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The British Astronomical Association

VARIABLE STAR SECTION

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VARIABLE STAR SECTION
CIRCULAR 70

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Doug Saw

It is with deep regret that we announce the death on 1990 March 6 of Doug Saw, Deputy Director and past Director and Secretary of the Section. Doug's contribution to the Section has been exceptional, most particularly in his handling of untold thousands of observations over many years. Although in poor health recently, he continued with the administrative work until very shortly before his death. A full obituary will appear in the BAA *Journal* in due course. We extend our deepest sympathy to Phyl, Doug's widow, who supported his work for the Section for so many years.

Gordon Patston

We also have the sad duty of announcing the recent death of Gordon Patston, a long-standing member of the Section, an assiduous and enthusiastic observer (particularly in the pre- and immediate post-war periods), and Secretary of the Section before Doug Saw. An obituary is being prepared for publication in the BAA *Journal.*

Jack Ells

Regrettably, we have yet another loss to announce, in that Jack Ells died on March 29th. Although Jack was not a Section officer, he was one of our (all too few) photoelectric observers, whose results made a very significant contribution to the eclipsing binary programme.

Changes in Administrative Arrangements

As a result of Doug Saw's death, members are asked to note that all routine matters will be dealt with by Melvyn Taylor for the time being. Any general queries should be addressed to him in the first instance. As Melvyn already has a very full workload as Secretary, members are asked to be understanding if non-urgent correspondence is subject to some delay. All letters sent to Doug Saw are being dealt with by one or other of the VSS officers.

Members are also asked to note that because of the untimely death of Alan Young, whose obituary appears in *The Astronomer* for 1990 March, only three persons (listed on the inside front cover) are available at present for telephone alerts concerning unusual activity or discoveries.

VSS Computerization - Appeal for an Organizer

John Isles

The Variable Star Section has an archive containing some 2 million visual estimates, in some cases going back to the 1890s. Most of the data are unpublished, but they are of considerable interest to professional astronomers. Much work has been done over the years in reducing them to a consistent scale of magnitudes and listing them in chronological order; but it remains a problem that most of the data do not exist in a machine-readable form.

A few years ago, report forms suitable for direct keying were introduced, a suite of programs was written and several years' data for stars on the telescopic programme were entered on BBC micros (which were adopted as a standard machine for the VSS) by two members, Greg Coady and Doug Saw. This work resulted in the issue to observers of annual booklets of computer-plotted light curves, which were much appreciated and which we would love to be able to revive. Two years' data for the binocular programme were also computerized by David Swain, enabling us to make a start on the backlog of analysis. Unfortunately, none of the present officers of the Section has time to organize a sustained assault on the keying.

Applications are therefore invited from UK members for the unpaid but prestigious position of Computer Secretary to the VSS. The successful applicant will have to give up at least a few evenings a week, and ideally will have some familiarity with variable-star observation, the BASIC programming language, the BBC microcomputer and the transfer of data between machines. She or he will not necessarily have to do a lot of keying, as others are willing to help, and there may be a possibility of obtaining a grant to pay for some keying to be done commercially. Above all, we need an organizer. Please write to:

John Isles, PO Box 6322, Limassol, Cyprus

Submission Of VSS Observations

The Secretary, Melvyn Taylor, has requested that the comments made in the note about submission of reports on VSS programme stars that was published in *VSSC 66* (1988 January) be restated.

Please make sure that all estimates made in the interval January to June are submitted by the end of August, and those in the interval July to December by the end of February. This applies to all binocular and telescopic stars included in the list in *VSSC 67* and in subsequent numbers. Requests for blank report forms should be made to the Secretary in advance of these time-limits.

Under-observed Stars in 1989

Melvyn Taylor

The following brief summaries of observed activity is from the efforts of either one VSS observer, or has been deduced from a small number of (generally) spasmodic estimates from a few observers. The list is preliminary, as is the table of stars for which no observations at all were reported in the relevant period.

Some of these seriously under-observed stars may be recommended to those members who are thinking of purging or reallocating their observational programmes.

Symbols: Stars marked * are on the recurrent objects programme, and charts are available from Guy Hurst, to whom enquiries should be sent. Stars marked ** are possible additions to the programme, and together with the remaining variables, their charts may be obtained from John Toone. For addresses and charges see inside of front and back covers.

BZ And (7.5 - 8.4, LB, K9)
Two observers in Jan. to Mar. and Aug. to Dec. suggest a mean magnitude of 8.2 with little variation.

V603 Aql (-1.4 - 12.0, NA/E+X, nova 1918)
Mar. to Aug. only; estimates range 11.4 - 11.7 from 3 observers.

TT Ari (10.2 0 14.5, UGZ, pec(UG)) **
Gainsford has the star varying; Jan./Feb. 9.1 - 10.1 and Aug./Dec. 10.1 - 10.9.

ZZ Cam (7.1 - 7.9, LB, M0-M5)
Four observers show a range 7.2 - 7.7 except during June when there are no estimates available.

SU Cnc (12.0 - 16, M, 187^d, M6)
Three observers have the star fading from magnitude 11.0 in Jan. to about 14.3 (March) and negative estimates in May. An estimate on the rising branch on Nov.26, magnitude 12.4.

RT CVn (10.0 - 14, M, 253.6^d, M5)
Only two observers; the variable is recorded fading in May from about magnitude 12 to 13.

TX CVn (9.2 - 11.8_p, ZAND, B1-B9 + K0-M4) **
Two observers indicate a mean magnitude of about 9.7 in Jan. to June. From Jly to Sep. only three estimates are available.

S Cas (7.9 - 16.1, M, 612.43^{d}, S3-S5)
The work of Jones, Stevens and Wheeler records the maximum early in the year, the last positive estimate being in April, about magnitude 12.

R Com (7.1 - 14.6, M, 362.8^{d}, M5-M8)
Five observers in first half of year recorded a fade from magnitude 9.5 to 13.0 in May, then only negative observations are available.

AL Com (13.0 - 20.0$_{p}$, UGSS) *
Worraker has a series of negative estimates Jan. - May and Nov. - Dec. (At faintest negative estimates, the comparison used in magnitude 14.7.)

TT Cyg (7.4 - 8.7, SRB, 118^{d}, C5)
Three observers have a mean magnitude of 8.2 in Jan.; then from March to Nov. about 8.0 to 8.4.

UW Dra (7.0 - 8.2, LB?, K5)
Four observers show an extreme range throughout the year of 7.3 - 7.9.

UX Dra (5.9 - 7.1, SRA:, 168^{d}, C7)
Two observers suggest a range 6.7 to 7.1 through the year, the star being brightest about March and August.

BQ Gem (5.1 - 5.5, SRB, 50^{d}, M4)
Again, two observers only have estimates in Jan. - May and Nov. - Dec. which show a mean magnitude of 5.4/5.5.

DW Gem (8.0: - 10.4, LB, M3-M7)
Three observers have a few positive estimates showing a mean mag. of 9.3/9.4.

RS Leo (10.7 - 16.0$_{p}$, M, 208.2^{d}, M5)
Fading from magnitude 10.98 on Jan.04 to 13.9 in March, then only negative observations are recorded; 3 observers.

RZ Leo (11.5 - 17.5$_{p}$, UG:) *
Three experienced observers; Lubbock, Poyner and Worraker provide negative estimates, except one between Jan. - May and Nov. - Dec. A rare maximum is recorded near 1989 Mar.11 at magnitude 13.6.

U LMi (10.0 - 13.3, SRA, 272^{d}, M6)
Three observers show a slow fade in the interval Jan. - May to magnitude 12.5 about Apr., then from Oct. - Dec. about magnitude 13.6.

X Lyn (9.5 - 16, M, 320.8^{d}, M5)
Between Jan. - May a maximum is recorded in March about magnitude 10.4; from Nov. to Dec. the brightening is from 14.3 to 11.8. Two observers.

R Lyr (3.9 - 5.0, SRB, $46:^{d}$ M5III)
A mean magnitude of 4.4 is derived in Jan., and Apr. - Nov. Four observers.

V2048 Oph (4.6 - 4.9, GCAS+UV, B2-B6)
A mean magnitude of 4.7 between Jan. - Nov. is recorded from R. Fraser and N. Kiernan.

FU Ori (9.6 - 16.5_{p}, FU) **
Two observers allow a mean magnitude of 9.6 to be recorded in Jan. - Mar. and Oct. - Dec.

V451 Ori (8.5 - 9.5_{p}, GCAS, B9) **
Only one observer has estimates indicating a magnitude about 9.1 during Jan. - Mar. and Nov. - Dec.

SU Per (7.0 - 8.5, SRC, 533^{d}, M3)
Two observers show a range 7.9 - 8.3 during the year except for month of June.

UW Per (13.5 - 18.8_{p}, UG?) *
Only negative observations are available. Faintest comparison used is of magnitude 15.6.

KK Per (6.6 - 7.6, LC, M1-M3)
Two observers' estimates show a mean magnitude of 8.2 in the year except for June when no observations were available.

PR Per (7.6 - 8.3, LC, M1)
A mean magnitude of 8.2 in Jan. - Apr. and 7.9 in Aug. - Oct.; three observers.

SV Sge (11.8 - 16.2_{p}, RCB) **
This star has been proposed as a possible addition to the programme, a chart appeared in *VSSC 68*, pages 28 and 29. At maximum it is about visual magnitude 10.5. Three observers have observations between May and Dec. which show a minimum. The star was fading on May 28 at magnitude 11.9, it was 13.7 on Aug.27, magnitude 14.2 on Sep.23, then brightened to 12.4 on \Oct.31 and by Dec.22 was 11.4.

FG Sge (9.45 - $13,7_{B}$, Unique, B4-K2) **
Three observers show a mean magnitude of about 9.1 between Mar. - Dec.

RV Tau (8.8 - 11, RVB, 78.7^{d}, G2-M2)
Only 59 estimates are available from 5 observers to date. Rather poor coverage.

TT Tau (8.1 - 8.8, SRB, 167^{d}, C4)
In the intervals Jan. - Apr. and Aug. - Dec. little variation from a mean magnitude of 8.5 is apparent; two observers.

W Tri (7.5 - 8.8, SRC, 108^{d}, M5)
Five observers have only 45 estimates for Jan. - Mar. and Nov.; mean mag. 8.2.

TV UMa (6.8 - 7.3, SRB, M5)
Three observers between Jan. - June and Nov. - Dec. suggest a mean mag. of 7.0.

NGC 4151 (Galaxy)
Between Mar. - June and in Dec. the object's mean magnitude was 11.7; two observers.

The work of the following observers has been used in preparing these summaries: Albrighton, Bone, Brelstaff, Brundle, Dryden, Fleet, Fraser, R.B.I., Gainsford, Jones, Kiernan, Leyland, Lubbock, Middlemist, Munden, Pointer, Poyner, Ramsay, Smeaton, Smith, Srinivasan, Stevens, Taylor, Ward, West, Wheeler, Worraker, and Xylaris.

Stars with no reported observations

**	Z	And	*	SV	Ari	*	GO	Com
	SU		*	UZ	Boo		RU	Cyg
*	DX		*	CR		**	BF	
**	EG		*	N.'62	Boo	*	EY	
*	FN		*	AK	Cnc	*	HN	
*	HP		*	EG		*	V542	
*	LL			W	CMa	*	V632	
*	LS		**	FS		*	V795	
	OS		**	HI		*	V1028	
**	AE	Aqr	*	V452	Cas	**	V1057	
*	EG		*	V630		*	V1060	
*	CI	Aql		FZ	Cep	*	V1113	
*	V725		*	WX	Cet	*	V1251	

Stars with no reported observations (cont)

*	V1454	Cyg	*	DM	Lyr	*	LX	Ser
*	Scovill's	Obj	**	MV		*	HW	Tau
	IS	Gem	**	BX	Mon	**	UX	UMa
	ST	Her	*	V616		*	BC	
**	YY		**	chi	Oph	*	CY	
**	AM		*	EF	Peg	*	DV	
	IQ		**	AX	Per	*	SS	Umi
*	PR		*	NSV 895			RW	Vir
**	V443			Z	Psc		RX	
*	V592			TV			SW	
	N.'87	Her		TX		*	HV	
	SX	Lac	*	T	Pyx	*	TY	Vul
	DX		**	V	Sge	*	UY	
	TU	Leo	*	AW		*	UZ	
	RX	Lep	**	V348	Sgr		PW	
**	SS		*	V1017			QU	
	W	LMi	*	U	Sco		Mark.421	
	W	Lyn	*	N.'81	Sct		3C 273	

Binocular Programme Priority List

John Isles

When the BAA VSS took over the observing programme and archives of the Binocular Sky Society in 1974, the then Co-ordinator, Alan Pickup, introduced a priority list of stars that were particularly recommended to observers. The list was not republished, but I think this excellent idea should be re-introduced.

Looking over my own estimates of the binocular stars in 1987 and 1988, I find that 85 of them apparently varied by less than a magnitude. 45 varied by one mag or more, of which only 8 varied by 2 mags or more (R CrB, CH Cyg, AH Dra, R Sct, SS Vir and three Mira stars). Visual estimates, particularly of red stars, can be uncertain by several tenths of a mag, so we learn little from them in the case of stars that have small ranges. I therefore propose that the priority list should include all the stars that vary by a magnitude or more, plus ones that, even though they may have been inactive recently, are particularly important to follow for other reasons. The list would also identify stars that may be most worth while to analyse, though that does not mean we should neglect the rest.

The following list, which includes stars on the telescopic programme indicated in VSSC 67 as usually bright enough for naked eye or binoculars, is not final, and is presented for comment. I hope to give a 'final' list in VSSC 72 along with the full programme of binocular and telescopic stars.

	AQ	And	Rho	Cas	TX	Dra	X Oph
	V	Aql	W	Cep	AH	Dra	AG Peg
—	UU	Aur	AR	Cep	X	Her	GO Peg
	AB	Aur	Mu	Cep	SX	Her	X Per
	RW	Boo	Omicron	Cet	UW	Her	R Sct
	RX	Boo	R	CrB	AC	Her	Y Tau
	U	Cam	— W	Cyg	IQ	Her	W Tri
	XX	Cam	AF	Cyg	OP	Her	Z UMa
	X	Cnc	CH	Cyg	R	Hya	ST UMa
	V	CVn	— U	Del	RX	Lep	VY UMa
	WZ	Cas	— EU	Del	Y	Lyn	SS Vir
—	V465	Cas	— RY	Dra	U	Mon	SW Vir
	Gamma	Cas					

I envisage the list being used as follows. Observers would be encouraged to observe all priority stars once every ten days, or once every five for those that appear to be changing rapidly. The remaining stars on the binocular programme would be a backup list of objects to check perhaps once a month to see if they are doing anything. Any that appeared to have increased its range might be raised to priority status. In this way, we would increase the useful information gained and also make the work more interesting for observers.

Comments are invited.

For Sale

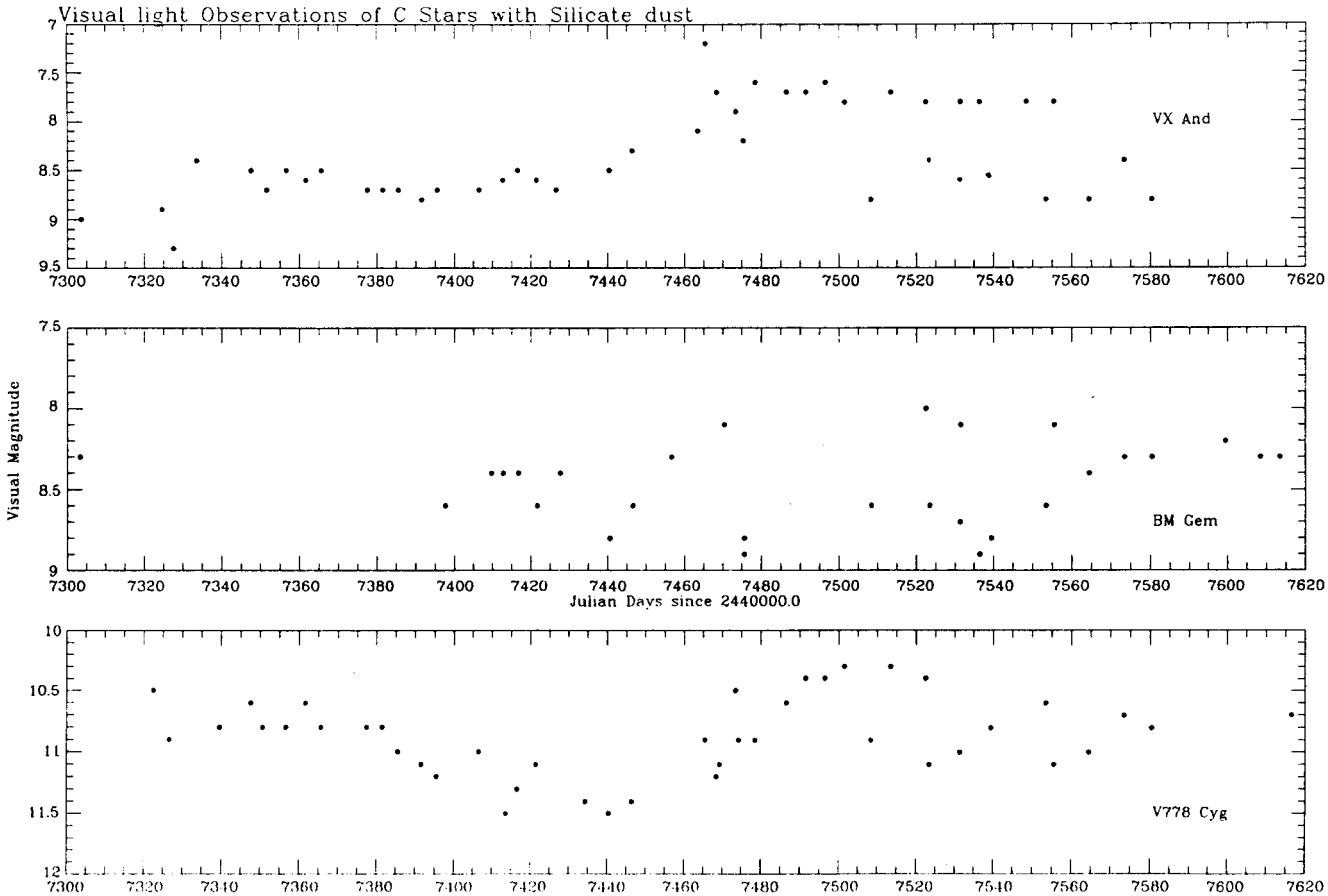
Long run (18 years) of *Sky & Telescope*, 1972 January to 1989 December, inclusive - £180, excluding carriage, (but could be collected). Good condition throughout and complete with indexes. Contact Storm Dunlop, who is handling the sale for the family of a recently deceased astronomer.

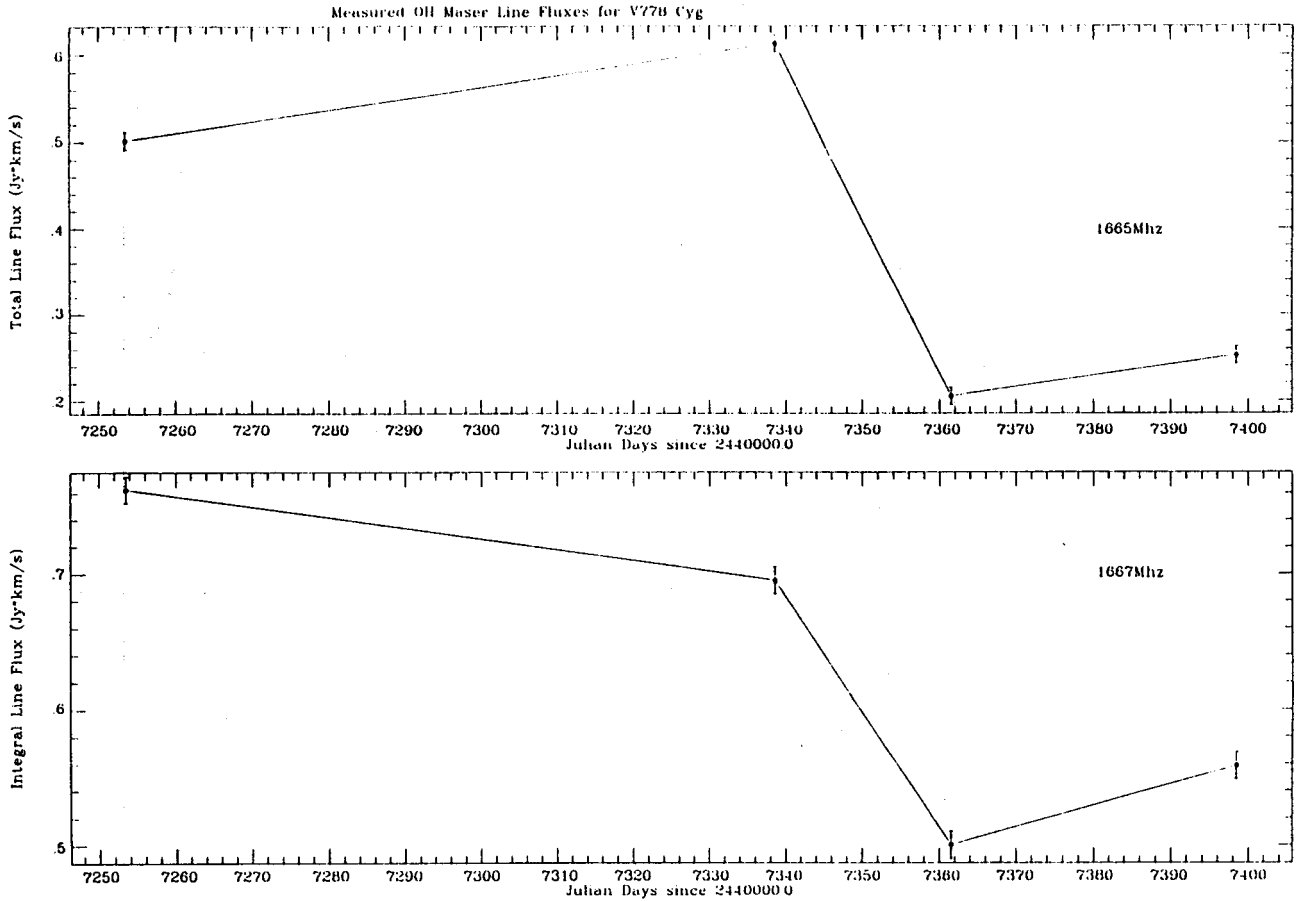
Unusual Carbon Stars

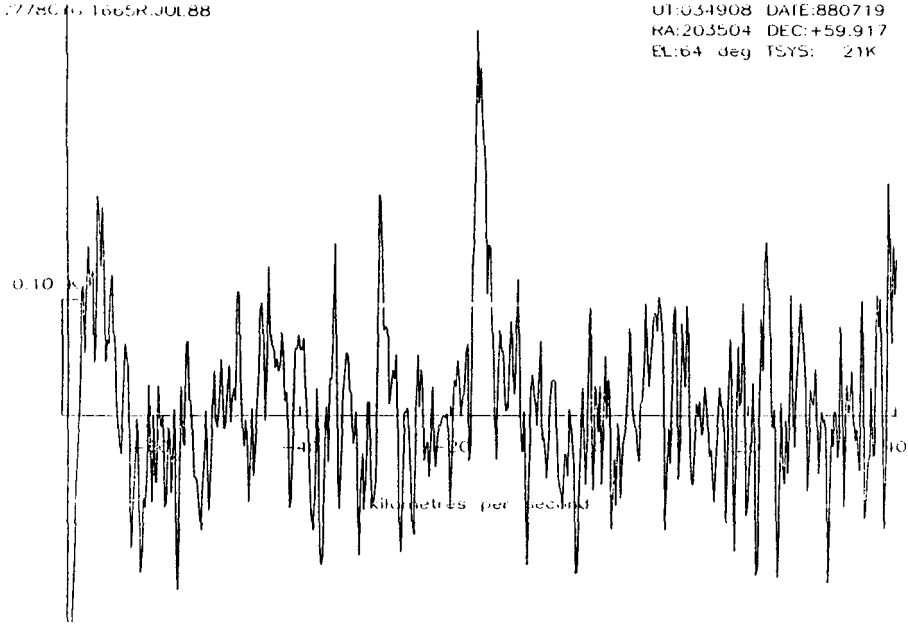
VSSC 68 gave details of a project on four unusual carbon stars - VX And, EU And, V778 Cyg and BM Gem - in collaboration with University College, London. Ian Griffin of UCL wrote to the Director on 1989 September 4 as follows:

> Many thanks for the data that you sent last month; they have already been of much use in comparing the optical light variations of V778 Cyg with some OH maser radio data that we got from Jodrell Bank last year. The visual observations do seem to correlate fairly well with the OH data, though since we only have radio OH fluxes at 4 epochs so far, we can not be too certain of anything yet! Anyway, I enclose a plot comparing the radio variations of V778 Cyg with the optical light curve derived from your observations; I hope that this is of some interest to you and the other observers who are aiding us in this project. I also enclose copies of the radio spectra of V778 Cyg at 1665/7 MHz obtained last summer, which saw the OH emission lines coming from the oxygen-rich dust shell around V778 Cyg and how the profile of those lines changes as a function of time. You might also be interested to know that recently (last week!) we had a (possible!) 2-sigma detection of OH maser emission from BM Gem; if we can confirm this observation, this will be the first time that this star has been observed to be masing in OH.
>
> My and Chris Skinner's first paper, just accepted for publication in MNRAS, attempts to summarize and explain out observations of the Carbon Stars with unusual dust shells made during the last year or so.
>
> Thanks once again for the data, and I hope that you and your observers will be willing to continue observing the stars, since I am sure that the optical light curves, in conjunction with our continuing programme of radio and infrared observations, will go a long way towards achieving a final explanation of this strange class of objects.

[Note: for reasons of space, only 2 spectral curves are reproduced here. The OH maser emission line is the major peak at a velocity of approximately -16 km/s.]


Visual light Observations of C Stars with Silicate dust
VX And
BM Gem
V778 Cyg
Visual Magnitude
Julian Days since 2440000.0


Measured OH Maser Line Fluxes for V778 Cyg
Total Line Flux (Jy-km/s)
1665Mhz
Julian Days since 2440000.0
Integral Line Flux (Jy-km/s)
1667Mhz
Julian Days since 2440000.0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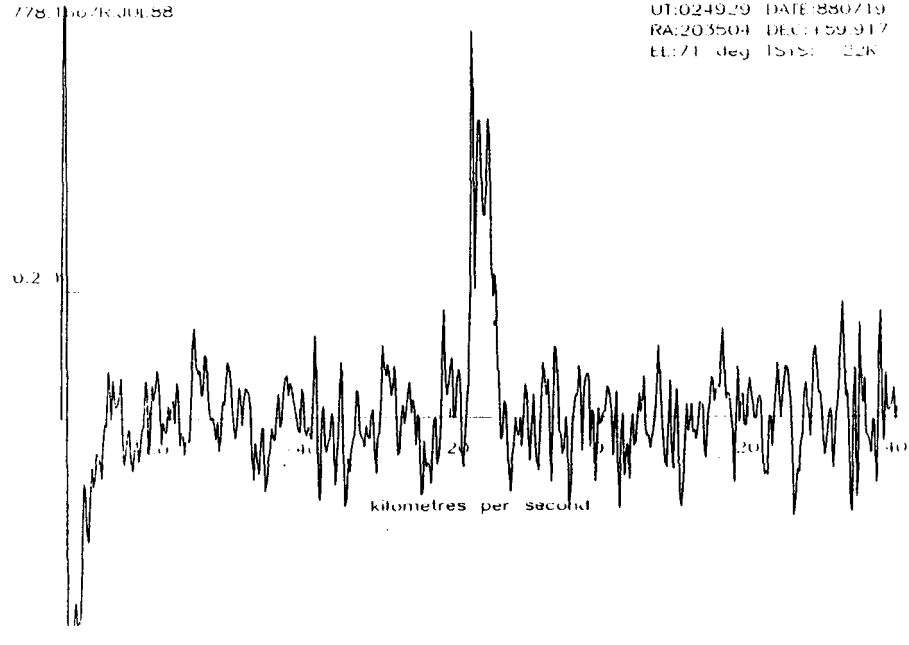
-20
0
20
40
kilometres per second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RA:203504 DEC:+59.917
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-40
-20
0
20
40
kilometres per second

Two Symbiotic Stars

John Isles

In VSSC 68 I discussed some proposed changes to the programme. Comments are still coming in from members, but one idea that has gained immediate support is that we should observe more symbiotic stars. Accordingly, preliminary charts are given here for two objects that are to be added to the telescopic programme: AX Per and UV Aur. Future Circulars will give some more.

Symbiotic stars are generally believed to be interacting binaries containing a red giant and a hot star that excites emission in the red star's extended atmosphere. In several objects regarded as symbiotic, their binary nature has been confirmed by the observation of eclipses; but for some others, certain astronomers have put forward single-star models. These are not generally accepted, but the symbiotic class may contain some very dissimilar objects. The defining feature is the presence of a combination spectrum with emission lines, showing features that, even if they really don't, certainly look like they come from two stars, one hot and one cool. Often there is a hot continuum at the ultraviolet end of the spectrum, but this may come not directly from a hot star but from an accretion disc around it, made up of matter the star has drawn off from its cool companion.

The term 'symbiotic' was applied to these objects by Paul Merrill 50 years ago, by analogy with symbiotic life forms of different species that live together because they need one another (such as dogs and some humans). This was before the binary nature of many other types of variable stars was recognized.

Most of the symbiotic stars vary in magnitude, sometimes irregularly and sometimes showing outbursts lasting several months, with ranges of up to four mags. These are type ZAND (Z And) in the GCVS. The outbursts are not properly understood but may be a brightening of the accretion disc, as in U Gem stars. In some, outbursts lasting many years have also been seen, which are thought to be thermonuclear runaway events as in novae. These objects are the very slow novae, type NC. Examples already on our programme are AG Peg, which had such an outburst in the 19th century, and PU Vul, now fading slowly from its 1979 maximum. The red giant components may also be intrinsically variable, as in CH Cyg which is a semiregular star and is listed as type ZAND+SR. Double classifications are also given if eclipses are observed, as in CI Cyg, type EA/G+ZAND (where the '/G' signifies the presence of a giant component). The recurrent novae T CrB and RS Oph, which have red giant components, are also regarded as symbiotic.

For more information, see the book *The Symbiotic Stars* by S.J. Kenyon (CUP, 1986). This includes a hundred-page appendix giving case histories for many objects. Visual light curves are helpful in trying to understand their nature, and any symbiotic star is worth monitoring in case it should undergo an outburst. Usually their variations are quite slow, and weekly checks are frequent enough. Unusual behaviour - particularly a sudden rise - should be reported to one of the alert numbers given on the inside front cover.

AX Per was discovered by Merrill and Humason in 1932 from its spectrum. Its magnitude range is 9.4 - 13.6 photographic (somewhat brighter visually), with eclipses every 682 days. My estimates in 1987 ranged 11.4 - 12.0. An outburst (the first since 1978) began in 1988 January, bringing AX as bright as 8.9 in May. There was a rapid fade to below mag 12 in December when the hot star and its accretion disc entered eclipse behind the red giant. The magnitude recovered in early 1989, and in July it was at mag 9.8 according to estimates reported to *The Astronomer*. AX Per is normally within the range of a telescope of 100-mm aperture, but at faint minima it probably needs 200 mm. The chart given here is adapted from that of the AAVSO. We may need one or two fainter comparison stars; suggestions please? The Eclipsing Binary Programme chart for IZ Per can be used as a finder; AX is about half a degree south of star A on that chart.

UV Aur, discovered by Pickering in 1911, is officially listed as a Mira star with range 7.4 - 10.6 and period 234 days. The classification as a Mira star is unconfirmed and others have suggested a period of about 400 days which may be that of orbital motion. Other sources suggest a brighter magnitude at minimum, and in 1988 the range I observed was only 8.3 - 9.2. If the GCVS range is correct, some additional fainter comparison stars may be needed than are given in the chart here, adapted from one published by the AFOEV. UV Aur is one of the few symbiotic systems to contain an evolved carbon star, rather than an M giant. It does seem to be a neglected bright variable suitable for small instruments.

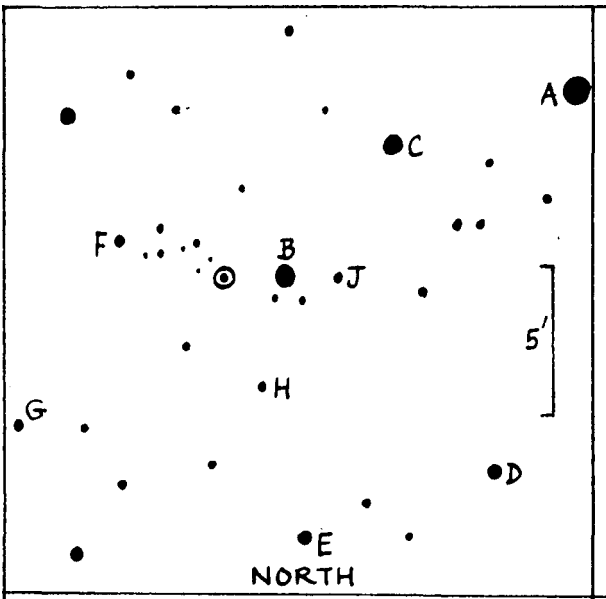
AX Per is circumpolar as seen from the UK, but is at a low altitude in the evening during the spring and summer months. Between April and July, UV Aur is available only after midnight. Observations during these months will be especially valuable to ensure we get continuous light curves and miss no outbursts. Comments on the comparison-star sequences will be welcomed by the writer, so that final charts can be drawn up.

Forthcoming VSS Report

(The full text of this report will be published in the BAA *Journal*.)

The Multi-Periodicity of W Cygni (J. Howarth)

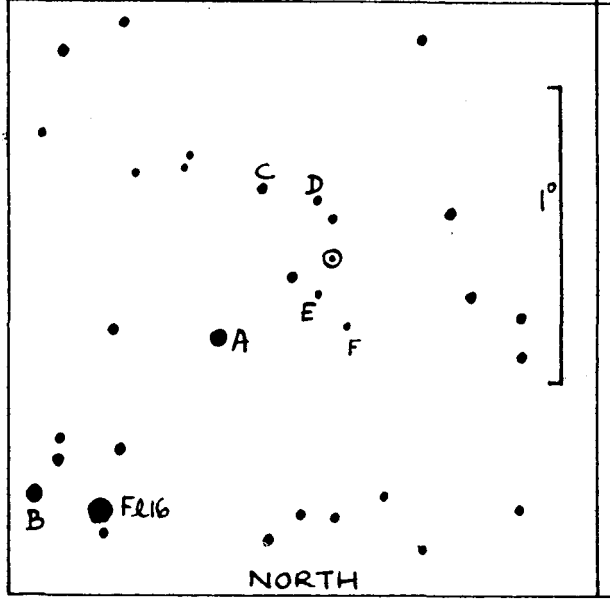
The behaviour of the variable star W Cygni has been analyzed from the past 89 years of BAA observations. Period of approximately 131 and 234 days are evident, both being subject to apparently random shifts in phase and amplitude.



AX Per

(1950)	(2000)
01 33.1	01 36.3
+54 00	+54 16

A = 8.5
B = 9.5
C = 10.0
D = 10.7
E = 11.0
F = 11.5
G = 11.8
H = 12.2
J = 12.3



UV Aur

(1950)	(2000)
05 18.6	05 21.8
+32 28	+32 31

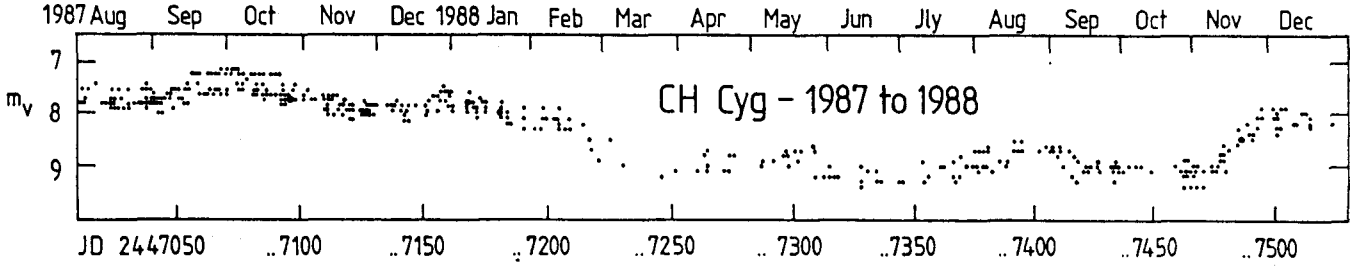
A = 7.0
B = 7.6
C = 8.2
D = 8.7
E = 9.1
F = 9.5

Minima of Eclipsing Binaries, 1987

John Isles

The numbers of observations received for known and suspected eclipsing variables in 1987, including estimates reserved for separate discussion, are given below.

	Observations	Timings
Photoelectric:		
J Ells (EJ)	429	17
A Hollis	2	-
J Watson (TW)	41	2
Total	472	19
Visual:		
C Allen	41	-
M Beveridge	3	-
N Bone	31	-
A Chapman (C1)	90	9
D Conner	6	-
H Duncan (DH)	447	10
R Fraser	25	-
R Geddes (G1)	105	1
A Horton	2	-
J Isles (IS)	2064	55
S Jenner	5	-
G Kirby (KG)	186	10
D Macmillan	2	-
G Maris (VM)	42	1
A Markham (QM)	88	2
I Middlemist (MM)	155	15
J Peck	18	-
G Pointer (P1)	103	2
M Price	1	-
M Savage	5	-
A Smeaton (S1)	18	1
J S Smith	20	-
R Watts	20	-
P Wheeler (WH)	46	1
W Williams	4	-
Composite timings	-	2
Total	3530	109
Grand total 3999	128	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Sep
Oct
Nov
Dec
1988 Jan
Feb
Mar
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May
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Sep
Oct
Nov
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7
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CH Cyg – 1987 to 1988
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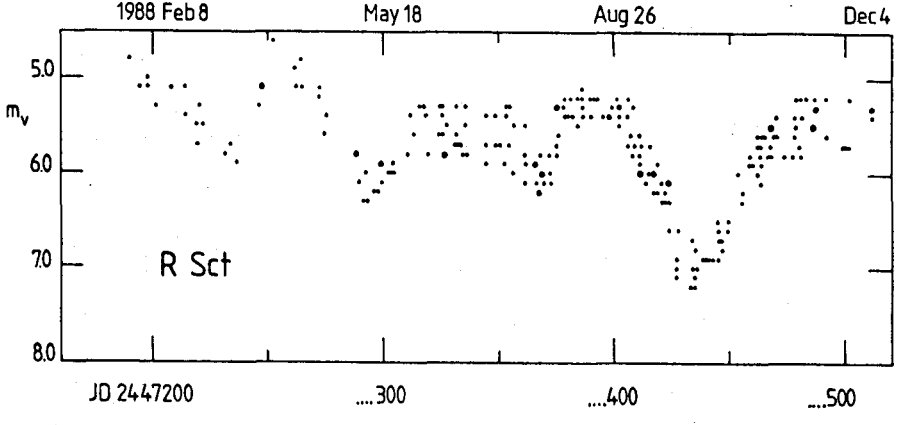
..7450
..7500


1988 Feb 8
May 18
Aug 26
Dec 4
5.0
6.0
7.0
8.0
m_v
R Sct
JD 2447200
....300
....400
....500

CH Cygni The preliminary light-curve from 1987 August to 1988 December shows this symbiotic variable behaving with an average period of 106^d (s.d. 17^d). During this interval the star reached a faint minimum of magnitude 9.3 at JD 2447344 in 1988 June. Its maxima varied strongly as shown by the following:

magnitude	date	JD
7.3	1987 Oct. 04	2447073
7.7	1988 Jan .02	7163
8.7	1988 May. 20	7302
8.6	1988 Aug .25	7399
8.0	1988 Dec. 04	7500

(The average period *P* is calculated from both maxima and minima.)

During 1989 CH Cyg has undergone similar variations and a deep minimum too the star to about magnitude 9.0 in January. In 1989 May to June a 'mini-outburst' occurred when it brightned by 1.5 magnitudes to reach about 7.5_{mv}.

R Scuti Obsevers of this star in 1988 may wish to critically compare their estimates with the preliminary plot of selected estimates, which gives an indication of the mean activity. The star's period of 146^d is clearly seen by the minima at JD 2447293 and 2447439 respectively. Some apparently irregular (or erroneous) variations have been reported during 1989 June. It would be reasonable to expect a brightening phase at this particular time of year; it is also possible that estimates in July (which had not been received at the time the plot was prepared) would clarify the situation. However, observers of this star are asked to communicate their estimates, even if small in quantity or apparently lacking in quality, to the Secretary in the normal way. Such observations might allow a clearer understanding of the light-curve during the summer months.

The codes C1, G1, P1 and S1 are temporary, pending the allocation of final VSS codes to these observers by the Deputy Director. In the accompanying list of observed minima, photoelectric determinations are distinguished by '(pe)' after the observer abbreviation. For further explanations, see VSSC 58.

An asterisk draws attention to further information in the following notes. For certain stars, all estimates made in the year were folded onto a single cycle in order to derive the timings. The dates covered by the observations were as follows:
LY Aur 7004-161; Beta Lyr 6797-7161; GK Cep 6827-7161; 68u Her 6847-7128; V1010 Oph 6975-7038; V367 Cyg 6969-7161 (DH) and 7024-101 (C1); Lambda Tau 6822-7160 (IS).

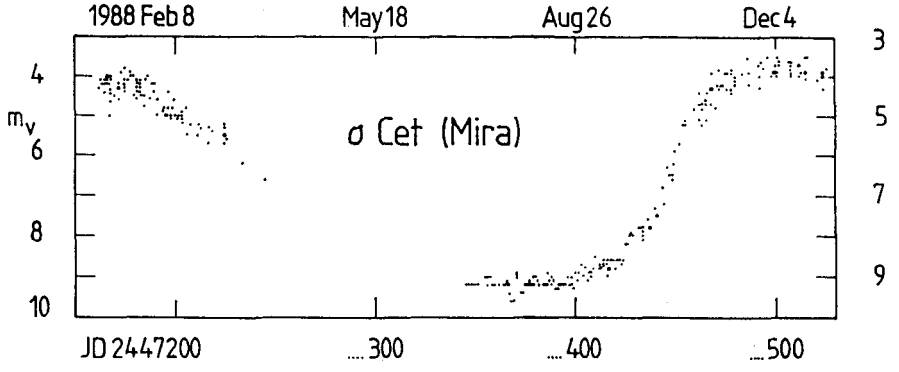
The numbers of estimates given against certain minima include estimates made on other nights that were also used in deriving the time of minimum. These were as follows:

Star	Date		No	Other dates
AB And	7139		18	7161
AD Boo	6907		7	6960
RZ Cas	7033		14	6843-7075
TV Cas	7138		2	7136
DM Del	6960		11	6970
TT Her	6970		8	6960
SW Lac	7063		10	7067
	7068		8	7070
HI Mon	6845		1	6889
V448 Mon	6846		4	6845
VV Ori	6842		4	6827-7160
Beta Per	6980		9	6837-7155
	7043		3	7041
	7066		4	7052
	7089		3	7072
	7112	(C1)	4	7115
	7115		5	7118
	7158		3	7141
HU Tau	6798		3	6792
Lambda Tau	7082		7	7090-4
	7161		8	6825-7122
RU UMi	7061		4	7052
AH Vir	6957		6	6970
	6958		7	6960

Observed minima

Star	Epoch	Helio JD 244...	O - C	No	Observer
RT And	9366	7032.447	+0.005	9	MM
	9385	7044.3916	-0.0009	25	EJ (pe)
AB And	33230	7138.346	-0.009	8	KG
	33233	7139.354	+0.003	18	KG *
	33272	7152.286	-0.009	8	KG
BX And	17396	7142.334	-0.010	8	MM
DS And	10841	7097.458	+0.021	12	KG
KO Aql	1774	6968.336	+0.030	11	IS
KP Aql	1960.5	6998.385	-0.050	10	IS
	1962	7003.457	-0.029	14	IS
OO Aql	16465	6957.497	+0.002	12	IS
	16467	6958.510	+0.002	12	IS
	16471	6960.533	-0.002	13	IS
	16490.5	6970.422	+0.004	14	IS
V342 Aql	2256	6968.386	-0.024	11	IS
V346 Aql	4560	6963.399	0.000	10	IS
	4561	6964.500	-0.006	13	IS
SX Aur	5524.5	6847.361	-0.063	8	MM
TT Aur	19211	6845.408	-0.021	4	KG
	19212.5	6847.359	-0.069	8	MM
	19220	6857.398	-0.025	7	KG
AR Aur	2103	7097.383	-0.063	4	C1
IM Aur	5103	6880.4568	-0.0412	34	EJ (pe)
IU Aur	4636.5	6847.364	+0.052	8	MM

Mira (omicron Ceti) The preliminary light-curve of this famous variable is constructed from selected estimates by VSS observers. The mean curve drawn through the uncorrected plots shows a mimimum at 1988 July 31 (JD 2447374), magnitude 9.3; maximum is calculated, only approximately, at December 06 (JD 2447502), magnitude 3.8. (The 1989 maximum was thus estimated to occur about November 02.)



R Coronae Borealis Since undergoing the 1988 irregular minimum (part of the preliminary light-curve was published in *JBAA* **99** (2), 51), the star struggled back to near maximum by mid-April 1989, mean magnitude 6.2. In brightening, R CrB reached about magnitude 8.0 on 1989 Jan.13, then dived into a minimum one magnitude deep centred on Jan.29. Magnitude 7.3 was reached on Feb.15, and a gradual brightening to magnitude 6.2 followed. Several VSS observers closely monitored the star's variations near this maximum's 'plateau' which ran from about Apr.12 to Jly.30. On Aug.06 Norman Kiernan reported a significant fade, which was duly confirmed and by Aug.28 the star had dropped to magnitude 8.2.

Whenever R CrB is undergoing irregular minima like this, observers are asked to attempt daily estimates (unbiassed, if possible.)

PRO-AM LIAISON COMMITTEE (PALC-VS) NEWSLETTER No.3

Professional - Amateur co-operation has continued to progress with participation in a number of projects, as witness the list in the Circular.

Particular mention must be made of the request by A. Labeyrie and D. Bonneau of Nice Observatory for observations of P Cyg. Their request was forwarded by Claude Merlin in France to Guy Hurst via e-mail and then via the TA network to other amateurs. Those amateurs on the e-mail network were then able to communicate their observations directly to Claude on a regular basis. This very rapid form of communication caused the French professionals to comment on how well the European amateur scene was organised.

On the PEP side, observations have been made by a number of amateurs of the Zeta Aurigae binaries as requested by Dr. Roger Griffin of Cambridge (see VSSC No.69).

Also on the PEP front, there has been a further meeting of (mostly) advanced amateurs to discuss various problems to which a number of professionals also contributed (see separate article in this Circular).

Fifty-two questionnaires have now been returned, twenty-one from professionals and thirty-one from amateurs. Those returned since the last questionnaire are as follows:

Professional	Amateur
Dr Graeme Waddington	John Fairweather
Mr Jonothan Shanklin	Andy Hollis
Dr Endre Zsoldos	David Conner
Mr Ian Griffin	
Dr Mike Bode	

Observing With Amateurs' Telescopes

Whilst many professionals have (occasional) access to large tele scopes they are often denied the pleasure that the amateur can gain from actual 'hands on' experience. With this in mind, I wonder whether any professionals would wish to take advantage of the suggestion that they be placed in contact with an amateur (or amateurs) who could offer the chance for some light (no pun intended!) relief?

More seriously, some of the amateurs with PEP equipment would also appreciate the chance to discuss, on a one to one basis, the 'professional' approach to observing. (Perhaps the Pros would also like the opportunity to try some PEP?).

Whilst not all amateur observatories are equiped with rotating domes and computer control of the telescope etc(!), many amateurs are skilled observers and would

appreciate the opportunity to discuss their hobby with a Pro on an informal basis. Furthermore, amateurs should not forget that many Pros became interested in astronomy through looking at the sky with a small telescope andwould be only too pleased for the opportunity to look through a telescope again. Are there any offers from either side?

Roger Pickard

Availability of Visual Data

John Isles

Newsletter No. 1 summarized the types of variable star under regular observation visually by the BAA Variable Star Section. The full list of stars was given in VSS *Circular 67* and an updated list is planned for *Circular 72*.

Newsletter 1 mentioned that most data are not yet computerized - a problem discussed elsewhere in the accompanying *Circular*. However, I wish to make it clear that this does not mean the data are not available. The original reports are filed in star order, and chronological lists of the observations of many stars, particularly those on the telescopic programme, have been prepared by hand and can be photocopied on request.

The VSS is always pleased to consider taking on additional stars either for long-term study (in which case requests are best sent to me) or for short-term monitoring (requests to Guy Hurst). There are limits to how many variables we can effectively cover, however, so suggestions as to stars we can stop observing are also welcome!

When observations are required of a star not on the programme, it is most helpful if the person making the request can supply a chart suitable for use by observers. This should ideally show:

1. The surrounding star field (usually half or one degree square is satisfactory) to about the same magnitude limit as the variable's minimum.
2. A sequence of comparison stars with their visual magnitudes, covering the full range of the variable in steps of 0.3 to 0.5 mag.

We will do our best with less information, but it may mean that research must be done or photographs taken before observations can properly begin. Charts plotted from the CSI database or enlarged from the Palomar Sky Survey are seldom directly usable.

Meeting on Photoelectric Photometry (PEP)

Malcolm Gough CMHAS

On 1989 November 11th Crayford Manor House Astronomical Society hosted a meeting of amateur and professional astronomers whose purpose was to further co-operation in PEP, and to help amateurs just getting started in this field.

The morning session commenced with Roger Pickard speaking on the progress that has been made in pro-am co-operation, and highlighted the fact that four professional astronomers were attending the meeting, attesting to the importance they attach to amateur PEP. He went on to describe the contribution made by amateur observers, (visual as well as PEP), to professional programmes. Many amateurs have joined the electronic mail network organised by Guy Hurst, and recent changes in this system have given amateurs the opportunity to communicate with professionals directly via the JANET sevice.

Norman Walker then described the current state of devolopment of his JEAP, (Joint European Amateur Photometer). The system uses a lightweight photometer head at the telescope, connected to an end window photomultiplier tube via a fluid light guide. Power supplies and electronics are housed in standard racking modules and the whole system is available in single or multi-channel modes.

John Watson, who is a leading amateur designer and constructor of electronics for PEP, discussed the problems of making your own equipment, most of which is not available commercially. Computer software can also be a problem for the computer illiterate.

Andy Hollis and Richard Miles have taken a different approach to multi-channel photometry to that adopted by Norman Walker. Andy spoke about sources of error in photoelectric measurements, i.e., in the electronics and telescope, and those introduced by atmospheric water vapour and light reflected from unseen clouds. He and Richard have minimised these errors by adopting a multi-telescope approach, which at the moment consists of two telescopes each with their own independent photometer, and is proving very successful. Soon, it is hoped to employ three telescopes which will also have their own independent photometers.

At the end of the morning session a vigorous discussion took place on the advantages and disadvantages of the different approaches adopted and on the relative costs, complexity and accuracy of the systems.

The afternoon session commenced with Jack Ells[1] discussing the accuracies that amateurs can achieve, given the vagaries of the British climate, and making the point that only differential photometry is possible from the U.K. Jack, who has gained considerable experience with his manual and automatic photometric systems went on to discuss the advantages of the latter.[2]

Dr. David Stickland of RAL, one of the professionals attending the meeting, outlined ways in which opportunities for collaboration might arise. He pointed out that not all areas of variable star astronomy are being pursued in this country very

actively at the moment by professionals, noteably Miras. Also, some objects that are currently in vogue, (dwarf novae and flare stars, for example), are too faint for study with most amateur PEP equipment. A fairly full dialogue is required between amateur and professional to establish compatibility, and the amateur needs to be assured that his results will be useful, and have a proper acknowledgement. Dr. Stickland went on to list possible areas of collaboration, the many types of variable star observed and the professionals researching them.

Peter Ells, for the amateurs, described the 'simple' data reduction performed on his father's observations, before listing the advantages and disadvantges of using a microcomputer for logging and reduction. He concluded that microcomputers have overwhelming advantages if carefully programmed.

The last of the formal presentations was by Dr David Pike, also of RAL, who gave an extremely able presentation on how professional astronomers do PEP, and the need for amateurs to employ similar methods for their reaults to be compatible and scientifically useful.

An open discussion followed the formal presentaions, producing informed and informative debate.

Finally, special thanks must go, once again, to Mrs. Jean Felles for undertaking the catering arrangements so ably which contributed in no small measure to another successful meeting.

1 We note with regret the death of Jack Ells since this meeting took place. An short obituary notice appears in the accompanying *Circular*.
2 This telescope is the subject of a series of 3 articles that have appeared in the BAA *Journal* **99** (6), 282 (1989); **100** (1) 24 & 30 (1990).

AAVSO Meeting, Brussels 1990 July 24-28

Attention is called to the details of this meeting on the subject of 'International Cooperation and Coordination in Variable-Star Research' which appear elsewhere in the accompanying *VSS Circular*. Papers and posters can still be accepted and any persons who would like to present material should contact Professor J.R. Percy at the University of Toronto:

Email from Janet:
CBS%UK.AC.EARN-RELAY::EARN.UTORPHYS::PERCY
Registration:
AAVSO, 25 Birch Street, Cambridge, Mass. 02138, U.S.A.
Email from JANET:
CBS%EARN-RELAY::CFA8::AAVSO

Please bring this to the attention of any friends or colleagues who may be interested in attending.

Star	Epoch	Helio JD 244...	O - C	No	Observer
GR Tau	5242	6826.375	-0.019	10	MM
HU Tau	2686	6798.564	+0.022	15	KG *
	2700	6827.349	+0.018	9	KG
Lambda Tau	6409	6841.328:	+0.035:	6	S1
	6461.5	7048.806:	-0.017:	20	IS *
	6462	7050.859	+0.060	60	IS *
	6470	7082.444	+0.021	10	C1 *
	6490	7161.550	+0.068	13	P1 *
TX UMa	512	6566.535	+0.009	21	UY
	589	6802.427	+0.033	6	WH
RU UMi	10411	7061.344	+0.001	10	MM *
AG Vir	2247	6876.4471	-0.0037	19	EJ (pe)
AH Vir	2682	6907.403	+0.047	7	IS
	2804.5	6957.337	+0.059	12	IS *
	2807	6958.336	+0.040	11	IS *
RS Vul	3164	6975.526:	-0.058:	13	IS
BE Vul	4411	6957.466	+0.021	10	IS
	4418	6968.333	+0.025	11	IS
DR Vul	2960.5	6964.390:	+0.040:	12	IS
	2964.5	6973.392:	+0.040:	14	IS
	2965	6974.538:	+0.060:	16	IS

Preliminary Light-curves and Reports on 4 Stars

Melvyn Taylor

Estimates of the four stars covered here have been submitted by the following; Albrighton, Bone, Brundle, Dryden, Duncan, Fleet, Fraser, Gainsford, Gavine, Howarth, Hurst, Isles (Cyprus), Jones, Kelly, Kiernan, Leyland, Macvey, Markham, Middlemist, Nicholls, Pickard, Poyner, Ramsay, Shanklin, Srinivasan (India), Swain, Tanti (Malta), Taylor, Toone, Worraker and Xylaris (Cyprus). Charts for the above stars may be obtained for the appropriate charges (see back inside cover of the *Circular*) from John Toone, the Chart Secretary.

Note: Small dots in the light-curves are 1 estimate, larger dots represent 2 or more estimates.

Star	Epoch	Helio JD 244...	O - C	No	Observer
LY Aur	2004.5	7084.439	-0.024	16	QM *
	2005	7086.443:	-0.022:	12	QM *
AD Boo	5291	6907.472	+0.006	11	IS *
SV Cam	7137	6827.3718	+0.0164	30	EJ (pe)
	7201	6865.333:	+0.021:	5	MM
	7326	6939.483	+0.037	7	MM
VZ CVn	9510	6892.3884	-0.0021	11	EJ (pe)
XZ Cnc	19015	6825.400	-0.003	5	MM
RZ Cas	3202	7027.534	+0.047	11	VM
	3207	7033.483	+0.020	22	DH *
	3273	7112.368	+0.018	8	C1
	3294	7137.418:	-0.032:	7	C1
TV Cas	1399	7138.272	-0.003	7	C1 *
YZ Cas	4045	6803.332:	-0.011:	9	KG
AB Cas	3031	6857.465	+0.007	17	KG
	3091	6939.476	+0.007	9	MM
	3159	7032.437	+0.020	9	MM
VW Cep	10671	7127.2713	-0.0369	15	EJ (pe)
	10671.5	7127.4126	-0.0347	19	EJ (pe)
	10710.5	7138.2680	-0.0336	13	EJ (pe)
ZZ Cep	8956	7110.4098	-0.0020	23	EJ (pe)
CQ Cep	8934.5	7120.3634	-0.0438	42	EJ (pe)
GK Cep	8903	7029.406:	+0.093:	40	DH *
	8903.5	7029.892:	+0.112:	31	DH *
MR Cyg	8168	7094.4214	+0.0039	31	EJ (pe)
V367 Cyg	518	7024.73	+0.25	32	DH *

Star	Epoch	Helio JD 244...	O - C	No	Observer
(V367 Cyg)	518.5	7034.05	+0.27	24	DH *
	519.5	7052.19	-0.19	10	C1 *
	520	7061.95	+0.28	11	C1 *
TY Del	3359	6960.466	+0.026	9	IS
	3395	7003.348	+0.027	9	IS
DM Del	2911	6960.381	+0.138	11	IS *
BH Dra	3865	7043.4230	-0.0023	30	EJ (pe)
GW Gem	32151	6847.366	+0.002	7	MM
RX Her	7758.5	7742.461	+0.009	16	IS
TT Her	7647	6970.561	+0.012	13	IS
	7983	7003.410	+0.026	10	IS
UX Her	4708	6964.365	+0.010	13	IS
	4730	6998.443	+0.014	10	IS
AK Her	11318.5	6957.466	+0.009	14	IS
	11321	6958.518	+0.007	13	IS
	11325.5	6960.407	-0.001	15	IS
	11349	6970.314	0.000	10	IS
	11349.5	6970.516	-0.008	6	IS
DI Her	449	6970.371	-0.002	14	IS
MM Her	1967	6960.422	+0.023	14	IS
	1968	6968.359	+0.001	11	IS
68u Her	20084.5	7023.898	+0.014	36	DH *
	20085	7024.898	+0.014	31	DH *
SW Lac	5575.5	7063.5196	-0.0075	20	TW (pe) *
	5591	7068.4906	-0.0077	22	TW (pe) *
	5612.5	7075.3850	-0.0087	28	EJ (pe)
	5631	7081.3189	-0.0082	18	EJ (pe)
	5824.5	7143.3746	-0.0120	17	EJ (pe)

Star	Epoch	Helio JD 244...	O - C	No	Observer
Beta Lyr	2999.5	7017.74	+34.75	230	12 *
	3000	7024.09	+34.63	229	12 *
HI Mon	10499	6845.305:	-0.012:	5	IS *
V448 Mon	12479.5	6846.376	-0.045	15	IS *
V451 Oph	971.5	6968.314	-0.044	11	IS
	972	6969.494	+0.038	16	IS
V839 Oph	15914.5	6957.410	+0.041	14	IS
	15917	6958.438	+0.047	14	IS
	15921.5	6960.291	+0.059	7	IS
	15922	6960.471	+0.034	9	IS
	15932	6964.534	+0.007	8	MM
V1010 Oph	12209	7013.130:	+0.010:	18	DH *
	12209.5	7013.451:	-0.001:	15	DH *
VV Ori	4007	6842.397:	-0.030:	5	DH *
GH Peg	2142	7114.3360	+0.0087	25	EJ (pe)
Beta Per	438	6897.402	+0.009	8	G1
	467	6980.548	+0.003	12	P1 *
	475	7003.499	+0.016	8	IS
	489	7043.630	+0.005	9	IS *
	497	7066.581	+0.017	9	IS *
	505	7089.517	+0.015	8	IS *
	507	7095.257	+0.020	6	IS
	513	7112.459	+0.019	7	IS
	513	7112.460	+0.019	13	C1 *
	514	7115.323	+0.015	10	IS *
	522	7138.267	+0.021	6	C1
	529	7158.325	+0.007	10	IS *
U Sge	8825	6964.378	+0.001	11	IS
	8828	6974.510	-0.009	14	IS
CD Tau	1515.5	6825.368	+0.010	9	MM

Editorial Note

We would point out to members that these Circulars are issued as frequently as possible, subject to considerable delays caused by pressure of other work. In this context perhaps we may quote from a note published in the Publications of the Variable Star Section of the R.A.S.N.Z.:
'At present these Publications appear at irregular intervals. The aim is to either print a larger number of papers in one issue, or to publish smaller issues at more frequent intervals. The actual date of publication depends on the amount of material available ... and how quickly an issue can be prepared for publication.'
Precisely the same conditions apply. One powerful argument for larger, less frequent issues is that postage costs (already very high) are relatively less. However, we hope to increase the frequency of publication once again.

Please note that subscriptions are for four issues of the Circulars, not for a calendar year. We should give advance warning to members that, because of cuts in the Section's budget imposed by Council, it will probably be necessary to increase the cost of subscriptions cost shortly.

Five Semiregular Variables, 1974-87

Ian Middlemist

This Report summarizes the results of visual observations of five red giant and supergiant variable stars, carried out by the writer from 1974 to the present. I acknowledge that there is an uncertainty inherent in using the uncorroborated observations of a single observer, but this is offset by a consistency not obtainable with a small group of observers with a continually changing membership.

Charts for S Dra, U Lac and Y UMa were obtained from *Atlas Stellarum Variablium, Series IV*, Hagen's magnitudes being adopted, being available for more field stars that the HP magnitudes. Sequences of TZ Cas and ST Cep were visually determined by the author.

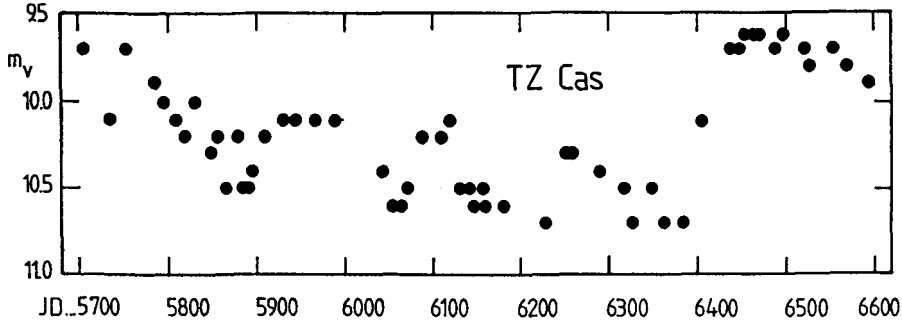
The accompanying illustrations comprise a sample light-curve for each star, covering a period of 900 days starting from Jan 0 1984 (JD 2445700), and charts for ST Cep, S Dra, U Lac, and Y UMa. A chart for TZ Cas was published in *VSSC 59*.

The results obtained for each star are summarized in tabular form. There were two periods of observation, from 1974 to Dec 31 1980, and from 1983 to the present. The hiatus was caused by the accidental destruction of my records for 1981, and the lack of a suitable instrument during 1982.

TZ Cas - GCVS 1969: 9.0 - 10.5 Lc

	JD Min	p	JD Max	p	Mv Min	Mv Max	Amp
1	5625	-	5710	-	10.5	9.7	0.8
2	5880	255	5970	260	10.5	10.5	0.4
3	6050	170	6100	130	10.6	10.2	0.4
4	6200	150	6230	130	10.6	10.3	0.3
5	6350	150	6470	240	10.7	9.7	1.0
6	6700	350	6800	330	10.4	9.4	1.0

The period seems to vary by a factor of more than 2, so that a much longer period of observation is required. There seems to be evidence of a variation of mean magnitude, expressed as changes in maximum brightness, in about the period of observation, i.e. ≈1000 days.



ST Cep - GCVS 1969: 9.7 - 11.1p Lc

	JD Min	p	JD Max	p	Mv Min	Mv Max	Amp
1	2305	-			8.5	9.0	0.5
2	2610	305			8.5	9.3	0.8
3	2895	285			8.5	9.2	0.7
4	3100	205			8.6	9.3	0.7
5	3405	305			8.3	9.4	1.1
6	3810	405			8.6	9.0	0.4
7	4040	260			8.3	9.1	0.8
8	4530	460			8.5	-	-
9	unobserved, surmised						
10	unobserved, surmised						
11	unobserved, surmised						
12	5530	-			8.4	8.9	0.5
13	5650	120			8.3	9.3	1.0
14	5910	260			8.6	9.1	0.5
15	6215	305			8.4	9.1	0.7
16	6485	270			8.5	9.0	0.5
17	6690	205			8.4	9.0	0.6
18	7030	340			8.5	-	-

The overall mean period is 278 days, assuming that three cycles were unobserved. A feature of the light-curve is that occurrence of humps or secondary maxima or minima. These were observed in cycles 2, 5, 6, 7, 13, 14, and 17. A plot of cycle length versus JD suggests a variation of cycle length in an interval of the order of 4000 days.

S Dra - GCVS 1969: 8.6 - 9.6 SRb 136d

	JD Min	p	JD Max	p	Mv Min	Mv Max	Amp
1	2270	-			8.8	9.5	0.7
2	2610	340			8.7	9.2	0.5
3	3090	480			8.6	9.3	0.7
4	3610	520			8.8	9.6	0.8
5	3850	240			8.7	9.2	0.5
6	4160	310			8.7	9.1	0.4
7	4490	330			8.6	-	-
a	5335	-			8.7	9.4	0.4
b	5880	545			8.6	9.2	0.6
c	6290	410			8.7	9.7	1.0
d	6550	260			8.8	9.8	1.0
e	6850	300			9.0	9.6	0.6

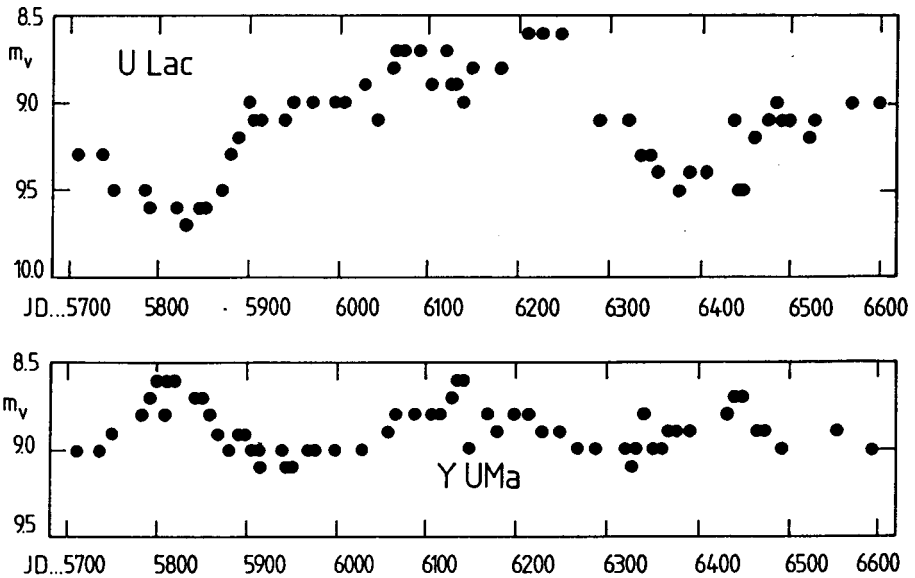
Mean period, cycles 1-7 370 days
Mean period, cycles a-e 376 days
Overall mean period 374 days.

There is evidence of a longer period-variation from the variation in depth of minimum, possibly in the order of ≈3000 days. The ≈370-day cycle has been remarkably stable during the period of observation, and no period-value close to 136d has been found.

U Lac - GCVS 1969: 10.8 - 12.0p SRc 150 / 520 / 2000d

	JD Min	p	JD Max	p	Mv Min	Mv Max	Amp
1	3300	-			9.6	8.8	0.8
2	3850	550			9.5	8.6	0.9
3	4600?	750±			9.6	8.8	0.8
4	-	-			-	-	-
5	5820	1420/2		9.6	9.0	0.6	
6	6370	550			9.5	8.7	0.8
7	7000	630			9.4	8.7	0.7

These data relate to the 520d period, and yield a mean value of 617d for this period, which shows the most evident fluctuations. There is little evidence of the 2000d period, but fluctuations superimposed upon the light-curve and seen best at maximum suggest a shorter period 120-180 days, consistent with the shortest period cited in the catalogue.



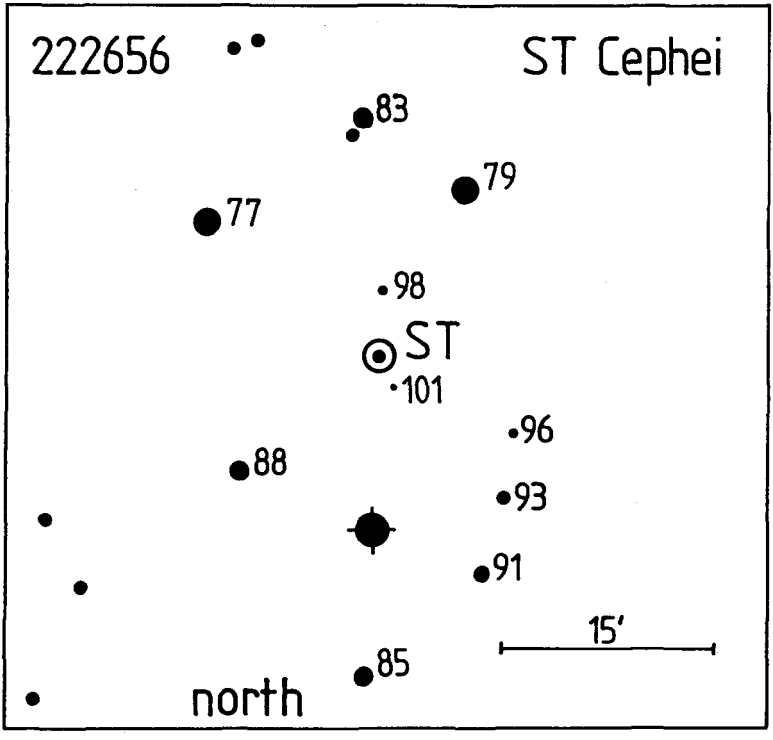
Y UMa - GCVS 1969: 10.0 - 11.2p SRb 168d

	JD Min	p	JD Max	p	Mv Min	Mv Max	Amp
1	2180	-			8.0	8.4	0.4
2	2300	120			8.2	8.6	0.4
3	2430	130			8.1	8.7	0.6
4	2610	180			8.2	8.9	0.7
5	2740	130			8.2	9.0	0.8
6	3015	275			8.4	8.9	0.7
7	3180	165			8.3	8.9	0.6
8	3330	150			8.4	8.7	0.3
9	3540	210			8.1	8.8	0.7
10	3870	330			8.1	8.5	0.4
11	4200	330			8.2	8.7	0.5
12	4540	340			8.2	-	-
13	-	-			-	-	-
14	-	-			-	-	-
15	5380	-			8.5	8.8	0.3
16	5505	125			8.5	9.2	0.7
17	5810	305			8.6	9.0	0.4
18	6140	330			8.6	9.0	0.4
19	6440	300			8.7	9.0	0.3
20	6770	330			8.7	9.0	0.3
21	7020	250			8.4	-	-

The mean period of cycles 1-9 is 170d, whereas the mean period of cycles 10 et seq. is 318d, suggesting a change of mode at this time. It is not clear whether the episode of reduced amplitude, long-period variation is at an end, as suggested by the recent 8.4 max, which may herald the onset of a new more active phase.

This study suggests that SR variables change their behaviour from one era to another, and that date in even the most reliable of sources may be based on observations extending over a relatively short span. Continued monitoring of as many such stars as possible is one major contribution which can be made by amateur astronomers, particularly those equipped with relatively small instruments unsuitable for the pursuit of eruptive variables and minima of Mira stars.

[We would like to thank Melvyn Taylor for redrawing the light-curves and charts that accompany this item.]


222656
ST Cephei
83
79
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98
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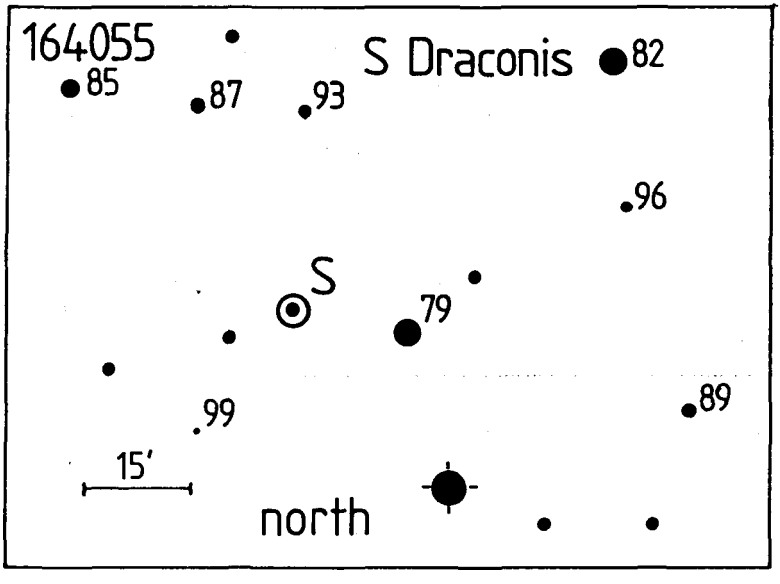
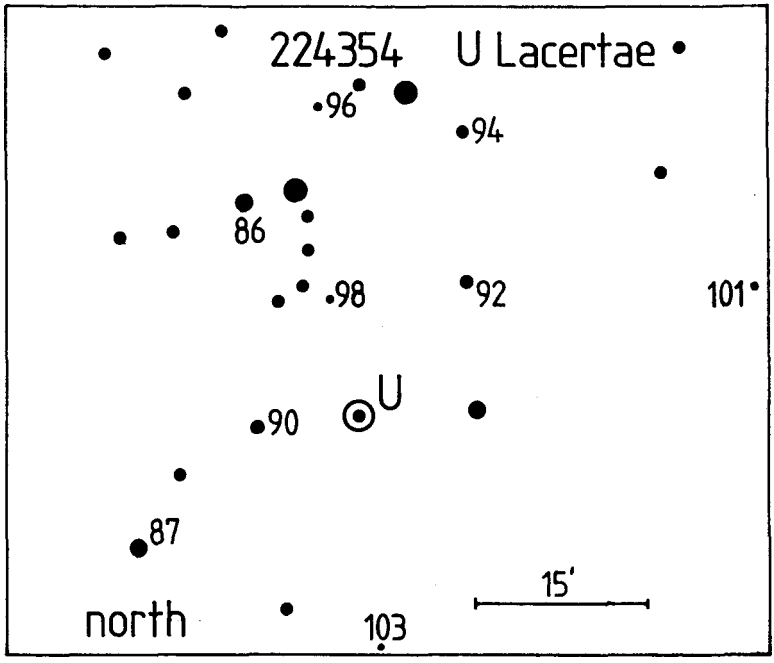
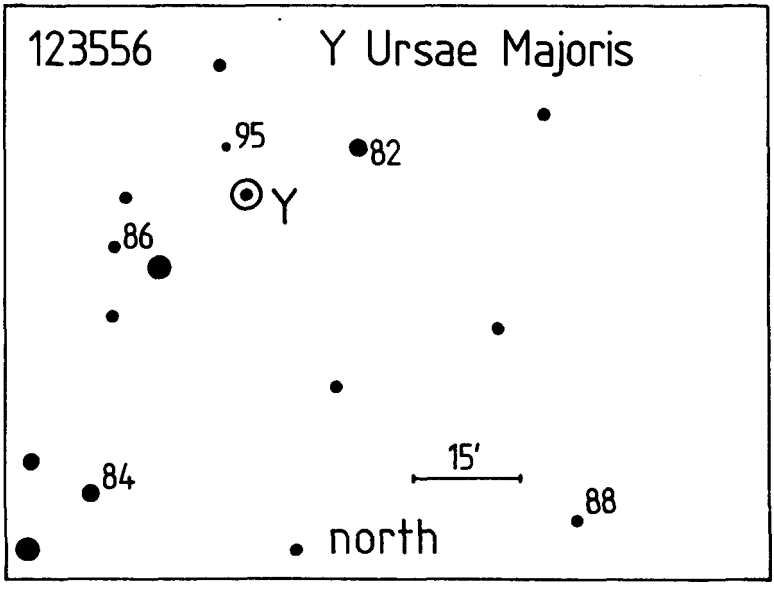

164055
S Draconis
82
85
87
93
96
S
79
99
89
15'
north


224354 U Lacertae
96
94
86
98
92
101
U
90
87
15'
north
103


123556 Y Ursae Majoris
95
82
Y
86
15'
84
88
north

Algols and Amateurs

Dave Wonnacott

Binary stars may not be the most exotic or outlandish set of objects in the night sky, but they are certainly one of the most important in terms of our understanding of the workings of stars in general, and the work of amateurs in this field can contribute greatly to this.

Why are binary stars so important? It is very hard (if not impossible) to get at the physical parameters, for instance the mass or radius, that descibe the single stars which we observe, and without this information we cannot hope to comprehend them. That is where binary stars come into the picture, and amateurs, not having to fight for telescope time, can play a vital role, in the data-gathering process, especailly since many of the most interesting of these objects are bright (- 6m) and have short orbital periods, putting reliable data-collection over many cycles well within the reach of most enthusiastic amateurs.

A certain class of binaries known as Algols (after the prototype of this class Beta Per or 'Algol') are orientated such that the plane of their orbit contains the line-of-sight to Earth. This means that twice every orbital period, one star passes in front of the other as seen from the Earth. Why is this so useful? For one thing, it then becomes a trivial matter to measure the period between eclipses very accurately, and more importantly, if past observations of the times of primary and secondary minima (eclipses) are known, then because a whole number of orbital periods must have elapsed between the old and new observations, the period can be found to an accuracy of a fraction of a second even if the observations are only accurate to fractions of an hour!

There is another useful consequence of eclipses that allows us to derive the physical parameters that descibe the two stars. If we time the duration of the eclipse and divide it by the (accurately-known) period, the result is the diameter of the star as a fraction of the length of its orbital path (1), and since there are ways of finding the size of the orbit, we may deduce the actual dimensions of the stars involved. Applying Newton's Universal Law of Gravitation to the problem gives us the individual stellar masses as well.

There are more subtle effects too. If we make a note of the darkest part of the eclipse over many periods, it is possible that we may notice the period between eclipses changing, either gradually or with a sharp jump. Newton's Law tells us that this can only happen in an isolated system if one or both of the stars are changing their mass(es)! If one star has evolved more quickly that the other (because it is more massive), it will become a giant star with a tenuous, extended outer layers which its companion can distort to the extent that a stream of matter will rise from the giant's surface and plunge down onto the companion; thus one star loses mass while the other gains it, and the period changes accordingly.

All these measurements and deductions are within the grasp of a keen amateur armed with nothing more than a good telescope, a watch and (of course) patience.

There is also good work that can be done by the photometrists. If you are lucky enough to own a photometer, then as well as performing more accurate versions of the observations described above, deeper questions can be investigated. For example, the tidal distortion of the giant star in an Algol system creates an observable effect. The fact that it is distorted in the direction of its companion (much as the tides of the Earth are distorted in the direction of the Moon) means that the outer layers are cooler than would normally be the case and that the star appears larger when viewed from the side. The net effect is to cause the star to appear unusually dim when seen side-on, and this causes the light curve (a graph of total light from the system versus time) to become 'twisted'. Further complications arise when the stream of plasma between the stars is taken into account. It only takes a small amount ofincandescent gas to produce a lot of light (witness the use of sodium vapour in street-lights), and this means even minor mass-transfer can contribute enough light ('third-light') to the total to disturb the light curves significantly. Nevertheless, there is information in such an observation, and careful analysis can reveal much about the geometry of the matter-stream in such cases.

A good general description of Algol can be found in *Burnham's Celestial Handbook* along with the names, positions and details of many Algol-type systems worth looking out for.

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(1) For this to work, the orbit must be circular ($e = 0$). This is not, however, a problem for short-period binaries (P - few days), as tidal friction will circularise the orbits in a few thousand years.

[Ed. note: Full details of methods of observing eclipsing binaries can, of course, be found in the VSS Eclipsing Binary Booklet, together with extensive information about individual systems, and a few charts. The price remains £1.25 for U.K. observers and £1.50 for those overseas, including postage, and obtainable from Storm Dunlop.]

AAVSO Meeting, Brussels 1990 July 24-28

International Cooperation and Coordination in Variable Star Research

The first European meeting of the AAVSO is being held at the Vrije Universitet, Brussels on 1990 July 24-28. Anyone interested in variable-stars is welcome to attend. A large number of professional and amateur astronomers will be attending from all over the world and will be presenting papers. A number of other events are also planned to take place apart from the formal sessions and these are described later. A preliminary list of the papers to be presented is also given.

Registration covering the whole meeting (and including a copy of the *Proceedings*) is $80 (guests - no *Proceedings* - $40). Accomodation is either at the University itself ($110 for 5 nights for a single room) or local hotel. Prices are for bookings before May.21. Full details of the range of prices and options are available on request, and may shortly be made available on email. At present, registration and payment must be made directly to the AAVSO in Cambridge, Massachusetts. It may be possible to make payments directly to Belgium via Eurocheque or Giro transfer and more details about this will be given to anyone requiring information.

Full details can be obtained from Storm Dunlop at the address given on the inside front cover of the accompanying *VSS Circular*.

Provisional Schedule

Monday, July 23	Registration	12:00 - 17:00
	Reception (Hosts VVS)	19:00
Tuesday, July 24	Registration	09:00 - 10:30
	Opening session	10:30
	Scientific session	am & pm
	Introductory paper:	
	Prof. A. Blaauw, Director Emeritus, ESO	
Wednesday, July 25	Scientific session	am
	General Assembly	pm
	Variable star activities worldwide	
	Concert	eve
Thursday, July 26	Scientific session	am
	Visit to Ghent	pm
	Banquet in Ghent	eve
Friday, July 27	Scientific sessions	am & pm
	Visit to Royal Observatory	
Saturday, July 28	Scientific Session	am
	Closing session	am

List of Papers/Speakers

Baglin, Annie (France)
'Observations of Delta Scuti Stars' (or 'Chaos')
Baldwin, Marvin E. (USA)
something on the AAVSO eclipsing binary program
Baliunas, Sallie (USA)*
'Automatic Photometric Telescopes' (invited review)
Baruch, John (UK)
something on robotic observatories
Bateson, Frank M. (New Zealand)
report on the work of the RASNZ VSS**
Bianchini, Antonio (Italy)
'Detecting Solar-Type Cycles in CV's'
Bohme, Dietmar (DDR)
1. 'NSV 01098: A New Bright Mira Star'
2. 'Mu Cephei: A Very Interesting Star'
3. 'The AKR - The East German Variable Star Observers Group'**
Boistel, G. (Belgium)
'NSV 1776 Orion'
Boninsegna, Roland (Belgium)
1. 'Results of GEOS Observing Programs'
2. general report on the work of GEOS**
Breger, Michel (Austria)
'Coordinated Studies of Short-Period Variables' (invited review)
Busarello, Giovanni (Italy)
'Off-Centering Errors in Multi-Aperture Photometry of Galaxies'
Coggins, John (UK)
TBA
Collins, Mike J. (UK)
TBA
Cordova, France (USA)*
'X-Ray Observations of Cataclysmic Variables' (invited review)
Cragg, T.A./Robert Evans (Australia)
'Searching for Supernovae' (invited review)
Cramer, Noel (Switzerland)
TBA
Drew, Janet (UK)
'UV Observations of Cataclysmic Variables' (invited review)
Feijth, Hendrik (Netherlands)
TBA
Fleet, Richard W. (UK)
TBA

Grenon, Michel (Switzerland)
'Photometry for the HIPPARCOS Project' (invited paper)
Guinan, Edward F. (USA)*
'Eclipsing Variables' (invited review)
Gunther, J. (France)
'Software for the Variable Star Observer'
Hall, Douglas S. (USA)
'Coordination in Photoelectric Programs' (invited review)
Hazen, Martha (USA)
'Photographic Photometry/Population II Variables' (invited review)
Iijima, T. (Italy)
TBA
Isles, John E. (UK)
'BAA VSS Research on Mira Stars' (invited paper)
Karovska, Margarita (USA)
1. 'Diameter Measurement and Imaging of Mira Stars'
2. 'International Coordinated Study of Mira Stars' (invited)
Kellomaki, Aare (Finland)
TBA
Kilkenny, David (South Africa)
'R CrB and Related Stars' (invited review)
Klinting, Ole (Denmark)
TBA
Korth, Stefan (FRG)
TBA
Kucinskas, Arunas (Lithuania)
TBA
La Dous, Constanze (USA)
'Boundary Conditions for Dwarf Nova Accretion Disc Models from Visual Observations' (invited paper)
Landis, Howard J. (USA)
something on AAVSO photoelectric photometry program
Lawson, W. (New Zealand)
something on R CrB stars
Le Contel, Jean-Michel (France)
1. 'Multichannel Photometry for Amateur Groups' (invited)
2. 'Multi-Longitude Observations of mid-B Variables'
Lipunova, N. (USSR)
TBA
Liu Zongli (China)
'Coordinated Observations of Spica'

Longo, Giuseppe (Italy)
'Extragalactic Photometry in the Transition Era from Photoelectric Photometry to CCD's' (invited paper)
Mahmoud, Farouk (Egypt)
'The Same Interesting Phenomenon of the Flare Star V774 Her Has Again Been Detected'
Manfroid, J. (Belgium)
'Homogenization of Photoelectric Photometry' (invited paper)
Mattei, Janet A. (USA)
'Coordination of Visual Observing Programs' (invited review)
Mennessier, Marie-Odile (France)
'Analysis of Observations of Mira Stars'
Mikolajewska, Joanna (Poland)
'Symbiotic Stars' (invited review)
Mizser, Attila (Hungary)
'Variable Star Astronomy in Hungary'
Mouchet, M. (France)
'Magnetic Cataclysmic Variables'
Mukai, Koji (USA)
'Coordinated Observations During the EUVE All-Sky Survey'
Osorio, Jose Ripero (Spain)
TBA
Padilla, Steve (USA)
TBA
Pazmino, John (USA)
TBA
Percy, John R. (Canada)
1. 'Variable Stars and Stellar Evolution' (invited review)
2. TBA
Proust, Dominique (France)
'X Ophiuchi'
Quercy, F.R. and M. (France)*
'Red Variables' (invited review)
Royer, Ronald E. (USA)
TBA
Sakuma, Sei-ichi (Japan)
TBA
Samolyk, Gerry (USA)
something on eclipsing variables
Samus, N. (USSR)
'The General Catalogue of Variable Stars'

Satoh, Hideo (Japan)
'Present Status and Prospects for Variable Star Observation in Japan' (invited)
Schott, Gerd Lutz
TBA
Schweitzer, M. Emile (France)
TBA
Silhan, Jindrich (Czechoslovakia)
TBA
Speil, Jerzy (Poland)
TBA
Starrfield, Sumner (USA)*
'Cataclysmic Variables' (invited review)
Sterken, Chris (Belgium)
'BW Vulpeculae'
Szeidl, Bela (Hungary)*
'Communication and Coordination in Variable Star Astronomy' (invited review)
Turon, C. (France)
'The HIPPARCOS Input Catalogue' (invited)
Venditti, Roberto (Italy)
TBA
Viotti, Roberto (Italy)
'Hypergiant Variables' (invited review)
Wamsteker, Willem (Spain)*
'Amateur Astronomers and Space Astronomy'
Watson, M.G. (UK)
TBA
Wilkerson-Montout, Winston (USA)
TBA
Williams, Thomas R. (USA)
something on the history of variable star observing
Wisniewski, W. (USA)
'Highly Variable Objects in the Solar System'
Wolf, Marek (Czechoslovakia)
'Light-Time Effects in Eclipsing Binaries'

* participation not yet confirmed

** report to presented in 'general assembly' session

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