



Roger Butland and Ed Budding with their schematic model of the semi-detached binary $\mu 1$ Scorpii (false colours) which featured in a poster paper at VSSS3

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From the Director – *Tom Richards*

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VSSS3 pushes research forward

For quality of presentations, excitement over progress, and enthusiastic level of audience participation, it would be hard to beat the third VSS symposium. Held over a day and an evening in Whakatane this June, it had a record 36 attendees and 10 presentations. In addition there were quite a few papers in the preceding RASNZ conference of interest to variable star people.

Some papers were reviews, such as Stan Walker's on measuring the stars, Stephen Hovell's on cataclysmic variables, and mine (to RASNZ) on close binary evolution. Others presented ongoing research – Margaret Streamer and David Moriarty on the Southern Eclipsing Binary Programme (EAs), Stan's on V1367 Cen (Nova Cen 2013) and Alan Baldwin's on Crux cepheids. Mark Blackford gave a thorough workshop on DSLRs in variables research. Two new projects were presented – Aline & John Homes on semi-regulars, and Mark and myself of EB and EW eclipsers. I gave a brief presentation on how to use CCDs for snapshot work (aimed at the new semi-regulars project in particular, but also any long-period variable studies).

I withdrew a brief paper on a problem I'd found in obtaining transformation coefficients because David Moriarty at lunch-time thought he'd found a spreadsheet error in the work. (It wasn't relevant, and I'll aim to publish about this in the next Newsletter instead).

At the end we all discussed where to go from here. Two topics emerged – Eta Carinae and visual observing. Eta Car is an important target of opportunity right now and for the next few months as its companion reaches periastron and, if the past is any guide, excites bright activity (it's already brightened). See about this in From the Director in the last Newsletter. In addition Bill Allen (whallen@xtra.co.nz) has kindly agreed to coordinate work and advise on this event. Please contact him if interested. On visual observing, a number of participants stressed the need for more of this activity and better outreach to clubs and societies to encourage it.

Alan Baldwin, with the help of John Homes, kindly agreed to act as recorder for the meeting. Their summaries will be in this Newsletter, together with some of the presentations. Others are more suited for the website and will appear there.

Thanks are due to the Whakatane Astronomical Society for their smooth organisation, but particularly to Stan Walker who effectively set up the whole event, from trawling for presenters to preparing an excellent programme booklet.



Impressions of Whakatane conference – *Stan Walker*

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Let's begin by saying this was a very interesting conference - probably one of the most enjoyable I've attended. The main RASNZ Annual Conference was disappointing in that the professional involvement was not strong, but that is a reflection of the New Zealand scene generally. Still, there were interesting presentations from Dennis Sullivan and Phil Yock, with several others, but the amateur presentations were good and on a wide variety of topics. These made the event quite memorable.

The VSSS3 Symposium was our best yet, with three dozen people there, and extending over the Sunday evening and all Monday. Whakatane is a small town and many people walked between the motels and the venues, although on the Sunday evening the local organising committee provided transport to and from the Whakatane Observatory. Luckily the storm which battered Northland did not arrive until Monday

evening, but it was a long, wet drive from Whakatane to Auckland on Tuesday.

It was a distinct pleasure to finally meet Mark Blackford on Friday morning after checking with Nichola Van Der Aa, our local liaison and secretary of the local society, that everything for the event was under control. We ran through some of the things we've been doing courtesy of emails, then later I met Margaret Streamer and David Moriarty, also from Australia and as Mark, Bob Evans and I were leaving for dinner on Friday Tom Richards came through the motel car park gate so an interesting discussion took place over dinner.

Tom and I had agreed to start the symposium earlier - who wants to be in a strange town on a Sunday evening with nothing much to do - so Nichola had offered us the use of the Whakatane Observatory on the Sunday evening. This was a friendlier place than the REAP complex where the main event took place. A bit crowded, but good 'audience' participation and a flying start to things.

I missed most of the Sunday morning RASNZ conference as I had to set up the REAP Centre rooms with Nichola. A few panels of poster papers on the walls, the full April Newsletter to show what we did for non-members and the place looked almost astronomical.

It was pleasing that the presentations fell into groups. Eclipsing binaries led off with Tom and Mark, Margaret and David, then the second session on DSLR photometry with Mark again, followed by Aline Homes' discussion of a DSLR and CCD a project on semiregulars, which is an ideal target for DSLR cameras.

Margaret and David discussed progress in the Southern Eclipsing Binaries project which studies EAs; and Mark and Tom introduced a new project on EB and EW binaries. These binaries are an interesting area and the results are quite impressive - even the by-products such as delta Scutis in binaries - but one can't look at everything. Mark has embarrassed me into finally deciding to brave the cold nights and get the DSLR system up and running and I'm familiar with many of Aline's targets.

After lunch the session began with Tom speaking about CCD snapshots. One area where these could provide valuable information is in CV monitoring - one image per star each fine night - and Stephen Hovell's presentation covered this field from a visual aspect, whilst drawing attention to the decline in the number of visual measures and observers generally. This led into a discussion of Nova Centauri 2013, possibly the most interesting astronomical event last year - a rather puzzling object. I discussed that, using material from Brian Warner's 1995 review of CVs in general and an interesting compilation by Carl Knight who could not attend our symposium. Almost all of our studies of nova are a mere record of what has happened after the event - not what led to its happening and what the system looked like beforehand. To understand this we need more of the type of observations that Stephen mentioned. Time series photometry of the type espoused by CBA is often more immediately rewarding but has all the innovative amateur-suitable work in that area already been done?

The final session went back to the visual theme. Alan Baldwin made a late offer of a paper which was substituted for the paper 'Seven Cepheids in Crux'. For every minute of a presentation it takes one or more hours of preparation and I was struggling - so a real gift. Alan's presentation covered some of the more well-known LPVs and an R CrB star, S Apodis, which many of us remember as an old friend. Very interesting and, after a brief discussion of targets for 2014, eta Carinae being the one identified, the final session turned back to a discussion of visual and other non-TSP observing.

A great conference which concluded with many there discussing when and where another similar event could be held. This latter a real vote of confidence.

Stan Walker

I was a visual variable star observer for several years, and then in 1968 introduced photoelectric photometry (PEP) to Auckland, with help from Brian Marino and others. Until 1990 Brian and I directed research at the Auckland Observatory, following which I collaborated with Harry Williams in PEP. After shifting to the Far North (north of Kaitia) I did CCD photometry with Joe Patterson's CBA group until about 2005. I was a joint director of the RASNZ Photometry Section which had a dozen or so active members and helped set up the successful series of PEP Pro-Am Conferences from 1976 to 2002. Today I spend most time analysing other observers' data. Responsible for the VSS Cepheid Project.

An update on the bright Cepheid project – Stan Walker

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At the RASNZ annual conference I presented a paper on Cepheids, largely based on the article in our April, 2014, Newsletter. In preparing this I considered the whole project at length and have some suggestions, in part based upon a note from Doug Welch of McMaster University in Canada:

“A few comments, some of which I am certain that you already appreciate:

- *the 10+ day Cepheids are certainly the ones most likely to show secular evolution of their periods in reasonable amounts of time and all observations are welcome and well-motivated scientifically.*
- *In the past, the time of maximum always seemed to be the goal. I would say that a more modern, mature goal would be a complete lightcurve at a given epoch.*
- *My feeling is that DSLRs are best used with lenses/telephotos instead of a telescope. The pixel size for the detectors is so small that it is almost always the best advice to defocus slightly to spread the light over a number of pixels - and more importantly - a number of distinct Bayer cells and then increase the exposure to get good signal-to-noise in the de-focused images.*
- *Southern bright Cepheids have been under-observed historically. The highest value would be from a programme that intends to keep observing them methodically for decade-long timescales, even if the number of observations per week is not large.”*



Stan Walker. Photo by Roger Butland

This suggests a project rather like the Dual Maxima Miras where we're keeping a watch out for period changes by measuring epochs of maximum, but hope to produce a full colour light curve at intervals. This latter is a DSLR or CCD target in as much of BVRI as possible, but the seasonal epochs may be a suitable visual target.

There were 21 stars in the list included in April. Of these 17 have amplitudes of one magnitude or more, up to 1.51. In intensities this is a range of 2.5 to 4.0, rather better than I Carinae's 1.95 or so. So once the basic colour curve is established for an epoch can we leave the coverage of some of these stars to the visual observers, preferably using Schrader's method of several comparison sets and an average?

Some stars deserve continued DSLR coverage. U Carinae and I Carinae show a strong possibility of a decade-long oscillation. So good V epochs are needed. Since these stars are close to circumpolar for some observers maybe we can get two epochs a season and be clearer about what they're doing.

Since we're about half way through the Cepheid season not all the listed stars are suitable for a visual project. Four look useful targets - XX Cen, WZ Sgr, U Nor and RU Sct. Others might be appropriate for more southern observers. XX Cen is a bit marginal - amplitude barely adequate and period rather short. One good measure any clear night is recommended - they

don't change that quickly. The observing method should be that recommended by Glen Schrader, several separate estimates with different pairs of comparisons, closely straddling the variable in magnitude, then the average calculated.

For these four stars I can supply charts with comparisons and magnitudes (to two decimal points) taken from Guide 9. For other stars I'd suggest using Guide or any similar planetarium software to make charts and insert comparison star magnitudes (using Publisher or some other software with text boxes). I've tried the AAVSO charts but they're designed for Miras with five to ten times the amplitude and are not really suitable. Some stars are not suited visually - I Carinae is one, U Carinae lacks suitable comparisons. This lack of comparisons affects most of the very bright objects.

In the listed stars I notice that many do not fit any period/amplitude relationship all that well. Since I Carinae's amplitude is ~0.7, rather than the 0.9 quoted in the GCVS, it would be interesting to check the literature for published measures and see how these compare.

For visual observers this is a binocular/deck chair or recliner project with a sidetable to hold the notes and charts. Use local time and convert to JD - not HJD - and plot your results in Excel using the epoch and period from the list. Keep me up to date each week if you become involved.

Southern semi-regular variables – a chance for new science?

Aline M Homes

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Abstract. In this paper we announce a new VSS project to study selected southern semi-regular variables. They are a numerous but neglected class that has largely been the province of visual observers. There is little photometric data available. Some do not appear to have been studied since they were discovered. The proposed project aims to fill this gap.

In the initial stages, attention will be focused on stars with periods of less than 90 days with the addition of one or two longer-period stars that appear to be undergoing changes. Seasonal lists will include targets suitable for both visual observers and DSLR and CCD photometry. There is also scope for determining spectral variations over the course of a cycle.

Introduction

Semi regular variables are evolved red giants or supergiants with pulsation patterns that, while showing some regularity, are not as predictable as Cepheids or Miras. They have mainly K, M or C-type spectra, with a handful of other classes, relatively low amplitudes and periods of tens to thousands of days. Some may show emission lines. Four main classes are recognised in the General Catalogue of Variable Stars (GCVS), which also publishes a fifth list of semi-regulars of uncertain type.

The most numerous are Class A stars (SRA) – giants or supergiants which show small amplitude variations

Aline Homes

I was born in England and moved to New Zealand in 1967. I have an honours degree in botany from Queen Mary, University of London and a PhD in geology from Victoria University of Wellington. During my career I have had a greater range of jobs than any sane person would contemplate. After retiring, I went back to work and am now an Adjunct Research Associate in the School of Geography, Environmental and Earth Sciences, Victoria University, specialising in palaeobotany.

My interest in science was fostered by my father, and my earliest memories of astronomy are looking at the moon through my grandfather's naval telescope steadied on the back of a chair. Patrick Moore's "Sky at Night" was essential viewing for the whole family, as were natural history and other science-based programmes.

I have been stargazing on and off ever since and joined the Wellington Astronomical Society after buying my first serious astronomical telescope. I have been a member of VSS since 2009.

(<2.5 magnitudes), persistent periodicity and variable light curves with periods of 35-1200 days. They are very similar to Miras and are essentially Mira-type stars pulsing in an overtone.

The second most numerous class are Type B stars (SRB). These are mainly giants with poorly-defined periods of between 20-2300 days, or with alternating intervals of periodic and slow, irregular changes or stillstands. There are two or more periods of variability.

Type C semi-regulars (SRC) are the smallest category. They are red supergiants only a few million years old with periods of from 30 to several thousand days and amplitudes of about 1 magnitude, and are considered to be Type II supernova candidates. The final class, D (SRD) are quite different. They are mainly giants or supergiants of F, G or K spectral type, sometimes with emission lines, amplitudes of 0.1-4 magnitudes and periods of 30-1100 days. They differ from Cepheids in their irregular pulsations.

Semi-regular variables are a neglected area, particularly southern hemisphere SRs. A brief survey conducted in the preparation of this project shows that very little has been reported to AAVSO in recent years. Little photometry has been done on these stars and most of the reported work is by visual observers. Some of this is sporadic. Many stars do not appear to have been studied since discovery and quite a large number have no reported period. The field is ripe for investigation.



Aline Homes. Photo by Roger Butland

Project aims

The primary aim of the project is to observe and analyse the variability of selected southern SRs and publish the results. Specifically, the project aims to:

- Obtain or improve light curves for the selected targets.
- Observe and investigate stars that are suspected of, or known to be, undergoing changes.
- Analyse data for multiple periods.
- Determine whether some of these stars have been misclassified.
- Generally improve our knowledge of these objects.
- Publish the results on the VSS website and in peer-reviewed journals.

Supplementary aims could include investigating colour/spectroscopic changes during a pulsation cycle and obtaining light curves and periods for stars with no published period. Other goals may be defined as the project proceeds.

The targets

To begin with, attention will concentrate on southern hemisphere SRs with periods less than 90 days and magnitudes at minimum brighter than about 13. This will ensure that participants do not have to wait too long to see results. There will be targets suitable for visual observers, and those using DSLR and

CCD cameras. New seasonal lists will be issued every two to three months to ensure continuity. Each list will contain roughly 20 short-period semi-regulars plus one or two extra targets, either semi-regulars with no published period or stars that are known or suspected to be changing.

What will be expected?

- Visual, DSLR and CCD observations of between 1 and 4 stars per seasonal list.
- DSLR observations on targets brighter than 10 in V, CCD observations on the fainter targets
- Visual observers are encouraged to observe very bright (>4.5) targets.
- Observations in V only will be acceptable.
- Choose your targets and comparison stars to suit your site and equipment.
- “Snapshot” observations ie a short bracket of frames, not extended time-series.
- 1 set of observations once a week, more often for really short periods, less often for very long.
- Reduce your data and submit your observed/instrumental magnitudes for further analysis.
- There is scope for spectroscopic analysis of some of these stars.

This is a good project for those who want to get involved in a project but have only limited time as a set of observations can be completed in an hour or so. The relatively long periods of many of the targets means that the odd cloudy night will not make a critical difference. Periods will be analysed using Percy’s self-correlation algorithm rather than Peranso, as this accommodates sporadic data better.

Project organisation

The project co-ordinators are Aline and John Homes. The project will operate entirely online. A new project area will be set up on the VSS website which will contain further details, target lists, a dropbox for data, a discussion forum and other areas as appropriate. It is anticipated that the project will evolve as it goes along. This is a neglected area, and who knows what we might find.

If you wish to participate, either as an observer or an analyst, contact Aline at either of the e-mail addresses for further information.

Possible outcomes

At the very least, we will obtain updated light curves and periods for an under-observed group of objects. For the few for which extensive data is available we may detect changes. Further analysis may show up multiple periods or pulsation modes which could lead to insights into the mechanisms driving the pulsations.

Potential problems

- Reddened objects which may vary through a cycle.
- Choice of suitable comparison stars
- Saturation, particularly of the brighter stars
- Correlating results from visual, DSLR and CCD observations
- Variations of output between software packages.
- Other.

Discussions and comments on the project will be welcomed

The EB and EW binaries project

This new project, headed by Mark Blackford, was described at length in VSS Newsletter 2014-2. A brief summary by *Alan Baldwin* follows, but please refer to Newsletter article and VSS website for details.

The type of eclipsing binaries for study are:

(i) EB (β Lyrae) type, having periods ~ 1 day with eclipses of differing depths eg Fig 1.

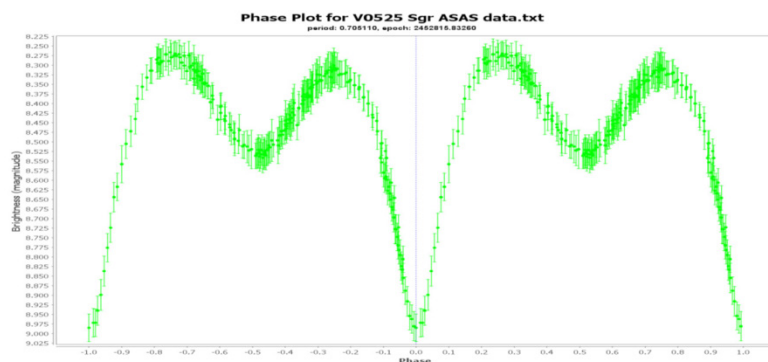


Figure 1. *EB (β Lyrae) type - ASAS light curve of the EB binary V0525 Sgr*

(ii) EW (W Ursae Majoris) type having periods ~ 0.5 day with eclipses of similar depths eg Fig 2.

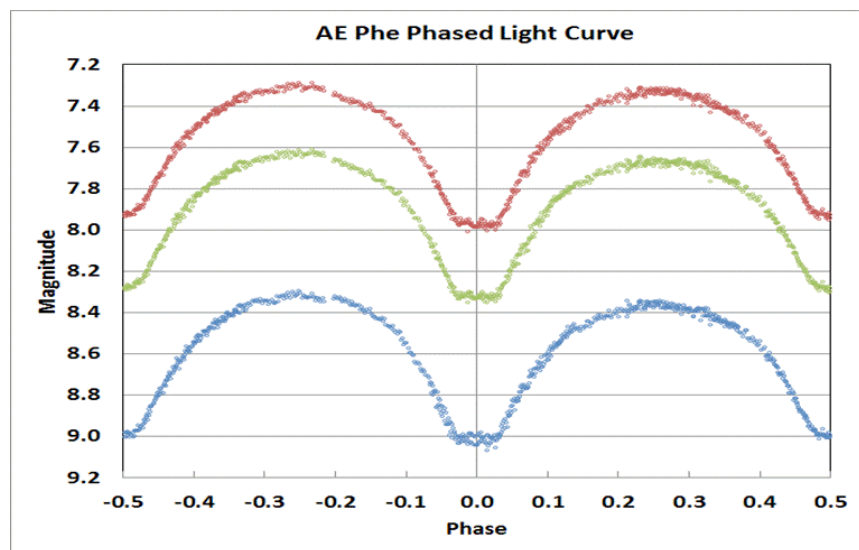


Figure 2. *EW (W Ursae Majoris) type - DSLR light curves of AE Phe by Mark Blackford.*

Southern EBs and EWs generally have rarely been observed since discovery and have woefully out of date light elements. They are ideal for time series observation using CCD (stars dimmer than V mag 10) and DSLR (stars brighter than V mag 10).

There are currently 16 primary DSLR targets (see Table 1 below) of specific interest to Ed Budding's group. Secondary DSLR targets are listed on the VSS website and were compiled from the AAVSO VSX database (southern declinations, period < 1.5 d, maximum mag at least 10 in V, primary depth at least 0.1 mag).

Tom will allocate CCD targets based on observer's equipment and experience.

Project objectives are:

- Update the light elements of the selected star.
- Obtain complete transformed light curves in two or more band-passes.
- Investigate historical period changes (ie an O-C analysis)
- Undertake astrophysical modelling.

- Publish results.

To work successfully in the EB project, this is what is required:

- A reliable mount, polar aligned, and driven
- CCD + telescope, or DSLR + lens
- Software for:
 - Image acquisition (eg BackyardEOS, EOS Utility, MaxIm DL).
 - Photometric measurement and analysis\ transformation (eg AIP4Win, MaxIm DL, Excel).
- Time of minimum determination (eg Minima, Peranso).
- Astrophysical modelling (e.g. BinaryMaker 3, PHOEBE) eg Fig 3.

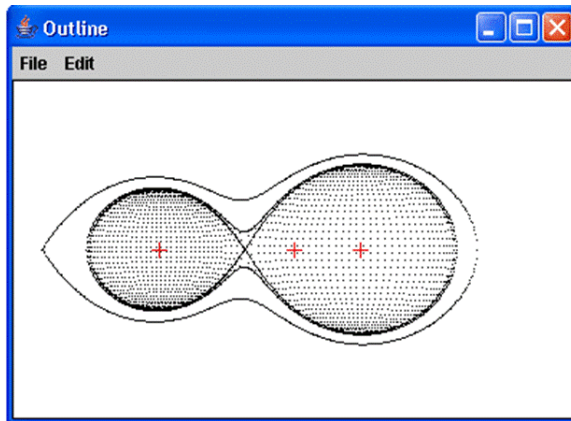


Figure 3. A BinaryMaker 3 model of an EW binary.



Mark Blackford. Photo by Roger Butland

Mark Blackford

I've been a visual deep sky observer for over 40 years. The second Variable Stars South Symposium in 2010 during the Canberra NACAA got me interested in variable star science, in particular Cepheid and eclipsing binary variables. I am actively involved with developing the techniques of DSLR photometry including contributing to the AAVSO DSLR Observing Manual. I coordinate the DSLR aspects of several Variable Stars South observing projects.

Joining the project

These are the steps required if you wish to join the project. Read all about it on the website and download the Excel files. For DSLR work email Mark (m.blackford@optusnet.com.au) for DSLR work & advice, including target selection. Email Tom (tomprettyhill@gmail.com) for CCD work. Remember, the project is aimed at short periods so it should generate fast results, fast throughput and high satisfaction!

Discussion following VSSS3 presentation

On the question of the number of comparison stars to use Mark said he prefers to use an “ensemble” of 6 comparison stars scattered across the field. These are required for extinction correction and transformation when using the recommended analysis spreadsheet.

On the other hand Tom prefers one comparison star which makes it easier if the catalogue magnitude is changed and a re-calibration is required.

Tom commented that observers should avoid targets with periods near one day as they will be in synchronisation with our day/night cycle. It can then be very difficult to observe the complete light curve in a reasonable period of time from one location. Tom has had a frustrating experience with this phenomenon. Observers at widely different longitudes are needed to fill in the gaps.

Simon Lowther asked if there is difficulty with accuracy ie in comparing data between different observers to which Mark replied that even transformed magnitudes from different observers may not line up. This is why the complete light curves should be recorded by the one observer.

Table 1 List of primary DSLR targets

Name	Const	Type	Max	Min (Pri)	depth (Pri)	Period (d)
V822	Aql	EB/DM	6.87	7.44	0.57	5.2950620
QZ	Car	EB	6.16	6.49	0.33	5.9985
V454	Car	EB	6.92	7.10	0.18	0.980417
V462	Car	EB	6.68	6.84	0.16	1.105686
V486	Car	EB	6.31	6.45	0.14	1.093893
V716	Cen	EB/KE	5.96	6.52	0.56	1.4900943
V964	Cen	EB	5.40	5.44	0.04	1.54259
AA	Cet	EW/KE	6.20	6.75	0.55	0.536168
tau	CMa	EB	4.32	4.37	0.05	1.28214
GG	Lup	EB/DM	5.49	6.00	0.51	1.8496224
V727	Mon	EB	7.88	7.99	0.11	0.798478
AE	Pic	EB	6.09	6.14	0.05	2.98179
PU	Pup	EB	4.69	4.75	0.06	2.58232
V410	Pup	EB	6.69	6.74	0.05	0.876165
mu1	Sco	EB/SD	2.94	3.22	0.28	1.44627
V356	Vel	EB	6.73	6.87	0.14	1.76791

Choosing the first target in the EB/EW CCD project – *Tom Richards*

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MR Apodis – a short period bright EB

It was good to announce the EB/EW Eclipsing Binary Project at VSSS3; but it meant that as leader of the CCD side of the project, I'd better set a good example and start observing. The DSLR side under Mark Blackford is already well under way, linking in with Ed Budding's spectroscopy work at Mt John; so some catch-up is needed.

I'm starting with MR Aps (J2000 RA 17 07 57.54, Dec -73 43 35.4). Dear reader, I'll wager that like me you've never studied anything in the circumpolar constellation of the Bee. So why did I choose this? For a start the RA band of 17 hours is well placed for all-night observing right now. Secondly, avoiding the dense 17 h band of the Milky Way from Ophiuchus to Triangulum Australe meant going further south. Apus was the only choice.

There are a few EBs listed by the GCVS in Apus – usually discovered long ago then forgotten. So the constellation is ripe for picking. I chose MR because its period of 0.5279(9) days as determined by INTEGRAL makes it short enough to get just about a complete light curve on a long winter's night – but bad aliasing if I don't! And it's bright at 10.6-11.1 V (again, INTEGRAL). Tycho-2 records B-V=0.437, and there are four other stars in the CCD field with similar V and B-V mags, so there's no difficulty in choosing reference stars, but I must look out for possible variability in them.

MR Aps is listed as an EB – ellipsoidal stars giving rise to smoothly varying light curves with unequal minima (see Fig 1). The only previous work on this star I can find are three minima timings listed in the O-C Gateway, scarcely enough to pin down period change. But my aim (as required by the project's spec-

ifications) is to obtain transformed light curves in B, V and Ic, as the data for astrophysical modelling.

It's always a good idea to have radial velocity spectra for orbital parameters in the astrophysical modelling process, but fairy godmothers don't provide telescopes of sufficient aperture to amateurs. Anyway with some safe assumptions you can do without. Even further, Zasche has shown in a series of papers in *New Astronomy* (starting at 14 (2009) 129) it is possible to use just the untransformed INTEGRAL/OMC V data (available from <http://sdc.cab.inta-csic.es/omc/var/>), with some reasonable assumptions, to deduce the inclination, mass ratio, omega potentials (measuring extent of fillout of the critical Roche Lobe), relative temperatures luminosities and radii, and some other parameters. However with good B, V and Ic data (INTEGRAL's V data and that from ASAS3 are a bit noisy), plus a good spectrum and classification if someone with a spectroscope would oblige, much more thorough modelling can be attempted. Zasche incidentally used PHOEBE (see Prša, A., Zwitter, T., 2005. ApJ 628, 426. and <http://phoebe-project.org/>).

So I'm using MR Aps as a proof-of-concept, both of the EB/EW Project plan, and of obtaining valuable astrophysical modelling in this way. I'll report back later!

The first INTEGRAL-OMC Catalogue of optically variable sources

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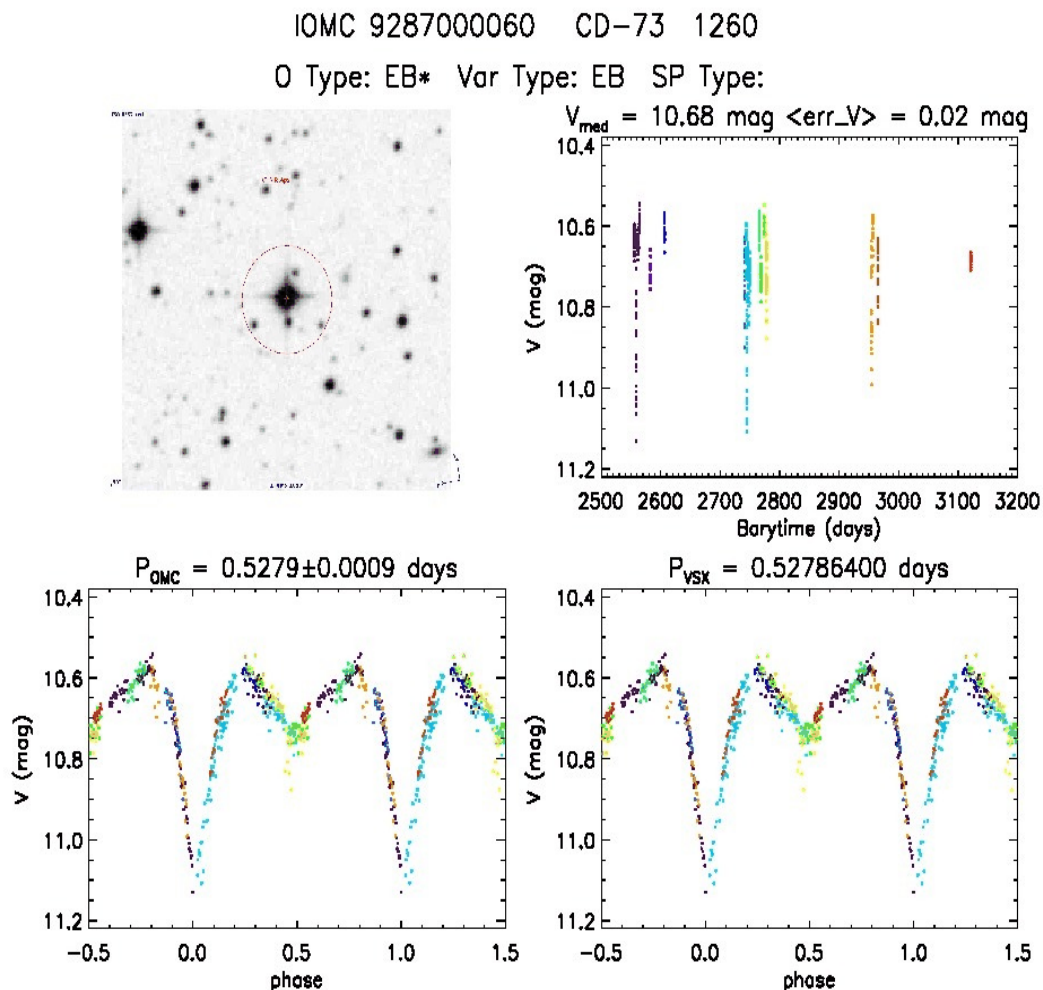


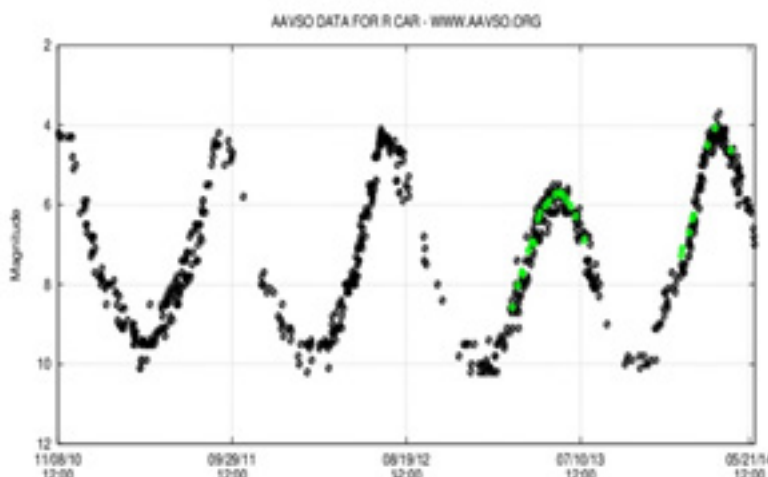
Figure 1. Light curve for MR Aps from the INTEGRAL OMC catalogue.

Irregular behaviour in the cosmic zoo — *Alan Baldwin \transcribed John Homes*

Or, steps to take when the unexpected happens

This paper derives from a VSS Google Group discussion commencing mid-2013, and is based on observation from AAVSO and RASNZ observers.

Five stars are listed which, after a long period in which their behaviour appeared predictable, suddenly showed a deviation from that behaviour.



R Carinae: This star has, showed similar magnitudes at each maximum, until the last but one, which fell about 1 magnitude short of the norm. It is the lowest maximum in 10 000 days (33 cycles) of data reviewed. The last maximum was back to normal. At present we do not have enough data to say positively whether there has been a period change or not.

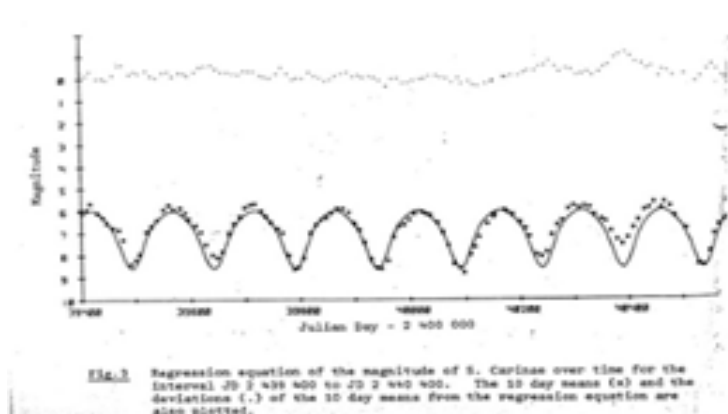
Figure 1. R Carinae displaying exceptionally low maximum. (AAVSO June 2014)



Alan Baldwin

Alan got really interested in astronomy when he attended Wellington College which had a functioning observatory where you could undertake daylight viewing of Venus, sunspots and prominences with a Zeiss slit spectroscope. Later on he did some visual variable star observing and data analysis (S Car). Worked in research in the dairy industry and dropped out of observing for quite a while, but with retirement approaching got into observing again. Located in Palmerston North, and observes with a 250 mm Dobsonian and 50 mm finder.

Alan Baldwin. Photo by Roger Butland



S Carinae: looking back at old data for this star spanning about 45 years (JD 2 426 350 – 2 442 990), we see a consistent level of minimum, with a rare instance of a minimum clearly brighter than usual. There is no evidence of any period change (based on RASNZ data).

Figure 2. Historical data of *S Carinae* (start of graph JD 2 439 400) displaying rare shallow minimum. (Baldwin A J & Thomson P J (1978) *Publications of Variable Star Section, RASNZ, No 6 (C78) pp 31-38*)

S Apodis: This star is characterised by long periods of constant brightness, with intermittent sudden declines. The most recent decline is the deepest on record, and was preceded by an abnormally shallow one.

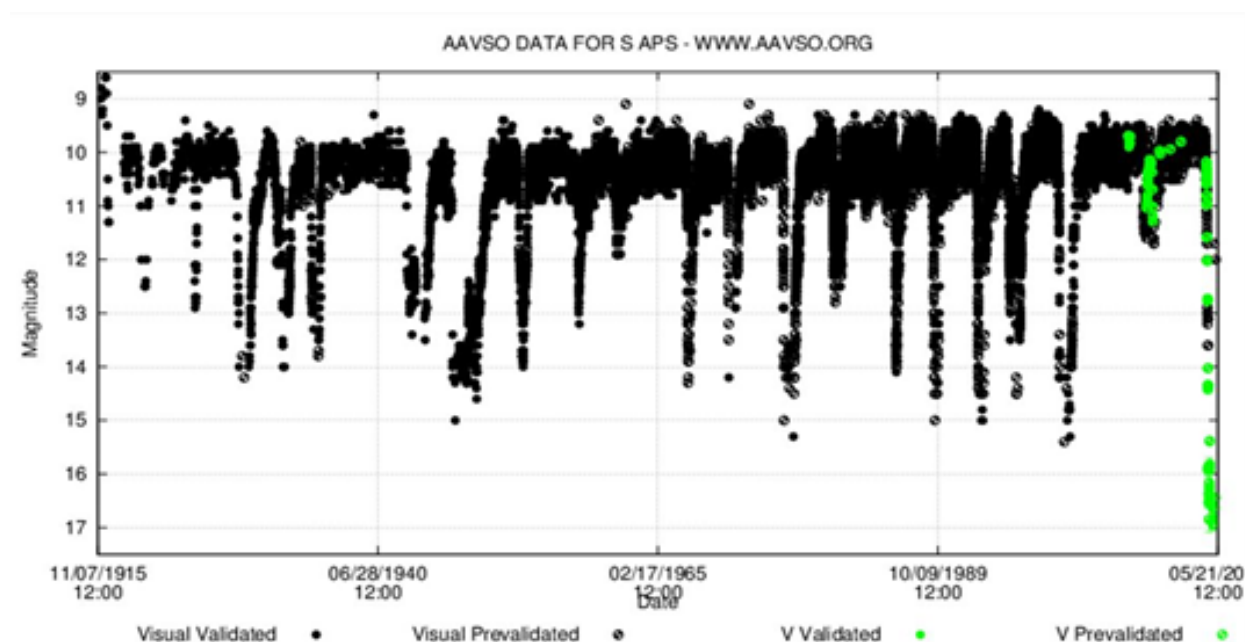
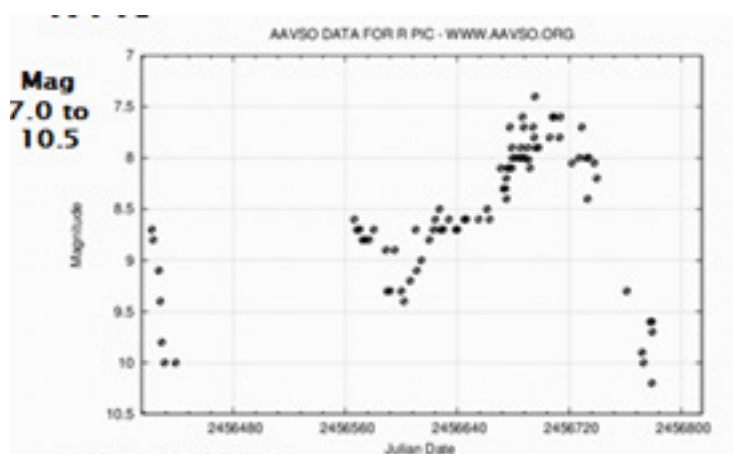


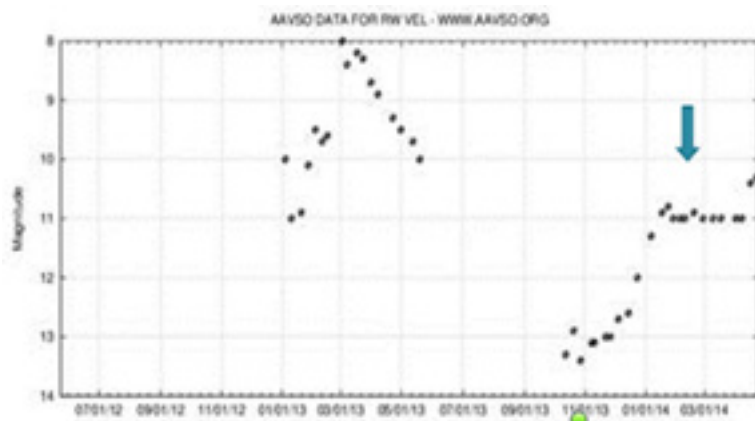
Figure 3. *S Apodis* 1915 to 2014. Note long pause around 1935. Depths of minima require investigation. (AAVSO June 2014)

Presented are 66 years of data for this star and the behaviour is very inconsistent. The declines are believed to be due to carbon dust clouds obscuring the star.



R Pictoris: In its most recent brightening, this star began significantly earlier than was expected, rose to a level well short of normal, and remained there for some time before brightening further to about the usual expected magnitude.

Figure 4. *R Pictoris* has a pause during its rising trajectory. (AAVSO June 2014)



RW Velorum: This star, which is a variable with an exceptionally long period (ca 440 days), also appears to have experienced a standstill.

*Figure 5. RW Velorum at standstill.
(AAVSO June 2014)*

Conclusion

When you appreciate the number of stars you realize we are only sampling a small percentage of the available objects – our cosmic zoo. But it is from these objects that we will learn and thus it is vitally important that we maintain sufficient observations of the objects that have been monitored for many years; more visual observers would be very beneficial

Discussion

A number of questions were put up for discussion.

Q What is a good number of visual observers for getting a reliable average for one of these stars?

A General consensus was minimum 3, preferably 5.

Q How might it be possible to get spectroscopic observations for a sudden event?

A For low resolution observations, an e-mail to the observing team should be sufficient. Higher resolution would be possible only for very bright stars. For faint stars, only a colour determination would be possible.

Q Are there any other observations that would be worth attempting?

Q Could the deeper than usual minimum of S Apodis be an artifact of previous observers being unable to record the true depth of the minimum?

A This is possible but unlikely, as observers should have in such a case have recorded the magnitude as fainter than whatever their cutoff was.

Q How often should the period of Mira-type stars, such as R Carinae and S Carinae, be re-analysed? Mira stars often have two periods, and will switch between them.

A Drawing up O-C diagrams would be useful. There is some useful software for Self-Correlation (SCS) and Weighted Wavelet Z-transform (WWZ) Analysis. 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. There is a tutorial on WWZ analysis on the AAVSO website at www.aavso.org/files/jaavso/v32n1/41.pdf

Acknowledgement

Those that drew attention to these events, Stephen Hovell, Andrew Pearce and Peter Williams,

Southern eclipsing binary programme – Margaret Streamer & David Moriarty

This article has been transcribed by Alan Baldwin from the talk given by David Moriarty and Margaret Streamer, who are the project leaders for the Southern Eclipsing Binary (SEB) programme.

The SEB programme is the successor to the SPADES project in which the priority was to establish times of minima of SEBs. Of the 150 targets, sufficient data were available for 30 targets to give revised epochs and periods via regression analyses; revised epochs only were obtained for 31 targets; times of minima and O-C values were obtained for another previously well-studied 17 targets. These results are presented in a paper being prepared for publication. There are no observations or insufficient observations on the remaining 72 stars.

The priorities of the current phase of the EB programme are:

- Continue to collect times of minima for those targets insufficiently studied as yet.
- Collect transformed data to generate full light curves for those targets of particular interest.
- Derive pulsation periods and amplitudes for the targets that show pulsations.
- Astrophysical modelling of particular targets.

Determining times of minima is essential to confirm, or revise, the currently available light elements. We have already found many light elements to be erroneous for these poorly studied southern targets.

Phase plots, using transformed data, are essential for astrophysical modelling of the system. At present



Margaret Streamer. Photo by Roger Butland

David Moriarty

David Moriarty has retired from career in microbial ecology with CSIRO and the University of Qld., and is now pursuing a life-long interest in astronomy. Since 2011 he has participated in the Southern Eclipsing Binaries Project. He has been a member of the Astronomical Association of Qld. for more than 30 years. He has an observatory at Wellington Point that is equipped for photometric observations with a C11 and an ST8XME CCD camera. A new observatory has now been established at the dark sky site of Glen Aplin equipped with a Celestron EdgeHD 14 on a Mathis 500F mount and a Moravian G3 camera (funded partially by grants from the AAQ's Edward Corbould Research Fund).

Margaret Streamer

Margaret lives on a lifestyle block out of Canberra and observes with a Meade 14" and a ST8 CCD camera. With David Moriarty she runs the VSS Southern Eclipsing Binary Programme.

there is limited transformed data for all targets as the SPADES project focused on obtaining good times of minima in one colour band. Consecutive observations in two colour bands, such as B and V, are essential for transforming data. It is impossible to transform data with only one colour band, so earlier data cannot be used.

In addition, a review of comparison stars is needed. Some have been found to vary and/or have a colour index (CI) different from the target by greater than 0.2 ($CI = B - V$ magnitude values). The Tycho 2 catalogue is OK for magnitudes less than 11 to 12, and APASS is better for magnitudes greater than 11 to 12.

Several ‘targets of interest’ have been identified to pursue for astrophysical modelling. These include targets with pulsating components, and those for which the depth of the primary and secondary eclipses are almost identical. V0490 Sco has identical primary and secondary eclipses.

A list of these targets will be made available to members of the Southern Eclipsing Binary research group in due course. For further information contact the programme leaders or the project tab on the web-site.



David Moriarty with his MI-500F mount and 14" Celestron Edge HD telescope. (photo supplied by David Moriarty)

Discussion

Q SL: Do you need a full set of colours?

A DM: Use of only B & V filters is fine. Margaret uses sequence B V I, B V I; Tom uses the sequence B V V V V V, B V V V V V

Comment Mark B: An advantage of DSLR is that it records the three colours at the same time.

Q BA: How often do you transform the data?

A DM: In the past, never. Now, I always try to get data for transformation.

Q SW: Why not reuse the existing data?

A DM: The earlier data gathered for the SPADES project was only collected in one colour. Transformation needs data in two colours. Aligning untransformed data from different observers using different equipment can be very difficult. Even aligning my own data has not proven to be easy. My initial data were gathered with a camera on loan from AAVSO and a smaller telescope. The filters on my new camera underwent a slow deterioration after about 18 months. So there is no consistency in the data and thus no easy fix.

Comments DM: For eclipses observed in V0490 Sco, spectroscopy is useful and some members are getting into this. However it requires a lot of observing time, typically half-an-hour per spectra.

Q SL: Don't AAVSO have comparison star magnitudes.

A TR: For nearly all our targets, there are no comparison star magnitudes given on the AAVSO charts. Mati Morel and TR chose the comparison and check stars for each target on the programme.

Comments DM. It is difficult to carry out CCD on bright stars; the difficulty is finding comparison stars within the limited field of view of the CCD camera. However if it was a priority target a focal reducer could be added to the telescope.

Q DM: What do we do with the variables we have discovered?

A MB: AAVSO have guidelines on what information is required to submit a star to their database. If you have this information there is a procedure to follow for submission. There are so many variables being discovered that it is not worth writing a paper unless there is something unique about the variable.

Using CCDs efficiently for snapshot work – *Tom Richards*

CCDs come into their own when you're taking fast time series images of one field - image after image as fast as you can for hours, then analysing all together in a batch. But taking snapshots – the analogue of the visual observer's looking once at many variables in a night - creates pain, particularly at the photometry stage the next day.

I describe an efficient observing/analysis pipeline I've set up, mainly to observe SRs for Aline & John Homes's semi-regulars project, and ask for contributions by other CCD/DSLR observers on how they handle it.

Two problems

CCDs are good at fast time series over a night on one target. But:

- Covering a list of many stars with one image each poses the visual observer's problem of where to start, where to finish, and finding.
- Photometry packages are designed for a series, not lots of single images of different targets.

Problem 1 - solved with ACP

Astronomer's Control Program automates image acquisition. www.dc3dreams.com

Write a plan listing all targets in RA order, with imaging requirements for each.

ACP plan

```
#Filter      V, I
#Count      1, 1
#Binning    2, 2
#INTERVAL 120, 60
DE Hyi      01 23 40.9 -78 23 11
#Interval 60, 60
VZ Phe      01 28 10.3 -45 24 34
#INTERVAL 120, 60
AT Phe      01 36 04.6 -42 01 29
```

This plan will:

- Locate first target in plan that's above the min altitude setting (30 deg for me). (That will be the westernmost such target.)
- Image it, then next one etc until it gets to one below min altitude in the east.
- Stops, and *chains* to the next plan (my all-nighter).

My night's sequence

- ACP starts at astronomical twilight with the snapshot plan.
- When either it runs out of targets or it's the end of astronomical twilight (half an hour), it chains to

my all-nighter plan (one target, until morning astro twilight)

- It then chains back to the snapshot plan, imaging different targets, until nautical twilight.

Problem 2 - efficient photometry

- Next morning I calibrate all the images together,
- Then put each image into a folder with its star name.
- When I get all the images for one target I'm going to get in an apparition, I simply do ordinary time series photometry on them.

Does it work?

So far so good, but I haven't done any time-series photometry yet. I'll tell you how it goes.

Do other observers have other ways of doing all this? How about a post to the VSS Google Group?

Possibilities for 2014 - *Tom Richards*

Bob Evans, as finance officer, told us that while there were now no subscriptions, donations are now requested. The website's home page has a Donate panel.

Bill Allen will co-ordinate observations of Eta Carinae as it goes to periastron. Details are to go up on the website. UVB photometry is required. This may be possible with a DSLR.

Spectroscopy by VSS members is important

Tom is concerned by the present lack of visual observers.

John Drummond suggested that we needed something like a CD that we could send to Astronomical Societies. Something physical was needed; a link to a website was likely to be ignored.

Gordon Hudson proposed a memorial to Albert Jones, which could take a form to encourage visual observing. Someone will have to organize this. Tom does not have the time. Alistair Brickell may be able to do something.

John Homes said that visual observing was a good start for new observers, as it required less investment in equipment. It was said that mentoring was needed for encouragement.

Bob Evans suggested that feedback for new observers, to acknowledge their contributions, would be useful. He suggested e-mail.

Simon Lowther suggested that the website should display recent contributors. This should perhaps be on a per-project basis, with links to the projects. Also, where observations are to be sent to AAVSO, some method of noting them would be desirable. Would it be possible for observations to be sent to VSS, which would acknowledge, and then forward to AAVSO?

Postscript from **Alan Baldwin**: Note that the VSS Website has useful information for those starting out on visual observing <http://www.variablestarssouth.org>. Scroll down to Areas of Research box. Select "Visual Observing", then go to Read More and follow options (tabs) to explore the material.

Pauline Loader has been experimenting with videoconferencing, which some groups might find useful. She has a subscription to a videoconferencing service, and can nominate others as meeting moderators. All anyone else (moderator or attendee) requires is a browser and internet connection, and a webcam. It is possible to download presentations and there is a facility for remote questions. Anyone wishing to try out the service should contact Pauline pauline.loader@clear.net.nz for arrangements. The service is at meet-cheap.com and Pauline says it is a horrible website but a good service.

Tom finished with thanks to the Whakatane Astronomical Society, to REAP (Rural Education Activities Programme), and to Stan Walker.

About

Variable Stars South is an international association of astronomers, mainly amateur, interested in re-searching 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 there 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 e-group (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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