British Astronomical Association

VARIABLE STAR SECTION CIRCULAR

No 103, March 2000

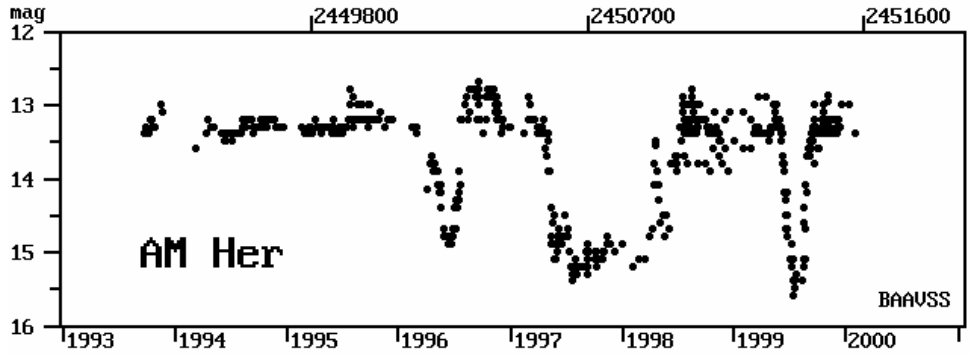
Contents

ISSN 0267-9272

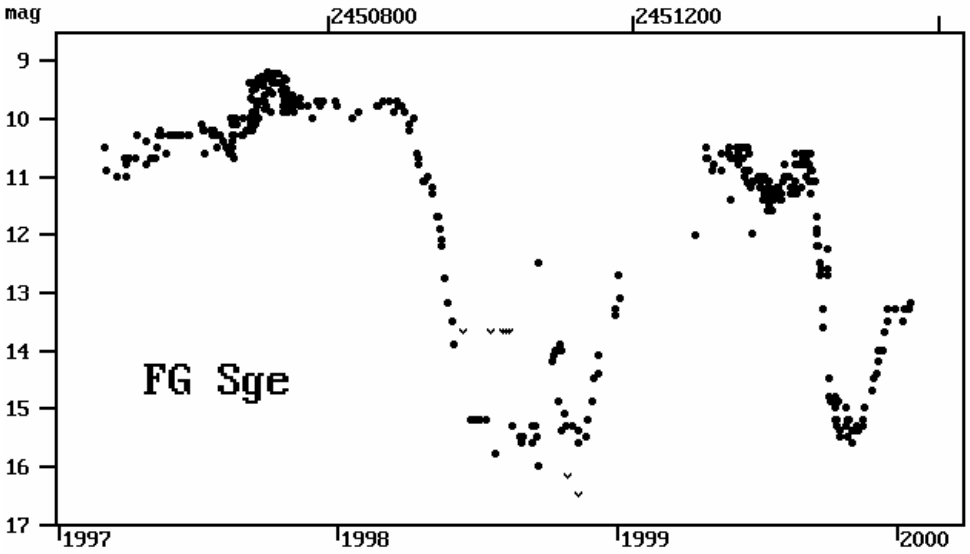
Office: Burlington House, Piccadilly, London, W1V 9AG

LIGHT CURVES

DAVE MCADAM



AM Her 1993 to 2000. 601 observations by:
J Greaves, Miroslav Komorous, H W McGee, E Muyllaert, G Poyner.



FG Sge 1997 to 2000. 464 observations by:
K G Andersson, D Gill, B H Granslo, G M Hurst, C P Jones, H W McGee, E Muyllaert, G Poyner, M Westlund, W J Worraker.

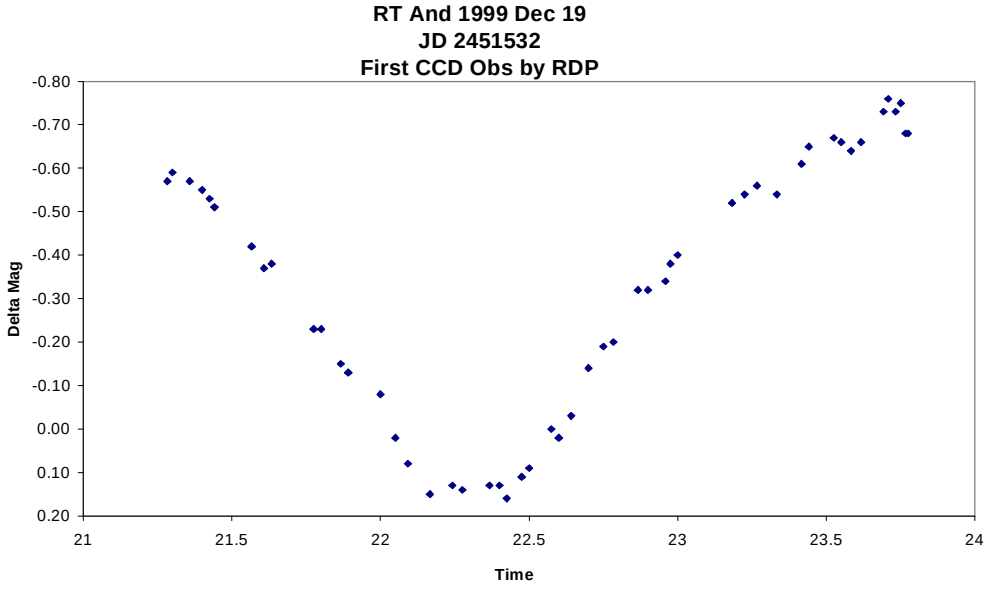
FROM THE DIRECTOR

ROGER PICKARD

On 13th February 2000, I had a conversation with one of my predecessors, Tristram Brelstaff, during the course of which he mentioned the star **XX Cam,** and how he had some old photoelectric observations but that nobody seem to be observing it nowadays. (The GCVS gives it as an R CrB star, but there are doubts about this). As it was clear that night, I decided to measure it photoelectrically, which I did, finding it at a magnitude of 7.4.

After securing this result, I came indoors to check to see what else was on my programme, but decided to log-on first. There was an interesting message from John Toone, saying that he had observed **V UMi** (SRb, 7.4 - 8.8) on 10th February at mag 7.5, its brightest level since he'd begun following it 20 years ago. This sounded like another ideal target under the conditions for PEP. Interestingly, I measured it at 7.2 - even brighter than John had made it. Using Tycho values John's measurement would have been 7.4; also, he confessed he is a "faint" red observer. Of course, I didn't know what magnitude I'd obtained for any of these measurements until I'd reduced them the following day. Oh, and all this was after I'd been over to set up the APT (about 7 miles away) as Malcolm Gough was working that night.

That weekend, I had also just acquired a set of extension rings in order to fit a cheap 50 mm camera lens to my Starlight Xpress CCD camera, and therefore I was keen to see if it worked. Although there was a bright moon around and, early on, conditions were not perfect, I was absolutely delighted with the performance I was getting. I can now see why Guy Hurst is keen on novae hunting with his CCD camera. I might take it up myself, if I can find a spare moment! After playing around for a while, taking shots of various well-known objects, I decided that the sky was good enough for photometry. Hence the observations of XX Cam. But why not use the CCD camera with my telescope? I do, but that weekend the tube which connects the CCD camera to the telescope was away having a new relay lens assembly fitted,



as the Barlow lens I had been using gave me a ridiculously small field of view of 4 x 5 arc minutes. That said, I had obtained one good run with the CCD camera before Christmas on the RS CVn star, **RT And**. This was as part of an observing campaign organised by Professor Jim Sowell of the Georgia Institute of Technology, who is running an international campaign to re-determine the times of minimum of a number of these stars. The graph obtained is shown on the previous page.

The joy of this particular observation, was that I could sit indoors with the telescope slow motion control in one hand and the computer mouse in the other, taking "pictures" every couple of minutes or so! If only I could do conventional photometry the same way, but alas, the comparisons are usually too far away, whereas with RT And they were in the same field of view even though it was so very small.

RED COMPARISON STARS - OUR FUTURE POLICY

JOHN TOONE

The accurate photometry undertaken during the ESA Hipparcos Mission has been responsible for detecting 8,237 new variable stars. A high proportion of these new variables are red stars, and in particular red giants, as illustrated in the diagram on page 465 of volume 1 of the Hipparcos and Tycho Catalogues. This diagram shows that 70% of giant stars with V-I mags greater than 1.5 are variable stars.

Recently, I did a check on the stars that are between 0 hours and 12 hours in the Sky Catalogue 2000 and that are also listed as spectral class M0 or later, and I compared them with the Hipparcos data. Not surprisingly, out of 759 stars sampled, only 48 (mainly spectral class M0) were not listed as variable. Hipparcos made on average 110 photometric observations per star within the period November 1989 and March 1993, and we know from long-term monitoring of red variable stars that variations can be intermittent, so the risk remains that some of these 48 stars may still be variable outside of the 3 year period that Hipparcos was monitoring them. The above would appear to support what Stebbins and Huffer suspected as long ago as 1930 - that no red giant star is of really constant brightness.

Consequently, it would seem that unless it is a main sequence dwarf, red stars of spectral class M0 or later are unsafe to use as comparison stars. Since the vast majority of bright red stars are giants and not dwarfs, and considering that visual observers have different spectral responses (particularly with red stars), it would be sensible to avoid using stars of spectral class M0 or later as comparison stars in the future.

As accurate spectral data on stars is not always readily available, it is proposed that a limit is imposed, instead, on the basis of the star's B-V index. Upon review of Table 45 on page 142 of Nortons Star Atlas (18th Edition), a sensible limit would appear to be a B-V index of 1.5, which equates roughly to spectral class M2 for main sequence stars, K8 for giants and K2 for supergiants. So with immediate effect, no stars with a B-V index of greater than 1.5 will be selected as comparison stars on future sequences. The few that appear on existing sequences will be reviewed at the time that the chart is updated. Only where the sequence seems fine and we have a long series of data will existing comparison stars of B-V >1.5 be retained.

THE BAAVSS DATABASE AT THE START OF Y2K

DAVE MCADAM

Since 1991 the database has grown to one-and-a-third million observations of over a thousand stars and active galaxies. It incorporates the work of some 930 observers and now spans 113 years. Seventy-four individuals have entered their own observations, and/or transcribed existing written records ready for logging. The basic database system, devised and written by myself, has been extended to meet the requirements of growing monthly reportage, and the output of increasingly larger datasets. Three years ago, software routines for compilation of summaries for *The Astronomer* magazine and for the maintenance of the BAAVSS web pages were added.

Computer equipment has also grown over 9 years; John Isles, at the end of his second term as Section Director, initiated the request to the BAA Council for the first PC (An 80386 with 1Mbyte memory and a 40Mb hard disk - quite minimal in comparison to todays standards!). Tristram Brelstaff continued supporting the project during his directorial term, and the *Stargazers Trust* provided two much-needed 500Mb hard drives, when the data quickly began to fill the initial hard drive. Gary Poyner then took over as Director and negotiated for a new PC (a Pentium 75), and a regular annual grant from the RAS, both were successful with support through the *Pro-Am Liaison Committee*. In addition, Gary also arranged with Bill Wilson, the Birmingham Starlink Manager, for a 'second location' backup copy of the data to be maintained on their Unix system. In stating the case for having facilities at a second location, I remember saying 'If an asteroid obliterates my house, the VSS will lose ALL its records!' - since a high proportion of observations in the last decade only exist in electronic form, more mundane events could, of course, have a similar effect.

Up to the end of 1999, the running of the database was shared between the two PC's and various chores divided between them. The 386 bore the brunt of logging input files via email or disc, whereas the P75 dealt more efficiently with lightcurves and other graphics. I personally added more memory and a scanner to ugrade the P75 for this work. Data and programs were backed up between the machines by means of an interchangeable hard drive swapped for the purpose. (with power off). Typically, around 1200 files per month would be updated in about an hour.

Throughout 1999, it became increasingly obvious that another machine upgrade was necessary - the Eclipsing Binary programme variables were added to the lists with Tony Markham's guidance, and John Toone's Binocular and Telescopic observing charts were being scanned for the web pages. Earlier, a decision had been taken by the Section committee for paper reports to be sent to me, but keeping abreast of keying these in (as I'd planned), as well as dealing with the monthly email reports proved impossible. One obvious result was that the 1998 observer totals presented by Gary Poyner in VSSC101 omitted a number of observations that were reported on paper but not yet entered into the database. My apologies for this - the section needs paper reports if you cannot use a computer; however, I hope observers understand the priority is to log data rather than spend extra time simply counting results on paper.

Roger Pickard has enlisted the help of Terry Miles at Crayford, and the backlog of paper reports is being tackled. Also, one of Roger's first actions as Section Director was to request expenditure on new equipment from the BAA Council. A Pentium III computer with a Gigabyte

hard drive capacity was obtained mid-December ,and is being brought into database use. The changeover is more protracted than expected; operating system differences mean that programs need checking and some modifications. Y2K non-compliance also cropped up mainly in programs written for generating the web pages. However, although the increased speed of the new computer is really impressive, the working of the VSS database ultimately depends on the humble keying-in of observations. Observers who key their own results are helping to spread the load - if you have a computer but still write your observations out, please consider making the switch!

HOW AMATEURS CAN OBSERVE WITH A 2 METRE ROBOTIC TELESCOPE

ROGER PICKARD

On Monday 17th January 2000, the Director, along with other VSS Officers, attended a meeting near Liverpool arranged by Richard Miles and professional astronomers from Liverpool John Moores University (JMU) to discuss this opportunity. All in all 19 amateurs and 8 professionals attended the meeting. I came away with the feeling that we have a very great opportunity to further, not just astronomy but, of course, amateur astronomy in particular.

Richard has already sent out a flyer which appeared at the recent "Astrofest" exhibition in London organised by the magazine Astronomy Now. It is also available on the Web site which has been especially prepared by Richard (see address below).

Very briefly, the project was conceived, in its present form, by Professor Mike Bode and colleagues at JMU, the National Museums and Galleries on Merseyside (NMGM) and PPARC. They have come up with the idea of building a 2-metre robotic telescope which will be housed on La Palma alongside the William Herschel and Isaac Newton telescopes. Funding for the project has come largely from The European Regional Development Fund (ERDF). Probably of more interest to the amateur community is that five percent of the observing time has been set aside for public education, part of which will be given over to amateur astronomers who may submit suitable applications (see below). Whilst 5% may not seem much, when put into context it is a fair amount. For example, supposing that La Palma has 300 clear nights per year at an average 8 hours per night that is 2,400 hours. Five percent of this is 120 hours. Even if amateurs only get part of this, it is to be compared with perhaps only 5 nights of observing that a professional might get for any given proposal - if he's lucky!

Initially, the telescope will be equipped with a 2Kx2K back-illuminated CCD with a field of view of 4.7 arcmin square. First light for the Liverpool Telescope (LT) is currently scheduled for 6th October 2000, and full robotic operation is planned to start in February 2001; amateurs could be observing with this telescope by March 2001.

To assess whether an amateur project is worthwhile, it is the intention to set up a Pro-Am Time Allocation Group (PATAG), which will be largely modelled on the groups used by professionals, but consisting largely of amateurs.

Part of the afternoon session was given over to proposals from amateurs, and these included (in no specific order!): Photometry of AGNs; follow up observations of Novae, Supernovae and flare stars etc; high-speed photometry of Cataclysmic Variables (including Dwarf Novae)

and photometry of variable star sequences.

This is a tremendous opportunity for amateurs and it is hoped that it will also produce a range of articles and even full scientific papers.

This is only the first of these new 2-metre robotic telescopes; during the tour of the workshops that we were given, we saw two more identical telescopes. However, the LT is the first.

Further details are available on the BAA Web site at: **http://www.ast.cam.ac.uk/~baa/LT.html.**

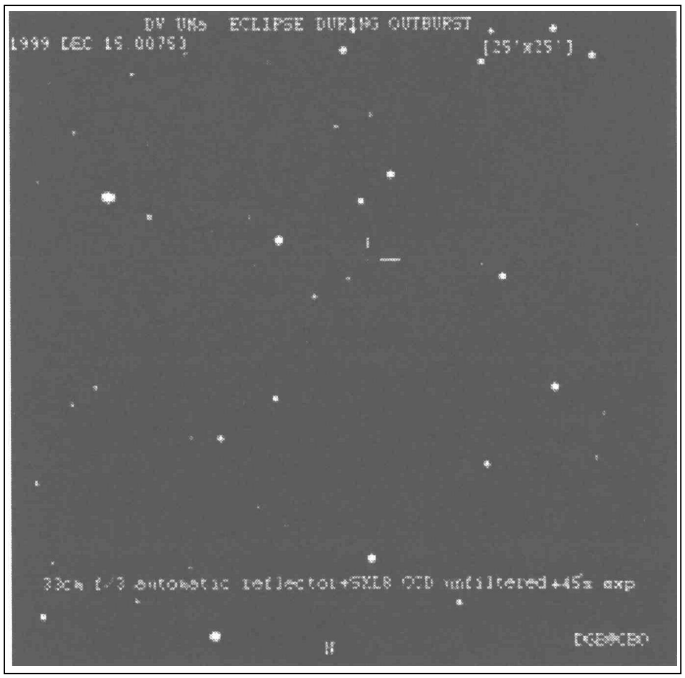
RECURRENT OBJECTS NEWS

GARY POYNER

Outburst of DV UMa

The third outburst to be monitored by visual and CCD observers of this eclipsing UGSU star was detected by the Finnish observer Timo Kinnunen, on December 8th at magnitude 15.3. Observations soon showed this to be the second superoutburst in succession to be detected - the previous outburst occurred in April 1997. **DV UMa** was observed in outburst for the first time in February 1995 during a normal outburst.

Deep eclipses of the order of 1.5 magnitudes were observed by several CCD observers, including Denis Buczynski at Condor Brow (see image below). The depth of these eclipses



A 45 second image of DV Uma in eclipse during outburst, taken by Denis Buczynski at Condor Brow using his 33cm f/3 automatic reflector and an SXL8 unfiltered CCD camera

were identical to those observed during the 1997 superoutburst. In addition to these, large amplitude superhumps were detected by observers at Kyoto University (M. Uemura and T. Kato) and by Tonny Vanmunster (CBA Belgium), who reported superhumps of 0.5 magnitude which were observed on December 10/11with a 0.35m f/6.3 telescope with an unfiltered SBIG ST-7 CCD camera.

Because the outburst was detected during the rise to maximum, Rudolph Novak (Nicholas Copernicus Observatory, Brno Czech Republic) was able to obtain early CCD photometry of the rising phase. He reports in vsnet-alert 3803 that early superhumps were detected on December 8th, along with eclipses of the accretion disc and a linear rise to maximum.

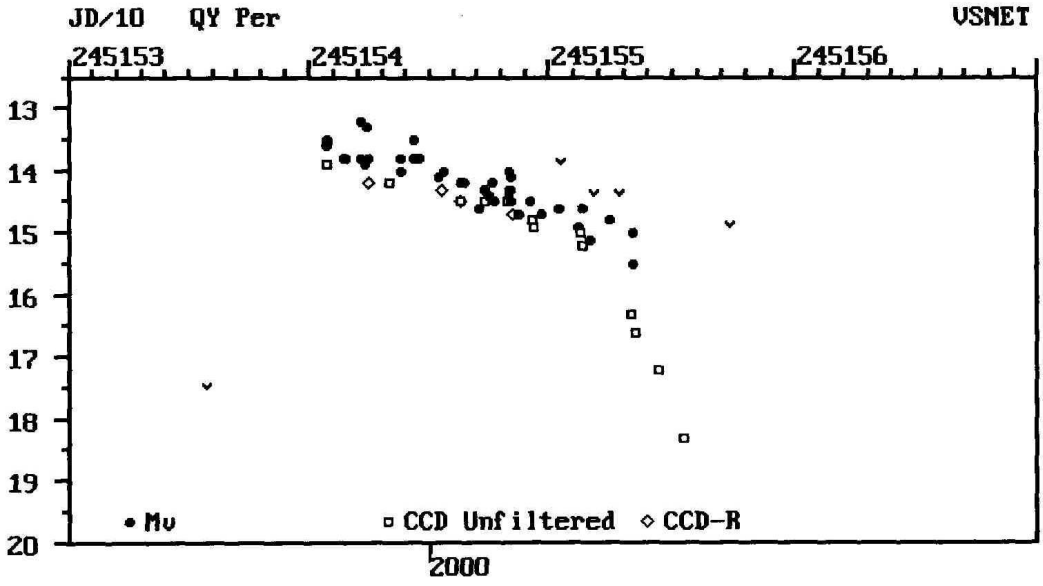
Further light curves and information on DV UMa eclipses can be seen at..

http://www.kusastro.kyoto-u.ac.jp/vsnet/DNe (including eclipse animations)
http://ian.cz/cba (CBA Brno homepage)
http://members.aol.com/GaryPoyner/DVuma.html (Visual observations of eclipses during the 1997 outburst)

Outburst of QY Per

A rare outburst of this UGSU star was detected by AAVSO observer Mike Simonsen (Michigan) on December 28.145 UT at magnitude 13.5. An independent outburst detection was made by Bill Worraker (Didcot, UK) on December 28.908 UT at magnitude 13.8.

QY Per was discovered by Hoffmeister in 1966, and he recorded two outbursts photographically in September 1964 (mag 14.2) and October 1969 (mag 16.0). A further outburst was reported by Rosino on IAUC 4900 in October 1989 (mag 14.9). The first visual outburst was detected by Vanmunster in October 1994 (mv=14.0), and accurate astrometry was also performed during



this outburst by Nick James. Further outbursts include Aug 1995 (mv=14.8) and July 1996 (mv=14.3).

The December 1999 outburst was intensely monitored by observers at Kyoto University. On vsnet-alert 3894, the Kyoto team reported their results from an 8.5 hour photometric run on December 30th. Superhumps with an amplitude of 0.3mag were detected, and a best superhump period was determined to be 0.0779 day. Data obtained by Gianluca Masi was also used in this analysis. Thus the long suspected UGSU status of this star was finally confirmed.

The accompanying light curve was compiled from BAAVSS observers reports (H. McGee, C.P. Jones, G. Poyner and W. Worraker) and observations posted to vsnet-obs. Congratulations to Mike Simonsen and Bill Worraker on their detection of this rare outburst.

HW Tau
This Recurrent Object has been identified by Patrick Schmeer with Minor Planet 49 Pales (1939 Oct. 22.07 and 23.01 UT) in a report on non-existent CVs compiled by him last year - but not yet published! The identification has been confirmed on plate copies supplied to Schmeer by Nikolai Samus. HW Tau has therefore been dropped from the Recurrent Objects Programme. Our thanks to P. Schmeer for notifying the CV community of his findings - albeit somewhat belated!

A FLARE ON EV LACERTAE

JOHN SAXTON

Introduction
Recently, I had the excitement of observing a flare on the flare star **EV Lac**. To the best of my knowledge, this is the first photoelectric detection of a flare by an amateur in the UK. In fact, I know of only one other observation of a flare by a UK amateur - of a flare on **AD Leo** by Roger Pickard around 1970. The success of this observation is partly due to several improvements made to my telescope over the last few years, which enable me to do long continuous runs on a single object. These were made with the aim of observing asteroid occultations, but the system is quite well suited to bright flare stars too.

My telescope is a 21 cm Newtonian, and the photometer employs a 1P21 family PMT and DC amplifier. The amplifier has a time constant of 0.3 seconds, and the output goes to a V/F converter and from there to a frequency counter. Manual photometry was performed by centering the star in the aperture, removing the flip mirror, walking to the desk (which took a few seconds during which the amplifier output stabilised and any vibrations in the telescope died away), pressing the reset button on the counter, noting the time and writing down the first three readings. Logging data by hand in this fashion was easy, but entailed a great deal of typing at the computer the following day !

Three main improvements have been made. First, the periodic error in the telescope drive has been reduced. The drive uses a mains synchronous motor to drive a worm, which rotates once every three minutes. Originally, the motor was driven from a variable frequency oscillator and

the periodic error could be as much as several tens of arc seconds - which could have disastrous consequences when I was using an 80 arcsecond diameter aperture. In the present system, which was entirely home-built, the drive is operated in 'learn' or 'replay' mode. In 'learn' mode, the telescope is made to track a star, using the fast and slow buttons as necessary to compensate for periodic error. This operation is recorded on an static RAM, so that after switching to 'replay' mode the telescope will track the star properly taking care of periodic error by itself. The fast and slow buttons can still be used to adjust the drive speed and to centre an object in the photometer aperture. (As an aside, many telescopes must have worm and wheel drives with synchronous motors, and I was suprised that PEC systems were not commercially available for such drives). Fine adjustment in declination is provided by means of a tangent arm which is operated by hand.

Second, it was necessary to read data directly into the computer. To do this, I bought an 8 bit to RS 232 interface kit from Maplin Electronics and built a simple 8 bit counter which has a 40 millisecond gate time and which is triggered by the Maplin interface. This combination samples the prescaled V/F output at 9 Hz. Given the noise in the signal, sampling the signal at 8 bit resolution 9 times a second is quite satisfactory. The computer sits in my study in the house, and is connected to the photometer by a 20-m long cable which runs out of a window and out across the garden.

Third, I added a guiding telescope. This time I opted to make life easy and bought something ready made - an 8-inch f/6 tube assembly from Orion Optics in Crewe. This was fitted to my original telescope so as to allow small adjustments of the two telescopes with respect to each other. A star central in the photometer aperture on the 8½ inch is arranged to be on the cross wires of the guiding eyepiece of the 8 inch.

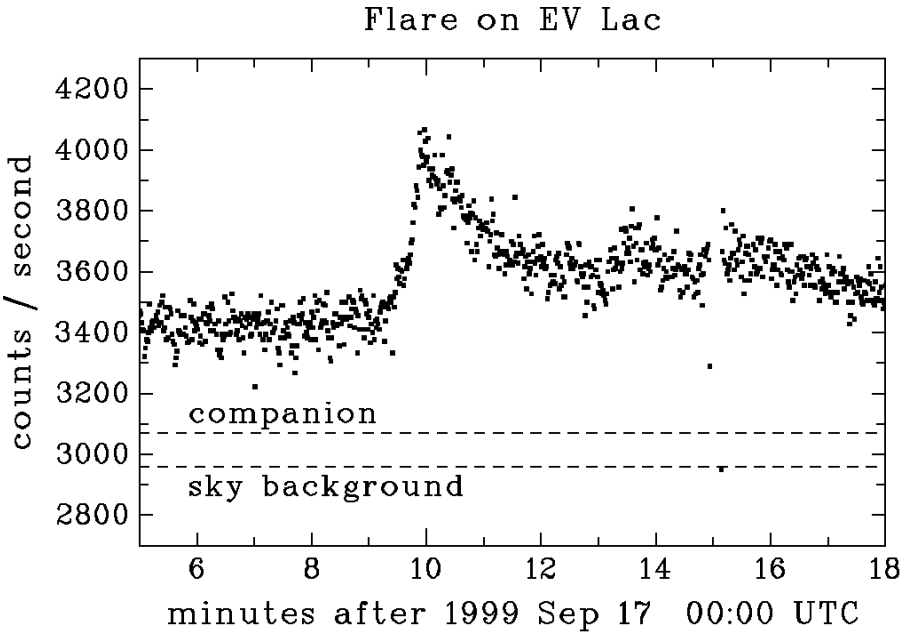
This system was working in time for the predicted occultation of a 10th magnitude star by 162 Laurentia on 1999 September 8. It was a beautiful moonless night and the equipment worked fine, but the path missed Lymm. Perhaps some other time ...

EV Lac

EV Lac is one of the more active flare stars. Leto et al (1997) observed 170 flares in the B band in a total of 1013 hours of monitoring, giving an average interval between flares of 6 hours. It is also the brighter component of a visual double star; according to photometry by Eggen the quiescent magnitude and colour of EV Lac are V=10.0, B-V= +1.38, whilst the companion has V=11.9, B-V= +0.65. EV Lac itself also shows low amplitude variations of the **BY Dra** type. I had to use a 145 arcsecond aperture in order to avoid having the companion very near the edge of the photometer aperture. Unfortunately, use of a large aperture increases the sky signal and reduces the signal to noise ratio.

On 1999 September 15-16, I monitored EV Lac for 70 minutes with a B filter without detecting any flares. On 1999 September 16-17, I observed the star again. After an hour, I was rewarded with the spectacular flare shown in the figure. I was away from the telescope during the rise part of the flare, but on returning, I was surprised to find the signal much higher than usual. I looked into the guiding eyepiece, and EV Lac did appear brighter than it had done several minutes previously. That said, I might add that I was very tired by that time, and would not relish the prospect of trying to detect flares visually. The figure shows the measurements binned to 1 second time resolution.

EV Lac brightened by almost a magnitude in 1 minute, with most of the brightening in about



20 seconds. There was then a slower fading, followed by a long 'tail' during which the brightness returned to normal around 20 minutes after the flare had started (not all the tail is shown in the figure). The gap in the lightcurve at 00:15 UTC is a guiding correction.

Unfortunately, this record is not perfect, which is a pity given the rarity of the event. The telescope tracking is good enough to be left unattended for several minutes at a time (just long enough to go indoors and make a cup of coffee!), but a small misalignment of the polar axis requires occasional manual adjustments in declination. I initially assumed the flare would be short lived, and was reluctant to break the record and manually move the telescope. The direction of drift was such that the companion star would reach the edge of the aperture before EV Lac itself. In fact, the flare lasted longer than I had expected, and I appear to have left the correction too late, for when I finally did apply a declination correction (at about 00:15:00) the signal increased by a level consistent with the companion star re-entering the aperture. The previous step in the lightcurve (near 00:13:20) is of a similar size, and therefore also somewhat suspect, although it could also represent a secondary flare.

We can estimate the energy radiated by the flare by calculating the area under the light curve. According to Leto et al, the quiescent luminsosity of EV Lac is 3.49×10^{22} Watts in B. This flare radiated about 1.5×10^{25} Joules in B alone. Leto et al show the energy distribution of flares they observed: only 10% radiate 1×10^{25} Joules or greater in B ! For comparison about 1×10^{25} Joules are radiated in large solar flares, about a quarter of this appearing at visible wavelengths (Phillips 1992, p187). My EV Lac flare was thus an order of magnitude larger than a large solar flare.

References:

G Leto, I Pagano, C S Buemi and M Rodono. Astron. Astrophys., 327, 1114-1122 (1997). K J H Phillips, Guide to the Sun, Cambridge, 1992. I have also made use of the SIMBAD database operated by CDS at Strasbourg, France.

THE JACK ELLS AUTOMATIC PHOTOELECTRIC TELESCOPE - Report for 1997

ROGER PICKARD AND MALCOLM GOUGH

The usual summary of the observations is reported in Table 1.

THE JACK ELLS APT AT TROTTISCLIFFE
(Operated by Crayford Manor House Astronomical Society)

RESULTS SUMMARY 1997

No	Double Date 1997	JD 2450...	Star Name	Star Type	No. of Obs.	Filter	Comments
1	Jan 14/15	463	RR Lyn	?	71	V	No result
2	Feb 7/8	487	IU Aur	EB	83	V	Min I
3	Feb 18/19	498	AE Aur	Ina	19	V	For Kevin West for info Only
4	Feb 18/19	498	SAO 28567	?	26	V	See VSSC 90&9
5	Mar 10/11	518	SAO 28567	?	107	V	Ditto
6	Mar 11/12	519	SAO 28567	?	84	V	Ditto
7	Mar 12/13	520	SAO 28567	?	75	V	Ditto
8	Mar 28/29	536	SAO 28567	?	108	V	Ditto
9	Mar 29/30	537	SAO 28567	?	46	V	Ditto
10	Mar 30/31	538	SAO 28567	?	85	V	Ditto
11	Apr 1/2	539	SAO 28567	?	103	V	Ditto
12	Apr 2/3	540	SAO 28567	?	76	V	Ditto
13	Apr 7/8	546	AM Leo	EW	84	V	Min I
14	Apr 9/10	548	U CrB	EA	41	V	Descending branch only

No.	Double Date 1997	JD 2450...	Star Name	Star Type	No. of Obs.	Filter	Comments
15	Apr 11/12	550	UV Leo	?	33	V	Min I - poor result
16	Apr 13/14	552	SAO 28567	?	94	V	See VSSC 90
17	Apr 14/15	553	TX UMa	EA	46	V	No result
18	Apr 15/16	554	20 CVn	Delta Scut	96	V	For Norman Walker
19	Apr 17/18	556	20 CVn	Ditto	82	V	Ditto
20	Apr 21/22	560	20 CVn	Ditto	97	V	Ditto
21	May 1/2	570	20 CVn	Ditto	79	V	Ditto
22	May 2/3	571	20 CVn	Ditto	68	V	Ditto
23	May 6/7	575	20 CVn	Ditto	78	V	Ditto
24	Sep 8/9	700	SW Lac	EW	70	V	Min II (poor result)
25	Sep 12/13	704	AR Lac	EA	72	V	Rising from Min I to max.
26	Sep 14/15	706	AR Lac	EA	104	V	Min I
27	Sep 17/18	709	AR Lac	EA	77	V	Min II
28	Sep 21/22	713	AH Cep	EB	74	V	Max!
29	Oct 4/5	726	SW Lac	EW	95	V	Min II?
30	Oct 21/22	743	V1898 Cyg	?	94	V	Descending branch only
31	Oct 25/26	747	V1898 Cyg	?	53	V	No result
32	Oct 29/30	751	ZZ Cep	EA	43	V	Min I, just
33	Oct 31/ Nov 1	753	V781 Tau	EW	97	V	No result
34	Nov 3/4	756	AR Aur	EA	89	V	Min I

Notes:- Chris Lloyd is a professional astronomer at Rutherford Appleton Laboratory.
Kevin West is a fellow amateur photometrist

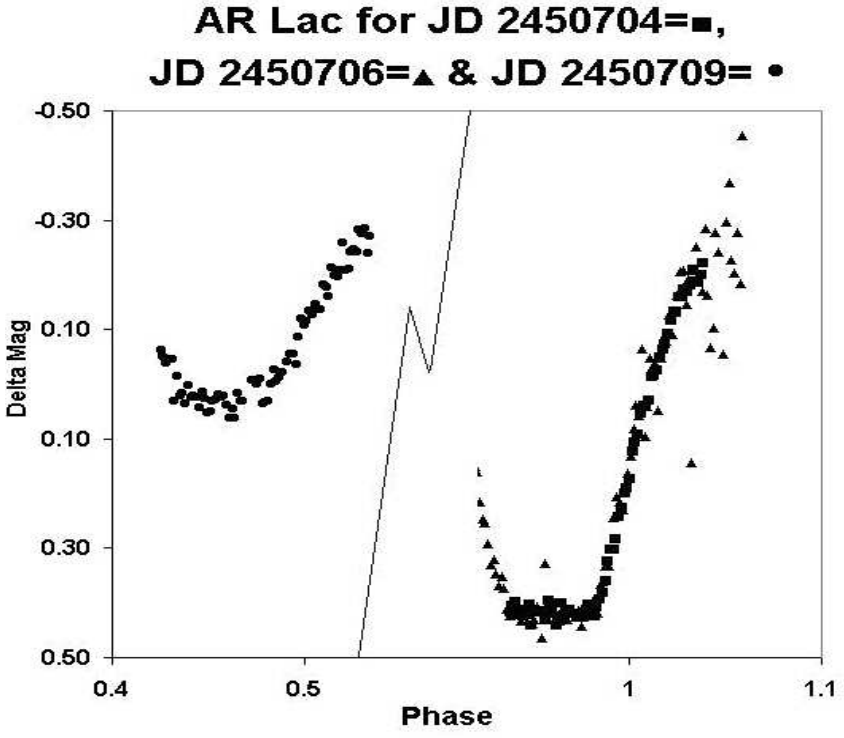
As will be seen, a number of observations were made of the suspected variable SAO 28567, and these were reported in VSSC 95.

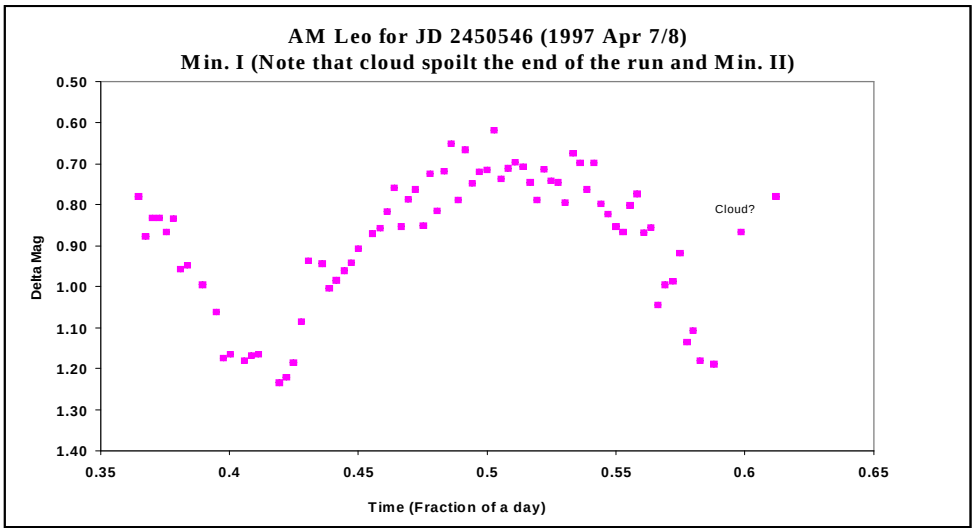
An unusual number of observations produced no meaningful result in 1997, being ruined by cloud, fog or mist. Regretably, this was a trend which continued into 1998 (and seemingly, 1999!).

However, some reasonable results were obtained, and a selection of these are described below. All "O-C" results were compared to the 4th Edition of the GCVS where possible, and the results were submitted to Tristram Brelstaff. (See report of Minima in VSSC No. 96 for June 1998).

AR Lac

Three nights observation have been combined on this chart which, unlike the other charts, has been plotted with the phase along the abscissa. The dots cover the secondary minimum on September 9th and the squares and triangles the primary minimum on September 4th and 6th respectively. The observation on September 4th (JD 2450704) caught the star rising from minimum, and so the observation was repeated on the 6th. Examination of the graph reveals that the star is reaching primary minimum just before phase 1, and secondary minimum just before phase 0.5. However, when compared to the latest ephemeris the O-C is only 0.001 and 0.0002 respectively for the minimum on JD 2450706 (Min I) and JD 2450709 (Min II).



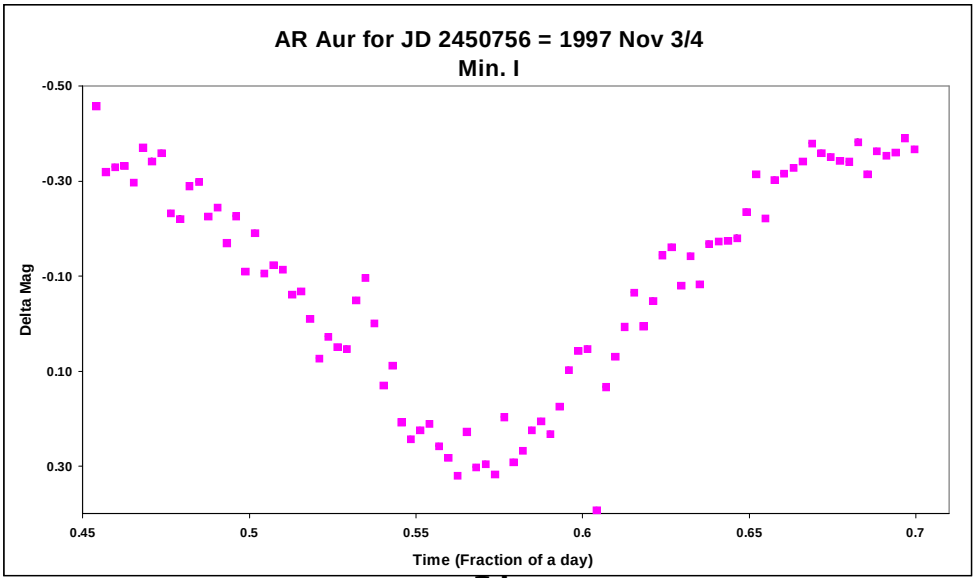


AR Aur

When compared to the latest ephemeris, the O-C of only 0.0006 (less than a minute) shows that this star is well behaved. One good observation per year is all that is required to keep check on it.

AM Leo

Unfortunately cloud was to spoil the end of this run preventing the observation of the secondary minimum. O-C = -0.0052 against the latest ephemeris.



PEP FROM THE BACKYARD OBSERVATORY AT RYDE - THE FIRST 5 YEARS (PART 3)

KEVIN WEST

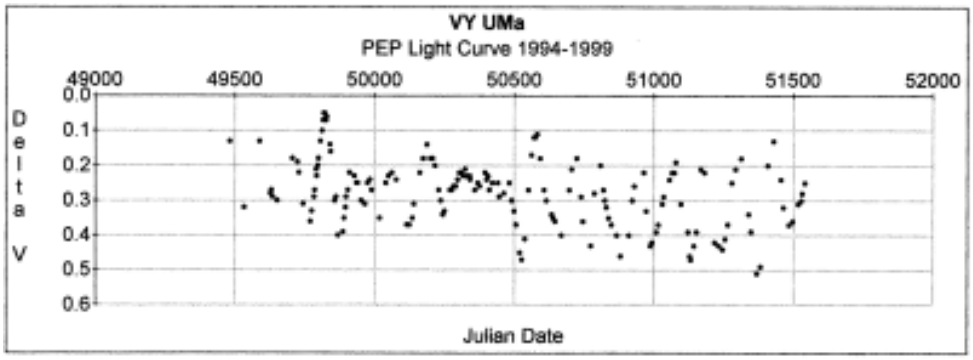
This series of articles sets out to show PEP light curves with some provisional analysis, and to compare these with any available visual light curves. The stars are all part of a programme of the long term monitoring of high declination, bright variables, conducted by the author. The data is readily 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.

VY UMa

An enigmatic variable that seems to reveal different periods depending upon the dataset used for analysis. It may be that the periods change over time. This star is the subject of a paper being prepared by Chris Lloyd. The difficulties of understanding the data shown in the light curve are reflected in the results of three analyses, which gave periods of 118 days, 124 days and 186 days.

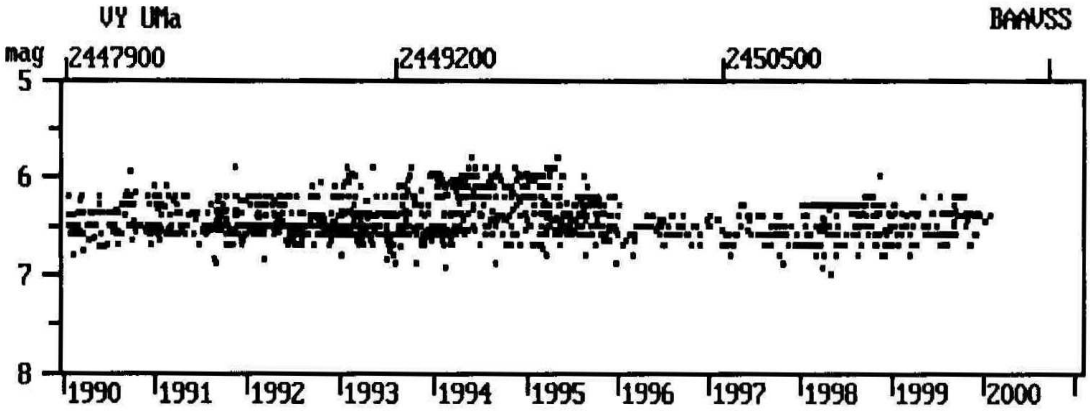
Kevin's PEP light curve for VY UMa



Light curve provided by Dave McAdam from the BAA database (see opposite)

VY UMa 1990 to 2000. 1341 observations by;-

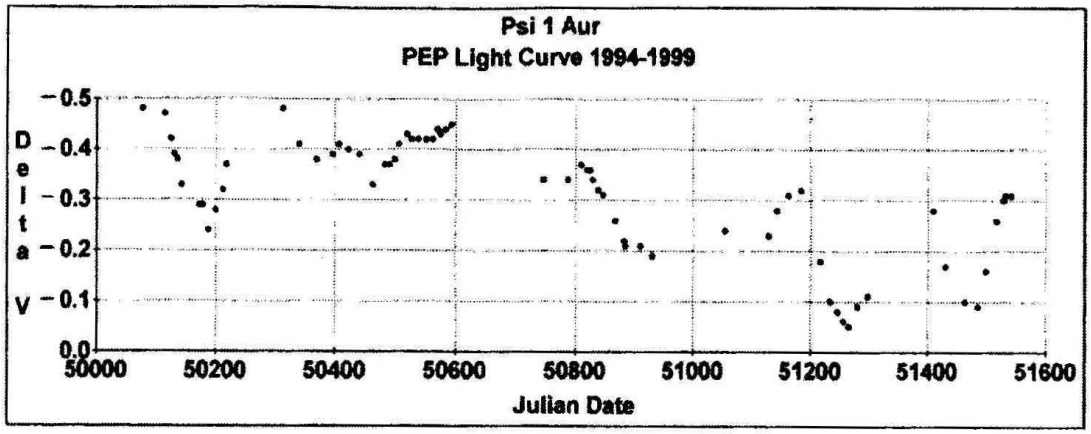
S W Albrighton, J M F Andujar, A R Baransky, N M Bone, D S Conner, B S Crawford, J S Day, S J Evans, R B I Fraser, Steve Johnston, S Koushiappas, T Markham, R A Marriott, I A Middlemist, I P Nartowicz, G Pointer, G Ramsey, A Smeaton, D Stott, T Tanti, M D Taylor, G Thompson, K Xylaris, Erol Yusuf.



Psi 1 Aur

I have no analysis of this rather patchy data and would welcome any information on references in the literature.

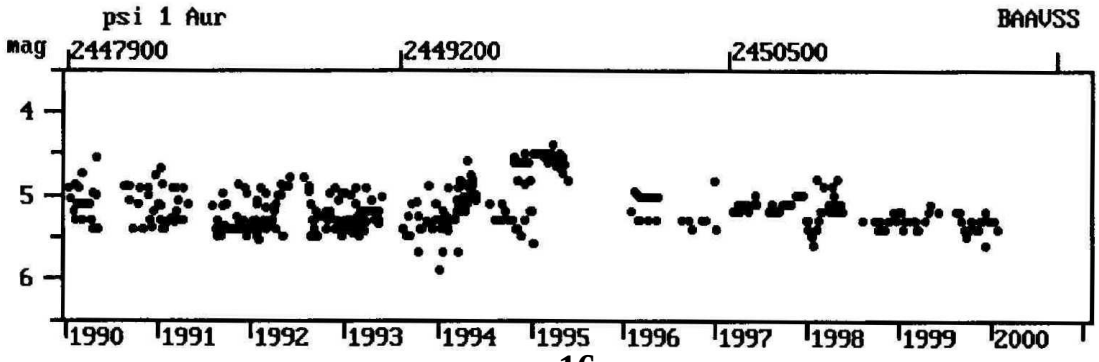
Kevin's PEP light curve for Psi 1 Aur



Light curve provided by Dave McAdam from the BAA database

psi 1 Aur 1990 to 2000. 413 observations by;-

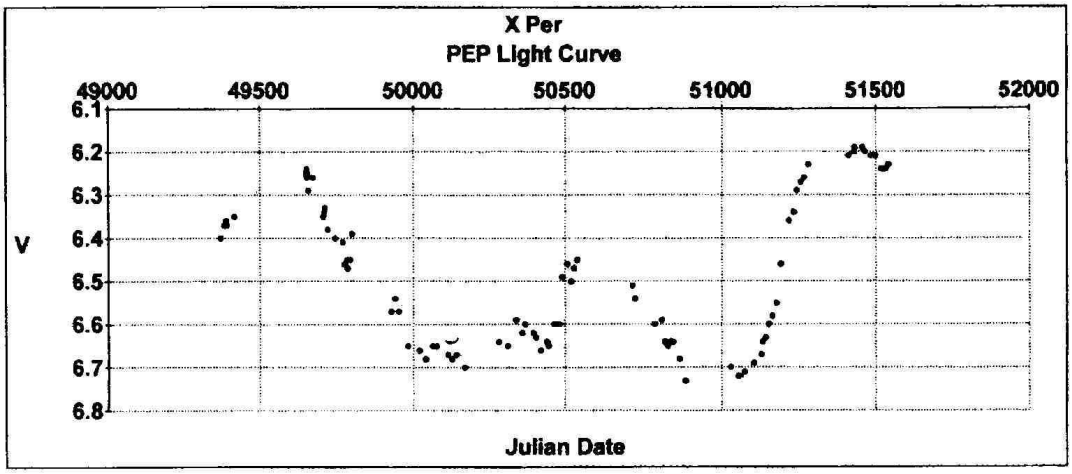
M A Adamson, S W Albrighton, R Billington, J S Day, R B I Fraser, T Markham, I A Middlemist, B R M Munden, I P Nartowicz, G Pointer, G Ramsey, A Smeaton.



X Per

The system X Per comprises an X ray pulsar and a shell star around which periodically single or even double shells can form. The disc(s) appear to add to the V magnitude and amateurs have co-operated with professionals to monitor the rather sudden disk loss events and to build up an important long term record.

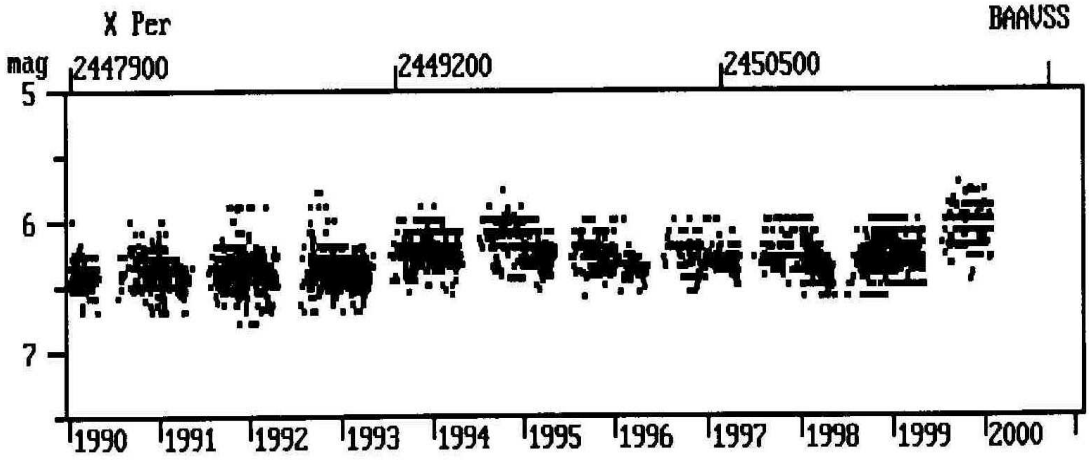
Kevin's PEP light curve for X Per



Light curve provided by Dave McAdam from the BAA database

X Per 1990 to 2000. 3206 observations by;-

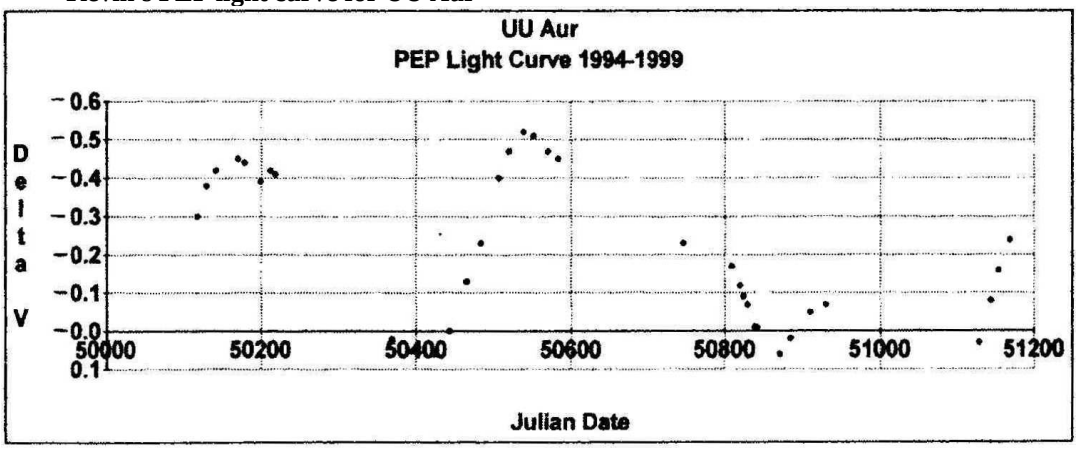
M A Adamson, S W Albrighton, M Barrett, R Billington, N M Bone, T Brelstaff, J S Day, R W Fleet, James Fraser, R B I Fraser, M J Gainsford, D Gavine, D Gill, M Gill, B H Granslo, C Henshaw, K Holland, E H Horsley, G M Hurst, Steve Johnston, R E Kelly, N S Kiernan, S Koushiappas, R J Livesey, Tosh Lubek, T Markham, R A Marriott, J Meacham, I A Middlemist, B R M Munden, I P Nartowicz, B O'Halloran, R D Pickard, G Pointer, G Poyner, G Ramsey, S G Ridley, A Smeaton, D Stott, T Tanti, M D Taylor, J Toone, S T Wanstall, K West, W J Worraker, K Xylaris, Erol Yusuf.



UU Aur

John Toone drew our attention to this one in VSSC 102 (following John's Greave's comments to him) regarding the difficulty of observing this very red variable using conveniently placed (but inconveniently coloured) comparisons D and E. I use E as a comparison and D as a check star for my photometry and the only contribution I can make to the problem is that they are at least reliable comparisons. The standard deviation of the D - E differential V mag is 0.016. One analysis gives a period of 440 days.

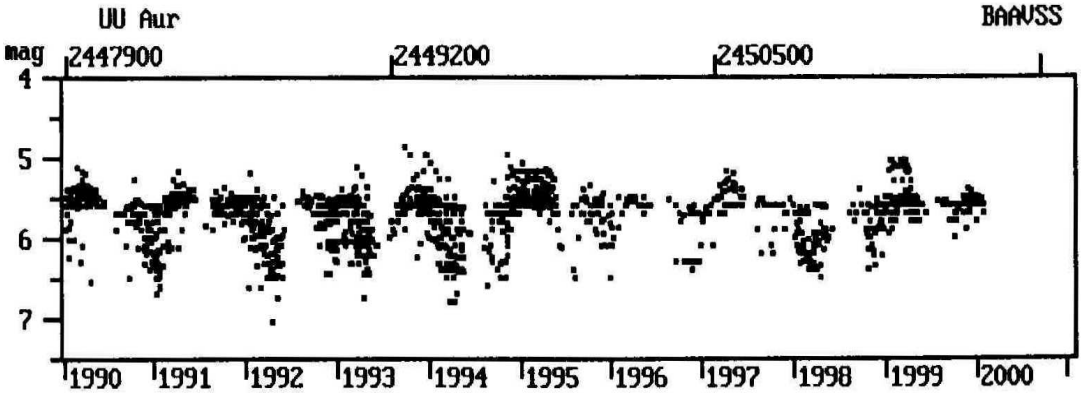
Kevin's PEP light curve for UU Aur



Light curve provided by Dave McAdam from the BAA database

UU Aur 1990 to 2000. 1634 observations by;-

M A Adamson, S W Albrighton, M Barrett, S Beaumont, P Bibbings, R Billington, N M Bone, N Britton, P Craven, B S Crawford, J S Day, R W Fleet, R B I Fraser, D Gavine, D Gill, M Gill, B H Granslo, E H Horsley, J J Howarth, Steve Johnston, R E Kelly, Brian Kelly, R J Livesey, T Markham, R A Marriott, I A Middlemist, R Minty, B R M Munden, I P Nartowicz, B O'Halloran, R D Pickard, G Pointer, G Ramsey, S G Ridley, A Smeaton, T Tanti, M D Taylor, J Toone, K Xylaris, Erol Yusuf.



For comments or further information please contact:

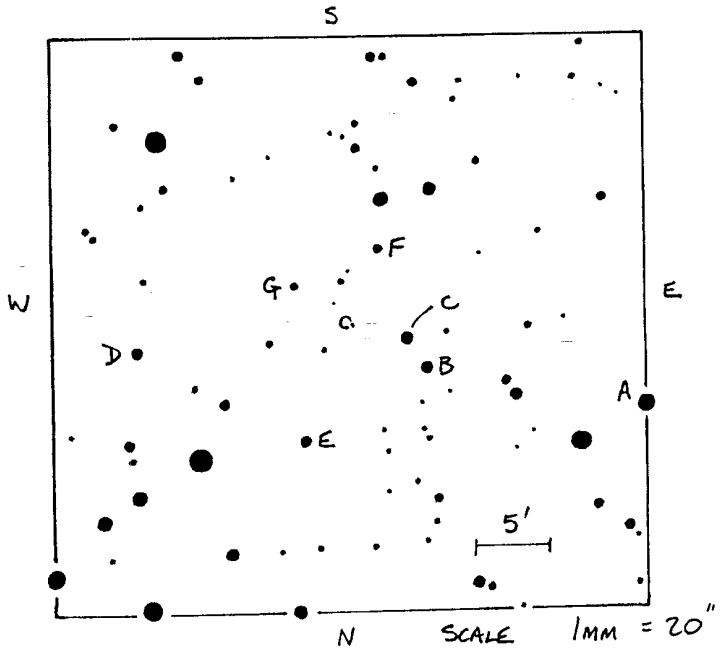
Kevin West at 5 Edward St., Ryde, Isle of Wight. England. PO33 2SH
Tel: 01983 614591. E mail: kwest@ryde.prestel.co.uk

(B) TASV 0626+34

RA 06^{h} 26.^{m}2 DEC +34° 44′ (1950)

MAGN : 9·8 – 11·9 TYPE : SP : M6

DISCOVERED BY MIKE J. COLLINS ON UK NOVA PATROL PHOTOS 7 OCT 1989



SEQUENCE :
pv trf from AAVSO (b) X Gem

A	9·4
B	9·9
C	10·1
D	10·8
E	11·3
F	11·5
G	12·0

CHART : From TVMPSA by M.J. COLLINS

Adopted 891010

VARIABLE STAR SECTION WEB PAGE UPDATES

DAVE MCADAM

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

BAAVSS www update 13, 16 Nov 1999
The following items have been added since 17/10/99;-

A New Project for Detecting Eclipsing DNe : W J Worraker

New Current lightcurves
FO And, TAV J0218+507 And, V1413 Aql, V1493 Aql, TAV0556+55 Aur, Z Cam,BY Cam, GX Cas, V635 Cas, V727 Cas, V386 Cep, R CrB, SS Cyg, CH Cyg, V516 Cyg,V1057 Cyg, V1329 Cyg, AB Dra, U Gem, HZ Her, V443 Her, V844 Her, BL Lac, MV Lyr, NSV8001, Oph, CZ Ori, RU Peg, HX Peg, IP Peg, NGC7469 Peg, FO Per, RY Sgr, V1860 Sgr,, Markarian 421 UMa, VW Vul

Observing charts (re-drawn): V448, V453 Cyg (860706), RS CVn (720206)

BAAVSS www update 14, 14 Dec 1999
The following items have been added since 16/11/99;-

V1494 Aql (Nova 1999 No.2): Image and Spectrum : M Gavin
Omicron Ceti: O-C diagram from derived elements *:* D McAdam
Epochs and Periods for EBs *:* Tony Markham

New Current lightcurves
Z And, RX And, AR And, 3C66A And, V1493 Aql, Markarian 509 Aqr, SS Aur, TAV J0550+543 Aur, AF Cam, V452 Cas, V635 Cas, NSV203 Cas, R CrB, SS Cyg, CI Cyg, DD Cyg, V1060 Cyg, V1504 Cyg, SN1999em Eri, U Gem, AH Her, var61 Her, DY Per, V409 Per, NSV1665 Per, R Sct, R Sge, companion East of FG Sge, RY Sgr

BAAVSS www update 15, 15 Jan 2000
The following items have been added since 14 Dec 1999;-

IP Peg: Full geocentric 2000 eclipse ephemeris *:* J Greaves
EM Cygni: Full geocentric 2000 eclipse ephemeris : J Greaves
IP Peg: UK 2000 Eclipse Ephemeris *:* W J Worraker
PEP from Ryde : K West
From the Director : R D Pickard
DV UMa: CCD images : D G Buczynski
V844 Her: Outbursts : G Poyner

New Current lightcurves
RX And, TAV J0218+507 And, V1494 Aql, EV Aqr, SS Aur, TAV0556+55 Aur, Z Cam, BY Cam, CG Cam, DK Cas, V727 Cas, V770 Cas, NSV203 Cas, V362 Cep, TASV2204+59 Cep, TAV2034+61 Cep, WW Cet, SY Cnc, YZ Cnc, AT Cnc, W Com, R CrB, TT Crt, CH Cyg, DD Cyg, EM Cyg, V503 Cyg, V516 Cyg, V751 Cyg, V930 Cyg, V1329 Cyg, NSV13262 Cyg, Q Cyg, TAV1933+53 Cyg, AB Dra, EX Dra, SN1999em Eri, J0712+296 Gem, AC Her, BL Lac, X Leo, CY Lyr, LL Lyr, MV Lyr, CN Ori, RU Peg, HX Peg, NGC7469 Peg, TZ Per, TASV0327+44 Per, FG Sge, RR Tau, SU UMa, ER UMa, 3C279 Vir, RZ Vul, WW Vul, FY Vul

ECLIPSING BINARY PREDICTIONS

TONY MARKHAM

2000 Apr 1 Sat
Z Dra D07(05)08
TW Dra D07(05)10
TX UMa D07(09)13
RZ Cas D07(09)11
U Sge L12(09)15

2000 Apr 2 Sun
Z Per D08(06)11
RZ Cas 11(14)16
Z Dra 11(14)16

2000 Apr 3 Mon
RZ Cas 16(18)16D

2000 Apr 4 Tue
U Cep D08(10)14
TX UMa D08(10)15
ST Per 11(15)11L
U Sge 12(18)16D

2000 Apr 5 Wed
Z Dra D08(07)09
Z Per D08(07)11L
SW Cyg L08(10)16
Z Vul L11(10)15
S Equ L14(15)16D

2000 Apr 6 Thu
Z Dra 13(16)16D
TW Dra 15(20)16D

2000 Apr 7 Fri
ST Per D08(06)11
RZ Cas D08(08)11
TX UMa
D08(12)16D
RW Tau 10(14)10L
Z Vul 15(20)16D

2000 Apr 8 Sat
Z Per D08(08)11L
RZ Cas 11(13)16

2000 Apr 9 Sun
Z Dra D08(09)11
U Cep D08(09)14
TW Dra 10(15)16D
RZ Cas 15(18)16D

2000 Apr 10 Mon
RW Tau D08(09)10L
TX UMa 09(13)16D
RW Gem 09(14)12L
Z Vul L11(07)13
Z Dra 15(17)16D

2000 Apr 11 Tue
Z Per D08(10)11L
U Sge L11(12)16D

2000 Apr 12 Wed
TW Dra D08(11)16
ST Per 09(14)10L
Z Vul 13(18)16D
S Equ L14(12)16D

2000 Apr 13 Thu
RZ Cas D08(08)10
RW Gem D08(11)11L
Z Dra 08(10)13
TX UMa 10(15)16D

2000 Apr 14 Fri
U Cep D08(09)14
Z Per D08(11)11L
SW Cyg D08(14)16D
RZ Cas 10(13)15
Z Per L15(11)16D
U Sge 16(21)16D

2000 Apr 15 Sat
ST Per D08(05)09
TW Dra D08(06)11
Z Vul L10(05)11
RZ Cas 15(17)16D

2000 Apr 16 Sun
RW Gem D08(07)11L
TX UMa 12(16)16D

2000 Apr 17 Mon
Z Per D08(12)10L
Z Dra 10(12)15
Z Vul 11(16)16D
Z Per L15(12)16D

2000 Apr 18 Tue
U Sge L11(07)12

2000 Apr 19 Wed
SW Cyg D08(03)09
RW Gem D08(04)09
RZ Cas D08(07)10
U Cep D08(09)13
TX UMa 13(18)16D
S Equ L14(09)14

2000 Apr 20 Thu
ST Per D08(12)10L
Z Per 09(14)10L
RZ Cas 10(12)14
Z Per L15(14)16D

2000 Apr 21 Fri
RW Tau D08(11)09L
U Sge L11(16)16D
Z Dra 11(14)16D
RZ Cas 14(17)16D

2000 Apr 22 Sat
Z Vul L10(14)15D
S Equ 14(19)15D
TX UMa 15(19)15D

2000 Apr 23 Sun
SW Cyg 11(17)15D
TW Dra 11(16)15D
Z Per L15(15)15D

2000 Apr 24 Mon
RW Tau D08(05)09L
Z Dra D08(07)09
U Cep D08(08)13

2000 Apr 25 Tue
RZ Cas D08(07)09
Z Dra 13(16)15D

2000 Apr 26 Wed
TW Dra D08(11)15D
RZ Cas 09(11)14
Z Per L15(17)15D

2000 Apr 27 Thu
Z Vul L10(12)15D
RZ Cas 14(16)15D

2000 Apr 28 Fri
SW Cyg D08(07)13
Z Dra D08(09)11
ST Per D08(11)09L
U Sge L10(10)15D

2000 Apr 29 Sat
TW Dra D08(07)12
U Cep D08(08)13
S Equ L13(16)15D
Z Per L14(18)15D
Z Dra 15(17)15D

2000 Apr 30 Sun
RW Gem 10(15)10L

2000 May 1 Mon
RZ Cas D09(06)09
U Sge 13(19)15D
U Cep 15(20)15D

2000 May 2 Tue
Z Dra D09(10)13
RZ Cas D09(11)13
RW Tau D09(12)09L
Z Vul L09(10)15
Z Per 14(19)15D
SW Cyg 15(21)15D

2000 May 3 Wed
RW Gem D09(12)10L
RZ Cas 13(16)15D

2000 May 4 Thu
U Cep D09(08)12

2000 May 5 Fri
U Sge L10(04)10

2000 May 6 Sat
RW Gem D09(09)10L
ST Per D09(10)09L
Z Dra 10(12)15
S Equ L12(13)15D
U Cep 15(19)15D
Y Psc L15(18)15D

2000 May 7 Sun
SW Cyg D09(10)15D
Z Vul L09(08)13
TW Dra 12(17)15D

2000 May 8 Mon
RZ Cas D09(10)13
U Sge L09(13)15D

2000 May 9 Tue
RW Gem D09(06)10L
U Cep D09(07)12
RZ Cas 13(15)15D
Z Vul 13(18)15D

2000 May 10 Wed
TW Dra D09(12)15D
Z Dra 12(14)15D
Y Psc L15(12)15D

2000 May 11 Thu
TX UMa D09(05)09
U Cep 14(19)15D
ST Per L14(17)15D

2000 May 12 Fri
Z Vul D09(05)11

2000 May 13 Sat
Z Dra D09(07)10
TW Dra D09(08)13
S Equ L12(10)15D

2000 May 14 Sun
TX UMa D09(06)11
U Cep D09(07)12

RZ Cas D09(10)12
Z Vul 11(16)15D
Z Dra 13(16)15D

2000 May 15 Mon
U Sge D09(08)13
RZ Cas 12(14)14D

2000 May 16 Tue
SW Cyg D09(14)14D
U Cep 14(19)14D

2000 May 17 Wed
TX UMa D09(08)12
Z Dra D09(09)11

2000 May 18 Thu
U Sge 11(17)14D

2000 May 19 Fri
U Cep D09(07)11
Z Vul D09(14)14D
ST Per L14(15)14D

2000 May 20 Sat
TX UMa D09(09)14
RZ Cas D09(09)12
S Equ L12(07)12

2000 May 21 Sun
SW Cyg D09(04)10
Z Dra D09(11)13
RZ Cas 11(14)14D
TW Dra 13(18)14D
U Cep 14(18)14D

2000 May 23 Tue
TX UMa D09(11)14D
S Equ 12(17)14D

2000 May 24 Wed
U Cep D09(06)11
Z Vul D09(12)14D
TW Dra D09(13)14D

2000 May 25 Thu
U Sge D09(11)14D
Z Dra 10(12)14D
SW Cyg 11(17)14D
Y Psc L14(14)14D
X Tri L14(12)14D

2000 May 26 Fri
RZ Cas D10(09)11
TX UMa D10(12)14D
U Cep 13(18)14D

2000 May 27 Sat
TW Dra D10(08)14
RZ Cas 11(13)14D
ST Per L13(14)14D

2000 May 29 Mon
U Cep D10(06)11
Z Vul D10(10)14D
TX UMa D10(14)14D
Z Dra 12(14)14D

2000 May 30 Tue
SW Cyg D10(07)13
S Equ L11(14)14D

2000 May 31 Wed
U Cep 13(18)14D

2000 Jun 1 Thu
U Sge D10(05)11
RZ Cas D10(08)10
TX UMa 10(15)14D

2000 Jun 2 Fri
RZ Cas 10(13)14D
Z Per L12(09)13
Z Dra 13(16)14D

2000 Jun 3 Sat
U Cep D10(06)10
Z Vul D10(08)13

2000 Jun 4 Sun
U Sge D10(14)14D
TX UMa 12(17)14D
ST Per L13(13)14D
TW Dra 14(19)14D

2000 Jun 5 Mon
Z Dra D10(09)11
Z Per L12(10)14D
U Cep 13(17)14D
Z Vul 13(19)14D

2000 Jun 6 Tue
S Equ L10(11)14D

2000 Jun 7 Wed
TW Dra D10(14)14D
TX UMa 14(18)14D

2000 Jun 8 Thu
U Cep D10(05)10
Z Vul D10(05)11
SW Cyg D10(11)14D
RZ Cas D10(12)14D
Z Per L12(11)14D

2000 Jun 9 Fri
Z Dra D10(11)13
Y Psc L13(15)14D

2000 Jun 10 Sat
TW Dra D10(09)14D
Z Vul 11(16)14D
U Cep 12(17)14D

2000 Jun 11 Sun
U Sge D10(09)14D
Z Per L12(13)14D

2000 Jun 12 Mon
ST Per L12(11)14D

2000 Jun 13 Tue
S Equ D10(08)14
Z Dra 10(12)14D
Y Psc L12(10)14D

2000 Jun 14 Wed
RZ Cas D10(12)14D
Z Per L11(14)14D
U Sge 12(18)14D

2000 Jun 15 Thu
Z Vul D10(14)14D
U Cep 12(17)14D

2000 Jun 16 Fri
S Equ 13(19)14D

2000 Jun 17 Sat
SW Cyg D10(14)14D
Z Per L11(15)14D
Z Dra 12(14)14D

2000 Jun 20 Tue
S Equ D10(05)10
RZ Cas D10(11)13
Z Vul D10(12)14D
U Cep 12(16)14D
ST Per L12(10)14D
Z Per 12(17)14D

2000 Jun 21 Wed
U Sge D10(12)14D
TW Dra D10(15)14D
RZ Cas 13(16)14D
Z Dra 13(16)14D

2000 Jun 22 Thu
X Tri 14(16)14D

2000 Jun 23 Fri
S Equ 10(16)14D
X Tri 13(15)14D
Z Per 13(18)14D

2000 Jun 24 Sat
Z Dra D10(09)11
TW Dra D10(10)14D
Y Psc 12(17)14D
X Tri 12(15)14D

2000 Jun 25 Sun
Z Vul D10(10)14D
U Cep 11(16)14D
X Tri L12(14)14D
ST Per 13(17)14D

2000 Jun 26 Mon
RZ Cas D10(10)13
SW Cyg 12(18)14D
X Tri L12(13)14D

2000 Jun 27 Tue
TW Dra D10(05)11
X Tri L12(13)14D
RZ Cas 13(15)14D

2000 Jun 28 Wed
U Sge D10(06)12
Z Dra D10(11)13
ST Per L11(09)13
Y Psc L11(11)14D
X Tri L12(12)14D

2000 Jun 29 Thu
X Tri L12(11)14

2000 Jun 30 Fri
Z Vul D10(08)13
S Equ D10(13)14D
U Cep 11(16)14D
X Tri L12(11)13

The deadline for contributions to the issue of VSSC 104 will be May 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.

Printed by RAMPrint 01604 233677

SECTION OFFICERS

Director Roger D Pickard
28 Appletons, Hadlow, Kent TN11 0DT
Tel : 01732 850663
E-mail : rdp@star.ukc.ac.uk

Secretary Dave McAdam
33 Wrekin View, Madeley, Telford,
Shropshire, TF7 5HZ.
Tel : 01952 432048
E-mail : dave@telf-ast.demon.co.uk

Chart Secretary John Toone
Hillside View, 17 Ashdale Road,
Cressage, Shrewsbury, SY5 6DT.
Tel : 01952 510794
E-mail : john.toone@dial.pipex.com

Binocular Secretary Melvyn D. Taylor
17 Cross Lane, Wakefield, West Yorks.,
WF2 8DA. Tel: 01924 374651

Nova/Supernova Secretary Guy M Hurst
16 Westminster Close, Basingstoke,
Hants, RG22 4PP .
Tel & Fax: 01256 471074
E-mail: Guy@tahq.demon.co.uk

Eclipsing Binary Secretary Tony Markham
20 Hillside Drive, Leek, Staffs, ST13 8JQ
Tel: 01538 381174
Email: tonymarkham@compuserve.com

Recurrent Objects Co-ordinator Gary Poyner
67 Ellerton Road, Kingstanding,
Birmingham, B44 0QE.
Tel: 0121 6053716
E-mail gp@star.sr.bham.ac.uk

Pro-am Liaison Committee Secretary & Photoelectric Photometry Advisor - as Director

CCD Advisor Richard Miles
1 Tall Trees Close, Northwich, Cheshire,
CW8 4YA
Tel: 01606 784132
Email: rmiles@baa.u-net.com

Circulars Editor Karen Holland
136 Northampton Lane North, Moulton,
Northampton, NN3 7QW
Tel: 01604 671373 Fax: 01604 671570
E-mail: kho@star.le.ac.uk

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/

Charges for Section Publications

The following charges are made for the Circulars. These cover one year (4 issues). Make cheques out to the BAA. Send to the Circulars editor.

	UK	Europe	Rest of World
BAA Members	£3.00	£4.00	£6.50
Non-Members	£5.00	£6.00	£8.50

The charges for other publications are as follows. Make cheques out to the BAA and please enclose a large SAE with your order.

	Order From	**Charge**
Telescopic Charts	Chart Secretary	30p
Binocular Charts	Chart Secretary	10p
Eclipsing Binary Charts	Eclipsing Binary Secretary	10p
Observation Report Forms	Director or Binocular Secretary	Free
Guide to Making Visual Observations	Director or Binocular Secretary	40p
Chart Catalogue	Director	60p
Sample Charts for NE and Binoculars	Director or Binocular Secretary	40p
Sample Charts for Smaller Telescopes	Director or Binocular Secretary	40p
Sample Charts for Larger Telescopes	Director or Binocular Secretary	40p