



Hawkes Bay Astronomical Society members at the site of their partially completed Pukerangi roll-off observatory. Photo by Graham Palmer and provided by Col Bembrick. Col's recollections of the 2011 RASNZ conference hosted by the Hawkes Bay Astronomical Society appear on page 11.

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From the Director – *Tom Richards*

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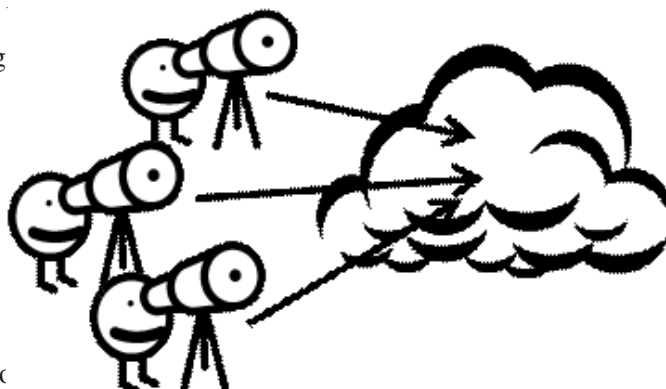


Just observers, or something more?

How can amateurs contribute to variable star research? What approaches to variable star work serve the scientific goals of the field best? Is there no “best” but many fruitful ways? How does, or can, VSS fit in to all this?

Let’s look, from the amateur’s perspective, at some ways of doing variable star research. Right now let me say that all the ways I’ll describe are important and valuable, complement each other, and provide different roles that suit the skills and interests of different amateurs. So let them all bloom!

First, there’s the old familiar model of getting observations, sending them off, and leaving it at that. Here, the amateur is just an observer, getting numbers from photons. The AAVSO headquarters (as the “O” on the end suggests) thrives on collecting these observations. The former Variable Star Section of the RASNZ had that model too, and “headquarters” that took all the observational results. Call that the Send-Off-Somewhere Model of variable star work as in Figure 1.



Some observers, not satisfied just to send off results, analyse their results themselves, study the relevant literature and publish papers on their work in the refereed journals. Of the many examples that come to mind I’ll just single out Alan Plummer and Peter Williams. Call this the DIY Model, as in Figure 2. This has an honourable history as old as variable star research itself.

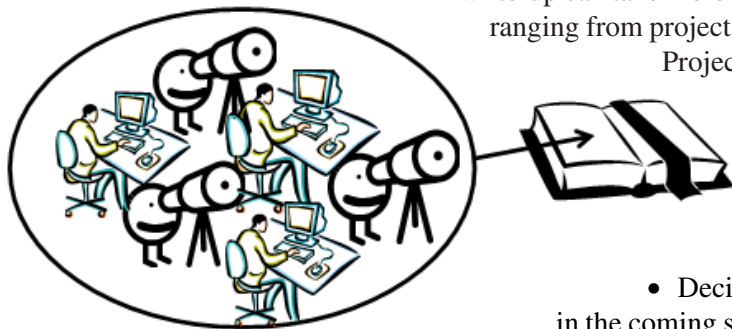


As long ago as the late 1960s the Send-Off-Somewhere Model of the VSS/RASNZ was challenged by Stan Walker and his group in Auckland, who saw the need to work collaboratively to choose targets and research techniques, to plan observing, and importantly to analyse and research the results themselves for publication. Interestingly, they had to work largely outside the VSS/RASNZ to do this. Call that the Collaboration Model, as in Figure 3. It has two great advantages over the DIY model: it

spreads the load and provides roles for different skills. Most scientific research around the world works like this.

Changing times and technologies have added power to the Collaboration Model. The globalisation offered by the Internet and remote robotic telescopes means that a research group no longer has to be tied to one small locality, in person-to-person contact with each other. Variable Stars South has taken advantage of that and offers an Internet-based Collaboration Model as the way to carry out its projects. The BL Tel Project is one example, where interest in a rare event on that star got Peter Williams to organise a team attack on it.

Team research however requires a thoughtful division of labour – not just a whole lot of observers sending off to a lone analyst, reminiscent of the Send-Off-Somewhere Model. That’s a recipe for a total work bottleneck, strangling the project, because the analysis and write-up can take more time than the observing and demands skills ranging from project management to statistics. Take the EEB



Project as an example. It consists of a small number of stars – one or two are observable in any given season. Maybe two sets of observations come in per week. But the desk work? Here’s a sketch of it:

- Deciding on the best approach to a given target in the coming season – filter? Transformed? Look only for minima? – what comp and check stars to use – and advising observers accordingly.
- Checking the file of photometry measurements for a night’s work as it comes in from an observer – does it seem right? Are all the metadata there? Is it good enough to use? Does it have bad patches and outliers? Cleanse it all, do a quick plot, and add the file to the database.
- How do the data sets from different observers compare? Are some so poor they will degrade results made from high-quality data? Are some observers measuring systematically higher or lower? Are there anomalies or disagreements? Can everybody’s results be cohered to produce a period and periodogram? What phases are missing data that we should ask observers to supply?
- What light elements can be derived from the season’s data? What are the uncertainties like?
- What historical data is out there in the literature? How does it compare to our data? Is ours in fact any contribution? Can we detect period changes historically? How does our data fit with historical period changes?
- What does the literature tell us about the astrophysics of the binary? Can we provide any sort of useful astrophysical model from our data? Does our data support, modify or reject earlier models? What other data and information sources can contribute to our modelling of the system?
- And finally, write it all up for publication.

Here’s the big question. Where do you fit into this type of work? Observing now seems just a small part, doesn’t it? Many VSS members, maybe you, do not contribute observations to a project, no doubt for good reasons. No telescope (like me at present) is one. So how about joining the desk-work side of a project that appeals to you? Contact the project leader to find out how you can help. For my projects, EEBs and SPADES, ask and it will be given you. The SPADES article later in the *Newsletter* makes the tasks explicit; for EEBs it’s much the same. And I’ll put the requirements on the forums for those projects, for all to see.

Publications authored by VSS members

The goal of a research project is usually publication in a refereed journal. I’d like to collect here, in each issue, references to published, refereed, papers with VSS members as (co)-authors. So when you are on the author list of a refereed paper that has just been published, kindly send the full reference to me for recording here. And also please, a PDF of the paper.

I’d like to record these publications calendar year by calendar year, and submit each year’s list in our annual report to the RASNZ. We’ll do this from the beginning of 2010. To begin with, if you’re an author of a refereed article that was published in 2010 or this year to date, tell me about it now. Don’t leave it to a co-author please!

Variables from Linden – towards the hub - *Alan Plummer*

What a difference a clear fortnight can make! The visual observing programme from Linden, Blue Mountains, Australia, has been in tatters for over two years because of bad weather. However, with a bit of luck it's back on track. All of us observe a different programme of stars, often with some overlap; here's a small part of mine.

Long period variables (LPVs)

Because it's winter, let's look at objects in the general direction of the Galactic hub. A big part of the programme is LPVs, especially those done at the request of the AAVSO in order to continue long term visual light curves. In Scorpius, first to do are some quite difficult targets for a star-hopper: Y, W, and X Sco, Miras all, and all in the heavily reddened part of the sky to the north and west of Rho Ophiuchi. Y Sco is the worst. For several square degrees around there is almost nothing visible in a 16" telescope other than the odd 12th or 13th magnitude star, and nothing at all in the finder. These variables are faint at the best of times, rarely rising to 10th mag.

Next are R and RZ Sco, both interesting for different reasons. R Sco is another one especially for the AAVSO, however R is in a beautiful field less than half a degree from the globular cluster M80. Again a faint Mira like those above, but it's no hardship to point a high magnification eyepiece here! Next take the finder over Antares through Sco towards the head of the scorpion, and here is RZ Sco, yet another Mira variable. But look at the irregularities in the light curve in figure 1 – this is just the last few years – and the curve has been that 'semi-regular' since observations began in 1899. (Maybe a paper should be written?) Other LPVs observed – all in beautiful fields - in this part of the sky are RS, RR, TU, BN, and SY Sco, plus RU Sgr, which is in a very ordinary field, but important to observe visually anyway.

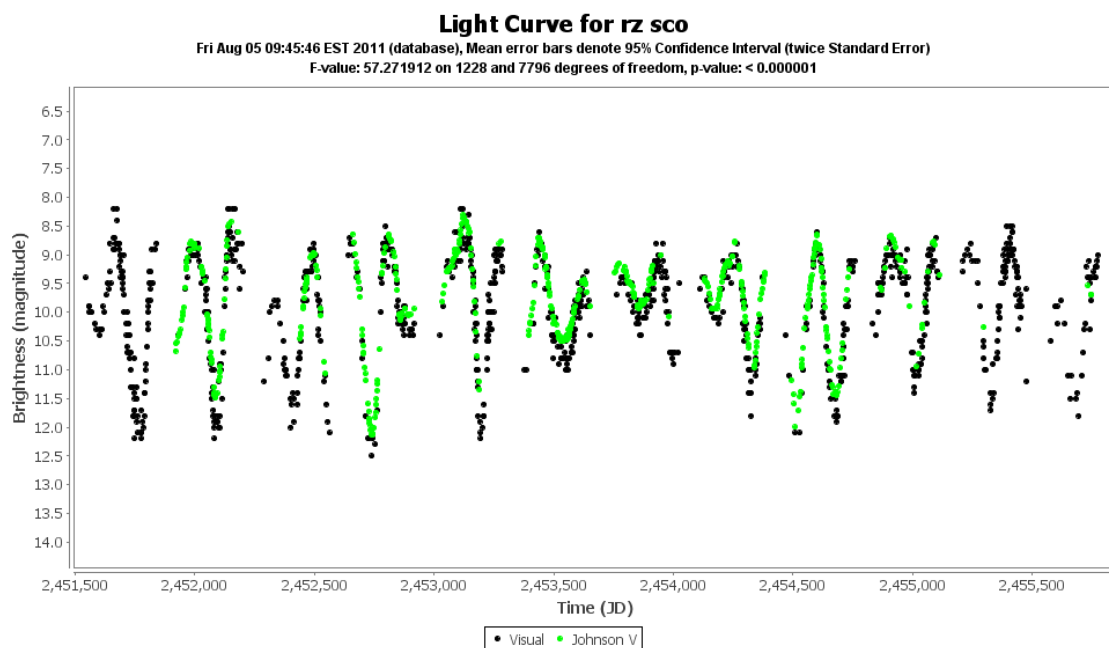


Figure 1. The light curve of RZ Sco from December 1999 until August 2011. Black are visual observations and green are Johnson V.

Cataclysmic variables, R Corone Borealis stars, Z Andromeda stars

A small group of CVs is observed in this area; V3941 Sgr is interesting in so far as I can't easily find out much about it. I have a suspicion it's never been seen in outburst except in archival plates. My light curve of U Scorpii makes the point about recent bad weather as over the last two years my 'fainter-than' observations are so sparse that the entire nova outburst came and went between two of them. Other recurrent novae such as V1017 Sgr and V2487 Oph are monitored also.

All the RCB stars in the programme are in this area of the sky. GU Sgr is beautiful to observe because

the globular cluster M28 is the finder object for us star-hoppers. In the 16" it looks a little like a smaller version of 47 Tuc; seemingly endless faint resolvable stars with a dense brighter core. See figure 2 for the light curve of GU Sgr from 1956 until today; the first 15 years of which are entirely due to Albert Jones. I observed GU for a couple of years before it finally rose into view. Just to the west we move back into a reddened field to find another RCB, V3795 Sgr. Other RCBs observed are V2552 Oph, V CrA, and WX CrA; all those mentioned are currently at maximum.

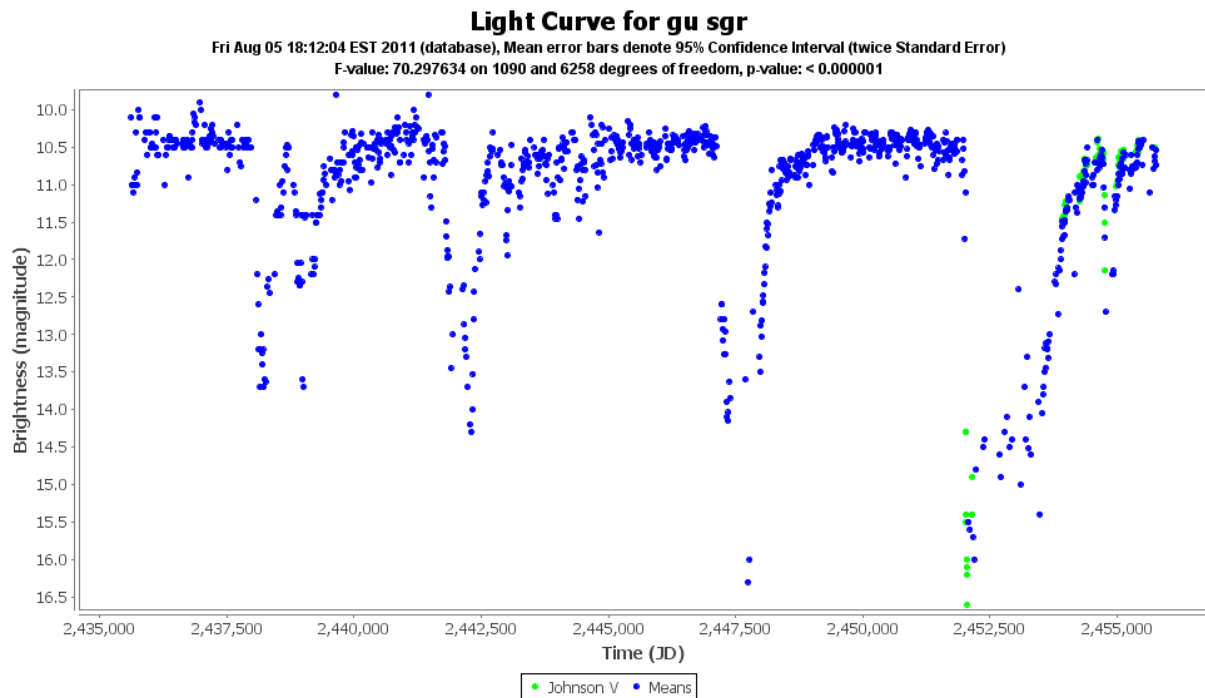


Figure 2. The light curve of GU Sgr 1956 until August 2011. Blue are 10 day means of visual observation, and green are Johnson V.

A little more to the west of V3795 Sgr is a window in the Galactic dust, revealing a rich star field. Through the gap in the dust the distant globular NGC 6553, barely resolvable in the 16", points the way to the next star in the programme, NSV 10219. This is a suspected Z And star of around 13.6 mag that was first identified by G H Herbig in 1969 and is not observed much at all (nor does the ASAS-3 get it). I picked it up for that very reason and the fact that there is a VSS chart for it, No 1294. Other Z And stars monitored in the general area are HK and CL Sco.

MWC 922

Further north from M28 and NGC 6553, past some of the sky's most famous nebulae and clusters, we go to Serpens. This is further north than I normally like to observe, but there is a good reason: MWC 922.

The literature list MWC 922 as a B[e] star, but opinion is divided as to whether or not it is a pre- or post-main sequence star. However, Peter Tuthill of the University of Sydney proposes it to be a possible S Dor star. There is a lot not known about the evolution of massive stars. Current (and over-simplified) thinking seems to be that as stars of >30 solar masses evolve from dwarfs to supergiants, then LBVs, WRs, and finally supernovas, they pass through the B[e] stage a couple of times. What should be observable is that some B[e] stars would be H-rich and others H-poor, depending on which direction they were heading on the HR diagram. I think observation is bit behind theory here! Whatever the case, it's a good object to have on anyone's observing programme. At present it is around 14.7 mag.

The fantastic picture of MWC 922 shown in figure 3 is called 'The Red Square', and was taken by Tuthill using methods outlined in the caption. To quote Tuthill, the overall architecture displays twin opposed conical cavities (known as a bipolar nebula), along the axis of which can be seen a remarkable sequence of sharply defined linear rungs or bars. This series of rungs and conical surfaces lie nested, one within the next, down to the heart of the system, where the hyperbolic bicone surfaces are crossed by a dark lane running across the principle axis (Tuthill, note 1).

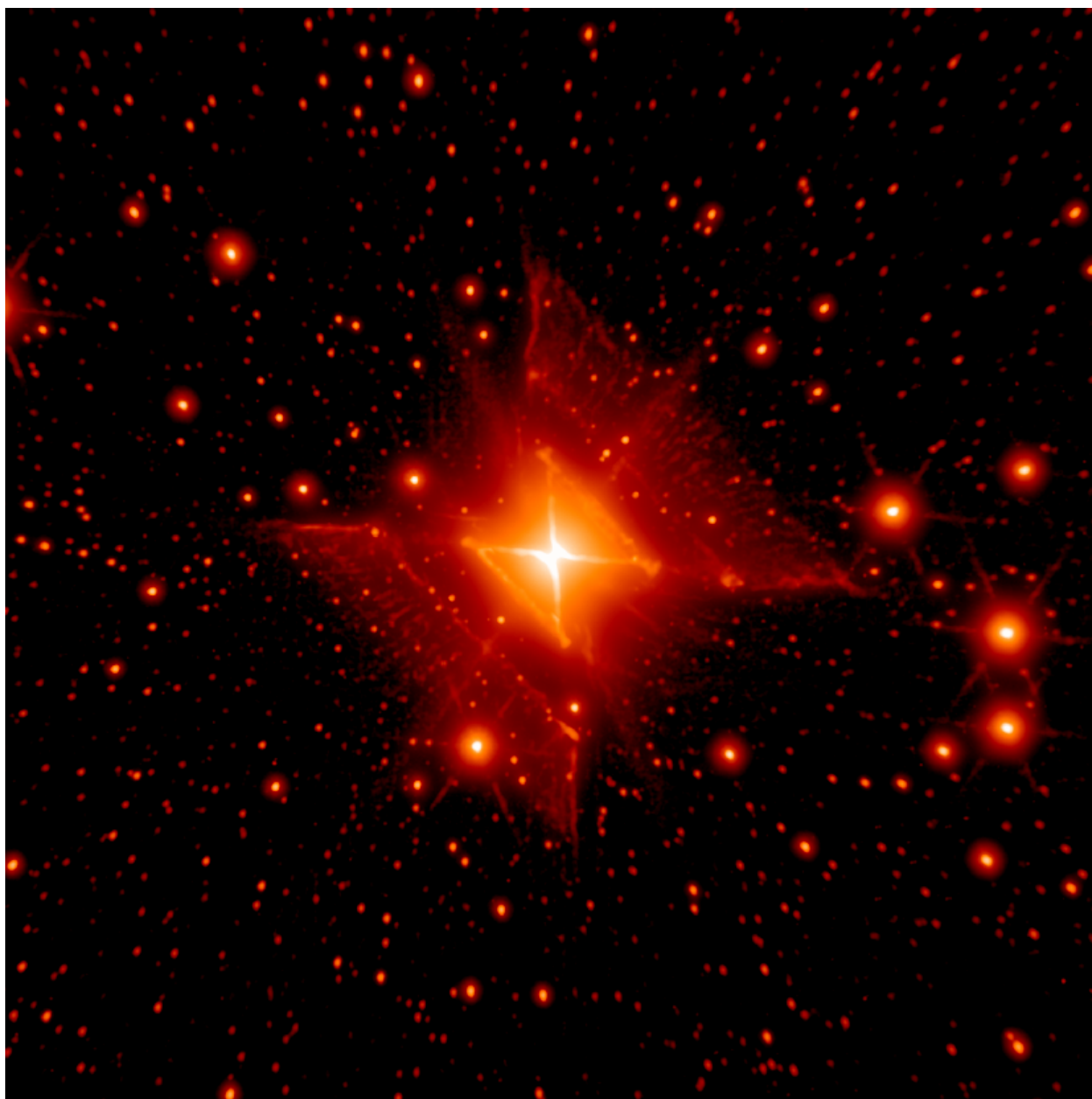


Figure 3. The image...which combines data from the Mt Palomar Hale telescope and the Keck-2 telescope, was taken in near-infrared light (1.6 microns) and shows a region 30.8 arcseconds on a side around MWC 922. As the outer periphery of the nebula is very faint compared to the core, the image has been processed and sharpened to display the full panoply of detail and structure (Tuthill, note 1).

Our knowledge of all the above stars will benefit from more observers taking them on, especially MWC 922, located at 18 21 16.06 -13 01 25.7, with a range of 13.9 - 15.0V. Thanks to Mati Morel, we have a VSS chart for the object available on request.

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Acknowledgment

This work is supported by the Edward Corbould Research Fund through the Astronomical Association of Queensland.

Note 1 <http://www.physics.usyd.edu.au/~gekko/redsquare.html>

BL Telescopii - observations of the 2011 eclipse - *Peter F Williams*

Summary

Observations of the 2011 eclipse of BL Tel are discussed. These indicate the date of mid-eclipse occurred on 2011 May 20.5 UT (GJD 2455702.0). This eclipse was of 57 days duration and a minimum brightness of magnitude 9.5 was attained. A mean period over 13 cycles since the 1983 eclipse is 777.73 days.

Introduction

Eclipses of the Algol type system BL Tel have been the subject of a long-term visual study by members of the VSS RASNZ with the aim of establishing and monitoring the basic parameters of these events.

The 2011 eclipse is the 9th eclipse observed, eight earlier events having been successfully recorded between 1983 and 2000. Details of all 9 visually observed eclipses are summarised in Table 1.

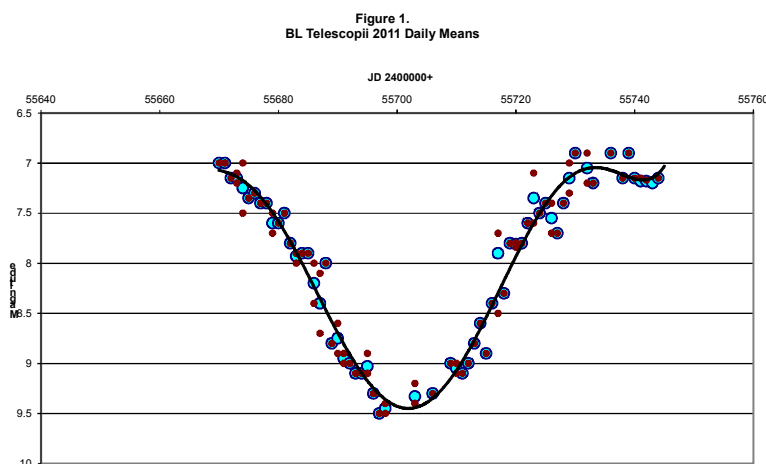
Year	Observed	Calculated	O-C (days)	Mag	Duration (days)	Interval from previous (days)
1983	2445591.5	2445585.4	+6.1	8.60	57.0	-
1985	2446369.5	2446363.5	+6.0	9.60	65.0	778.0
1987	2447144.5	2447141.6	+2.9	9.30	63.0	775.0
1992	2448703.0	2448697.8	+5.2	9.20	58.0	779.3 (1558.5/2)
1994	2449481.0	2449475.9	+5.1	10.10	62.0	778.0
1996	2450256.0	2450254.0	+2.0	8.90	65.0	775.0
1998	2451034.5	2451032.1	+2.4	8.96	56.0	778.5
2000	2451812.5	2451810.2	+2.3	9.60	68.0	778.0
2011	2455702.0	2455700.7	+1.3	9.50	57.0	777.9 (3889.5/5)

Mean period over 10,110.5 days (13 cycles) = 777.73 days.

Table 1. BL Tel eclipse summary calculated relative to catalogue elements JD 2434692 +778.1 days.

Visual observations

Seven observers listed below contributed a total of 108 visual estimates. These have been plotted using Excel to produce the light curve shown in Figure 1. This curve shows both individual observations (small red circles) and daily means (blue circles). Unfortunately, the density of observations is not as great as recorded in earlier eclipses, resulting in some scatter in the curve. Also, the daily means often rely on just a single observation.



Contributing Visual Observers

Robert Evans	Rod Stubbings
Stephen Kerr	Glen Schrader
Alan Plummer	Peter Williams
Robert Price	

Figure 1. visual observations during 2011 of BL Tel

A 6th order polynomial has been added for the daily means from which the date of mid eclipse has been measured directly from the curve. As the rate of both decline and recovery is seen to vary, the date of mid eclipse has been determined as the mid point between decline and recovery at magnitude 9.0, half a magnitude above minimum brightness.

The date of mid eclipse thus measured occurred on 2011 May 20.5 UT (GJD 2455702.0). No heliocentric corrections have been applied due to the nature of visual observations and the use of daily mean magnitudes.

This eclipse appears to have been total with BL Tel remaining constant at magnitude 9.5 for near 10 days.

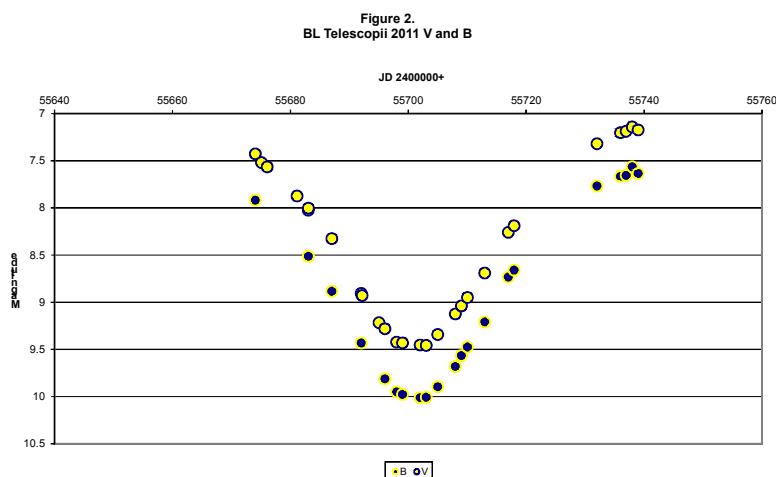
The available observations indicate BL Tel initially declined 0.9 magnitudes in 14 days (0.06 mag/day) followed by a more rapid fading of 1.6 magnitudes in 11 days (0.15 mag/day). During initial recovery it rose by 1.6 magnitudes in 13 days (0.12 mag/day) followed by a more gradual 0.9 magnitude in 9 days (0.10 mag/day).

This gives a slightly asymmetrical character to the light curve, a feature also noted in some previous eclipses, notably during the 2000 event.

Overall duration of the 2011 eclipse was 57.0 days.

CCD observations

Two observers as listed below also obtained CCD photometry. These 48 observations are plotted in Figure 2 wherein V and B measures are plotted as yellow and blue circles, respectively. The CCD data is in good agreement with the visual observations and the same features are present in both light curves.



Contributing CCD Observers

Terry Bohlson
Neil Butterworth

Figure 2. CCD observations during 2011 of BL Tel in V and B photometric filters

Conclusion

Observations of the 2011 eclipse of BL Tel indicate the date of mid eclipse occurred on 2011 May 20.5 UT (GJD 2455702.0) with a minimum brightness of 9.5 magnitude. This is 3889.5 days since the previously observed eclipse of 2000, indicating a mean period of 777.9 days over 5 cycles and 777.73 days over 13 cycles.

Based on these results, the next eclipse of BL Tel is expected to be centred near 2013 July 06 (JD 2456480).

Acknowledgements

All observers are thanked for providing their observations, including those from the AAVSO International Database.

Introduction

We need some more observers to measure bright Cepheid stars. With the cessation of data from ASAS3 there appears to be no group other than VSS measuring these stars. If you have a DSLR camera and an hour or two of good weather a week then it's easy to participate. And since all the targets are between fifth and eighth magnitude finding them is easy.

Elsewhere in this newsletter is an announcement about a 'how to' tutorial on Variable Stars South website (see page 17). But such a tutorial is of no use unless there is an associated project. Thus the site also contains details of two observing projects:

- 1) Bright Cepheids - mainly those unsuited to the visual project
- 2) Southern Binaries DSLR - bright, relatively under-observed, or newly discovered, southern binaries.

Two other projects involving rather redder stars are in the pipeline.

Some comments from the Bright Cepheid project notes follow this introduction. But as an initial test of the techniques and other requirements Glen and Mark have been observing a group of Cepheids in Crux. These are especially suited to the project - there are half a dozen stars in close proximity necessitating only the use of two charts and there are very useful measures from the Auckland observers at an earlier date. A paper incorporating historical data and updating epochs and periods of these Crux variables to 2011 is almost ready for publication.

Historically, PEP and CCD photometry has tended to measure a small number of objects - a comparison star, a check star and the variable. But DSLR photometry, with its wider fields and simultaneous three colour measures lends itself to ensemble photometry using six or more stars as comparisons. This has many advantages which are discussed on the website.

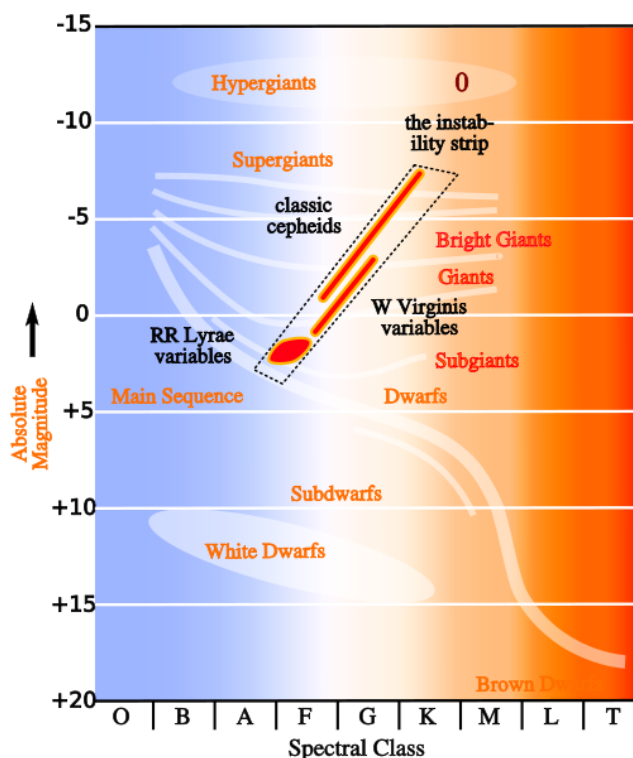
Purpose of the measures

Cepheids are massive and luminous stars which are evolving quite quickly. This evolution sees changes in temperature and radius. At certain temperatures and envelope densities, a mechanism within the star causes sustained oscillations which are seen as pulsations at the surface of the star causing brightness and colour

changes. On the Hertzsprung-Russell diagram this produces what is called an instability strip.

These massive stars cross this strip several times as they expand and contract on a long time scale (103- 105 years) due to the changes in internal nuclear processes. As they proceed across this region the periods change, sometimes smoothly but often abruptly. By using an O-C diagram which plots the actual observed epochs of maximum against a calculated epoch and period these changes can be detected to a high degree of accuracy. These provide information about how the internal structure of the star is changing.

Figure 1. This Hertzsprung Russell diagram shows that there are various types of Cepheid stars. We are mainly interested in the classical Cepheids although a few of the W Virginis stars are also observable. The classical Cepheids are very bright objects, with a strong period/ luminosity relationship.



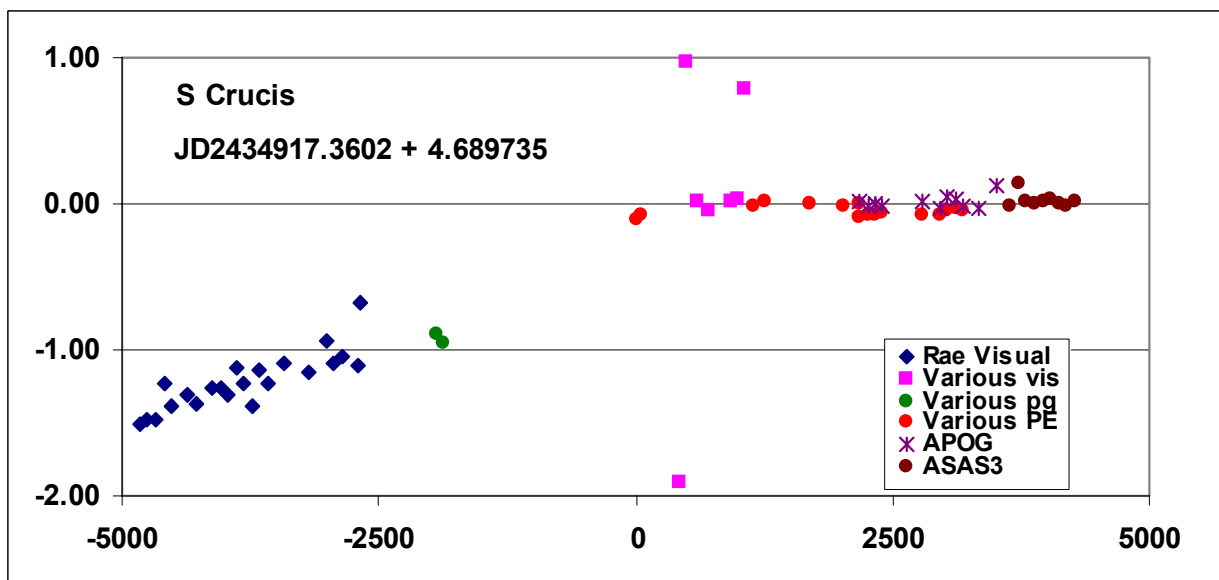


Figure 2. In this graph we show epochs of maximum of the Cepheid S Crucis fitted to the GCVS epoch of JD 2434917 (23 June 1954) and a period of 4.689735 days (not the GCVS period, see Figures 3a,3b below). The vertical scale shows deviations in days, the horizontal scale indicates cycles before and after that epoch. The earliest measures are visual, dating from 1891. There was a marked change in period in 1968 and there may be a smaller cyclic change. We await the 2011 epoch with interest!

Observing

The website now contains a detailed tutorial on making measures with a CCD camera. Unlike other groups we're using all the filters - R, G and B - and transforming these to the standard B, V, R system. Spreadsheets are incorporated in this tutorial so it's quite simple to work on your measures.

Observations should be made in clear sky and not within 30° of the Moon. They preferably should be made within 45° of the zenith. Best results are obtained with about 10 consecutive images of each star. The reduction methods are explained in the DSLR tutorial and you should then use the Data Reduction Spreadsheet to derive the transformed measures. These can then be entered in each star's spreadsheet available from the Managing the Data section. There is much more information available on the site.

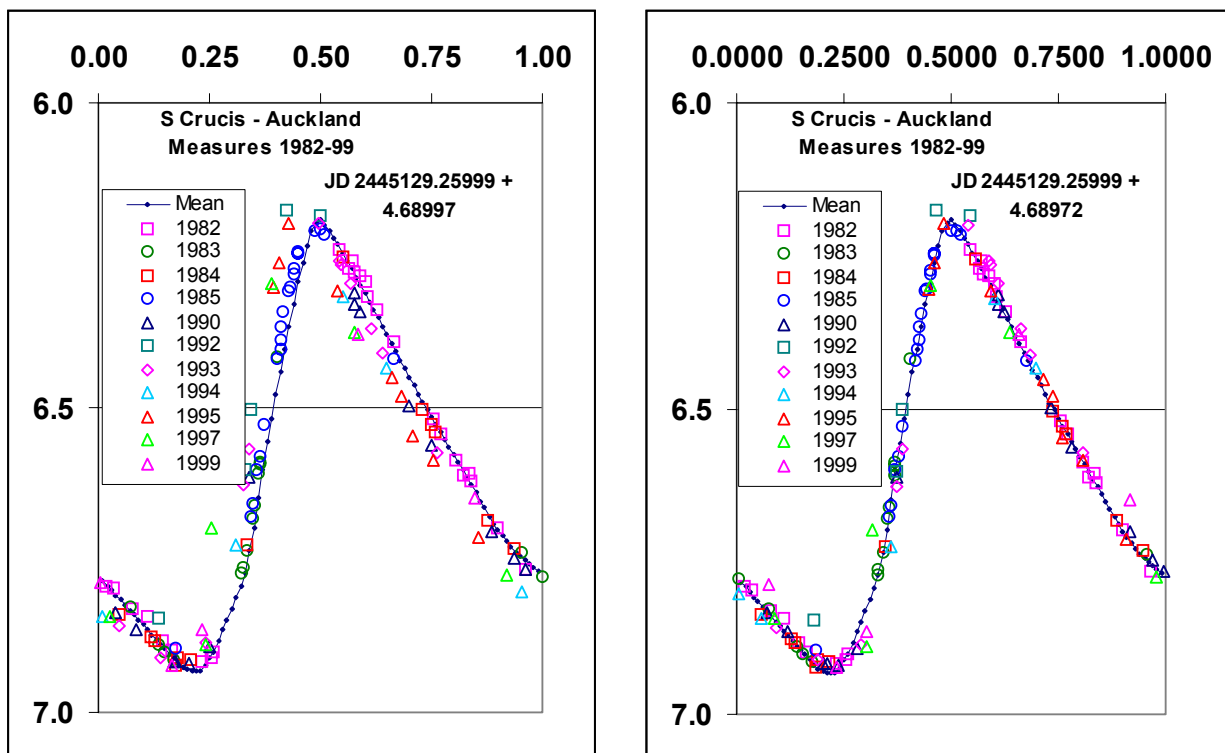
Our goal is to determine annual epochs of maximum which require about 20 to 40 measures each season. To avoid over-observing of some stars refer to the website tables of measures which will be updated regularly.

Reporting observations

These should be sent each month to the project coordinators. They should also be sent to the International Database maintained by the AAVSO. You should keep a careful eye upon the accuracy as shown in the spreadsheet.

Analysing the Measures:

Epochs are determined by fitting the individual measures to a mean light curve. These two graphs show the mean light curve and individual measures through the V filter. The U and B light curves made in Auckland are not shown. This project will be fitting BVR measures as U and I are not accessible to DSLR equipment. These stars show large colour changes associated with temperature so the greatest amplitude is in the B filter with least in R. We also have to allow for a slight colour/phase effect - maximum is reached in B before V and is even later in R.



Figures 3a and 3b. On the left this graph shows measures over 18 years of *S Crucis*, a relatively bright Cepheid near κ Crucis, fitted to the GCVS period and an epoch based on the first epoch determined at Auckland Observatory. There has obviously been a change in period and this is shown by the better fit in the graph to the right where the same measures are fitted to the period of 4.68972 days. Prior to these measures it was believed that the period of this star was changing in a gradual manner but it's now quite clear that there was an abrupt change in 1968.

Publication

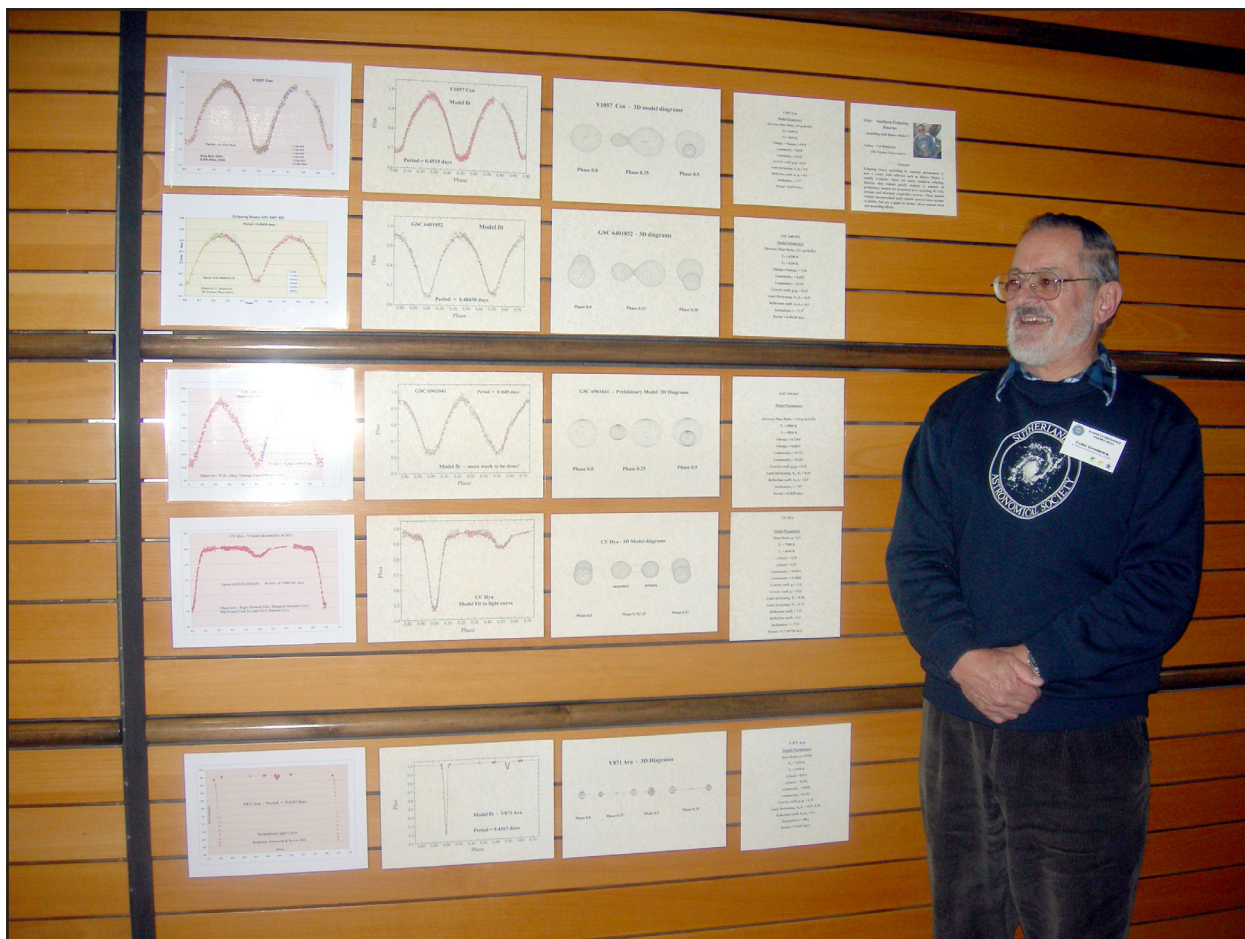
Determined epochs will be published annually and if any star proves particularly interesting a special paper will be published. All contributors will be acknowledged with the more prolific observers included as co-authors in accordance with conventional practice.

RASNZ Conference Napier, 2011 - Col Bembrick

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This conference was held in Napier, in the North Island of New Zealand on 27-29 May 2011, hosted by the Hawkes Bay Astronomical Society. It was preceded by the TTSO5, the 5th symposium on occultations - which saw quite a few Aussies making the trans-Tasman trek. It was followed on the Monday by a workshop on astrophotography, led by David Malin. The main conference was well attended, there being over 100 participants and attendees. The one and a half day occultation symposium was also very well attended, with over 30 people present and some presentations being given via the Internet. A very professional RASNZ conference CD has now been produced – it's well worth a look.

Apart from the normal conference oral paper presentations, there were several poster papers, plus a public lecture by guest speaker, Fred Watson. Fred also gave a lively conference presentation and an after-dinner speech. In typical FW fashion, these were all very entertaining and informative. Friday night saw a very interesting talk by RASNZ Fellow Graham Blow, which was well received with much enthusiastic applause. In it Graham outlined the highlights of his career as an astronomer, both as an amateur and later as a professional for 17 years at Carter Observatory. Naturally enough, occultations figured prominently in these recollections.



The author with his poster paper presented at the conference on modelling southern eclipsing binaries using Binary Maker 3 software

The main conference presentations were usually 20 mins with some papers running to 40 mins. For variable star observers, the paper by Tom Richards was of considerable interest – appealing for observers to join the SPADES project to observe eclipsing binary minima to detect extra-solar planets. A related paper has also appeared in the AAO Newsletter of Feb 2011, which is available free on request.

Other papers which took my eye were “High Precision CCD time-series Photometry” by Paul Chote and “Modelling White Dwarf Stars” by Michael Miller. David Malin also gave an interesting historical review entitled “The Discovery of the Southern Cross”. Two poster papers dealt with variable stars. One was by Ed Budding and Roger Butland, entitled “Observations and analysis of the system R Canis Majoris”. The other was by myself, dealing with “Southern Eclipsing Binaries- modelling with Binary Maker”. This made use of CCD data from amateurs in both Australia and NZ.

As usual, the informal discussions over morning and afternoon teas and lunches provided a great opportunity to learn what others are doing in many and varied fields of both amateur and professional astronomy. This is a unique feature of the RASNZ conferences in that both amateurs and professionals mix and discuss their data, techniques and publications. There is no equivalent in the Australian astronomy scene.

The conference concluded on the Monday, 30th May, with the photographic workshop, but my wife and I used that day to visit the Pukerangi Observatory of the Hawkes Bay Astronomical Society. We were impressed not only with the building (still a work in progress), but with the beautiful site and the lack of any habitation in sight, plus the wonderfully low horizons visible in nearly all directions. Coincidentally, following the conference the month of June brings the start of the Maori New Year marked by the first rising of Matariki (the Pleiades). This event was highlighted by a full page spread in the Dominion Post, the major Wellington Newspaper.

Introduction

One of the most exclusive variable star groups is that of the recurrent novae - RN - which numbers less than a dozen in our galaxy. In this context recurrent means on a timescale of a few decades as most classical novae - CN - also are expected to recur but at much longer intervals.

The stars recognised as members seem to change frequently but this results from uncertainty about the nature of the 'outbursts' of many poorly studied dwarf novae. It's quite easy to confuse them with members of the WZ Sagittae stars which have infrequent, large amplitude outbursts. To avoid confusion the nova events are referred to as eruptions.

The mechanism

The eruptions are attributable to the same cause as CNs, thermonuclear runaways in the surface regions which cause ejection of part of the stellar envelope at speeds ranging from about 800 to 2000 km/sec. Generally the ejection speed is related to the speed of development of the nova outburst - fast novae have high ejection rates, slow novae are at the bottom end of the scale.

It's interesting to realise that until around 1960 novae were believed to result from different element abundances in some stars. The nuclear burning near the surface releases a wide variety of unexpected elements with a variety of ionisation and spectral studies of these led to the acquisition of a vast amount of puzzling observational information and a variety of models based on ways to produce the observed element distributions. But the mass transfer-nuclear runaway model explains all this quite simply, although the details are still complex and by no means clearly understood. But basically a nova occurs because the white dwarf star has a massive degenerate isothermal core with temperatures in excess of 107K which means that accreted hydrogen rich material can undergo nuclear fusion quite close to the surface.

To produce a thermonuclear explosion every few decades or even more frequently, a high rate of mass transfer is needed. Thus RN are modelled as systems with a high mass flow rate, usually onto a massive white dwarf with a thin envelope approaching the Chandrasekhar limit. This suggests the exciting prospect that at some stage the RN will exceed this limit and explode in what is expected to be a Supernova Type Ia event.

Types of Recurrent Novae

Since the mass-losing star is in contact with at least the inner L1 point of its Roche lobe, the size of this star will determine the separation of the two stars in the system. There seem to be three main groups: the T Pyxidis sub-class where the period is a small fraction of a day (T Pyxidis may be the only member of this class with a period of about 2 hours); the U Scorpii sub-class with periods of about a day probably indicating a somewhat evolved secondary; and the T Coronae Borealis sub-class with periods of 100 days or more indicating giant companions.

The U Scorpii group includes V394 CrA and a RN in the LMC. All are amongst the fastest novae known.

The T Coronae Borealis group is more extensive with T CrB, RS Oph, V745 Sco as well as V723 Sco and possibly V3645 Sgr, EU Sct and others. With the giant companions this group appears a little difficult to separate from the symbiotic novae which arise from a WD, cool giant pairing. However, the symbiotic novae have much longer timescales and the accretion mechanisms may be by stellar winds rather than through the L1 point. Until adequate measures are available, and this has not always been the case historically, some stars cannot be adequately categorised. But the symbiotic novae are completely dissimilar objects and there appear not to be any intermediate objects.

Using simple celestial mechanics we end up with a separation approximately Earth-Moon size for T Pyx, about a million kilometres for the U Scorpii group and about the Sun-Mercury distance or greater for the T CrB stars. Diameters of the secondaries are a bit less than the separations, maybe 300,000 for T Pyxidis

and maybe 900,000 for the second group. The secondary masses of the T CrB stars may well exceed that of the WD primary so this relationship falters there. It's only the high temperature of the WD in these latter systems which allows their light to dominate, although the secondaries are also detectable.

The outburst light curves

Generally the light curves of RN are fairly repetitive which allows comparison with a range of CN outburst curves. McLaughlin (1960) has produced a schematic general light curve for eruptions and this is reproduced in Figure 1.

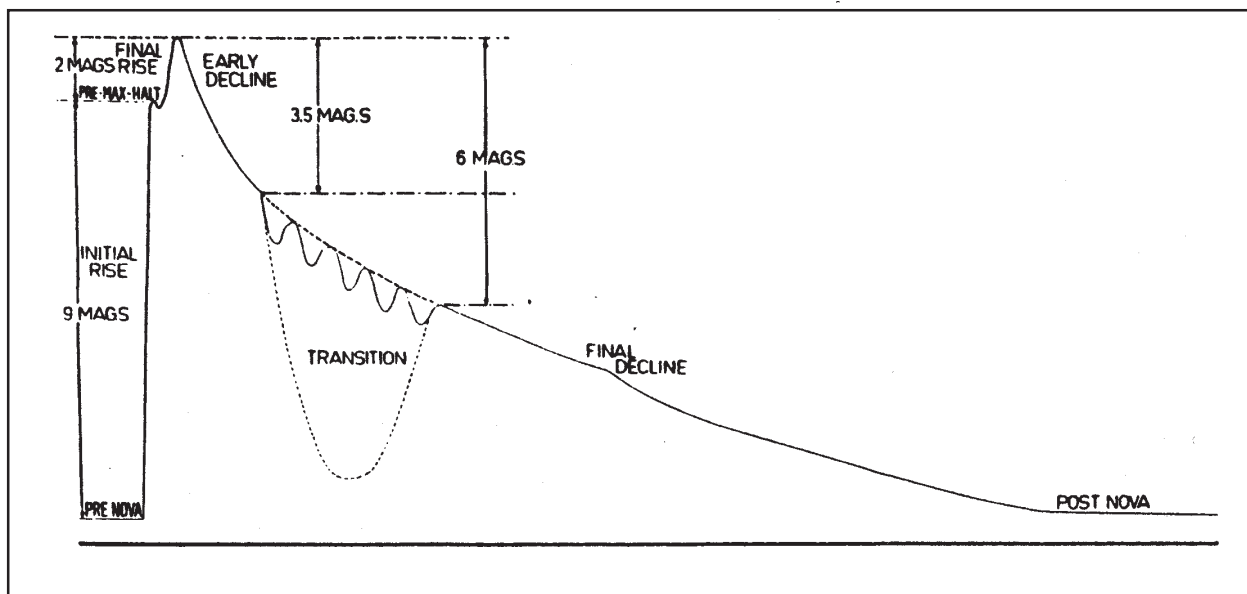


Figure 1. A general outline of the light variations during the nova outburst from McLaughlin, 1960. Amplitude and duration are flexible, but the overall shape is generally consistent. See the table below for an idea of timescale.

Warner, 1995, reproduces Cecilia Payne-Gaposchkin's table of some outburst properties:

Speed Class	t_2 in days	dm/dt (mag d ⁻¹)
Very fast	<10	>0.20
Fast	11-25	0.18-0.08
Moderately Fast	26-80	0.07-0.025
Slow	1-150	0.024-0.013
Very Slow	151-250	0.013-0.008

In this context speed is determined by the time a nova takes to fade from maximum by two magnitudes (t_2). Other times that are often used, eg t_3 , follow a similar format. The current object of interest, T Pyxidis, is in the moderately fast class with a t_2 of 62 days and t_3 of 88 days.

A crude description of events in these stages is that in the initial rise we're seeing the nuclear burning at the surface of the star with the pause being related to its obscuration by the formation of the ejected shell. Initially this brightens, but then the R^2T^4 luminosity relationship (R = radius, T = temperature) comes into play and the brightness declines in a manner related to the inverse of the expansion velocity - the faster the shell is travelling the more quickly it cools.

Another point of interest is what will happen in the transition stage. Landolt, 1970, measured what appear to be oscillations of the type shown in Figure 1. The predictions appear to show that measures of T Pyx will be sun affected at that time but it may be observable during some of this interval from southern locations.

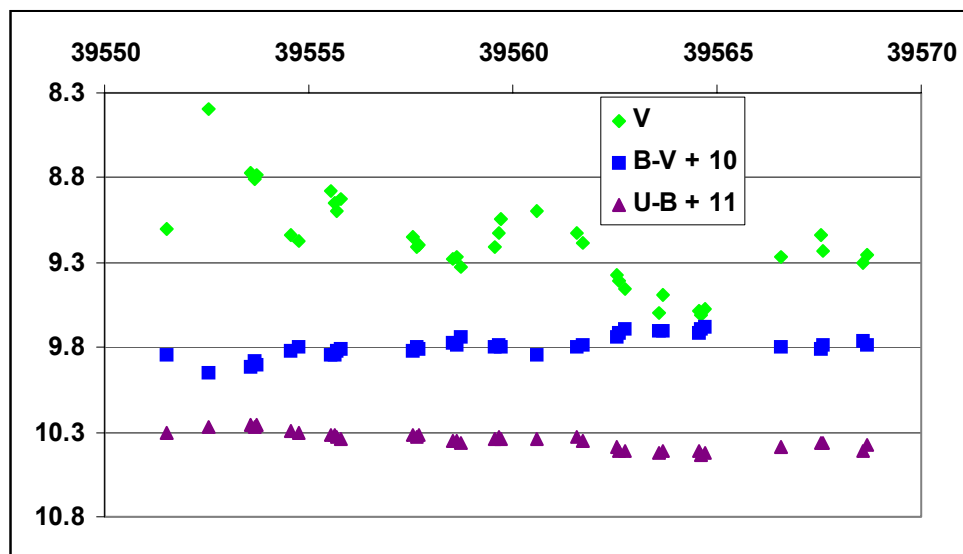


Figure 2. UB measures by A Landolt (1970) during the fading of the 1966 outburst of T Pyxidis showing oscillations during the transition phase. The B-V colours are interesting in that they appear almost the opposite of what would be expected. Note that the colours are on the same scale but are displaced to present them on the same graph.

T Pyxidis in eruption

Warner (1995) lists eruptions of T Pyx in 1890, 1902, 1920, 1944 and 1966. Intervals are 12, 18, 24, 22 and now 45 years. A study of the visual measures during the last interval probably precludes a missed event, particularly if the light curves of the eruptions are as similar as believed.

Warner discusses shells surrounding T Pyx at distances (in 1995) of 2.5" and 5" and attributes these to the eruptions of 1944 and 1966. In his request for observations Shaefer, 2011, mentions a 10" shell which is attributed to a normal (non-RN) eruption in 1866+/-5. These may help in determining the distance to the star, although the distance of ~1 kpc determined from the expansion of the 1944 shell conflicts with the time taken to fall two magnitudes which produces 2.1 kpc.

There are also various orbital periods around 1.75-1.85 days quoted but Uthas et al, 2010, seem to have resolved this with their spectroscopic period of 1.8295 hours and inclination of 10°. The masses derived are 0.7 solar for the primary and 0.14 for the secondary which would preclude any possibility of a Type Ia supernova.

Schaeffer mentions probable changes in the T Pyx behaviour, partly because of the increasing intervals as discussed above, but also because of an apparent change in the brightness of T Pyxidis in quiescence. But the comparison of photographic magnitudes in the 1890s giving a calculated B of 13.8 to a CCD B of 15.7 in 2010 may be open to argument. Certainly this aspect needs further observations.

Why the importance of Type Ia supernovae progenitors?

In simple terms it's because these supernovae are amongst the brightest objects we see in other galaxies and distances can be determined from these if we know how they originate and whether they have a consistent brightness as theory suggests - the same mass and same mechanism gives strong support to this idea. The Uthas et al mass is based upon a theoretical relationship which may not hold true in the case of this unique object.

The more ways we have of measuring the scale of the universe and the objects in it, the better. Narlikar and Hoyle have on occasions questioned aspects of the widely accepted cosmologies which are all based

upon the fundamental assumptions that constants like the speed of light and the force of gravity are everywhere the same. But to balance the equation we now need to introduce dark matter and dark energy - almost reminiscent of the supposed ether of the nineteenth century. Being much brighter than Cepheids and novae the use of SNIa extends the accurate measurement scale by a factor of 100 times the distance.

The 2011 eruption

T Pyxidis is a star well worth observing, not only for the possibility of its turning into a SNIa, but for a variety of other reasons. The possible changes in minimum light and the increasing eruption intervals may be significant - let's hope they don't mean the star will become a 'used to be RN!'

Unfortunately it seems unique in many ways and understanding it in detail may not lead to understanding all the others. Its evolution seems to have been unusual in that such a massive WD is accompanied by a star about the same dimensions as Proxima Centauri.

Figure 3 shows measure from the International Database of the AAVSO as at 28 July, 2011.

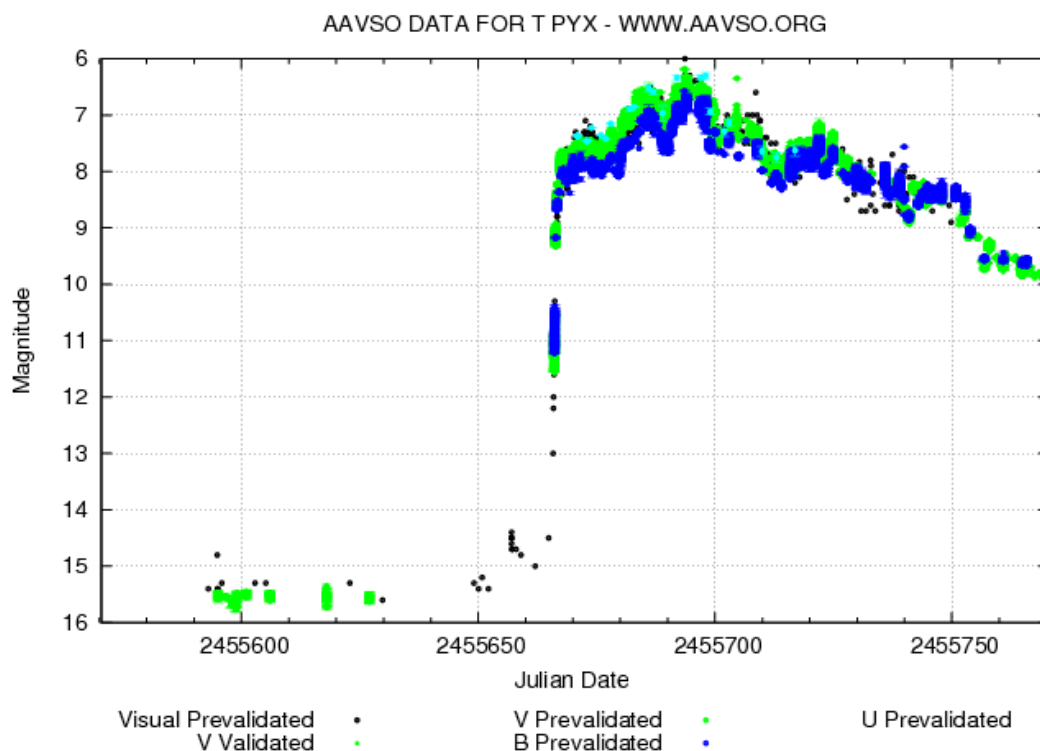


Figure 3. This shows the classical nova stages - the sharp rise (actually observed by several people), the pause and subsequent rise, then the slow decline. There are some interesting brightness variations which are seen in many novae. But will the transition period follow Landolt's measures of 1966?

Acknowledgements

Much of the material in this article is based upon Brian Warner's review of the CV field 'Cataclysmic Variable Stars' which covers the field up until 1995 in an excellent manner. We hope someone else will update this extremely useful publication in the near future to cover the next 16 years.

References

- Landolt, A. 1970 Pub astr Soc Pacific 82,86
- McLaughlin 1960 Stellar Atmospheres, Univ of Chicago Press p 585
- Uthas, H., Knigge, C., Steeghs, D. 2010 MNRAS 409, 1, 237
- Schaefer, B. E. 2011 Observational Request
- Warner, B. 1955 Cataclysmic Variable Stars, Cambridge University Press

Introduction

SBDSLRL is a new, long-term project proposed by Professor Edwin Budding of the University of Canterbury and Carter National Observatory (CONZ), New Zealand, and is being developed and run jointly with VSS. Mark Blackford is the project coordinator.

Analysis of photometric, spectroscopic and radial velocity measurements of eclipsing binary systems provides absolute physical parameters, such as mass, radii, luminosities etc. These may be used to test astrophysical models and ultimately lead to an understanding of the relationship of stellar properties to their local galactic environment.

Careful monitoring of eclipsing binaries may uncover the presence of apsidal motion, the progressive change in the orientation of the major axis of the orbit. There are several possible causes, including perturbations by other bodies; mass transfer between the stars; tidal effects due to the elliptical shape of stars in a close binary; and relativistic effects due to curvature of space around a massive body.

So how does the humble amateur astronomer equipped with a simple DSLR camera fit into this picture? We are unlikely to make significant contributions to spectroscopic and radial velocity measurements, so we'll leave those to our professional colleagues. However, the required photometric measurements are well within our capabilities, at least for the brighter eclipsing binaries.

The SBDSLRL project aims to provide photometric data in support of Ed Budding's Southern Binaries programme (E. Budding, Proceedings of the 10th Asian-Pacific Region IAU Meeting, 33-38, 2008 – available from the project web page). Our targets will be bright, relatively under-observed or newly discovered southern binaries. They will mostly be eclipsing binaries but others may be close binaries with possible photometric effects of binarity but not eclipses.

Due to their brightness our targets will generally be unsuited to the narrow field of view of CCD imaging through a telescope. DSLR cameras with standard lenses provide fields of view wide enough to include suitable comparison stars.

This project is suitable for observers new to DSLR photometry as well as for experienced observers. Feedback and advice on observing and results will be provided. This is a good opportunity to learn and improve technique, as well as making publishable scientific contributions.

Participants in the SBDSLRL Project will need to develop skills in recording and measuring images as well as transforming their measurements to the standard magnitude system. Whilst time of minimum can be determined from untransformed magnitudes, the magnitudes cannot be compared and combined with other observer's data. A tutorial on DSLR photometry is available on the VSS website, including determining and applying transformation coefficients.

Lists of targets will be published on the project web pages from time to time, together with observational requirements. VSS members will be notified by email of new targets and issues arising about current targets.

Purpose of the measurements

The available epoch and period data may be quite old and cannot be relied upon for predictions of eclipses. The initial aim of the project is to determine accurate Times of Minimum (TOM) for our targets. These will allow confident predictions of TOM for future eclipses which are important for planning spectroscopic and radial velocity observations with professional telescopes.

Repeated TOM measurements over the coming years will allow refinement of apsidal motion and light travel time effects (due to the orbit of a third component).

Some targets may also require complete light curves for comparison with binary models.

Observing

Observational requirements may differ somewhat from target to target, but in general they are:

1. DSLR images with standard camera lens (not through a telescope).
2. Use the epoch and period data given for each target to predict eclipses using Tom Richards' Times of Minima Excel spreadsheet. These predictions may be out by many minutes or even hours due to the length of time since the epoch and period were determined. Therefore it may take several attempts to record an eclipse.
3. Time series are needed, preferably through an entire night or as much of it as possible. Therefore the camera must track the target, eg piggy backed on a motorised telescope.
4. The date and time setting of the camera must be as accurate as possible, ie better than 1 second.
5. Record time series images with as fast a cadence as you can whilst keeping $\text{SNR} > 100$.
6. Photometric filters are not required; we will use the three colour channels of the camera.
7. Exposure time and defocus should be optimised to achieve green channel peak ADU values of $\sim 3/4$ of your camera's saturation value for the brightest comparison star (or target). This will ensure all three colour channels will be below saturation for the target and comparison stars.

Reporting observations

Measurements should be reduced and sent to the project coordinator as soon as possible after observation. They should also be sent to the International Database maintained by the AAVSO.

Target information on the project web pages will be updated with new epochs as observations are analysed.

A list of comparison stars and a finder chart are provided for each target. Everyone should use the catalogue V, B-V and V-R values listed for these comparison stars for reduction of their measurements. A time series analysis spreadsheet and tutorial will eventually be available on the project web pages. However, you are welcome to use your preferred reduction software if that suits you better.

Data submitted to the project coordinator should be in the form of an Excel spreadsheet with columns for Julian date (preferably heliocentric Julian date), transformed B, V and R magnitudes, and B, V and R errors for both the target and a check star. An example will be available on the project web page.

Analysing the measurements

Submitted data will be analysed using the software package Peranso to determine TOM. We are aiming for TOM accuracy of better than 15 seconds.

Figure 1 is an example showing the transformed V magnitude during a primary eclipse of RS Sgr recorded on the evening of 4 August 2011.

The estimated TOM is $\text{HJD } 2455778.073918 \pm 0.000062$. Exactly the same TOM was found using transformed B and R magnitudes; however the errors were 0.000126 and 0.000166, respectively, due to the larger spread of data points in these colours.

The minimum V magnitude during primary eclipse should be 6.97. I recorded a value of 6.68 due to the presence of several close companion stars which were included in the measurement annulus. This will not influence TOM determination but will complicate light curve analysis should that be required.

Publication

Determined TOM's will be published periodically and if any star proves particularly interesting a special paper will be published. All contributors will be acknowledged with the more prolific observers included as co-authors in accordance with conventional practice.

Project updates will be published in the VSS Newsletter.

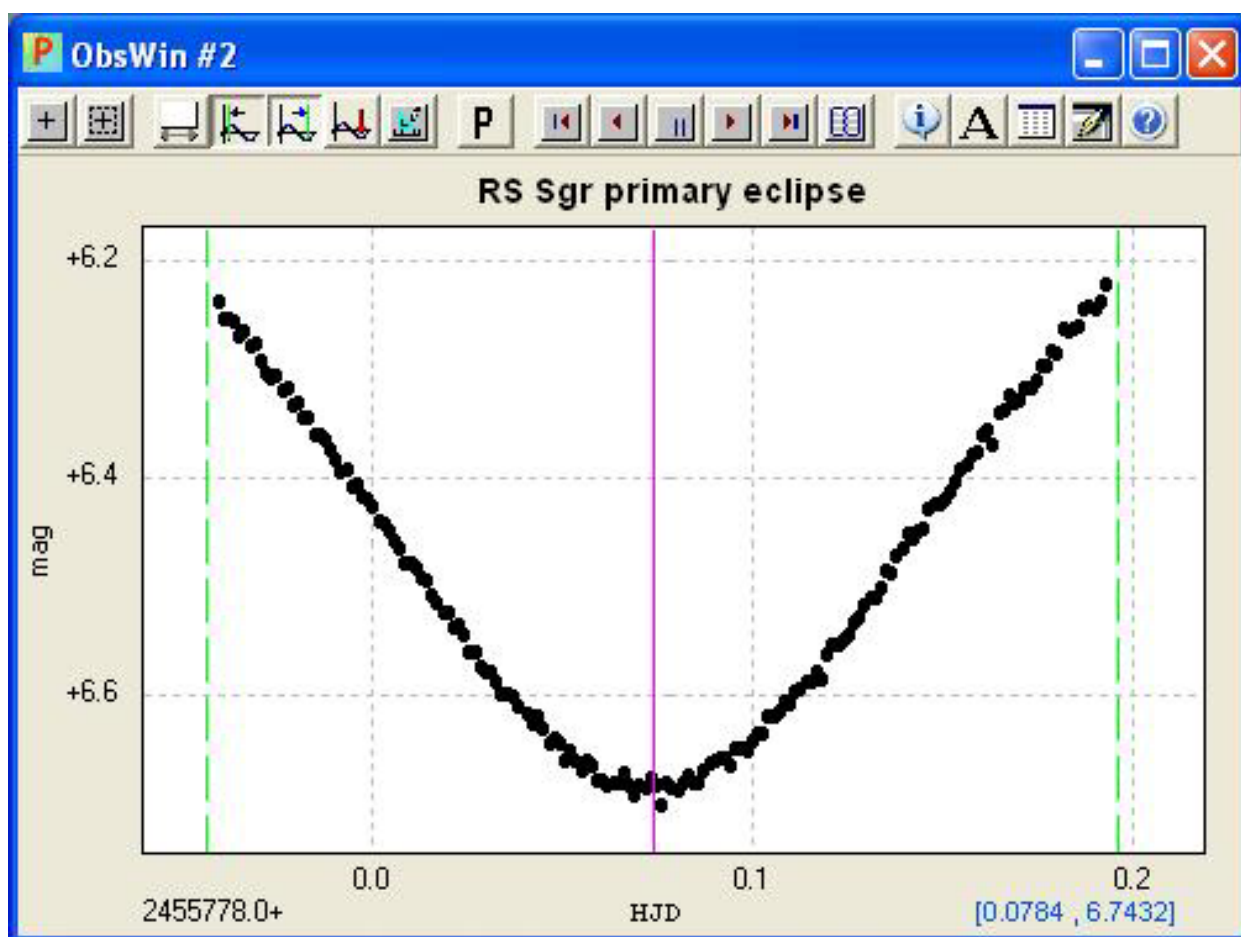


Figure 1. A primary eclipse of RS Sgr plotted in Peranso software. The data was recorded during the evening of 4 August 2011.

Getting Started:

The SBDCLR project will evolve as we learn our capabilities and limitations. It will provide plenty of challenges along the way, but the effort will be rewarded with valuable data suitable for publication. If you are interested in participating please contact Mark Blackford at the email address above.

Equatorial Eclipsing Binaries Project – *Tom Richards*

tom@prettyhill.org

The EEB Project is joint with the Variable Star Section of the British Astronomical Association, hence the restriction to equatorial targets. Even that can be a little hard for latitude 50-plus Britain! Full information is on our website at Research Projects > Equatorial Eclipsing Binaries.

Here are some notes on the state of play with some of the EEB targets.

CU Hya

I have written up our work on this system and submitted the paper to the Journal of the British Astronomical Association. My thanks to my seven co-authors for their contributions to this campaign and their comments on an earlier draft. For now, take this target off your observing list.

UV Psc

We received 18 observation sets (a set being one night's data by one observer in one filter) on this binary

during its 2010-11 apparition. The observers were:

Observer	Location	# Obs. Sets	Filter
Neil Butterworth	Australia	4 (2 nights)	B, V
Roger Pickard	UK	12	V
Margaret Streamer	Australia	2	V

Six primary and three secondary minima were observed. I have not yet had a chance to study the data in any detail. Margaret Streamer has offered to assist in the analysis of the data – thank you Margaret.

This is now a low priority target – see below.

V1246 Aql

A paper on this binary is in preparation. We may need more data on it next year – watch this space.

V1692 Aql

We got quite good data on this in 2009, providing an almost complete phase diagram, but only two primary minima. See the previous issue of this newsletter for a summary and phase diagram. In 2010 we had four observation sets, only one with a good minimum (Yenal Ögmen, North Cyprus).

So far in 2011, we have received no less than 30 observation, as follows:

Observer	Location	# Obs. Sets	Filter
Neil Butterworth	Australia	3	V
Phil Evans	Cook Is.	9	unfiltered
Margaret Streamer	Australia	18 (9 nights)	9 in V, 9 in Ic

Five primary minima were observed, and four secondary minima. These have not yet been carefully measured, owing to the demise of my computer and not yet having much software on my new one. However it is apparent that eclipses are running ~ 0.05 d (~ 75 m) early on the prediction of Lloyd et al (Lloyd, Frank, Bernhard, & Moscher, 2002), and in a rather erratic manner.

The system is not easy to observe, as it lies in a crowded field with at least one other star blended with it, as Figure 1 shows. Whether there is any variability in the blended stars is not known.

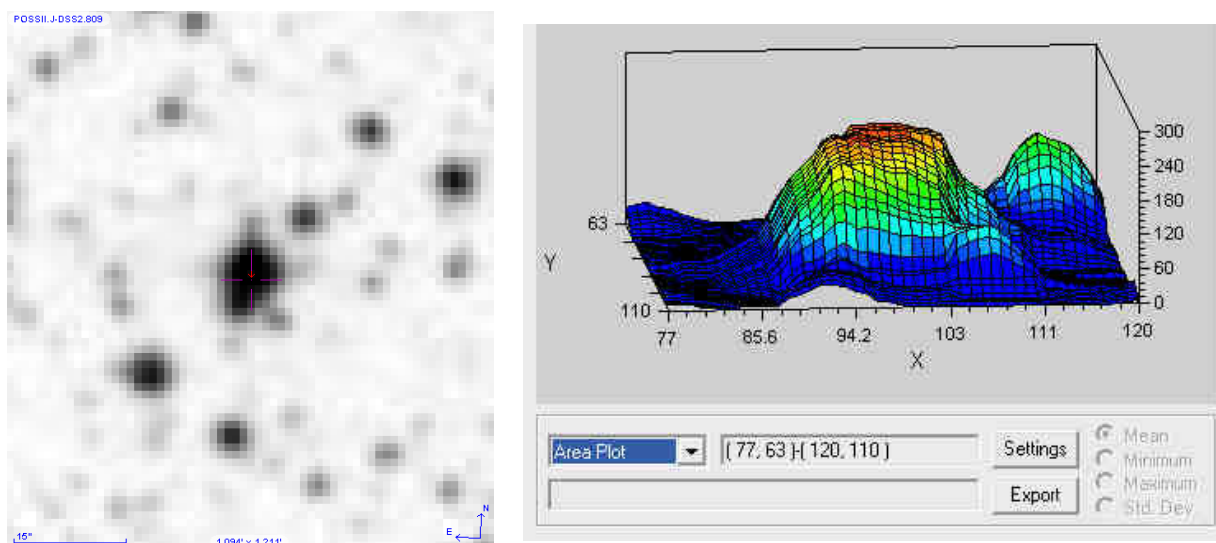


Figure 1. Palomar Observatory Sky Survey image of V1692 Aql (left) and MaxIm 3D luminosity plot of the central pixels.

More good observing runs on this system are eagerly sought through August and September. Observing details are on the VSS website: Research Projects > Equatorial Eclipsing Binaries > V1692 Aql.

What to observe next

UV Psc is well placed for observation from now until November. Observing details are on the VSS website: Research Projects > Equatorial Eclipsing Binaries > UV Psc. For this apparition, transformed data are particularly sought. But UV Psc has been well worked – see above – so has low priority.

SZ Psc is a preferable target on which we have received very little data so far. Unfiltered, V, or transformed B and V data are wanted. (Transformed V and I data will be fine, Margaret!)

WZ Cet is also well placed now. Same requirements as for SZ Psc.

SPADES targets. Yes, this project is about finding exoplanets in a little-explored search space; but at the same time valuable data on its target eclipsing binaries can be gathered and studied. Very many of these stars have not been seriously looked at since discovery, so the field is wide open. The project has many equatorial targets to suit our Northern Hemisphere collaborators. Choose one. Or two or three or ...

SPADES requires V filtered data, transformed or not, but to study the eclipsing system transformed data are ideal – B and V preferably. Right now, just getting some good eclipse data would be a breakthrough on most of these stars! Do make sure you have good computer clock accuracy, as described in the SPADES area of our website.

Reference

Lloyd, C., Frank, P., Bernhard, K., & Moscher, W. (2002). IBVS(5260).

SPADES Report – *Tom Richards (joint project leader)*

tom@prettyhill.org

Results pouring in

The late T.J. Marshall (former Director, Soils Physics, CSIRO) liked to say, “No experiment is a failure. It may not show you what you wanted it to show, but you always learn something.” This is true of most of the results we’re getting, and in fact their “failure” opens up an exciting area of work. Read on!

We now have fast CCD time series data on seventeen targets, from Steve Kerr (Australia), David Moriarty (Australia), and Yenal Ögmen (North Cyprus). Details of their results are listed below. Now that the ice is broken, how about joining in? See the SPADES section of our website for all information and instructions.

Although 10 eclipses have been caught, few will yield precise minima timings. The main reason is that observers were caught off guard by poor ephemeris predictions, and found the eclipses at the beginning or end of their runs. Also of course there’s a bit of learning and experience needed to get really good results. Fortunately at this stage, as you’ll realise when you read on, we’re happy now just to find these elusive eclipses!

Our main source of light elements for our targets, from which we can make the ephemeris predictions of eclipses, is the General Catalogue of Variable Stars (Samus, 2011). However many southern eclipsers in its list have never been updated since discovery, often in the 1930s. These discoveries were made by examining photographic plates, which gives poor periods and worse epochs. So unless we can find better light elements in the literature, we have to update them ourselves by observation. These bad predictions are the “failures” I mentioned, and the new work area is simply finding light elements so that we have decent ephemerides to guide your observation planning. I thought we’d have some trouble from poor ephemerides, but not on this scale! And of course good light elements are eminently publishable!

Results summary

The punch line here is The GCVS is usually wrong! As the following table shows, 10 eclipses have been observed of 6 binaries. Following it is a list of eclipse-free observations made, usually, in expectation of a predicted eclipse.

Eclipses observed

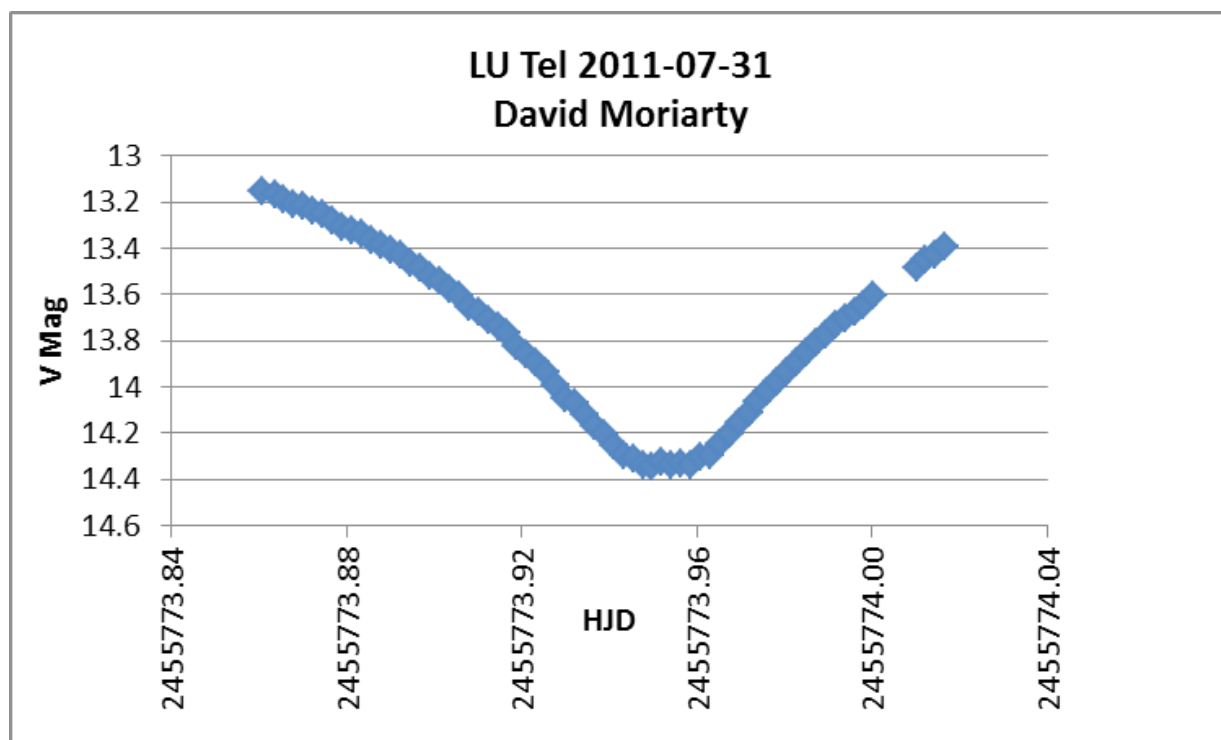
Star	# Obs	Sets	Observer	Eclipses	O-C [d]	Elements
AA Cru	4		DM	2 of Min I	0.025	Krakow
AF Cru	1		DM	Min I	0.226	GCVS
SZ Cru	5		DM	2 Min I, 1 Min II	0.01	Dvorak
LT Her	5		YO	1 of each	0.001	Dvorak
V0634 Sco	1		DM	Min I	0.024	GCVS
LU Tel	1		DM	Min I	0.01	GCVS

The Light Elements column refers to the GCVS (Samus, 2011), the Krakow database (Kreiner, 2004), and Dvorak's study of ASAS light curves (Dvorak, 2004).

AA Cru. Krakow gives elements $\text{HJD } 2452502 + 3.787630 \times E$. This is twice the GCVS period, which is probably the case. (Dvorak, 2004) has a similar period. We need to establish good elements.

SZ Cru. Dvorak's elements, $2453075.715 + 1.084033 \times E$, are more accurate than GCVS's.

LT Her. Dvorak's elements seem accurate: $2452426.5059 + 1.084033 \times E$. Cited from <http://www.rollinghillsobs.org/>. Use these not GCVS's.



Non-eclipses

AS Car (DM). Flat, but an ascent should have been observed if GCVS elements are right. So they're not.

V0762 Cen (DM). Descent observed, consistent with GCVS ephemeris.

BE Cru (DM – 2 obs sets). One quite flat observation run spanned a GCVS min I prediction at HJD 2455727.983. The other was a descent when it should have been flat. All that can be said is that eclipses are at least half a day away from prediction. The GCVS period is 2.22 d so finding an eclipse will require patience.

DO Car (DM). Flat data, but on GCVS predictions a descent should have begun.

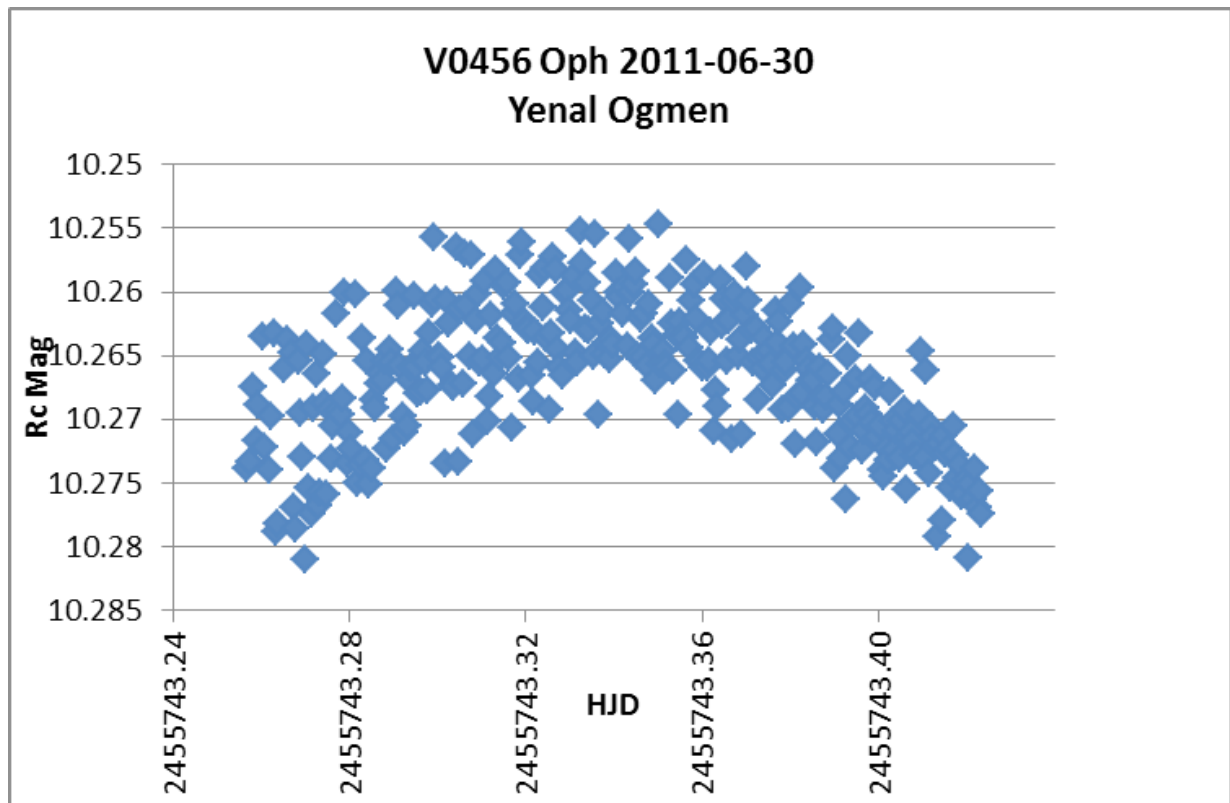
FV Lup (DM). Descent, consistent with GCVS.

FX Lup (SK). Descent observed with no minimum at the end of the run at HJD 2455731.047760, but the Krakow elements predict a secondary minimum at 2455731.000313. So eclipses are running over an hour late on the Krakow elements. GCVS elements are clearly wrong, but Dvorak's elements, $2452717.746 + 4.535 \times E$, may be better as they predict a min II at 2455731.2535.

BX Mus (DM). A descent was observed when an eclipse was predicted by the GCVS elements, suggesting that minima are running 0.1d late at least.

GM Nor. DM observed a descent from 2455770.931227 to 2455770.986979, during which GCVS predicted a min I @ 2455770.95344. The Krakow elements, $\text{HJD } 2452501.25 + 1.884583 \times E$ do better, predicting a min II after the end of observation, at 2455770.059214. So use these elements for now to predict observable minima.

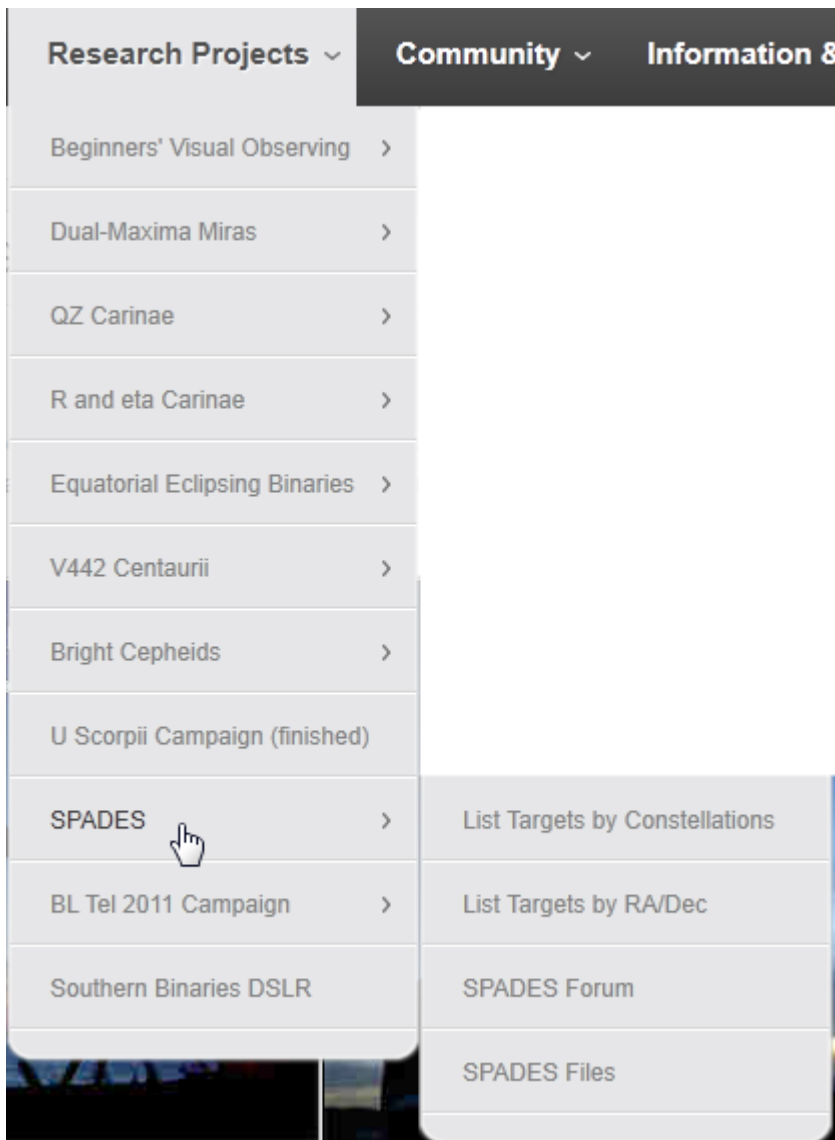
V0456 Oph (YO). GCVS says this is an EA/DM type. However YO's light curve records an EW-style maximum at HJD ~2455743.33. Confirmation and more work needed!



V0491 Sco (DM). GCVS predicted a min I @ HJD 2455726.9928, but DM's light curve was flat throughout his observing period from 2455726.98 to 2455727.05. Work needed to establish even crude light elements! GCVS period is ~3.7 d so great patience and many nights may be needed to catch an eclipse.

V0634 Sco (DM). GCVS predicted a min I at 2455774.995, right in the middle of David's observing run. But his data were entirely flat – no sign of an eclipse. So GCVS is wrong and patience will be needed to get new elements since the GCVS period is ~2-1/3 d.

Using our Website



The SPADES area of our website contains not just project information and instructions to observers (go to SPADES and List Targets by...), but also discussion forums and a files area for each target. Please use the forums – SPADES for general discussion, and the star forums for discussion of each star and the work on it. The star forums are being created when we get data on a given star, and likewise the files area. Forgive if they're a little behind!

RSS Feeds

Did you know you can receive notifications of forum posts (or other changes in pages of the website that interest you)? Then you don't have to be forever visiting the website to check for updates. Click on the

RSS Feed icon  at the bottom of the page. You can get notifications by email or in your browser – check their Help files to see how.

Observers' results files will be uploaded to the star's files area after checking and, if necessary, editing. At present these consist of XLSX (Excel 2007) files with observational results and a plot. Formats may change in future. You can download these for study and analysis. See how good an eclipse measurement you can make! They're also very useful for assessing quality of photometry. How do you compare?

Further work

There's quite a range of tasks needed to progress this project. We need not just observations but quite a bit of desk work, which like observing needs to be shared around if we are to get anywhere. Please contact me if you want to do some of the desk work and I'll set it up for you.

1. Observing – first run on a star. Find a SPADES target with an eclipse predicted near midnight and near the meridian at your location, and give it an all-night run. The aim is to check on GCVS (or other) light elements. All observing information and instructions are in the SPADES pages of our website.
2. Observing – catching wayward eclipses. Adopt one of the stars listed above that does not agree with GCVS (or other) predictions and observe it patiently, night after night if need be, till you catch at least one eclipse. The aim is to get light elements – period and epoch. If you have good control software such as ACP (www.dc3.com) you can observe three or so targets in parallel through the night. Eclipse timings won't be as tight, but if you're looking at seriously wrongly predicted targets, this is an efficient method for finding eclipses.
3. Desk work – finding light elements. The GCVS is not the only source of light elements. Adopt a few stars (I'll suggest them to you) and comb the literature for other light elements. The AAVSO VSX portal is a good place to start (www.aavso.org). Link from it to the ASAS3 data on a star, which might at least give you a reasonable period. Go through it also to the ADS and CDS bibliographies, and the Krakow database (Atlas of O-C Diagrams, www.as.up.krakow.pl/ephem/). You'll soon learn other useful links from VSX too. The aim of this task is just to get reliable ephemerides so observers can plan their nights. Once we have good, observationally confirmed light elements, we'll need to update the SPADES online database and also our data table for Motl's Ephemeris program.
4. Desk work – finding eclipse timings. This overlaps the previous task. The literature contains a lot of reports of timings of eclipses for a given binary. Some of these may be gathered in the O-C Gateway (<http://var.astro.cz/ocgate/>, accessible from VSX), but there are usually many others. Ask me for a list of targets. When you find a timing, see if it has an error estimate attached and record that too! The data we need are eclipse type (I or II) HJD of min, error, observer, bibliographic reference. The aim of this task is to get all historical eclipse data so we can investigate O-C changes that may indicate third bodies. After all, this is a planet-finding project! And to record all this we will start a database of eclipse timings.

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Kreiner, J. M. (2004). Acta Astron., 54, 207. <http://www.as.up.krakow.pl/ephem>.

Samus, N. N. (2011). General Catalog of Variable Stars. Moscow: Sternberg Astronomical Institute. <http://www.sai.msu.su/gcvs/gcvs/index.htm>.

About

Variable Stars South is an international association of astronomers, mainly amateur, interested in researching the rich and under-explored myriad of southern variable stars.

Renamed from the Variable Star Section of the Royal Astronomical Society of New Zealand, it was founded in 1927 by the late Dr Frank Bateson, OBE, and became the recognised centre for Southern Hemisphere variable star research.

VSS covers many areas and techniques of variable star research, organised into "Projects" such as Beginners' Visual Observations and Dual-Maxima Miras. The goal of each project is to obtain scientifically useful data and results. These may be published in recognised journals, or supplied to international specialist data collection organisations.

VSS is entirely an Internet based organisation, working through our website <http://www.VariableStarsSouth.org> and its e-group <http://groups.google.com/group/vss-members>. It also encourages members to work in with major international organisations such as the British Astronomical Association, the Center for Backyard Astrophysics and the American Association for Variable Star Observers.

To find out more, please visit our website, where, incidentally, you will find PDF copies of all our newsletters. Our website has a great deal of information for VSS members, and for anyone interested in southern hemisphere variable star research. All VSS project information and data is kept here too.

WHO'S WHO

Director Dr Tom Richards, FRAS.

Treasurer/Membership Bob Evans

Newsletter Editor Phil Evans

Webmaster David O'Driscoll

Visit our website to see a list of our area advisers and to find out about our projects and how to contact their leaders

MEMBERSHIP

New members are welcome. The annual subscription is NZ\$20, and the membership year expires on April 30th. Find out how to join by visiting the VSS website. There you will find out how to join by post, email, or directly online. If you join by email or online you will get a link to pay by PayPal's secure online payment system, from your credit card or bank account.

After you've joined and received your membership certificate, you will be signed up to the VSS-members egroup (see above), and you will also receive a password to access the members' areas of our website.

NEWSLETTER ITEMS

These are welcomed and should be sent to the Editor. I'd prefer Microsoft Word (or compatible) files with graphics sent separately. Don't use elaborate formatting or fancy fonts and please do not send your contribution as a fully formatted PDF file.

Publication dates are February, May, August and November, nominally on the twentieth day of these months and the copy deadline is the thirteenth of the month though earlier would always be appreciated.

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