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"LIGHT-CURVE"

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For subcription rates and charges for charts and other publications see inside back cover.

Editorial

Once again, we must offer our apologies to members for the long delay in publication of this issue. As always happens, we either have no material, or much more than we can include! Our thanks to John Isles for sending a large amount of material (some of which is held over to the next issue), and to John Toone for a most interesting article on the 1985-6 activity of U Gem. Regrettably, no amount of juggling would fit the latter article and its accompanying illustrations into this issue. It will, however, certainly be included in the next *Circular* - which is already in an advanced stage of preparation.

Similar apologies must also be made to members for the fact that the 1986 Eclipsing Binary Handbook was not announced in these *Circulars*. The response to the notice in the BAA *Newsletter* was unexpectedly great. In addition, so many copies have been sold at BAA meetings and from the Association's Office, that this Handbook is now out-of-print. It is our intention to issue a 1987 edition, and notification of its availability will be given in due course.

Change of address and Officer

Members are asked to note that the Eclipsing Binary Secretary, John Isles, has moved to the new address given inside the front cover.

Members are also asked to note that Greg Coady has been forced to resign as the Telescopic Programme's Secretary, because of other personal commitments. This post is temporarily vacant.

Binocular Chart Booklet: a correction

P.J. Wheeler has pointed out a minor error on page 31, under 'Harvard Designation'. The last 2 digits show, of course, the approximate declination in degrees only, not degrees and minutes as inadvertently stated. This correction has been made in the latest printing of the booklet, made necessary by the high demand from observers outside the Section.

'Variable Stars' by Hoffmeister, Richter and Wenzel

As most members will have seen from the notice in the BAA *Newsletter*, the publishers have kindly offered BAA members a discount on this book. The exact amount will depend upon the size of our bulk order, but will be about 25%. (Postage and packing will be charged for those unable to collect their copies from the Office at Burlington House.) Confirmation of a firm price is awaited from the publishers.

Anyone interested in this offer is urged to write immediately - if they have not already done so - to the Association's Assistant Secretary or, if renewing subscriptions to the *Circulars*, to Storm Dunlop, who will pass on any requests. Enclose a stamped, addressed envelope to receive a priority order form when details are finalized. (This may take a few weeks.)

Detailed reviews of this English-language edition - which differs considerably from the 2nd German edition - have appeared in the BAA *Journal*, 96, (3) 181 (1986 Apr) and in *Sky & Telescope*, 72, (1) 37 (1986 Jly).

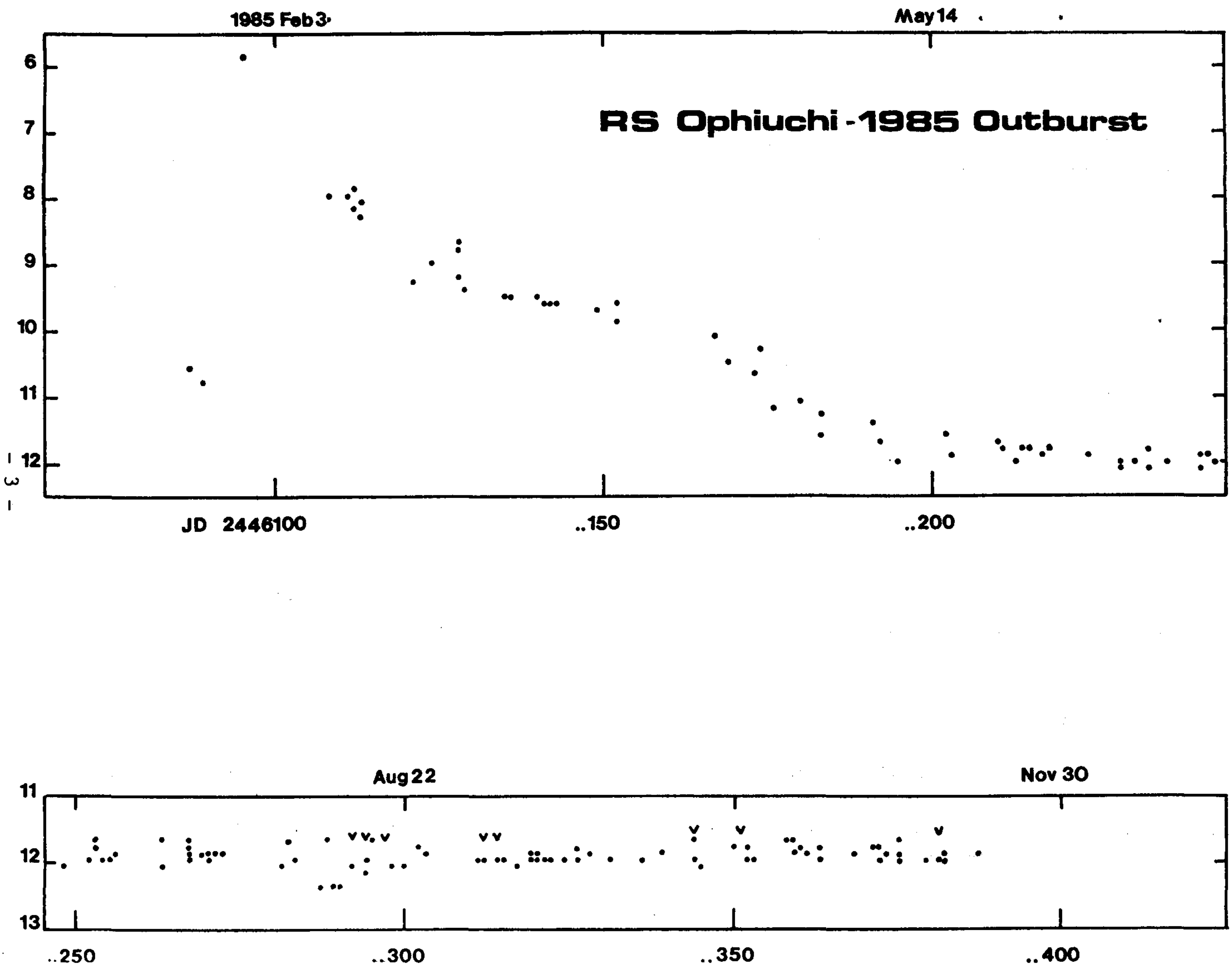
Booklist

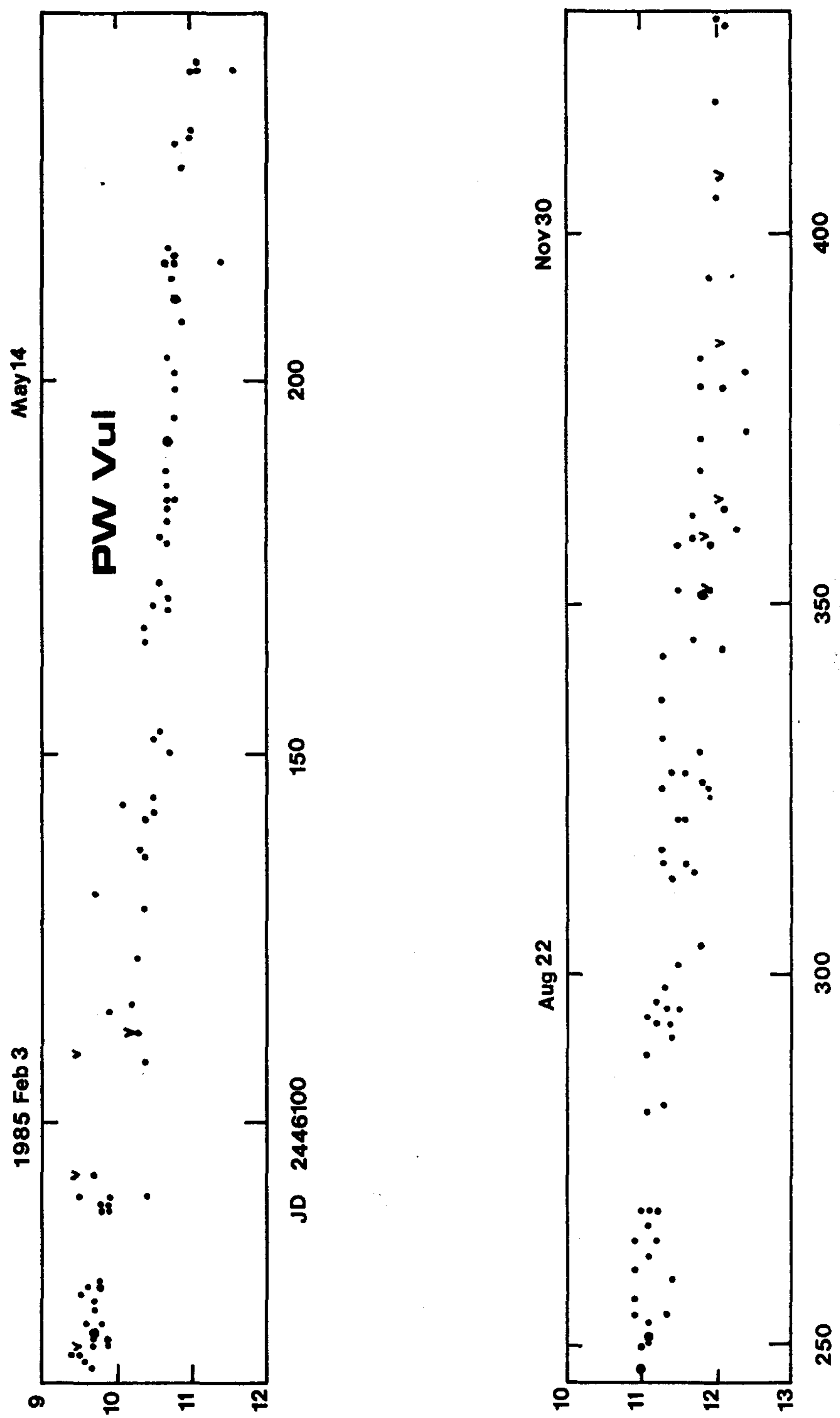
We receive many requests for details of books on variable stars. There are very few general, modern books on this subject, apart from the work mentioned in the previous note. (There are, of course, many volumes covering the proceedings of specialised symposia and colloquia.) To help members, a short booklist has been compiled with brief details of both 'classic' and modern books. Copies may be obtained from Storm Dunlop, at a cost of 25p (postage stamps are acceptable).

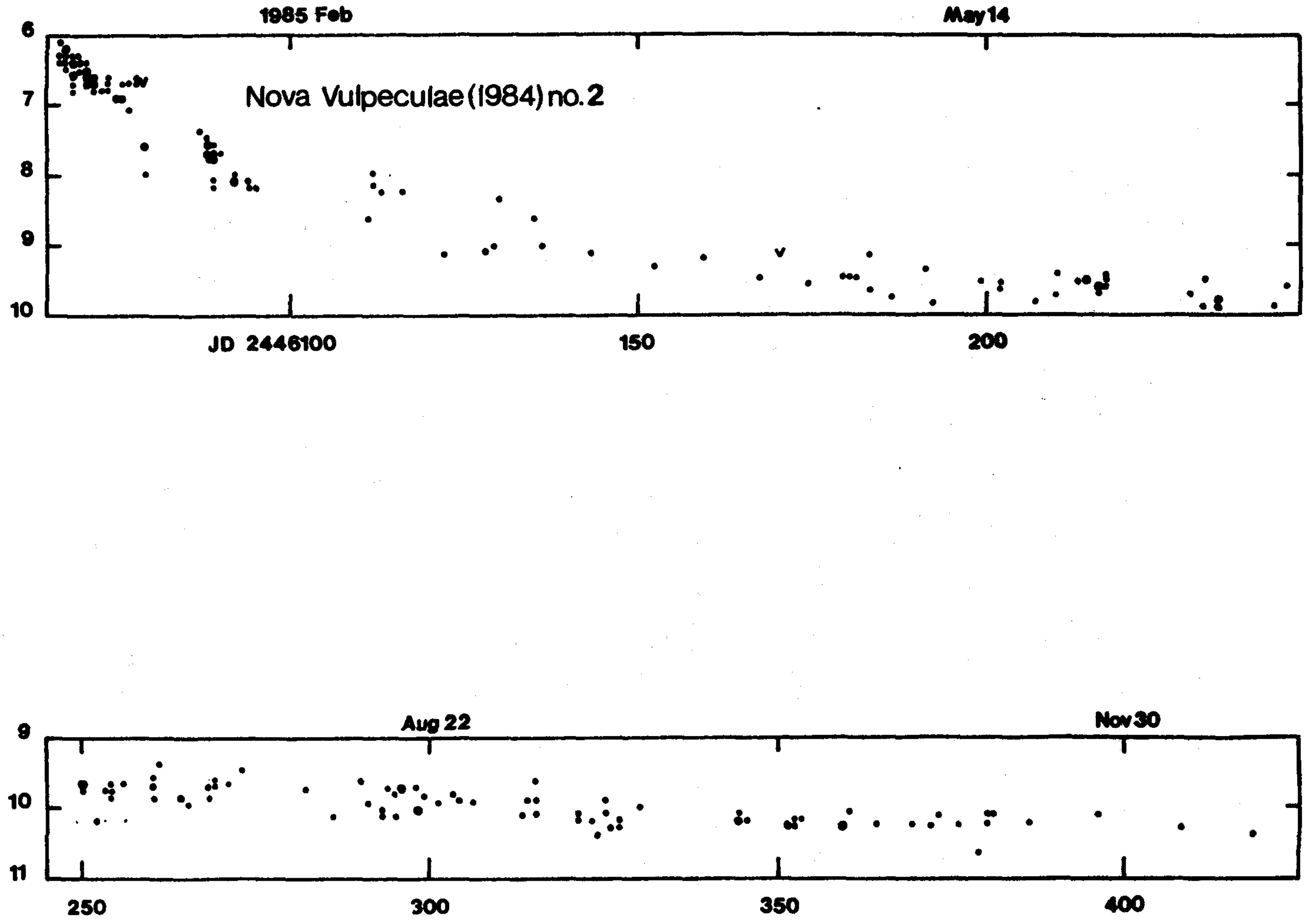
RS Oph, PW Vul and Nova Vul 1984 No.2

Preliminary light-curves for 1985 observations of these objects (prepared by Melvyn Taylor) are given here. The data are uncorrected. The small-size dots indicate single estimates and the larger, 2 or more. Full analyses will be published in due course. Estimate/observer details are as follows:

	RS Oph	PW Vul	N.Vul (1984) No.2
S. Albrighton	10	19	18
N. Bone			2
L. Brundle	28	45	41
G. Hurst	3	21	31
N. Kiernan		8	
S. Lubbock	42		
T. Markham			9
I. Middlemist	13		
C. Munford	6		
G. Ramsay		4	4
J. Shanklin	1	7	13
D. Stott	59	65	61
M. Taylor		3	22
W. Worraker		6	45
Total	162	178	246


RS Ophiuchi -1985 Outburst
1985 Feb 3
May 14
Aug 22
Nov 30
6
7
8
9
10
11
12
13
JD 2446100
..150
..200
..250
..300
..350
..400


PW Vul
1985 Feb 3
May 14
JD 2446100
150
200
9
10
11
12
Aug 22
Nov 30
250
300
350
400
10
11
12
13


1985 Feb
May 14
Nova Vulpeculae (1984) no. 2
6
7
8
9
10
JD 2446100
150
200
Aug 22
Nov 30
9
10
11
250
300
350
400

V 533 Ophiuchi - Tristram Brelstaff

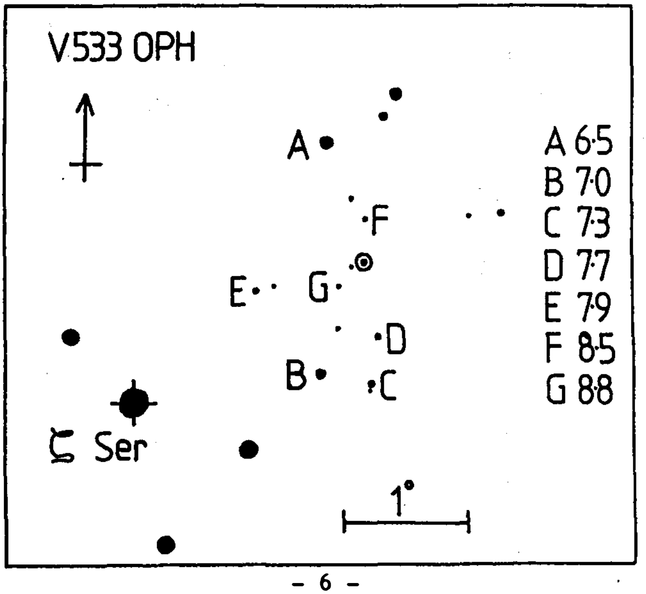
The 1985 GCVS lists V 533 Ophiuchi as a possible semiregular variable with a photographic range of 8.3 to 9.3 and a spectral type of M6. The value given for the period is 80 days.

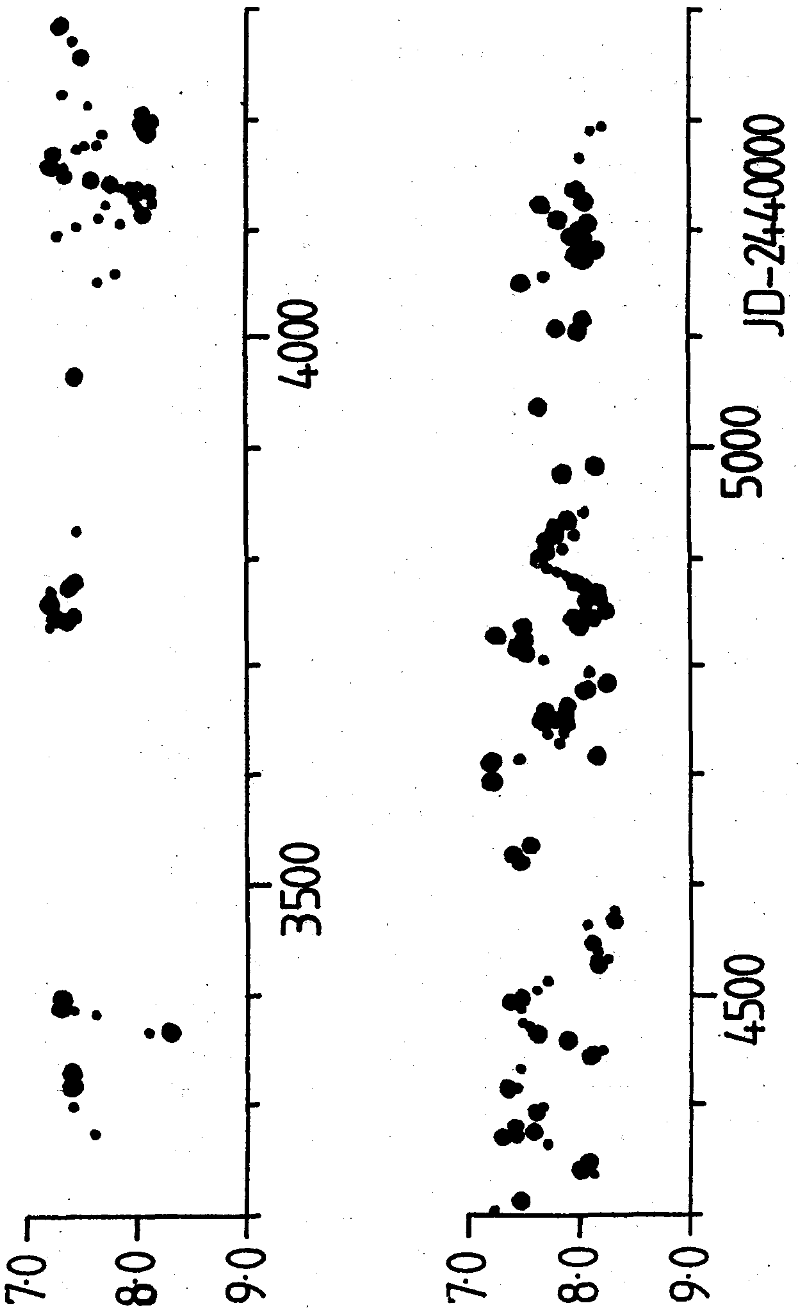
In the years 1977-1982, I made 164 visual estimates of this star using binoculars. The chart used was based on one drawn up by Alan Pickup in 1973. The comparison star magnitudes were determined by him from visual estimates, the zero point being fixed by reference to two nearby stars with known V-magnitudes.

V 533 Oph is one of those peculiar stars like R Sct, which, although nowhere near being circumpolar, can be followed for almost the whole year from these latitudes. It is normally lost into the evening twilight in early December and reappears in the early morning sky in mid-January.

The light-curve from my observations shows clear semiregular variations between the extreme visual magnitudes 7.2 and 8.3. Both the magnitude at maximum and that at minimum show considerable variations. The intervals between well-observed consecutive maxima and minima vary between 45 and 100 days with a mean of 67 days. The mean value can be used to determine the number of cycles missed in the unobserved gaps. This allows the value for the mean period to be refined to 67.5 days, although the extra decimal place might be difficult to justify in view of the large variations in the period.

To conclude, V 533 Oph should therefore be classified as type SRb, with a visual range of 7.2 - 8.3 and a mean period of 67.5 days. It is an ideal subject for binocular observers as it is relatively bright, easy to find, shows clear variations and can be followed for much of the year.




V533 OPH 1977–1982
7·0
8·0
9·0
3500
4000
7·0
8·0
9·0
4500
5000
JD–2440000

Telescopic Programme 1986

Underobserved stars are indicated by *.
The quoted range, type, period and spectrum (Spec.) are approximate only.

Star	Desig.	Range	Type	Period	Spec.	Chart No.
R And	001838	6.9 - 14.3	M	409	M7	053.01
W And	021143	7.4 - 13.7	M	347	M7	035.01
RW And	004132	8.7 - 14.8	M	429	M6	022.01
RX And	005840	(11) - (14	UG	(14.1)	Pec.	001.02
DZ And	002725	10.3 - (14	RCB	-	R	055.01
R Aql	190108	6.1 - 11.5	M	293	M6	030.01
* UU Aql	195109	11.4 - 15.9	UG	(56)	G	002.02
* UW Aql	185200	8.9 - 9.5	SR	(120)	M2	028.01
*V603 Aql	184300	-1 - (11	Na	-	-	GMH
* VY Aqr	210609	8 - (15	N?	-	-	GMH
SS Aur	060547	10.8 - 14.8	Z?	(56)	Pec.	003.02
* U Boo	144918	10.3 - 12.4	SR	201	M4	036.01
V Boo	142539	7.6 - 10.4	SR	258	M6	037.01
* V Cam	054974	7.8 - 15.4	M	522	M7	027.01
X Cam	043274	8.0 - 13	M	143	M3	038.01
Z Cam	081473	10.2 - 14.5	Z	(22)	Pec.	004.02
XX Cam	040053	7.3 - 9.7	RCB	-	G1	068.01
* SU Cnc	080714	12 - 15 pg	M	187	M6	AAVSO
U CVn	124238	8.8 -(12.5 pg	M	346	M7	AAVSO
RT CVn	134434	12 - 16 pg	M	254	M5	AAVSO
* S Cas	011272	9.7 - 14.8	M	611	S4	054.01
T Cas	001755	7.9 - 11.9	M	445	M7	067.01
UV Cas	225859	10.5 - 15.2	RCB	-	-	061.01
Cas	005060	1.6 - 3.0	C	-	B0	064.01
Cas	234956	4.1 - 6.2	SR?	-	F8/K5	064.01
* DM Cep	220672	8.4 - 9.6	Lb	-	M4	-
Cet	021403	3 - 10.1	M	332	M6	039.01
R Com	115919	7.3 - 14.6	M	362	M6	AAVSO
R CrB	154428	5.8 - 14.4	RCB	-	(F)	041.01
S CrB	151731	7.3 0 12.9	M	360	M7	043.01
T CrB	155526	2.0 - 10.5	Nr	-	B + M	025.01
* V CrB	154639	8.5 - 12.8	M	358	N2	057.01
* W CrB	161138	8.0 - 13.5	M	238	M3	044.01
R Cyg	193449	7.5 - 14.2	M	426	S5	031.01
S Cyg	200357	10.3 - 16	M	323	S5	032.01

Telescopic Programme 1986 (cont.)

	Star	Desig.	Range	Type	Period	Spec.	Chart No.
	V Cyg	203847	9.1 - 12.8	M	421	Np	034.01
	W Cyg	213244	5.0 - 7.6	SRb	131	M5	062.01
	SS Cyg	213843a	8.2 - 12.4	UG	(52)	A/G	005.02
	BC Cyg	201736	9.6 - 10.5	SRc	-	M4	065.01
	BI Cyg	201737	9.3 - 9.8	SRc	-	M4	065.01
	CI Cyg	194635	9.1 - 11.5	Z And	-	Pec.	006.01
	Cyg	194632	4.8 - 13.9	M	407	S7	045.01
	HR Del	203718	3.5 - 12	Nb	-	Pec.	JEI 1972 Nov.
*	T Dra	175458	9.6 - 12.3	M	422	C8	046.01
	AB Dra	195377	12.3 -(14	Z	(13)	Pec.	007.03
	U Gem	074922	8.2 - 14.5	UG	(103)	B + K	008.02
*	IR Gem	064128	11 -(13	UG	(56)	-	042.01
*	RU Her	160625	8.0 - 13.7	M	485	M6	060.01
*	SS Her	162807	9.2 - 12.4	M	107	M2	047.01
	AC Her	182621	7.0 - 8.4	RVa	75	F/K	048.01
	AH Her	164025	11.0 - 14.3	Z	(20)	Pec.	009.03
*	R Hya	132422	4.5 - 9.5	M	388	M7	049.01
	SU Lac	221955	11 - 15	M	294	M5	069.01
	DK Lac	224552	5 - 15	Na	-	Pec.	GMH
*	X Leo	094512	11.8 -(15	UG	(17)	Pec.	010.01
	RS Leo	093720	10.4 - 15.7 pg	M	208	M5	AAVSO
	RY Leo	095814	9.5 - 12 pg	SRb	155	M2	AAVSO
	U LMi	094836	10.0 - 13.3	SRa	272	M6	AAVSO
	W LMi	103926	10.5 - 13.5	SRd	117	G2/K2	AAVSO
	W Lyn	081040	8.8 -(13	M	295	M	AAVSO
	X Lyn	081935	9.5 - 16	M	321	M5	AAVSO
	AY Lyr	184137	12.9 - 15	UG	(24)	G?	011.01
	U Mon	072609	5.9 - 7.8	RVb	92	F8/K0	029.02
	RS Oph	174406	4.6 - 12.3	Nr	-	O	024.01
	U Ori	054920	6.3 - 12.2	M	372	M7	059.01
*	CN Ori	054705	12.0 - 14.3	Z	(18)	Pec.	012.02
*	CZ Ori	061115	12.1 - 15.7	UG	(27)	-	013.02
	RU Peg	220912	9.8 - 12.7	UG	(74)	B/G	014.02
	S Per	021558	8.6 - 12	SRc	826	M3	050.01
	RS Per	021556	7.8 - 8.9	SRc	152	M4	063.01
	TZ Per	020657	12.4 - 15	Z	(15)	Pec.	015.02
	UV Per	020356	12.8 -(17	UG	(350)	-	016.03
	BU Per	021156	9.0 - 10.0	SRc	(365)	M4	063.01
*	GK Per	032443	0.2 - 14	Na	-	B/K	IDH 1977 Aug.
*	WZ Sge	200317	6.0 - 15	Nr	-	Pec.	023.01

Telescopic Programme 1986 (cont.)

	Star	Desig.	Range	Type	Period	Spec.	Chart No.
	R Sct	184205	5.0 - 8.4	RVa	(140)	G/K	026.01
*	R Ser	154615	6.4 - 13.4	M	357	M7	033.01
	RV Tau	044126	8.8 - 11	RVb	79	G/M	056.01
*	SU Tau	054319	9.3 - 16	RCB	-	GO	017.02
	T UMa	123160	7.7 - 13.0	M	257	M5	066.01
	SU UMa	080362	11.6 -(14	UG	(14)	Pec.	018.02
	SW UMa	082953	10.5 - 16	UG	(460)	Pec.	019.02
	CH UMa	095968	11.7 - 15	UG	(201)	Pec.	020.02
	V Vul	203226	8.1 - 9.7	RVa	76	G/K	058.01
	PU Vul	201621	8.4 -(14	-	-	-	052.01
*	3C 273	122402	12 - 13	Quasar	-	-	1981 May
*	NGC 4151	120939	12	Seyfert	-	-	1980 May
*	Mark.421	110138	13	BL Lac?	-	-	1981 Jan.

Several novae and other unusual objects, discovered and observed in recent years, have been omitted from the above list, usually because they have become too faint for most telescopes. Observations of these objects remain welcome; charts are available from the Chart Secretary. For future novae, initial charts are obtained from the Nova/Supernova Search Secretary.

New eclipsing binary charts

New charts (6p each + postage) are available from John Isles for the stars in the following list. The chart for UW CMa (by Colin Henshaw) is also suitable for observing the binocular variables VY and Omega CMa. The other charts are based on observations by Tristram Brelstaff and John Isles.

Star	R.A. & Dec. (1950) h m	o '	Range m m	Min.II*	Type	Period d	D* h	With*
RZ Cnc	08 36.0	+31 58	8.7 - 10.0V	0.5	EA	1.20	78	
TW Cnc	08 26.9	+12 37	8.5 - 9.0V		EA	70.76	51	
UU Cnc	07 59.7	+15 19	8.7 - 9.4V	0.5	EB	96.70	580	
WY Cnc	08 59.0	+26 53	9.5 - 10.1V		EA	0.83	3.2	
XZ Cnc	08 26.6	+13 23	9.8 - 10.2p	0.4	EB	1.11	6.7	TW Cnc
ZZ Cnc	07 54.4	+11.07	9.4 - 10.9p		EA	25.60	49	
NSV 4441	09 14.8	+16 55	8.3 - 8.8p		E?	?	?	
UW CMa	07 16.6	-24 28	4.8 - 5.3V	0.4	EB	4.39	26	
RX Cas	03 03.2	+67 23	8.6 - 9.5V	0.8	EB	32.33	194	
TW Cas	02 41.7	+65 31	8.3 - 9.0V		EA	1.43	5.5	
TX Cas	02 48.2	+62 35	9.2 - 9.8V	0.4	EB	2.93	18	

* Min.II = depth of secondary minimum, if at least 0.3m
D = length of eclipse in hours (or a quarter of the period - types EB, EW)
With = other variable on whose chart the star appears

'ROM THE LITERATURE: Monthly Notices of the RAS
(Compiled by John Isles)

RX And, Z Cam, SY Snc

Theoretical properties of model accretion discs can explain many aspects of the visual light curves of Z Cam stars, according to Lin et al., M.N, **212**, 105 (1985). AAVSO light curves of Z Cam, SY Cnc and RX And show that the stars spend little of the time at minimum; indeed, the latter two systems usually begin to rise to maximum as soon as they have touched minimum. Entry into standstill may be from below or above. Transitions into and out of standstill may be relatively abrupt or more gradual. For the more gradual transitions, changes in the envelope of minima over 2 or 3 outburst cycles are more noticeable than variations in the maxima. During standstills, variations are often present, ranging from hardly discernible to about 1 mag. The authors conclude that a detailed analysis of the light curves may help us to understand not only the stability and evolution of the disc, but also the process which regulates the mass-input rate.

RU Peg, TZ Per

Observations of the dwarf novae RU Peg and TZ Per during decline from outburst, made by the International Ultraviolet Explorer satellite, are reported by la Dous et al. in M.N., **212**, 231 (1985). These observations were made possible by the co-operation of amateur observers co-ordinated by the AAVSO and RASNZ. Comparison with the visual data showed that the flux dropped simulaneously at all wavelengths. In TZ Per the flux distributions during standstill and during the decline from different outburts were similar.

U Ori

OH maser emission has been detected from the circumstellar envelopes of some 300 long-period variables. In general, the OH spectra have remained remarkably constant in shape for many years, although the intensity of the emission follows the pulsation of the central star. U Ori is a striking exception to this general pattern. In 1974 the emission underwent a spectacular outburst. New maps of its OH maser emission by Chapman and Cohen, M.N., **212**, 375 (1985), show an incomplete ring of sources of radius 100 billion km and two compact clusters of sources. To explain the complex structure, a model is developed which it may be possible to test as the maser emission from U Ori continues to evolve.

VW Hyi, WX Hyi

Schwarzenberg-Czerny et al., M.N., **212**, 645 (1985) report a comparison of IUE data on VW Hyi with visual observations by the RASNZ. The continuum flux distribution behaves in a similar manner from one outburst to another. In particular, the outburst starts at optical wavelengths and spreads later to the ultraviolet. This is also the case for SS Cyg and possibly RX And; and for WX Hyi, according to Hassall and others, who discuss IUE spectrophotometry in relation to outburst phase deduced from RASNZ observations, in M.N., **216**, 353 (1985).

GK Per

EXOSAT observations of GK Per during the 1983 optical outburst show that the hard X-ray flux is strongly modulated with a coherent 351-second periodicity, which is probably the spin period of the white dwarf. The visual light curve is presented, from observations reported in IAU Circulars. Watson et al., M.N., **212**, 917 (1985).

BL Lac

Multisite observations of the brightness and polarization of the optically variable galaxy BL Lac are reported by Brindle and 14 other authors in M.N., **214**, 619 (1985). At the time, 1981 Sept-Oct, BL Lac was relatively faint. V magnitudes show variations in the range 15.8-16.3, with changes of up to 0.2m occurring in the course of a few hours. No periodicity was found on short time-scales (<1 week).

R Cyg

In 1983 R Cyg experienced its faintest maximum ever recorded, barely exceeding mag. 10. A study by Wallerstein et al., M.N., **215**, 67 (1985), of the AAVSO light curve from 1921 to 1984 shows correlations between brightness at maximum and interval from the previous cycle, in the sense that fainter maxima occur later than normal and are followed by maxima that occur earlier than normal. The velocities of the emission lines in the spectrum are correlated with the magnitude at maximum, in that during bright maxima they are displaced to the red by 15 km s^{-1}, while during the faintest maximum there is no displacement relative to the red component of absorption lines. This may be due to an enhanced degree of limb brightening during a faint minimum.

OY Car

High-speed photometry of the eclipsing dwarf nova OY Car is reported by Cook in M.N., **215**, 211 (1985). The observations were made when this SU UMa system was quiescent according to observations by members of the RASNZ, 28-49 days after a short outburst. Eclipse timings reveal a significant decrease in the orbital period, too great to be explained by conservative mass exchange.

EK TrA

Simultaneous spectrophotometry in the optical and UV (the latter by the IUE satellite) of the dwarf nova EK TrA, a member of the SU UMa subclass, was carried out during a supermaximum reported by RASNZ observers. Hassall discusses the results in relation to steady disc models in M.N., **216**, 335 (1985). Superhumps were observed with a period of 93 min. The orbital period is not known but is presumably a few percent shorter.

Epsilon Aur, Rho Cas

Some bright yellow supergiants show semiregular variation with periods from 40 to 500 days, which may be cepheid-like pulsations. Photometry of five of these stars is reported by Ferro, M.N., **216**, 571 (1985). Analysis of previously published photometry and radial velocities for Epsilon Aur indicates a variety of possible periods, among which 123d appears to be the primary period up to 1930, and 160d thereafter. For Rho Cas, photoelectric observations since 1964 show a range 4.1-4.8 in V, but are not continuous. Fourier analysis indicates a possible period of 483.5d, longer than visual observations by the BAA and AAVSO which are quoted as showing a rough cycle length of 200-400d. It is suggested that both stars are non-radial pulsators, with masses in the range 15-30 Suns and radii 250-800 times that of the Sun.

TX Cas

The Beta Lyrae variable TX Cas may be a massive close binary in the first contact phase of rapid mass transfer. Such systems are considered to be very rare, owing to the short time-scale of the process. No photoelectric light curve of TX Cas has been published. A 70-year-old visual light curve by McDiarmid is therefore used to model the system, in a paper by Breinhorst and Karimie in M.N., **216**, 663 (1985). Visual, photographic and a few photoelectric timings from the literature indicate a possible period decrease, which needs to be confirmed.

RU Mon

A third body has been discovered in the eclipsing binary RU Mon, according to Khaliullina et al., M.N., **216**, 909 (1985). Visual, photographic and photoelectric eclipse timings over 80 years, including work by the AAVSO and the Swiss group BBSAG, show period variations which are apparently due to both apsidal motion and the light-time effect. The eclipsing pair and the third body have a long-period orbit with period 67.6 years.

RS Oph

Radio and X-ray emission of the 1985 outburst of RS Oph are discussed in terms of a spherically symmetrical model in which high-velocity ejecta interact with a slow-moving pre-outburst wind, in a paper by Bode and Kahn, M.N., **217**, 205 (1985). The total energy in the nova explosion is estimated to be 8×10^{42} erg, equivalent to the nuclear burning of about one billionth the Sun's mass of hydrogen.

RY Sgr, MV Sgr

The R CrB stars RY Sgr and MV Sgr were observed by the IUE satellite during deep extinction minima. The grains responsible for the extinction event in MV Sgr are deduced to have dimensions of about 0.2 μm. Evans et al., M.N., **217**, 767 (1985).

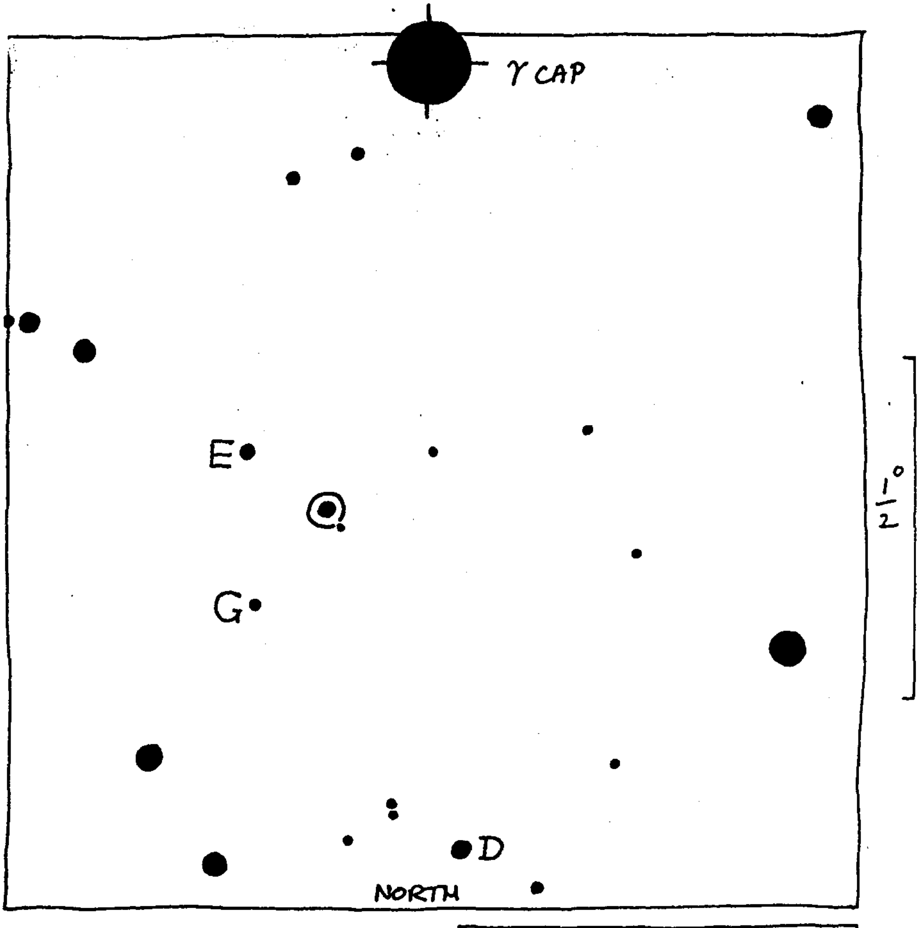
RR Pic

RR Pic is the remnant of a moderately slow nova that erupted in 1925. It is currently about 12.3m visually, and still dropping in brightness. Warner, M.N., **219**, 751 (1986), reports high-speed photoelectric photometry over the period 1972-84, showing unexplained structural changes. Whereas in the 1970s a strong orbital modulation of brightness was present, this has been replaced in the 1980s by an irregular, shallow eclipse superimposed on a flickering background. The disappearance of the orbital modulation coincided with a decline in the mean brightness of the system recorded by the VSS of the RASNZ.

AH Her

A model of the dwarf nova AH Her based on spectroscopy at Mt Wilson is developed by Horne et al. in M.N., **219**, 791 (1986). The binary period is determined as 0.258116 day from radial velocity variations of the emission lines.

AD CAP



AD Cap 10.77 - 11.4 B Sp G5

E? P = $2^{d}.96$? or CEP? P = $3^{d}.109$?

(1950) 21^{h} $37^{m}.1$ -16° 14'
(2000) 21 39.6 -16 00

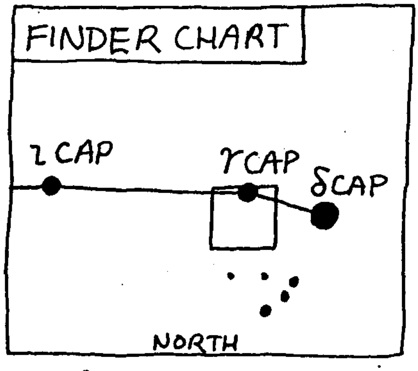
Preliminary sequence:

D = 9.8

E = 10.2

G = 10.6

JEI 1984 Jun 8



TJB. 1982. AUG. 15

CH Cyg

CH Cyg was formerly classified as a semiregular red giant variable. Three outbursts have, however, been observed, in which the spectrum becomes that of a symbiotic star, with additionally a strong blue continuum and numerous emission lines. The last outburst began in 1977 May, and the V magnitude was about 5.5 until mid-1984. Between 1984 July 24 and Aug 1, it decreased suddenly by about one magnitude. By mid-1985 the V magnitude had fallen to about 7.4. Together with the photometric drop, spectacular spectroscopic changes were observed, and a radio outburst was reported with also the detection of expanding radio jets. X-ray emission was detected in 1985 by EXOSAT, whereas previous observations with Einstein had given negative results. All these events coincided with a predicted eclipse by the red giant of a compact companion, which is believed to be surrounded by an accretion disc, the presumed source of the strong blue continuum during outbursts. However, it is far from clear how all the observed phenomena are inter-related.

Five phases of the spectral evolution of CH Cyg since mid-1984 are distinguished by Mikołajewski and Tomov, M.N., **219**, 13P (1986). No photoelectric data have been published for 1985 Feb-Apr, so visual observations may provide the only information about the final decrease of brightness. During this period, CH Cyg developed the strongest nebular spectrum so far seen in this star.

Z Cha

Photometry of dwarf novae such as Z Cha, in which both the white dwarf and the bright spot on the accretion disc are eclipsed, enables the size of the disc to be calculated. An analysis of such measurements, in relation to the dates of outbursts recorded by RASNZ observers, is given by O'Donoghue, M.N, **220**, 23P (1986). The disc radius is 30-40% larger just after an outburst than just before; its radius then decreases steadily as a function of the fractional time between outbursts. A similar effect has previously been reported in the case of U Gem.

Puzzle Stars - 2: AD Capricorni - John Isles

AD Cap was listed in the 1969 GCVS as a Beta Lyrae variable with photographic range 9.3-9.9 and period 6.11826d according to Tsesevich (1954). The spectrum is given as K0. The 1974 Supplement, however, lists it as eclipsing without attribution to one of the subclasses EA, EB, EW; gives the period as 2.96d according to radial velocity observations by Popper (1973); and gives the spectrum as G5. No epoch is given for a minimum. In the 1976 Supplement the period is improved (?) to 2.96000d, source Popper (1974), and the spectrum is G5+G5. The 1985 GCVS repeats these details but gives a B range of 10.77-11.4, and gives the type as E/RS. This should mean that in addition to eclipsing it is an RS CVn star, a close binary with H and K CaII in emission, and chromospheric activity which causes light variability with a period which should be close to the orbital one, and an amplitude of perhaps 0.2m or more.

The rounded value given in the 1985 GCVS for the minimum mag. indicates that the photographic amplitude of 0.6m has probably been carried forward from earlier lists. The allocation to type RS is probably based on Popper's observation of H and K emission (IBVS 1083). So despite the apparent growth in our knowledge it is by no means clear that anyone had actually observed AD Cap's variations since the original study by Tsesevich, until Tristram Brelstaff began visual observations in 1982.

His 31 estimates on 17 nights in 1982-3 do not appear to fit the catalogue period of 2.96d (figure 1). Fourier analysis indicates a possible period of 3.109d, a little over half that given by Tsesevich. The light curve (figure 2), however, does not look like half a cycle of a Beta Lyrae variable, but rather like that of a cepheid; yet a cepheid with this period should have a supergiant spectrum of about F5-F9. Moreover, further observations by Brelstaff in 1985 do not appear to fit the 3.109d period.

AD Cap's declination is -16°, so it can only be seen from the British Isles when it is quite near the meridian. This makes it difficult to distinguish the true period from a number of alias periods. Observations from other longitudes would help very much to solve the puzzle. Brelstaff's chart is given here for use by any observers, particularly those overseas, who may be interested.

RU Sex. Puzzle star No 1 (VSSC 60) has been solved. Observations by Brelstaff on three nights in 1985 Feb confirmed that this is an RR Lyrae star, and helped to define the period well enough to establish the number of cycles elapsed since observations in the early 1960s by Strohmeier et al. (IBVS 115). The corrected elements are

$$\text{Max} = \text{JD } 2438471.57 + 0.539806\ E.$$

The visual range is about 10.5-10.9, and the rise time expressed as a fraction of the period, (M-m)/P, is 0.4. Full details have been submitted to the Journal.

If you have a favourite puzzle star you would like featured in this series, please let me know.

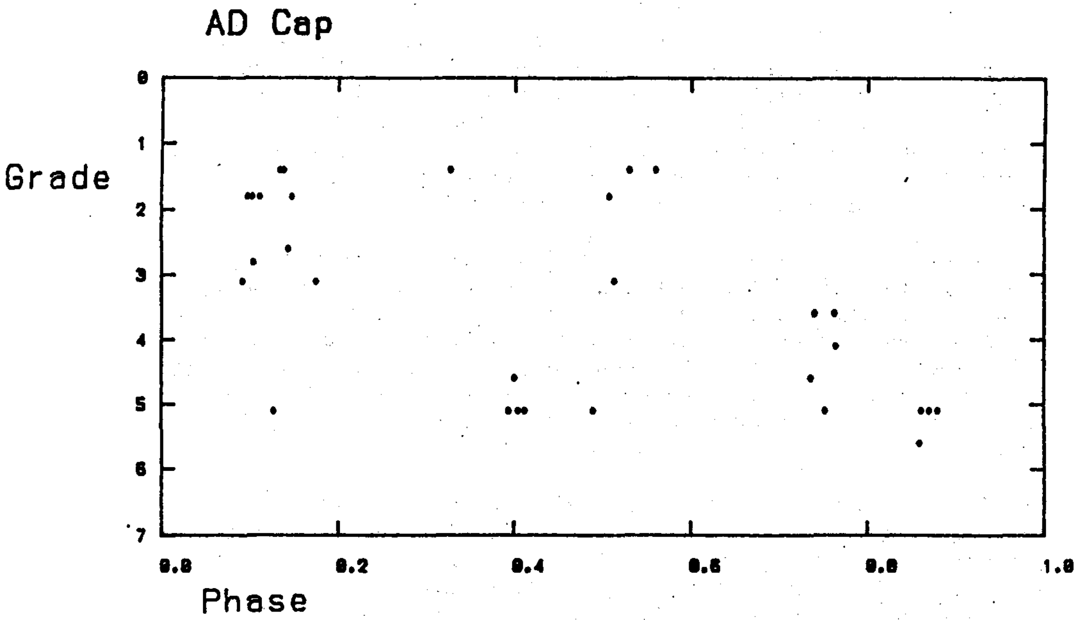


Figure 1. Observations of AD Cap in 1982-3 by Tristram Brelstaff, plotted according to phase using the catalogue period of 2.96d. Phase zero corresponds to JD 2400000.0.

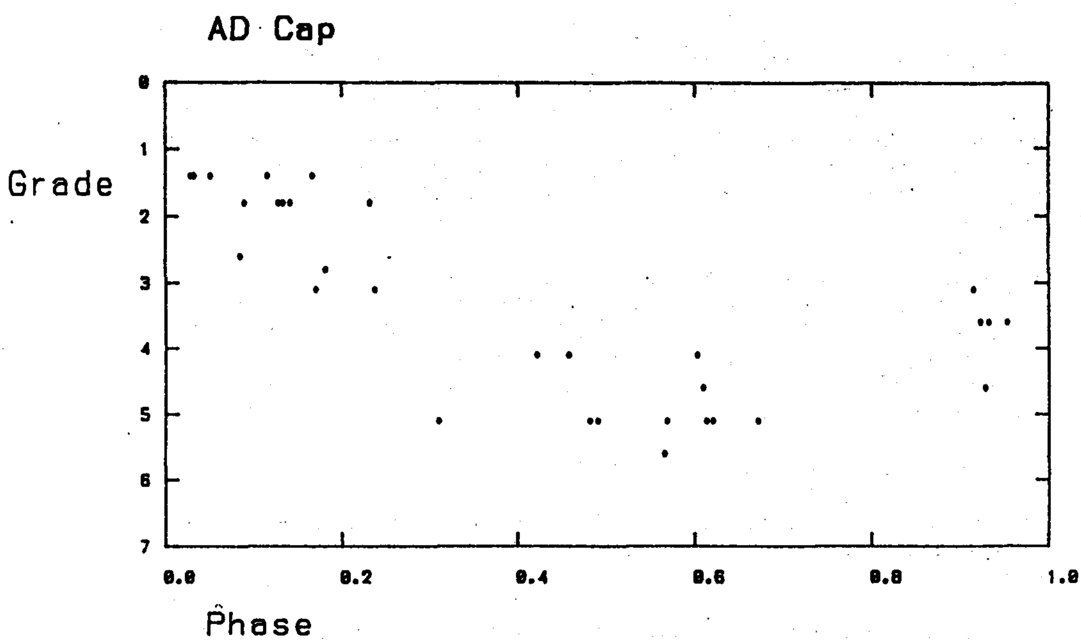


Figure 2. As figure 1, but using the possible period of 3.109d.

MINIMA OF ECLIPSING BINARIES, 1985 - (1) And to Com

John Isles

Because of the rapid growth in the number of eclipsing binary minima observed by the Section, it has been decided that timings should in future be published each year in three instalments, corresponding to volumes I-III of the 1985 GCVS. These respectively cover constellations And-Cru, Cyg-Ori, and Pav-Vul. At the time of writing, volume III has not yet appeared; but the opportunity is taken in this "volume I" report to change to the linear elements of the 1985 GCVS, as the basis for calculating O-C values.

In the accompanying table, photoelectric determinations are underlined. For further explanations, see VSSC 58.

The total numbers of observations received for known and suspected eclipsing variables in constellations And-Com, including estimates reserved for separate discussion, are summarised below.

	Observations	Timings
Photoelectric:		
J Ells (EJ)	813	17
A Hollis	3	-
R Pickard (PI)	13	1
J Watson (TW)	106	3
Total	935	21
Visual:		
M Beveridge	3	-
N Bone	26	-
T Brelstaff (BS)	655	56
H Duncan (DH)	159	5
R Geddes	27	-
A Hollis (HO)	20	3
J Isles (IS)	320	15
S McRoyall (UX)	22	2
A Markham (QM)	115	2
I Middlemist (MM)	228	26
G Pointer	4	-
J S Smith (IJ)	30	1
M Taylor	5	-
N Taylor	21	-
W Williams	5	-
Total	1640	110
Grand total	2575	131

An asterisk draws attention to further information in the following notes.

CD And. Observations 6113-6290 folded onto a single cycle in order to derive the timing.

Zeta Aur. Observations 6136-6180 with 8x30 binoculars and blue filter, in order to increase the amplitude.

UU Cnc. Observations 6091-6130.

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

Star	Date	No	Other dates
WZ And	6383	5	6387
SS Ari	6351	3	6352
SX Aur	6101	8	6094-6130
	6115	11	6088-6121
TT Aur	6088	4	6091-6115
BF Aur	6094	15	6088-6121
	6101	2	6130
IM Aur	6113	5	6088
LY Aur	6091	4	6088-6115
	6121	15	6094-6130
XZ Cam	6380	2	6214
AZ Cam	6372	5	6380
WY Cnc	6095	1	6091
	6120	3	6130
XZ Cnc	6091	3	6113-6130
ZZ Cnc	6120	4	6091-6130
RZ Cas	6170	6	6243
	6298	6	6292
	6304	4	6298-6383
TV Cas	6179	7	6112-6382
	6304	7	6257-6382

Errata in 1984 report

Some transcription errors occurred in VSSC 61, p. 15, as follows:-

- The note on RV Psc in fact relates to BV Tau.
- A note on RV Psc should be added: "The period given in the 1969 GCVS is wrong, so the O-C is against the elements of the 1976 Supplement."
- The initial epoch of the elements for GR Tau should be 2444982.334
- Four lines lower, 'V 450 Sco' should read 'V453 Sco'.

Star	Epoch	Helio JD 244...	O - C	No	Observer	
RT And	8283	6351.312?	0.000?	6	MM	
WZ And	7922	6383.278	-0.011	12	BS	*
AB And	30762.5	6319.414	+0.003	7	BS	
	30859	6351.445	+0.006	5	BS	
AD And	7211.5	6114.369	-0.034	9	BS	
BX And	16134	6372.3643	-0.0143	25	EJ	
	16139	6375.4229	-0.0063	33	EJ	
CD And	575	6219.03	+0.63	16	BS	*
LO And	6036	6380.334?	-0.046?	4	BS	
	6044	6383.374	-0.053	9	BS	
	6054.5	6387.377	-0.050	7	BS	
RY Aqr	2783	6297.437	-0.008	8	BS	
ST Aqr	6474	6292.484	+0.005	8	BS	
KP Aql	1763	6333.338?	-0.020?	5	MM	
OO Aql	15162.5	6297.412	+0.009	6	BS	
	15269	6351.380	+0.005	7	BS	
	15326	6380.270	+0.008	7	BS	
V346 Aql	4033	6380.339	-0.007	7	BS	
RX Ari	7757	6385.3982	+0.0196	13	PI	
SS Ari	17451	6113.360	-0.029	9	BS	
	17453.5	6114.358	-0.047	8	BS	
	18037.5	6351.478	-0.027	9	BS	*
	18116	6383.328	-0.047	7	BS	
SX Aur	4909	6101.408?	-0.002?	11	IS	*
	4919.5	6115.396?	+0.071?	12	IS	*
TT Aur	18643	6088.419?	-0.016?	7	IS	*
	18646	6092.397	-0.036	10	MM	
	18661	6112.383	-0.041	10	MM	
	18674.5	6130.407	-0.009	10	MM	
	18679	6136.398	-0.016	9	MM	
WW Aur	5218.5	6122.341?	-0.011?	6	HO	
	5218.5	6122.352	-0.001	7	MM	

Star	Epoch	Helio JD 244...	O - C	No	Observer	
AR Aur	1865	6113.343	-0.047	7	IS	
	1865	6113.354	-0.035	8	MM	
BF Aur	3452.5	6094.393?	-0.041?	18	IS	*
	3457	6101.602?	+0.043?	5	IS	*
	3469.5	6121.410	+0.061	6	MM	
	3479	6136.406	+0.016	9	MM	
	3637.5	6387.345	+0.015	9	BS	
HL Aur	32965	6109.331	0.000	8	BS	
	32973	6114.310	-0.001	8	BS	
IM Aur	4488	6113.391?	-0.020?	12	IS	*
IU Aur	4270	6183.399?	-0.007?	7	MM	
LY Aur	1756.5	6091.549?	-0.297?	9	IS	*
	1764	6121.708?	-0.156?	18	IS	*
Zeta Aur	19	6162.7	-1.2	20	DH	*
TZ Boo	22162	6218.510	-0.036	9	BS	
AC Boo	57767.5	6135.435	+0.037	9	BS	
	57997.5	6216.504	+0.047	8	BS	
	58213	6292.451	+0.046	7	BS	
AD Boo	4623	6216.495?	+0.009?	5	MM	
	4623	6216.508	+0.022	8	BS	
	4624	6217.514	-0.001	9	BS	
SV Cam	5933	6113.312	+0.013	6	BS	
	5972	6136.444	+0.015	7	BS	
	6304	6333.348?	+0.020?	4	MM	
XZ Cam	1263	6380.025?	+0.083?	8	BS	*
AL Cam	14829	6109.366	-0.013	8	BS	
	14832	6113.351	-0.013	9	BS	
AS Cam	1805	6397.4085	-0.0086	29	EJ	
AW Cam	9530	6089.3842	-0.0028	49	EJ	
	9849	6335.4497?	+0.0031?	20	EJ	
AZ Cam	4333.5	6372.355	+0.010	9	BS	*
UU Cnc	52	6093.4?	-7.5?	6	IS	*

Star	Epoch	Helio JD 244...	O - C	No	Observer	
WY Cnc	23805	6095.581	+0.009	6	IS	*
	23835	6120.440?	-0.013?	5	IS	*
XZ Cnc	18356	6091.394	-0.046	7	IS	*
ZZ Cnc	756	6120.57	+0.40	6	IS	*
VZ CVn	8706.5	6215.446	-0.027	5	IS	
RZ Cas	2402	6071.2890	-0.0006	39	EJ	
	2428	6102.366	0.000	10	UX	
	2433	6108.343	+0.001	12	UX	
	2433	6108.356	+0.014	6	MM	
	2433	6108.363	+0.021	9	HO	
	2438	6114.322	+0.004	7	MM	
	2459	6139.419	0.000	12	MM	
	2459	6139.428	+0.009	10	DH	
	2464	6145.398	+0.003	9	MM	
	2485	6170.505	+0.010	19	DH	*
	2490	6176.484	+0.013	9	DH	
	2592	6298.392	+0.006	13	DH	*
	2597	6304.379	+0.016	10	QM	*
TV Cas	822	6092.407	0.000	12	MM	
	822	6092.4087	+0.0017	54	EJ	
	833	6112.360	+0.015	10	MM	
	838	6121.419?	+0.010?	6	MM	
	838	6121.429	+0.021	5	HO	
	870	6179.399	-0.012	8	IJ	*
	939	6304.483	+0.003	14	QM	*
TW Cas	2914	6170.5194	-0.0040	29	EJ	
	3035	6343.3501	-0.0005	23	EJ	
AB Cas	2682	6380.423	+0.005	7	BS	
	2687	6387.262	+0.010	7	BS	
KR Cas	6341	6136.330?	+0.074?	6	MM	
OR Cas	1612	6218.477	0.000	9	BS	
	1693	6319.377	-0.002	7	BS	
PV Cas	3498.5	6351.374	-0.049	7	MM	
V368 Cas	4672	6352.3271?	-0.0643?	30	EJ	
V523 Cas	20921	6109.352	+0.006	7	BS	
	20938	6113.329	+0.010	8	BS	

Star	Epoch	Helio JD 244...	O - C	No	Observer
V523 Cas	20942.5	6114.372	+0.002	8	BS
	20972.5	6121.376	-0.005	8	BS
VW Cep	6960	6094.4664	-0.0163	35	EJ
	6985	6101.4236	-0.0170	26	EJ
	7136	6143.4517	-0.0144	33	EJ
	7143	6145.4005?	-0.0138?	26	EJ
	7269	6180.4648	-0.0171	34	EJ
	7671.5	6292.4860	-0.0175	6	TW
	7750.5	6314.4655?	-0.0249?	6	TW
	7883.5	6351.4841	-0.0222	15	TW
CW Cep	4017	6336.3826?	-0.0224?	36	EJ
EG Cep	6454	6109.377?	+0.006?	6	BS
	6476	6121.362	+0.009	8	BS
	6590	6183.444	+0.004	8	MM
GK Cep	7922.5	6111.436	+0.026	8	MM
	7923.5	6112.385	+0.038	10	MM
	7924.5	6113.298?	+0.015?	8	MM
	7977	6162.4943	+0.0636	53	EJ
SS Cet	1230	6109.338	+0.018	10	BS
VV Cet	28758	6351.426	+0.052	7	BS
	28819	6383.301	+0.060	7	BS
RW Com	25663	6113.418	-0.006	5	BS
	25760	6136.440	-0.007	8	BS
RZ Com	33314	6114.415	+0.005	7	BS
	33376	6135.407	+0.009	9	BS
	33618.5	6217.489	+0.004	10	BS
	33621.5	6218.503	+0.003	8	BS
SS Com	51396.5	6218.518	-0.051	9	BS
CC Com	29820	6114.456	+0.008	8	BS
	29915	6135.415	+0.002	10	BS
	29919.5	6136.407	+0.001	7	BS

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