

BRITISH ASTRONOMICAL ASSOCIATION: VARIABLE STAR SECTION

CIRCULAR No 17

1974 JANUARY

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The Director asks members to note his new address given above. The move has caused some disruption of the Section's work, and it is the reason for the lateness of this Circular, but it is hoped that normality will be restored by the time this Circular is in the hands of members.

R Coronae Borealis. The current minimum of R CrB was first reported to the Director by Peter Hornby on Dec. 16, enabling the IAU International Bureau for Astronomical Telegrams to be notified at an early stage. The star had fallen to 8.3 at the end of December according to the latest observations available at the time of writing. Since R CrB is now an early morning object, all estimates will be of considerable value.

International Project on RV Tauri stars. VSSC 16 referred to this project, in which all variable star organisations in Western Europe are participating. Observations of the stars listed below are to begin immediately, and to continue for either 18 months or 2 years, and the results should be reported annually along with routine VSS work. One of the 20 stars concerned, RV Tauri is already under study by the Section, and two others (CO Aur, AC Her) are already observed by the Binocular Sky Society. Being south of the equator, U Mon and R Sct are not included in the project, although they remain on the VSS programme.

Name	Harvard Design.	Visual range	Period	Type
CO Aur	055335	7.3 - 8.1	39.6 ^d	RV?
TW Cam	041257	9.8 - 10.6	85.6	RVa
EQ Cas	234754	11.7 - 13.4	58.31	RVa
DF Cyg	194542	10.1 - 13.9	49.808	RVb
V360 Cyg	210630	10.6 - 12.8	70.449	RV
SS Gem	060222	8.7 - 10.0	89.31	RV
SU Gem	060727	9.9 - 12.2	50.12	RVb
AC Her	182621	7.0 - 8.4	75.462	RVa
EG Lyr	190738	11.1 - 13.1	136.7	RV
EP Lyr	191427	10.0 - 11.4	83.315	RVa
TT Oph	164403	9.8 - 11.1	61.08	RVa
TX Oph	165905	9.3 - 11.3	135	RVa
UZ Oph	171707	9.6 - 11.9	87.44	RVa
V564 Oph	174707	9.8 - 10.4	70.6	RV
CT Ori	060409	10.3 - 11.6	135.52	RV
DY Ori	060013	11.1 - 11.8	60.26	RV?
R Sge	200916	8.9 - 10.6	70.594	RVb
Z Sex	100503	8.3 - 9.2	57	RV?
RV Tau	044126	9.2 - 11.7	78.698	RVb
V Vul	203226	8.1 - 9.4	75.72	RVa

Charts for the stars between 0^h and 12^h RA are already available from Steve Anderson. Those for CO Aur, SS Gem and RV Tau are 'final' charts, and the remainder are preliminary. Charts for stars between 12^h and 24^h RA will be available shortly.

RV Tauri. Different comparison star sequences for this object have been in use among the various variable star organisations, and it has therefore been decided to revise the sequence used by the VSS in accordance with Series IX of the Atlas Stellarum Variabilium for stars fainter than magnitude 9. This sequence is now compatible with that used by the AAVSO. The new values are as follows:

Beta	7.5	3	9.5	31	11.1	48	12.4
Gamma	7.8	7	10.0	32	11.2	49	12.5
Delta	8.7	9	10.2	34	11.8	50	12.6
1	9.1	17	10.6	39	12.2	51	12.7
2	9.4	28	10.9	43	12.3		

Stars 48 and 49 are not shown on the 1° field chart dated 1961 Mar, which is in use by most observers. Their positions are as follows:

48: Just over half-way from 7 to RV, 7' West and 3' North of the variable.

49: 1' due West of 31.

Revised charts for RV Tau are available from Steve Anderson.

VSS Programme. The committee mentioned in the last Circular has completed its initial review of the VSS programme, and has made the following recommendations which are to be implemented:

- (1) The following Mira stars, which are of particular interest for one reason or another (variable period, variable amplitude, etc.), should be retained:

R And	S Cas	R Cyg	R Hya
R Aql	o Cet	S Cyg	U Ori
V Cam	S CrB	Chi Cyg	R Ser
X Cam	W CrB	SS Her	T UMa

- (2) The following Mira stars, which are not of special interest and which are adequately observed by the AAVSO and other groups, should be dropped:

R Ari	W Cas	T Her	R Per
R Aur	S Cep	U Her	R Tri
X Aur	T Cep	R Leo	R UMa
R Boo	U Cyg	R Lyn	S UMa
S Boo	S Del	W Lyr	S UMi
R Cas	R Dra	R Peg	S Vir
T Cas	R Gem		

- (3) The following objects of various types should be included in the programme, along with the balance of the SRC stars listed in VSSC 13:

Name	Harvard Design.	Extreme range		Period	Type
DZ And	002725	10.0 - (14.0	v	-	RCB?
VY Aqr	210609	8.0 - 16.6	p	55 ^{y?}	Nr
XX Cam	040053	8.7 - 10.3	p	-	RCB
UV Cas	225859	11.8 - 16.5	p	-	RCB
CI Cyg	194635	10.7 - 13.1	p	800 ^{d?}	Z And
SU Lac	221955	11.3 - 16	p	319 ^d	M
V529 Ori	055420	6: - (11	v	114 ^{y?}	Nr?
GK Per	032443	0.2 -14.0	v	-	Na
BW Tau	042705	13.7 - 14.8	p	-	Seyfert galaxy

- (4) Some of the RV Tauri stars mentioned earlier should be retained after the end of the international project.

Although the Director suggested phasing out the stars listed under (2) above as charts for additions to the programme became available, other members of the committee felt that these stars should be dropped immediately, in order to encourage members to concentrate on the objects new to the programme, and that the effects of the consequent decrease in the size of the programme would be offset by the addition of the 19 RV Tauri stars for the duration of the international project. The Director bowed to the general consensus of opinion, and accordingly requests that observers

whose current working lists include any of these 26 Mira stars now drop them in favour of the additions to the programme.

It is hoped that charts for the stars listed under (3) above will be available before the end of 1974. A complete list of stars under observation in 1974 will be published with the next Circular.

1973 observations. Observers are asked to submit their observations for 1973 to the Secretary, who has to prepare a tabular summary of observations received for each star (used in planning changes to the programme and allocating work among observers, as well as for the summary in the annual Council report), to plot the observations onto separate graphs for each star and to edit the observations in preparation for the logging of the results to be published in the first of our duplicated annual Reports listing individual estimates. In order that all this work can be as complete as possible, and not subject to unnecessary delay, observers should ensure that their results are in the Secretary's hands before the end of March.

Report forms will be supplied free of charge by the Secretary, but members should enclose return postage. The second class postal charge for up to 15 forms is 3p, up to 30 - 4p, up to 45 - 5½p, up to 60 - 7p, up to 90 - 10p, up to 120 - 13p.

Volunteers (preferably not beginners at variable star work) to check magnitude reductions should contact the Secretary, who will supply full instructions.

IAU Flare Star Patrols. The programme of international patrols on flare stars, arranged by IAU Commission 27, had not been announced at the time of writing. It will be published in a BAA Circular as soon as details are known.

AB Draconis. Observers are asked to disregard the note on this star appearing on page 5 of VSSC 16, since it is possible that further amendments will be required to the charts and sequence.

AY Lyrae. It has come to the Director's attention that several observers are using an out-of-date comparison star sequence for this object. The magnitudes to be used are:

A	9.1	G	12.8	O	13.9
B	10.3	H	12.8	P	14.2
C	10.7	K	12.9	Q	14.4
D	11.3	L	13.3	R	14.7
E	11.5	M	13.4	S	15.0
F	11.8	N	13.6	T	15.3

Preliminary Charts. The following list of preliminary charts currently in use replaces that published in VSSC 15. An asterisk in the "Remarks" column signifies that the Director will welcome comments on the accuracy of the charts and comparison star magnitudes. The absence of an asterisk signifies that the comments already received from observers may be sufficient to prepare final charts and sequences. However, for the present, efforts will be concentrated on the preparation of further preliminary charts for the stars to be added to our working list.

"Seq" indicates that the comparison star magnitudes are given on a separate list; in other cases, they are included on the largest scale chart - e.g. on the 1° field chart for UV Cet.

Chart	Star	Field	Date	Remarks
P1	{ BC Cyg { BI Cyg	2°	1972 May	needs revision
P2	EV Lac	3°	1972 Jun	}
P3	UV Cet	9°	1972 Jun	} for use in international patrols
P4	UV Cet	1°	1972 Jun	}
P5	-			
P6	UW Aql	9°	1972 Aug	
P7	UW Aql	2°	1972 Aug	needs revision
P8	{ RS Per { BU Per	1°	1972 Oct	needs revision
P9	AD Leo	3°	1972 Oct	for use in international patrols
P10	-			
P11	CH UMa	9°	1972 Oct	= SVS 1851
P12	CH UMa	1°	1972 Oct	*
P13	HT Cas	9°	1971 Feb	

P14	HT Cas	1°	1971 Feb	
P15	HT Cas	20'	1973 Feb	*
P16	AB Dra	9°	1969 Jun	to be replaced by 3° chart
P17	AB Dra	1°	1969 May	
P18	AB Dra	20'	1969 May	*
P19	AF Cam	9°	1969 Jun	}
P20	AF Cam	1°	1969 May	} believed OK
P21	AF Cam	20'	1969 May	}
P22	-			
P23	AY Lyr	1°	1969 May	} believed OK
P24	AY Lyr	20'	1969 May	}
P25	WZ Sge	9°	1973 Jun	
P26	WZ Sge	3°	1973 Jun	
P27	WZ Sge	1°	1973 Jun	
P28	WZ Sge	20'	1973 Jun	*
P29	WZ Sge	Seq	1973 Jun	*
P30	-			
P31	TW Cam	9°	1973 Dec	
P32	TW Cam	1°	1973 Dec	
P33	TW Cam	Seq	1973 Dec	*
P34	DY Ori	3°	1973 Dec	
P35	DY Ori	1°	1973 Dec	
P36	DY Ori	Seq	1973 Dec	*
P37	CT Ori	9°	1973 Dec	
P38	CT Ori	1°	1973 Dec	
P39	CT Ori	Seq	1973 Dec	*
P40	SU Gem	1°	1973 Dec	for 9° chart use 373 (SS Gem)
P41	SU Gem	Seq	1973 Dec	*
P42	Z Sex	9°	1973 Dec	
P43	Z Sex	3°	1973 Dec	
P44	Z Sex	Seq	1973 Dec	*

The preliminary charts for AH Her promised in the last Circular have not, in fact, been drawn up yet, but copies will be sent to those members who have requested them as soon as they are available.

Suspected Variable. E Waring (1 Little Stoke Road, Stoke Bishop, Bristol 9) writes concerning his K-type suspected variable BD +32° 3848, at (1950) 20^h 29.5^m, +32° 30' (see VSSC 13), as follows: "Brian Jobson, of Glasgow, was the only person who contributed observations, from August 1972. His results (Aug - Dec 1972) showed the star fairly steady at 9.4, with some drops to 9.6. My results for the same period showed a decline from 9.6 to 9.9. At the end of the year we seemed to be quite out of agreement, and I didn't think we were going to prove anything. However, 1973 has been much better. From Feb to the end of July we agree almost exactly, showing the star as rising from 9.7 to 9.4. Obviously if variable it is of low amplitude. My suggestion, based on previous years' observing, of a period of about a year is consistent with these results. Unfortunately Brian Jobson has moved house, and is no longer well placed for observing." Observers interested in joining in the investigation should write to Mr. Waring for a chart and comparison star sequence.

Device for Converting Times to Decimals. The new report forms, discussed in the last Circular, require observers to convert times in hours and minutes to decimals of a day. The required accuracy is to one or two decimal places, depending on the type of the variable, and the conversion can be carried out rapidly using the critical table published in the "Methods" pamphlet.

Mr. J. Shepherd (13 Park Road, Gravesend, Kent) has constructed a device which enables a rapid conversion to be made to three or, at a pinch, four decimals. Since the occasions on which such accuracy is required are likely to be exceptional we are not publishing a full account here, but further information is available from Mr. Shepherd.

Future Circulars. We are looking into the possibility of producing more substantial Circulars more frequently, but to do this without charging a subscription will mean restricting our mailing list to about 100 known active observers. For the immediate future, it is intended to publish Circulars three times a year, in April, August and December. (In the event of a nova being discovered, a special additional Circular will be issued, containing a chart and preliminary comparison star sequence). Material for inclusion in the Circulars should be sent to the Director before the end of the

month preceding publication. This material may consist of articles, letters, comments or reports of interesting or unusual observations.

Change of Address. Members requiring Eclipsing Binary Predictions are asked to note that J C Smith's address is now 18 St. James' Close, Hanslope, Buckinghamshire (Tel: Hanslope 720).

Published jointly by the 'Variable Star Section' and 'Instruments and Observing Methods Section' of the British Astronomical Association.

Introduction. This Supplement, which, it is hoped, will be published regularly with each of the VSS Circulars, is intended as a means by which members of the Association can exchange information on photoelectric equipment and techniques, not necessarily exclusively in the field of variable stars. The duplicated format of the Supplement should encourage members to contribute notes for discussion where they would not be prepared to submit more formal papers or letters for publication in the Journal; but it is not our intention to discourage members from using the Journal, which has a wider readership. Indeed, Council has invited Mr. H K Robin, who has constructed a successful photoelectric photometer for less than £40), to describe his experiences in a paper which will be published in the Journal.

Contributions to the Supplement should be sent in by the middle of the month preceding publication (i.e. by mid-Mar, mid-Aug or mid-Nov) to:

D C Salter
16 Moore Lane,
St. Budeaux,
Plymouth PL5 1UA

Mr. Salter, who introduces himself below, will be the Editor of future Supplements.

Attention is drawn to two notices which have appeared in recent VSS Circulars:

VSSC 15, 1973 Apr: M Page gives a general discussion on photoelectric techniques using a 200 mm reflector and a photomultiplier.

VSSC 16, 1973 Sep: E G Moore discusses possible solid state replacements for the photomultiplier, and safety considerations in the use of electrical equipment attached to telescopes.

Photoelectric Projects. Three-colour photometry in the U, B, V system used by professional astronomers is considered by some to be too difficult for most amateurs. The following possible applications of photoelectric photometry are not subject to the same constraints:

1. Timing minima of eclipsing binaries. There are many hundreds of systems, mostly fainter than tenth magnitude, which have rarely or never been observed photoelectrically. Measures of the difference in magnitude between a variable and a comparison star accurate to $\pm 0.05m$ will yield a time of minimum accurate to $\pm 0.002d$ or better for most systems. Since the time of minimum will be nearly the same at all wavelengths in most eclipsing systems, it is not necessary that the spectral response of the equipment be constant over periods longer than a few hours.
2. Measures of comparison stars for variables to be observed visually. An accuracy of $\pm 0.05m$, and effective wavelength close to that of the eye, are required. The range in which such work would be most useful is between magnitudes 10 and 15.
3. Timing occultations at the Moon's dark limb. Because of the element of uncertainty in the limb profile, such timings need not be more accurate than $\pm 0.1s$.

(J E I)

Pulse-counting. D C Salter (16 Moor Lane, St. Budeaux, Plymouth PL5 1UA writes "Perhaps some of the current interest in photoelectric photometry has been generated by the information on pulse-counting techniques using photomultipliers given in the JBAA two or three years ago; certainly this prompted me to start a couple of experiments which you might perhaps be interested to hear about. The original idea was to obtain magnitude estimates, to 0.1m or better, by shining a diffuse light through slides showing the stars concerned. I developed a sort of 'optical bridge' technique to measure the size of small holes, and, via this, to give the magnitudes. It uses a little microphotometer which I built using as detector a photosensitive device made by Microelectronics Ltd.; this is basically a Darlington pair on a chip under a plastic lens, the whole being rather smaller than a normal transistor. The microphotometer isn't calibrated properly yet, but it caused some interest at Rank Optics when I visited them in Leeds in November.

I am particularly interested in pulse-counting techniques, even though the original advantages of these methods have now largely disappeared due to the improvements in DC amplifiers. I had been hoping to start some experiments using, for example, unijunction trigger circuits in conjunction with the little microphotometer since such equipment is very cheap to make.

However, I also have experience of photomultiplier methods since in addition to the usual nuclear scintillation techniques, the Physics Department at Durham University is also very used to pulse-counting methods, and is developing an extremely sensitive light detector using a photomultiplier and pulse-counter to detect optical bremsstrahlung from high-energy cosmic rays. Actually we are all very interested in astronomy up there, and I gave a colloquium on 'Electronic Aids to Optical Astronomy' only a couple of weeks ago, which dealt mainly with multi-channel photometers and filter techniques."

P Helm (74 Neston Road, Walshaw, near Bury, Lancashire) writes: "I have the means to calibrate equipment in the range 0.01 to 10^{12} foot lamberts (0.0032 to 3.2×10^{11} candles per sq. ft.). The instrument is as accurate as the reading of the scale. Is this service of interest?"

PREDICTED BRIGHTNESS OF LONG PERIOD VARIABLES IN 1974

The following diagram indicates when the Mira and SRa variables on the VSS programme are expected to be brighter than magnitude 9 and therefore observable in binoculars (XXX), between magnitudes 9 and 11 and therefore within the range of instruments of 75 - 100 mm aperture (xxx), between magnitudes 11 and 13.5 and therefore within the range of about 150 mm aperture (---), and fainter than magnitude 13.5 and therefore requiring observation with large instruments (blank). The predicted dates of maximum and minimum are indicated by M and m respectively.

It must be remembered that considerable deviations from the predicted behaviour can occur and observers should not allow these predictions to influence their observations. The purpose of these predictions is simply to indicate which stars are worth looking for on a given date with an instrument of a given aperture.

Star	Mean range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
001838	R Cyg	6.9 - 14.3	-		m		---	-xx	XXX	XXM	XXX	XXX	xxx	xx-
011272	S Cas	8.9 - 14.8	xxx	xx-	---	---	--						m	
021403	o Cet	3.5 - 9.2	XXX	XXX	XXX	MXX	XXX	XXX	XXX	XXX	xxx	mxx	XXX	
043274	X Cam	8.1 - 12.6	xxX	XXM	xxx	--m	--x	xXX	MXX	xxx	--m	-xx	XXM	XXx
054974	V Cam	9.9 - 15.4				m				-	-xx	Mxx	x--	
054920	U Ori	6.3 - 12.0	x--	---	-m-	---	xxx	xXX	XXM	XXX	XXX	XXX	xxx	xxx
123160	T UMa	7.7 - 12.9	XXX	xxx	x--	---	-m-	---	xxX	XXM	XXX	Xxx	xx-	---
132422	R Hya	4.5 - 9.5	XXM	XXX	XXX	XXX	XXX	XXX	Xxx	xxm	xxx	XXX	XXX	XXX
142539	V Boo	7.6 - 10.4	xxm	xxx	xxX	XXX	XXX	MXX	XXX	XXx	xxx	xmx	xxx	XXX
151731	S CrB	7.3 - 12.9	XXX	MXX	XXX	Xxx	xxx	xx-	---	---	-m-	---	---	xxX
154615	R Ser	6.9 - 13.4	xxx	xx-	---	---	m--	---	-xx	xxX	XXM	XXX	XXX	XXx
161138	W CrB	8.5 - 13.5	XXx	xxx	---	---	m--	---	-xx	XXM	Xxx	xx-	---	---
162807	SS Her	9.1 - 12.4	xxx	-m-	-xx	xMx	x--	m--	xxM	xxx	--m	-xx	xMx	x--
190108	R Aql	6.1 - 11.5	Xxx	xxx	--m	--x	xxx	xxX	XXX	XXM	XXX	XXX	xxx	xxx
193439	R Cyg	7.5 - 13.9	XXX	xxx	xxx	x--	---	---	m	--	---	-xx	xXX	
194632	Chi Cyg	5.2 - 13.4	XXX	XXX	XXM	XXX	XXX	XXx	xxx	x--	---	-m-	---	---
200357	S Cyg	10.3 - 16.0					Mxx	---	--			m		
221955	SU Lac	10 - 14												

No reliable predictions available