BRITISH ASTRONOMICAL ASSOCIATION

VARIABLE STAR SECTION

CIRCULAR No. 245

OFFICERS OF THE V.S.S.

Director:J.E. Isles, 118 Liverpool Road, Watford, Herts.
WD1 8DNSecretary:D.R.B. Saw, 12 Taylor Road, Aylesbury, Bucks.
HP21 8DRChart Curator:S.J. Anderson, 65 Peartree Road, Luton, Beds.
LU2 8AZCirculars:S.R. Dunlop, 140 Stocks Lane, East Wittering,
Nr. Chichester, W.Sussex. PO20 8NT

BINOCULAR GROUP

Co-ordinator: D.A. Pickup, 38 Brockwood Avenue, Penicuick. Midlothian. EH26 9AN Tel: Penicuick 72098

Asst. Co-ordinator: A.L. Smith, 11 Lerryn Road, Gosport, Hants. P013 OYG Tel: Fareham (032 92) 4677

Recorder: A.E.J. Forno, 92 Crockford Park Road, Addlestone, Surrey. KT15 2LR Tel: Weybridge (0932) 44668

ECLIPSING BINARY PROGRAMME

Co-ordinator: P.W. Hornby, 3 Mount Gardens, Leeds 17.

Predictions: J.C. Smith, 18 St. James' Close, Hanslope, Bucks.

NOVA SEARCH PROGRAMME

<u>Co-ordinator</u>: C.V. Borzelli, 12 Corbin Avenue, Jersey City, N.J. 07306, U.S.A. BRITISH ASTRONOMICAL ASSOCIATION: VARIABLE STAR SECTION CIRCULAR No. 25 1976 MARCH

<u>Charts.</u> The last Circular referred to the considerable amount of work which needs to be done in order to make available charts for objects which ought to be on our programme, and to overhaul existing charts and sequences. It is now planned to set up a Chart Comittee to tackle these tasks, and further details will be anounced in a future VSSC. Meanwhile, in the absence of a detailed chart catalogue, this Circular includes a list of objects on our main programme, indicating which charts are no held by the Chart Curator because they are either out of print or do not yet exist. We hope to follow this up with binocular and eclipsing binary lists in future Circulars.

<u>V 1500 Cyg (Nova 1975)</u>. The charts available now are as follows: N44 3 field (comparisons to 9.8)

N45 Sequence to 9.8

N46 1° field (comparisons to 12.4)

N47 20' field with sequence to 14.7

This information supersedes that given in VSSC 24. Comparison with photographs by W.E. Pennell and the photovisual magnitudes on the AAVSO preliminary (b)chart indicates that the magnitudes of comparisons K to P in the preliminary sequence issued in 1975 September were too bright. The revised values to be used are: K 8.0, L 8.6, M 9.0, N 9.7, P 9.8. The adopted magnitudes from 9.9 to 14.7 are based on Pennell's photovisual and visual estimates, but are corrected by +0.2 to tie in with the brighter part of the sequence.

<u>1975 Observations</u>. Any estimates made last year which have not yet been reported are now considerably overdue and should be reported at once to Doug Saw, Alan Forno, Peter Hornby or the Director, as appropriate (see VSSC 24). Last year's results are already being used to answer the requests for information we receive from professional astronomers, and if you want maximum use to be made of your work you must submit it promptly.

<u>Netherlands Astronomical Satellite</u>. ANS stopped performing pointing observations in mid-November. The ultra-violet instrument is no longer being operated but the satellite is still scanning the sky picking up the bright X-ray sources as they pass through the visibility windows (see B.A.A. Circular 561). Data are recorded and dumped at NASA ground stations twice a day.

A few observers have communicated their visual estimates of the stars listed in the Circular to the Director in time for inclusion in the reports requested by Dr. C.C. Wu, Dept. of Space Research, University of Groningen.

<u>AR And</u>. On 1975 Jan 28-9 a maximum was observed in the UV at five bandpasses centred at 1500, 1800, 2200, 2500 and 3300 Å. This dwarf nova is not observed by the VSS, but AAVSO Circular 52 reported a 13.0 maximum on Jan 29.

<u>SS Aur</u>. This star was observed on Mar 22 and 23. A large increase in the signal was recorded at 16h UT on Mar 23, as it was rising to a short maximum.

<u>Z Cam.</u> On Apr 5, 6 and 7 this object, visually at a standstill of 11.7, was very bright in the UV.

Other stars for which good data were recorded included <u>R CrB</u> and <u>W UMa</u>; <u>R CrB</u> was at maximum (windows centred on <u>Feb</u> 5 and Aug 9), and W UMa (Apr 28 and Oct 31) was performing about 0.10 later than according to the elements in the 1969 GCVS.

<u>AH Her</u> (window Aug 29) was at maximum $(11^{m}_{..5})$ at the beginning of September, and <u>U Gem</u> (window Oct 21) was at maximum $(9^{m}_{..0})$ at the end

of October, and our visual curves are now being compared with the UV data.

There is no need for observers to send further reports on these stars to the Director, unless the UV telescope should be re-activated in which case an announcement will be published.

VSSC 24 announced the end of a collaborative pro-T Tauri stars. gramme of visual observation of several of these objects by the VSS and spectroscopic observation by R Forrest at Herstmonceux, with the object of investigating any correlation between the velocities of the emission and absorption lines and visual magnitude. The results of our own observations were as follows.

<u>RW Aur</u>. Spectacular variations between $9^{m}_{\cdot}4$ and $12^{m}_{\cdot}5$, deep minima occurring around 1974 Oct 16, Dec 24, 1975 Jan 20, Sep 24, Nov 6. Possible slow oscillations with a period around 50^d in SU Aur. both observing seasons; range 8.8 - 9.4.

In 1974/5 a possible slow decline 9.5 - 9.7. Sensibly GW Ori. constant at 9.3 in late 1975. (A possible rapid variation was ob-served on the TV finder screen of the 98 in. telescope by Forrest and the night assistant on 1975 Jan 31, the star fading by a magni-tude and recovering in the space of 15 minutes. Unfortunately we had only one observation that night, about two hours later.)

T Tau. No definte variation from 10^m3, but the unusually high scatter 9.7 - 10.7 may conceal rapid variations. RY Tau. Possible slow variations 10.5 - 10.8 in 1974/5; sen-

sibly constant at 10.75 in late 1975.

UX Tau. Not tackled officially but a few observations made by Porter showed rapid night-to-night variations 10.5 - 12.6 in similar style to RW Aur.

Examination of the spectrum plates in continuing, and it is known that another observer at Herstmonceux is undertaking a similar project so VSS participants are advised to keep working on these stars. Special thanks are due to O.J. Knox, B.J. Beesley and A.K. Porter for their superb series of observations.

Canterbury H₂O stars. BAA Circular 562 announced another collaborative project, with the Radio Astronomy Group at the University of Kent at Canterbury; the team headed by Dr. E.A. Parker is observing a number of water vapour emission line sources at 22 GHz and hope to correlate changes in the H_2O spectra with VSS light-curves. R LMi and RS Vir were temporarily added to the programme for this (Charts are still available from Steve Anderson and these purpose. stars were included in the LPV predictions in VSSC 24.)

This project is continuing and three further sources are now being added:

•

R Aql (Mira, 5.7 - 12.0, variable period) U Her (Mira, 6.5 - 13.4, 409^d) RT Vir (SRb, $7\frac{1}{2}$ - 9, 115:^d)

U Her is R Aql is of course already on the main VSS programme. one of the stars which was dropped at the end of 1974; those members who still have charts for it are asked to observe it again until further notice. RT Vir is completely new and interested observers should write to Steve Anderson for a chart.

Some of this project's results to date are noted below. Rose from 10.2 in early 1975 Apr to max (6.0) around R Aql.

Jul 2, then a linear fall to 11.0 at the end of Nov. <u>RX Boo.</u> Variations during 1973 - 5 showed period 164^d, extreme range 7.7 - 9.0, mean range 7.9 - 8.6. This seems to disagree with the period of 340^d found in 1968 - 70 (BAA Journal 1973 Dec, p 39). The 1971 GCVS Supplement gives the period as 210^{±d} which seems a

2

fair compromise!

<u>S CrB</u>. Maxima 1974 Feb 3 (6.1) and 1975 Jan 14 (7.4); minima 1974 Sep 14 (12.7) and 1975 Sep 7 (13.1). <u>U Her</u>. Rose from 12.3 in 1975 Jan to max (7.7) around May 7,

<u>U Her</u>. Rose from 12.3 in 1975 Jan to max (7.7) around May 7, then a linear fall to 11.0 in early Nov, according to the VS notes in "The Astronomer".

<u>R LMi</u>. Fell from 9.7 in early 1975 Jun to min (11.8) early Nov, rose to 9.6 at end Dec.

Observations from 1920 to 1975 are being analysed by S Per. the Canterbury group to see whether H₂O variations are correlated more with one Fourier component of the light-curve than with the (The longer light-curve enables more accurate details of others. the components to be extracted.) For 1973-5 the curve shows variations 8.9 11.2, the star being brightest 1973 Nov (10.5), 1975 Feb (8.9) and faintest 1973 Jun (11.1), 1974 Jun (11.0) and 1975 Dec (11.2 and apparently fading). Prior to 1974 Sep the H₂O emission spectrum showed two strong peaks, and a third developed during the following six months as the star brightened visually. Further remarkable changes in the spectrum were recorded last year, there being as many as five obvious peaks in October when the decline in visual magnitude was steepest. (A periodogram analysis of VSS observations is discussed in a paper by Ian Howarth which should appear in next month's BAA Journal.)

<u>RS Vir</u>. Fell from 7.4 in early 1975 Jun to 10.6 in Sep, since when no positive observations have been reported although it was below 10.9 at the beginning of Dec.

Observers of the above stars not already communicating their results to the Director are urged to do so as soon as possible after the end of 1976 Apr, Aug and Dec. Lists of dates and magnitudes will be quite sufficient and full details should still be sent at the end of the year to Alan Forno (RX Boo) or Doug Saw (other stars).

<u>1974 Light-curves</u>. The following notes, compiled from plots prepared by the Secretary from all the reports he has received, are continued from VSSC 24. For GW Ori, T Tau, RY Tau see above.

Orion variables. Limits of scatter were: IU Ori 8.5 - 9.2, KS 9.6 - 10.7, KX 6.9 - 7.4, LP 7.7 - 8.6, MX 9.5 - 10.7, NU 6.9 - 7.4, NV 9.9 - 10.9, V359 7.5 - 8.5, V361 8.0 - 8.9, V372 7.5 - 8.2, V566 9.6 - 10.6, CSV 100567 7.4 - 8.0, Var No. 2 8.3 - 8.8. KX and V359 were very badly under-observed. MX showed large, rapid fluctuations contrasting with the slower changes of KS and NV with V359 apparently an intermediate case.

<u>R Peg</u> (M). Rose to 8.2 mid-Jan, unobserved until mid-Jun (11.6), fell to min (13.1) late Aug, rose to $9\frac{1}{2}$ late Dec.

<u>RU Peg</u> (UG). Well observed except Feb-May when hardly any results are available. Maxima late 1974 Dec, Jun 4 (10.7, short), Aug 20 (10.5, short), Dec 22 (10.2, anomalous). A missing max assumed in Apr (observed by the AAVSO) yields period 81^d. <u>R Per</u> (M). Fell from 11¹/₂ early Jan to min (14.1?) Feb, rose to

<u>R Per</u> (M). Fell from 11½ early Jan to min (14.1?) Feb, rose to 13 Mar, max unobserved, fell from 10.3 Jul to min (14.1?) early Oct, rose to 9 end Dec.

<u>RS Per</u> (SRc). Slow variations 7.8 - 8.9 with max in Feb (7.8), Dec? (8.0) and min in Jun. In conjunction with 1974 results a period of about 300^{d} is suggested which disagrees with the GCVS value of 152^{d} . The 1974 GCVS Supplement notes that Stothers and Leung also found the 152^d period to be too short. <u>TZ Per</u> (Z Cam). Erratic variation with extreme range 12.5 -

<u>TZ Per</u> (Z Cam). Erratic variation with extreme range 12.5 -14.2 with peaks at average intervals of 15 - 16 days. The amplitude was smaller during May - Jul and almost gives the impression of a disturbed standstill.

Two maxima observed, Mar 18 (12.7, long), Sep 26 UV Per (UG). (13.0, short) interval 192^d. <u>BU Per</u> (SRc). Slow vari

Slow variations 9.5 - 10.0, no obvious period. Results range 12.7 - 13.4; no observations re-GK Per (Na). ported Mar-Jun.

V400 Per (Nova 1974). Slow decline from 11.2 Nov 14 to 11.6 Dec 31.

<u>R Sge</u> (RVb). Max around Jul 21 (8.7), Sep 8 (9.0), Nov 6 (8.9), min around Aug 14 (9.6), Oct 22 (9.7); (half) period = 59° , but GCVS gives (double) period as 71° .

WZ Sge (Nr(E)). Positive observations range 14.6 - 15.2. V3888 Sgr (Nova 1974). A few observations 9.5 - 9.7 Oct 27 -Nov 24.

R Sct (RVa). Min (6.3) around Feb 17, max (5.5) around Mar 16, min (6.5) around Apr 25, max (5.4) May 27; variations then damped down to less than 0^m₊ and no distinct maxima or minima occurred before early Dec when a possible 6.1 min may herald the resumption of normal fluctuations.

Z Sex (SRc). Erratic variation 9.1 - 9.6, no definite period but no observations Jun - Sep.

RV Tau (RVb). Variations 8.5 - 10.6 in double period 80^d, primary and secondary waves of nearly equal amplitude.

SU Tau (RCB). Faint, 14.0 - 15.0, during Jan - Apr. Unobserv 26 - Aug 3. Bright (10.3) early Aug but rapid fall over next Unobserved Apr 26 - Aug 3. few weeks, poorly observed, to 14.0. Slower, erratic recovery brought the star to 11.4 at end Dec.

Two positive estimates, 14.1 and 14.5. Few observations; max (6.4) late Aug. BW Tau (*).

R Tri (M).

 $\frac{R \text{ UMa}}{max}$ (M). Fell from 9.5 early Jan to max (7.1) end Aug and fall to 11 late Dec. Fell from 9.5 early Jan to min (13.3) mid May, then

<u>S UMa</u> (M). Max (7.8) Apr/May, min (11.7) mid Aug, max (7.8) mid Dec; a hump on both rises.

SU UMa (UG). 32 maxima were observed or are suggested, implying a period around 11 days in none were missed. Magnitudes range 12.0 - 13.0. The maximum of Mar 30 may have been a long (width at $13^m = 11^d$), but did not exceed 12.1. Apart from this there were <u>no</u> supermaxima! Underobserved.

<u>SW UMa</u> (UG). One maximum, 12.0 on Nov 9. Estimates at minimum

range 14.7 - 15.6. Underobserved. <u>CH UMa</u> (UG). Max (11.0) Jan 14, the star being brighter than 13^m for 8^d. At min (14.5 - 15.1) for the rest of the year. <u>S UMi</u> (M). Min (12.4) mid Nar, max (8.3) Aug/Sep. <u>S Vir</u> (M). Decline from 7.4 early Jan to 12.7 mid Jun. Unob

<u>S Vir</u> (M). Decline from 7.4 early Jan to 12.7 mid Jun. served until Nov 28, 6.8, then fall to 7.2 in mid Dec. Unob-

<u>V Vul</u> (RVa). No observations before Jul 11. Primary min (9.3 - 9.5) early Jul, Sep 17, Dec 2; period about 76^d. Max mag 8.3 - 8. Max mag 8.3 - 8.7.

<u>Circulars</u>. Since so many members missed the announcement at the beginning of the last VSSC, this time we are trying at the end. SAEs for Circulars should not be sent to the Director, but to Storm Dunlop, whose address is given on the cover.

4

STARS ON THE MAIN PROGRAMME OF THE B.A.A. V.S.S. IN 1976

(excludes Binocular and Eclipsing Binary Programmes)

.

. .

Star	Extreme r ange	Mean range	Type	Period	Remarks
R And RX And DZ And R Aql	6.0 - 14.9 10.3 - 13.6 10.3 -(14.0 5.7 - 12.0	6.9 - 14.3 - 6.1 - 11.5	M Z Cam RCB M	408.90 (14.1) 293.0	1 1
UU Aql UW Aql RW Aur SS Aur	11.4 - 15.9 8.9 - 9.5 9.4 - 12.5 10.5 - 15.0	-	UG SRc IsT Z Cam?	(56) 120± (55.8)	2 2 2
SU Aur U Boo V Boo V Cam X Cam Z Cam	9.1 - 10.7 9.8 - 12.9 7.0 - 11.3 8.5 - 16.0 7.4 - 14.2 10.2 - 14.5	- 10.3 - 12.2 7.6 - 10.4 9.9 - 15.4 8.1 - 12.6	Ins SRb SRa M Z Cam	201.7 257.99 522.11 143.50 (22)	2
XX Cam S Cas UV Cas Gam Cas	7.3 - 9.7 $7.9 - 15.2$ $10.5 - 15.2$ $1.6 - 3.0$	9.7 - 14.8	RCB M RCB GamC	611.44 _	1 1
RHO CAS Omi Cet R CrB S CrB T CrB	4.1 - 6.2 2.0 - 10.1 5.8 - 14.4 5.8 - 14.0 2.0 - 10.2	3.4 - 9.1 7.3 - 12.9	RCB? M RCB M	331.65	2
W CrB R Cyg S Cyg W Cyg SS Cyg	7.8 - 14.3 6.5 - 14.2 9.3 - 16 5.0 - 7.6 8.2 - 124	8.5 - 13.5 7.5 - 13.9 10.3 - 16	M M M SRb UC	238.33 426.52 322.83 126.26	2
BC Cyg BI Cyg CI Cyg V1500 Cyg	9.6 - 10.5 9.3 - 9.8 9.1 - 11.5 1.8 - (21		SRc? SRc? Z And Na	? ? ?	2 2 1 2
HR Del AB Dra U Gem U Her	3.3 - 14.2 3.5 - 12.3 12.0 - 15.8 8.2 - 14.9 6.5 - 13.4	7.5 - 12.5	Nb Z Cam UG(E) M	(13.4) (103.0) 405.83	1.3
SS Her AC Her AH Her R Hya	8.5 - 13.2 $7.0 - 8.4$ $10.2 - 14.7$ $3 - 11$	9.2 - 12.4 4.5 - 9.5	M RVa Z Cam M	107.30 75.4619 (19.8) 388.0	1 1
SU Lac X Leo R LMi AY Lyr	10.7 - 15.4 11.4 - 15.2 6.3 - 13.2 12.6 - 15?	11 - 15 12.3 - 15.0 7.1 - 12.6	M UG M UG	315 (17.4) 371.93 (24)	1,2 1,2 3 2
U Mon RS Oph T Ori U Ori CN Ori CZ Ori	5.8 - 7.6 4.3 - 12.6 9.5 - 12.6 5.3 - 12.6 11.5 - 14.8 12.1 - 15.7	6.3 - 7.1 - 6.3 - 12.0	RVb Nr Inas M Z Cam UG	91.32 ? 372.42 (18.4) (26.6)	2 2
GW Ori IU Ori KS Ori KX Ori LP Ori	8.9 - 10.3 $8.8 - 11.0$ $9.9 - 10.9$ $7.1 - 8.3$ $8.0 - 9.4$	-	Inb E? Ina Ina? Inas?	- ?	2
MX Ori	9.5 - 10.5	-	Inbs?	-	2

. .

Star	Extreme range	Me a n range	Type Period	Remarks
NU Ori NV Ori V359 Ori V361 Ori V372 Ori V529 Ori V529 Ori V566 Ori CSV100567 Ori Var No 2 Ori RU Peg S Per RS Per TZ Per UV Per BU Per GK Per WZ Sge R Sct R Ser T Tau RV Tau RV Tau RV Tau SU UMA SW UMA CH UMA RS Vir RT Vir V Vul	6.5 - 7.8 $8.7 - 11.3$ $7.1 - 10.0$ $7.8 - 9.6$ $7.4 - 8.1$ $?6 - (11)$ $9.9 - 10.5$ $9.8 - 12.7$ $7.9 - 11.5$ $7.8 - 8.9$ $12.0 - 15.6$ $11.9 - 17.3$ $9.0 - 10.0$ $0.2 - 14.0$ $6.0 - 15.0$ $5.0 - 8.4$ $5.2 - 14.4$ $9.6 - 13.5$ $8.6 - 11.6$ $8.7 - 11.7$ $9.3 - 16.0$ $13.7 - 14.8$ $6.6 - 13.4$ $10.4 - 14.6$ $10.5 - 16.0$ $11.0 - 15.3$ $7.0 - 14.4$ $7.5 - 9.0$ $8.1 - 9.4$	$ \begin{array}{c} - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\$	Inas? - Inbs - Inas -	222 2222 2222 2222 2222 21 2 2 2 1,4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2

Remarks

s sa sa Charts for these stars are temporarily unavailable; the VSS Circulars will announce when they are next printed. GCVS data amended or superseded by the results of VSS observa-1

2 tions.

Temporary addition for collaborative project with radio astron-3 omers.

...

. .

. ..

19.

4 Seyfert galaxy.