

British Astronomical Association



VARIABLE STAR SECTION CIRCULAR

No 92, June 1997

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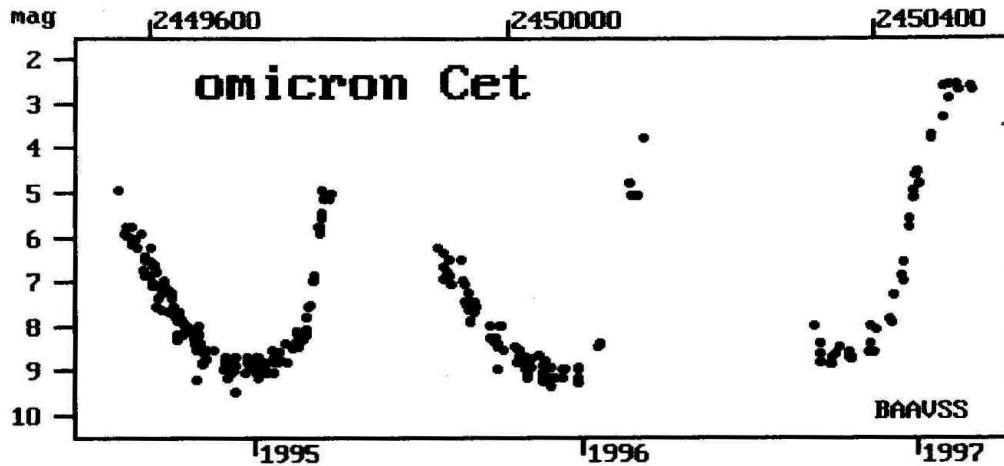
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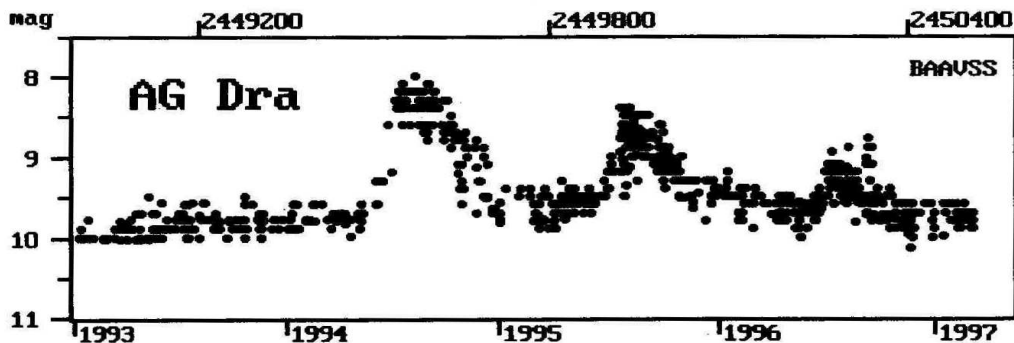
Light Curves

DAVE McADAM



Omicron Ceti observers 1994 to 1997

S W Albrighton, A R Baransky, R J Bouma, M Clarke, J Coates, B S Crawford, R C Dryden, B H Granslo, F Hamilton, E H Horsley, T Markham, J Meacham, Nartowicz, M J Nicholls, J D Shanklin, D Storey, M D Taylor, J Thorpe, J Toone, W J Worraker.



AG Dra observers 1993 to 1997

S W Albrighton, A R Baransky, R J Bouma, J S Day, D Gill, G M Hurst, S Koushiappas, T Markham, G Poyner, M D Taylor, E J W West.

SECOND UK SUPERNOVA!

GARY POYNER

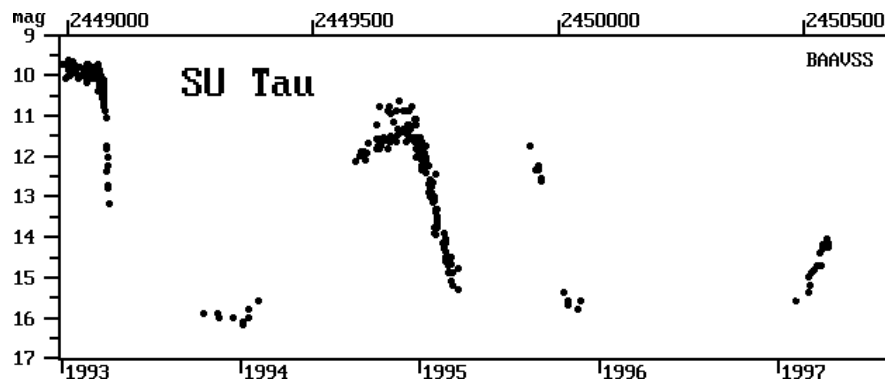
Stephen Laurie, Church Stretton, has discovered the UK's second supernova following on from Mark Armstrong's discovery earlier in the year. SN 1997bq was discovered in NGC 3147 on April 7th at approximately magnitude 16.1, with a 25cm SCT & CCD camera. Visual observations made by the Director reveal the SN at magnitude 15.9 on April 9th, and peaking at magnitude 14.5 around the 20th. At the time of writing (April 30), SN 1997bq had faded to magnitude 14.9. Our congratulations go out to Stephen on his discovery!

SU TAU

GARY POYNER

The RCB star SU Tau appears to be making a slow recovery after spending the whole of 1996 in a deep minimum. Recent observations in April show SU Tau approaching magnitude 14.0. Japanese observers recorded SU Tau as faint as magnitude 17 in February 1996, even with a red sensitive CCD. It is probable that the star was even fainter in V-band, which almost certainly means that this was the faintest ever observed minima of this

star. As usual, SU Tau will be visible with telescopes again as it approaches conjunction with the Sun, and therefore the rise to maximum (if it continues at this slow rate) will be extremely difficult to follow.



EXCESS OF TEV-ENERGY GAMMA RAYS

DAVE MCADAM

An excess of TeV - energy gamma rays from galaxy Markarian 421 may oblige astronomers to revise their models of active galactic nuclei (AGN). Many suspect that AGNs, quasars, and indeed all the most violent celestial objects in the universe share a common energy-production architecture - a black hole, supplied by a surrounding accretion disk, broadcasting powerful jets of matter in two polar directions. Mrk421 (400 million light years away) is the closest such object whose jet axis is aimed directly at us. Last year Mrk 421 rewarded patient observers with the most explosive gamma display ever, with a flux ten times higher than that of the much closer Crab Nebula, the strongest known steady gamma source in the sky. At last week's APS/AAPT meeting in Washington, DC, Trevor Weekes of the Whipple Observatory presented a detailed spectrum for Mrk421. The flux of gammas falls off at the highest energies (up past 6 TeV), but not nearly as fast as one would have expected. Weekes suggested that the anticipated effect of two sources of attenuation, dust near the AGN and the amorphous population of infrared photons in intergalactic space, may have been overestimated.

FROM PHYSICS NEWS UPDATE: The American Institute of Physics Bulletin of Physics News Number 318 April 23, 1997 by Phillip F. Schewe and Ben Stein

VY AQR

GARY POYNER

Observers are reminded that the Asteroid 107 Camilla (12.7 mag) passes within 18 arc minutes of VY Aqr on September 1st, and will be visible near this UGSU star from Aug. 28th - Sep. 09th (VSSC 90, Dec 1996, pg10). A finder chart plotting the position of Camilla is available from the Director (SAE please).

DETECTION OF OPTICAL COUNTERPART OF GAMMA-RAY BURST

TRISTRAM BRELSTAFF

Van Paradijs et al. (Nature, 386, 686-689, 1997) report the first identification of the optical counterpart of a gamma-ray burst. The burst in question was first detected in gamma-rays by the Italian-Dutch BeppoSAX satellite at 1997 Feb 28 02h 58m 01s UT. Located at RA 5h 01m 75s Dec +11deg 46.4' J2000, about mid-way between Aldebaran and Gamma Orionis, it lasted 80 seconds. Eight hours later, when the satellite was oriented to point other instruments at the location, a weak X-ray source was detected.

About 21 hours after the burst, V and I band images of the field of the burst were obtained with the William Herschel Telescope on La Palma. Further images were also obtained on Mar 8 with the WHT and with the Isaac Newton Telescope. Comparison of these images revealed an object of mag 21.3V on Feb 28 which had faded to below 23.6V on Mar 8. Observations made with the Hubble Space Telescope show it at about 26V on Mar 26. There is some suggestion of nebulosity around the optical image which might be the host galaxy.

The authors expect to detect the optical counterparts of other bursts in the near future. Detailed studies of the optical light-curves and spectra should be appearing within a year or so.

POSSIBLE NEW DWARF NOVA IN PISCES

GARY POYNER

Bruce Sumner reports on VSNET-CHAT 217 of the announcement by H. Reimann & C. Friedman in IBVS 4463 of a possible new UG star in Pisces, discovered whilst examining plates of the nearby variable RZ Psc. The range of the new variable is noted as 12.44B-16.17B, thus indicating a possible visual maximum magnitude around 12.0. No mention of any outburst frequency was made.

Two positions have been determined by Sumner from the DSS and USNO A1.0, to which he adds that the USNO one is to be preferred...

01h 09m 59.15	+28d 01'26.3	(J2000) DSS
01h 09m 59.23	+23d 01'25.0	(J2000) USNO

At this time only B-magnitudes are available for nearby comparison stars, therefore the chart shown here gives GSC values for stars. It is hoped that when V-magnitudes are made available, a VSS chart will be produced along with a sequence. In the meantime, these GSC comparisons should suffice in enabling any interested observers to monitor this star closely for outbursts. Please report any positive sightings to the Director.

DV UMA

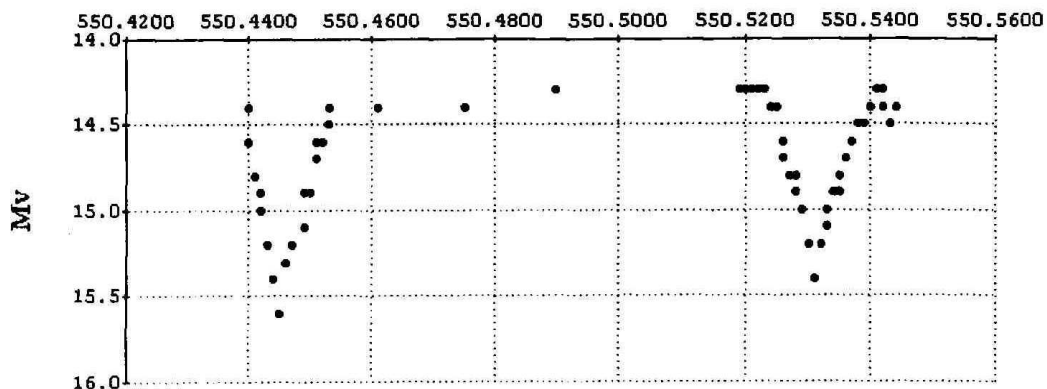
GARY POYNER

This eclipsing UGSU star (which is on the recurrent objects programme) has been detected in outburst independently by Timo Kinnunen and Tonny Vanmunster on April 8th at magnitude 13.9. The previous outburst - and the first to be visually detected - occurred on Feb. 26th 1995. DV UMa was discovered by Usher et al in 1981, and identified to be eclipsing by Howell et al in 1988, whose photometric observations showed deep eclipses of 1.5 mag or more with an orbital period of 0.08597 day. The eclipses lasted slightly less than 20 min. Unfiltered time series photometry by Vanmunster on April 9/10th 1997 over a 4.8hr period revealed prominent superhumps (0.35 mag) and three eclipses. These are the first superhumps to be detected in this system, thus confirming it's UGSU status. The outburst lasted 16 days, as compared to the 1995 one (which was not a supermax) of 4 days.

An attempt to observe eclipses visually in DV UMa by the Director on April 12/13 resulted in the light curves shown below. The time of minima in each of the two eclipses agrees well with the orbital period of DV UMa (2h 04m). One estimate was made every minute resulting in the first eclipse showing a 1.4 magnitude drop in brightness, and the second 1.1 magnitude. DV UMa was slightly brighter at the start of the second eclipse. A noticeable drop in magnitude of 0.25 mag immediately followed the second eclipse, which could have been related to a superhump. It is very regrettable that the visual monitoring did not continue following this second eclipse. Needless to say, a prolonged observing run over several hours will be carried out at the next superoutburst in the hope of detecting superhumps visually - weather permitting!

For some strange reason, DV UMa receives poor coverage from UK observers, despite it's obvious attractions of eclipses and large amplitude superhumps. It's magnitude at maximum brightness is around 14.0 (at supermaximum) and ordinary outbursts around 14.5 - both well within the limits of a 10 inch! Observers are asked to add this star to their observing programme, in the hope of detecting more outbursts (and eclipses) in this exciting dwarf nova.

Visual; G. Poyner 40cm: Apr 12 1997



THE JACK ELLS AUTOMATIC PHOTOELECTRIC TELESCOPE - REPORT FOR 1996

ROGER PICKARD AND MALCOLM GOUGH

The telescope performed without incident during 1996, but of course, the weather, oh the weather! Indeed, until the Autumn, we recorded the fewest number of observations ever. Apart from a short spell of fine weather in February, only one worthwhile observation was made until the onset of Autumn, when a more normal weather pattern developed.

A summary of the observations is reported in Table 1 on page 10.

It must be emphasised that the results summary presented here, as in previous years, does not list all the occasions when the APT was set up, but for some reason, such as cloud (usually) or mechanical breakdown, etc., no results were obtained.

In Table 1, under "Comments", any reference to "no result" means that, although a number of observations were obtained, apparently the ephemeris is in error, and no eclipse was seen. Although our prediction programme is constantly updated, some of the stars have not been observed for a number of years, or at least, no observations have been reported that we are aware of, and so we are relying on an old ephemeris. With some stars this is just not adequate, as in the case of V1898 Cyg, where we have been trying to catch at another minimum for some years now! (The minimum recorded on 2449332 was not a particularly good one).

This might also be a good moment to explain a little of the procedure that must be adopted in order to report APT observations.

It must be explained immediately that all the telescope software was written for use on a BBC computer which means that it is not immediately readable on a modern PC. Therefore, after the initial reduction and analysis of the observations on the trusty Beeb, the results must be converted into a plain text format for transporting to the PC. In this respect it was necessary for fellow Crayford member, John Howarth, to write a programme and supply a suitable cable so that the Beeb and the PC could be connected together and the data transmitted across. Once that has been done, the data can be manipulated using one of the standard software packages available.

In some instances, for example the data for Chris Lloyd, it is has become necessary to supply more than just the reduced data and John Howarth again came to the rescue by writing a suitable programme to transfer all the Beeb output onto a PC.

In addition, sometimes it is useful to play around with the data analysis programme on the Beeb to extract the last bit of useful information, especially where EBs are concerned.

All this represents quite a time consuming exercise, especially if there are many results to analyse.

Notes on the Table and Graphs

X Per

Observations continue of this star, although it is high time we secured some more before Paul Roche is after us!

NSV 1663

Chris Lloyd suggested this star would be a good target for the APT, and so after a stuttering start in February, a better run of observations were made in November/December. At the moment we are awaiting a full analysis of these observations from Chris, although apparently the early diagnosis is not too good.

AR Aur

The telescope didn't record the passage of any nocturnal visitor on the night of December 24th, only the eclipse of yet another EB!

This eclipsing binary has a period of over 4.1 days. Despite a lot of scatter in the observations a primary minimum was observed with an "O-C" of only 0.004 days (around 6 minutes), showing that this is a system which is well behaved.

VW Cep

Once again our old favourite VW Cep has been observed to make sure it is behaving properly. The graph doesn't look that brilliant until it realised that the total range is only 0.4 mag!

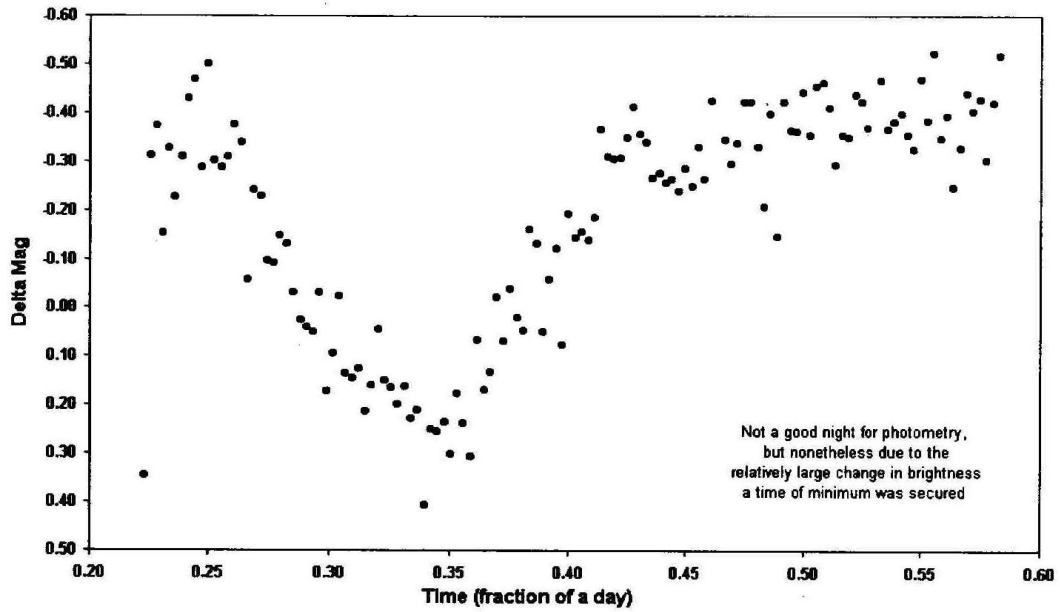
AR Lac

A good result, probably the best of the year as far as scatter in the observations is concerned. It shows interesting variations at the bottom of the curve, assuming they are real and not due to local atmospheric conditions, which is a possibility - an area which would repay greater research. This was a secondary minimum, and the range of magnitude covered is only 0.4. The O-C was 0.0049 days, about 7 minutes.

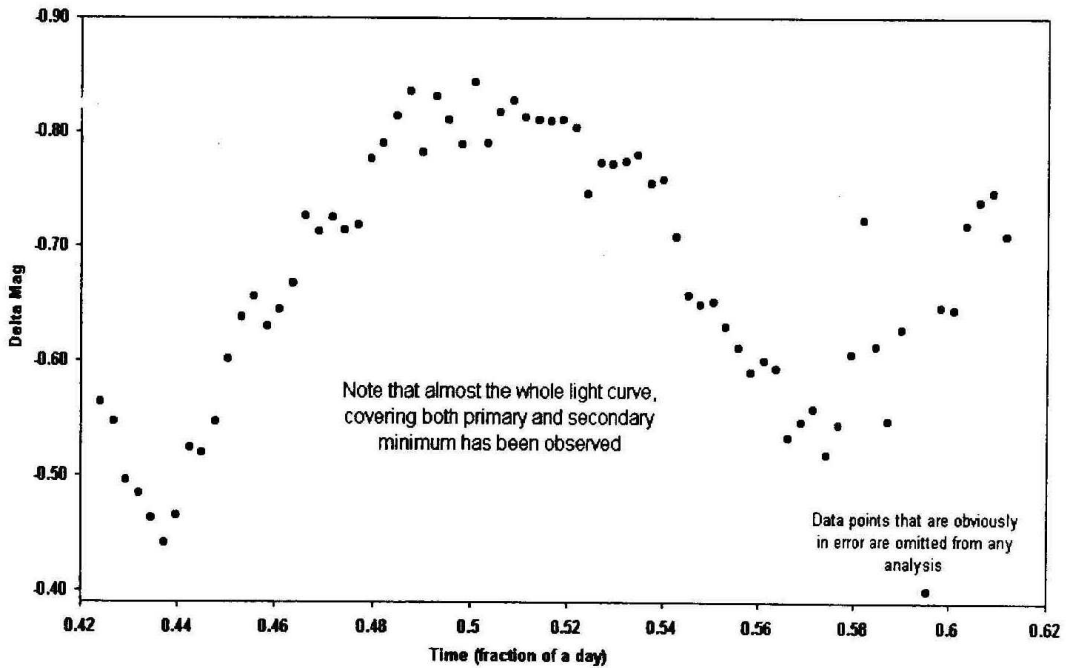
CM Lac

One of the nicer curves, even though the range is relatively large with an amplitude of one magnitude. The system is well behaved with an O-C of only 0.004 day.

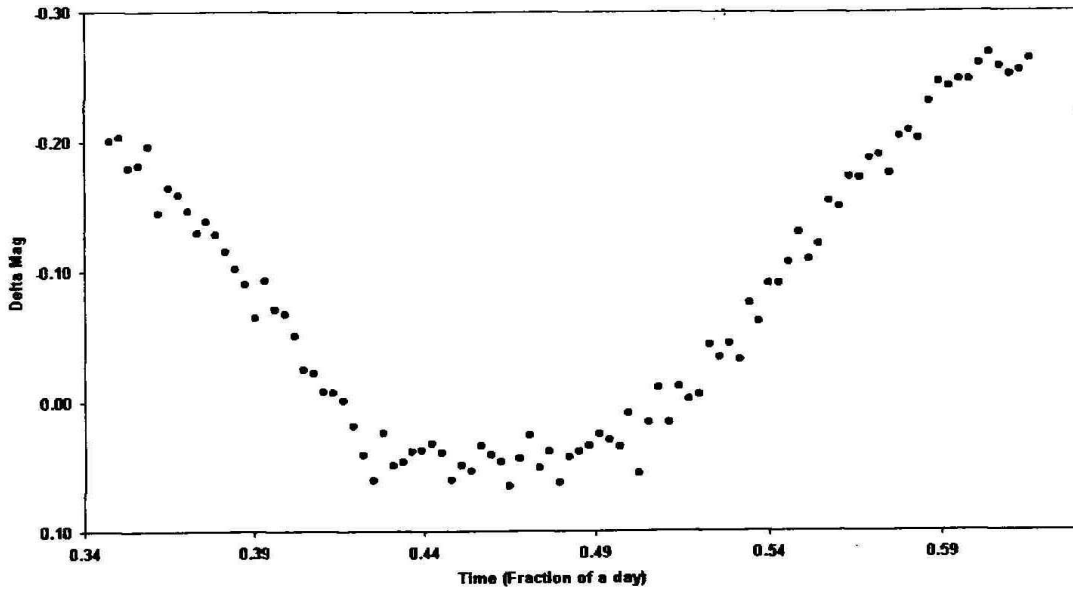
AR Aur for JD 2450442 = 1996 Dec 24/25



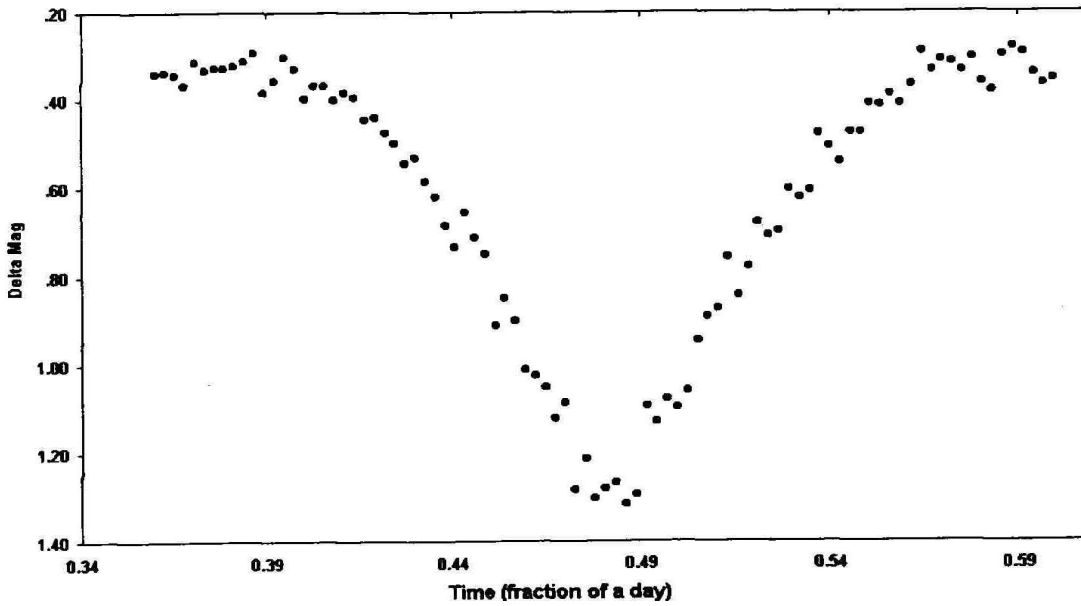
VW Cep for JD 2450218 = 1997 May 14/15



AR Lac for JD2450344 = 1996 Sep 17/18



CM Lac for JD 2450342 = 1996 Sep 15/16



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

RESULTS SUMMARY 1996 - TABLE 1

No	Double Date 1996	JD 2450..	Star Name	Star Type	No. of Obs.	Filter	Comments
1	Feb 8/9	122	NSV 1663	Delta Scuti	72	V	For Chris Lloyd at RAL
2	Feb 16/17	130	“	“	38	V	“
3	Feb 27/28	141	“	“	56	V	“
4	Apr 17/18	191	AW UMa	EW	50	V	No result
5	May 14/15	218	VW Cep	EW	71	V	Mins I & II
6	Jun 4/5	239	V1898 Cyg	?	67	V	No result
7	Sep 13/14	340	SW Lac	EW	95	V	Min I
8	Sep 15/16	342	CM Lac	EA	90	V	Min I
9	Sep 16/17	343	V836 Cyg	EB	119	V	Min I
10	Sep 17/18	344	AR Lac	EA	94	V	Min II
11	Oct 2/3	359	V477 Cyg	EA	47	V	No result
12	Oct 5/6	362	XZ Cep	EB	48	V	No result
13	Oct 15/16	372	DM Per	EA	80	V	No result
14	Oct 16/17	373	GH Peg	EA	21	V	No result
15	Oct 22/23	379	AO Cas	EB	54	V	No result
16	Nov 14/15	402	X Per	Be	6	V	For Paul Roche at Sussex University
17	Nov 14/15	402	X Per	Be	3	B	“
18	Nov 18/19	406	AH Cep	EB	45	V	No result
19	Nov 23/24	411	NSV 1663	Delta Scuti	52	V	For Chris Lloyd at RAL
20	Nov 29/30	417	“	“	61	V	“
21	Dec 4/5	422	“	“	136	V	“
22	Dec 5/6	423	“	“	93	V	“
23	Dec 24/25	442	AR Aur	EA	130	V	Min I

Notes:- Chris Lloyd is a professional astronomer at Rutherford Appleton Laboratory.

Paul Roche is a professional astronomer at Sussex University.

VSS MEETING, NORTHAMPTON, 1996 OCTOBER 5TH

- CONTINUED

TRISTRAM BRELSTAFF

The last speaker before lunch was John Toone who spoke about Binocular Variables. Thirty years ago binocular observing played only a minor role in British variable star observing but this was changed in the late 1960's by the success of George Alcock in nova searching and by the work of the Binocular Sky Society on bright variable stars. The advantages of binoculars relative to telescopes include their robustness, handiness, low cost, and the fact that the observer uses both eyes. John said that binocular vision was more comfortable than monocular vision

John went on to describe a few of the best binocular variable stars and to show charts, photos and light-curves of them. R Sct is situated in the Scutum stars cloud near the cluster M11 and varies from mag 5 to about mag 8 in a deep minimum. Z UMa, in the bowl of 'The Plough' shows occasional double maxima. V CVn, below the tip of the handle of The Plough is the 'Variable Star of the Year' in the BAA Handbook for 1997. R CrB shows occasional unpredictable fades and the detection of these fades is almost entirely down to binocular observers. CH Cyg shows very complicated light variations which involve semiregular pulsations, Z And type outbursts, rapid flickering and eclipses. At maximum it is brighter than mag 6 but at the present it is below mag 10, as faint as it has ever been seen, and it is too faint for binoculars. Finally, John showed a light-curve of the short-period pulsating star SX Phe that he had obtained one night while on holiday in the Canary Islands. This showed very clearly the 80 minute period and the modulation of the magnitude at maximum.

In the discussion, Bob Marriot said that he had recently been to visit the old VSS observer Frank Knight at his home in Epsom. Frank had just donated his observing notebooks to the BAA. These notebooks contained records of observations of R Sct that Frank made from fox-holes at El-Alamein during the war. Melvyn Taylor said that in more recent years, Frank's early morning observations of R Sct in January had been very important in reducing the winter gaps in the light-curve. Bob said that he had found binocular observing a good way of salving his conscience when he couldn't be bothered to open up his observatory.

Shaun Albrighton said that ever since a large number of suspected variables had been dropped from the programme he often found himself running out of stars to observe. He suggested that we should add another 30 to 40 binocular stars to the program. Gary Poyner said that personally he would have an open programme suggested that this might make things difficult for the Secretary. Guy Hurst said that there were many neglected variables in the mag 9 to 11 range that were within the reach of large binoculars. Mark Kidger suggested that what was needed was some sort of prioritisation. John Toone pointed out that we do actually have a 'Priority List' of stars that should be observed in preference to the others. He added that the main problem with adding stars to the Program was the production of charts.

After lunch the first speaker was Dr Mark Kidger who was to speak on the International OJ287 Project. Mark started off by explaining that when the Canary Island observatories were established, 5% of the time on them was set aside for collaborative projects that were too large to be carried out by any other means. This 5% is a very significant resource when you consider that it means about 17 nights per year on each of the Canary Island telescopes. This includes the 4.2m William Herschel Telescope, the 2.56m Nordic Telescope, the 2.5m Isaac Newton Telescope and so on. The average professional astronomer would be lucky to get more than one night per year on one of these telescopes. In 1993, it was decided that the active

galaxy OJ287 would be a suitable subject for one of these collaborative projects. Mark then gave a brief introduction to active galaxies and quasars. He described 3C279 which in 1936 had brightened to mag 10.4 and had briefly become the most luminous object in the observable universe. This object shows regular outbursts of 3 to 4 mags. Mark's favorite galaxy is 3C345 which shows 2 to 3 mag eruptions at 3.5 year intervals. However, it is currently at mag 18 and professional astronomers have tended to lose interest in it. Getting back to OJ287, Mark described it as 'The Finnish National Quasar' as you apparently could not qualify as an astronomer in Finland without having observed it. He showed the light-curve from 1891. This showed evidence for large outbursts at intervals of about 11.5 years. Periodicity in astronomical phenomena is often significant as it can indicate the presence of either pulsations or else orbital motion. For OJ287 the latter may well be the case. A model of it has been proposed that consists of a binary system with a 100 million solar mass black hole orbiting a 17 billion solar mass one (the latter is about 1/20th the mass of our Galaxy). The true orbital period of these would be 9 years but, because of the red-shift, this is stretched out to 11.5 years in our observing frame.

The period and amplitude of the outbursts seem to be modulated, maybe on a period of 60 years. This may be due to the orbit precessing very fast. Mark said that not everyone on the project team believed this (out of 40, 3 were convinced, 3 thought it rubbish, and the rest thought it interesting but remained undecided). One problem is that a binary black hole such as this would be unstable and would lose energy very rapidly by emitting gravitational radiation. The orbit would decay and the black holes coalesce in about 1000 years. Calculations showed that there was only about a 1 in 1000 chance that of all the observable quasars one would be in this binary stage at the moment.

The OJ287 project was started in 1993 in order to observe the next major outburst which was predicted for 1994. Observations were made from all round the world and from satellites, as well as from the Canary Islands. Visual observations by amateurs (including the BAA observers Bill Worraker, Gary Poyner, John Toone and Nick Hewitt) were also accepted. A particularly valuable contribution was made by the Canadian amateur Paul Boltwood who made 1200 observations out of the 3000 total using a 7-inch refractor fitted with a CCD.

The prediction was that there would be two outbursts about a year apart. This is actually what was seen. However, observations at various wavelengths raised all sorts of other questions. For example, when it was bright in visual light it was faint in radio waves and in X-rays but a marginal detection with the Compton Gamma-ray Observatory suggested it was bright in gamma-rays. It is difficult to explain how it could simultaneously be bright in gamma-rays and faint in X-rays.

As well as the major flares, the light-curve seems to show almost continual small flares of 0.5 to 1.0 mags with a periodicity of about 35 days (this period also shows up in polarisation data). In addition, in late 1993, Mark obtained evidence for a fade of 0.5 mag in the V-band during one night.

In one model for the OJ287 system it has a relativistic jet similar to that of 3C273 but which is pointing almost directly at us. The flares are shock waves going into the jet which are then magnified by relativistic effects.

In summing up, Mark said that they couldn't have chosen a better subject than OJ287 for their International Project.

- **To be continued in the next circular**

GKevin WestH then spoke on GPhotoelectric PhotometryH. First he described how

MORE VARIABLES TO OBSERVE USING BINOCULARS

TONY MARKHAM

At the last section meeting, it was requested that more variables be added to the section's programme that are suitable for binocular observation, possibly to replace some of the less active binocular variables. The problem is, of course, that there are not many Semi-Regular / Irregular variables not already on the programme that are of suitable brightness and have sufficiently large ranges.

One possibility would be to reinstate some of the dropped Mira type variables back on to the programme, since many of these reach binocular brightness at maximum. However, there are already many variables on the Eclipsing Binary program that are currently neglected by most binocular observers. Many of these variables DO vary by much larger amounts than do many of the Semi-Regular and Irregular variables that most binocular observers follow.

As an indication of what is available, the table below summarises my observations of some of these variables during the summer and autumn of 1996. Although there may be advantages in calculating/looking up the predicted times of eclipses in advance, I usually find it more rewarding to find the eclipses by trial and error. It is worth noting that in some cases the observed magnitudes may be significantly different from the values listed on the charts - not all chart ranges are visual ranges (and different observers may see slightly different values anyway).

Star	Chart Range	Type	Period Max	Observed Range Min	Notes
EO Aur	7.5-8.0B	EA	4.066d	8.1/8.2	(1)
IU Aur	8.2-8.9V	EB	1.811d	8.5/8.6	(1)
LY Aur	6.7-7.4V	EB	4.002d	6.8 7.5	(2)
ZZ Boo	6.6-7.4	EA	4.99d	6.6 7.5	
RS CVn	8.0-9.5	EA	4.80d	7.8 8.9	
RZ Cas	6.4-7.8	EA	1.195d	6.6 7.8	
TV Cas	7.3-8.4	EA	1.81d	7.5 8.2	
TW Cas	8.3-9.0V	EA	1.428d	8.6/8.7	(1)
U Cep	6.7-9.0	EA	2.49d	6.8 9.1	
GK Cep	6.9-7.5	EB	0.94d	7.0 7.5	
U CrB	7.7-8.8V	EA	3.452d	7.9 8.7	
TW Dra	7.5-9.8	EA	2.81d	(6.8)	(1),(3)
AI Dra	7.1-8.1	EA	1.20d	7.2/7.5	(1),(4)
BH Dra	8.0-8.6	EA	1.82d	7.9	(1)
u Her	4.6-5.3	EB	2.051d	4.8 5.4	
EE Peg	6.9-7.6	EA	2.63d	6.7	(1)
DM Per	7.6-8.4	EA	2.73d	8.1/8.2 8.5	(5)
IQ Per	8.0-8.7	EA	1.74d	6.9/7.0 7.2	(6)
IZ Per	7.7-8.9	EA	3.69d	7.6/7.7	(1)
RW Tau	8.0-11.6	EA	2.769d	8.0 (9.5)	(7)
HU Tau	6.0-6.8	EA	2.06d	5.6/5.7 6.7	
W UMa	7.7-8.4	EW	0.334d	7.9 8.5	
TX UMa	6.9-8.5	EA	3.06d	6.9	(1)

- (1) Not caught in eclipse
- (2) Secondary eclipse approx mag 7.3
- (3) Comparison star magnitudes (chart 710927) seem too faint - by up to a magnitude ?
- (4) Large scatter in estimates at maximum - PA effect ?
- (5) Comparison C (listed as mag 7.8 on chart 720409) looks more than half a magnitude fainter. Comparison D (mag 8.6) was used instead.
- (6) Chart 721107 refers to nearby companion and gives the combined range as 7.6-8.2
- (7) Too faint to be seen at mid eclipse.

PRO-AM EXCHANGES REPORT 13

GUY HURST

Covering period 1994 July 1 to Dec 31.

Date	Subject	Professional
940701	LL And	Steve Howell, USA
Confirms joint paper with Howell/Hurst accepted for publication on IBVS 4043.		
940704	T CrB, X Per; VY UMa	Eran Ofek, Israel
We supply T CrB 9514 obs (1946-1993); X Per 1980 obs (1971-93) VY UMa 3581 obs (1971-93) Total obs supplied 15,075		
940707	H0857-242	Taichi Kato, Japan
Advises us of new UGSU variable at: RA 08h57m07.7s DEC -24 17' 12" (1950). Outburst on Harvard Plates		
940708	3C66A	Leo Takalo, Finland
Report by G.Poyner of visual estimate 14.3 July 8 relayed.		
940711	Comet (1994m)	Brian Marsden, CBAT
Astrometry by Nick James on July 10 relayed to CBAT		
940712	Z UMi	Priscilla Benson, USA
Paper on this new R CrB variable supplied to us.		
940715	Q Cyg	Daisaku Nogami, Japan
Ouda Station are to monitor this old nova and request exchange of data to which we agree.		
940718	Various data	Frank Bateson, NZ
Total 7,854 observations supplied on southerly variables.		
940719	VZ Aqr & HP And	Brian Skiff, USA
Supplies details of existing sequence and new measures for comparisons in the field of these variables.		
940719	Sequence Project	Brian Skiff, USA
Provides an update on progress on the re-measure of sequences and which stars remain a high priority target.		
940721	New variable star names	Taichi Kato, Japan
Supplies us with new designations announced by Samus at CV Conference at Padova-Abano, Italy		
940727	AR UMa etc	Ron Remillard, USA
Papers supplied to us on AR UMa, H0459+246 and H0857-242 (new X-ray cataclysmic variables)		
940728	BC UMa	Steve Howell, USA
Requests data on outburst of 1994 May 1 which is sent.		
940728	IAU Commission 27	John Percy, Canada
Requests view on international cooperation on VS matters ready for the IAU General Assembly in The Hague (8/94). We supply completed questionnaire.		
940810	Pos Nova Sgr	Hilmar Duerbeck, Germany
Sakurai, Japan reports pos nova at RA 17h56m35s DEC -25 13' 16" (1950). Spectrum by Duerbeck et.al. suggests symbiotic star in outburst.		
940812	KV And	Taichi Kato, Japan
Tonny Vamunster reports outburst Aug 10, 13.7v. Kato at Ouda confirms superhumps amplitude 0.2mags.		
940815	3C66A	Tapio Pursimo, Finland
Results by Poyner for Aug 13-15 mag 14.2-14.3v relayed.		
940819	Pos SN NGC 5371	Bill Wren, USA

Aug 19, mag 15.0v. Found during visual search using 0.9-m McDonald telescope.
940821 Comet (1994m) Brian Marsden, CBAT
 Astrometry by Nick James for Aug 14 relayed.

940823 Mrk 421 Massimo Fiorucci, Italy
 Since 1992 we have supplied data for joint analysis and now relay update. Paper will be prepared in due course.

940824 UZ Boo Steve Howell, USA, Taichi Kato, Japan
 Astrometry by Nick James Aug 23 (mag 13.1) derived and relayed to Steve Howell to refine positional records. Kato supplies measures of current outburst.

940902 V635 Cas Diane Roussel-Dupre
 Gary Poyner reports outburst Sept 2, 14.7v. Confirmed by Vanmunster. Relayed to Diane Roussel-Dupre as part of joint project.

940912 Wakuda Object Cygnus Brian Marsden, CBAT, Taichi Kato, Japan
 Possible nova found by Wakuda reported by Kato to CBAT. However our research (by Mike Collins) shows it on earlier UK patrol photos and that it is designated V1965 Cygni.

940917 3C66 Tapio Pursimo, Mark Kidger
 Observations by Poyner of 1994 Aug-Sep at 14.2 relayed.

940919 TT Ari Ivan Andronov
 Requests our help with appeal for campaign on TT Ari as e-mail from Russia unreliable. We circulate numerous astronomers and receive confirmation from Stanislaw Zola that a telescope at Mt.Suhora will be used Oct 5-10.

940920 Cataclysmics WU Xue-bing
 Observer at Beijing Astronomical Observatory, China requests general information on cataclysmics monitored by amateur astronomers which we supply.

940928 TT Ari;IP Peg; V603 Aql Keith Horne
 Keith Horne supplies HST schedule for observation of the above cataclysmics and requests simultaneous ground-based coverage which we arrange.

941005 IP Peg Brian Skiff
 New sequence measures supplied by Brian Skiff at the request of Bill Worraker as part of this campaign on this object.

941006 OJ287 Mark Kidger
 Mark Kidger reports OJ287 has brightened to $V=14.3$ on Oct 5 and requests confirmation. David Strange images on Oct 8.16UT at mag 14.4 (CCD no filter) and confirms.

941008 BZ UMa Fred Ringwald
 Following a report from Patrick Schmeer that BZ Uma is bright (Oct 7, 11.4) Fred Ringwald circulates various professional astronomers appealing for time-resolved photometry of this dwarf nova.

941008 1988 WC Gareth Williams
 Martin Moberley imaged this asteroid on Oct 4 at 18.4 one of the faintest so far recorded. Astrometry submitted to the Minor Planet Center.

941022 UY Tau Brian Skiff
 Brian Skiff supplies newly measured sequence.

941022 V1974 Cyg Brian Skiff
 Brian Skiff supplies sequence update for this 1992 nova.

941025 BZ UMa Fred Ringwald
 Fred Ringwald requests data from 'The Astronomer' for 1988 as to whether an outburst of BZ UMa was published. All estimates supplied to Keele but no really bright estimates noted with adequate confirmation.

941023 U Ori Brian Skiff
 Sequence around U Ori supplied to us by Brian Skiff

941024 S UMa, RR Boo, W Lyr Brian Skiff

Sequence around these stars supplied by Brian Skiff

941025 EM Cyg and V930 Cyg Brian Skiff

New measured sequence supplied to us.

941027 QY Per Ron Downes, Steve Howell

During an outburst Nick James obtains astrometry confirming star 15" NW of the Downes and Shara position which is relayed to them. We supply image at their request.

941028 V604 Aql; V465 & V1819 Cyg Paula Szkody

Supplies new finders for above novae to us.

941031 TV Aur, R Cnc, V Aqr Brian Skiff

New sequences supplied to us.

941101 OW, OX Aql, S Del, T Cep Brian Skiff

TY And

New sequences supplied to us.

941107 P/Borrelly Brian Marsden

Astrometry by Denis Buczynski for Oct 4-12 supplied to CBAT.

941107 FS Sct Steve Howell

A report from L Szentasko that this old nova was at mag 10 on Oct 6.7UT was widely circulated on the Internet and several professional astronomers took this at face value.

Our research showed a star had been omitted from the VVS Belgium chart when compared with the TA chart of 1979 and this had led to a false alarm by Szentasko.

941109 OJ 287 Mark Kidger

Mark Kidger advises new campaign starting on this object and requests our simultaneous coverage to which we agree. Estimates by W.Worraker and G.Poyner submitted.

941115 BL Lac Jim Webb

Requests data from Gary Poyner on brightenings of this object.

941120 Markarian 421 Gino Tosti

Data from our records for 1981-1984 submitted in connection with forthcoming paper.

941122 PKS 0422+004 Massimo Fiorucci

News received from Italy that this object, normally near mag 17 had reached V=13.8 by Nov 18. Nick Hewitt, Deep Sky Director, BAA alerted and chart circulated.

941122 PG 0943+521 Taichi Kato

Requests copy of TA 29,45 (1992) for a copy of the paper relating to this object which we duly supply.

PRO-AM Exchanges Summary Updated

Half year ending	Number of exchanges	My Report Nos
1988 Dec 31	42	1
1989 Jun 30	51	2,3
1989 Dec 31	45	3
1990 Jun 30	69	4
1990 Dec 31	23	5
1991 Jun 30	40	6
1991 Dec 31	43	7
1992 Jun 30	52	8
1992 Dec 31	42	9
1993 Jun 30	63	10
1993 Dec 31	59	11
1994 Jun 30	58	12
1994 Dec 31	48	13
To Date	635	

Updated 1997 Feb 10

IBVS'S NO. 4396 - 4451

GARY POYNER

- 4396 Photoelectric BVRc observations of the new Cepheid Variable Star GSC 4019.3103 (Berdnikov et al, 1996)
- 4397 Photoelectric BVRc observations of the new Cepheid Variable Star GSC 3596.0433 (Berdnikov et al, 1996)
- 4398 Photoelectric BVRc observations of the Cepheid V553 Cas. (Berdnikov et al, 1996)
- 4399 Photoelectric minima of four RS CVn type binary systems: RT And, SV Cam, WY Cnc & Z Her. (Albayrak et al, 1996)
- 4400 Photometry of the active-chromosphere eclipsing binary HD 9770 (Bromage et al, 1996)
- 4401 On the cyclicity of the S Dor phases in AG Carinae. (Sterken et al, 1996)
- 4402 The period and light curve of NSV 4497. (Borovicka & Sarounova, 1996)
- 4403 A new very long period variable star in Norma. (Liller & Jones, 1996)
- 4404 Unusual fading of V1357 Cyg (Cyg X-1) in early November 1996. (Karitskaya & Goranskij, 1996)
- 4405 New eclipsing binary star CoD -24.12698 in the direction of the star forming region rho Oph. (Grankin et al, 1996)
- 4406 GSC 4261.1197: A new eclipsing binary. (Agerer, 1996)
- 4407 NSV 08513, a new detached eclipsing binary star in Ophiuchus (Lasala-Garcia, 1996)
- 4408 RY Tauri at high brightness. (Zajtseva et al, 1996)
- 4409 HV 2554 and the supersoft X-ray source RX J0527.8-6954 (Greiner & Hazen, 1996)
- 4410 NSV 03438, a new detached eclipsing binary star in Canis Minor. (Garcia-Melendo & Gomez-Forrellad, 1996)
- 4411 New variables in the north eastern part of M31. (Nedialkov et al, 1996)
- 4412 New variables in the field of RE J0725-002. (Robb & Gladders, 1996)
- 4413 Variable stars in the Globular Cluster M72. (Zadla et al, 1996)
- 4414 Variable stars in the Globular Cluster NGC 6681. (Zadla et al, 1996)
- 4415 On novae 1982 and 1986 and possible nova 1955 in M33. (Sharov, 1997)
- 4416 V676 Cen: New times of minima and a possible short period modulation. (Cerruti, 1997)
- 4417 A revision of Dolidze's "List of probable long period variables of M types". (Skiff, 1997)
- 4418 Variable stars in the globular cluster NGC 5286. (Gerashchenko et al, 1997)
- 4419 UBV(RI) photometry of the rapidly rotating K-type star HD197890 = "Speedy Mic". (Cutispoto et al, 1997)
- 4420 NSV 11164 = Minor Planet (563) Suleika. (Williams, 1997)
- 4421 Photoelectric BVic observations and a new classification for V804 Arae. (Berdnikov & Turner, 1997)
- 4422 Photoelectric BVic observations for the RS CVn star GR Normae. (Berdnikov & Turner, 1997)

- 4423 NSV 02541, a detached eclipsing binary in Orion. (Gomez-Forrellad & Garcia-Melendo, 1997)
- 4424 NSV 00361 is an overcontact binary system in Pisces. (Vidal-Sainz et al, 1997)
- 4425 NSV 08156, a possible semiregular variable in Hercules. (Juan-Sanso & Guarro-Flo, 1997)
- 4426 A new Beta Lyrae variable SAO 56342, and two new possible irregular stars: BD+32.0599 and SAO 56366. (Campos-Cucarella et al, 1997)
- 4427 NSV 00821, a new overcontact eclipsing binary system in Triangulum. (Gomez-Forrellad & Garrigos Sanchez, 1997)
- 4428 Activity of T Coronae Borealis in 1996. (Mikolajewski et al, 1997)
- 4429 Accurate positions for 38 variables in a 5x5 degree field around BL Lac. (Shokin & Samus, 197)
- 4430 A search for gamma Doradus type variables in the open cluster M34. (Krisciunas & Crowe, 1997)
- 4431 Identification of the Margoni-Stagni variables. (Skiff, 1997)
- 4432 NSV 4539 is an eclipsing binary. (Berthold & Agerer, 1997)
- 4433 Identification of the Rosino-Guzzi variables in Saggita. (Skiff, 1997)
- 4434 Variable Stars in the Globular Cluster M12. (Malakova et al, 1997)
- 4435 Sudden period change in the contact binary AW UMa? (Pribulla et al, 1997)
- 4436 Two variable stars in Auriga: The new classical Cepheid NSV 01771 and the new Eclipsing Binary system GSC 2906.0213. (Garcia-Melendo et al, 1997)
- 4437 Photoelectric BV_{Ic} observations, new elements and a new classification for BZ Tuc. (Berdnikov & Turner, 1997)
- 4438 Photoelectric BV_{Rc} observations for the UU Her star EV Aurigae. (Berdnikov et al, 1997)
- 4439 Optical photometry of CF Tuc, Mid-1995 through 1996. (Rounthwaite et al, 1997)
- 4440 A suspected red variable in the error box of GRB970111. (Masetti et al, 1997)
- 4441 Identification of variables near NGC 7635. (Skiff, 1997)
- 4442 GSC 1657.1754: A new deeply eclipsing binary system in Delphinus. (Lloyd et al, 1997)
- 4443 HD 193084: A new variable star. (Paunzen, 1997)
- 4444 Detection of 43 new bright variable stars by the Tycho instrument of the HIPPARCOS Satellite. (Woitak, 1997)
- 4445 Observations of three Lambda Bootis stars by using dual channel photometer. (Dorokhova & Dorokov, 1997)
- 4446 Variable stars in the Globular Cluster NGC 6717. (Gerashchenko et al, 1997)
- 4447 Variable stars in the Globular Cluster NGC 4372. (Gerashchenko et al, 1997)
- 4448 Identification of Dahlmarm variables: I. (Skiff & Williams, 1997)
- 4449 Identification of Dahlmarm variables: II. (Williams & Skiff, 1997)
- 4450 Identification of Dahlmarm variables: III. (Skiff & Williams, 1997)
- 4451 Identification of Dahlmarm variables: IV. (Williams & Skiff 1997)

PHOTOELECTRIC MINIMA OF ECLIPSING BINARIES, 1996

TRISTRAM BRELSTAFF

The numbers of photoelectric observations of eclipsing binaries received from various observers in 1996 are listed in Table 1.

Table 1. Observer Totals

Observer	No Obsns	No Timings	Notes
J Ells APT (EJ)	1012	7	1
J Saxton (XT)	147	5	
K West (WEK)	43	1	
Total	1202	13	

Notes:

1. The code EJ indicates timings made with the Jack Ells Automatic Photoelectric Telescope operated by M Gough and RD Pickard.

The timings derived from these observations are listed in Table 2. A colon (':') following a timing indicates that it is uncertain either because the observations show large scatter or else because the rising or fading limb was poorly covered. The O-C values are relative to the linear elements given in the 4th Edition of the GCVS.

Table 2. Timings of Minimum

Star	Epoch	JD Hel	O-C (d)	No	Obs	Filter
AR Aur	2912	2450442.3368	-0.0782	86	EJ	V
44i Boo	38664.5	2450207.5150	0.0568	19	XT	V
44i Boo	38672	2450209.5238	0.0570	24	XT	V
44i Boo	38679.5	2450211.5331	0.0577	27	XT	V
44i Boo	38814	2450247.5541:	0.0575:	11	XT	V
RZ Cas	5896	2450247.5065	0.0239	38	WEK	V
VW Cep	21777.5	2450218.4366:	0.0273:	29	EJ	V
VW Cep	21778	2450218.5724	0.0239	40	EJ	V
V836 Cyg	8402	2450343.4627	0.0031	73	EJ	V
V1143 Cyg	1050	2450235.5566	-0.0079	20	XT	V
SW Lac	15793	2450340.4558	-0.0371	36	EJ	V
AR Lac	4412.5	2450344.4641	-0.0831	94	EJ	V
CM Lac	14530	2450342.4816	-0.0034	90	EJ	V

ECLIPSING BINARY PROGRAM - VISUAL TOTALS FOR 1996

TRISTRAM BRELSTAFF

A total of 1329 visual observations of eclipsing binaries have been received for the year 1996. The names of the observers and their individual totals are listed below. Many of the observers are members of the Variable Star Section of the Society for Popular Astronomy whose observations have been submitted by Tony Markham.

These observations will be analysed and the results published in a future issue of the VSS Circular.

Name	No Obs	No Stars	Name	No Obs	No Stars
K Barnwell	85	3	S Jenner	11	1
M Barrett	44	3	GJ Kirby	60	1
M Clarke	191	5	T Markham	388	15
J Coates	9	1	C Newman	53	2
D Conner	107	3	G Pointer	11	4
S Godwin	77	4	D Storey	42	3
EH Horsley	34	2	MD Taylor	217	8

ECLIPSING BINARY PREDICTIONS

TRISTRAM BRELSTAFF

The following predictions are calculated for an observer at 53 degrees north, 1.5 degrees west but 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, that is UT-12h. 'D' and 'L' are used to indicate where daylight and low altitude, respectively, prevent part of the eclipse from being visible. Charts for all of the stars included in these predictions (17 in all - see VSSC 90 for a list) are available from the Eclipsing Binary Secretary at 10p each (please enclose a large SAE).

1997 Jul 1 Tue	RZ Cas 11(14)14D	1997 Jul 6 Sun	Z Vul 13(18)14D
TW Dra D10(08)13	X Tri L12(11)14D	Z Vul D10(07)13	1997 Jul 9 Wed
Z Vul D10(10)14D	1997 Jul 4 Fri	X Tri L11(09)12	RZ Cas 11(13)14D
TX UMa D10(13)14D	SW Cyg D10(09)14D	1997 Jul 7 Mon	U Cep 11(16)14D
X Tri L12(13)14D	Z Dra D10(10)12	S Equ D10(06)12	TW Dra 13(18)14D
1997 Jul 2 Wed	TX UMa 10(15)14D	TX UMa 12(17)14D	1997 Jul 10 Thu
U Sge D10(08)14	U Cep 11(16)14D	RW Tau L13(13)14D	S Equ 12(17)14D
RZ Cas D10(09)11	X Tri L12(11)13	1997 Jul 8 Tue	TX UMa 13(18)14L
Y Psc L11(08)13	1997 Jul 5 Sat	RZ Cas D10(08)11	1997 Jul 11 Fri
X Tri L12(12)14D	U Sge 11(17)14D	Z Dra D10(12)14D	Z Vul D10(05)11
1997 Jul 3 Thu	X Tri L11(10)13	ST Per L11(11)14D	1997 Jul 12 Sat

U Sge D10(11)14D
 TW Dra D10(14)14D
 Z Dra 11(13)14D
1997 Jul 13 Sun
 SW Cyg D10(12)14D
 Z Vul 11(16)14D
 Y Psc 11(15)14D
1997 Jul 14 Mon
 RZ Cas D10(08)10
 U Cep 11(15)14D
 SS Cet L14(15)14D
1997 Jul 15 Tue
 TW Dra D10(09)14
 RZ Cas 10(12)14D
1997 Jul 16 Wed
 ST Per L10(10)14
 Z Dra 13(15)14D
1997 Jul 17 Thu
 S Equ D10(14)14D
 Y Psc L10(10)14D
 SS Cet L14(15)14D
1997 Jul 18 Fri
 Z Vul D10(14)14D
 RW Tau L13(15)14D
1997 Jul 19 Sat
 U Sge D10(06)11
 Z Dra D10(08)11
 U Cep 10(15)14D
1997 Jul 20 Sun
 SS Cet L14(14)14D
1997 Jul 21 Mon
 RZ Cas D10(12)14
 RW Tau L12(10)14
 ST Per 13(17)14D
1997 Jul 22 Tue
 U Sge D10(15)15D
 SW Cyg 10(16)15D
 RZ Cas 14(16)15D
1997 Jul 23 Wed
 Z Per D09(05)10
 Z Dra D09(10)13
 Z Vul D09(12)15D
 SS Cet L14(13)15D
 TW Dra 14(19)15D
1997 Jul 24 Thu
 S Equ D09(11)15D
 ST Per L10(09)13
 U Cep 10(15)15D
1997 Jul 26 Sat
 Z Per D09(06)11
 TW Dra 10(15)15D
 SS Cet L13(13)15D
1997 Jul 27 Sun
 SW Cyg D09(05)11
 RZ Cas D09(11)14
 Z Dra 09(12)14
1997 Jul 28 Mon
 Z Vul D09(10)15D
 Y Psc 13(17)15D
 RZ Cas 14(16)15D
1997 Jul 29 Tue
 Z Per D09(08)12
 U Sge D09(09)15
 TW Dra D09(10)15D
 U Cep 10(14)15D
 ST Per 12(16)15D
 RW Tau 12(17)15D
 SS Cet L13(12)15D
 X Tri 15(17)15D
1997 Jul 30 Wed
 X Tri 14(16)15D
1997 Jul 31 Thu
 S Equ D09(08)13
 Z Dra 11(14)15D
 SW Cyg 13(19)15D
 X Tri 13(16)15D
1997 Aug 1 Fri
 TX UMa D09(05)09
 TW Dra D09(05)10
 Z Per D09(09)14
 Y Psc L09(11)15D
 ST Per L09(07)12
 RW Tau L12(11)15D
 U Sge 12(18)15D
 X Tri 12(15)15D
 SS Cet L13(11)15D
 RW Gem L14(17)15D
1997 Aug 2 Sat
 Z Vul D09(07)13
 RZ Cas D09(11)13
 X Tri 12(14)15D
1997 Aug 3 Sun
 Z Dra D09(07)09
 U Cep 09(14)15D
 X Tri 11(14)15D
 S Equ 13(18)15D
 RZ Cas 13(15)15D
1997 Aug 4 Mon
 TX UMa D09(06)11
 Z Per D09(10)15D
 X Tri 10(13)15D
 SS Cet L13(11)15D
 Z Dra 13(15)15D
 Z Vul 13(18)15D
 RW Gem L14(14)15D
1997 Aug 5 Tue
 U Sge D09(03)09
 Y Psc D09(06)10
 SW Cyg D09(09)15
 X Tri 10(12)15
1997 Aug 6 Wed
 X Tri L09(12)14
 ST Per 10(15)15D
 TW Dra 15(20)15D
1997 Aug 7 Thu
 S Equ D09(05)10
 Z Vul D09(05)11
 TX UMa D09(08)12L
 Z Dra D09(08)11
 Z Per D09(12)15D
 X Tri L09(11)13
 SS Cet L13(10)15
 RW Gem L14(11)15D
1997 Aug 8 Fri
 RZ Cas D09(10)12
 U Sge D09(12)15D
 U Cep 09(14)15D
 X Tri L09(10)13
 Z Dra 15(17)15D
1997 Aug 9 Sat
 ST Per D09(06)10
 X Tri L09(10)12
 TW Dra 10(15)15D
 Z Vul 11(16)15D
 RZ Cas 12(15)15D
 RW Tau 14(19)15D
1997 Aug 10 Sun
 TX UMa D09(09)12L
 Z Per D09(13)15D
 X Tri L09(09)11
 S Equ 10(15)15D
 SS Cet L12(10)14
1997 Aug 11 Mon
 Z Dra D09(10)13
 X Tri L09(08)11
1997 Aug 12 Tue
 TW Dra D09(11)15D
 X Tri L09(07)10
 RW Tau L11(13)15D
 Y Psc 14(19)15D
1997 Aug 13 Wed
 TX UMa D09(11)12L
 U Cep 09(13)15D
 X Tri L09(07)09
 Z Per 10(14)15D
 SS Cet L12(09)14
 TX UMa L14(11)15D
1997 Aug 14 Thu
 RZ Cas D09(10)12
 SW Cyg D09(12)15D
 Z Vul 09(14)15D
 ST Per 09(13)15D
1997 Aug 15 Fri
 TW Dra D09(06)11
 U Sge D09(07)12
 Z Dra 10(12)14
 RW Tau L11(08)12
 RZ Cas 12(14)15D
1997 Aug 16 Sat
 TX UMa D08(12)12L
 Y Psc D08(13)15D
 Z Per 11(16)15D
 SS Cet L12(08)13
 TX UMa L14(12)15D
1997 Aug 17 Sun
 ST Per D08(05)09
 S Equ D08(12)16D
1997 Aug 18 Mon
 U Cep D08(13)16D
 U Sge 10(16)16D
1997 Aug 19 Tue
 Z Vul D08(12)16D
 TX UMa 09(14)11L
 Z Dra 11(14)16D
 SS Cet L12(08)12
 Z Per 12(17)16D
 TX UMa L14(14)16D
1997 Aug 20 Wed
 Y Psc D08(07)12
 RZ Cas D08(09)11
1997 Aug 21 Thu
 RZ Cas 11(14)16D
 RW Gem 13(19)16D
1997 Aug 22 Fri
 Z Dra D08(07)09
 ST Per D08(12)16D
 TX UMa 11(15)11L
 SS Cet L12(07)12
 Z Per 14(18)16D
 TX UMa L14(15)16D
1997 Aug 23 Sat
 U Cep D08(13)16D
 SW Cyg 10(16)16D
 RW Tau 10(15)16D

TW Dra 11(16)16D
 Z Dra 13(15)16D
1997 Aug 24 Sun
 S Equ D08(09)14
 Z Vul D08(10)15
 RW Gem L13(15)16D
1997 Aug 25 Mon
 U Sge D08(10)16L
 TX UMa L14(17)16D
 Z Per 15(20)16D
1997 Aug 26 Tue
 RZ Cas D08(08)11
 Z Dra D08(09)11
 TW Dra D08(12)16D
 RW Tau L10(10)14
 Z Vul 15(21)16D
1997 Aug 27 Wed
 RZ Cas 11(13)15
 RW Gem L13(12)16D
 S Equ 14(19)16L
 Z Dra 15(17)16D
 ST Per 15(19)16D
 Y Psc 16(20)16D
1997 Aug 28 Thu
 SW Cyg D08(06)12
 U Cep D08(12)16D
 U Sge 14(19)15L
 TX UMa 14(18)16D
 RZ Cas 15(18)16D
1997 Aug 29 Fri
 TW Dra D08(07)12
 Z Vul D08(08)13
1997 Aug 30 Sat
 ST Per D08(11)15
 Z Dra 08(10)13
 RW Gem L12(09)14
1997 Aug 31 Sun
 S Equ D08(06)11
 Y Psc 10(14)16D
 Z Vul 13(19)16L
 TX UMa 15(20)16D
 X Tri 15(18)16D
1997 Sep 1 Mon
 U Sge D08(04)10
 RZ Cas D08(08)10
 SW Cyg 13(19)16D
 X Tri 15(17)16D
1997 Sep 2 Tue
 U Cep D08(12)16D
 RZ Cas 10(12)15
 X Tri 14(16)16D

1997 Sep 3 Wed
 Z Vul D08(05)11
 Z Dra 10(12)14
 S Equ 11(16)15L
 RW Tau 12(17)16D
 X Tri 13(16)16D
 RZ Cas 15(17)16D
1997 Sep 4 Thu
 Y Psc D08(09)13
 U Sge 08(13)15L
 X Tri 13(15)16D
 ST Per 14(18)16D
 1997 Sep 5 Fri
 Z Vul 11(16)15L
 X Tri 12(14)16D
 1997 Sep 6 Sat
 Z Dra D08(05)08
 SW Cyg D08(09)15
 RW Tau L09(11)16
 X Tri 11(14)16D
 TW Dra 12(17)16D
1997 Sep 7 Sun
 S Equ D08(03)08
 RZ Cas D08(07)10
 ST Per D08(09)13
 U Cep D08(12)16D
 X Tri 11(13)16
 Z Dra 11(14)16
1997 Sep 8 Mon
 Y Psc D07(03)08
 Z Vul D07(03)09
 RZ Cas 10(12)14
 X Tri 10(12)15
1997 Sep 9 Tue
 TW Dra D07(12)16D
 X Tri 09(12)14
 RW Tau L09(06)10
 RZ Cas 14(17)16D
1997 Sep 10 Wed
 Z Dra D07(07)09
 S Equ 08(13)15L
 X Tri 08(11)13
 Z Vul 09(14)15L
 RW Gem 15(20)16D
1997 Sep 11 Thu
 U Sge D07(08)13
 X Tri 08(10)13
 Z Dra 13(16)16D
1997 Sep 12 Fri
 TW Dra D07(08)13

X Tri D07(10)12
 U Cep D07(11)16
 ST Per 12(16)16D
1997 Sep 13 Sat
 Z Per D07(04)09
 RZ Cas D07(07)09
 X Tri D07(09)11
 RW Gem 12(17)16D
1997 Sep 14 Sun
 X Tri D07(08)11
 Z Dra D07(09)11
 RZ Cas 09(11)14
 U Sge 11(17)14L
 RW Tau 14(19)16D
1997 Sep 15 Mon
 TW Dra D07(03)08
 X Tri D07(08)10
 ST Per D07(08)12
 Z Vul D07(12)15L
 SW Cyg D07(13)16D
 Y Psc 11(16)16D
 RZ Cas 14(16)16D
 Z Dra 15(17)16D
1997 Sep 16 Tue
 TX UMa D07(03)08
 Z Per D07(05)10
 X Tri D07(07)09
 RW Gem L11(14)17D
1997 Sep 17 Wed
 X Tri D07(06)09
 S Equ D07(10)14L
 U Cep D07(11)16
 RW Tau L09(13)17D
1997 Sep 18 Thu
 U Sge D07(02)08
 X Tri D07(05)08
 Z Dra 08(10)13
1997 Sep 19 Fri
 X Tri D07(05)07
 TX UMa D07(05)09L
 RZ Cas D07(06)08
 Z Per D07(07)11
 Y Psc D07(10)15
 RW Gem L11(10)15
 Z Dra 17(19)17D
1997 Sep 20 Sat
 SW Cyg D07(02)08
 Z Vul D07(10)14L
 RZ Cas 08(11)13
 RW Tau L08(08)12

ST Per 11(15)17D
 TW Dra 13(18)17D
1997 Sep 21 Sun
 U Sge D07(11)14L
 RZ Cas 13(15)17D
1997 Sep 22 Mon
 TX UMa D07(06)09L
 Z Per D07(08)13
 U Cep D07(11)16
 Z Dra 10(12)15
 RW Gem L11(07)12
1997 Sep 23 Tue
 Y Psc D07(05)09
 ST Per D07(07)11
 TW Dra 08(13)17D
1997 Sep 24 Wed
 S Equ D07(07)13
 SW Cyg 10(16)17D
1997 Sep 25 Thu
 Z Dra D07(05)08
 RZ Cas D07(06)08
 Z Vul D07(08)13
 TX UMa D07(08)09L
 Z Per D07(09)14
 TX UMa L12(08)13
 RW Tau 16(20)17D
1997 Sep 26 Fri
 TW Dra D07(09)14
 RZ Cas 08(10)13
 Z Dra 11(14)16
1997 Sep 27 Sat
 U Cep D07(10)15
 S Equ 12(18)14L
 RZ Cas 13(15)17D
 Z Vul 13(19)14L
1997 Sep 28 Sun
 U Sge D07(05)11
 TX UMa D07(10)09L
 Z Per D07(11)15
 ST Per 10(14)17D
 RW Tau 10(15)17D
 TX UMa L11(10)14
1997 Sep 29 Mon
 TW Dra D07(04)09
 SW Cyg D07(06)12
 Z Dra D07(07)09
 1997 Sep 30 Tue
 Z Vul D07(06)11
 Y Psc 13(17)16L
 Z Dra 13(16)17D
 RW Gem 16(21)17D

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