The British Astronomical Association

VARIABLE STAR SECTION

CIRCULAR 60

"LIGHT CURVE"

APRIL
1985

Head Office: Burlington House, Piccadilly, London W1V 0NL. Telephone 01-734 4145

SECTION OFFICERS:

Director	D.R.B. Saw, 'Upanova', 18 Dollicott, Haddenham, Aylesbury, Bucks. HP17 8JG Tel: Haddenham (0844) 292065
Assistant Director	S.R. Dunlop, 140 Stocks Lane, East Wittering, nr Chichester, West Sussex PO20 8NT Tel: Bracklesham Bay (0243) 670354

Programme Secretaries:

Secretary	M.D. Taylor, 17 Cross Lane, Wakefield, West Yorkshire WF2 8DA Tel: Wakefield (0924) 374651
Assistant Secretary Telescopic	G.A.V. Coady, 1 Mossop Drive, Longtoft, Peterborough Tel: Market Deeping (0778) 345396 (unchanged)
Assistant Secretary Binocular	J. Toone, 2 Hilton Crescent, Boothstown, Worsley, Manchester M28 4FY Tel: 061 702 8619
Eclipsing Binary Secretary	J.E. Isles, Flat 5, 21 Bishops Bridge Road, London W2 6BA Tel: 01 724 2803
Nova/Supernova Search Secretary	G.M Hurst, 16 Westminster Close, Kempshott Rise, Basingstoke, Hants. RG22 4PP Tel: Basingstoke (0256) 471074
Chart Secretary (except Eclipsing)	J. Parkinson, 229 Scar Lane, Golcar. Huddersfield, West Yorkshire

CIRCULARS

Charges: (4 issues)	U.K. & Eire - £2 for Circulars and light-curves Other countries - £3

Payments (made out to the BAA) and material for inclusion should be sent to Storm Dunlop.

CHARTS: Eclipsing - John Isles; All others - John Parkinson

Charges:

Telescopic	- SAE plus 20p per star (4 charts)
Eclipsing	- SAE plus 6p per star (1 sheet)
Binocular	- SAE plus 5p per star (1 sheet)

Submission of Observations

Observers are reminded that observations for Main and Binocular Programme objects should be submitted to Melvyn Taylor at six-monthly intervals. Please try to forward observations for January to June by the end of August at the very latest, and for July to December by the end of February. Early submission helps greatly with the task of collating and checking all the observations.

Canadian Meeting on Study of Variables with Small Telescopes

A symposium devoted to the subject of variable stars is to be held from the evening of Thursday, 1985 July 11 to Sunday, July 14 at the Department of Astronomy, University of Toronto. It will deal with all aspects of the observation of variables by visual, photographic and photoelectric techniques, and is especially aimed at those using smaller telescopes (very approximately of 200-600 mm aperture).

The meeting is part of the celebrations for the 50th anniversary of the David Dunlap Observatory and participating organizations include the AAVSO, the IAPPP, and the RASC. Several invited review lectures will be given, and a limited number of oral papers will be accepted by the organizing committee. 'Poster' or 'display' papers on any topic related to the subject of the symposium are welcome.

Apart from the scientific programme there will be displays, tours of local astronomical facilities (including David Dunlap Observatory, McLaughlin Planetarium, University of Toronto Campus Observatory), and formal and informal social events. Accommodation is available in Victoria College, University of Toronto. Further information may be obtained from the chairman:

Dr John R. Percy
Department of Astronomy
University of Toronto
Toronto
Ontario
M5S 1A1
Canada

(Although additional details are not yet to hand, John Isles expects to receive further information in the near future about this meeting.)

Vesta in 1985

Members are invited to help the Minor Planets Section in a programme of observations of Vesta, from now until July. This has as its inspiration a successful project on Ceres, carried out in 1980 and 1981, and organized by John Toone, now the Binocular

Group's Assistant Secretary.

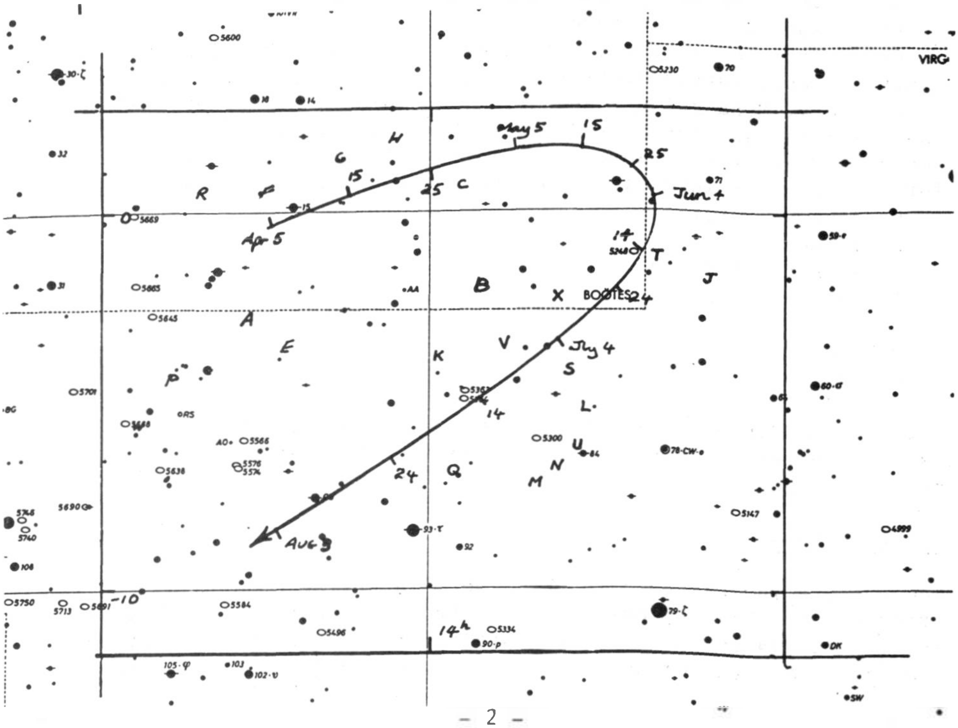
Full details of this project may be obtained from the Director of the Minor Planets Section, Mr A.J. Hollis, 'Ormada', 85 Forest Road, Cuddington, Northwich, Cheshire CW8 2ED. Please include a stamped, addressed envelope for the project notes and report form.

Visual estimates are required by standard fractional or step methods. No more that two estimates should be made per night. The chart below gives suitable comparison stars - from the AAVSO *Atlas*. [The basic chart is from Wil Tirion's *Sky Atlas 2000.0*. The chart supplied would not reproduce, so the path of Vesta has been redrawn and the comparisons marked. Beware of potential confusion is reporting estimates using comparison 'V' - SRD.

4 VESTA - 1985

Magnitudes

A	5.1	G	6.4	N	6.9	T	7.1
B	5.1	H	6.4	P	7.0	U	7.2
C	5.9	J	6.4	Q	7.0	V	7.5
D	5.9	K	6.4	R	7.1	W	7.7
E	6.1	L	6.5	S	7.1	X	7.9
F	6.2	M	6.6				



Nova Vulpeculae 1984 No.1

The accompanying light-curve shows the plot of VSS observations reported to the Secretaries by 1985 February 19, from the following observers:

Brundle	BE	49
Chaplin	CG	27
Dryden	DR	2
Gainsford	GD	3
Markham	QM	67
Shanklin	SK	21
Stott	DT	66
Taylor	TY	73
Worraker	IW	62

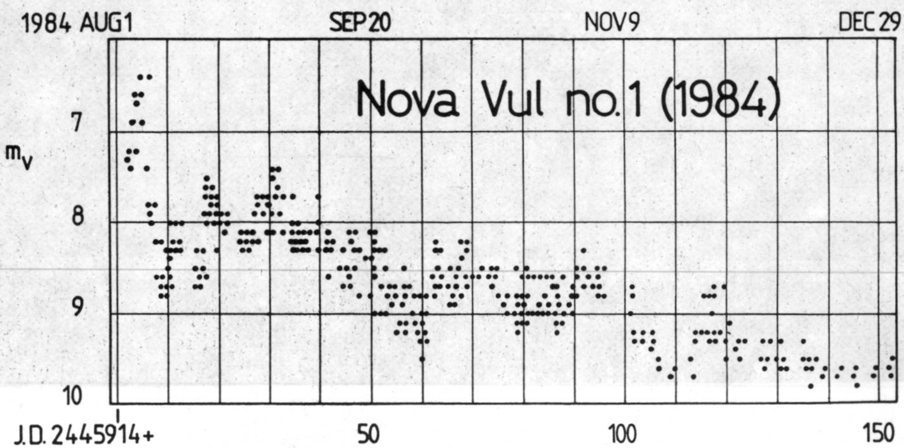
The observations, which have not been corrected for personal equation, have been compiled by Greg Coady. The final diagram has been reduced and redrawn by Melvyn Taylor. The 'mean' line has not been included as it is anticipated that many more estimates are still to be submitted. A preliminary look, however, shows quite regular variations with a mean period of about 11 to 12 days.

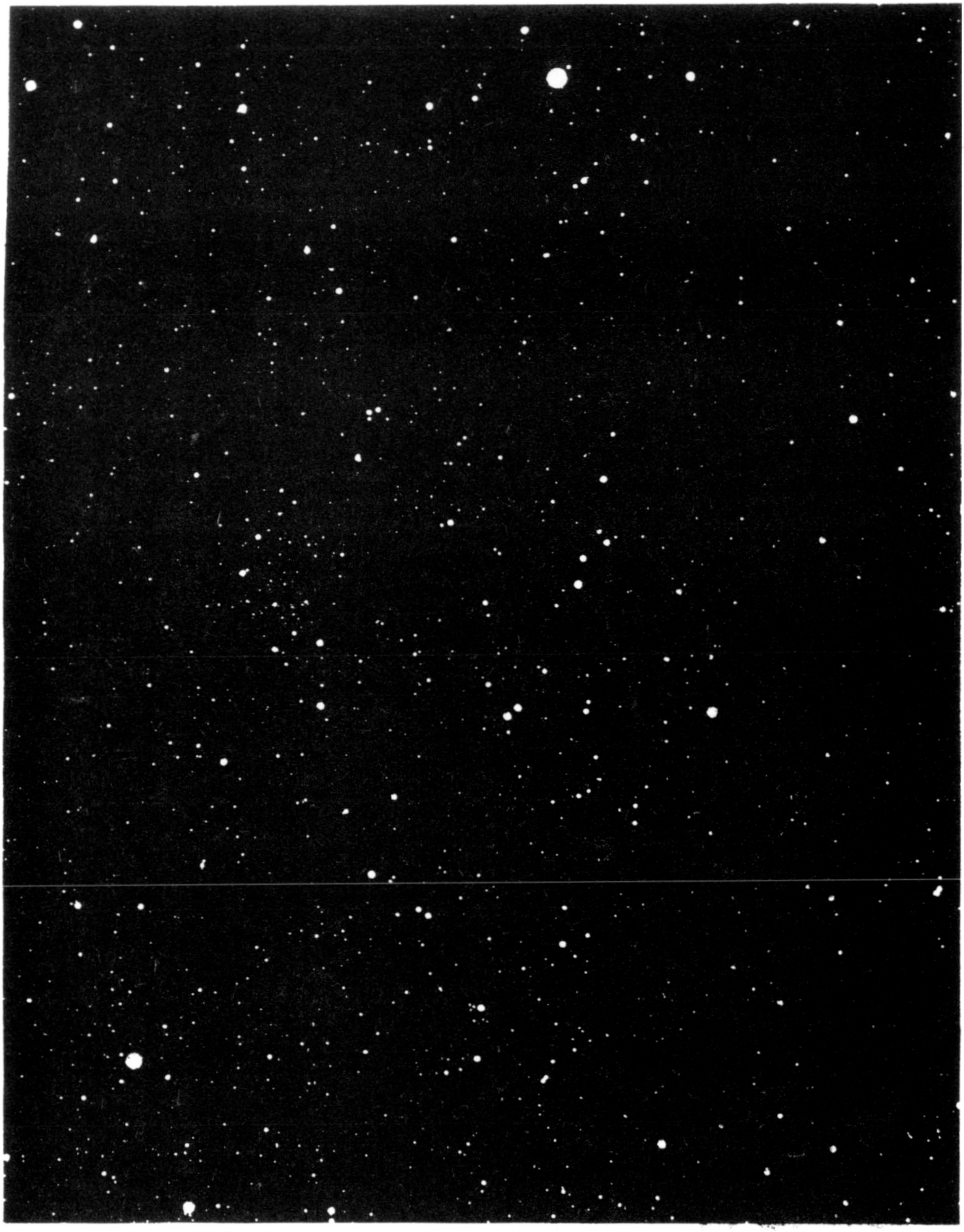
Observers are urged to submit all their observations of this object and also of Nova Vulpecula 1984 No.2 without delay. Full analyses will be published in due course.

The magnitudes of these two objects at 1985 March 10 were:

N.Vul.1984 No.1 = 8.9;
N.Vul.1984 No.2 = 10.3.

See also page 12 for further details of Nova Vul 1984 No.1 - just named PW Vul in the latest Name-List of Variable Stars.





Nova Vul 1984 No.2

The accompanying photograph of Nova Vul 1984 No.2 (opposite) was obtained by Harold Ridley on 1984 Dec 28, 18:05 - 18:10 UT. The exposure was on Kodak 103a-F, using a Ross lens with a focal length of 500 mm, f/6.3. The scale of reproduction used here represents a 3x enlargement from the original negative. North is at top, and the field is centred on the nova.

HT Cas

An outburst of this object was reported in the 'Stop Press' of the last Circular. It appears that an eruption was last seen in 1980. On this occasion it was observed bright for about 10 days, which may therefore be considered a supermaximum. It is a known binary with a period of 106 minutes and shows eclipses during maxima. The AFOEV's publication *La Bonne Etoile* No.81 reports that Verdenet was lucky enough to observe two consecutive eclipses on 1985 Jan.24, when it rapidly varied between 13.5 and 15.2. We had intended to include a photograph of this object in this issue but, regrettably, the identification chart to accompany this has not come to hand.

Puzzle Stars - 1: RU Sextantis - John Isles

RU Sex is listed in the 1969 GCVS as a Beta Lyrae variable with photographic range 10.6-11.4, secondary minimum 11.3, and period 13.07 days. The reference is Strohmeier and others, IBVS 115, 1965. According to the Krakow Yearbook, no further observations have been reported.

Tristram Brelstaff began observing RU Sex in 1982, using a home-made chart which is reproduced here. The comparison star magnitudes are based on his step estimates, assuming the average magnitude is the same as the mid-range according to the catalogue.

The puzzle is that the period is obviously not 13.07 days, the range is barely half that given in the Catalogue, and it is not an eclipsing binary at all as it is more often seen at minimum than at maximum. So what is it?

I have run Tristram's observations through a period search program and found that several values will roughly fit the data. Possibly the most likely period is about 0.54d. Using this period, the observations are plotted according to phase in Figure 1; zero phase is arbitrary. If this period is correct, RU Sex is probably an RR Lyrae star.

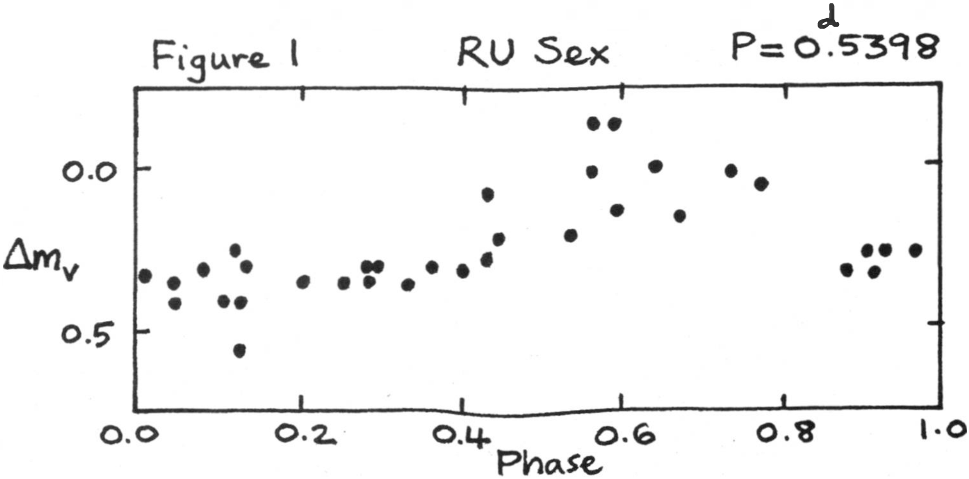
Another possible period, however, is about 6.8d (Figure 2). This would probably make RU Sex a Cepheid variable of W Virginis type.

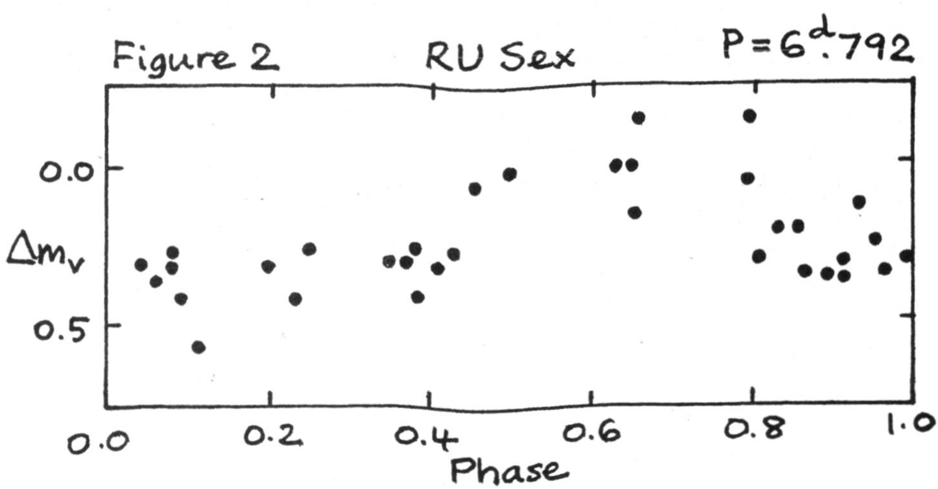
So far, RU Sex has only been observed once a night. In these circumstances it is well known that, in addition to the true period, an infinite number of spurious periods may also fit the data. The two possible periods just mentioned are related by the equation:

$$1/0.54 + 1/6.8 = 2 \text{ (nearly)}$$

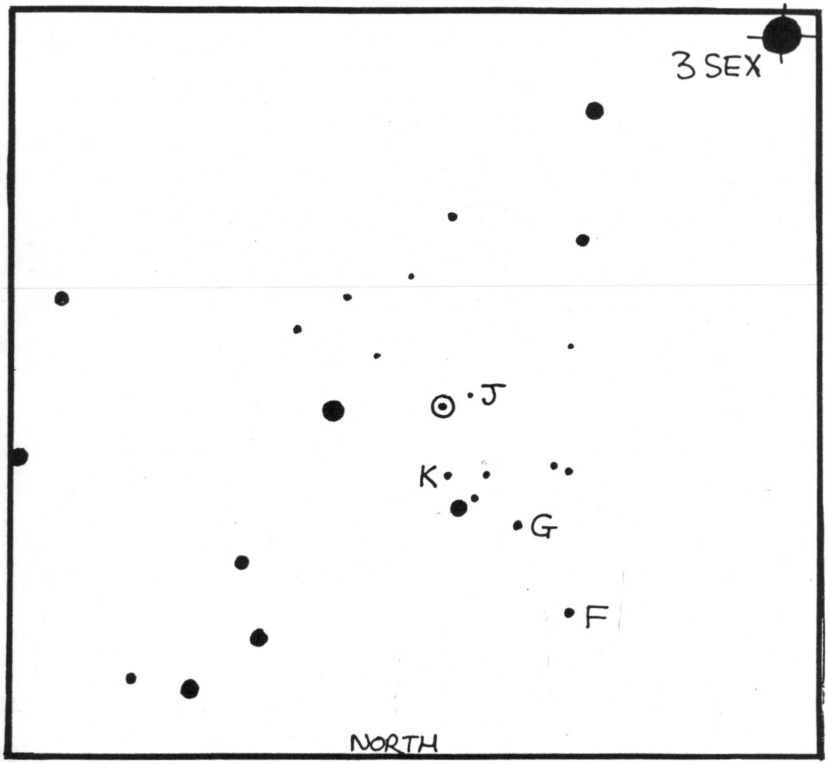
To decide between these and other possible periods, we need observations made at various times during the night. Anyone who would like to help solve this puzzle should make observations at about hourly intervals and send me the results. Don't be put off by the fact that RU Sex is south of the equator. Its declination is about the same as that of the Orion Nebula.

Further puzzle stars will be reported in future VSSCs. If you have a favourite puzzle star you would like covered, please let me know.





RU SEXTANTIS



RU Sex RR? CW? 10.8 - 11.2

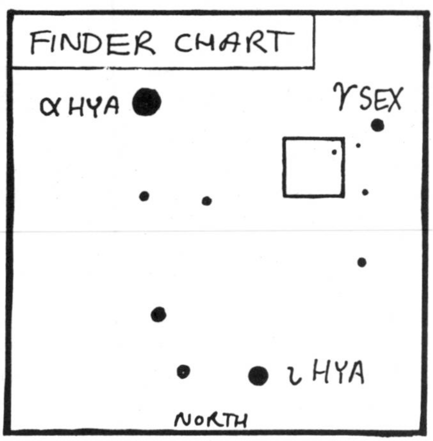
P= 0.5398d? or 6.792d?

(1950) 09h 43.2m -06° 30'
(2000) 09 45.7 -06 44

Preliminary sequence:

F = 10.8
G = 10.9
J = 11.4
K = 11.7?

JEI 1985 Jan 29



 TJB. 1982. JAN. 3

PREDICTIONS OF MAXIMA AND MINIMA FOR LPV's DURING 1985/1986

M = max.   m = min.

Star	Desig.	Mar.	Apr.	May	Jun.	Jly	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.
R And	001838						20m					20M	
W And	021143					29M							
RW And	004132								29m				
R Aql	190108		11m				13M					27m	
V Cam	054974								20m				
X Cam	043274		30m			10M		10m		30M			
SU Cnc	080714			12?M		22?m				15?M		25?m	
U CVn	124238					3?M						19?m	
V CVn	131546	27m			28M				5m			6M	
RT CVn	134434				20?m			30?M					28?m
S Cas	011272							12M					
T Cas	001755	30m							31M				
o Cet	021403		15M							17m			
R Com	115919					21?m					25?M		
S CrB	151731						22m				22M		
V CrB	154639	13m					8M						
W CrB	161138				1m			17M				25m	
R Cyg	193449		5m					19M					
S Cyg	200357			10m					26M				
V Cyg	203847								2m				
RU Cyg	213753				26m				7M				15m
χ Cyg	194632					10M							27m
T Dra	175458						21m						20M
RU Her	160625	15m							9M				
SS Her	162807		21M		14m		6M	29m		21M		14m	
R Hya	132422						10M						
SU Lac	221955			10m						3M			
RS Leo	093720		20?m			27?M				14?m			20?M
W Lyn	081040		12?M				27?m						
X Lyn	081935		27?m					13?M					
X Oph	183308				16m						8M		
U Ori	054920				25m					22M			
R Ser	154615				9M							3m	
T UMa	123160	8M					14m			20M			
SS Vir	122001				25m							4M	
		Mar.	Apr.	May	Jun.	Jly	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.

Predictions of LPV maxima and minima in 1985/1986

The dates given in the list opposite are taken from predictions prepared by the AAVSO. We acknowledge their kind permission to reproduce this information, which is presented in a different manner to that used in previous years.

M = max.   m = min.

- D.R.B. Saw

Errata

CH Cygni & CI Cygni

In VSSC 58, page 8, the report of photoelectric observations of CH Cyg gave a date of 198 (!). The correct date is 1982. In the details about CI Cyg in the same issue, page 9, the date of phase 0.0 was incorrect. It should be 244 5250.

Eclipsing Binary Programme - John Isles

In VSSC 59 it was proposed that the range of charts available should be expanded. The accompanying list (overleaf) gives details of the systems covered by the first batch of new charts, all in constellations And to Cam. Most of them have been drawn up by Tristram Brelstaff, and I have constructed comparison star sequences from his step estimates. Further charts in the list are based on work by Henshaw, Isles and Taylor. John Parkinson has asked to be relieved of the task of supplying eclipsing binary charts, so all orders should be sent to me until further notice.

Most of the charts are for telescopic use; these cover an area of 1 or 2 degrees square, and where necessary a finder chart is also included on the sheet. The details given include the latest available elements (often more recent that the last GCVS Supplement) so that observers can derive their own predictions. These are pretty well essential for List E stars for which prediction are not issued by the VSS. The charts also give co-ordinates for both 1950.0 and 2000.0.

The list also included binocular charts, on a smaller scale and with north at the top, for R Ara, RR Ari and AR/EO/LY Aur. The last of these replace the old AE Aur chart so far as eclipsing binary observers are concerned. The revised sequence is now largely photoelectric V measures, and extra comparisons have been added near EO and LY. Binocular Group observers should continue to use the old chart when observing AE Aur, until instructed otherwise.

Although the sequences are described on the charts as preliminary they should prove perfectly satisfactory in most cases. Suggestions for improvements will of course be welcome. A further batch of new eclipsing binary charts will be announced shortly.

NEW ECLIPSING BINARY CHARTS

STAR	LIST	R.A. (1950) h m	DEC. ° ′	RANGE m m	MIN II* m	TYPE	PERIOD d	D* h	WITH*
TW AND	B	00 00.7	+32 34	8.8 -10.9V		EA	4.12	13	
WW AND	E	23 42.4	+45 25	10.3 -11.4v		EA	23.29	40	
AB AND	E	23 09.1	+36 37	10.3 -11.2B	11.0	EW	0.33	2	
AD AND	E	23 34.3	+48 24	10.9 -11.6p	11.6	EB	0.99	6	
BX AND	B	02 05.1	+40 34	8.9 - 9.6v		EW	0.61	4	
CD AND	D	01 23.5	+44 06	9.8 -10.3p		EA	34.44	99	
DS AND	E	01 54.8	+37 50	10.8 -11.4p	11.1	EB	1.01	4	
ST AQR	C	22 18.4	-07 13	9.2 - 9.7V		EB	0.78	5	
SU AQR	E	22 49.4	-13 13	10.2 -10.8p	10.5	EB	1.04	6	
OO AQL	B	19 45.8	+09 11	9.1 -10.1p	9.9	EW	0.51	3	
V346 AQL	B	20 07.6	+10 12	9.0 -10.2p		EA	1.11	5	
R ARA	E	16 35.6	-56 54	6.0 - 6.9p		EA	4.43	10	
RR ARI	D	01 53.0	+23 20	6.4 - 6.8p	6.8	EA?	47.9?	92?	
SS ARI	E	02 01.4	+23 46	10 -11 p		EW	0.41	2	
SX AUR	B	05 08.2	+42 06	8.2 - 8.9p	8.6	EB	1.21	7	
TT AUR	B	05 06.2	+39 31	8.3 - 9.2p	8.7	EB	1.33	8	
AM AUR	E	04 53.4	+32 08	10.6 -12.1p		EA	13.62	56	
AR AUR	A	05 15.0	+33 43	6.1 - 6.7B	6.6	EA	4.13	7	
BF AUR	B	05 01.6	+41 13	8.5 - 9.3p	9.2	EB	1.58	9	
CQ AUR	C	06 00.6	+31 20	9.6 -10.6p		EA	10.62	36	
EO AUR	A	05 15.0	+36 35	7.5 - 8.0B		EA	4.07	22	AR AUR
HL AUR	E	06 15.3	+49 44	10.8 -11.9p		EB	0.62	4	
IU AUR	B	05 24.5	+34 44	8.2 - 8.9V	8.6	EB	1.81	11	
IY AUR	B	05 44.9	+43 04	9.4 -10.1p		E	2.79	?	
LY AUR	C	05 26.4	+35 20	6.7 - 7.4V	7.3	EB	4.00	24	AR AUR
SS BOO	E	15 11.6	+38 45	10.2 -11.2p		EB	7.61	46	
AC BOO	E	14 54.7	+46 34	10.0 -10.6V	10.6	EW	0.35	2	
AD BOO	B	14 33.0	+24 51	9.8 -10.4p		EB	1.03	6	
SV CAM	B	06 30.6	+82 19	9.8 -10.6p		EA	0.59	2	
AN CAM	E	03 59.1	+76 46	10.4 -11.2p		EA	21.00	35	

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

Notes from other publications

Information Bulletin on Variable Stars (IBVS) and *Monthly Notices of the RAS* (MN)

(From 1984 January MN have been issued twice monthly. The references below are to date and page.)

AM Cas

In IBVS 2634 (1984 Dec.4) Notni and Richter announce confirmation that this object is a very short-period Z Camelopardalis dwarf nova. Its period is only 9 days. Hydrogen emission lines are seen at minimum superimposed on a blue continuum. [This object has a nominal range of 12.3 - 15.2 pg.]

R CrB

Dietmar Böhme reports photoelectric observations made with his 165 mm Newtonian in IBVS 2646 (1984 Dec. 17). His series of 38 observations shows a fairly steady rise from 8.66 (V) on JD 244 5808.333 to about 6.08 on 244 6071.221, with some minor fluctuations.

SU UMa stars

Whitehurst (MN '84 Mar 1, 215) discusses possible models for the behaviour of these objects, in particular the 'precessing elliptical ring' model, which he concludes to be untenable. The data that are quoted for the two objects on our programme are as follows:

		AY Lyr	SU UMa
Eclipsing?		No	No
Period (days):	superhump	0.0755	?
	orbit	0.0730	?
Mean interval between outbursts:	normal	24	13
	supermaxima	205	180
Mean outburst duration:	normal	1.5	2.2
	supermaxima	15	13.2
Magnitude range		12.5 - <18	11 - 15

The outburst durations (actually widths at 14^m and 13^m for AY Lyr and SU UMa respectively) and periods (except the 'normal' interval for AY - see correspondence in 1978 April *Journal*) are taken ultimately from the most recent VSS reports on these objects.

Dwarf novae in outburst

F. Verbunt et al. (MN, 210, 197, 1984 Sept. 1) report spectroscopic and photometric observations in the optical and ultraviolet for three dwarf novae in outburst: RX And, AH Her and

UZ Ser. Visual observations by the AAVSO and RASNZ are used to complete the light curves.

The observed changes of the continuum distribution are different in the three objects. For UZ Ser the distribution apparently repeats from outburst to outburst, but the line strengths do not. The spectrum of RX And in decline is similar to an earlier-recorded spectrum taken at the same brightness, but during a prolonged standstill.

Nova Vulpeculae 1984 (No.1)

Duerbeck, Geffert and Nelles, report on the position and distance of this nova in IBVS 2641 (1984 Dec.11). The object coincides with an oval object on the Palomar Sky Survey plates, which probably is a blending of the images of several stars. An upper limit for the pre-maximum magnitude is 16.3 (B).

Spectra analyzed for the strength of the interstellar calcium lines enabled a distance of 1.2 kpc to be derived. The nova lies in a field where interstellar absorption has been studied, and a magnitude correction of 1.4 (V) may be assumed. With a maximum apparent magnitude of 6.3 (V) an absolute magnitude of −5.5 (V) is obtained, rather fainter than the mean absolute magnitude for slow novae.

Eclipsing binaries

Objects that have been discussed include BH Vir (MN '84 Jan 15, 305) and SW Lac. The latter system has a light-curve which "is highly unstable with almost unbelievable variations in light levels and amplitudes". This may in part be due to the presence of very dark spots on one component. "SW Lac has a long record of violently changing orbital period. The parabolic shape of the O-C diagram suggested initially period changes on the thermal time-scale; newer data indicate a succession of almost instantaneous period changes separated by intervals of period constancy lasting typically a few years. ... The same time-scale of a few years ... seems to be also present in the light-curve changes." (Rucinski *et al.*, 1984 May 15, 309).

Stellar variability over 21 centuries

According to the elder Pliny, Hipparchus recorded observations of the positions and brightnesses of the stars so that future astronomers should be able to discern whether stars perish or are born, whether some are in motion, and also whether they increase or decrease in magnitude. Historians now agree that Hipparchus' observations, made about 130 BC, are the basis of the star catalogue in Ptolemy's *Almagest*. The magnitude estimates, even when reduced to a modern photometric scale, are of course imprecise. But comparison with modern catalogues yields a number of surprises, as shown in a paper by K.P. Herzog (MN, 209, 533, 1984 Aug. 1).

Among the stars that may have changed in brightness, a large number are Be stars (hot blue stars, rapidly spinning and with emission lines, often indicating the presence of a circumstellar shell). These include π Aqr, which has apparently faded by 1.3 m; β CMi, which has risen by 1.3 m; η Tau, which has risen by 1.4 m; and V344 Car, which has faded by 2.6 m, if Ptolemy's magnitudes are correct. In addition three of the brightest stars missing from the catalogue, and so probably fainter than 4.5 m in Hipparchus' time, are Be stars: ω CMa (now 3.8 m), β Mon (3.8) and 17 Tau (3.7). Some of these are known from modern observations to vary slightly.

This suggests that the magnitudes of Ptolemy's catalogue may not be so bad after all, so it is worth looking into other stars with discrepant magnitudes. These include stars thought to be pulsating, although lying outside the blue edge of the instability strip in the H-R diagram: γ UMi (faded 1.1 m) and β Leo (faded 0.6 m); probably evolving binaries containing a cool primary and a hot secondary: δ Sge and HR 3080 (a 3.7 m star in Puppis at 1950: $7^h\ 50^m$, $-40.^\circ4$) which have both apparently risen by 1.2 m; and two stars in Puppis, which were not recorded by Hipparchus, nor apparently by anyone else until about 1800, and which may have come into view relatively recently from behind a dust cloud: HR 2906 (4.4 m, $7^h\ 32^m$, $-22.^\circ2$) and HR 2874 (4.8 m, $7^h\ 28^m$, $-22.^\circ9$).

NGC 4151

Photographic B measures of this Seyfert galaxy in 1968-83 are reported by T.R. Gill et al. (MN, **211**, 31, 1984 Nov. 1). A light-curve for 1978-83 is constructed including other available photoelectric and photographic data, showing irregular variation in the range 12.3 - 13.4. The galaxy is in Canes Venatici at (1950) $12^h\ 08.^m00$, $+39^\circ\ 41'$.

The same issue (MN, **211**, 33P, 1984 Nov. 1) contains a report by M.V. Penston and E. Perez on the first spectra to be obtained with the newly sited Isaac Newton Telescope (INT) on La Palma. The targets were the galaxies NGC 4151 and 3C 390.3. Comparison with earlier INT spectra of these objects taken at Herstmonceux indicates that they have both faded over the years and that the broad components of the emission lines have faded, so that both galaxies have changed from Seyfert type I very nearly to Seyfert type II. The authors suggest that the continuum source has switched off, perhaps because of a temporary lack of fuel.

Light-time effect in TW Dra

All available visual and photoelectric timings of minima are discussed by K.D. Abhankar and T. Panchatsaram (MN, 211, 75, 1984 Nov. 1). There were no photoelectric timings between 1954 and 1969. Apparently the number of cycles between these two dates was miscounted by one in an earlier study by Tremko and Kreiner in 1981. Some 30 visual timings in this interval are, however, available, enabling the authors to correct the mean period from 2.806847 to 2.80685833 . Both visual and photographic observations show that minima oscillate between occurring 22 minutes early and 22 minutes late, compared with the new linear elements. This appears to be due to the eclipsing pair's orbital motion about the common centre of gravity of a triple system, in a period of 24 days.

The carbon star R For

Visual observations by the South African amateur Danny Overbeek and infrared photometry at SAAO show that this Mira variable became unusually faint in 1983. This is interpreted as a change in circumstellar obscuration, possibly by graphite particles - M.W. Feast et al. (MN, 211, 331, 1984 Nov. 15).

Nova Mus 1983

Optical and infrared photometry of this moderately fast nova is reported by P.A. Whitelock et al. (MN, 211, 421, 1984 Nov. 15), together with visual observation by the RASNZ. From the rate of decline the absolute magnitude is estimated and the distance derived as 5 kpc.

Review

Solar System Photometry Handbook, Genet, R.M. (ed.), Willmann-Bell, Richmond (Virginia), 1983. Pp 220 (approx.), $19.95.

At first sight it might appear that photometry of objects in the Solar System, discussed in this book, has little in common with variable star work. However, as is pointed out in the Introduction, many of the techniques, particularly in the first half of the book, 'Low-speed photometry', are very similar to those required for the study of variables. The production of light-curves of minor planets and phase-curves of planetary satellites are the most obviously similar, but those wanting to carry out high-speed photometry would also find much of value in the four chapters that form the second half.

A list of the chapters (each with a different author) will give some idea of the comprehensive scope of the book:

Part 1: 'Low-speed photometry'

has chapters individually covering the photometry of Asteroids, Planets and Satellites, Comets, the Moon, the Sun, and Equipment.

Part 2: 'High-speed photometry'

has chapters on occultations by Planets and Satellites, Asteroids, the Moon, and, once again, one on Equipment. Each of the chapters follows a generally similar format, introducing the subject, making interesting suggestions for observing programmes and experiments, discussing observational techniques and data reduction, and proving a set of references. The equipment chapters provide some very useful information and constructional circuits for power supplies, amplifiers, translators, counters and timers (including photon counting applications). A portable high-speed photometer, controlled by an Intel 8085A chip is also described.

Much of current interest will centre on the chapter on cometary photometry, which is actually the longest in the book. The point is made that although broadband photometry can provide information of great interest, conventional UBV techniques are not particularly relevant to the conditions found in comets. Specific recommendations are made for narrow-band interference filters that can be selected to cover just individual emission features or else to reject them, giving true continuum measurements. Anyone hoping to do photometry of Comet Halley would be well advised to study this chapter thoroughly - it is far more comprehensive that the section in the NASA/JPL *International Halley Watch Amateur Observers' Manual.*

The printing is from camera-ready copy but the book has been laid out properly, so that it is fully legible, yet has little wasted space. There are a few errors but these are minor in nature, and are unlikely to cause confusion. In short, this book should prove of great interest to anyone interested in photoelectric photometry. The only slight reservation is that, especially with recent currency fluctuations, it may unfortunately prove rather expensive for most observers.

Minima of Eclipsing Binaries, 1982-83 - John Isles

The Section's visual and photoelectric timings of minima of eclipsing binaries in the years 1982-83 are given in the accompanying table. Photoelectric determinations are distinguished by '(PEP)' following the observer abbreviation. Unless otherwise stated, O - C values are against the linear elements of the 1969 GCVS. For further explanation, see VSSC 58.

The following observers contributed timings:

AV = J. Agar	BS = T. Brelstaff
HC = C. Henshaw	HO = A.J. Hollis
PB = M. Peel	TN = A. Thomson
TY = M.D. Taylor	UM = R. Miles

Estimates of β Lyr and V505 Mon were also received from observers named in the remarks below.

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

UU Cnc The first minimum is derived from observations 5024-44, the second from observations 5019-55 (folded).
RX Cas The first minimum is derived from observations 4976-87, the second from observations 5010-23.
BM Cas The first minimum is derived from observations 5155-243, the second from observations 5266-326.
V523 Cas Not listed in the 1969 GCVS. The O - C is against the elements of the 1969 Supplement.
β Lyr Observers in 1982 were AV, BS, TN and S. Evans; in 1983 AV, BS, TN, R. Archer, P. Garner, D. Martin, G. Pointer and M. Savage.
V505 Mon Elements not given in the GCVS or Supplements. A period of 53.7805 days is given in IBVS 1998 and confirmed by Stagni and Margoni, *Astrophys. and Space Sci.*, **88**, **115** (1982). But as the elements are given in neither reference, the epoch and O - C are not given. Observers were TY, N. Bone and I. Kennedy.
IQ Per No period is given in the 1969 GCVS, so the O - C is against the elements of the 1974 Supplement.
LS Per The period given in the 1969 GCVS is wrong, so the O - C is against the elements of the 1971 Supplement.
GN Sge No period is given in the 1969 GCVS, so the O - C is against the elements of the 1971 Supplement. The observations indicate that 'Min II' is deeper than 'Min I', so the initial epoch given in the 1971 Supplement is presumably actually a secondary minimum.
BV Tau The period given in the 1969 GCVS and repeated in the 1971 Supplement is wrong. The O - C is against the provisional revised elements:

Min = 244 6052.63 + 0.93044 E

GR Tau The period given in the 1969 GCVS is wrong. Consequently the timings listed in the last report, which were obtained by combining observations on different nights assuming the GCVS period to be correct, should be ignored. The present report gives all available timings for the years 1981-83, with O - C against the provisional revised elements:

Min = 244 4841.347 + 0429849 E

For the following stars, all observations made in the calendar year were folded onto a single cycle and used to derive the times of the minima nearest the median date of the observations:
UW CMa, AI Cep, V367 Cyg, V448 Cyg, HP Lyr,
Lyr, V505 Mon, RU Sex, BV Tau.

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

Star	Date	No.	Other Dates
TW And	5365	3	5357
WW And	4980	7	4979-5120
AD And	5226	3	5221
	5290	7	5227
DS And	4977	10	4979
V889 Aql	5226	2	5170
	5315	6	5326
AM Aur	5234	7	5015-5315
	5561	8	5357-5671
SS Boo	5442	3	5587
UW Boo	5120	1	5135
SV Cam	5180	5	5193
XZ Cam	5234	17	5300-5674
AN Cam	5023	13	4980-5234
	5674	7	5464-5674
TX Cas	5195	3	5198-5315
XZ Cep	5191	5	5155-5293
CQ Cep	5440	4	5442
VV Cet	5322	8	5290
	5326	6	5293-5295
SW Cyg	5576	6	5581
VW Cyg	5180	18	5104-5315
	5576	15	5568-5635
KU Cyg	4993	8	5033-5300
V466 Cyg	5104	5	5193
	5120	5	5170
	5191	5	5177
RR Del	5293	6	5150-5325
BI Del	5293	14	5177-5322
	5561	5	5576-5612
RY Gem	5052	3	5015-5322
GW Gem	5052	4	5054
RT Leo	5033	7	5055
TT Lyr	5191	13	5170-5322
DN Ori	5055	3	5315
V530 Ori	5363	2	5681
V643 Ori	5673	14	5341-5675
DF Peg	5573	4	5558
AB Per	5054	8	5033-5326
AY Per	5170	15	4982-5300
LS Per	5681	1	5667
β Per	5667 (AV)	4	5670
Y Psc	5198	14	5228-5326
GN Sge	5170	10	5180-5193
	5175	84	5155-5290
CF Tau	5326	1	4987
RT UMi	4977	5	4979

EEEF

STAR	EPOCH	HELIO JD 244...	O - C	No	OBSERVER	
RT AND	19633	5630.5587	-0.0190	41	UM (PEP)	
TW AND	6140	5365.338	+0.021	9	BS	*
WW AND	956	4980.116	-0.002	24	BS	*
WZ AND	15236	5674.425	-0.024	12	BS	
	15246	5681.370	-0.034	7	BS	
AB AND	28524	5576.469	+0.026	7	BS	
	28527	5577.482	+0.043	8	BS	
	28584	5596.388	+0.031	15	BS	
	28701.5	5635.383	+0.029	9	BS	
AD AND	6311	5226.322	-0.011	7	BS	*
	6376	5290.422	-0.014	16	BS	*
	6427.5	5341.235	+0.010	4	BS	
	6666	5576.414	-0.019	9	BS	
	6667	5577.403	-0.016	8	BS	
DS AND	8743	4977.355?	+0.083?	20	BS	*
	9119	5357.319	+0.096	10	BS	
	9321	5561.460	+0.113	13	BS	
SU AQR	9800	5577.498	-0.008	8	BS	
OO AQL	22242	5197.418	-0.058	8	BS	
	22244	5198.436	-0.058	12	BS	
	22990	5576.500	-0.062	9	BS	
	22992	5577.518	-0.058	7	BS	
	23005.5	5584.344	-0.074	8	BS	
	23043	5603.364	-0.058	12	BS	
V889 AQL	1620	5226.270?	+0.123?	7	BS	*
	1628	5315.219	+0.103	10	BS	*
SS ARI	36031	5576.445	-0.087	9	BS	
	36033.5	5577.458	-0.090	9	BS	
	36058	5587.386	-0.109	6	BS	
	36176	5635.306	-0.095	7	BS	
	36289.5	5681.379	-0.103	9	BS	
AM AUR	1118	5234.47	+0.60	9	BS	*
	1142	5561.35	+0.66	11	BS	*
AR AUR	4568	5629.5730	+0.0095	96	UM (PEP)	
HL AUR	32085	5561.528	+0.022	16	BS	
	32109	5576.468	+0.024	10	BS	
IM AUR	5537	5675.5775	-0.0542	?	PB (PEP)	
	5540	5679.319	-0.054	10	TY	
SS BOO	3204	5077.39?	+0.17?	5	BS	
	3219	5191.48	+0.16	4	BS	
	3252	5442.57	+0.26	8	BS	*
UW BOO	9373	5119.438	+0.010	7	BS	

STAR	EPOCH	HELIO JD 244...	O - C	No	OBSERVER	
UW BOO	9374	5120.433	0.000	5	BS	*
AC BOO	22179.5	5581.374	-0.008	7	BS	
	22188	5584.404	+0.026	13	BS	
	22222	5596.389	+0.028	12	BS	
SV CAM	19185	5155.496	-0.011	13	BS	
	19212	5171.503	-0.017	8	BS	
	19222	5177.432	-0.019	5	BS	
	19227	5180.413	-0.003	10	BS	*
	19473	5326.318	+0.007	8	BS	
	19994	5635.294	-0.008	6	BS	
	20055	5671.479	-0.001	10	BS	
XZ CAM	1159	5234.492	+0.067	20	BS	*
AL CAM	14138	5191.495	-0.004	11	BS	
	14141	5195.477	-0.008	14	BS	
	14165	5227.362	-0.003	7	BS	
AN CAM	906	5023.32	-4.88	17	BS	*
	937	5674.23	-4.93	11	BS	*
AY CAM	14251	5175.448	-0.006	9	BS	
	14289	5227.410	-0.008	7	BS	
	14335	5290.297	-0.025	10	BS	
	14384	5357.317	-0.012	11	BS	
UU CNC	98	5033.3	-4.5	9	TY	*
	98	5034.4	-3.4	11	BS	*
R CMA	8379	5033.426	-0.036	10	TY	
UW CMA	4406.5	5685.94	-0.38	12	HC	*
	4407	5688.19	-0.33	11	HC	*
YY CMI	15531	5014.404	+0.037	9	TY	
AK CMI	34745	5014.414	+0.032	14	BS	
RX CAS	649	4984.8	+2.7	7	BS	*
	650	5017.1	+2.7	7	BS	*
RZ CAS	6583	5012.302	+0.001	6	TY	
	7106	5637.418	+0.003	10	TY	
	7126	5661.324	+0.004	12	TY	
TW CAS	18072	5636.340	-0.007	8	TY	
TX CAS	8455	5195.381	-0.123	4	BS	*
BM CAS	98.5	5208.9	+3.9	19	BS	*
	99	5308.3	+4.7	9	BS	*
V523 CAS	17147	5227.390	-0.005	7	BS	*
	17177	5234.413	+0.007	7	BS	*
	17185	5236.256	-0.019	6	BS	*
	17185.5	5236.372	-0.020	6	BS	*

STAR	EPOCH	HELIO JD 244...	O - C	No	OBSERVER	
V523 CAS	17703	5357.331	+0.005	10	BS	*
	18576.5	5561.461	+0.006	12	BS	*
	18598	5566.487	+0.007	6	BS	*
	18627.5	5573.383	+0.010	7	BS	*
	18641	5576.538	+0.010	10	BS	*
VW CEP	44541.5	5560.5229	-0.1328	30	HO (PEP)	
	44900	5660.311	-0.121	6	TY	
	44903.5	5661.275	-0.132	7	TY	
	44904	5661.399	-0.147	5	TY	
XX CEP	3189	5440.481	-0.013	12	BS	
XZ CEP	3758.5	5191.370	-0.035	6	BS	*
AI CEP	4418	5216.596	-0.968	10	BS	*
	4418.5	5218.745?	-0.931?	18	BS	*
CQ CEP	7911	5440.481	-0.013	15	BS	*
EG CEP	34253	5584.361	+0.027	8	BS	
	34275	5596.341	+0.026	10	BS	
EK CEP	1362	5033.381	+0.009	12	TY	
GK CEP	7916	5636.363	-0.052	8	TY	
	7953.5	5671.4680	-0.0539	?	FB (PEP)	
	7962	5679.393	-0.087	14	TY	
VV CET	26788	5322.314	+0.048	15	BS	*
	26795.5	5326.251	+0.067	14	BS	*
	27456	5671.277	+0.055	11	BS	
	27462	5674.397	+0.040	13	BS	
SW CYG	1525	5576.598	-0.005	11	BS	*
VW CYG	2948	5180.314	+0.108	20	BS	*
	2995	5576.495	+0.066	25	BS	*
WZ CYG	28144	5198.472	+0.032	10	BS	
	28161	5208.401	+0.026	8	BS	
	28953	5671.304	+0.032	12	BS	
BR CYG	9086	5566.475	+0.015	11	BS	
KU CYG	289	4993.821	+0.023	9	BS	*
V367 CYG	586.5	5174.05	+0.49	31	BS	*
	587	5183.26	+0.41	22	BS	*
	612.5	5657.95	+0.87	19	TY	*
	613	5666.60?	+0.22?	6	TY	*
V448 CYG	4427	5223.75	-0.19	12	BS	*
V466 CYG	11735	5104.418	-0.018	11	BS	*
	11746.5	5120.427	+0.044	9	BS	*
	11797.5	5191.392	-0.006	11	BS	*
	11800.5	5195.586	-0.019	9	BS	

STAR	EPOCH	HELIO JD 244...	O - C	No	OBSERVER	
V466 CYG	12067	5566.414	-0.005	9	BS	
	12072	5573.381	+0.004	9	BS	
	12088.5	5596.331	-0.007	11	BS	
	12116.5	5635.292	-0.010	7	BS	
V748 CYG	1435	5198.46?	-0.49?	7	BS	
RR DEL	5894	5293.17	+0.09	7	BS	*
BI DEL	2334	5293.24	-0.31	15	BS	*
	2371	5561.61	-0.28	11	BS	*
TW DRA	4199	5674.459	-0.040	13	BS	
RY GEM	2907	5052.55	-0.49	11	BS	*
GW GEM	29429	5052.359	-0.028	16	BS	*
	29467	5077.429	-0.017	12	BS	
	29470	5079.393	-0.031	7	BS	
V450 HER	21244	5077.411	-0.168	12	BS	
α HER	19408	5636.384?	+0.022?	9	TY	
SW LAC	24955.5	5576.495	-0.007	9	BS	
	24958.5	5577.481	+0.016	9	BS	
	24980	5584.357	-0.003	8	BS	
	25139	5635.351	-0.006	11	BS	
VX LAC	10551	5561.472	-0.084	17	BS	
	10590	5603.380	-0.083	14	BS	
AW LAC	16250	5195.592	+0.060	15	BS	
	16391.5	5357.334	+0.089	11	BS	
	16574.5	5566.451	+0.065	9	BS	
	16669	5674.458	+0.072	12	BS	
	16675	5681.319	+0.076	14	BS	
CM LAC	11619	5671.228	0.000	10	BS	
	11621	5674.438	+0.001	10	BS	
RT LEO	21244	5033.321?	-0.008?	12	BS	*
TT LYR	2770	5191.401	+0.210	19	BS	*
TZ LYR	46382	5197.430	+0.045	10	BS	
	46384	5198.488	+0.045	11	BS	
	47210	5635.291	+0.040	10	BS	
	47278	5671.254	+0.043	11	BS	
UZ LYR	11267	5577.437	+0.029	12	BS	
	11277	5596.345	+0.024	14	BS	
HP LYR	130	5171	-35	24	BS	*
	130.5	5240	-37	28	BS	*
	132.5	5510	-49	14	BS	*
	133	5587	-43	18	BS	*

STAR	EPOCH	HELIO JD 244...	O - C	No	OBSERVER	
BETA LYR	3607	5200.10	+49.92	31	4	*
	3607.5	5206.48	+49.84	47	4	*
	3635.5	5568.95	+50.88	76	8	*
	3636	5575.39	+50.86	77	8	*
V505 MON		5039.5?		17	3	*
		5067.2?		14	3	*
V566 OPH	25078	5518.5397	+0.0184	7	HO (PEP)	
DN ORI	1277	5055.689	-0.014	11	BS	*
FZ ORI	9106.5	5681.412	+0.158	8	BS	
V392 ORI	29647	5052.420	+0.007	13	BS	
	29650	5054.397	+0.006	13	BS	
V530 ORI	3240	5357.374	-0.022	10	BS	
	3241	5363.474?	-0.033?	7	BS	*
V643 ORI	235	5673.4	+1.6	16	BS	*
U PEG	24344	5635.336	-0.024	9	BS	
	24440	5671.308	-0.031	12	BS	
	24466.5	5681.238	-0.033	6	BS	
AT PEG	7050	5577.427	-0.134	10	BS	
BX PEG	28349.5	5175.460	+0.001	9	BS	
	28406.5	5191.430	-0.013	7	BS	
	28421	5195.500	-0.009	10	BS	
	28428	5197.456	-0.016	6	BS	
	29726	5561.446	-0.014	11	BS	
	29744	5566.487?	-0.021?	5	BS	
	29768.5	5573.374	0.000	8	BS	
	29779.5	5576.451	-0.011	9	BS	
	29783	5577.443	0.000	10	BS	
DF PEG	821	5573.323?	+0.071?	7	BS	*
ST PER	2449	5577.492	-0.033	14	BS	
AB PER	3082	5054.587	-0.629	27	BS	*
AY PER	1530	5170.460	-0.049	17	BS	*
IQ PER	3097	5622.425	-0.001	9	TY	*
	3105	5636.401	+0.027	10	TY	*
IU PER	12933	4982.368	+0.057	12	BS	
	12968	5012.368	+0.061	12	BS	
	13177	5191.484	+0.060	11	BS	
	13695	5635.433	+0.071	11	BS	
	13737	5671.419	+0.062	17	BS	
LS PER	2156	5681.525?	-0.229?	7	BS	*
BETA PER	2134	5598.512	-0.145	11	TN	

EI	STAR	EPOCH	HELIO JD 244...	O - C	No	OBSERVER	
	BETA PER	2158	5667.326	-0.148	8	TY	
		2158	5667.336	-0.138	9	AV	*
	Y PSC	2700	5198.410	+0.160	23	BS	*
	UV PSC	20073	5322.356	+0.025	8	BS	
		20095	5341.300	+0.026	14	BS	
		20490	5681.410	+0.022	12	BS	
	V SGE	14233	5208.463	+0.010	9	BS	
		15001	5603.362	+0.008	13	BS	
	GN SGE	12224.5	5170.455	-0.008	15	BS	*
		12228	5175.518?	+0.007?	90	BS	*
	RU SEX	500	5042.7?	+3.5?	13	BS	*
		500.5	5048.3?	+2.6?	11	BS	*
	BV TAU	-1083	5044.948	-0.016	18	BS	*
		-662.5	5436.199	-0.015	10	BS	*
		-662	5436.655?	-0.024?	6	BS	*
	CD TAU	5311	5037.359	-0.076	10	BS	
	CF TAU	5325	5326.332	-0.012	13	BS	*
	GR TAU	0.5	4841.599?	+0.038?	4	BS	*
		328	4982.335	-0.002	8	BS	*
		398	5012.422	-0.004	10	BS	*
		491	5052.394?	-0.008?	11	BS	*
		831	5198.539?	-0.012?	4	BS	*
		1119	5322.355	+0.007	11	BS	*
		1128	5326.226?	+0.010?	8	BS	*
		1163	5341.263	+0.002	5	BS	*
		1931	5671.388	+0.003	11	BS	*
		1938	5674.384	-0.010	8	BS	*
	X TRI	7860	5208.447	-0.043	9	BS	
		7970	5315.316	-0.043	10	BS	
		8247	5584.431	-0.044	14	BS	
	XY UMA	21833	5674.410	+0.004	8	BS	
	ZZ UMA	4127	5440.525	-0.005	8	BS	
	RT UMI	9960	4977.380	-0.083	13	BS	*
		9979	5012.369	-0.092	12	BS	
	RU UMI	36445	5587.355	-0.006	7	BS	
		36605	5671.342	-0.007	10	BS	
	GP VUL	10615	5561.482	-0.033	17	BS	
		10731	5681.253	-0.033	9	BS	

Classification and Cataloguing of Variable Stars

It is said that 'coming events cast their shadows before' and the 67th Name-List of Variable Stars (IBVS 2681), listing 648 objects designated up to the end of 1984, gives an indication of some of the changes that may be expected in the 4th edition of the GCVS. (This is to contain those variables named up to 1982, totalling 28457.) The Name-List now gives a additional serial number to new designations and is arranged in order of Right Ascension, not by constellation, although a cross-reference table is given, which gives the serial numbers as well as other catalogue designations.

Alarge number of new classifications are introduced, as expected. Some of the classifications with which we shall have to become familiar include: EB/GS; DSCTC; EW/KW; XBP; XI+RS; XM; XPRM; XFPNG and EA/DM. Slightly easier to recognize are: ACYG; FKCOM; SXARI; PVTEL and UGSU.

The first volume (out of five) of the new edition of the GCVS is now becoming available. This covers the constellations Andromeda to Crux. We expect to give further details in VSSC 61 about the various improvements that have been made and also information about any changes that affect stars on the various VSS programmes.

Editorial

It is pleasant to record that a reasonable amount of material is being received for publication. Although this Circular has been increased in size by 4 pages at the last moment, it has been necessary to hold over until a later issue certain items that we had hoped to include. We apologize to Tony Markham, in particular, for the delay in publishing his work on some variables. Colin Henshaw has also sent an account of his work in charting southern hemisphere binocular variables, the first installment of which should be published in the next Circular.

We assure members that we have not forgotten the promise to continue the series of articles on the subject of 'Atlases for Variable Star Observers', which was started in VSSC 54, and met with such an enthusiastic response. VSSC 61 should carry the next item on this subject.

Material is always welcome, and members are invited to send in contributions. In general, text has to be retyped, both for editorial reasons and for the purpose of reproduction, so hand-written material is quite suitable. If possible, however, please try to prepare any light-curves, charts or other diagrams so that they may be reproduced directly, as redrawing them involves such a large amount of work and time. Please use black ink on white paper (or tracing paper). Ball-point pens do not give good lines and should be avoided if at all possible. We do not quite understand why some members seem absolutely unable to draw a straight line ...

NEW MEMBERS

M.A. Brooks - 26 Albert Road, Finedon, Northants. NN9 5JE

J. Ells - 7 Avenue Road, Bexley Heath, Kent DA7 4HA

I. Howard-Duff - 13 Nuffield Drive, Claremont Wood, Camberley.
Surrey GU15 4UX

D.J.J. Keep - 155 Carnation Crescent, East Malling,
nr Maidstone, Kent ME19 6HD

P. O'Neill - 13 Wynnland Crescent, Newtownabbey, Co. Antrim
BT36 6RJ

M.D. Seekings - 'The Golden Ball', Wisbech Road, March,
Cambs. PE15 0BA

A.A. Smeaton - Flat 8, 12 Bayne Street, Stirling FK8 1PQ

CHANGES OF ADDRESS

B. Espey - 19 Chilswell Road, Oxford OX1 4PQ

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Please note Greg Coady's change of address to that shown inside the front cover.

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