

BRITISH ASTRONOMICAL ASSOCIATION

L I G H T C U R V E

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VARIABLE STAR SECTION CIRCULAR No. 47 1981 SEPTEMBER

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\* IMPORTANT NOTICES within:

Submission of Binocular Observations  
Receipt of future Circulars  
Up-to-date Chart Lists

CHANGES OF ADDRESS:

S. Albrighton - now: Merevale Hall, Merevale, nr Atherstone, Warcs.  
CV9 2HG

R.M. MacLeod - now: 46 Josephine Court, Southcote Road, Reading  
RG3 2DG

A. Markham - now: 7 Spence Street, Edinburgh, EH16 5AG

NEW MEMBERS:

A. Canton - Flat A, 9 Oak Ave., Manningham, Bradford, W. Yorks.

J. Dunne - 67 Pool Lane, Oldbury, Warley, W. Midlands B69 4QX

R. Edwards - 21 Dorian Road, Hornchurch, Essex RM12 4AN

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G.S. Hawkins - 11 Hazell Road, Farnham, Surrey

D. Haynes - Henford, Ashwater, Beaworthy, Devon EX21 5DA

D. Miles - 15 Bevan Road, Lovedean, Portsmouth, Hants. PO8 9QH

I.P. Nartowicz - 1 Malgam Drive, Manchester M20 0GH

K. Robinson - 139 Oxford Street, Frenchwood, Preston PR1 3QY

A.J. Rogers - 11 Stanley Place, Pontnewydd, Cwmbran, Gwent NP44 1DT

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Gujrat, INDIA

R.J. Stuart - Dental Centre, Normandy Barracks, BAOR, BFPO 16

I.A. Townend - 17 Edward Street, Darfield, Barnsley, S. Yorks.

Welcome back:

G. Hirst - 46 Heatherdown Road, West Moors, Dorset BH22 0BY

H.W.S. Smith - 96 Manor Green Road, Epsom, Surrey KT19 8LN

### BAA VSS and NWA VSO

It has been agreed that the programmes of the Variable Star Section and of NWA VSO (North-Western Association of Variable Star Observers) will be amalgamated. Henceforward all observations will be handled by the appropriate Secretaries listed on the cover. It should be noted in particular that ALL BINOCULAR OBSERVATIONS MUST BE SENT TO MELVYN TAYLOR ONLY. BAA and NWA VSO members will be co-operatively undertaking subsequent reduction and analysis.

### New Chart Curator

Please note that John Parkinson has now been appointed Chart Curator and will handle charts for all programmes.

### Publications

As will be seen the BAA's 'VSS Circulars' and NWA VSO's 'Light-curve' are now combined in this single publication. We anticipate that issues will be quarterly, and that a greater amount of material will be included than was the case with previous 'Circulars'. We shall be pleased to receive contributions from observers on all subjects relating to variable stars. Please send any such material to the Director or Assistant Director. It is expected that 10-day means of most binocular objects will be published here, continuing the NWA VSO series of data. Light-curves will be prepared on a yearly basis and issued as a separate item (although 1980 VSS Binocular Light-curves are included with this issue). Contributors should note that light-curves or other figures may be included as part of their articles, but that due to production problems they may have to be reproduced on a separate sheet.

After considerable discussion regarding the most appropriate forms of publications the following scheme has been devised to prevent unnecessary overlap and to allow observers to receive the particular sort of information which they require. These are the following:

- 1) TA (The Astronomer) supplementary subscriptions. These are described on the enclosed list and are available to all observers, whether subscribers to TA or not. They provide rapid coverage of significant events, and are issued very quickly - within a couple of days - in most cases.
- 2) TA itself. This will continue to publish monthly details of individual variable star observations.
- 3) This publication. Quarterly, with 10-day means of certain variables, articles and preliminary analyses (if appropriate). General reports upon stellar behaviour.
- 4) Other major publications such as BAA Journal, etc. Full analyses of data.

PLEASE see the note on the last page of this issue for important details of changes in method of payment for receiving this 'Circular/Light-curve'.

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### European Co-operation

As yet it remains undecided whether co-operation between the various groups of variable star observers in Europe will be on a fully formal, or an informal basis. However, everyone appears to be interested in greater contact, co-ordination and (probably) integrated programmes and analyses. As a further step we would like to invite any European organisations and individuals to contribute to this publication, which we offer as a European variable star magazine, and as a means of communication between all interested in the subject. We would like to emphasize that the BAA VSS does not wish other European organisations to feel that this is an attempt to promote just the BAA's views or methods. Obviously, however, some organisation has to undertake to produce any such publication. We shall be pleased to publish any reasonable contribution or discussion, and although we assume that many persons will find English the most suitable language, can possibly include items in any major European language. (It may be possible to arrange for translation of short items into English). Please write to the Assistant Director.

### The BAA Programme

The reports which follow of BAA Main and Binocular programme observations for 1980, together with the subsequent lists of charts should provide a useful summary of BAA activity. Following the NWAVSO amalgamation, a number of objects will become part of the overall programme. These stars are not given in the main lists but are:

Star	Harvard No.	Range	Type	Period	Spectrum
W Boo	143927	5.0 - 5.4	-	-	M3
VV Cep	215463	6.6 - 7.5	EA	7430	M2 + B
DM Cep	220672	8.4 - 9.6	Lb	-	M4
RR UMi	145666	6.2 - 6.5	SR?	40?	M5
3C 273			QSO		
NGC 4151					
Markarian 421					

In addition the following stars will also be included in VSS coverage:

V603 Aql [Na; 11.0 at present; showing interesting activity]  
 DK Lac [Na; 5 - 15; 13 at present]  
 PU Vul [= Kuwano's object]  
 Honda's variable in Cygnus  
 Branchett's object in Scutum

### Main Programme Secretary's Report - 1980

A total of 15,410 useful observations were received from fifty-seven observers. These figures mark increases of 34% and 16% respectively over the 1979 observations and observers' figures. Indeed we have to go back to 1975 to find a higher total of observations - a very encouraging sign.

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## Main Programme Secretary's Report - 1980 (cont..)

We gained several new observers during the year and welcomed back, after a lapse of a year or two, Kevin Brady, Karl Lewis and Robert Paterson. Frank Knight also rejoined the section as an active observer having last submitted observations during the 1940's! On the debit side, we received no observations from the following formerly active members: T. Gough, G. Hirst, M.L. Joslin, R.H. McNaught, P.A. Moore, A.K. Porter, T.A. Robinson and A. Snook. It is to be hoped that theirs is only a temporary absence.

## Observer Totals - Main Programme 1980.

(Minimum 20 observations).

S.W. Albrighton	737	K. Lewis	313
K. Brady	77	R.L. Lyon	184
W. Barnes	74	A. Markham	70
M. Bell	289	I.A. Middlemist	528
G.C. Blair	66	C.R. Munford	451
T. Brelstaff	203	I. Nartowicz	75
L.K. Brundle	789	J. Parkinson	23
R.H. Chambers	25	R. Paterson	250
G.A.V. Coady	522	M. Peel	56
E.H. Collinson	81	R.D. Pickard	473
R. Dryden	105	G. Poyner	394
J. Ellis	83	J. Rock	31
B. Espey	41	D.R.B. Saw	853
M.J. Gainsford	801	J.D. Shanklin	531
R.J. Godden	380	H.W.S. Smith	104
L.J. Higgins	181	D. Stott	1936
A.J. Hollis	442	C. Swan	87
M.B. Houchen	41	T. Tanti	162
G.M. Hurst	173	M. Taylor	279
S.J. Kay	1376	F. Ventura	55
N.S. Kiernan	232	P.J. Wheeler	805
N.F.H. Knight	202	P.B. Withers	500
J. Lashley	134	11 observers	98
		Photographic	74
		T.A. (non-VSS)	42

Thanks to all observers for their efforts. The following deserve special mention for their major contributions and/or their ability to get up before dawn and so extend our light curves for a few precious weeks or months:

Shaun Albrighton, Tristram Brelstaff, Len Brundle, Mike Gainsford, Steven Kay, Norman Kiernan, Frank Knight, Karl Lewis, Ian Middlemist, Colin Munford, Roger Pickard, Doug Saw, Jonathan Shanklin, Dave Stott, Melvyn Taylor, Peter Wheeler and Philip Withers.

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## Star, Observations &amp; Observers' breakdown - Main Programme 1980

Star	No. Obs.	Observers			
R And	166	17	T Dra	153	10
W And	119	13	AB Dra	161	9
RW And	127	14	U Gem	330	16
RX And	394	15	RU Her	109	9
DZ And	193	11	SS Her	140	9
R Aql	175	16	AC Her	297	18
*UU Aql	52	7	AH Her	213	12
*UW Aql	66	6	*R Hya	75	11
*RW Aur	104	8	*SU Lac	79	5
SS Aur	486	21	X Leo	172	14
SU Aur	226	14	AY Lyr	225	11
U Boo	134	10	U Mon	182	18
*V Boo	116	12	*RS Oph	112	4
V Cam	187	12	U Ori	210	20
X Cam	226	12	CN Ori	175	13
Z Cam	401	11	*CZ Ori	139	12
XX Cam	285	17	V529 Ori	20	2
S Cas	163	15	RU Peg	252	18
T Cas	203	17	S Per	138	16
UV Cas	453	13	RS Per	179	14
Gamma Cas	377	10	TZ Per	424	14
Rho Cas	196	11	UV Per	188	12
Omicron Cet	197	19	BU Per	176	14
R CrB	449	22	GK Per	150	8
S CrB	235	16	WZ Sge	110	8
T CrB	205	17	HS Sge	11	1
V CrB	134	10	R Set	341	18
W CrB	131	12	*R Ser	75	12
R Cyg	203	15	T Tau	147	16
S Cyg	148	10	RV Tau	155	17
V Cyg	160	12	SU Tau	196	17
W Cyg	304	18	T UMa	173	13
SS Cyg	678	28	SU UMa	287	14
BC Cyg	152	10	SW UMa	151	14
BI Cyg	155	11	CH UMa	165	13
CI Cyg	286	18	V Vul	206	11
V1500 Cyg	7	3	NQ Vul	19	3
V1668 Cyg	20	4	PU Vul	166	10
Chi Cyg	233	19	SN NGC6946	201	17
HR Del	160	11	Honda's V.in Cyg	46	5
T Dra	153	10			
AB Dra	161	9			

cont.....

SS Cyg maintained its position as the most observed star and was, as usual, underobserved during the spring gap. SS Aur, Z Cam, UV Cas, R CIB and TZ Per were observed over 400 times each. Interest in UV Cas seems to have really taken off - 107 observations in 1979, 453 in 1980! Thankfully the number of grossly under-observed stars has been much reduced. Those most obviously in need of attention are marked with an asterisk. Four of them: UW Aql, RW Aur, V Boo and R Hya are observable in large binoculars or small telescopes. A 150 mm reflector will cover RS Oph and R Ser, and enable useful observations to be made of UU Aql, SU Lac and CZ Ori; while larger instruments will extend the coverage of these fainter stars.

Although the other stars on the programme have healthier looking totals, there are a number for which the light curve is based, in the main, on the work of one or two observers only. R, W and RW And, V and W CRB, T and AB Dra, RU and SS Her, X Leo, AY Lyr, CN Ori, S and GK Per, WZ Sge, RV Tau, T UMa and PU Vul all come into this category and all observers of these stars are urged to follow them as often as possible, weather permitting!

Having passed the 15,000 mark let us hope that we can increase our total even further.

Well done everybody. Keep up the good work. G.A.V. Coady

#### Binocular Secretary's Report - 1980

During the year 1980 thirty observers contributed more than 8600 light estimates of stars on the binocular programme. These are tabulated below together with their abbreviation and observational contribution.

#### Observer Totals - Binocular Programme 1980

Observer	Abbreviation	no. obs./no. stars observed	
S. Albrighton	AG	1184	85
Miss M. Beach	UC	60	6
M. Bell	YM	532	15
G. Blair	XD	11	4
E.H. Collinson	CO	113	11
G. Dobie	DG	82	9
R.C. Dryden	DR	5	5
D.J. Ellis	EL	33	11
B. Espey	EP	150	26
Miss R.B.I. Fraser	FB	616	129

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## Observer Totals (cont.)

Observer	Abbreviation	no. obs./no. stars observed	
M. Hapgood	HP	25	9
A.C.A. Henley	YH	5	3
M.B. Houchen	NH	111	13
D. Hufton	HU	44	38
G.M. Hurst	HF	159	46
N.S. Kiernan	KS	43	8
J. Lashley	LJ	22	8
M. Lunn	LU	121	10
T. Markham	QM	158	7
I.A. Middlemist	MM	2320	89
I.P. Nartowicz	NZ	66	3
J. Parkinson	JR	12	4
M. Peel	PB	4	1
R. Pickard	PI	10	6
D.H. Roberts	OR	8	6
J. Shanklin	SK	126	10
S.U.A.A.	(SUAA)	799	9
C. Swan	QS	232	7
M.D. Taylor	TY	1503	112
D. Young	YD	63	20

Total 8617

It can be seen that six observers contributed about 80% of the estimates, an exceedingly high proportion, and those were; Middlemist, Taylor, Albrighton, the V.S. team from the Scandanavian Union of Amateur Astronomers, Miss Fraser, and Bell.

## Star/Observation Breakdown - Binocular Programme 1980

RS And	31	Psi <sup>1</sup> Aur	10	RT Cnc	23
SU And	7	BD+31 <sup>0</sup> 1048	281	*V CVn	107
TZ And	30	RV Boo	42	*Y CVn	104
AQ And	34	RW Boo	43	*TU CVn	74
BZ And	16	*RX Boo	52	W CMa	5
*V Aql	41	*UV Boo	45	*WZ Cas	54
V450 Aql	61	U Cam	50	*V377 Cas	57
V1293 Aql	62	RY Cam	29	V391 Cas	79
CSV101849 Aql	15	ST Cam	106	V393 Cas	79
V Ari	5	UV Cam	42	*V465 Cas	149
*UU Aur	90	VZ Cam	12	CSV171 Cas	60
AB Aur	263	ZZ Cam	40	*Wr162 Cas	34
AE Aur	246	BD+61 <sup>0</sup> 0668 Cam	10	BD+49 <sup>0</sup> 4329 Cas	22
*CO Aur	49	*X Cnc	33	*W Cep	85
NO Aur	83	*RS Cnc	70	RU Cep	48

cont.....

## Star/Observation Breakdown - Binocular Programme 1980 (cont.)

*RW Cep	79	TV Gem	72	*X Per	130
RX Cep	88	WY Gem	66	SO Per	27
*SS Cep	65	BN Gem	62	AD Per	28
*AR Cep	112	BQ Gem	25	KK Per	8
FZ Cep	17	BU Gem	74	PR Per	8
NN Cep	17	DW Gem	5	Z Psc	19
Mu Cep	39	IS Gem	82	TV Psc	39
CSU927 Cep	9	NQ Gem	7	TX Psc	24
BD+59°2383	33	*X Her	64	*S Sct	21
BD+60°2217	30	ST Her	30	*Y Tau	56
BD+84°0536	51	SX Her	15	TT Tau	32
33 Cet	12	UW Her	39	*BU Tau	45
RR CrB	50	*IQ Her	9	CE Tau	29
SW CrB	50	*OP Her	71	CSU6048	20
T Cyg	28	V566 Her	37	BD+22°0743	15
RU Cyg	41	*g Her	192	W Tri	29
RV Cyg	51	U Hya	5	*Z UMa	88
TT Cyg	42	SX Lac	19	*RY UMa	90
*AF Cyg	116	CSV8775	65	ST UMa	64
*CM Cyg	555	CSV102195	55	TV UMa	19
*V460 Cyg	63	RX Lep	15	VW UMa	121
V973 Cyg	63	*Y Lyn	64	VY UMa	118
V1351 Cyg	12	SV Lyn	35	V UMi	52
P Cyg	119	CSV100869	17	RW Vir	6
F1 28 Cyg	24	R Lyr	92	RX Vir	6
CSV8307 Cyg	32	XY Lyr	69	SS Vir	12
CSV8683 Cyg	21	Delta <sup>2</sup> Lyr	164	SW Vir	14
BD+47°2801 Cyg	66	S Mon	8	BK Vir	6
*U Del	52	RV Mon	23		
*EU Del	70	SX Mon	6		
BD+19°4450	35	V505 Mon	11		
*RY Dra	123	X Oph	62		
TX Dra	197	V2048 Oph	137		
UW Dra	49	W Ori	46		
UX Dra	57	BL Ori	12		
VW Dra	33	*BQ Ori	55		
AM Dra	60	CK Ori	33		
AT Dra	35	BD+14°1247 Ori	6		
F1 69 Dra	15	*AG Peg	76		
TU Gem	45	GO Peg	14		

\* = "priority list"  
variable

cont.....

As can be seen distribution of effort over the entire binocular programme was very uneven, but the "priority list" of variables (with a few exceptions) were well covered. These exceptions are; V Aql, X Cnc, WZ Cas, IQ Her, BQ Ori and S Sct. Some observations have been sent which are not on the binocular programme notably; VX And; ADS 5188 (Auriga); BD+49°2165 (CVn); KY Cep; BD+26°2769 (CrB); V449 Cyg, V1339 Cyg, CSV103049 Cyg, BD+32°3634 (Cyg); BD+44°0446 (.ac), Eta Gem, V533 Oph and RUMa. Where appropriate these observations will be recorded on AAVSO report forms and forwarded to the U.S. N.B. 18 observations were received of UX Cam, a star now dropped (see VSSC no. 38 page 2).

#### Underobserved Stars

Stars badly underobserved were; SU And, BZ And, CSU101849 Aql; V Ari; Psi<sup>1</sup> Aur; RY Cam (is this too faint?); VZ Cam, BD+61°0668 Cam; RT Cnc; W CMa; BD+49°4329 Cas; FZ, NN Cep; CSV927 Cep; BD+59°2383 and BD+60°2217 Cep; 33 Cet; T Cyg; F128 Cyg; CSV8683 Cyg; 69 Dra; BQ Ori\*; DW Gem; ST, SX, IQ Her\*; U Hya; RX Lep; CSV100869 Lyn; S Mon; RV, SX, V505 Mon; BL Ori; BD+14°1247, GO Peg; SU, AD, KK, PR Per; Z Psc; TX Psc; S Sct\*, CE Tau, CSV6048 Tau; BD+22°0743; W Tri; TV UMa; RW, RX, SS, SW, BK Vir.

The need for continuous coverage (bearing in mind our 4/10 day rule for SRs, LPVs and Ls) and even distribution cannot be over-emphasised. For a programme of this nature we need roughly 20-30 estimates/star/year for an individual observer. Also it is worth stressing that what we need are good quality observations! There are few better guides than the BAA VSS's re-printed article by F.M. Holborn, "The Methods of the Variable Star Section" Vol. 68, No. 8, (1958 October), about general variable star observing and recording for the beginner.

#### Quality of Observations

From a logging and checking viewpoint, the most common fault seen on the reports was the 1-day error in the conversion to Julian Date. A small number of observers, mainly those new to V.S. work, would help our light curves considerably by the use of "good practiced" observing and recording. For example a Pogson step of A-5 is not a wise estimate, especially if there is a fainter comparison nearby, when a fractional method would allow a better assessment. Generally steps of 0.1, 0.2, 0.3 and 0.4 magnitudes are adequate; estimates of larger steps could be seriously in error. Also, a reminder to all observers that, if possible, two comparison stars, one brighter, and one fainter should be used in estimates.

#### Charts

It is important that the chart being used at the telescope, and for reduction from the sequence, be the up-to-date one. The VSS Catalogue of Charts shows which is to be used by giving the latest date (at bottom right on the chart) alongside each star.

#### RX Boo (1971-1980)

Observations of this SRb have been logged and checked, much of the work being performed by E.H. Collinson, and an initial investigation shows a period roughly half that given in the GCVS, and an extreme range of 7.5 to 9.0. A final report is to be made and any outstanding estimates should be sent to the Binocular Secretary before the end of the year.

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Society V.S. Observing Groups

Variable star observing groups in the Birmingham, Crayford Manor House and Huddersfield AS's are active in observing and communicating their work and experiences to the Binocular Secretary. Local AS's with Observing Groups may like to consider that with the aid of an experienced co-ordinator, the personal approach may assist new variable star observers in the methods of light estimation and proper recording.

M.D. Taylor

BAA VSS Programme Charts Lists

The latest charts are shown in the following lists. It is important that these are used by all observers. For the main programme identification may be by means of either a specific number or a date. Binocular charts are identified by the latest date shown - normally in the bottom right-hand corner.

Main Programme

<u>STAR</u>	<u>LATEST SEQUENCE</u>	<u>PREVIOUS SEQUENCE</u>	<u>NOTES</u>
R AND	RGA 1958 OCT		
W AND	035.01	RGA 1960/JEI '72 JUN	1
RW AND	022.01		
RX AND	001.02	001.01	1
DZ AND	IDH 1978 MAR		
R AQL	030.01	JEI 1972 JUN	1
UU AQL	002.02	002.01	1
UW AQL	028.01	JEI 1972 AUG/'74 JUN	1
RW AUR	JEI 1974 AUG		
SS AUR	003.02	003.01	1
SU AUR	JEI 1974 AUG		
U BOO	036.01	RGA 1960 SEP	1
V BOO	037.01	JEI 1973 FEB	1
V CAM	027.01	RGA 1961 JAN	1
X CAM	038.01	RGA 1960 MAR	1
Z CAM	004.02	004.01	1
XX CAM	DAP 74.11.09		
S CAS	RGA 1961 APR		
T CAS	RGA 1961 JAN		
UV CAS	IDH 1978 MAR		
GAMMA CAS	IDH 1977 AUG		
RHO CAS	IDH 1978 JAN		
OMICRON CETI	039.01	RGA 1961 FEB	1
R CRB	041.01	RGA 1959 MAR	2
S CRB	043.01	RGA 1960 NOV	1
T CRB	025.01	JEI 1972 JUN	3
V CRB	IDH 1977 AUG		
W CRB	044.01	RGA 1959 NOV	1
R CYG	031.01	RGA 1960 NOV	1
S CYG	032.01	RGA 1960 NOV	1
V CYG	034.01	RGA 1960 NOV	4

cont.....

## Main Programme (cont.)

STAR	LATEST SEQUENCE	PREVIOUS SEQUENCE	NOTES
W CYG	MDT 77.09.10		
SS CYG	005.02	005.01	1
BC CYG	JEI 1974 MAY		
BI CYG	JEI 1974 MAY		
CI CYG	006.01		
CHI CYG	045.01	RGA 1961 FEB	1
HR DEL	JEI 1972 NOV		
T DRA	046.01	IDH 1977 APR	1
AB DRA	007.03	007.02	1
U GEM	008.02	008.01	1
IR GEM	042.01		
RU HER	IDH 1977 MAR		
SS HER	047.01	RGA 1962 NOV	5
AC HER	048.01	JEI 1974 JUN	6
AH HER	009.03	009.02	1
R HYA	049.01	RGA 1961 MAR	7
SU LAC	IDH 1978 MAR		
X LEO	010.01		
AY LYR	011.01		
U MON	029.01	RGA 1963 DEC	
RS OPH	024.01	RGA 1958 SEP	
U ORI	JEI 1974 FEB		
CN ORI	012.02	012.01	1
CZ ORI	013.02	013.01	1
RU PEG	014.02	014.01	1
S PER	050.01	RGA 1961 MAR	8
RS PER	JEI rev'd 1974 FEB		
TZ PER	015.02	015.01	
UV PER	016.03	016.01	
BU PER	JEI rev'd 1974 FEB		
GK PER	IDH 1977 AUG		
WZ SGE	023.01		
R SCT	026.01	JEI 1972 MAR	
R SER	033.01	RGA 1961 MAR	7
T TAU	JEI 1974 FEB		
RV TAU	JEI 1973 DEC		
SU TAU	017.02	017.01	1
T UMA	RGA 1960/JEI 1972 AUG 1974 JUN		
SU UMA	018.02	018.01	1
SW UMA	019.02	019.01	1
CH UMA	020.02	020.01	1
V VUL	JEI 1974 JUN		
PU VUL	052.01	021.01	1

cont.....

## Notes to main programme chart list

- 1 - New chart issued for epoch 1950. No change to sequence, old chart may still be used.
- 2 - Star d on old sequence = 6.28.
- 3
- 4 - Star 23 = 10.14 )  
Star X = 14.15 ) on old sequence.
- 5 - Star H = 10.0 on old sequence.
- 6 - Star E = 8.1 on old sequence.
- 7 - Some stars have been dropped from the sequence.
- 8 - Star 25 = 10.33 on old sequence.

In all other cases the latest chart should be the one in use.  
Supplies may be obtained from the chart secretary.

Binocular Programme

(Based on the 1976 Chart Catalogue with the addition of  
CSV 8232 Cyg and omission of UX Cam.)

RS And	1977 Sep 10	U Cam	1972 Nov 04
SU And	"	RY Cam	1972 Jul 29
TZ And	"	ST Cam	1976 Jun 02
AQ And	1972 Nov 11	UV Cam	1972 Jul 29
BZ And	1970 Oct 22	VZ Cam	1972 Aug 12
V Aql	1973 Jul 14	ZZ Cam	1972 Jul 29
V450 Aql	1978 Mar 10	+61 <sup>0</sup> 0668 Cam	"
V1293 Aql	"	X Cnc	1972 Sep 09
CSV103849 Aql	"	RS Cnc	1971 May 09
V Tri	1978 Jul 15	RT Cnc	1972 Jul 29
UU Aur	1972 Nov 11	V CVn	1977 Sep 10
AB Aur	1971 May 01	Y CVn	"
AE Aur	1972 May 27	TU CVn	"
CO Aur	1973 May 17	W CMa	1973 Jul 08
NO Aur	1973 Jul 08	WZ Cas	1972 Nov 11
Psi <sup>1</sup> Aur	1973 Jul 14	V377 Cas	"
+31 <sup>0</sup> 1048 Aur	1973 Jul 08	C391 Cas	1978 May 15
RV Boo	1974 Jan 20	V393 Cas	"
RW Boo	"	V465 Cas	1974 Jul 27
RX Boo	1972 Aug 12	CSV171 Cas	1978 May 15
UV Boo	"	+49 <sup>0</sup> 4329	1973 Jul 08
		Wr162	1974 Jul 27

cont.....

## Binocular Programme (cont.)

W Cep	1978 Jul 14	TU Gem	1972 Nov 11
RU Cep	1978 Jul 15	TV Gem	"
RW Cep	1978 Jul 14	WY Gem	"
RX Cep	1978 Jul 15	BN Gem	1972 Jul 29
SS Cep	1972 Nov 04	BQ Gem	1972 Sep 16
AR Cep	1978 Jul 15	BU Gem	1972 Nov 11
FZ Cep	1972 May 13	DW Gem	1972 Sep 09
NN Cep	1978 Jul 14	IS Gem	1972 Jun 10
Mu	1973 Jul 14	NQ Gem	1978 Jul 29
CSV927 Cep	1972 Aug 12	X Her	1973 Jul 14
+59°2383	1973 Jul 08	ST Her	1971 May 01
+60°2217	1973 Jul 08	SX Her	1972 Jul 29
+84°0536	1978 Jul 15	UW Her	1973 Aug 30
33 Cet	1970 Jan 09	IQ Her	1974 Jul 27
RR CrB	1969 Jan 31	OP Her	1977 Sep 14
SW CrB	"	V566 Her	"
T Cyg	1972 Jul 29	g Her	1973 Jul 14
RU Cyg	1972 Nov 04	U Hya	1969 Aug 14
RV Cyg	1972 Sep 09	SX Lac	1974 Jul 28
TT Cyg	1972 Sep 16	CSV8775	1978 Jul 14
AF Cyg	1973 Jul 14	CSV102195	1978 Jul 14
CH Cyg	1975 Sep 07	RX Lep	1972 Sep 16
V460 Cyg	1974 Jul 28	Y Lyn	1978 Jul 14
V973 Cyg	1978 Oct 30	SV Lyn	1981 Jun 18
V1351 Cyg	1978 Jul 14	CSV100869	1978 Jul 14
P Cyg	1972 Jul 29	R Lyr	1972 Nov 11
F128 Cyg	1972 Jul 29	XY Lyr	1972 Sep 16
CSV 8232	1978 Jul 14	Delta <sup>2</sup> Lyr	1972 Nov 11
CSV 8307	1972 Sep 16	S Mon	1972 Sep 16
CSV 2863	1972 Sep 09	RV Mon	1972 Mar 14
+47°2801	1973 Jul 14	SX Mon	1972 Mar 14
U Del	1971 Jan 23	V505 Mon	1971 Aug 22
EU Del	"	X Oph	1972 Nov 04
+19°4450	"	V2048 Oph	1978 Jul 14
RY Dra	1972 Nov 11	W Ori	1972 Nov 04
TX Dra	1972 Jan 25	BL Ori	1972 Sep 16
UW Dra	1974 Jul 27	BQ Ori	1974 Nov 09
UX Dra	1972 Apr 08	CK Ori	1972 Aug 12
VW Dra	1972 Jan 25	+14°1247	1972 Sep 16
AH Dra	1972 Jan 25	AG Peg	1973 Jul 14
AT Dra	1972 Jan 25	GO Peg	1971 Jul 28
F139 Dra	1972 Apr 08		

cont.....

## Binocular Programme (cont.)

X Per	1972 May 27	W Tri	1973 Jul 08
SU Per	1972 Feb 04	Z UMa	1972 May 20
AD Per	"	RY UMa	"
KK Per	"	ST UMa	1972 Jun 10
PR Per	"	TV UMa	1974 Jan 20
Z Psc	1969 Nov 10	VW UMa	1977 Sep 10
TV Psc	1972 Sep 09	VY UMa	"
TX Psc	1972 May 27	V Mi	1981 May 10
S Sct	1973 Jul 14	RW Vir	1969 Apr 18
Y Tau	1974 Nov 09	RX Vir	"
TT Tau	1971 May 01	SS Vir	1972 Aug 12
BU Tau	1972 May 27	SW Vir	1974 Jan 21
CE Tau	1972 May 27	BK Vir	1974 Jan 21
CSV6048	1972 May 27		
+22°0743	1972 Nov 04		

N.B. Latest charts:

075736 SV Lyncis (6.6 - 7.5) L The chart has simply been redrawn and there is no change to the sequence. Latest date - 1981 Jun 18.

133674 V Ursae Minoris (7.4 - 8.8) SRb As above chart - note that T UMi 8.1 - 15.0, Mira, 314<sup>d</sup> has been added. This is the final chart. Latest date - 1981 May 10.

Photography of variable stars and fields The VSS already receives certain photographic observations which are largely from nova patrol photographs. Some members are interested in following certain stars on a regular basis, and it is hoped that this might become a standard method of observation. Such a technique is obviously not necessarily suitable for all objects currently observed visually, but will doubtless be of value in 'difficult' cases.

Lists of suitable stars on the current programmes are being prepared, but in addition, members may like to consider whether they might be interested in following some of the variables which are not otherwise observed. (Flare stars have been specifically mentioned). Photographs need not necessarily be taken with photovisual response, although this would be of great assistance in some cases. Particularly valuable would be coverage of faint variables on current programmes, which are difficult to observe at minimum.

Even if members do not wish to take part in regular photographic coverage of specific objects, they are asked to always bear in mind that any photographs, at any scale, may show images of programme stars, and that they could therefore help to fill gaps in visual coverage.

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A further photographic project is to help with the accurate charting of variable star fields, where existing charts are unsatisfactory. In particular, the Binocular Programme Secretary would be pleased to hear from anyone whose photographs (colour or black and white) reach down to about mag. 9-10 (visual) and who may have photographed areas near RX Boo, UV Boo, RU Cep, RU Cyg, DW Gem, TT Tau, RY UMa or BK Vir.

Further details of photographic projects will be announced in due course, but any interested is invited to contact the appropriate Secretary (or Secretaries).

### Report of Lincoln Meeting (concluded)

R Coronae Stars - Dr. P. Andrews

After the break for morning coffee, Dr. Peter Andrews of the Royal Greenwich Observatory, Herstmonceux, described some of the aspects of studies of RCB stars.

R Coronae Borealis was discovered at a time (1795) when only sixteen variables were known - 5 Novae, 4 LPVs, 2 Eclipsing Binaries, 2 Cepheids, 1 Irregular, 1 Semi-regular and R CrB itself. This famous star is normally at maximum, magnitude 6 or thereabouts, and is subject to random fades. Fades are rapid and also usually very deep - 9 magnitudes for the prototype star - and recoveries are more sedate. At maximum small amplitude variations have been reported in R CRB, RY Sgr, UW Cen, GU Sgr and Z Aps. Spectra of this small band (40 at most) of important variables, range from G to R, although there are a few 'odd' sub-types; MV Sgr (B) and V348 Sgr (WN10) a cool Wolf-Rayet star. Stars suspected of being RCB types are; DZ And, UV Cas and AE Cir.

In galactic distribution they are disc stars, fairly old, highly luminous, hydrogen-deficient carbon stars. High-dispersion spectroscopy gives abundance ratios of the sun, R CrB and RY Sgr to be, respectively; 0.11, 0.75 and 0.8.  $C_2$  and CN bands are strong, CH is absent at or near maximum. During minima their spectra change and rich emission lines are seen indicating obscuration of the star's chromosphere. At minimum lines H and K of calcium are seen, with hydrogen remaining weak. Spectra taken during a fade indicate a photospheric shell receding from the star at speeds of many tens of km/s. On recovering to maximum the emission changes quickly back to an absorption feature.

Development of a model for these stars results from suggestions made in the 1930's and from recent IR and polarimetric observations which Dr. Andrews has put to the test - at least for one star, RY Sgr. Fading appears to occur when gas clouds on the line-of-sight reach a black-body temperature of about

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2300°K. At this point, the condensation of graphite takes place in the extended atmosphere. Infrared studies suggest a temperature of the graphite at 800 - 900°K, which Dr. Andrews said was a good fit. For RY Sgr the predicted distance from the star at which this condensation takes place is 7 stellar radii. A correlation between the pulsational period as seen in the visual light curve of RY Sgr (about 40d), and observed times of the onset of a fade tie in with some success. The phases for declines of RY Sgr were shown to be about 0.55 (i.e. 22 days). On expansion of the cloud, its temperature falls and the graphite clouds disperse, allowing a view of the star's photosphere.

[In the discussion which followed, Dr. Andrews said that amateur visual observations were not only of assistance in alerting professionals of fades, but also provided a fundamental source of data for various studies, such as those which he had made of fade/phase relationships for RY Sgr.]

The afternoon session opened with Storm Dunlop, VSS Assistant Director, discussing the computing project and, in particular, the development of report forms suitable for both observers and data processing purposes. The VSS's policy with observations is not to sacrifice information reported by members, and professional advice confirmed this view. In handling analyses, Mr. Dunlop said that the computer would not undermine this approach. Facilities at RGO which are being made available to the VSS will aid the reduction/checking/logging of the last 100,000 estimates and will assist future work. However, the steep rise in publication prices since the last VSS Memoir printed meant that this particular form of publication is unlikely to be seen again.

[In the discussion, it was pointed out that there was sometimes confusion as to the significance of the 'Class' rating. It was often the case that observers seemed to feel that it applied to the actual 'Deduced Magnitude'. However it was explained that it only applied to the actual 'Estimate', that it expressed the observer's level of confidence in how accurately the particular details recorded actually represent the variable's relationship to the comparison stars. Dr. Andrews pointed out that in any subsequent analysis, an investigator would usually assign an appropriate weight to the value of the 'Deduced Magnitude'. There were, in his opinion, various important reasons for the full 'Estimate' details to be recorded, including their use for just such a weighting process. However, in addition, it was almost inevitable that the magnitudes of some comparison stars would be subject to later revision - even if none of them turned out to be variable!

Retention of the 'Estimate' details enabled corrections to be made at any time, and computerized records would make this comparatively simple.]

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## NN Cephei and other stars - T. Brelstaff

The second speaker of the session, Mr. Tristram Brelstaff, a binocular observer from Cleveland, presented an account of his observations of NN Cep, BD+59°2816, SW Lacerta, SAO 077615, TW Cas, AW Peg and V CVn.

Turning to NN Cephei in some detail, Mr. Brelstaff described the known data on the star and said that he had thought it to be an eclipsing variable with a period of about 8 hours. (Data from the Catalogue were uncertain, but gave it a probable RR Lyr type). The speaker's observations from 1973, which numbered about 320, had a mean magnitude of 8.10 and s.d. of 0.18. Experimental light-curves were shown to the audience in slide form; these apparently indicated several periods but Mr. Brelstaff pointed out that these were spurious. Determination of a mean curve with each part representing some 20 light estimates, enabled various conclusions to be drawn and these will shortly be published in the BAA Journal.

Mr. Brelstaff's findings confirm an investigation by Figer and Rolland (communicated in IBVS 1231), that the star is of type EA or EB and has a period of  $2.058216^d + 0.000070^d$ ; with an epoch of JD 2442959.58 (geocentric)  $+0.06^d$ .

Of the other stars, one of the comparison stars for WZ Cas, one of the most carbon-rich stars in the sky, at  $23^h59^m43^s$ ,  $+60^\circ25.5'$  (1950) had been suspected of variability by several observers. The field of WZ Cas was one "problem" area which merited further description; information about it being communicated in the BG chart and sequence notes (CSN). Mr. Brelstaff's observations show that this star, which is given a V magnitude of 6.73 (spectrum K8III; B-V index +1.80) in USNO Publication XXI, varies between 6.7 and 7.1 with a possible period of  $140^d$ .

## Eclipsing Binaries - J.E. Isles

The final main speaker at the meeting was the BAA Vice-President, Mr. John Isles, who had recently been appointed to co-ordinate the eclipsing binary programme. These variables had often been inferred as being "mundane" and "varying like clockwork" but a more pertinent statement about them was to say that they were not very well represented in an amateur V.S. programme. Mr. Isles pointed out that important, subtle period changes could be investigated by normal visual observations and the application of statistical analyses. Observations of these stars are undertaken to determine times of mid-eclipse.

From a set of predictions of mid-eclipse (usually according to elements in the 1969 GCVS and 3 supplements) the observer makes normal estimates at half-hourly intervals for the duration of the eclipse. In some respects the Argelander

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(personal step) method is to be preferred since an arbitrary magnitude scale can be found from a set of observations and this is liable to be less seriously affected by inaccuracies in a given sequence. On constructing a light curve, and assuming that minima are nearly symmetrical (a reasonable assumption), the "tracing-paper" method can be used to deduce the time of minimum. Mr. Isles demonstrated this procedure for RX Herculis (7.0 - 7.6,  $P = 1.78^d$ ) on 1978 Oct 7 and showing how the primary minimum at 08<sup>h</sup> 35<sup>m</sup> GMT could be defined. Once the light-time correction has been calculated and applied to each minimum, a listing of residuals would be published annually. O-C values in this form can be of use in the understanding of period changes and theoretical studies of mass flow including possible aspects of the system being a multiple.

Certain objects referred to in the Supplements to the 1969 GCVS have been photoelectrically observed and the published data amended, so that visual observations are liable not to be so worthwhile in the future. Even so the speaker had drawn up a list of about 300 possible candidates out of the 4700 (approximately) from the Catalogue.

These eclipsing variables were of the 3 principal types - EA, EB and EW - and satisfied the criteria:

maximum	$\leq 8$ to 10 mags.
eclipse duration	$\leq 12$ hours to $\infty$
Declination	$\geq 0^\circ$ to $-18^\circ$
amplitude	$\geq 0.5$ to 0.4 mags

Any stars meeting these parameters would be eligible for observation by the new VSS eclipsing binary programme. However, the existing programme would be maintained. Mr. Isles suggested that these objects would cater for most observers, whether they had only their eyes as instruments or photoelectric devices. The publication of predictions for observers was being investigated, and a new style of report sheet specifically for eclipsing binaries was in preparation.

After final discussions over tea with old and new acquaintances, the second VSS meeting in the last six years came to an end, with everyone very pleased with its success.

M.D. Taylor 1980 September

#### 1982 Variable Star Section Meeting

It is hoped to hold another VSS Meeting next year. Keele University has been proposed as a suitable site and the first weekend in July (3 & 4) as possible dates. However a one-day meeting in London has also been suggested. Any person with strong preferences for a particular time or place is invited to contact Storm Dunlop. (Even an indication of whether members would like a meeting would also help.)

#### 'Computer' forms

Due to a misunderstanding, the 'Observer' forms (which will be completed once a year), were not prepared and issued at the same time as the 'Estimate' forms on which observations are reported. The proper forms will be available shortly. Anyone with particular queries should contact any of the Secretaries, or the Assistant Director.

Computing - an appeal

Although we have been given time on the RGO computer at Herstmonceux, we are still having problems in putting our data into machine-readable format for the computer to read and store. Several members are either already assisting us with this or are contemplating purchase of small machines. Although a general appeal will appear in the BAA Journal we would be most interested to hear from anyone who can either help with our processing or would pass on details of their experience with small computer systems. Rather than just asking members to enter large quantities of data and nothing else, we hope to be able to ask anyone taking part to carry out preliminary checking, reduction, and analyses in batches, perhaps all observations of a single star for one year. Such batching should prove of more interest than just data-entry. Direct entry to RGO is possible in the following formats:

Paper tape

Punched cards

Full size (9 track) magnetic tape - compatible with RGO's ICL 1900

8" Floppy discs (operating system unknown at present)

Data in other formats (e.g. cassettes, 5¼" floppy discs) may be acceptable in future, so we shall still be interested to hear from you! We also hope to be able to develop (and exchange) suitable programs. Please contact the Main Programme Secretary, Greg Coady.

Analysis of Binocular Star Observations

Work on the back-log of BG/BSS observations is underway and with 6-monthly reporting now in operation the presentation of summaries and light-curves in the Circular will start soon. If any person with a careful, patient method of handling observational V.S. data, would like to help the Section, would he/she please contact the Binocular Secretary.

Binocular Stars - Priority list:

V Aql	WZ Cas	U Del	AG Peg
UU Aur	V377 Cas	EU Del	X Per
CO Aur	V465 Cas	RY Dra	S Sct
RX Boo	Wf162 Cas	X Her	Y Tau
UV Boo			
X Cnc	W Cep	IQ Her	BU Tau
RS Cnc	RW Cep	OP Her	Z UMa
V CVn	SS Cep	g Her	RY UMa
Y CVn	AR Cep	Y Lyn	
TU CVn	AF Cyg	BQ Ori	
	CH Cyg		
	V460 Cyg		

IMPORTANT NOTICE \* Charges for VSS Publications

We regret that it is necessary to implement some charge for these Circulars and the annual light-curves, which are proving to be very expensive to the Section, which will continue to bear part of the costs from Association funds. Charges are:

UK members - SAEs + 50p per annum for Light-curve/Circular

Overseas subscribers - £1.50 per annum

All subscribers - £1.00 per annum for light-curves

Stamps acceptable for small amounts - send payments to Storm Dunlop.