British Astronomical Association

VARIABLE STAR SECTION CIRCULAR

No 104, June 2000

Contents

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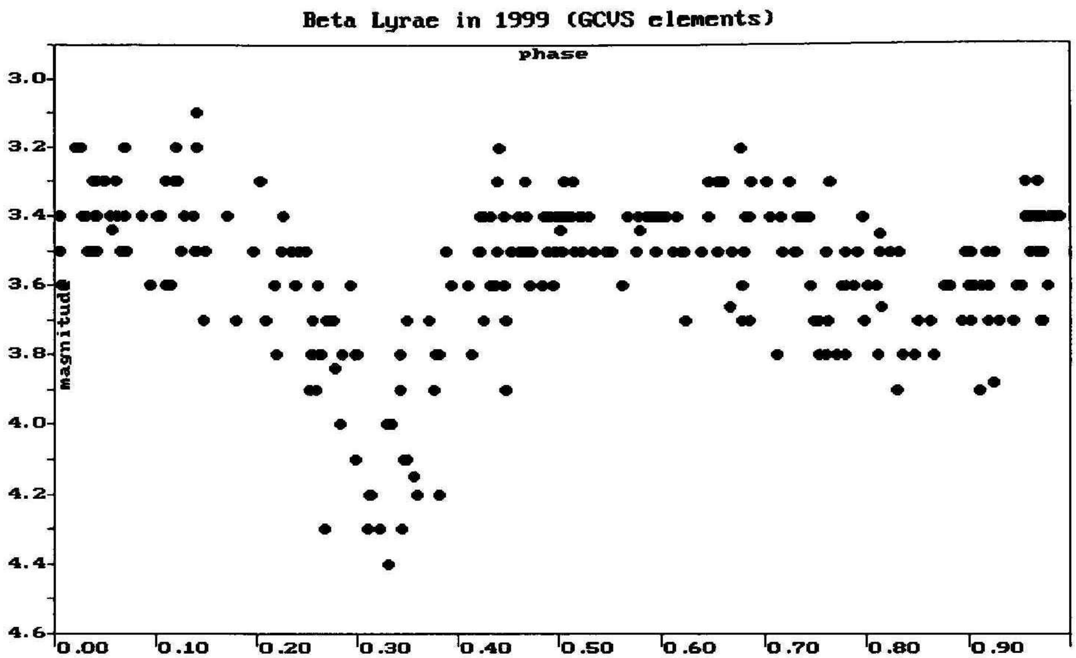
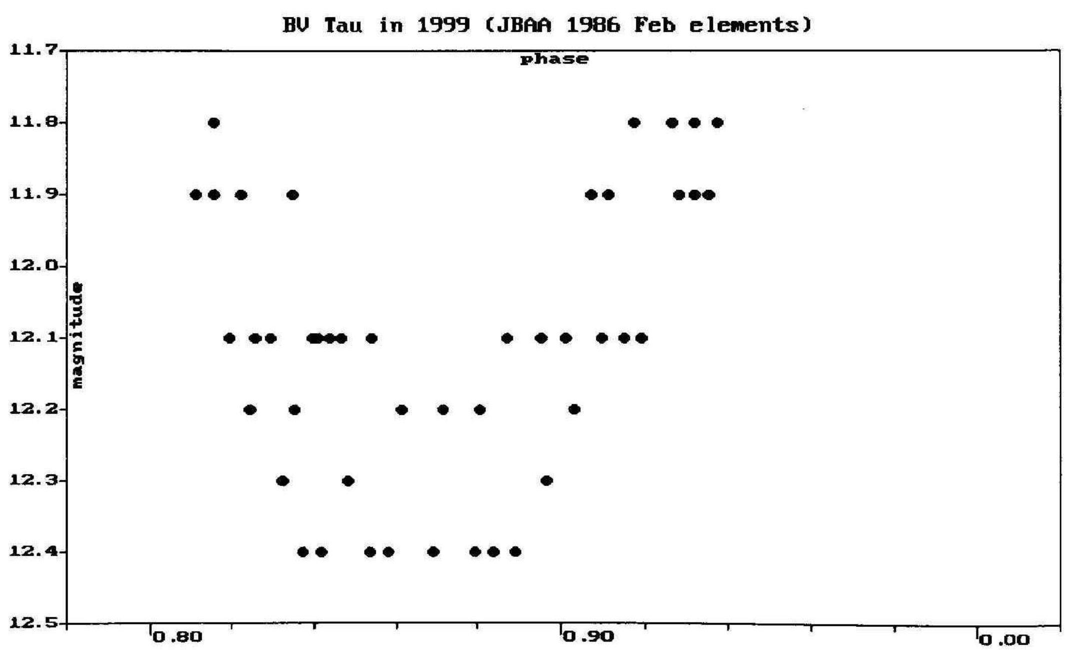
ECLIPSING BINARY LIGHT CURVES

(see page 22 for notes and observer lists)

TONY MARKHAM





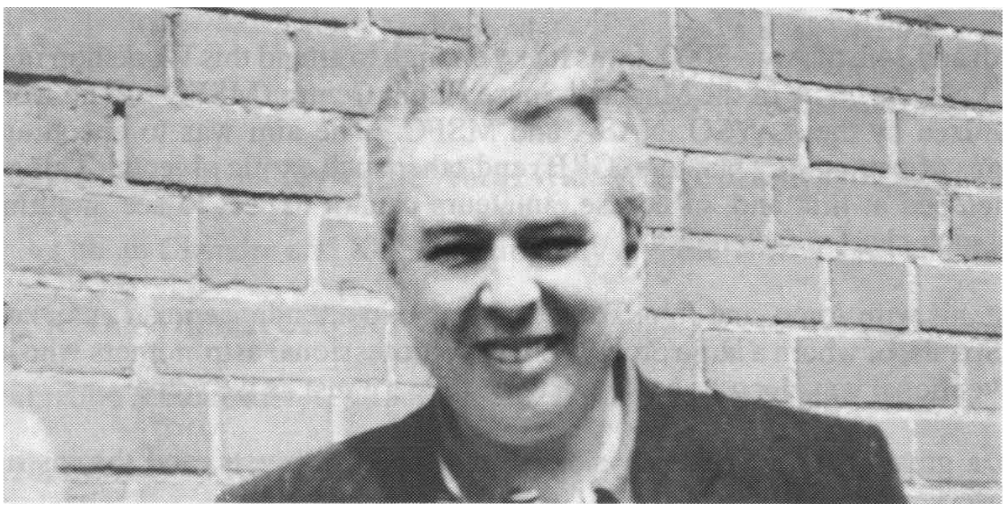
FROM THE DIRECTOR

ROGER PICKARD

I'm sure all VSS Members will be aware of the prodigious number of visual observations made by my predecessor, Gary Poyner (see photograph below). His name has been at the head of leading British observers for many years. Indeed, in the last decade he has accumulated over 94,000 observations. Just how he does this, I'm hoping he will reveal in a later Circular.

To recognize this amazing achievement, Karen Holland and I successfully nominated Gary for receipt of the BAA Steavenson Award (this award is presented to a member who has made an outstanding contribution to observational astronomy). This will be presented to him at the forthcoming Exhibition Meeting in London on June 24. I hope that many of you will be able to be there to see Gary receive his award. What, of course, makes Gary's achievement even more remarkable, is the fact that he makes his observations from the light-polluted skies of north Birmingham. This should serve as a spur to all of us who make light pollution an excuse as to why we can't observe!

Congratulations Gary, may you long continue to observe.



MEETING OF THE VARIABLE STAR SECTION AT NORTHAMPTON 14TH OCTOBER 2000

ROGER PICKARD

I'm pleased to report that Bob Marriott and the Northamptonshire Natural History Society have kindly agreed to host the next Section Meeting on Saturday 14th October 2000.
It is anticipated that the doors will open at around 09.30 and coffee will be served from around 10.00. The meeting will officially begin at 11.00 with a break at 12.30 until 14.00 for lunch (available at one of the many eating establishments nearby). It is expected that the meeting will close around 17.30.

If anyone wishes to give a talk (of not more than about 30 minutes duration) please contact the Director. Speakers booked so far are as follows:

Don Pollaco .... Queen's University, Belfast
Mark Kidger .... Instituto de Astrofisica de Canarias
Albert Zijlstra .... UMIST
Sylvain Chatty .... The Open University
Coel Hellier .... Keele University
Guy Hurst .... Editor, The Astronomer
Tony Markham .... BAAVSS Eclipsing Binary Secretary
Bill Worraker....................... BAAVSS
John Howarth .... Crayford
Tonny Vanmunster............... CBA, Belgium

The NNHS has modern equipment available including slide projector, overhead and powerpoint projectors. It is anticipated that there will be a charge of 5 pounds, payable on the door, for the meeting.

HIGH ENERGY ASTROPHYSICS WORKSHOP

ROGER PICKARD

On the 13th and 14th of April 2000, I was lucky enough to attend this Workshop in Huntsville, Alabama, US - the home of the Marshall Space Flight Centre (MSFC). The workshop had been organized by the AAVSO, NASA and MSFC. The aim was to encourage amateur observations of gamma-ray bursters (GRB) and other such exotic objects! This may seem a little far fetched at first and, of course, amateurs cannot expect to see anything of these objects at such short wavelengths.

Guy Hurst, his wife Anne, and John Toone were also in attendance in an audience of nearly 100 participants, of whom a large proportion were professional astronomers who observed at more conventional wavelengths and were there to learn just as we were.

We learnt a great deal about the physics behind these outbursts, and the instrumentation built to observe them - satellites.

Basically, GRBs are thought to be either two coalescing neutron stars or black holes, or a collapsing hyperstar, a super-massive star that is thought to have formed early in the history of the universe.

But how can amateurs help? Well, it appears that although the initial outburst only lasts a matter of seconds or minutes, some systems may still be visible down to magnitude 16 or so even after a few hours - possibly up to about 5 hours - as an afterglow in visible light. If amateurs can be alerted quickly enough, they could turn their telescopes onto these exotic objects and acquire useful observations by following the decline. Furthermore, it seems that although they continue to fade, the wavelength emitted becomes longer, and so those equipped with R and perhaps I filters could follow them for even longer after outburst. This was ably demonstrated by a group of amateurs from Buffalo, New York, who observed a GRB afterglow at around magnitude 21 using an R filter. To help amateurs observe these objects, and of course professional observatories that can respond quickly enough, a network is being instigated by the gamma-ray astronomers themselves via a number of nodes, of which the AAVSO will be one. The Astronomer Magazine will also have a connection to this node so that UK observers can also receive any alerts at the earliest opportunity. As the UK is around five hours ahead of the US it gives us a chance to steal a march on them!

Of course, this was only part of the HEA Workshop. Other topics that were covered included jets from galaxies and stars, and of course, the energies produced from CV outbursts. But perhaps more of them another time.

Members may be interested in the following list of high energy missions and WWW links. (Note: HST is included because it has the capability to observe in the UV).

Recent Missions in High Energy Astrophysics

Mission	Year (Launch)	Agency/Country	Emphasis
HST	1990	NASA/ESA	Optical/UV/IR Comprehensive
Compton GRO	1991	NASA (Germany)	Gamma Ray
ASCA	1993	Japan	X-ray Spectra
Rossi XTE	1995	NASA	X-ray Timing
BeppoSAX	1996	Italy(Netherlands)	X-ray-Various; GRBs
Chandra XRO	1999	NASA	X-ray - Comprehensive
XMM	1999	ESA	X-ray - Spectra, imaging

Chandra and X-Ray Astronomy on the World Wide Web (Current as of 24/3/2000)

Find out more about Chandra and X-Ray Astronomy at these WWW sites and their links:

CHANDRA X-RAY OBSERVATORY CENTRE
Home Page .... http://chandra.harvard.edu
Public information & Education .. http://chandra.harvard.edu/pub.html

MARSHALL SPACE FLIGHT CENTER (MSFC)
Chandra Project .... http://chandra.nasa.gov
Chandra Project Science .... http://www.astro.msfc.nasa.gov/xray/axatps.html
Space science at NASA .... http://science.nasa.gov/

HIGH ENERGY ASTROPHYSICS SCIENCE ARCHIVE RESEARCH CENTER (HEASARC)
Home Page .... http:/heasarc.gsfc.nasa.gov
Public Outreach and Education ... http:/heasarc.gsfc.nasa.gov/docs/outreach.html
X-Ray images .... http:/measarc.gsfc.nasa.gov/lmagespretty_pictures.html
History of X-Ray Astronomy .... http:/measarc.gsfc.nasa.gov/docs/heasarc/headates/heahistory.html

NASA Headquarters
NASA Home Page .... http://www.nasa.gov
NASA HQ .... http://www.hq.nasa.gov
Search Page .... http://www.nasa.gov/search

THE 89TH SPRING MEETING OF THE AAVSO

ROGER PICKARD

This meeting took place on the Saturday immediately after the HEA Workshop. It was slightly more formal than any VSS Meeting that I've ever attended, with reports from the various committee chairmen, which included the observing sections (visual, PEP and CCD for example) as well as the business side. However, the bulk of the meeting was made up of short (10 minutes with 5 minutes for questions) presentations. I gave a short presentation on the BAAVSS, pointing out that although our database may not be so large as theirs (>2 million observations compared with >9 million), ours does predate theirs by some 20 years! Guy Hurst then spoke on the UK Nova and Supernovae Programme following which we were surprised to hear another English voice giving a presentation.

This turned out to be Dr. Alex Murphy who is currently working in the US, and who is interested in neutrino astronomy. He would like to set up a network whereby amateurs could be advised of a potential SN by the prior receipt of neutrinos. However, neutrino detectors are unable to tell in which part of the sky a new SN will appear. Therefore, it is likely to be up to amateurs to spot any new SN first, and report it so that professionals using telescopes of all types, including those in space, can be advised of where to point their instruments. With nearly 400 years having elapsed since the last SN in our galaxy we are well overdue for another. However, Dr Murphy pointed out that as the neutrino detector with which he is currently involved has not yet been built he is hoping that any new SN in our galaxy will not go off for at least another 5 years!

Following the meeting a banquet was held in the evening at which the guest speaker was astronomer and astronaut Dr John Grunsfeld who spoke about *The 1999 HST Servicing Mission and Remarks on High Energy Astrophysics.* His talk was superbly illustrated with many slides and a fine video.

I had to leave at 7 am the next morning and found it a little surprising when I boarded the shuttle bus to the airport to find myself sitting next to Dr Grunsfeld. I expected such an important person to have VIP status, but apparently being an astronaut is regarded as just another job! But he did say that he wouldn't swap it for anything!

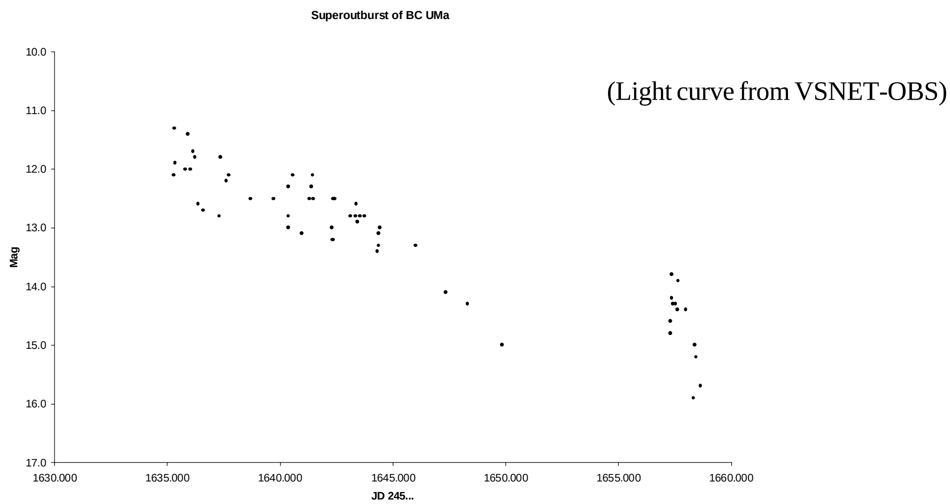
RECURRENT OBJECTS NEWS

GARY POYNER

BC UMa

The Recurrent Objects star **BC UMa** was detected in outburst by Patrick Schmeer on March 31.799 UT at magnitude 12.1v, and the observation was quickly confirmed by Timo Kinnunen (Finland) shortly after on March 31.836 UT at magnitude 11.3v. The previous superoutburst occurred during April 1994, although the last reported outburst (very low coverage) was in July 1995 (*York & Dyck, AAVSO*).

BC UMa peaked at around magnitude 11.5, after which a slow decline followed, taking 16 days
to reach magnitude 15.0, compared to 12 days in 1994. In a similar manner to the 1994 superoutburst, a post-outburst brightening was observed 7 days later, when BC UMa



brightened to magnitude 13.8 briefly, before fading to below magnitude 16.0 three days later. Post-outburst brightenings have been observed in several other DNe, notably **UZ Boo, AL** and **GO Com, T Leo, UV Per, V1028 Cyg** and of course those wonderful series of outbursts seen in **EG Cnc** during 1996/1997.

CI Aql

Those observers who regularly monitor objects on the Recurrent Objects Programme will know that CI Aql (**Nova Aql 1917**) was dropped from the programme in 1998 because of evidence that the star was actually an eclipsing star. *IBVS No. 4342 (Mennickent & Honeycutt)* reported that CI Aql was indeed a short period eclipsing binary with a period of 0.618355 days, and displayed a light curve similar to a Beta Lyr type system. The depth of the primary minima is 0.6 magnitudes. *Mennickent and Honeycutt* also state that spectroscopic observations show no emission lines, but instead show absorption lines evolving from a red secondary of spectral type K-M. With this in mind, CI Aql was dropped from the programme - despite hundreds of negative observations being made by the writer!

On April 28.669 UT, K. Takamizawa, Nagano Japan detected a new object very close to the position of CI Aql photographically at magnitude 10.0p. Independently, M. Yamamoto, Aichi Japan recorded the new object on April 28.964 at magnitude 9.8p. Initial positions given by Takamizawa indicated that this was a new separate object in Aquila. However subsequent astrometry from various sources now show this to be an outburst of Nova Aql 1917! CI Aql is now a Recurrent Nova! To add to the excitement, Japanese CCD observers are, at the time of writing, monitoring what appear to be eclipses. If these are confirmed, CI Aql will be only the second Recurrent Nova to show eclipses during outburst (the other one being **U Sco**). The outburst is at this time (May 4th) very much on-going, and hopefully a further report on eclipses and a light curve will appear in the next issue of the VSS Circular.

Needless to say since CI Aql decided to *go recurrent*, I have had a few sleepless nights thinking about what might have been, had I not dropped it from the ROP in 1998. I certainly felt a little regretful as I looked at it in outburst on the morning of April 30th - but the excitement of seeing it at all, more than made up for any disappointment!

RED COMPARISON STARS ON CURRENT CHARTS

John Toone

In 1979 and 1980 Ian Howarth and Jeremy Bailey published papers in the BAA Journal that investigated the relationship between V and visual magnitudes. Several BAA VSS sequences were used in the investigation, and B-V values were published for the comparison stars. I checked the sequences for red stars and several of those identified turned out to be stars which I have had problems with visually in the past. Listed below are the red stars with comments on how I personally have perceived them:

SS Cyg, star A (7.80)
This star is a K5 giant with a B-V of 1.75 that is listed as an unsolved variable in Hipparcos with a range of 7.59 - 7.65. I have never had any trouble with it because it is nearly a full magnitude brighter than anything else on the sequence.

CI Cyg, star F (10.8)
This star has a B-V of 1.85 and is nearly always used when CI Cyg is bright. I have tended to see F seemingly >0.3 mag fainter than E (10.5) but consistently so. Interestingly, Tycho indicates a B-V of 1.39 which is quite a discrepancy with the Herstmonceux photometry (*Howarth & Bailey*).

CN Ori, stars C (12.04) and D (12.24)
When CN Ori is bright it usually exceeds E (12.55), but I have had difficulty sometimes in distinguishing differences between C, D and E. C has a B-V of 1.55 and D has a B-V of 1.62. I do usually make C brighter than E, but D nearly always appears the same as E; accordingly I have discontinued using D.

CZ Ori, star G (12.95)
I have not used this star for several years now and rely on F (12.80) and H (13.63) because it seemed closer to H than F. G has a B-V of 1.62.

RU Peg, star G (12.20)
I have struggled to make G brighter than H (12.63) and now I never use it. G has a B-V of 1.61.

TZ Per, star E (12.28)
This star has a B-V of 1.98 but I cannot recall ever using it, as TZ Per rarely rises above G (12.62).

I think most of my difficulties can be explained by the fact that I am a faint red star observer, but it would be interesting to hear comments from other observers to ascertain whether this is a widespread problem or not. It is not proposed to modify the sequences at this stage, unless it can be established that several observers have had similar problems with these red stars.

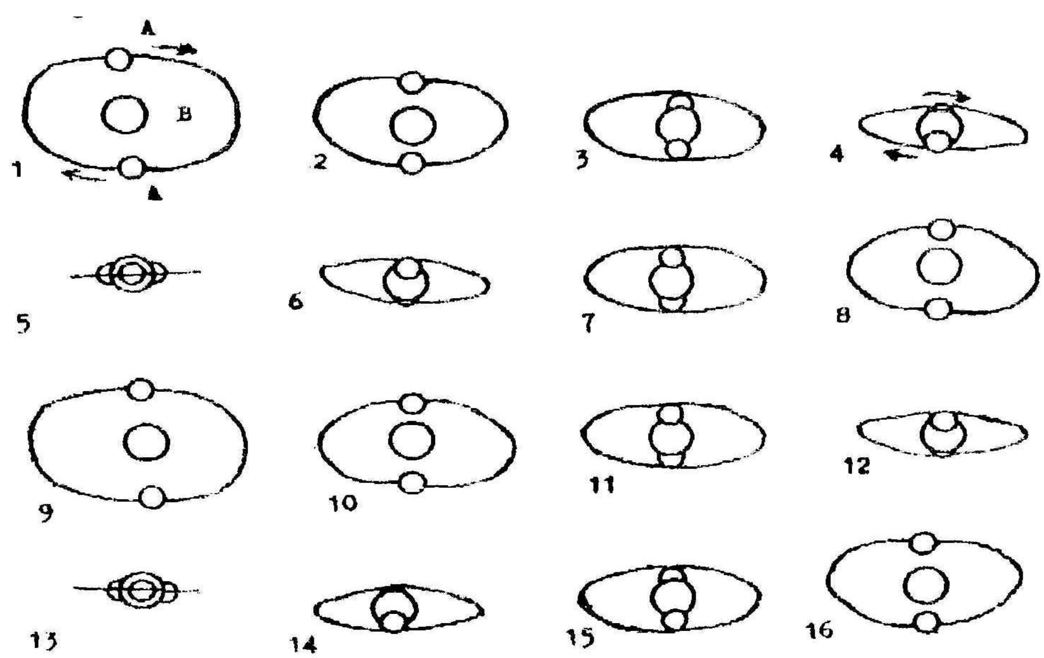
ALL ECLIPSING BINARIES

ALEX VINCENT

An eclipsing binary is a system in which the orbit of a binary star is seen edge on, or at a very low angle as viewed by the observer. If the angle of the binary star's orbit is too great, then no eclipses will occur, and so the stars are seen passing above or below each other as they revolve. Thousands of binary stars are known today, and some are eclipsing binaries.

Algol (Beta Persei) is the most famous of the eclipsing binaries and was also the first to be identified as such. It has a period of 2.87 days, and its range in magnitude is 2.1 at maximum, and drops down to 3.4 at minimum. As seen from the Earth, the eclipses are not total; they are about 79%, but they may have been total several thousands of years ago, or perhaps may be in the future. Ancient observations may tell us if this system was fainter or brighter at minimum in the past.

It is possible that many binary stars become eclipsing binaries at some time or other if their orbits move up and down, or to and fro over periods of many thousands of years (see diagram). If so, then Algol may no longer be an eclipsing binary star for thousands of years, until its orbit becomes edge on again. Eclipsing binaries with very small magnitude ranges are probably systems with slight eclipses in which an eclipsing binary phase is just starting or ending.



The diagrams above show how the orbit of a binary star may behave to produce an eclipsing binary phase. The system is at its widest (at 1) and closes in to become edge on (5). It then moves out again to its widest (9), and closes back to become edge on again (13), it then moves out again (14, 15 and 16) to its widest back at (1)

IBVS 75TH NAME-LIST

GARY POYNER

Three recently added stars to the Recurrent Objects Programme have been given official names in the 75th Name List as issued by Konkoly Observatory on March 31st. These are...

Var 62 And .... V402 And
Var 61 Her .... V1008 Her
USNO 1425.09823278 .... V2176 Cyg

Please use these new designations when reporting future observations.

IDEAS FROM THE ARMCHAIR

KEVIN WEST

I guess all local astronomical societies are the same (Crayford excluded) in that most of the members are not regular observers but prefer to enjoy and explore astronomy in other ways. I have had many communications with a number of variable star observers on the subject of what to observe, and most of us were so tired from observing we couldn't dredge up any creative observational projects.

It occured to me that we have a wealth of talent and creativity in our *armchair astronomers*. I am particularly interested in exploring areas that can make use of the high sensitivity of photoelectric photometers (PEP), perhaps in fields that are under observed. Because I am limited to a relatively bright limiting magnitude of about 7 for PEP, the best ideas I could come up with were:

1. Secondary minima of eclipsing binaries
2. Spotty stars (RS CVn type)
3. Detailed studies of single bright variables using multi wavelength observations, including spectra. There would be good opportunities for collaboration on the latter. This could also discover unknown new features about our naked eye stars

I'm certain that one of our biggest handicaps to progress in science is the difficulty of thinking of the right questions to ask. I know there have been recent brainstorming sessions on what to do with the Liverpool Telescope. How about a similar session applied to PEP, visual, or indeed any observational project, dare I say it, even outside variable stars? I hope this will prompt a response.

Kevin West
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kevinwest@beeb.net

ST LMI: THE FIRST CCD PHOTOMETRY FROM LYMM

JOHN SAXTON

Introduction

Recently, I bought a Starlight-Xpress CCD camera, after more than a decade of doing photometry with a photomultiplier tube (PMT). PMT photometry can certainly produce accurate results, but is only suitable for use on bright objects, and requires practically perfect sky conditions, which are not common here in Cheshire. So I finally decided that the time had come to take the plunge and buy a more versatile detector. Karen Holland suggested that my initial experiences of using the camera for variable star work might make a suitable article for the VSSC. So here follows an account of the first CCD photometry at Lymm.

Linearity Testing

My camera is a Starlight Xpress MX916. I chose this camera since it has the largest chip area and largest full well capacity of the Starlight Xpress range. The former increases one's chances of getting suitable comparison stars in the same field as the variable; the latter helps to ensure a large dynamic range. One potential problem, however, is that the CCD chip used in the MX916 has anti-blooming gates. In some cases this has been known to render cameras non-linear and unsuitable for photometric work.

Therefore, before my camera arrived, I built a device to test its linearity. Briefly, this device consists of a light-tight metal can, containing a small white illuminated target, which is viewed by the CCD camera. The target is illuminated by a light-emitting diode (LED), which is pulsed once every four seconds by a special timing circuit which uses a quartz oscillator. The *on* time can be varied from 4 ms to 400 ms in steps of 4 ms. In operation, one starts an exposure of (say) 40 seconds, and immediately thereafter sets the pulse generator running. The CCD camera sees 10 pulses in this instance, and the total light in each pulse can be easily and accurately set from 1 to 100 units. Shortly after the camera arrived, Richard Miles, Andy Hollis and myself characterised its linearity. We quickly found the camera's response to be linear to 0.2% at up to 50 % of full scale (full well capacity), which seems entirely satisfactory for photometry, provided one stays in the lower half of the range.

Installing the camera on the telescope

My first CCD images were taken with the camera attached to my 8-inch guiding telescope, as the focussing mount had enough travel to allow me to focus the camera. In mid March, however, one of Norman Walker's filter boxes arrived on loan from the BAA. This has BVRI filters and an unfiltered position. The box measures approximately 6x6x3 inches. My main (8.5 inch) telescope has a square wooden tube, and the filter box is attached directly to the wooden tube. Norman supplied me with an adapter which is threaded to take the filter box, and also has countersunk holes for wood screws. The camera screws into the back of the filter box, and the whole assembly is very rigid (which is desirable, since the filter box is quite heavy). The next problem is focussing, which can now only be done by moving the primary mirror. (Before I started on this exercise, I had checked that focussing was theoretically achievable.) I had to move the mirror about 1 cm forwards in its cell, which was certainly not trivial, but after a few nights of fiddling I had achieved satisfactory focus and alignment with the colour filters in place. The focus has been left fixed since. Since the filter box has an unfiltered position, rather than a *clear* piece of glass, unfiltered observations are not possible with my system.

Observing

In late March, I had several successful nights observing. I obtained several images of M67 for calibration purposes, which are not yet fully reduced. I was particularly eager to do some time series photometry of a cataclysmic variable. But what star should I observe for my first attempt ? I wanted something with which to test my system, but I also wanted to be confident of getting at least some results. After perusing Brian Warner's book, I decided on the polar ST LMi. It is faint enough (V=14.7 to 17.2 according to his table 6.1) to be a fairly severe test of the system, but also has a large amplitude of variation, so that I would hopefully see something even if my signal to noise ratio turned out to be poor. The orbital period is short enough (114 minutes) for it to perform in a single observing session. As a bonus, polars like ST LMi also change colour throughout their orbital cycle, becoming redder at maximum light.

Between 25 March and 30 March, I obtained four runs on ST LMi - two in V and two in R. Flat fields were obtained from the dawn sky. I used 30 second exposures for ST LMi. The exposure time is something of a compromise; longer exposures would mean that a lower proportion of time would be lost reading out the CCD image (my readout time is about 15 seconds) and would also result in a lower proportion of readout noise in the images, but I would then run a greater risk of tracking errors ruining the images. With very faint objects one cannot afford to smear the image, and even with periodic error correction (see my last article in VSSC 103, page 8), my drive is not perfect.

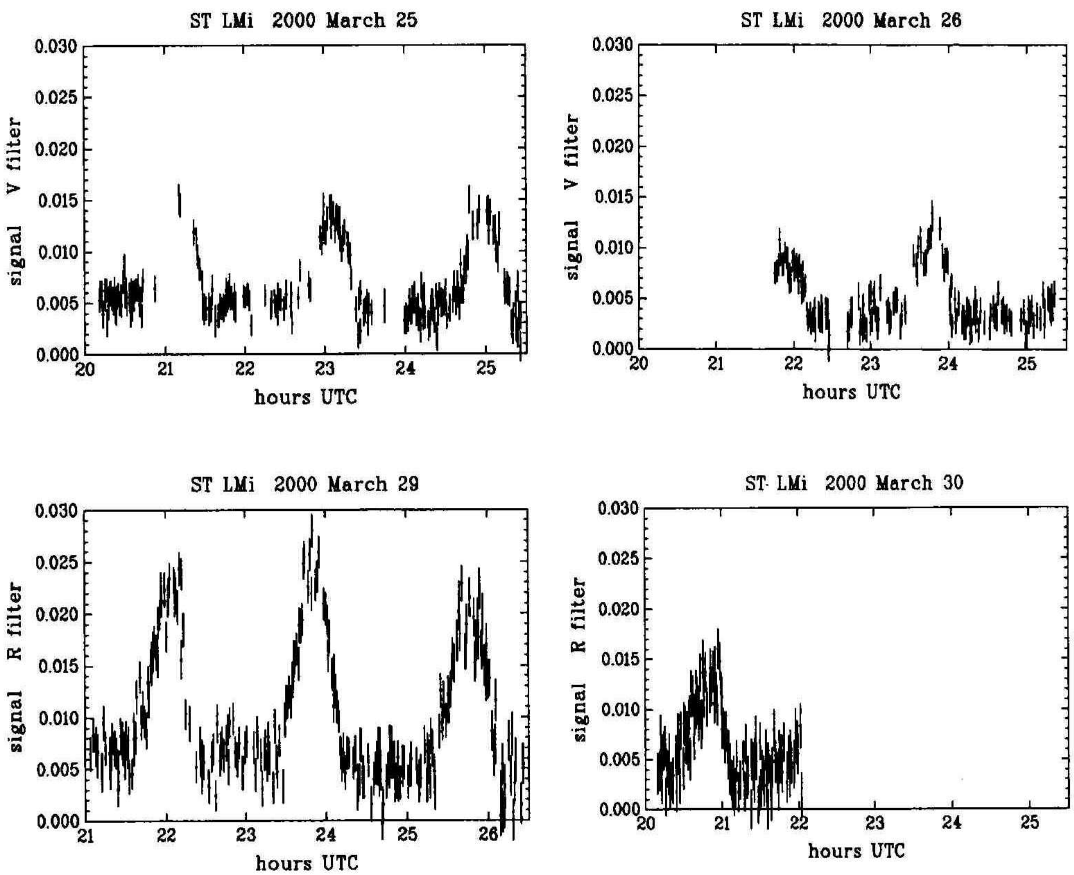
After years of doing PMT photometry, which involved repeatedly moving the telescope and writing down the results by hand, observing with the CCD was very pleasant - I could even go indoors and leave the system gathering data on its own! As I had expected, it was occasionally necessary to adjust the telescope tracking, to stop the stars of interest from drifting out of the field of view. An unanticipated, but significant, problem turned out to be time-keeping; the computer clock was dreadful, and could drift by a few minutes in one hour! I frequently noted down both the computer time and UTC (from an MSF clock) in my log book. Perhaps I can find a more satisfactory solution in due course.

Data Analysis

This has proven far more time consuming than the process of acquiring the data in the first place! Fortunately, I like writing my own software. Indeed, trying to squeeze as much information as possible out of the data is a good way to appreciate some of the subtleties of CCD image analysis, of which there seem to be quite a few. In the past, my CCD friends had told me of nights of data which were still waiting to be analysed weeks after data acquisition. After generating more than 1000 images over four nights, I now have a better appreciation of the reason why! It is quite possible that some improvements can still be made to the analysis. Very briefly, data analysis for the ST LMi runs proceeded essentially as follows:

First the raw data files were dark and flat-field corrected. Also at this stage, a simple star search algorithm was to used generate a list of the coordinates of the stars found in each image and write them to a file called STARS.LST. The average width of the star images in each image was also obtained, so that images with poor tracking could be rejected from further analysis. One frame with good tracking was then chosen to define the master coordinate system. Several bright, but not saturated, stars were chosen to act as fiducial stars in this image and their positions were measured. A program which incorporated a pattern-recognition algorithm then searched through STARS.LST and attempted to locate these fiducial stars in the other images, and so determine the image offsets with respect to the master coordinate system. Field rotation (which in principle might arise in long runs due to slight polar misalignment) has been ignored for the time being; judging by the deviations of the fiducial stars from their expected positions after allowing for the offset (around 0.1 pixel rms), this seems a satisfactory approximation. Next, accurate positions of the variable and comparison stars in the master coordinate system were obtained from stacked frames. The final positions that were used for photometry used almost all the available frames with good tracking. The positions of blank areas of sky were also determined from a stacked frame. For the faint stars, it was important that the positions used for photometry were determined from stacked frames, rather than determined individually in each frame. The latter method, i.e. positioning the aperture to yield maximum signal in each frame, would systematically over-estimate the brightness of the star, since the sky noise is a significant fraction of the star signal.

For the photometry, I used a *soft aperture*, i.e. an imaginary circular aperture was placed at the expected position of the star and the pixels were weighted according to the fraction that was within the aperture. (Here I ignore the fact that the pixels are not quite square; they are slightly elongated E-W, but then the star image probably is too, due to imperfect tracking). For faint



stars, the choice of the aperture size was important; too small, and one would not sample enough photons from the star; too large and one would sample too many photons from the sky. I examined the scatter in the results of photometry on a field star (GSC 1978 1314) which was of similar brightness to the variable, as a function of aperture size. I ended up using an aperture 4 pixels in diameter. As I expected, the best signal to noise ratio is obtained when the aperture diameter is about the same as the full width at half maximum of the star image.

The results are shown in the figures (which are plotted at the same scale to facilitate comparison). I have used a linear scale, since a logarithmic scale is inappropriate when dealing with signals with poor signal to noise ratio (it would exaggerate the low intensity part of the light curve and the noise). I have normalised the brightness to that of SAO 81659. Fortuitously, the field also includes the bright star 51 LMi, for which SIMBAD gives a Johnson V-magnitude of 7.63. I acquired some 3 second exposures to cross calibrate 51 LMi with SAO 81659; the latter turned out to have V=10.02 (consistent with its Tycho VT magnitude of 10.0). Use of other check stars in the field of view showed that SAO 81659 was constant to better than 1% between the pairs of nights. My derived magnitude of SAO 81659 should be pretty good, as it and 51 LMi have almost identical colour indices. For ST LMi, I've left the data in the instrumental system: there seems to be little point in worrying about the colour transformations, since the data are of low precision and the spectrum is unlike that of a standard star. Initial indications (from M67) are that my instrumental V-band is a fairly good match to the standard system, whilst my R band is shifted to slightly shorter wavelengths than the standard. No R-band data seem to be available for 51 LMi anyway.

I estimated the errors for these measurements, based on the measured readout noise of the CCD and the expected photon (shot) noise (the latter was calculated using the specified photoelectron/ADU conversion ratio). The error bars in the plots are 1 standard error, and they seem realistic (or, conversely, the scatter in the data is pretty much as expected). For example, on 25-26 March, 218 measurements of GSC 1978 1314 yielded a mean signal (relative to SAO 81659) of 0.0087 with an rms scatter of 0.0011; the computed error averages 0.0012. Hardly precision photometry, but probably acceptable for 30 second exposures of a 15.2 magnitude star through a colour filter with an 8-inch telescope !

Results

The reader may be beginning to wonder if, after all this effort on such a faint star, the data show anything interesting! Fortunately, the answer is 'Yes!'. First a bit about ST LMi: this system is a *polar*, consisting of a magnetic white dwarf which accretes material from a red dwarf. The magnetic field prevents the formation of an accretion disc, and an *accretion column* forms instead: material flows along the field lines towards a magnetic pole of the white dwarf. Here it is shock heated and cyclotron radiation is produced. This radiation is polarised (hence the name polar) and is also very red. In ST LMi, the stars do not eclipse each other, but the system appears bright when the cyclotron radiation-emitting region is visible, and fainter when it is hidden by the limb of the white dwarf. Cyclotron radiation dominates, and the system is reddest, during the bright phase. Early studies of this star attributed the faint phase optical radiation largely to the white dwarf (yielding V approx 17). However, more recently, Ciardi et al (PASP, 110, p1007) observed ST LMi in an extreme low state, when - as judged by the absence of emission lines - accretion had apparently stopped completely. It was then about V=18. (These notes are based mainly on a paper on ST LMi by *J Bailey et al, MNRAS, 215, p179 (1985)).*

It is very pleasing that many of these features of the system are present in my data. The bright/ faint phase nature of the light curve is very apparent. The amplitude is generally greater in the red, as is expected. Night to night variability is also apparent, especially during the bright phase. Previous observers also commented on bright phase variation; this presumably represents a varying accretion rates onto the white dwarf. There also seems to be some smaller variations during the faint phase: perhaps this is due to variable emission from the accretion column well above the white dwarf. In this regard, I note that my V band observations always showed the system to be well above its low-state value of V=18, referred to above (note that 0.01 in my figures corresponds to V=15.0).

Acknowledgements I am very happy to acknowledge the loan of the BAA filter box. Also, as usual, this note has benefited from interrogation of the SIMBAD database.

PEP FROM THE BACKYARD OBSERVATORY AT RYDE - THE FIRST 5 YEARS (PART 4)

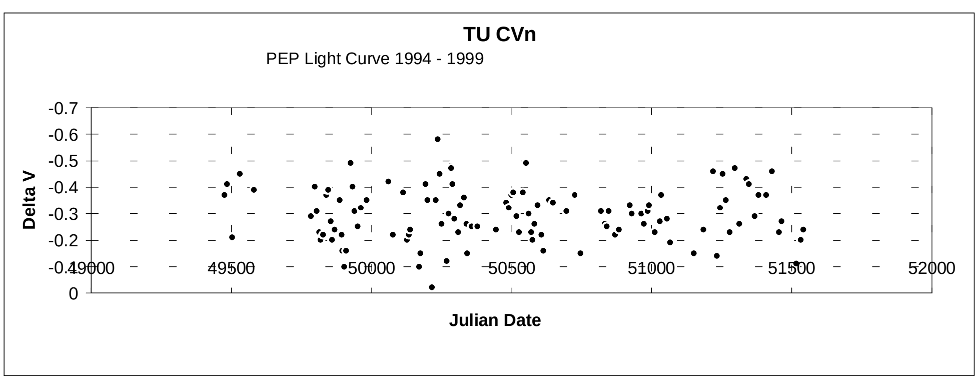
Kevin West

This series of articles sets out to show PEP light curves with some provisional analysis, and to compare these with any appropriate visual light curves. The stars are all part of a programme of the long term monitoring of high declination, bright variables, conducted by the author. The data is readily available from the BAA database. It is intended that a more detailed compilation of the articles will be submitted for publication in the Journal. The programme comprises:

Psi 1 Aur, UU Aur, BR CVn, TU CVn, Y CVn, V465 Cas, Mu Cep, UX Dra, g Her, OP Her, Delta 2 Lyr, R Lyr, XY Lyr, X Per, ST UMa, VY UMa, RR UMi.

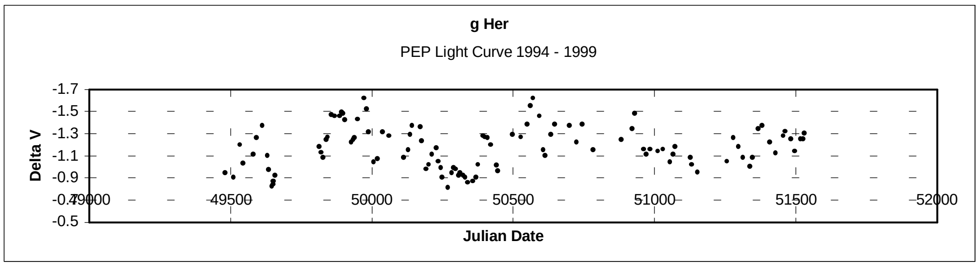
TU CVn

The relatively short period of TU CVn, and the fact that I can only observe about every 10 days (on average), make for a rather spotty, featureless light curve. It is here that the tools and skills of period searching techniques come in to their own. Two independent analyses of the data found a strong period at 44 days, and I was about to tell the world of this discovery, when Chris Lloyd informed me that I had been beaten to it in 1995(1), a year after I had first started to observe TU CVn. Lesson learned, check the literature. GCVS(2) lists a period of 50 days.



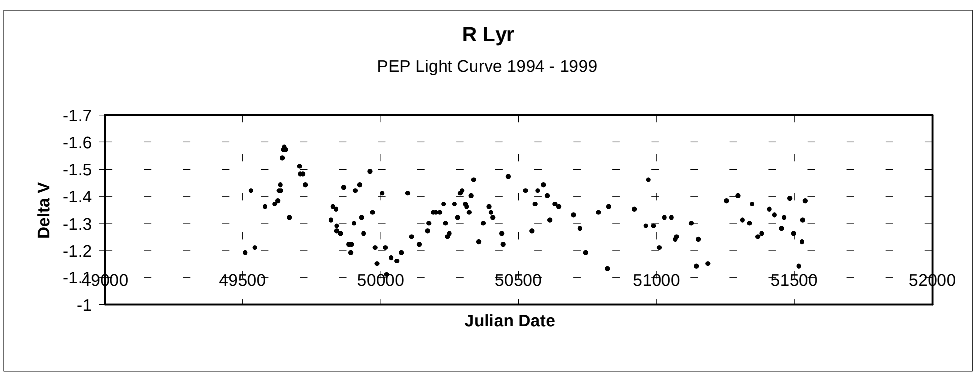
g Her

The slightly longer period of g Her enables one to begin to see maxima and minima in the light curve. GCVS lists a period of 89.2 days, and two independent analyses give an apparently close match with 87 days. However, the data covers 20 or so cycles of such a period, and a 2 day difference must be statistically significant so there may be something new to say here. Also found were much longer periods of 668 days and 715 days. More observations may resolve the difference between the analyses. AAVSO(3) found a “time scale of 80-90 days”.



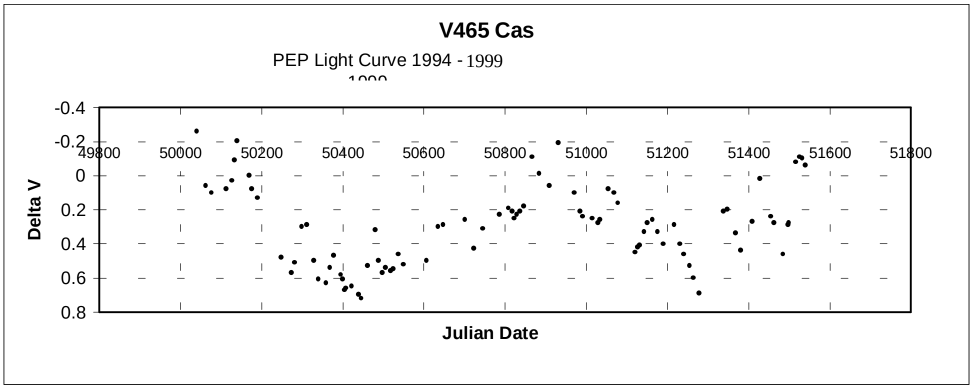
R Lyr

In the same paper mentioned above (1), *Cristian et al* found periods of 65 days and 25 days for R Lyr, using data covering a maximum of 5 seasons. My data, which spans a similar time, does not show this. Instead, two independent analyses agreed on a weak 43 day cycle. Once again a significant departure from GCVS, which listed 46 days. I would be interested to learn the sources of GCVS data if anyone can point me in the right direction.

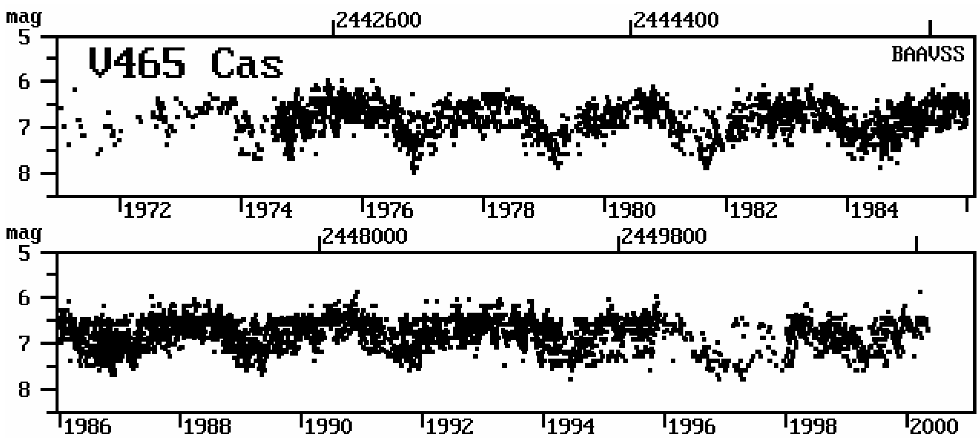


V465 Cas

This is perhaps the most visually interesting of the four light curves, with the appearance of short term variations superimposed on a very long cycle (about 800 days). I know of a few visual (and PEP) observers who follow this star, and some have commented on the recent high brightness of it. This prompted me to check GCVS, which gives a period of 650 days and a magnitude range of 7.7 - 8.9. I’m certain that there is an error here. The comparison star used for V465 was listed in Sky Catalogue 2000.0 as 7.1 and I suspect that this may be the source of the error. The BAA chart (4) gives star C (the comparison) as 6.3 and I suspect that this is much closer to the true value. I welcome any comments on this apparent anomaly. No formal analysis of my observations has been performed to date, so the field is open for any budding mathematicians. The data is in the public domain.



Above, Kevins PEP data for V465 Cas, and below, light curve provided by Dave McAdam from the BAA database



V465 Cas 1971 to 2000. 7035 observations by

M A Adamson, S W Albrighton, C M Allen, J M F Andujar, J W Barry, M Beach, S Beaumont, B J Beesley, M R Bell, M Beveridge, P Bibbings, G C Blair, N M Bone, T Brelstaff, N Britton, G Broadbent, J S Bullivant, A Chapman, P R Clayton, R Corrigan, A Davies, S R Dunlop, A R Edwards, S Elliott, P E Ells, D J Ells, B Espey, S J Evans, J Farrer, R W Fleet, R B I Fraser, J Fraser, V J Freeman, D Gavine, R J Geddes, D Gill, T Gough, M A Hapgood, M Harris, A C A Henley, C Henshaw, A J Hollis, P W Hornby, E H Horsley, A Horton, D Hufton, G M Hurst, A Hutchings, J E Isles, S Johnston, B J Keenan, B Kelly, R E Kelly, R A Kendall, I H Kennedy, G J Kirby, S Koushiappas, J Lashley, R J Livesey, D K Lloyd, M Long, T Lubek, M Lunn, J W Macvey, A Mark, T Markham, R A Marriott, K P Marshall, L R Matthews, P McGenity, R H McNaught, I A Middlemist, I Miller, R Minty, B R M Munden, I P Nartowicz, B O'Halloran, P O'Neill, J Parkinson, R N Pennell, R D Pickard, D A Pickup, G Pointer, M J D Price, G J Privett, G Ramsey, N Reid, S G Ridley, D H Roberts, D W Robinson, D R B Saw, P A Scaven, A Smeaton, J S Smith, D M Swain, T Tanti, M D Taylor, G Thompson, A J Thomson, J Thorpe, J Toone, R P Watts, K West, E J W West, S Woodbridge, W J Worraker, K Xylaris, D Young, E Yusuf.

References.
(1) Cristian, V. et al. Pulsation Time Scales and Amplitudes in a Sample of Bright Semi-Regular Variable Stars, Publications of The Astronomical Society of the Pacific. Vol 107, 1995 May, No.711.
(2) General Catalogue of Variable Stars Volumes I - III, 4th edition, Kholopov et al 1985-1999.
(3) Percy, J.R. and Wong, N. et al, Photometric Surveys of Suspected Small Amplitude Red Variables. III. An AAVSO Photometric Survey. Publications of The Astronomical Society Of The Pacific, 106, 611-615, 1994 June.
(4) MDT, 1974 July & 1983 Oct. (I suspect that this chart has been updated)

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VARIABLE STAR SECTION WEB PAGE UPDATES

DAVE MCADAM

http://www.telf-ast.demon.co.uk/

BAAVSS www update 17, 14th March 2000
The following items have been added since 15 Feb 2000;-

SW UMa: CCD time series : D G Buczynski
U Cep: Why Observe Eclipsing Variables? : Tony Markham

New Current lightcurves
RX And, DX And, FN And, TAV J0218+507 And, V1494 Aql, SS Aur, TAV J0550+543 Aur, TAV0556+55 Aur, HL CMa, Z Cam, S5 0716+71 Cam, V362 Cep, SY Cnc, YZ Cnc, AK Cnc, AT Cnc, SS Cyg, SN1999em Eri, IR Gem, J0712+296 Gem, OI+158 Gem, X Leo, U Mon, CN Ori, CZ Ori, V1159 Ori, TZ Per, V513 Per, NSV623 Per, V818 Sco, SU Tau, BW Tau, SW UMa, CY UMa, EI UMa, ER UMa, Z UMi, 3C279 Vir

BAAVSS www update 18, 14 Apr 2000
The following items have been added since 14 Mar 2000;-

A Flare on EV Lac : J M Saxton
Recurrent Objects News : G Poyner
Amateur Use of 2 Metre Robotic Telescope : Roger Pickard
Modern catalogues for variable star comparisons : J Greaves
Red Comparison Stars - Future Policy : J Toone

New Current lightcurves
AR And, V1494 Aql, SS Aur, TAV0556+55 Aur, CR Boo, BR CVn, NGC4151 CVn, Z Cam, BY Cam, CG Cam, S5 0716+71 Cam, AM Cas, V635 Cas, V727 Cas, V770 Cas, NSV165 Cas, NSV203 Cas, TASV J2352+665 Cas, YZ Cnc, AT Cnc, OJ+287 Cnc, W Com, TT Crt, EM Cyg, EX Dra, U Gem, OI+158 Gem, YY Her, AH Her, HZ Her, RZ LMi, V426 Oph, FO Per, V513 Per, NGC1275 Per, NSV1665 Per, TY Psc, LX Ser, RR Tau, SU Tau, SW UMa, EI UMa

BAAVSS www update 19, 14 May 2000

The following items have been added since 14 Apr 2000;-

V Boo: a SR of declining amplitude : J Greaves & J J Howarth

New Current lightcurves

RX And, TAV J0218+507 And, V1494 Aql, TASV0722+37 Aur, SV CMi, Z Cam, AF Cam, S5 0716+71 Cam, VX Cas, V724 Cas, DY Cen, TAV2034+61 Cep, SY Cnc, OJ+287 Cnc, W Com, TT Crt, SS Cyg, NSV13262 Cyg, Q Cyg, AB Dra, J0712+296 Gem, OI+158 Gem, AH Her, AM Her, BL Lac, X Leo, MV Lyr, BX Mon, NSV8001 Oph, V409 Per, V818 Sco, NY Ser, FG Sge, SU Tau, SU UMa, BC UMa, CH UMa, ER UMa, Markarian 421 UMa, XTE J1118+480 UMa, 3C273 Vir, 3C279 Vir

Observing charts: BF Cyg (088.02) revised

ECLIPSING BINARY PREDICTIONS

TONY MARKHAM

The following predictions, based on the latest Krakow elements, should be usable for observers throughout the British Isles. The times of mid-eclipse appear in parentheses, with the start and end times of visibility on either side. The times are hours GMAT (UT-12h). D and L are used to indicate where daylight and low altitude respectively prevent part of the eclipse from being visible.

The variables covered by these predictions are :

Star	Mag Range	Star	Mag Range
RZ Cas	6.18 - 7.72 V	Z Per	9.7 - 12.4 p
U Cep	6.75 - 9.24 V	ST Per	9.52 - 11.40 V
SS Cet	9.4 - 13.0 v	Y Psc	9.44 - 12.23 V
SW Cyg	9.24 - 11.83 V	U Sge	6.45 - 9.28 V
Z Dra	10.8 - 14.1 p	RW Tau	7.98 - 11.59 V
TW Dra	8.0 - 10.5 v	X Tri	8.88 - 11.27 V
S Equ	8.0 - 10.08 V	TX UMa	7.06 - 8.80 V
RW Gem	9.53 - 11.76 V	Z Vul	7.25 - 8.90 V
V640 Ori	11.2 - 13.5 p		

2000 Jul 1 Sat
SW Cyg D10(07)13
U Sge D10(16)14D
X Tri L12(10)12

2000 Jul 2 Sun
TX UMa D10(06)11
RZ Cas D10(10)12
Z Dra 10(13)14D
X Tri L12(09)12
Z Vul 13(19)14D
RW Tau L14(10)14D

2000 Jul 3 Mon
ST Per 12(16)14D
RZ Cas 12(15)14D

2000 Jul 5 Wed
Z Vul D10(06)11
TX UMa D10(08)13
TW Dra 11(16)14D
U Cep 11(15)14D

2000 Jul 6 Thu
ST Per L11(07)12
Z Dra 12(14)14D

2000 Jul 7 Fri
S Equ D10(09)14D
Z Vul 11(16)14D

2000 Jul 8 Sat
RZ Cas D10(09)12
TX UMa D10(09)14D
U Sge D10(10)14D
TW Dra D10(11)14D

2000 Jul 9 Sun
RZ Cas 12(14)14D
Y Psc 14(18)14D

2000 Jul 10 Mon
SW Cyg D10(11)14D
U Cep 10(15)14D
RW Tau L13(18)14D
Z Dra 14(16)14D

2000 Jul 11 Tue
TW Dra D10(06)11
TX UMa D10(11)14L
ST Per 11(15)14D
U Sge 13(19)14D

2000 Jul 12 Wed
Z Vul D10(14)14D

2000 Jul 13 Thu
Z Dra D10(09)12
Y Psc L10(13)14D
RW Tau L13(12)14D

2000 Jul 14 Fri
S Equ D10(06)12
RZ Cas D10(09)11
TX UMa D10(12)14L

2000 Jul 15 Sat
U Sge D10(04)10
U Cep 10(15)14D
RZ Cas 11(13)14D

2000 Jul 17 Mon

Z Dra D10(11)13
Z Vul D10(12)14D
TX UMa D10(14)14L
Y Psc L10(07)11
S Equ 11(17)14D

2000 Jul 18 Tue

Z Per D10(05)10
U Sge D10(13)14D

2000 Jul 19 Wed

SW Cyg D10(14)14D
ST Per L10(13)14D
TW Dra 11(16)14D

2000 Jul 20 Thu

RZ Cas D10(08)11
U Cep 10(14)14D
TX UMa 11(15)13L

2000 Jul 21 Fri

Z Per D09(06)11
Z Dra 10(13)14D
RZ Cas 10(13)14D

2000 Jul 22 Sat

Z Vul D09(10)14D
TW Dra D09(12)14D

2000 Jul 23 Sun

TX UMa 12(17)13L

2000 Jul 24 Mon

SW Cyg D09(04)10
Z Per D09(08)12
S Equ D09(14)15D
RW Tau L12(14)15D

2000 Jul 25 Tue

TW Dra D09(07)12
U Sge D09(08)13
U Cep D09(14)15D
Z Dra 12(14)15D
X Tri 14(17)15D

2000 Jul 26 Wed

RZ Cas D09(08)10
X Tri 14(16)15D

2000 Jul 27 Thu

Z Vul D09(08)13
Z Per D09(09)14
ST Per L09(12)15D
RZ Cas 10(12)15
RW Tau L12(08)13
X Tri 13(15)15D

2000 Jul 28 Fri

Z Dra D09(08)10
Y Psc 10(14)15D
U Sge 11(17)15D
SW Cyg 12(18)15D
X Tri 12(15)15D
RW Gem L14(11)15D
RZ Cas 15(17)15D

2000 Jul 29 Sat

X Tri 12(14)15D
Z Vul 13(19)15D
Z Dra 14(16)15D

2000 Jul 30 Sun

Z Per D09(10)15D
U Cep D09(14)15D
X Tri 11(13)15D
SS Cet 15(19)15D

2000 Jul 31 Mon

S Equ D09(11)15D
X Tri 10(13)15D

2000 Aug 1 Tue

Z Vul D09(06)11
RZ Cas D09(07)09
Z Dra D09(09)12
Y Psc L09(08)13
X Tri L10(12)15

2000 Aug 2 Wed

SW Cyg D09(08)14
Z Per D09(12)15D
RZ Cas 09(12)14
X Tri L10(11)14
TW Dra 12(17)15D
SS Cet 14(19)15D

2000 Aug 3 Thu

X Tri L10(11)13
Z Vul 11(17)15D
RZ Cas 14(16)15D

2000 Aug 4 Fri

ST Per D09(11)15
U Sge D09(11)15D
U Cep D09(13)15D
X Tri L09(10)13
RW Tau L11(16)15D

2000 Aug 5 Sat

Z Dra D09(11)13
TW Dra D09(13)15D
Z Per D09(13)15D
X Tri L09(09)12
SS Cet 13(18)15D

2000 Aug 6 Sun

X Tri L09(09)11

2000 Aug 7 Mon

RZ Cas D09(06)09
S Equ D09(08)13
X Tri L09(08)10
RW Tau L11(10)15
U Sge 14(20)15D

2000 Aug 8 Tue

TW Dra D09(08)13
RZ Cas D09(11)14
Z Vul 09(14)15D
X Tri L09(07)10
Z Per 10(14)15D
SS Cet 13(17)15D

2000 Aug 9 Wed

U Cep D09(13)15D
Z Dra 10(13)15
RZ Cas 13(16)15D
ST Per 14(18)15D

2000 Aug 10 Thu

S Equ 13(18)15D

2000 Aug 11 Fri

U Sge D09(05)11
SW Cyg D09(11)15D
Z Per 11(16)15D
SS Cet L12(17)15D
RW Gem 14(19)15D

2000 Aug 12 Sat

ST Per D09(09)13
Y Psc 11(16)15D

2000 Aug 13 Sun

Z Vul D09(12)15D
Z Dra 12(14)15D

2000 Aug 14 Mon

S Equ D09(05)10
RZ Cas D09(11)13
U Cep D09(13)15D
U Sge 09(14)15D
SS Cet L12(16)15D
Z Per 12(17)15D
RW Gem L13(16)15D

2000 Aug 15 Tue

RW Tau 13(17)15D
RZ Cas 13(15)15D

2000 Aug 16 Wed

Z Dra D08(08)10
Y Psc D08(10)14
TW Dra 13(18)15D

2000 Aug 17 Thu

TX UMa D08(05)10
S Equ 10(15)15D
SS Cet L12(16)15D
ST Per 12(16)15D
RW Gem L13(13)15D
Z Per 14(18)15D
Z Dra 14(16)15D

2000 Aug 18 Fri

Z Vul D08(10)15
RW Tau L11(12)16D

2000 Aug 19 Sat

U Cep D08(12)16D
TW Dra 08(13)16D

2000 Aug 20 Sun

Y Psc D08(04)09
TX UMa D08(07)11L
ST Per D08(08)12
Z Dra D08(09)12
RZ Cas D08(10)12
SW Cyg 09(15)16D
SS Cet L12(15)16D
RW Gem L13(09)15
Z Per 15(20)16D

2000 Aug 21 Mon

U Sge D08(09)14
RW Tau L10(06)11
RZ Cas 12(15)16D
Z Dra 16(18)16D

2000 Aug 22 Tue

TW Dra D08(09)14

2000 Aug 23 Wed

Z Vul D08(08)13
TX UMa D08(08)11L
SS Cet L11(14)16D

2000 Aug 24 Thu

S Equ D08(12)16D
U Cep D08(12)16D
Z Dra 09(11)13
U Sge 12(18)16L

2000 Aug 25 Fri

TW Dra D08(04)09
SW Cyg D08(04)10
ST Per 11(15)16D
Z Vul 14(19)16D

2000 Aug 26 Sat

RZ Cas D08(09)12
TX UMa D08(10)11L
SS Cet L11(14)16D
TX UMa L14(10)14
RW Tau 15(19)16D

2000 Aug 27 Sun

RZ Cas 12(14)16D
Y Psc 13(17)16D
X Tri 15(18)16D

2000 Aug 28 Mon

U Sge D08(03)09
Z Vul D08(06)11

ST Per D08(07)11
Z Dra 10(13)15
X Tri 14(17)16D

2000 Aug 29 Tue
TX UMa D08(11)11L
U Cep D08(12)16D
RW Tau L10(14)16D
SS Cet L11(13)16D
SW Cyg 12(18)16D
TX UMa L13(11)16D
X Tri 14(16)16D

2000 Aug 30 Wed
Z Vul 11(17)16L
X Tri 13(16)16D
TW Dra 14(19)16D

2000 Aug 31 Thu
Z Dra D08(06)08
S Equ D08(09)14
Y Psc D08(11)16D
U Sge D08(12)15L
X Tri 12(15)16D
RW Gem 15(21)16D

2000 Sep 1 Fri
RZ Cas D08(09)11
TX UMa 08(13)11L
RW Tau L10(08)13
SS Cet L11(12)16D
X Tri 12(14)16D
Z Dra 12(15)16D
TX UMa L13(13)16D

2000 Sep 2 Sat
Z Vul D08(04)09
TW Dra 09(14)16D
ST Per 10(14)16D
X Tri 11(14)16
RZ Cas 11(14)16

2000 Sep 3 Sun
SW Cyg D08(08)14
U Cep D08(11)16D
X Tri 10(13)15
RW Gem 12(17)16D
S Equ 14(19)15L
RZ Cas 16(18)16D

2000 Sep 4 Mon
Y Psc D08(06)10
Z Dra D08(08)10
Z Vul 09(15)15L
TX UMa 10(14)10L
X Tri 10(12)15
SS Cet L11(12)16D
TX UMa L13(14)16D

2000 Sep 5 Tue
ST Per D08(05)10
TW Dra D08(10)15
X Tri 09(11)14
Z Dra 14(16)16D

2000 Sep 6 Wed
X Tri 08(11)13
RW Gem L12(14)16D

2000 Sep 7 Thu
S Equ D07(06)11
U Sge D07(06)12
RZ Cas D07(08)11
X Tri 08(10)13
SS Cet L10(11)16
TX UMa L13(16)16D
SW Cyg 16(22)16D

2000 Sep 8 Fri
Z Per D07(04)09
TW Dra D07(05)10
X Tri D07(09)12
Z Dra D07(09)12
U Cep D07(11)16
RZ Cas 11(13)15

2000 Sep 9 Sat
X Tri D07(09)11
Z Vul D07(12)15L
RW Tau 11(15)16D
RW Gem L12(11)16
RZ Cas 15(18)16D
Z Dra 16(18)16D

2000 Sep 10 Sun
X Tri D07(08)11
ST Per 08(13)16D
U Sge 10(15)14L
SS Cet L10(11)15
S Equ 11(16)15L
TX UMa 13(17)16D

2000 Sep 11 Mon
Z Per D07(05)10
X Tri D07(07)10
Y Psc 14(19)16D

2000 Sep 12 Tue
X Tri D07(07)09
SW Cyg D07(11)16D
Z Dra 09(11)14
RW Tau L09(10)15
RW Gem L11(08)13

2000 Sep 13 Wed
ST Per D07(04)08
X Tri D07(06)08

RZ Cas D07(08)10
U Cep D07(11)16
SS Cet L10(10)15
TX UMa 14(19)16D
TW Dra 15(20)16D

2000 Sep 14 Thu
S Equ D07(03)08
X Tri D07(05)08
Z Per D07(07)11
Z Vul D07(10)15L
RZ Cas 10(12)15

2000 Sep 15 Fri
X Tri D07(05)07
Y Psc 08(13)16D
RW Tau L09(04)09
RZ Cas 15(17)16D
ST Per 16(20)16D

2000 Sep 16 Sat
SS Cet L10(09)14
TW Dra 10(15)16D
Z Dra 11(13)15
TX UMa 16(20)16D

2000 Sep 17 Sun
SW Cyg D07(01)07
Z Per D07(08)13
U Sge D07(10)14L
S Equ 08(13)14L

2000 Sep 18 Mon
U Cep D07(10)15
ST Per 07(11)15

2000 Sep 19 Tue
Z Dra D07(06)08
RZ Cas D07(07)10
Y Psc D07(07)12
Z Vul D07(08)13
TW Dra D07(10)15
SS Cet L10(09)13

2000 Sep 20 Wed
Z Per D07(09)14
RZ Cas 09(12)14
Z Dra 12(15)17D
RW Tau 13(17)17D
U Sge 13(19)14L

2000 Sep 21 Thu
ST Per D07(03)07
SW Cyg 09(15)17D
Z Vul 14(19)14L
RZ Cas 14(17)17D

2000 Sep 22 Fri
TW Dra D07(06)11

SS Cet L10(08)13

2000 Sep 23 Sat
Z Dra D07(08)10
U Cep D07(10)15
Z Per D07(11)15
RW Tau L08(12)16
RW Gem 14(19)17D
ST Per 14(18)17D

2000 Sep 24 Sun
U Sge D07(04)10
Z Vul D07(06)11
S Equ D07(10)14L
V640 Ori L14(11)14
Z Dra 14(16)17D

2000 Sep 25 Mon
RZ Cas D07(07)09
SS Cet L09(07)12

2000 Sep 26 Tue
SW Cyg D07(05)11
ST Per D07(10)14
Z Per 07(12)17
RW Tau L08(06)11
RZ Cas 09(11)14
RW Gem L11(15)17D
Z Vul 11(17)14L
V640 Ori L13(12)14
Y Psc 16(20)17L

2000 Sep 27 Wed
Z Dra 07(10)12
U Sge 07(13)13L
RZ Cas 14(16)17D
TW Dra 15(21)17D

2000 Sep 28 Thu
U Cep D07(10)15
SS Cet L09(07)11
V640 Ori L13(12)15
Z Dra 16(18)17D
X Tri 17(19)17D

2000 Sep 29 Fri
TX UMa D07(02)07
Z Vul D07(04)09
Z Per 09(13)17D
RW Gem L10(12)17D
X Tri 16(18)17D

2000 Sep 30 Sat
Y Psc 10(15)16L
TW Dra 11(16)17D
SW Cyg 12(18)17D
V640 Ori L13(13)15
X Tri 15(18)17D
U Cep 17(22)17D

PRELIMINARY ECLIPSING BINARY LIGHT CURVES FOR 1999

TONY MARKHAM

Presented on the covers of this circular are four preliminary light curves generated using the visual observations submitted for 1999. In each case, observations from more than one observed eclipse have been combined into a single light curve. Phases were calculated using the GCVS elements unless stated otherwise.

RZ Cas

Observers : Michael Clarke, David Conner, Shelagh Godwin, Tony Markham, Melvyn Taylor.

The primary eclipse continues to be late. The discrepancy is slowly increasing.

TV Cas

Observers : David Conner, Ron Livesey, Tony Markham, Melvyn Taylor.

Here the primary eclipse may be slightly earlier than predicted. The scatter is partly due to some observers seeing shallower eclipses than do others.

Beta Lyr

Observers : Matthew Barrett, Michael Clarke, Shelagh Godwin, Lindsay Green, Eric Horsley, Simon Jenner, Tony Markham, Robert Naudziunas, Melvyn Taylor.

The primary eclipse is at predicted phase approx 0.33, with the secondary eclipse approx half a cycle later. The latest elements issued by Krakow Observatory give a period which is now approx 37 minutes longer than that given in the GCVS.

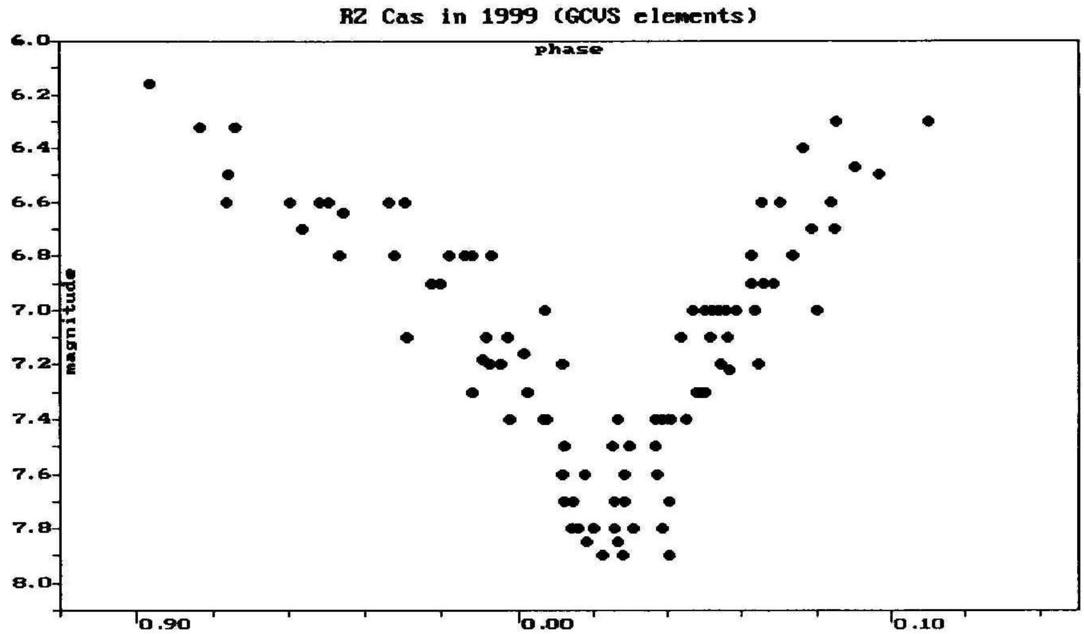
BV Tau

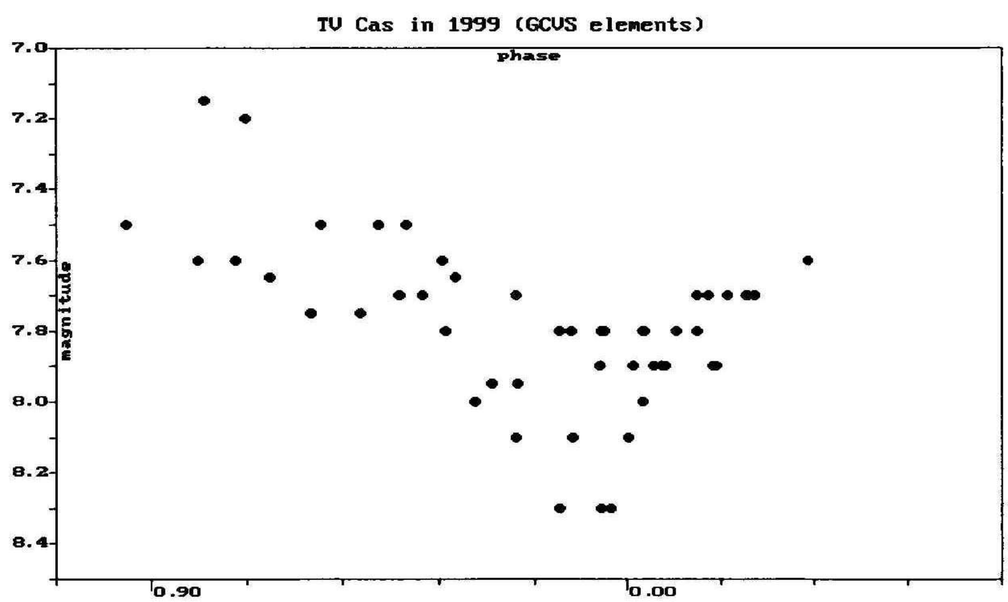
Observer : David Conner.

The observations (from 3 eclipses: Nov 16, Nov 29, Dec 28) clearly do not fit the longer period of 12.349 days given in the GCVS. Instead, the phases in this light curve were calculated using the ephemeris suggested by John Isles and Tristram Brelstaff in the 1986 Feb BAA Journal :

Min I = 2445053.31 + 0.93047 E

Given the short period and the fact that only 2 dp were specified originally in the ephemeris, it is not surprising that the observed and predicted minima have diverged slightly. However, by continuing to observe eclipses, we can define the elements more precisely.





The deadline for contributions to the September issue of VSSC will be August 7th, 2000. All articles should be sent to the editor (details are given on the back of this issue)

Whilst every effort is made to ensure that information in this circular is correct, the Editor and Officers of the BAA cannot be held responsible for errors that may occur.

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TELEPHONE ALERT NUMBERS

Nova and Supernova discoveries

First telephone the Nova/Supernova Secretary. If only answering machine response, leave a message and then try the following: Denis Buczynski 01524 68530, Glyn Marsh 01772 690502, or Martin Mobberley 01245 475297 (weekdays) 01284 828431 (weekends).

Variable Star Alerts

Telephone Gary Poyner (see above for number)

BAAVSS web pages:http://www.telf-ast.demon.co.uk/

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