

BRITISH ASTRONOMICAL ASSOCIATION

VARIABLE STAR SECTION

CIRCULAR No. 33

1977 NOVEMBER

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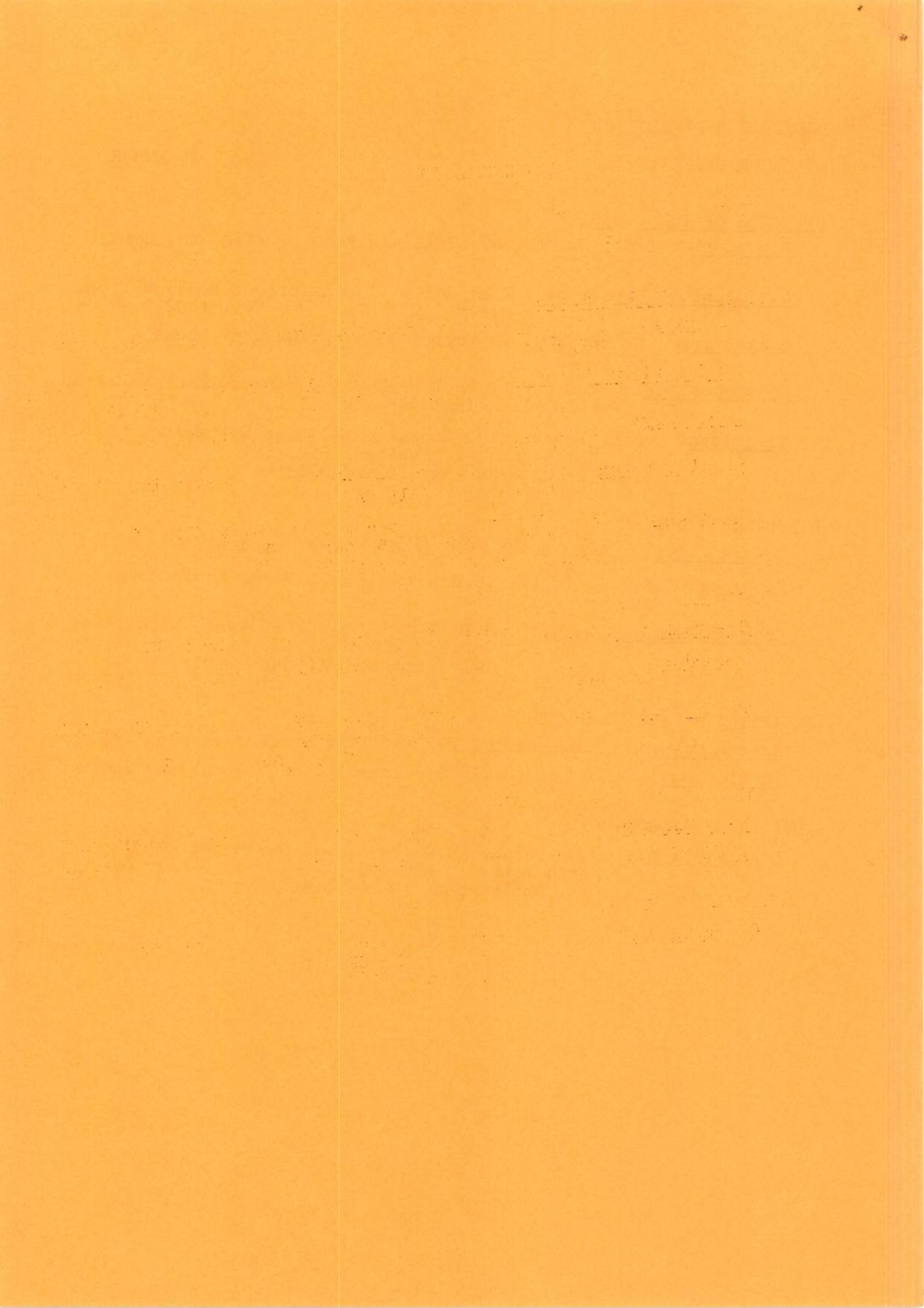
ECLIPSING BINARY PROGRAMME

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NOVA SEARCH PROGRAMME

Co-ordinator: G.M. Hurst, 12 Clare Close, Earls Barton,  
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1977 November

We record with regret the sudden death of Professor Boris Kukarkin on 1977 September 15

IMPORTANT

As the end of the year approaches, observers should start thinking about writing up their 1977 results. EVERYONE should carefully read the following notes produced by Doug Saw. The directions may seem largely self-evident, but they are sometimes neglected even by experienced observers, and incorrect filling in of forms causes very considerable inconvenience.

- 1) Record chart used on EVERY sheet.
- 2) Don't forget to note the YEAR.
- 3) In the 'Date' column, NAME the month for the first observation each month (it need not be repeated for subsequent observations in the same month).
- 4a) In the Julian Date column, only the last three digits of the JD need be given (except when the 'thousand' number changes - this doesn't occur in 1977).
- 4b) The decimal time is required to one place except for dwarf novae and certain other stars; the number of decimals needed for each star is given in the programme listing which accompanies this circular, and (hrs, mins) → (decimals) tables are given below.
- 5) The correct method of recording 'fainter than C' (say) is  $< C$ . If the variable is estimated  $3/10$  magnitude fainter than C, the record is C-3  
and the correct notation for fractional estimates is (e.g.)  
B(1)V(2)C
- 6) Deduced magnitude is required to ONE decimal place, followed by '±' for a class 3 estimate.
- 7) Include in the Remarks column any non-standard instruments, adverse conditions, etc. Comments on comparison star magnitudes may also be made, but a separate note of these should be sent to the Director.

Below we give examples of what correctly filled in forms should look like.

Report forms are available from Doug Saw (address on cover) in exchange for a large SAE. Please apply for forms BEFORE Christmas; completed forms should be returned to the Secretary NO LATER THAN THE END OF FEBRUARY.

1977 Julian Date Table

2,443,...

Jan	144	May	264	Sep	387
Feb	175	Jun	295	Oct	417
Mar	203	Jul	325	Nov	448
Apr	234	Aug	356	Dec	478

Dates are for day ZERO; e.g. Jun 5 = ....300, Sep 11 = ....398 etc.

Sample Forms

a) OBSERVATIONS OF: R Andromedae  
 OBSERVER: B.J. Beesley  
 LOCATION: Carrickfergus, Co. Antrim  
 INSTRUMENT: See Remarks  
 SHEET NO 1 of 1

CHART: VSS B1  
 207-209, 209a

YEAR: 1976

Define which chart(s)  
 used

DATE	TIME	JULIAN DATE & DECIMAL	LIGHT ESTIMATE	DED. MAG.	CLASS	REMARKS
	GMAT h m	2442...				
Jan25	0728	803.3	13(3)V(2)17	9.6	1	tx35
Feb08	0808	817.3	17(3)V(1)19	9.8	2	M, Hz Tx36
Mar18	0805	856.3	28(3)V(2)33	11.3	2	20° Tx93
Jul30	1333	990.6	=59, 59+1 (glimpses)	13.7±	3	Visual limit Tx112
Aug15	1220	3006.5	<48, gl.	<12.6	1	M "
	20 1234	011.5	<44, gl??	<12.4	1	Hz "
	25 1159	016.5	<37	<11.7	1	Hz, AV "
	30 1217	021.5	<43-3, gl=56	13.5±	3	LoV "

Name the  
 Month

4 Digits  
 because of  
 change from  
 2999 to 3000  
 otherwise  
 3 digits  
 sufficient

Class 3 because  
 of uncertainty;  
 glimpses only

When Class 3  
 write ±

t = 6cm Refractor  
 T = 15cm Reflector  
 M = Moon  
 Hz = Haze  
 LoV = Limit of Vision  
 AV = Averted Vision

One decimal only except for  
 U Gems (Dwarf Novae), Novae  
 and Nebular Variables

Single Decimal Divisions are:-

03.36 to 05.59	=	0.2
05.00 to 08.23	=	0.3
08.24 to 10.47	=	0.4
10.48 to 13.11	=	0.5
13.12 to 15.35	=	0.6
15.36 to 17.59	=	0.7
18.00 to 20.23	=	0.8



b) OBSERVATIONS OF: AB Draconis  
 OBSERVER: D.R.B. Saw  
 LOCATION: Aylesbury Bucks  
 INSTRUMENT: 350mm Sp. CHART: VSS 195377  
 SHEET NO. (1 of 2) i.e. first of two sheets  
 YEAR: (1976) Don't forget the year

DATE	TIME	JULIAN DATE & DECIMAL	LIGHT ESTIMATE	DED. MAG.	CLASS	REMARKS
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GMAT

h m

2442...

Jan 3	6.50	781.29	=E	12.3	1	
Feb 25	7.30	834.31	E(1)V(2)G	12.5	1	
Mar 1	7.05	839.30	L-2	13.8	1	
2	8.05	840.34	< G-3	<13.2	2	Haze
3	7.35	841.32	< G-1	<13.0	2	Haze
5	7.25	843.31	< K	<13.4	1	
12	7.35	850.32	< G-1	<13.0	2	Moon
26	7.50	864.33	K+1	13.3	1	
Apr 19	10.00	888.42	=K	13.4	1	
20	9.35	889.40	K-3	13.7	1	

Name the Month

Month need not be repeated

Only last 3 digits need be given

Correct notation for fractional method

&lt; means 'fainter than'

Estimated limit 0.3<sup>m</sup> fainter than G (but K not seen)

Two decimals needed only for U Gems, Novae and Nebular Variables

Two decimal conversion table

5 <sup>h</sup> 24 <sup>m</sup> - 38 <sup>m</sup>	= 0.23
5 39 - 52	.24
5 53 - 6 <sup>h</sup> 07 <sup>m</sup>	.25
6 08 - 21	.26
6 22 - 35	.27
6 36 - 50	.28
6 51 - 7 <sup>h</sup> 04 <sup>m</sup>	.29
7 05 - 19	.30
7 20 - 33	.31
7 34 - 47	.32
7 48 - 8 <sup>h</sup> 02 <sup>m</sup>	.33
8 03 - 16	.34
8 17 - 31	.35
8 <sup>h</sup> 32 <sup>m</sup> - 45 <sup>m</sup>	0.36

8 <sup>h</sup> 46 <sup>m</sup> - 59 <sup>m</sup>	= 0.37
9 00 - 14	.38
9 15 - 28	.39
9 29 - 43	.40
9 44 - 57	.41
9 58 - 10 <sup>h</sup> 11 <sup>m</sup>	.42
10 12 - 26	.43
10 27 - 40	.44
10 41 - 55	.45
10 56 - 11 <sup>h</sup> 09 <sup>m</sup>	.46
11 10 - 23	.47
11 24 - 38	.48
11 39 - 52	.49
11 <sup>h</sup> 53 <sup>m</sup> - 12 <sup>h</sup> 07 <sup>m</sup>	0.50

(cont.)

12 <sup>h</sup> 08 <sup>m</sup> - 21 <sup>m</sup>	= 0.51	15 <sup>h</sup> 29 <sup>m</sup> - 43 <sup>m</sup>	= 0.65
12 22 - 35	.52	15 44 - 57	.66
12 36 - 50	.53	15 58 - 16 <sup>h</sup> 11 <sup>m</sup>	.67
12 51 - 13 <sup>h</sup> 04 <sup>m</sup>	.54	16 12 - 26	.68
13 05 - 19	.55	16 27 - 40	.69
13 20 - 33	.56	16 41 - 55	.70
13 34 - 47	.57	16 56 - 17 <sup>h</sup> 09 <sup>m</sup>	.71
13 48 - 14 <sup>h</sup> 02 <sup>m</sup>	.58	17 10 - 23	.72
14 03 - 16	.59	17 24 - 38	.73
14 17 - 31	.60	17 39 - 52	.74
14 32 - 45	.61	17 53 - 18 <sup>h</sup> 07	.75
14 46 - 59	.62	18 08 - 21	.76
15 00 - 14	.63	18 22 - 35	.77
15 15 - 28	.64	18 36 - 50	.78
		18 51 - 19 <sup>h</sup> 04	.79
		19 05 - 19	.80

### Rho Cas

We are introducing new photoelectric magnitudes for comparison stars, as follows:

A (ζ Cas)	3.61	E (σ Cas)	4.89
B (κ Cas)	4.15	H	5.56
C (θ Cas)	4.33	K	6.00
D (λ Cas)	4.73		

Comparisons F (= δ Cas) and G are being dropped from the sequence; however, when reducing 1977 results for submission (see above) they may be taken as 4.87 and 5.57 respectively, if necessary.

### U Gem

Garvine et al. report intense ultrasoft X-ray emission from U Gem during the October outburst (IAU Circ.3125). "Preliminary spectral analysis yields a temperature of less than 0.04 K" (!)

### 1976 Light-Curves (Continued from VSSC 32)

HR Del: Thanks to Beesley for a.m. observations. Possible decline from 11.3 to 11.5 during the year.

AB Dra: Irregular behaviour continues; some maxima no brighter than 12.8/9. Maxima were seen about Jan 3, Feb 11, 25, Mar 23, Apr 25, Jun 6, Jul 5, 24, Sep 7, Oct 5, Nov 19. Assuming maxima missed in mid-May, late Oct and mid-Dec, the mean interval was 28<sup>d</sup>. The star is badly underobserved.

U Gem: The only max seen was 9.3 on Feb 28. It was caught on the 27th on the rise at 10.7 by James Bryan, our observer in Texas. Another max on Oct 4 was missed by the VSS, but may have been seen fading at 13.1 by Beesley on Oct 23.

CS Her: Thanks to Beesley and Griffin for a.m. observations. Near max (8.6) on Jan 2, min (12.9) Feb 26, max (9.8) Apr 13, min (12.9) Jun 5, max (9.5) Jul 27, poorly observed min (probably 12.9) about Sep 14, bright max (9.2) Nov 4, lost on Nov 13. Period 100 to 105<sup>d</sup>.

AC Her: Thanks to Brelstaff, Broadbent, Griffin and Swain for a.m. observations. Max (7.1 to 7.3) occurred about Jan 23, Mar 1, Apr 8, May 15, Jun 21, Jul 30, Sep 3, Oct 15, Nov 22, Dec 30. Primary (8.6-8.8) and secondary (7.9-8.1) minima on Feb 13, Mar 23, Apr 28, Jun 5, Jul 14, Aug 19, Sep 26, Nov 6, Dec 14 to give double period of 76 days.

AH Her: Only two observations before max (11.4) Apr 5; further max Apr 28 (11.6), May 18 (11.7), Jun 8 (11.3), Jun 30 (11.5), Jul 17 (11.4), Aug 8 (11.6), Aug 26 (11.3), Nov 2 (11.4). Assuming max were missed in Sep & Oct, a mean period of 21.2 days results. Under-observed, especially Oct to Mar.

R Hya: Thanks to Beesley, Brelstaff, McLeod, Spalding for a.m. observations of this important star. Rose from 6.3 on Jan 2 to max (5.1) Feb 20. Fell to 7.7 on Jun 1 (last observation).

SU Lac: Only one class three observation! Jan 14, 12.9 $\pm$ .

X Leo: Thanks to Beesley, Moore, Munford for a.m. observations. Max Jan 22 (12.1), Feb 11 (12.2), 24 (12.1), probably Mar 10 (12.2), 26 (12.2), irregular 12.8/13.0 on Mar 31 and Apr 1, max Apr 7 (12.4), 20 (12.1, long), May 2 (12.5), 18 (12.0, long), Nov 6 (12.1), Dec 22 (12.2). Mean period Jan to May, 14 $\frac{1}{2}$  d.

R LMi: Rose from 9.3 in early Jan to sharp max (6.9) about Mar 2. Lost at 9.9 on Jun 9. Recovered (Beesley) at 11.2 on Sep 11. Poorly observed to end of year but min (probably 12.6) in second half of Oct.

AY Lyr: Max about Jan 3 (13.1), Jul 5 (13.1), very long max (12.8) well observed July 22 - Aug 6, Aug 22 (13.4), Sep 26 (13.2).

U Mon: Max Feb 9 (5.9), Mar 26 (6.0), Nov 6 (5.9), Dec 20 (5.9). Primary min (7.2), Mar 4; secondary min Jan 19 (6.7), Apr 16 (6.9), Nov 30 (6.7).

RS Oph: Irregular variability (11.1-11.5) till end of June. Definite brightening during July reaching max (10.3) early in Aug. Decline to end of Aug after which 11.0  $\pm$  0.3.

U Ori: Fell from 10.3 to min (12.6) about Apr 6. Lost Apr 24 when rising, 12.3. Recovered Aug 12 at 7.8, reaching max of 6.8 about Sep 14. Fall to 9.9 by end of the year.

CN Ori: Maxima (all 12.0 - 12.1) about Jan 26, Feb 29, standstill mid-March, max Apr 4, Nov 16, Dec 2. Possible standstill mid-Dec. Underobserved.

CZ Ori: Max about Jan 3, 30, Mar 5, Apr 3 (11.8, long), Nov 18, Dec 22. Underobserved. Both CN and CZ undoubtedly have many maxima missed, especially Sep-Nov.

RU Peg: Maxima (10.2 - 10.3) about Jan 13, Apr 7, Sep 8; no maxima missed, but underobserved in the first half of the year.

S Per: Fell from 11.3 early in Jan to a record min of 12.1 about Mar 13. Rose slowly throughout remainder of the year, reaching 9.2 during the last days of Dec.

RS Per: Fell from 8.2 at start of the year to 8.7/8 in mid-March. Lost late Apr; recovered mid Jul at 8.7, and remained 8.6-8 until mid-Oct. Rose to 8.2 during the last half of Oct and remained 8.2/3 till the end of the year.

TZ Per: Irregular fluctuations 13.0 - 13.5 until max (12.2) on Jun 20. Fell to 13.2 until Aug 3, when a dip to 13.8/14.0 may have lasted 2-3 days. Thereafter 13.0 - 13.6 until the end of the year.

UV Per: No max observed. One positive observation at 15.9, but observer suspects sequence error and UV actually 17<sup>m</sup>.

BU Per: Probably 9.7 - 10.0 until early Aug. Rise to 9.5/7

until early Dec, falling to 9.9 by the end of the year. Large scatter in observations.

WZ Sge: No positive obs. Probably fainter than 14.6 all year.

R Sct: Secondary min (6.1) Feb 9, max (5.5) Feb 28, min I (7.7) Apr 19, max (5.2) Jun 1, min II (5.8) Jun 27, max (5.1) Jul 19, min I (7.7) Sep 20, max (5.1) Oct 28, min II (5.9) Nov 21. Period from primary minima = 154<sup>d</sup>. Fairly well covered Jan-Apr due to the excellent work of the following a.m. observers: Beesley, Brelstaff, Bullivant, Chesterfield, Griffin, Rothery, Swain, Shanklin.

R Ser: Fall from 10.2 early in Jan to 13.4 min about May 4. Rise to max (7.8) about Aug 31. Decline to 9.2 Nov 13 (last obs.).

RV Tau: Min (10.2) Jan 24, max (9.0) Feb 11, min (10.2) Mar 4, max (9.2) Mar 23 ... min (10.9) Aug 18, max (9.3) Aug 31, min (10.4) Sep 28, max (9.5) Oct 14, min (10.8) Nov 3, max (9.4) Nov 19, min (10.0) Dec 9. Double period about 77<sup>d</sup>.

CI Tau: Near max, 9.7 - 10.2, until lost on May 1. Recovered Aug 12 at 10.8; 14, 11.6; thereafter all observations negative, fainter than 14.3 at end of year.

T UMa: Near max (7.5) at start of year. Fell to min (12.9) about Jun 22. Rose to max (7.7) about Sep 14, fell to 12.3 by late Dec.

SU UMa: Maxima (12.0-2) on Jan 30, Feb 29, Apr 8, 27, May 25, Aug 5. Supermax (11.7) Sep 16-23, then max (12.0/1) about Nov 2, 24 and Dec 11.

SW UMa: One max (11.3) Nov 15. Fell to 13.8 by Nov 18. Badly underobserved.

CH UMa: One max (10.8) Apr 22. Minimum 14.3-15.1. Underobserved.

RS Vir: Thanks to Beesley, Broadbent, Griffin and Shanklin for a.m. observations. Underobserved, especially until Apr. Min (13.6) about Jan 28. Rose to max (7.9) mid May, then falling to 10.9 on Sep 11, 14.1 on Nov 26.

V Vul: Max (8.4-8.7) about Jan 27, Mar 15, Apr 23, Jun 2, Jul 10, Aug 16, Sep 24, Nov 6. Double period about 80<sup>d</sup>. Underobserved.

NQ Vul: Oct 21, 7.0. Oscillations 6.9-7.3 until Nov 1. Nov 2, 6.3; 3, 7.6; 4, 8.4; rose to 7.6 on 13. Decline with oscillations to 8.5 on Dec 11. Gap until Dec 21, 8.8. Fell to 9.5 on Dec 28.

#### NEW MEMBERS

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# THE MAIN PROGRAMME OF THE BAA V.S.S. (November 1977)

Star	Type	No. dec.	Star	Type	No. dec.	Star	Type	No. dec.
R And	M	1	BC Cyg	SR	1	*V359 Ori	Inas	2
W And	M	1	BI Cyg	SR	1	*V361 Ori	Inas	2
RW And	M	1	CI Cyg	ZAnd	1	*V372 Ori	Ina	2
RX And	Z	2	VL500 Cyg	Noval	1975	V529 Ori	Nr?	1
DZ And	RCB	1	X Cyg	M	1	*V566 Ori	Inas	2
R Aql	M	1	HR Del	Noval	1967	*CSV 100567	?	2
UU Aql	UG	2	T Dra	M	1	*'Var No 2 Ori'	?	2
UW Aql	SR	1	AB Dra	Z	2	RU Peg	UG	2
RW Aur	Ist	2	U Gem	UG	2	S Per	SR	1
SS Aur	Z	2	*U Her	M	1	RS Per	SR	1
SU Aur	Ins	2	RU Her	M	1	TZ Per	Z	2
U Boo	SR	1	SS Her	M	1	UV Per	UG	2
V Boo	SR	1	AC Her	RV	1	BU Per	SR	1
V Cam	M	1	AH Her	Z	2	GK Per	Noval	1901
X Cam	M	1	R Hya	M	1	WZ Sge	Nr	2
Z Cam	Z	2	SU Lac	M	1	Nova Sge	1977	2
XX Cam	RCB	1	X Leo	UG	2	R Sct	RV	1
S Cas	M	1	*R LMi	M	1	R Ser	M	1
T Cas	M	1	AY Lyr	UG	2	T Tau	InT	2
UV Cas	RCB	1	U Mon	RV	1	RV Tau	RV	1
Y Cas	YC	1	RS Oph	Nr	2	*RY Tau	Int	2
o Cas	SR?	1	*T Ori	Inas	2	SU Tau	RCB	1
Mira Cet	M	1	U Ori	M	1	BW Tau	*	1
R CrB	RCB	1	CN Ori	Z	2	T UMa	M	1
S CrB	M	1	CZ Ori	UG	2	SU UMa	UG	2
T CrB	Nr	1	*GW Ori	Inb	2	SW UMa	UG	2
V CrB	M	1	*IU Ori	E?	2	CH UMa	UG	2
W CrB	M	1	*KS Ori	Ina	2	*RS Vir	M	1
R Cyg	M	1	*KX Ori	Ina?	2	*RT Vir	SR	1
S Cyg	M	1	*LP Ori	Inas?	2	V Vul	RV	1
V Cyg	M	1	*MX Ori	Inbs?	2	NQ Vul	Noval	1976
W Cyg	SR	1	*NU Ori	Inas?	2			1
SS Cyg	UG	2	*NV Ori	Inbs	2			

\*No longer on VSS programme; 1977 results should, however, be reported as usual.

'No. dec.' gives no. of decimals to which time is required on report forms.