38	+45 36	Lb	7.5 - 8.4	1982Aug16
Psi1 Aur	06 25	+49 17	Lc	4.8 - 5.7	1973Jul14
ZZ Cam	04 18	+62 21	Lb	7.1 - 7.9	1972Jul29
W CMa	07 08	-11 55	Lb	6.4 - 7.9	213.02
V391 Cas	01 57	+70 12	Lb	7.6 - 8.4	1978May15
DM Cep	22 08	+72 46	Lb	6.9 - 8.6	Undated
UW Dra	17 58	+54 40	Lb	7.0 - 8.2	1974Jul27
BU Gem	06 12	+22 55	Lc	5.7 - 8.1	294.01
XY Lyr	18 38	+39 40	Lc	5.8 - 6.4	331.01
BL Ori	06 26	+14 43	Lb	6.3 - 7.2	211.01
KK Per	02 10	+56 34	Lc	6.6 - 7.9	1974Jan13
PR Per	02 22	+57 52	Lc	7.6 - 8.3	1974Jan13
TX Psc	23 46	+03 29	Lb	4.8 - 5.8	276.01
VY UMa	10 45	+67 25	Lb	5.9 - 7.0	226.01
RW Vir	12 07	-06 46	Lb	6.7 - 7.6	317.01

The Binocular Secretary is always willing to assist in the choice of stars to follow. In addition he would like to hear from the Variable Star Section's observers of any possible new additions which could be added to the programme.

ECLIPSING BINARY PREDICTIONS – WHERE TO FIND THEM

DES LOUGHNEY - *desloughney@blueyonder.co.uk*

The publication of Eclipsing Binary Predictions is now discontinued in the VSS Circular. Predictions for RZ Cas, Beta Per and Lambda Tau can still be found in the BAA Handbook. Predictions, completed on a monthly basis, are available on the BAA VSS website at:

http://www.britastro.org/vss/dpredict.html

If readers require paper copies of the predictions please contact me.

The best source for predictions for Eclipsing Binaries is the Mt. Suhora Astronomical Observatory, Cracow Pedagogical University website (known as the Krakow website)at:

http://www.as.up.krakow.pl/o-c/index.php3

Click on 'Constellation List', choose your constellation and then choose your system.

A webpage will then appear with lots of useful information regarding the system. In the section entitled 'Light Elements' there is a link entitled 'current minima and phase'. When you click on this link, in the example of Beta Lyrae, you get predictions of primary and secondary eclipses for a period of three months. For systems with very short periods such as RZ Cas the predictions are for one week. For a system such as SW Cyg, with a period of around 4.57 days, the predictions are for a month.

The Krakow website does not tell you how much of an eclipse will be observable at a particular time of the year at your latitude and longitude. However, it has some useful literature references for each system, although they may not necessarily be up to date. Nor are references to the 'Information Bulletin on Variable Stars' included, but these can be found at:

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

Although the Krakow website lists the depth of eclipses it does not list the actual V magnitudes at maximum and minimum. For an indication of these magnitudes you will need to visit the 'General Catalogue of Variable Stars' website at:

http://www.sai.msu.su/groups/cluster/gcvs/gcvs/

Click on 'GCVS Query Form', type in a designation such as SW Cyg, and click on 'Search'. The resulting information displayed shows that maximum is 9.24V, primary minimum 11.83V, and secondary minimum 9.30V. These magnitudes, however, may have been determined some time ago.

The GCVS website gives SW Cyg a period of 4.57313411 days but the Krakow website lists the period of SW Cyg as 4.572986 days. The latter is more likely to list the most up to date period. It must always be borne in mind that small changes in a period can result in significant changes in the times of minima if the period was determined a few years ago.

CHARGES FOR SECTION PUBLICATIONS

The following charges are made for the Circulars. These cover one year (4 issues). PDF format subscriptions are £3.00 per year. Make cheques out to the BAA, and send to the Circulars editor (address on back cover); or you can now pay on-line.

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* ***** *

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CCD Guide	BAA Office	£7.50
Binocular Booklet	Director or BAA Office	£2.50
CD-ROM of the last 3 items	BAA Office	£7.50

Charts are downloadable from the VSS web pages at
http://www.britastro.org/vss/chartcat/wfb.php

For more information, please visit our web pages at **http://www.britastro.org/vss**

CONTRIBUTING TO THE CIRCULAR

If you would like to prepare an article for consideration for publication in a Variable Star Section Circular, please read the *Notes for Authors*, published on the web pages at:
http://www.britastro.org/vss/circs.htm; reproduced in full in VSSC132 p 22, or contact the editor (details on back cover) for a pdf copy of the guidelines.

If you are unsure if the material is of a suitable level or content, then please contact the editor for advice.

The **deadline for contributions** to the next issue of VSSC (number 160) will be 7th May, 2014. All articles should be sent to the editor (details are given on the back of this issue).

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Nova and Supernova discoveries
First telephone the Nova/Supernova Secretary, Guy Hurst: 01256 471074
If only answering machine response, leave a message and then try the following:
Denis Buczynski 01862 871187,
Glyn Marsh 01624 880933, or
Martin Mobberley 01284 828431.

Variable Star Alerts
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