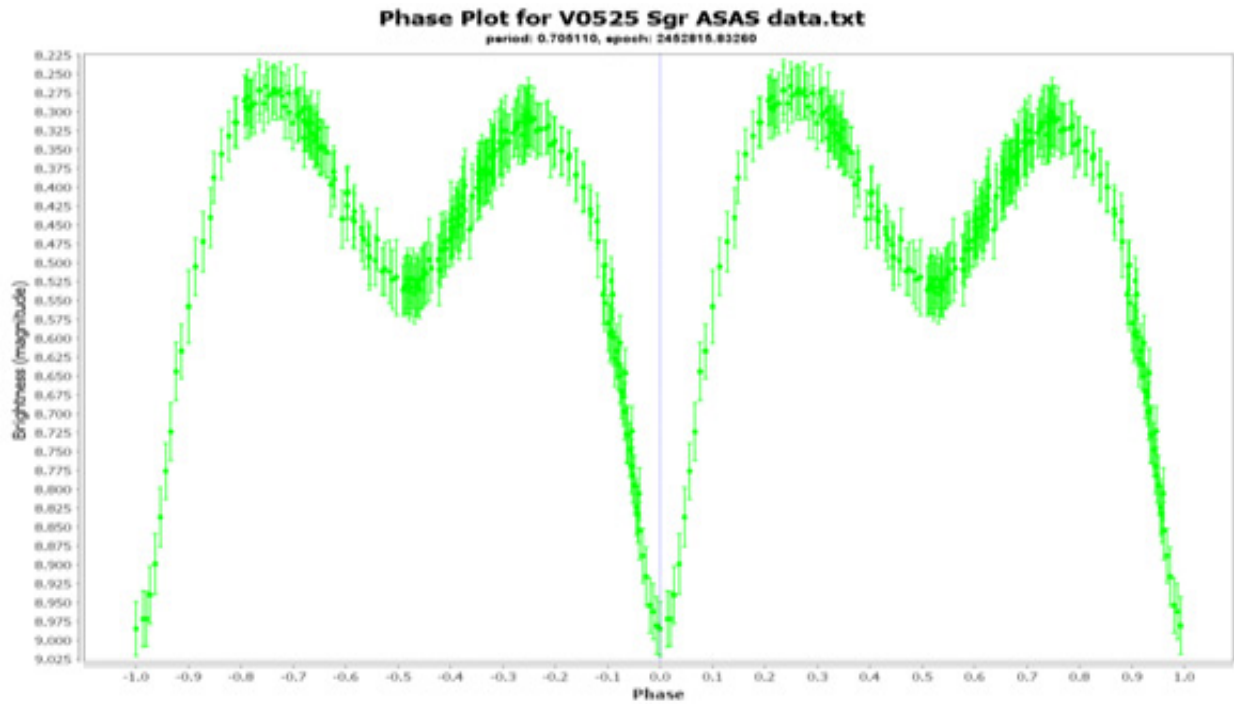




A phased light curve for the EB type binary V0525 Sgr. Mark Blackford and Tom Richards have announced a new project to research and model such close interacting binaries, EB and EW types. It's open to both DSLR and CCD observers. See Mark and Tom's article on page 19.

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From the Director — *Tom Richards*

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A superoutburst of activity!

Has there ever been a busier time for VSS? Southern novae popping up, Eta Car promising to show off, new projects, big developments in existing ones, and to top it all off three conferences in three months. Here's an incomplete rundown of all the activity.

Variable Stars South is changing. We've dropped having subscriptions, and with it the idea of membership. Anyone can join in our work, without upfront payments. Anyone can register on our website for enhanced access. Anyone can join the VSS email group. And importantly, anyone can join any of our projects – just contact the project leader. They're all listed on our website under the Research tab.

Operational costs will now have to be defrayed by **Donations**. Right now is a very good time to hit that Donate button on our home page, especially if these changes mean you saved your 2014 membership fee!

V1369 Cen continues to excite, as it becomes easier to observe as the days go by. Right now it's hovering around mag 7-8. A lot of data, including spectroscopic, is being uploaded on our email forum from Ken Harrison, Jonathan Powles, Julian West, and Malcolm Locke and others. Roger Butland hopes to supply some high-resolution spectra from Mt John. Mark Blackford is preparing a paper for NACAA promising to "use the spectra to explain why transformed DSLR magnitudes don't agree with CCD magnitudes". Hmmm. Stan Walker is trying to get our voluminous data together for a presentation at VSSS3. And the show isn't over yet!

David Moriarty and Margaret Streamer have taken over from me the running of the **Southern Eclipsing Binaries Programme**. For this many thanks! They're throwing a lot of energy into it; in particular Margaret is preparing a paper on all the minima and light elements results to date. Since there are ~100 targets under observation and 10 or so observers and analysts, this is a Herculean task indeed. Was one of his labours herding cats?

Eta Carinae is having a periastron passage on July 26th. Bernard Heathcote is organising a spectroscopic campaign on this very interesting and important event – more on that in due course. NASA is also interested in coordinating a southern spectroscopy campaign – download www.astroscu.unam.mx/massive_stars/other/2012/12120320106.pdf.

Mark Blackford and I are setting up an **EB and EW Binaries Project** to study these extremely close and rapidly orbiting systems. Read all about this below. It should appeal to any CCD or DSLR observer who'd like to get complete light curves very quickly and analyse their data for period changes, modelling, etc.

NACAA is happening this Easter, in Melbourne. The Programme Chair is our indefatigable David O'Driscoll, who can't be blamed if there's lots of good stuff for variable star people:

- Ken Harrison: *Introduction to spectroscopy workshop*
- Tom Richards: *It takes two to tango: the intertwined lives of close binary stars*
- Donna Burton: *Spotty stars*
- David Moriarty: *Pitfalls for unwary photometrists of the understudied southern eclipsing binaries*
- Peter Nelson: *BSM South*
- David Moriarty: *Establishing an observatory at a dark sky site (with Boss the Builder)*

- Margaret Streamer: *Delta Scuti-type pulsating stars in eclipsing binary systems*
- Roy Axelsen: *From light curves to light elements: New ephemerides for the Delta Scuti stars RS Gru and BS Aqr*
- Mark Blackford: *Variable star photometry with a DSLR camera*
- Peter Norman: *The nucleosynthesis of all elements by a supernova*
- Wayne Roberts: *The life and death of stars - part 2: neutron stars*

Plus some pretty high-powered presentations in other areas such as occultations. Andrew Prentice of Monash University is the after-dinner speaker, “*New insights into how the solar system was formed, based on the wealth of new spacecraft data and a novel mathematical theory*”.

For more on the conference, visit <http://www.nacaa.org.au/>.

The **RASNZ Conference** in Whakatane, June 6th-8th, seems to be shaping up well. The programme isn’t out yet, but my spies tell me there will be plenty of good stuff for variable stars researchers. Keep up to date at www.rasnz.org.nz.

Variable Stars South Symposium 3 is happening on the Monday following, June 9th. We might also be able to grab Sunday afternoon after the main conference closes – no promises yet. Presentations to date are:

Speaker	Title
Mark Blackford	DSLR Workshop
Tom Richards	Photometry Errors
Stan Walker	Seven Cepheids in Crux
Stan Walker	V1369 Cen
Margaret Streamer & David Moriarty	Southern Eclipsing Binary programme
Mark Blackford & Tom Richards	The EB and EW Binaries Project
Aline Homes	Semi-Regulars – an opportunity for new science?

We can still take more offerings, we still want more offerings, we still expect more offerings. Where are the NZers? Two versus four from Australia! Come on Kiwis, it’s your turf. Are you shy?

I’m on holiday, travelling without email, from the end of NACAA to the start of RASNZ. Stan Walker (astroman@paradise.net.nz) has very kindly agreed to take over organising VSSS3 in my absence, so please send your flood of proposals to him. Posters, oral presentations, workshops, discussion groups... Does somebody want to organise a question-answer session perhaps? Or run a round-table on developing variable star work down south? This is our big get-together and best opportunity to push the field forward – and if people leave it all to me it won’t happen!

In IBVS 3030 six apparently bright, new variables in Sagittarius were reported (Campos and Sanchez 1987). Five of these stars proved to be already known, and only their star ‘K’ was new (Morel 1987). At my request Rob McNaught, Siding Spring Observatory, studied the field on UK Schmidt plates and reported that a star just following ‘K’ was missing. In IBVS 3096 I reported this observation and duly labelled this problematic star as **K¹**. See Fig 1. Both stars have received NSV names, as follows:

K = NSV 24318 = GSC 6276 1299 K¹ = NSV 24319 = GSC 6276 1119

Campos and Sanchez provided an approximate magnitude (12) for K, but no other information. K and K¹ lie within a group of five stars, mostly of comparable brightness, the other members of the group are labelled B, C and D. With the availability of recent photometric surveys, it now appeared feasible to check the variability of the NSV stars using published data.

NSV 24319

This is the brightest star in the group. $V = 11.896$, $B-V = 0.701$ (APASS). Adopted values.

The ASAS database yields $V = 11.766$ (err 0.068), but this is most likely contaminated by nearby stars, and the ASAS lightcurve is essentially a flat line, ie constant. I scaled up the chart by Campos and Sanchez and overlaid it on a DSS red print. NSV 24319 is displaced east of the correct position by about 1' (end figs 39.90s, 49.3"). There is nothing at this spot, and it is clear that the hand-plotted position of this star is inaccurate, leading to the erroneous conclusion that the star is “missing”. When this error is accounted for, the NSV designation is spurious, and NSV 24319 is constant.

NSV 24318

According to APASS, $V = 12.882$, $B-V = 1.557$. The ASAS light curve is too severely contaminated by nearby stars, especially NSV 24319, to be useful. A study of available DSS images (6 in all) shows no variation, relative to surrounding stars, especially compared to NSV 24319. A study of the NSVS (*Northen Sky Variability Survey*) light curve suggests an upper limit to any variability, possibly 0.4mag at most.

Adopted BV photometry

Star	(J2000)	V	Verr	B-V	B-V err	Source	Remarks
B	18 11 36.24 -21 03 06.5	13.75		+2.0		2MASS	
C	18 11 37.80 -21 02 56.9	13.764	0.026	0.757	0.032	APASS	
D	18 11 34.21 -21 03 19.5	14.57		0.99		GSC 2.3	
K	18 11 34.50 -21 03 21.0	12.882	0.007	1.557	0.027	APASS	NSV 24318
K ¹	18 11 35.70 -21 03 25.0	11.896	0.014	0.70	0.021	APASS	NSV 24319

The integrated magnitude of these five stars is $V = 11.235$, as calculated using standard algorithm via spreadsheet. This is not dissimilar to the nearest object in the NSVS database, no. 16648040, average $V = 11.174$ (err 0.035), which is almost certainly a blend of the same five stars.

NSVS light curve

I have downloaded the light curve for NSVS 16648040, which is a blend of 5 stars. While limited in coverage, the range is from 11.0 V to 11.25 V. The first figure could, in theory at least, be due to star K brightening to 12.5V, while the latter figure (11.25) is almost exactly what one would expect if K were $V=12.882$ (the APASS value). If K were to drop to 13.50V, the integrated magnitude would be 11.344V; if K were 14.00V the integrated magnitude would drop to 11.400V. There is no indication in the NSVS

light curve of such large variations. Star 'K' could have intrinsic variations of, say 0.3- 0.4mag, but it would be very difficult to detect them under these circumstances.

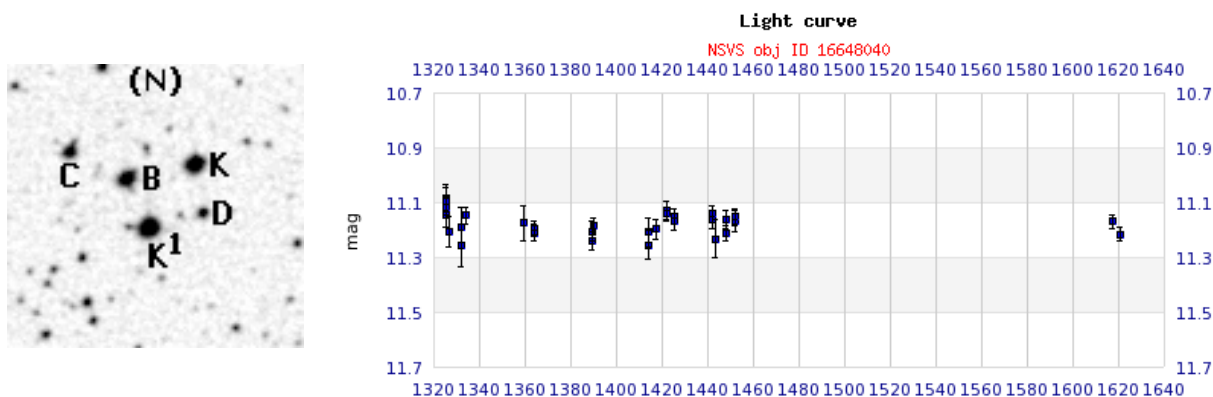


Fig 1. Finder chart for stars around K = NSV 24318 and K1 = NSV 24319. Size of field as shown is $\sim 1.7' \times 1.7'$.

Fig 2. Light curve for NSVS 16648040, a blend of five stars including NSV 24318 and NSV 24319

NSVS (Northern Sky Variability Survey): A brief synopsis

This system used 4 CCD cameras on one mount. Each camera had a FOV of $8.2^\circ \times 8.2^\circ$, with 14.4" pixels. The limiting V magnitude of the faintest stars recorded in 80-second exposures was typically 14.5-15.5. Saturation occurred at 10-10.5 mag in normal exposures (80s). Because of an inability to deblend, particularly along the Milky Way, the NSVS data often is a record of **patches** of sky rather than individual stars. The circular patch of sky can be 84" in diameter ie 3 pixels in all directions from the centroid, but may vary.

For a complete description of the NSVS system, refer to Wozniak et al (2008).

Conclusions

Within the limitations of the NSVS one can determine the approximate upper limit of variability of NSV 24318. A much more targeted approach would be required to establish its degree of variability, if any.

NSV 24318 is **not** a variable of large lamplitude. It is a red star, possibly an M-giant, and small-range variability, up to 0.3mag, would not be unexpected. APASS data provides no hint of this.

V = 12.882 B-V = 1.557 Constant?

NSV 24319. V = 11.896 B-V = 0.701 Constant. Erroneously reported as variable.

Acknowledgement

This research was made possible through the use of the AAVSO Photometric All-Sky Survey (APASS), funded by the Robert Martin Ayers Sciences Fund.

References

- Campos, J. and Sanchez, A. 1987. Inf. Bull. on Var. Stars 3030
- Morel, M. 1987. Inf. Bull. on Var. Stars 3096
- Wozniak, P. R. et al 2008. *arXiv:astro-ph/0401217v1* [see <http://skydot.lanl.gov>]

The Sonneberg Observatory in Germany published many results of research into variable stars in a serial bulletin called, for convenience, MVS (= *Mitteilungen über Veränderliche Sterne* / *Notices on variable stars*). From the estate of the late Albert F. Jones I received an extensive set of MVS. These run from MVS 102 (1945 March 31) to MVS 755 (1963 Feb. 18), issued as one MVS number per sheet. The system of plain serial numbering ended with number 755. Thereafter MVS papers were issued by Band & Heft (=volume & issue) numbers. The new numbering system was maintained from 1963 to 1993. Most papers are written in the German language. The editors have compiled indexes, by star name.

In January and February 2014 I undertook the tedious task of examining all issues of MVS, particularly those with finder charts, with the aim of extracting new information, perhaps hitherto scarcely known to researchers, and also checking known data. This paper provides a summary of my findings:

- coordinates for 15 variables near Omega Cen reported by Wilkens (1965a).
- 4 poorly known or unrecognized long-period variables, first reported in MVS.

New variables in the region of Omega Cen

Wilkens (1965a) published a list of 15 new variables near this globular cluster. Many of them are rather distant, and this fact alone (in the absence of other parameters) raises doubts as to their membership of the GC. The first 10 objects appear in the DDO (Publications of David Dunlap Observatory, Catalogue of variables in GCs, 3rd ed 1973). Wilkens 11 to 15 do not appear in any catalogue, GCVS, VSX or DDO, and a footnote on page 23 of the latter indicates that they had been rescinded, as being only “suspected”. Wilkens gave finder charts for **all** of his discoveries, and it turns out that at least two of the rescinded stars (#12 and #14) are genuine variables after all. These variables are discussed in detail, below. Precise coordinates for all of Wilkens’ objects are attached. See Appendix I.

Table 1. Confirmed variables

Name	RA (J2000)	Dec.	Range	Class	Period	ASAS3 id.	Chart Ref
Wilkens 7	10 13 02.54	-45 53 44.6	11.0 - 15.0V	M	211.8d	101302-4553.7	MVS3,3,75
Wilkens 12	13 29 24.68	-47 01 43.9	12.0 - 14.1V	SRB/L	~533d	132924-4701.7	MVS3,3,72
Wilkens 14	13 21 07.23	-47 59 20.8	12.8 -(15.0V	M	253.4d	132107-4759.3	MVS3,3,72
NSV11630	18 59 28.53	+31 06 46.0	12.0V-19.8B	M			MVS 384

Wilkens 7 (NGC 3201) = CI*NGC 3201 SAW V94 (SIMBAD)

Mira type. 14 cycles in ASAS. [M, 208d, 11.61(2.49)V a/c to VSX.] See also Appendix 2.

Primary Epoch: JD 2451994.61 Too bright to be a member of NGC 3201; likely foreground star.

Coordinates, source: Samus et al 1996AstL...22..239S

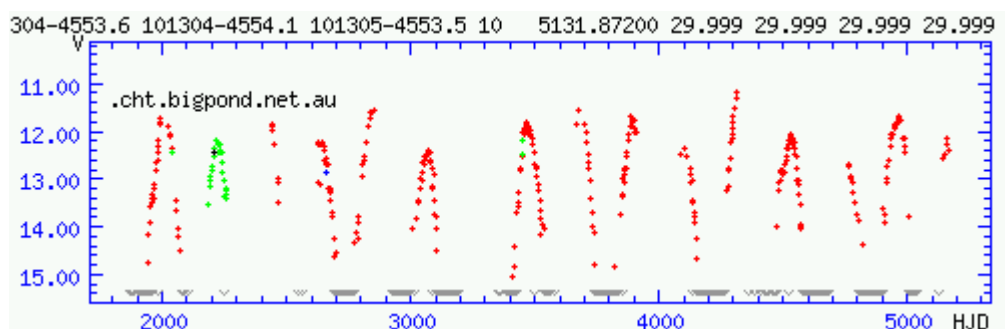


Fig 1. ASAS light curve for Wilkens 7 = ASAS 101302-4553.7

Wilkins 12 (Omega Cen) = ASAS 132924-4701.7

SRB/L type. Between JD 2452600 and 2454000 there is some periodicity ($P \sim 533$ d), after 2454000 the variations seem to be irregular. **Not in VSX, or DDO cat.**

Coordinates, source: UCAC3

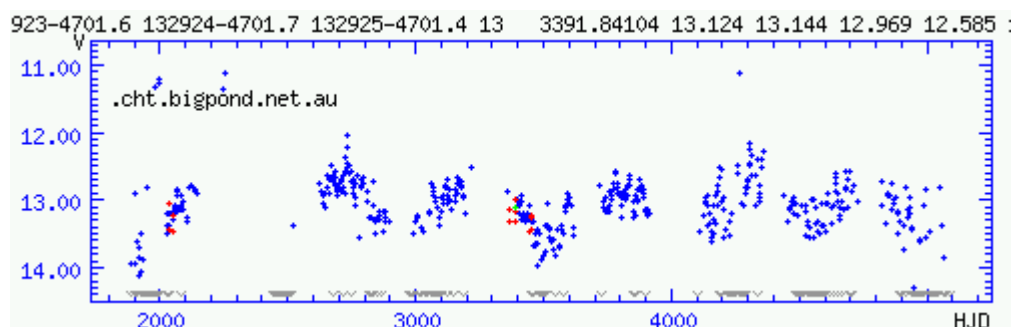


Fig 2. ASAS light curve for Wilkins 12 = ASAS 132924-4701.7

Wilkins 14 (Omega Cen) = ASAS 132107-4759.3 = IRAS 13181-4743

Mira type. ASAS light curve covers 12 cycles. **Not in APASS, GCVS, NSV, VSX, DDO cats.**

Period: 253.4d

Primary Epoch: JD 2451949.78

From 2MASS, $J-K_s = 1.48$, indicating a very red star. Red giant ($B-V + 1.6$) members of Omega Cen appear at slightly below apparent magnitude $V=12.0$. The median magnitude of Wilkins 14 is $\sim 15.3V$, and this seems to indicate non-membership of Omega Cen, i.e. a background star. It appears in the USNO-B1.0 catalogue as 0420-0388099, magnitude $B_2 = 19.34$.

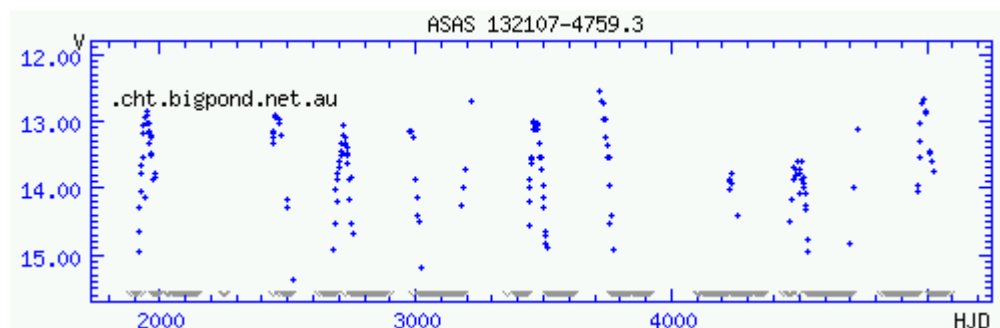


Fig 3. ASAS light curve for Wilkins 14 = ASAS 132107-4759.3

NSV 11630 = Mehlretter's variable. 14-20:p LPV

Discovered by Mehlretter (1959), but was rarely seen, at 14p, on his plates. Usually below the plate limit (17p). His finder chart is reproduced here, see figure 4. Mehlretter notes that he had identified the variable on POSS I prints (1950 June 7) and he estimated magnitudes of $\sim 17R$ and $\sim 20B$. A cutout of the POSS I red plate is reproduced here, see figure 5. I have examined both POSS I and POSS II plates on DSS, estimating the star by eye against comparison stars magnitudes from the USNO-A2.0 catalog.

My results are:

$R = 16.4$ $B = 19.8$ POSS I, 1950 June 7.

Near IR = 12.6 $B = 17.5$ POSS II, ~ 1995 . V. bright in IR Unmistakeable change.

The strong red colour is supported by 2MASS ($J-K_s = 1.56$), suggesting $B-V = 2.5$.

Position : (J2000) 18 59 28.53 +31 06 46.0 CMC14. The position in VSX is too far south.

General. NSV 11630 is not in APASS, or Brian Skiff's catalogue of MK types (mktypes.dat). Identical with 2MASS J1859285+3106460 and evidently a long-period variable.

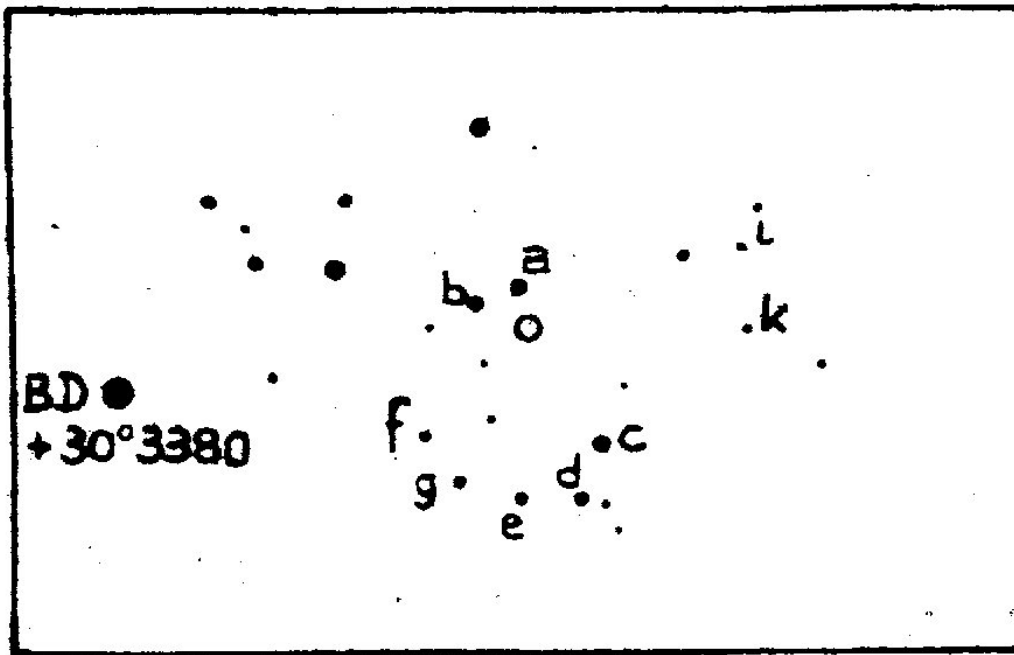


Fig 4. Mehlretter finder chart for NSV 11630. North is up.

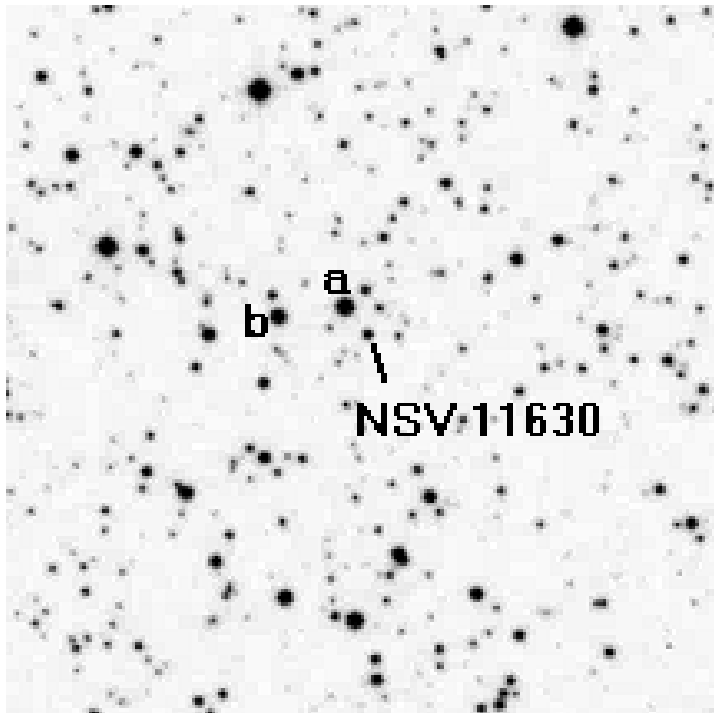


Fig 5. Identification of NSV 11630, from POSS I Red plate.

NSVS 8255044 = NSVS J1859293+310653

A search of NSVS (*Northern Sky Variability Survey*, Wozniak et al 2008), and VSX, turned up this LPV, cited as an alias for NSV 11630. The updated coordinates for NSV 11630 and the NSVS object differ slightly, which required close examination.

NSVS 8255044 has the following coordinates : (J2000) 18 59 29.33 +31 06 52.7.

This places it near the midpoint between NSV 11630 and star 'a'. This suggests a possible blend. According to Wozniak et al (2008), the CCD cameras used in the NSVS had a resolution of 14.4"/pixel. However, they caution (Table 4) that stars closer than 3 pixels are generally merged, severe at Galactic $|b| < 20^\circ$.

NSV 11630 and star 'a' are only 18.6" apart. From the NSVS database I have downloaded the light curve for NSVS 8255044, a multi-cadence plot for 12 months. See figure 6. The magnitude scale is equivalent-V; however the points appear far too bright when compared with the results of Mehlretter and the appearance on POSS I/POSS II. This confirms the suspicion, alluded to earlier, that the NSVS object is in fact a blend of two stars. Star 'a' (=GSC 2639 2574) is $V = 12.99$, from GSC 2.3. If one were to remove the contamination from 'a', NSV 11630 could still reach 12.0V at maximum, or even a little brighter. The NSVS database assigns a period of 194d, but much more data is required to determine an accurate period and the range. This work has now established the position of NSV 11630 beyond doubt, and is likely a LPV of large amplitude.

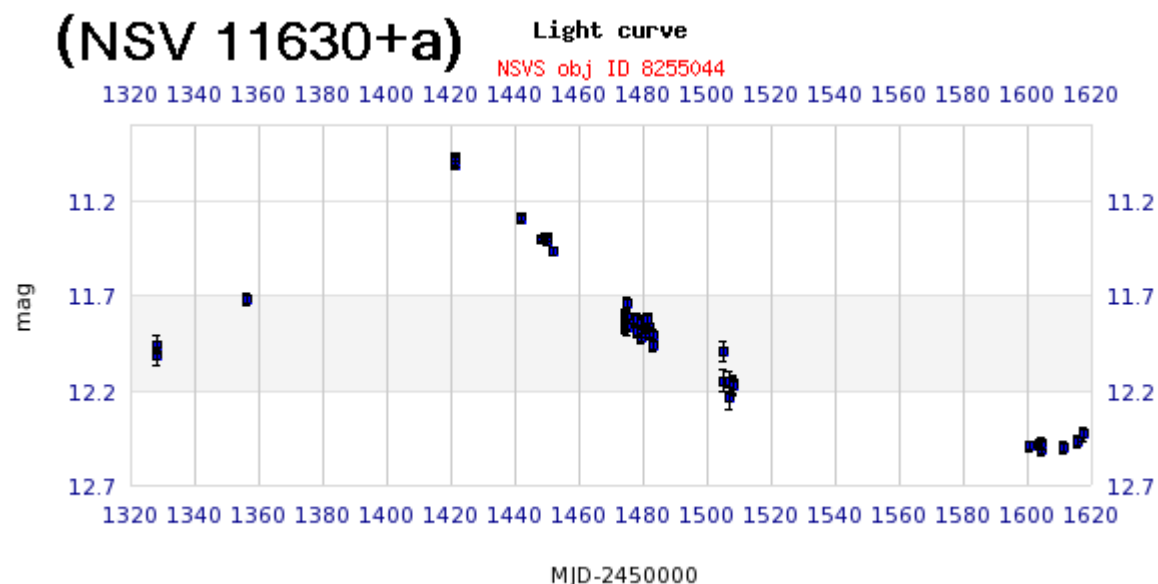


Fig 6. NSVS light curve for NSVS J1859293+310653, which blends NSV 11630 + 'a'.

References.

- Mehlretter, J. P. 1959 MVS 384
- Wilkens, H. 1965a MVS 3,3,72 [Variables near Omega Cen]
- Wilkens, H. 1965b MVS 3,3,75 [Variables near NGC 3201]
- Wozniak, P.R. et al 2008. ArXiv 0401217v1.
- NSVS database. <http://skydot.lanl.gov>
- Sawyer Hogg, H. 1973 Publ. David Dunlap Obs. vol. 3, no. 6. [3rd catalogue of Variable Stars in Globular Clusters, DDO].
- VSX. AAVSO database, <http://aavso.org/vsx>

Appendix 1

Coordinates for Variable Stars near Omega Cen found by Wilkens (1965a)

Wilkens #	RA (J2000)	DEC	S	R	J-Ks	MVS Type	Remarks
1	13 22 58.73	-46 47 24.4	U3	14.54	0.10	RRa	
2	13 27 55.03	-47 04 38.5	U3	14.75	0.38	RRa	
3	13 29 43.12	-47 16 53.9	U3	15.02	0.22	RRa	
4	13 28 10.04	-48 02 29.5	U3	13.76	0.28		V1182 Cen, EA, foreground
5	13 22 22.85	-48 19 04.6	U3	13.50	0.20	?	V. bright
6	13 27 01.79	-47 30 46.4	U3	12.49	0.76	RRc	Weak. Crowded field.
7	13 29 04.15	-47 36 21.5	U3	14.78	0.30	RRb	
8	13 31 59.83	-47 19 00.1	U3	15.71	0.52	RRb	
9	13 23 45.23	-48 17 52.7	U3	14.36	0.50	RRb	
10	13 24 15.22	-47 40 32.1	U3	14.49	0.42	RRc	Weak
11	13 24 41.69	-48 19 22.1	U3	14.27	0.44	RRc?	Not in DDO Cat.
12	13 29 24.68	-47 01 43.9	U3	13.13	1.30	RRc?	Not in DDO Cat. SEE TEXT
13	[13 27 14.16 -47 25 21.4]			15.63	0.62		Not in DDO Cat. Crowded
14	13 21 07.23	-47 59 20.8	U3	12.53	1.48		Not in DDO Cat. SEE TEXT
15	13 31 38.60	-46 36 08.2	U3	13.46	0.04	Algol?	Not in DDO, VSX, GCVS

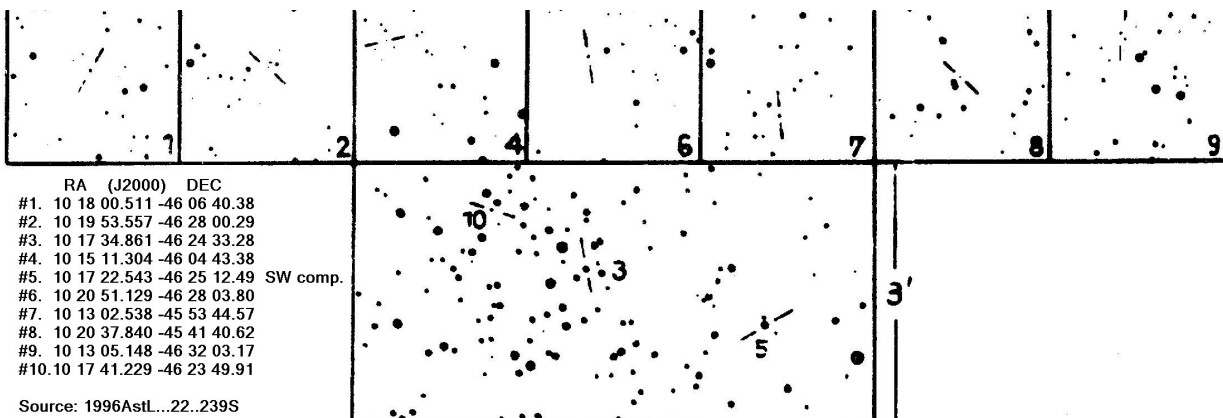
Notes. U3 = UCAC3. R and J-Ks are taken from 2MASS. MVS types are copied from Wilkens.

#13 is uncertain, but apparently observed only in maximum.

Reference. Wilkens, H. 1965a MVS 3,3,72

Appendix 2

Finder charts for Variables Stars found by Wilkens (1965b) near NGC 3201.



Note: #5 is a close double. Only the SW component is listed here. Coordinates are sourced from list of 96 variables near NGC 3201, measured by Samus, N. N. et al 1996 Astronomy Letters 22, 239.

Appendix 3

Note on S10491. A possible UG star, range 15- (20p reported in 1969MVS....5...69R, and located at (J2000) 05 48 22.7 +22 42 17. Date 1968 Oct. 20. Not found in any subsequent catalogue or namelist.

By using GUIDE9 I found that the minor planet 586 Thekla was very close to the stated position on 1968 Oct. 20d23h59.8m UT, mag. 14.2. Mystery solved.

Factors affecting novae ejecta - *Carl Knight*

sleeplessatknight@gmail.com;

V1369 Centauri, the recent naked eye nova in Centaurus that I hope you are all familiar with has brought discussion of the astrophysics of novae and resulting ejecta to the fore. This article is brief and attempts to cast a wider view of the evolution of novae ejecta from the thermonuclear runaway (TNR) to its expansion into the interstellar medium.

Broadly speaking there are additional intrinsic and extrinsic factors affecting the genesis and evolution of novae ejecta. These can determine the morphology, velocity and temperature (and therefore colour and brightness) profile of the ejecta over time.

In our mind's eye we might construct a model of a symmetrical nova eruption propagating through some hypothetical homogeneous medium, a largely neat and clean affair. Nature abhors such things.

José (2012) briefly discusses the effects of nova progenitor mass and temperature and the violence of the resulting mass ejection. Citing Schwartzman et al (1994) and others José discusses a range of mass ejection results from different progenitors. These range from cold, low luminosity progenitors to highly luminous, hot progenitors. Due to an extended period of accretion, cold, low luminosity progenitors achieve larger proper pressures at the core envelope interface, and therefore undergo eruptions of greater violence. Progenitors that are too hot and too luminous undergo convective mixing through the outer layers of the core and the envelope. These progenitors undergo a weak TNR that yields no mass ejection. Electron degeneracy has a key role to play. The more of the envelope that is degenerate, the more favourable the conditions for TNR. Electron degenerate matter does not respond to temperature by expanding, this maximises the trapping of radiation and as José puts it, "These circumstances pave the way for a thermonuclear runaway." Hence a particularly hot, luminous progenitor lacks the necessary "pressure cooker" effect of strong electron degeneracy to produce a strong TNR. Conversely the highly degenerate envelope of a colder, less luminous progenitor presents ideal conditions for TNR.

CNO content in the WD envelope is also a critical component in the resulting detonation (José (2012)). Fundamentally the detonation is a CNO cycle runaway reaction that takes place at the interface between the white dwarf (WD) degenerate core and the envelope. The more CNO, the more energy it can produce. And the inverse is also true.

Regarding the onset of TNR and its propagation through the progenitor envelope, José (2012) discusses various models of the hydrodynamics. What is clear is that the modelled thermonuclear runaways are asymmetrical. Also José's discussion of turbulence in the thermal runaway process and its impact on the resulting "inhomogeneous nova shells" hints at the fact that the nova detonation is likely asymmetric.

So in summary, the shape of the expanding nova ejecta is asymmetric because the detonation is asymmetric.

The notion that a WD can be too hot to achieve an effective TNR due to weaker electron degeneracy raises another possibility to consider when discussing the prospect of a nova light curve oscillations being the result of multiple TNRs (cf. A. Henden, post to VSS Google Group, *Re: [VSS] Nova Cen 2013 (was: My Mistake)*, 8 January 2014). That is, given a system that has already undergone an eruption, the secondary if sufficiently heated by the eruption might expand. This could lead to enhanced Roche lobe overflow. This might provide the necessary gas to rebuild the WD envelope to the point where a subsequent TNR is possible. However if the progenitor has been heated significantly then might it fall into the "too luminous, too hot" category described above? A subsequent TNR might then occur on the WD but not result in any ejection of material. Whilst not contributing ejecta, this would contribute heat and enhanced stellar wind. Depending upon velocities these may interact with the expanding ejecta.

Also, early on, the fireball expands to enclose the binary system (Hellier (2001)) and this allows the orbiting components to act as what Hellier calls a "propeller" to expel the ejecta from the system. Effectively this is a "return to the 'common envelope' phase from which the cataclysmic variable (CV) formed" (Hellier (2001)).

Much later on in the evolution of the nova oscillations can appear. Hellier (2001) posits that these oscillations in some novae light curves are the result of a dust formation cycle, but these are poorly studied. As

the ejecta cools, dust forms. This dust is an effective heat trap. The trapped heat causes the light curve to increase in brightness and additionally destroys the dust that caused it. This leads to cooling and the light curve correspondingly drops again allowing the reformation of dust and the cycle repeats. Hellier cites Nova Aql 1992 No 2 (V1494 Aql) as a good example of this phenomena.

Regarding what the ejecta is expanding into long term and over significant distances (light years), studies of Planetary Nebulae (PN) morphology by A.A. Zijlstra and others at the University of Manchester (A.A. Zijlstra, Lecture to the Webb Deep Sky Society AGM 6 December 2008 at the Institute of Astronomy, Madingley, Cambridge University, UK attended by the author) show that the bizarre and apparently unnaturally regular shapes we can see are likely the result of density gradients in the stellar wind. Specifically the interaction of previous slow stellar winds from the PN precursor with more rapid stellar winds from the PN WD (A.A. Zijlstra personal communication 13 January 2014). Correspondingly, the nova ejecta is affected by any density gradients created by the stellar winds of the WD and secondary it might encounter. This includes where, as with, PN there may be faster and slower winds (perhaps pre and post nova) and the interaction between the WD and secondary's winds.

It is also worth asking if the effects of density gradients is at all noticeable, or even measurable in the early days of a nova or are they only seen much later? I suspect the latter as any effects of density gradients affecting the light curve early in novae are likely lost in the noise. Can anyone provide a source discussing measurable stellar wind density gradient effects earlier in the ejecta evolution?

These phenomena are worthy of a good deal of thought to determine if any of these contributors might be shown to be more or less able to explain any anomalies in brightness or other features of the light curve or spectra and how we might distinguish their signature from all the noise.

I'd like to close by asking if anyone would like to pick up any of the threads discussed in this article and expand them with more rigor to further all of our understanding of the underlying astrophysics.

References

- Hellier, C. (2001). *Cataclysmic variable stars: how and why they vary*. Springer-Praxis.
- José, J. (2012). *Classical nova explosions - hydrodynamics and nucleosynthesis*. Bull. Astr. Soc. India, 40, 443-456.
- Maciel, W. J., & Costa, R. D. D. (2011). *Symmetric vs. asymmetric planetary nebulae: morphology and chemical abundances*. Asymmetric Planetary Nebulae V, Jodrell Bank Centre for Astrophysics, Manchester, UK .
- Schwartzman, E., Kovetz, A., Prialnik A. (1994). MNRAS, 269, 323 as cited in José (2012).

For most types of variable stars, one of the most important things to determine is the period. The period is a significant clue to the state of the star and changes in the period yield information as to the evolution of the system; period analysis is therefore a significant part of studying a variable star.

The usual method of period analysis, for most purposes, is Fourier analysis, and most astronomical software uses it, but it has limitations. In particular it can have trouble with sparse data, such as may be produced by astronomical observations when bad weather, stars moving into the day sky, and other interruptions create gaps.

Another method of period analysis is self-correlation. This does not work as well with complete data, but has fewer problems with sparse data. This article looks at a particular self-correlation program, SCS.

Why WINE

Most astronomical software intended for use on personal computers is written to run under Microsoft Windows, because Windows is by far the most common operating system installed on such machines. However there are a significant number of users who prefer other operating systems, such as Apple System X, Linux or BSD. Such users may find that there are many potentially useful programs that are not intended to run on their systems.

There are a number of possible options open to these users. Obviously, if someone can modify the program to run under different operating systems, a process known as porting, this would be ideal. However, porting requires someone with the time and the expertise to do the job, and usually the permission of the original author, which may not always be forthcoming.

Other options include dual boot, and virtual machines. A dual boot machine has both Windows, and the preferred operating system installed on it, and the user selects which to use when starting up. This requires the user to shut down one system to use the other, and a copy of Windows (with a licence) is needed.

A virtual machine is based on software that enables one operating system to run inside another one. It is thus possible to run Windows in a virtual machine on a Linux or BSD system, or run Linux inside a Windows system. This obviates the need to shut down one system to run the other, but there may be a substantial performance cost, and again, Windows and a licence are needed.

Then there is WINE (WINE Is Not an Emulator). All this slightly silly name means is that the parts of the program that do not depend on a particular operating system run normally, but every time the program tries to call the operating system using Windows-specific calls, WINE intercepts the call, translates it into (say) Linux calls, hands them over to Linux to perform, and then translates the responses back into Windows format and returns them to the program. Because the operating system functions are performed by Linux, there is no need for a Windows system or a licence.

WINE is not perfect. Some programs have operating system dependencies other than the system calls. Sometimes these dependencies can be worked round, but not always.

SCS Intro

SCS is a self-correlation program developed by students at the University of Toronto under the direction of Professor John R Percy. For more details, and a download, go to the Web page at <http://www.astro.utoronto.ca/~percy/analysis.html> and scroll down.

SCS is intended to run under Windows, but with a little work can be persuaded to run under WINE on a Linux or BSD system. The rest of this article discusses how well this works.

Input Issues

The SCS program can accept input either as Microsoft Excel spreadsheets, or as text files. Under WINE, the Excel input option (which is the default) does not work. I presume that this is because the program relies on Microsoft Office code libraries, which will not be present, to interpret the files. If this is the case

then Windows users who have not installed Microsoft Office will also have this issue

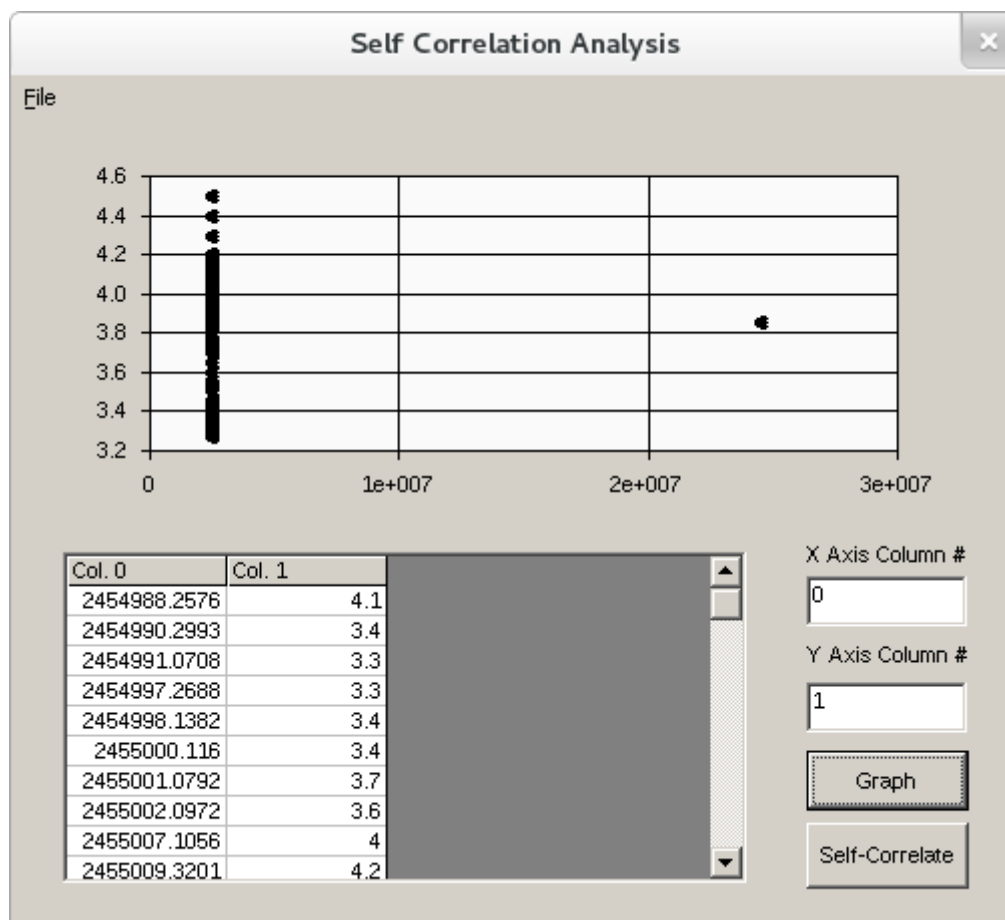
Spreadsheet programs such as Microsoft Excel and LibreOffice Calc can save spreadsheet data as text files if required, and LibreOffice Calc can read Excel spreadsheets, enabling them to be converted to text.

The text input option can be made to work, but requires a little effort. The program expects each line of input to be terminated with both a carriage return and a line feed, as in Windows and its predecessor DOS, and does not separate the lines correctly without them. Unix based systems such as Linux or BSD have just a carriage return, and Apple systems just a line feed. The problem is easily resolved. Some Linux text editors, such as gedit, have as an option saving files with DOS/Windows line ends, or failing that a simple script can add the required characters. Once this is done, the program loads text files without further issues.

Output Issues

The output of the program can be displayed as a graph, and no issues with this display have been found. If required, the graph can then be captured by a screenshot utility for inclusion in a report or paper.

Example:



The program can also save the generated output as a text file for further analysis or input into more sophisticated plotting software. This will have Windows/DOS line endings which again can be converted to standard Linux endings by a sufficiently aware editor, or a small script.

Sample data

The program was tested with a sample data set provided with the program, and with three data sets from visual observation of three bright Cepheids. All three Cepheid sets showed a single well-defined period.

Test System

Testing of SCS was carried out on Fedora 17 Linux, or for the last few tests Fedora 19. WINE was loaded from the standard Fedora repositories.

Cepheids with longer periods - *Glen Schrader & Stan Walker*

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One of the interesting problems with Cepheid periods is the way in which they change. Theory suggests that changes should be a continuous slow process with epochs of maximum light appearing as a parabola in an O-C diagram. The epochs of RY Scorpii, as shown in Figure 1, seem to fit two linear segments with an abrupt change. But others, such as AQ Puppis, do appear to show continuous and often large period changes.

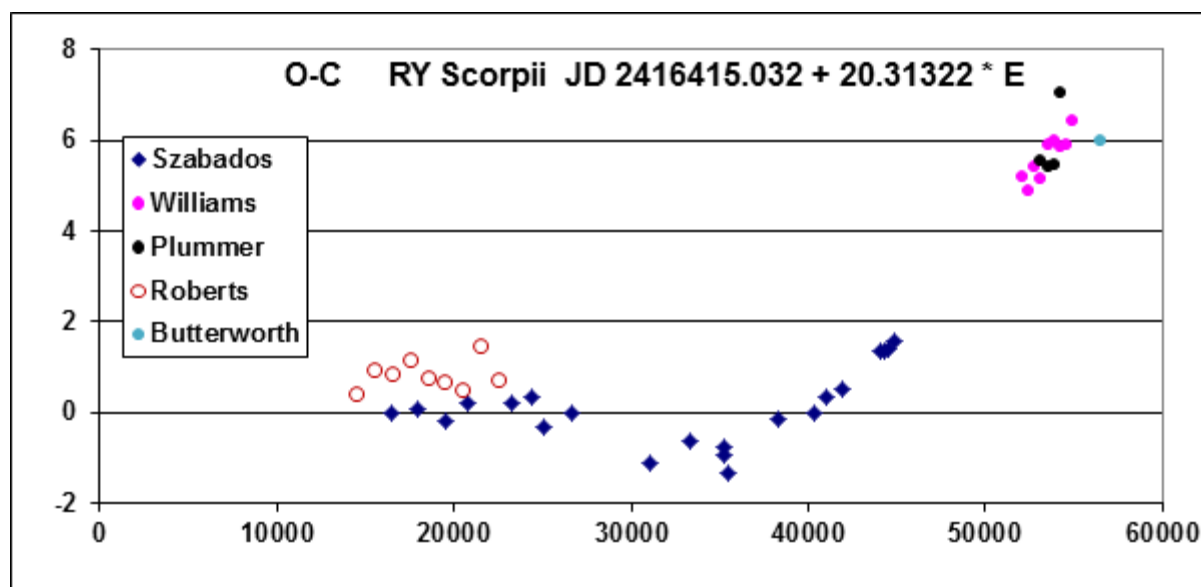


Figure 1. Epochs of maximum from a variety of sources are shown in this graph. They also comprise a mix of visual, photographic and electronic (PEP, CCD, DSLR). Due to differences in the wavelengths measured the visual measures with a Cepheid of this colour show maxima 12-36 hours. This is noticeable in Roberts' visual measure as compared to early blue sensitive photography and again with Butterworth's DSLR photometry as compared to Williams' and Plummer's visual measures. The scales are in days before or after vertically and JD -2400000 horizontally - the normal presentation.

Our determination of epochs has been restricted in the past due to lack of measures to produce mean light curves. But Leonid Berdnikov has sent our group a massive file of measures which are being used to determine these mean curves. As well, as mentioned in the previous Newsletter, Mark Blackford has written an Excel program which determines a master light curve and fits seasonal data to it very quickly. So these provide the 50-80 measures needed for the MLCs and good seasonal epochs can now be produced from 12-15 measures away from maximum or minimum. The table overleaf shows 23 Cepheids with periods in excess of 10 days and maximum in V brighter than 9.0. The asterisk denotes a comment in the GCVS which is normally a variation in period. Rise is the interval in phase - minimum to maximum - expressed as a percentage.

With Puppis and Vela moving toward the west DSLR measures of stars in those constellations could be treated with urgency. To avoid too much duplication could you advise either Glen or Stan on a monthly basis what observations you have made and what other stars are on your list. If anyone can go a bit fainter there are 17 stars of ninth magnitude at maximum. Stars of particular interest shown here are AQ Puppis, I Carinae, RZ Velorum, RS Puppis and YZ Carinae.

RS Puppis is particularly interesting in that there appear to be remnants of gas shells ejected at times in the past. This may be involved in some way with the period changes which are quite large. Since an unexpectedly large percentage of these 23 stars show changes over a century or so others may be expected to undergo similar events in the next decade or two. Before and after colour/spectroscopic measures will be valuable - as they are in the case of the Mira stars BH Crucis and R Centauri.

Star		RA	Dec	Vmax	Vmin			Epoch	Period	Rise	Spectrum
l Car		94514.8	-623028	3.28	4.18	0.9	V	40736.9	35.53584	26	F6Ib-K0Ib
U Car	*	105748.2	-594356	5.72	7.02	1.3	V	37320.055	38.7681	21	F6-G7Iab
Y Oph	*	175238.7	-60837	5.87	6.46	0.59	V	39853.30	17.12413	44	F8Ib-G3Ib
RZ Vel		83701.3	-440653	6.42	7.64	1.22	V	34845.57	20.39824	30	G1Ib-G8
RS Pup	*	81304.2	-343443	6.52	7.67	1.15	V	35734.426	41.3876	24	F9-G7
VY Car	*	104432.7	-573355	6.87	8.05	1.18	V	10009.58	18.99	36	F6-G4Iab-Ib
XX Cen		134018.6	-573647	7.30	8.31	1.01	V	40366.24	10.954348	49	F6-G4(F7/8II)
SW Vel	*	84338.7	-472411	7.44	8.96	1.52	V	40738.24	23.441	15	F8/G0Ib
WZ Sgr	*	181659.7	-190433	7.45	8.63	1.18	V	35506.629	21.849708	31	F8-K1
RY Sco	*	175052.3	-334220	7.51	8.44	0.93	V	28256.45	20.31322	37	F6-G2
X Pup	*	73247.0	-205435	7.82	9.24	1.42	V	41108.8	25.961	15	F6-G2
RY Vel	*	102041.0	-551917	7.86	8.89	1.03	V	44017.94	28.1357	22	F5-G3Ib/II
SV Vel		104456.3	-561722	7.91	9.12	1.21	V	36195.125	14.09707	34	F6-G5II
XZ Car	*	110413.5	-605848	8.05	9.13	1.08	V	36205.754	16.6499	37	K5
AQ Pup	*	75822.1	-290748	8.08	9.39	1.31	V	44676.57	30.104	17	F5Ib-G2Ib
YZ Car	*	102816.8	-592101	8.24	9.08	0.84	V	34907.04	18.1631	41	G5
U Nor	*	154220.9	-551843	8.63	9.83	1.2	V	44788.5	12.64371	46	F6-F8Ib/II-G5
WZ Car	*	105518.7	-605624	8.65	10.01	1.36	V	44143.17	23.0132	17	F8
XX Car	*	105709.2	-650805	8.67	9.89	1.22	V	36221.730	15.71624	33	G0
RU Sct	*	184156.4	-40638	8.82	10.02	1.2	V	31174.67	19.70062	36	F4-G5
XY Car	*	110216.1	-641546	8.82	9.77	0.95	V	36190.230	12.43483	39	G5
VZ Pup	*	73835.2	-282959	8.92	10.35	1.43	V	41121.19	23.171	17	F5-G2
SY Nor	*	155442.8	-543359	8.98	9.94	0.96	V	40737.43	12.6452	35	

Table 1. 23 Cepheids with periods in excess of 10 days and maximum in V brighter than 9.0

AAVSO does not have charts with comparisons for most of these. As well, the magnitudes are quoted to one tenth only which is adequate for Miras but not Cepheids. The best plan is to use planetarium type software like Guide 9 and to use their magnitudes and B-V colours to two decimals. If you wish to use R, it's approximately **0.52 x B-V**, but the amplitudes in R are disappointing. Many of these stars are suitable for visual measures - those with large amplitudes. Some amplitudes may be in error - l Carinae is only 0.7 in V, not the 0.9 of the GCVS. Use the method described by Schrader in various places - select two to four pairs of comparison stars straddling the target star in magnitude and derive a value from each, then average these values.

The spectroscopists might also care to look at some of these stars. Allen's Astrophysical Quantities quotes velocity amplitudes of **Vamplitude(mags) x 54kms** which now seems to be in the amateur, small telescope range. And finally, there will be at least two papers at the RASNZ Conference and VSS Symposium.

R Scuti - RVa - but just exactly what type of variable is it? - Stan Walker

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There was an interesting article in the latest BAA Newsletter about this star by John Toone. In this he urged some electronic measures and some of the DSLR people might add this to their list of targets. A little perusal of the available visual measures is quite fascinating.

The first epoch in the GCVS is JD 2377165 which is 1796. It's one of the few stars where more than 5 digits in the JD have some value. Since then there were 15 different periods recorded by 1985, ranging from 137.4 to 152.5 days. It's an RV Tauri a type - where the 'a' indicates lack of a secondary period, unlike the 'a' of SRa which indicates a quite regular pulsator. The range given is 4.2 to 8.6 and this appears fairly realistic.

Toone's article is titled '*2013 the Year that R Scuti switched to Mira Mode*' and his light curves show a steep rise and slower fall. The periods are rather erratic. RV Tauri stars are described in the GCVS as radially pulsating double wave supergiants with a strong spectral change between maximum and minimum, say F/G to K/M. There are two minima of different depths which may exchange places and periods are from 30-150 days with amplitudes of up to 4 magnitudes.

A quick scan of ASAS data shows a wide variety of shapes. Some resemble the dual Maxima stars with a very shallow second minimum and an almost symmetrical shape, others are just plain messy. But at the brighter limits there is considerable saturation of the detector.

Even more confusing are the measures from the International Database. Figure 1 shows the last 2000 days - Toone's article is based upon the two very deep minima in 2013. Figure 2 overleaf is a 10,000 days sample from JD 2440000 (1968) onward

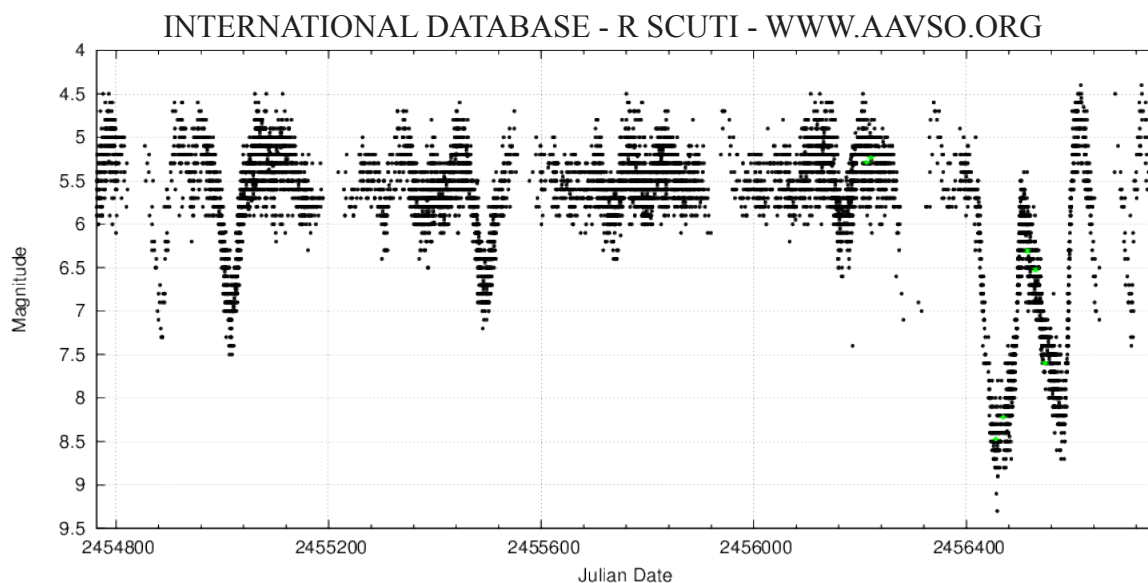


Figure 1. The last 2000 days measures of R Scuti

These almost suggest that R Scuti is better classified as an SRd stars - a semi regular supergiant. My thanks to John for his interesting article - it's well worth reading.

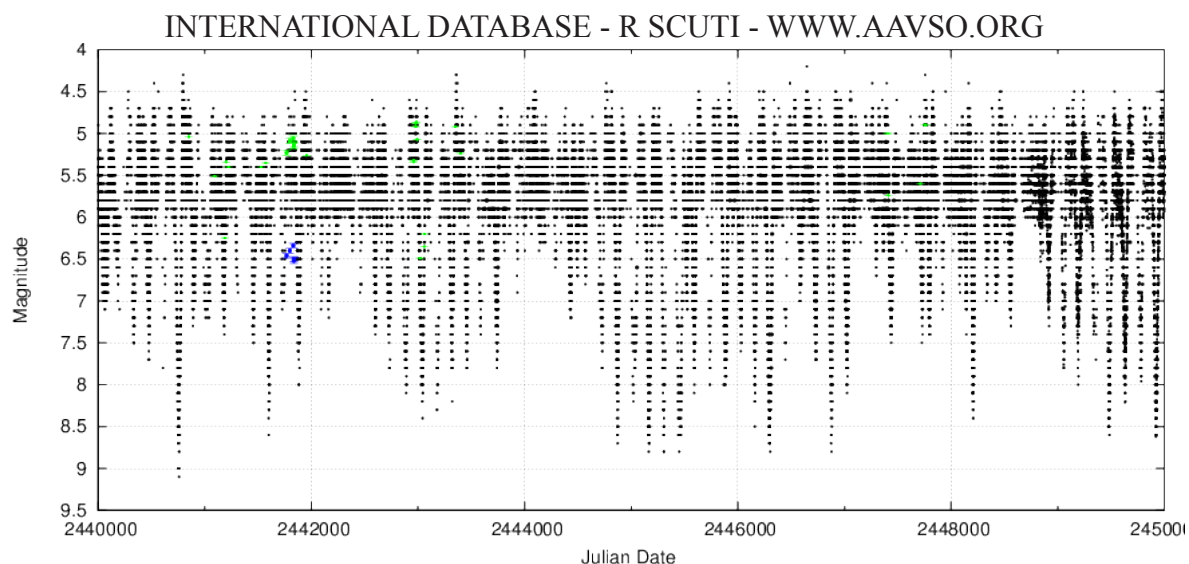
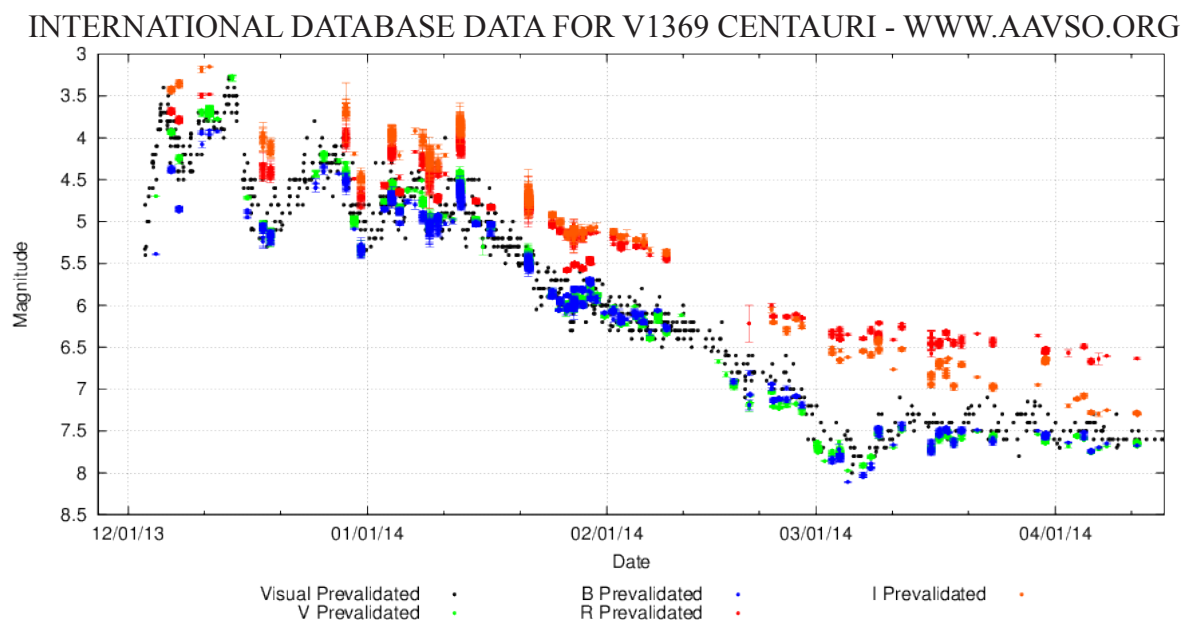


Figure 2. 10,000 days sample from JD 2440000 (1968) onward.

V1369 Cen - a star which continues to surprise us - Stan Walker

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About the best thing to do with this star - apart from observing it as much as possible - is to look at the light curve and wonder. Figure 1 shows BVRI measures up until 15 April, 2014.



The declining light curve reached a minimum about 10 March at about 8.1 visual. It then recovered to about 7.5 where it has remained for 30 days. But if we look at R and I the picture is different. In the near infra-red of I (the orange markers) the decline is still steady but R is more in keeping with the B, V and visual measures. So we're probably seeing the influence of the H alpha emission line still in R. The fading in I indicates less energy in the expanding shell. But why is the visible brightness static?

B and V magnitudes have changed from a moderate equivalent of a late F spectrum star during outburst to a bluer level of mid-A. How do these colours match the spectroscopic results of our members? Hope-

fully they're being presented at NACAA now and again at Whakatane in June. I'd hoped to make UBV measures - which are more suited to hot objects like novae - but the photometer is still undergoing surgery.

At times various members have mentioned oscillations in the light curve. These are hard to understand physically - but now we see a similar pattern in the visual measures. The present level is reminiscent of the Z Camelopardis DNs, or even of the differing levels of the ultra-short period AM CVn objects. But this star was around magnitude 15 prior to the outburst and it's still a thousand times brighter than that.

There will be a discussion at the Third Variable Stars South Symposium in Whakatane in June. We need more material for that. If you're attending and can present measures or comments these will be welcome. But even if you cannot attend a review supported by measures, or a poster paper, would be suitable. Contact me directly about this as Tom will be overseas until about the end of May.

The EB and EW binaries project – Mark Blackford, Tom Richards

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A new project to research very close interacting binaries.

What is this project about?

EBs and EWs are (usually) very close eclipsing binaries, hence with very short periods – usually under two days. The GCVS defines them as follows:

EB – Beta Lyrae-type eclipsing systems. These are eclipsing systems having ellipsoidal components and light curves for which it is impossible to specify the exact times of onset and end of eclipses because of a continuous change of a system's apparent combined brightness between eclipses; secondary minimum is observed in all cases, its depth usually being considerably smaller than that of the primary minimum; periods are mainly longer than 1 day. The components generally belong to early spectral types (B-A). Light amplitudes are usually <2 magnitudes in V. An example EW binary light curve is shown in Figure 1.

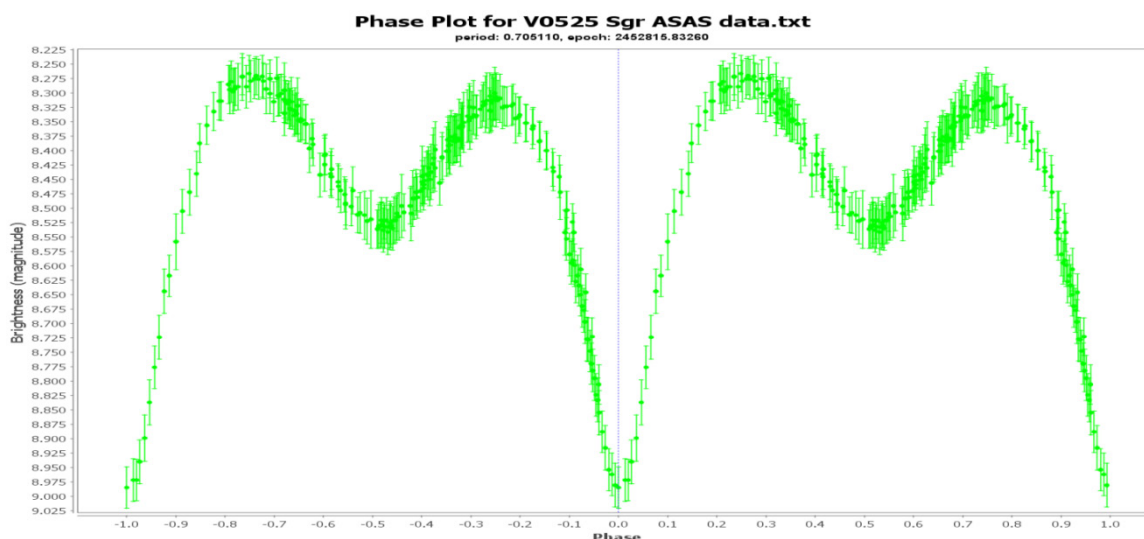


Figure 1. ASAS Light curve of the EB binary V0525 Sgr.

EW – W Ursae Majoris-type eclipsing variables. These are eclipsers with periods shorter than 1 day, consisting of ellipsoidal components almost in contact and having light curves for which it is impossible to specify the exact times of onset and end of eclipses. The depths of the primary and secondary minima are almost equal or differ insignificantly. Light amplitudes are usually <0.8 mag in V. The components

generally belong to spectral types F-G and later. See figure 2 for an example of an EW light curve.

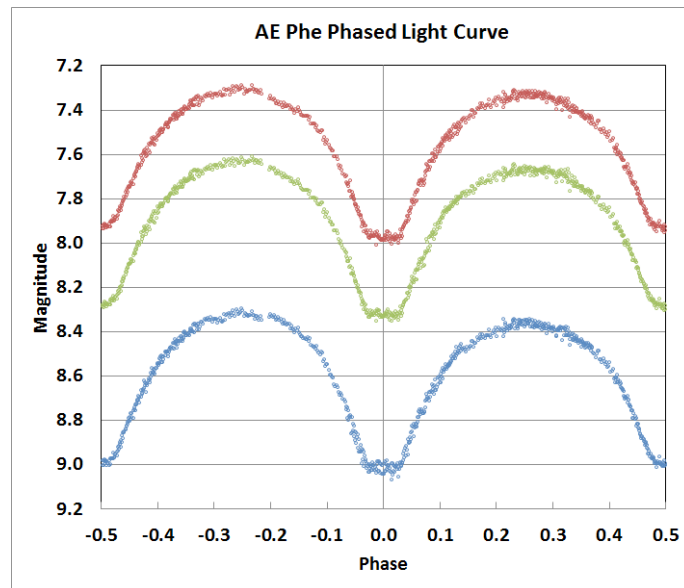


Figure 2. Light curve of the EW binary AE Phe from DSLR observations by Mark Blackford, acquired over two consecutive nights.

Their short periods make them excellent targets for CCD and DSLR observation by doing all-night imaging runs. In the southern hemisphere they have been very poorly observed and we just don't know enough about them.

Binary star systems are as common as single-star systems like the Sun, and the stars in them can act very differently from isolated stars, testing and constraining our theories of stellar origin and evolution. Yet they are not nearly as well understood. In particular, theories of the origin of binary stars have difficulty in accounting for very close binaries such as the EBs and EWs. Maybe they spiralled in towards each other when both were in a primordial dust disc; maybe one reached red-giant phase when they were far apart and enveloped the other causing inward spiralling and other changes.

Moreover our understanding of what happens to the stars when they are this close is not settled. For example, the EWs often have a common gaseous envelope whose photosphere we see. It is thought this common atmosphere may cause them to spiral together and coalesce, but we're not sure what results. See Figure 3.

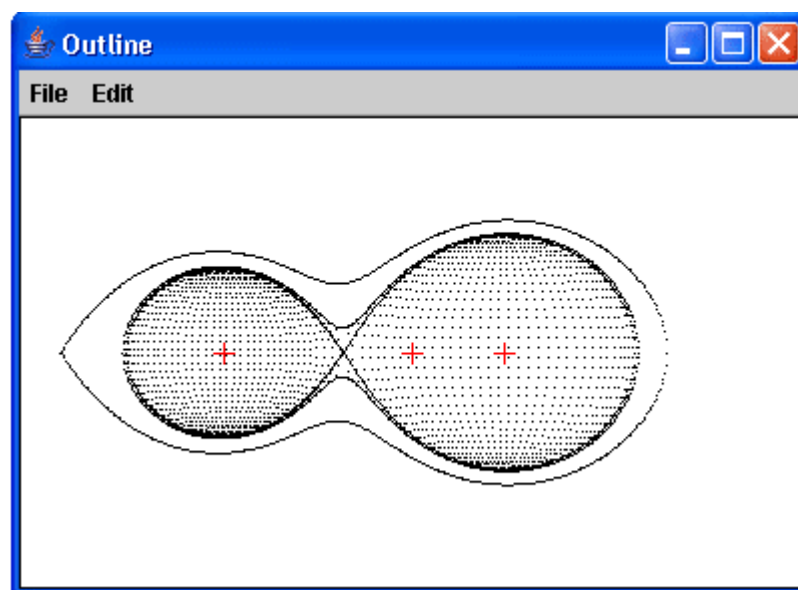


Figure 3. A model of an EW binary constructed from light curve data such as in Figure 2, using BinaryMaker 3.

To shed more light on these problems, more observations are needed, which can be very well done at the amateur level. Indeed, there are few professionals with the telescope time, and grants, to do the rather time-intensive observational work needed.

What are the aims of the project?

The overall aim is to observe and analyse our selected EB and EW targets, leading to publication. Many of the chosen DSLR targets are of particular interest to Ed Budding's group, who will do extended analyses as well as carrying out spectroscopic work.

More specifically the aims are:

- Updating light elements;
- Obtaining transformed light curves in two or more bandpasses;
- Investigating historical period changes (O-C analysis);
- Carrying out astrophysical modelling.

Successful results will be published on the VSS website, and in refereed journals carrying as authors everyone who contributed significantly to the published research.

What equipment do I need?

DSLR cameras will be used on targets brighter than mag 10.0 V, and CCD cameras for fainter objects. Since you will be tracking a target for many hours, you will need a reliable mount and drive. CCD cameras require a telescope of course, but for DSLR work a telephoto lens will usually do. For more on using DSLRs for photometry see <http://www.variablestarssouth.org/information-and-resources/techniques/dslr-photometry-guide>.

You will need to carry out photometry on the images you acquire. Most imaging software contain a photometry package.

How does the project operate?

The project operates entirely online. Aside from the material on the VSS website under Projects > EB and EW Binaries Project, project members have access to two other resources:

- A Dropbox folder containing all observations, analyses, etc. on each target, general material such as articles, and a job sheet in which project members record progress on each target.
- An email forum for open discussion amongst project members.

The first stage of work is for an observer to acquire a long run of images on their selected target, and then carry out photometry on them. When enough photometric data are acquired on a target, you can start the analysis of your photometry, aiming at the goals listed earlier. If you're new to this work, Mark or Tom will assist you.

Results and analyses are all kept online, and you are encouraged to collaborate with other project members, especially for the more advanced analysis stages. Mark or Tom will provide advice along the way.

How do I do the observing and analysis?

This differs somewhat between DSLR and CCD work. But whichever instrument you use, you will be given a target system to observe and you should carry out long imaging runs, preferably all night, until you have covered all phases of its orbit. It is best if only one observer works on each target, to ensure the data all come from one instrument system. This greatly improves the reliability of the data and simplifies a lot of analysis. Use Tom's spreadsheet Orbital Phase Calculator, on the website under Resources > Software and Calculators, to help you get full phase coverage over several nights.

Your best source of information on your target is the AAVSO VSX portal (www.aavso.org), and make use of the External References therein.

When you've done the photometry on your night's work on the target, you'll upload it to the project's Dropbox folder. We'll provide you details on how to do this (it's all in the Project Specs document in the Dropbox). However when you start out in the project, you'll send your data to Mark or Tom as appropriate for comment and advice, after which you'll get access to the Dropbox and egroup.

When you've got enough such observation sets to cover all orbital phases, or three primary minima, you can start analysis. Here's some software we recommend:

PERANSO (www.peranso.com) is a widely used software product to find times of minimum and light elements, and to construct phased light curves out of your observation sets. O-C analysis can be done with a spreadsheet. There are two very good products for astrophysical modelling, BinaryMaker 3 (www.binarymaker.com) and PHOEBE (<http://www.phoebe-project.org/>).

The following is more specific advice for DSLR and CCD work.

DSLR notes (by Mark)

There are two sets of DSLR targets, available on the website under Projects > EB and EW Binaries Project.

Observers should concentrate on the primary DSLR targets as these are of particular interest to Ed Budding's group. However a list of secondary targets has been compiled from the AAVSO Variable Star Index (VSX) for those nights when no primary targets are suitably positioned.

These secondary targets are bright southern EB and EW eclipsing binaries with periods less than 1.5 days, maximum brightness of at least magnitude 10 in V and primary eclipse depths greater than 0.1 magnitude in V. Most have rarely been observed since discovery and have woefully out of date light elements.

Finder charts and recommended Comparison stars have not been provided. To measure Times of Minima untransformed instrumental magnitudes are fine. The observer is free to select Comparison stars suitable for the field of view of their imaging system. I am happy to help with this.

For light curve modelling, however, good comparison star catalogue magnitudes are needed. See below for advice on finding suitable comparison stars. Furthermore, instrumental magnitudes must be corrected for atmospheric extinction and transformed to the standard BVR system.

Traditional methods for accomplishing extinction correction and transformation are well covered in the literature and require calibration images of different fields to be acquired in addition to the target star images. To avoid this added complication I've developed an Excel spreadsheet which performs extinction correction and transformation using only a time series of the target field. It's based on the Citizen Sky Intermediate Spreadsheet (CSIS, <http://www.citizensky.org/content/calibration-intermediate>) which processes a single observation at a time. My CSIS2 spreadsheet uses macros to process any number of observations. This spreadsheet and a user guide are on the website at Resources > Software and Calculators.

CSIS2 requires an ensemble of 6 comparison stars which you need to identify within your DSLR field of view. These comparison stars must be non-variable, well separated from nearby stars, have similar brightness to the target and have well-known catalogue magnitudes. Planetarium software is invaluable for this selection process.

Since our targets are relatively bright the Tycho 2 photometric database is a suitable source of catalogue magnitudes for comparison stars. The database contains standard B and V magnitudes derived from Tycho B_t and V_t magnitudes. The planetarium software Guide9 provides these values along with a wealth of information on the bright stars suitable for DSLR photometry. Other planetarium software may also be suitable. The AAVSO SeqPlot application (<http://www.aavso.org/seqplot>) is another excellent source of catalogue magnitudes.

Catalogue V-R colour is not included in the Tycho 2 database (or elsewhere generally) but can be estimated from the B-V colour index and luminosity class of the star using equations from Caldwell et al. 1993, SAAO Circulars, 15, 1-29 (see figure 4). The CSIS2 spreadsheet includes a worksheet with this calculation. Spectral type and luminosity class can be found in Guide9 or the SIMBAD database.

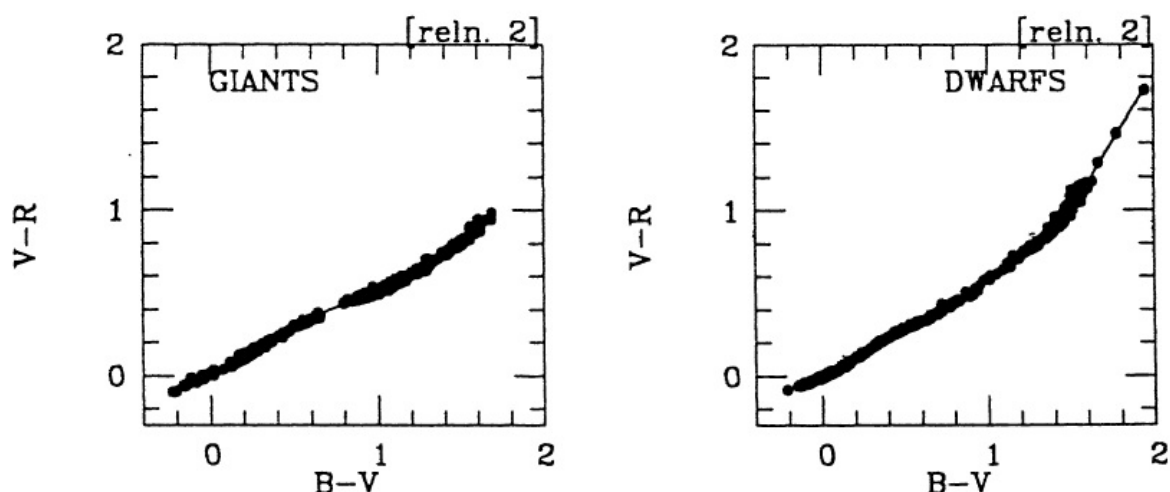


Figure 4. Relationship of $V-R$ and $B-V$ colour indices for giant (left) and Dwarf (right) stars. From Caldwell et al. 1993, *SAAO Circulars*, 15, 1-29.

CCD Notes (by Tom)

Most of what Mark said above about DSLR work applies here too, but we don't need to worry about extinction because of the small field size of a CCD camera, and provided you choose comparison stars of about the same colour index as the target.

In the interests of not scattering our efforts too widely, I have a short list of interesting southern EBs and EWs. Contact me and I'll assign you one suitably positioned for the current time of year. This will be "your" star, you will collect all the observational data on it. When done with that one, contact me again for another.

Observations must be carried out using Johnson-Cousins filters, and you need to have the transformation coefficients for your filters. The only exception to this is if you're simply aiming to capture minima times. But even then it's a pity not to be able to use that data for later analysis tasks, so use filters anyway and transform the data later if you haven't yet acquired your transformation coefficients.

Ideally you will observe in B, V and Ic; if necessary V and one of the other two. You might find, for example, that B integrations take too long for late-type targets, so use V and Ic; and just B and V for early-type targets. It's best to obtain a dense V data set, with the other filter being used less often. For example you might repeat VVVVB or VVVBVVV_{Ic}. Then use the V series to measure minima times.

That's all...

Now all you have to do is contact Mark (DSLR) or Tom (CCD) and you can start on the next clear night – and make a serious contribution to the astrophysics of close binary stars. Enjoy.

Software Watch

Starry Night version 7 — was released at the beginning of April - at long last. It's been 5 years since the last update and many have been thinking that the owners had abandoned it. Not so.

Only the standard version was made available initially and judging by the comments on the Starry Night Yahoo group it is still a work very much in progress. Updates are being released weekly and it is plainly obvious that the original release was a beta version.

There are versions for Mac (OS X 10.7 or later) and Windows (Vista or later) but it is not compatible with Win XP. UPDATE: Pro Plus V7.0.2 is now available for download but be warned it is a 2.6GB file. An option to have DVDs mailed is available. See www.starrynight.com

MaxIm version 6 — is still coming, real soon now.

ASCOM v6.1 — was released on 5 March 2014. If you are using a 64-bit system you should download this latest version. Do make sure you have Microsoft's .NET Framework enabled before using the ASCOM package.

From the website "*The current generation of the ASCOM Platform provides compatibility with Windows 7 and Windows 8 enhanced security and 64-bit systems, greatly expanded support for .NET languages, some new device interfaces, and even more support for both drivers and astronomy applications. It contains new simulators, updated Visual Studio driver templates, and much more. This huge project was first released in June 2011, and is now the standard for general use. Updates are provided as needed.*"

Good news for those using **The Sky X Pro**. As of September last year The Sky X Pro incorporates **ASCOM** compatibility as standard for mounts, cameras, domes, rotators, filter wheels and focusers. For more information see <http://ascom-standards.org/FAQs/TheSky.htm>.

Publication Watch

Following on from Tom and Mark's article on contact binaries, our friends in Russia have been looking at EW binaries in the Catalina Sky Survey. From their bulletin (<http://www.vs-compas.belastro.net/bulletin/issue/2/p6>):

Twenty New W Ursae Majoris-type Eclipsing Binaries from the Catalina Sky Survey by Stefan Hummerich, Klaus Bernhard, Gregor Srdoc in September-October 2013 (#2)

Abstract: *A short overview of eclipsing binary stars and their traditional classification scheme is given, which concentrates on W Ursae Majoris (WUMa)-type systems. Details for 20 new WUMa systems are presented, along with a preliminary model of the totally eclipsing system GSC 03090-00153, which was computed using Binary Maker 3.*

If you are interested in some technical aspects of modelling W UMa binaries this article (http://www.scielo.org.za/scielo.php?pid=S0038-23532009000200013&script=sci_arttext&tlng=es) may help:

Modelling of W UMa-type variable stars by P.L. Skelton; D.P. Smits

S. Afr. j. sci. vol.105 no.3-4 Pretoria Mar./Apr. 2009

Abstract — *W Ursae Majoris (W UMa)-type variable stars are over-contact eclipsing binary stars. To understand how these systems form and evolve requires observations spanning many years, followed by detailed models of as many of them as possible. The All Sky Automated Survey (ASAS) has an extensive database of these stars. Using the ASAS V band photometric data, models of W UMa-type stars are being created to determine the parameters of these stars. This paper discusses the classification of eclipsing binary stars, the methods used to model them as well as the results of the modelling of ASAS 120036–3915.6, an over-contact eclipsing binary star that appears to be changing its period.*"

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.VariableStars-South.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. There is no annual subscription but donations would be gratefully received. 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 and wish to make a donation 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 January, April, July and October, 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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