The British Astronomical Association

VARIABLE STAR SECTION

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Castle Printers of Wittering

Director's Change of Address

Please note that John Isles has moved. His postal address remains the same, but his telephone/telefax number has altered. He can now also be contacted by telex. The new numbers are given inside the front cover.

Appointment of Computer Secretary

Following the announcement about computerization in VSSC 69, Dave McAdam has been appointed Computer Secretary of the VSS. Dave is already well known as the discoverer of Nova PQ And 1988, in which detection he was helped by his computerized index of his photographs of the sky. We are very pleased to welcome Dave to the team and look forward to re-introducing as soon as possible the publication of an annual booklet of computer-plotted light curves. Elsewhere in this Circular, Dave writes about the computer project, in which much help will be needed from members with suitable computers who can take part in the keying of observations.

Electronic Mail Addresses

Following the closure of Microlink, members are asked to note changes in the electronic mail addresses of the Section Officers as shown on the inside front cover. Telecom Gold is now the preferred system. Anyone considering subscribing to an electronic mail system is advised to discuss this with one of the Officers. This should certainly be done before submitting observations by this method.

BAA VSS Centenary Meeting 1991 October 19 and 20 Professional-Amateur Collaboration on Variable Stars

To commemorate its centenary, the Variable Star Section will be holding a meeting at The Manor House, Mayplace Road East, Crayford, Kent on 1991 October 19 & 20.

The meeting will consist of presented papers and poster displays together with an exhibition of equipment and trade stands. There will be ample opportunity for delegates to meet for discussion on an individual basis.

To celebrate the centenary of the Section a banquet will take place on the Saturday evening. The conference charge will be £25 all-in for 2 days, or £24 for one day. Both include lunch, morning and afternoon refreshments, and banquet. Charges excluding banquet are £10 for two days, and £7 for one. 'Bed and breakfast' accommodation can be arranged at an approximate cost from £12 per person per night.

Those wishing to participate are invited to complete the enclosed registration form and return it as soon as possible to:

R.D. Pickard, 28 Appletons, Hadlow, Kent TN11 0DT (Tel: 0732-850663)

Full details of the venue and programme will be sent at a later date.

Observing New Variables

Richard Fleet (60 Blacklands Drive, Hayes End, Mddx UB4 8EX)

Although few observers make discoveries there is no reason why many others should not have the satisfaction of exploring the behaviour of an entirely new variable.

There are, of course, plenty of under-observed stars in existing programmes, but I feel there would be extra motivation if individual 'mini research projects' could be arranged. What I would like to see eventually is a situation where a suitably experienced observer could be allocated a new, suspected variable. It would then be up to the observer to confirm the identity of the variable, produce a chart and sequence if necessary, and observe it in detail until it is possible to give a useful description of the star's behaviour. A few might prefer to work alone, but I expect most experienced observers would ask others for confirming observations, or work in small groups.

The value of confirmation should not be underestimated, because it will be essential to be able to demonstrate the reliability of the observations and any conclusions drawn from them. Archive photographs will be valuable for showing past behaviour, but it may be worth persuading a few deep-sky photographers to record some of the fields, at various times, to provide a completely independent check. (Film and filter combinations would need to be standardized.)

Source Material

An obvious source of new objects are the anomalies turned up in automated searches; these may not be good news for potential discoverers, but could provide an unusual opportunity for others.

One possibility should be available in a few years' time when the second stage of the Hubble Space Telescope *Guide Star Catalog* is merged with the first, and is '... expected to reveal thousands of previously unknown variables of all types.' (*Sky & Telescope*, 1989 December, p.589). Most of them may not be suitable for amateur observation, but there should still be enough to go round, even after the professionals have taken their pick.

This is still several years away, but in the meantime there are plenty of objects that could be taken up. NSV objects are an obvious source, and Mike Collins has suggested a few others.

Co-ordination

While the main objective is to provide worthwhile individual projects, co-operation will be essential for success. Many observers will encounter similar problems so experience and expertise can be shared. Co-ordinating the allocation of objects will help to retain the personal-goal element, by avoiding duplication, and increase the number of stars covered. It may be useful to publish a list of which stars are being investigated by whom, as this would make it easier for outstanding observations and other information to be directed to whoever needs it. Working to common standards will be helpful, not only for the credibility of such an exercise, but also for the sharing or publication of the information gathered.

Worth Trying?

Results are likely to be highly variable, because it may be a matter of luck whether or not the stars involved are interesting - and the output from observers may range from nothing useful to excellent. Doing the job properly is likely to take years rather than months, so a long-term view is necessary. Those who make the effort would have the satisfaction of taking what was just an anomaly up to the point where it might be worthy of inclusion in the *GVCS*. Provided the results are of a high standard there should be no great problem getting them published in existing journals.

Not many amateurs seem to have tried this sort of work, yet there are many who can do it, and there is much that could be done. How about a few volunteers, each willing to take up a particular star?

BAAVSS Computerization

Dave McAdam

For some time now there has been a pressing need for the section records to be put onto an overall database system. Such a system is not easy to devise, because not only would it have to accept input in all the different ways that observers have reported observations to date, it would also need to be compatible with, or at least accept, the data which already exists in machine readable forms. There is also the possibility in the near future that it will have to contend with the growing number of PEP observations which some observers are now doing.

Output from such a database would also need to provide several options, such as chronological listings of estimates - either abbreviated or in full, or lists which are compatible with existing light curve plotting programs, and perhaps eventually providing output from its own internal plotting routines. There must also be the facility for re-reducing observations as sequences are revised and improved, and this could possibly be extended to include more sophisticated forms of analysis.

Although the complexities are somewhat daunting, I have agreed to have a go at devising an overall system and have begun work on writing the software as a computer "language" which will do the job of storing and accessing the data as required. Some helpful advice and suggestions on certain aspects have been forwarded by some section officers and members, and there will be other areas of section practice and know-how about which I will need to seek advice.

A basic concept for the system is that it will input pure ASCII text reports in similar layout to the current paper reports but with the addition of keyword headings which can be read and recognised. This means that computer reports can be typed by anyone with a word processing computer and saved on floppy disk or tape ready to send to a section officer. Here, "send" includes electronic mailing as well as letter/parcel post. Of course, sending reports on disk or tape is not as straight forward as it may sound due to the diversity of home computer storage formats. However, it may be that this problem can be partly overcome so that a few of the more popular formats are acceptable.

A first priority is to tackle the massive job of typing existing paper records into computer files: if any members with word processing facilities think they can help with this work, I would be very pleased to hear from them. For anyone with a BBC computer, utility programs are available for entering reports without a word processor. A leaflet describing the computer report formats is available in exchange for an SAE.

Unusual Carbon Stars

Participating observers have already been notified that the collaborative programme on four unusual carbon stars, together with astronomers at University College, London, (UCL) was completed in 1990 September. All results reported to the Director have been forwarded to UCL for inclusion in the final report of the programme. The observed amplitudes of the four stars concerned (VX And, EU And, V778 Cyg, BM Gem) were small and it has been decided that they should not be included in the main programme of the VSS.

The work by visual observers included the experimental use of colour filters for observing these very red stars, and the results are likely to be of interest in planning future studies of strongly coloured stars. We therefore plan to publish an analysis of the data in a future VSS *Circular*. Any outstanding observations (with or without filters) of these four stars should be sent to the Director immediately.

Symbiotic Stars - New Work for the VSS

John Isles

Recent VSS Circulars have proposed the addition of several symbiotic stars to our programme, and two such objects - UV Aur and AX Per - were introduced to members in VSSC 70. Shortly afterwards I received from Dr L. Hric and Dr A. Skopal an invitation for both photoelectric and visual observers in the VSS to participate in an international campaign of long-term photometry of symbiotic stars. Their call for observations is published in the accompanying PALC Newsletter.

Accordingly, charts have been drawn up for all the known northern and equatorial symbiotic stars not already on our programme that are suitable for observation, and visual observers may order these charts from John Toone. The full list of symbiotic stars now on the VSS programme is as follows.

Z And	CI Cyg	SS Lep	AS 245 Sgr
EG And	V1016 Cyg	BX Mon	FR Sct
R Aqr	V1329 Cyg	RS Oph	FG Ser
UV Aur	AG Dra	Hen 1341 Oph	AS 289 Ser
TX CVn	NQ Gem	AG Peg	PU Vul
T CrB	YY Her	AX Per	
BF Cyg	V443 Her	HM Sge	
CH Cyg	RW Hya	QW Sge	

The three stars without variable-star names are not so far known to vary, but are very much worth checking for change. Details of ranges, types and available charts are given in the full list of stars on the binocular and telescopic programmes, given elsewhere in this VSSC. The symbiotic stars include eruptive variables of Z Andromedae type, recurrent novae, very slow novae, Mira stars or semiregular variables, and eclipsing binaries. Often a given star shows more than one type of variation.

Observers of CH Cyg and AG Peg are particularly asked to note that the charts for these stars have been redrawn with revised comparison star sequences linked to photoelectric V measures.

The list of stars includes all those proposed by Drs Hric and Skopal, except V471 Per (the 13 mag central star of the planetary nebula M1-2), Draco C-1 (a 17 mag star in the dwarf spheroidal galaxy Draco C) and V407 Cyg (of mag 15). These three objects are not suitable for study in small telescopes but observations from members with appropriate equipment would still be welcome. Five symbiotic stars readily observed in small instruments have been added to the original list: NQ Gem (a former binocular programme star), SS Lep, Hen 1341 Oph, AS 245 Sgr and FR Sct. Anyone who refers to the original list in IBVS 3364 should also note that V741 Per should read V471 Per, AS 296 has been identified with the variable star FG Ser, and AS 360 has been named QW Sge.

The first results of the campaign, including the available visual data for the years 1988 and 1989, will be published shortly. Many of the stars new to our programme have not been well observed hitherto, and I hope observers will pay special attention to them. Most of these stars should be observed once or twice a week, but the recurrent novae need nightly checking. Unusual activity, particularly a sudden rise, should be reported to a member of the alert team whose telephone numbers are given inside the front cover. In future VSS Circulars we plan to summarize the observational history of each of these fascinating objects.

Binocular and Telescopic Programmes 1991

John Isles

The accompanying list gives details of all objects currently on the binocular and telescopic programmes, and the charts available for them. It does not include objects on the separate programme of recurrent objects (see VSSC 69), eclipsing binaries (see the Eclipsing Binary Handbook), or supernova search charts (see VSSC 67).

The positions, types, ranges and periods are mostly from the GCVS, but account has also been taken of some data appearing since that catalogue was compiled. For many red variables, visual ranges have been taken from other sources. A key to the abbreviations under "Type" is given at the end of the list.

The column "Pr" indicates whether each star is on the binocular (B) or telescopic (T) programme. The separation into two programmes is a matter of administrative convenience, and affects observers only in that the charges for binocular and telescopic charts differ (see inside back cover). Several objects on the telescopic

programme are normally bright enough for observation with binoculars or the naked eye; these are marked "T*". Conversely, several objects on the binocular programme are often too faint for binoculars, and may be suitable for small telescopes; these are marked "B*".

The final column usually gives: the serial number appearing at the foot of the chart (or at the head on newer charts); the date of the latest revision; or the name of another variable on whose chart the star in question appears. Observers are urged to check their charts to make sure they are using the latest versions, and where necessary to obtain replacements from the Chart Secretary.

Binocular Priority List. Binocular observers are asked to note that stars in the following list (slightly expanded from that given in VSSC 70) have priority status because of their importance. When possible, they should be observed once every ten days, or every five days if they appear to be changing rapidly.

The remaining stars on the binocular programme can be observed less frequently, for example once a month. The priority stars are:

AQ And	Mu Cep	RX Lep
EG And	Omicron Cet	SS Lep
V Aql	R CrB	Y Lyn
UU Aur	W Cyg	SV Lyn
AB Aur	AF Cyg	U Mon
V Boo	CH Cyg	X Oph
RW Boo	U Del	BQ Ori
RX Boo	EU Del	AG Peg
U Cam	RY Dra	GO Peg
ST Cam	TX Dra	X Per
XX Cam	AH Dra	R Sct
X Cnc	NQ Gem	Y Tau
RS Cnc	X Her	W Tri
V CVn	SX Her	Z UMa
WZ Cas	UW Her	ST UMa
V465 Cas	AC Her	VY UMa
Gamma Cas	IQ Her	V UMi
Rho Cas	OP Her	SS Vir
W Cep	R Hya	SW Vir
AR Cep	RW Hya	

Alert Reports. Unusual activity in any star on the binocular or telescopic programme should be reported to any member of the alert team of "The Astronomer", whose telephone numbers are listed inside the front cover of each VSSC. The following should be watched for in particular:

- major outbursts or subsidiary rises in the recurrent novae, old novae (especially GK Per), long-period dwarf novae (VY Aqr, UV Per, WZ Sge, SW UMa), and Z And stars.
- supermaxima of UGSU stars.
- fades of RCB stars to 0.5m or more below normal maximum brightness.
- any sudden fade of PU Vul below its current brightness of 11m.

Early detection and reporting will enable important observations to be made by amateurs and professionals world-wide.

Binocular and Telescopic Programme Stars 1991

Star	*R.A. (1950)*	*Dec*	*Type*	*Range*	*Period*	*Pr*	*Chart*
R And	00 21.4	+38 18	M	5.6 - 14.9V	409	T	053.01
W And	02 14.4	+44 04	M	6.7 - 14.6V	396	T	035.01
Z And	23 31.3	+48 33	ZAND	8.0 - 12.4P		T	095.01
RS And	23 52.8	+48 22	SRA	7.0 - 9.1V	136	B*	TZ And
RW And	00 44.6	+32 25	M	7.9 - 15.7V	430	T	022.01
RX And	01 01.8	+41 02	UGZ	10.3 - 14.0V	14	T	001.02
SU And	00 02.0	+43 16	LC	8.0 - 8.5V		B*	TZ And
TZ And	23 48.4	+47 14	SRB	7.6 - 9.0V		B*	1977 Sep 10
AQ And	00 24.9	+35 19	SR	8.0 - 8.9V		B*	1982 Aug 16
BZ And	00 34.9	+45 20	LB	7.5 - 8.4V		B*	1982 Aug 16
EG And	00 41.9	+40 24	ZAND	7.1 - 7.8V		B	072.01
R Aqr	23 41.2	-15 34	M	5.8 - 12.4V	387	T	096.01
VY Aqr	21 09.5	-09 02	UGSU	8.4 - 17.2P		T	1987 Oct 25
R Aql	19 04.0	+08 09	M	5.5 - 12.0V	284	T	030.01
V Aql	19 01.7	-05 46	SRB	6.6 - 8.4V	353	B	026.02
UU Aql	19 54.6	-09 27	UGSS	11.0 - 16.8P	50	T	002.02
UW Aql	18 55.0	+00 23	LC	8.9 - 9.5V		T	028.01
V450 Aql	19 31.3	+05 21	SRB	6.3 - 6.7V	64	B	070.01
V603 Aql	18 46.4	+00 32	NA/E+X	-1.1 - 12.0V		T	1986 Oct 24
V1293 Aql	19 30.6	+04 55	SRB	6.7 - 7.4V		B	V450 Aql
V1294 Aql	19 31.1	+03 39	GCAS	6.8 - 7.2V		B	V450 Aql
V Ari	02 12.3	+12 00	SRB	7.8 - 8.8V	77?	B*	1984 Oct 26
SS Aur	06 09.6	+47 45	UGSS	10.3 - 15.8V	56	T	003.02
UU Aur	06 33.1	+38 29	SRB	5.1 - 6.8V	234	B	1984 Apr 9
UV Aur	05 18.5	+32 28	M	7.4 - 10.6V	394	T	074.01
AB Aur	04 52.6	+30 28	INA	6.9 - 8.4B		B	TT Tau
Psi^1 Aur	06 21.1	+49 19	LC	4.8 - 5.7V		B	1973 Jul 14
U Boo	14 52.0	+17 54	SRB	9.8 - 13.0V	201	T	036.01
V Boo	14 27.7	+39 05	SRA	7.0 - 12.0V	258	T	037.01
W Boo	14 41.2	+26 44	SRB?	4.7 - 5.4V	450?	B	undated

Binocular and Telescopic Programme Stars 1991

Star	*R.A. (1950)*	*Dec*	*Type*	*Range*	*Period*	*Pr*	*Chart*
RV Boo	14 37.1	+32 45	SRB	6.3 - 8.0V	137	B	1974 Jan 20
RW Boo	14 39.1	+31 47	SRB	6.4 - 7.9V	209	B	RV Boo
RX Boo	14 21.9	+25 56	SRB	6.9 - 9.1V	160	B*	1972 Aug 12
U Cam	03 37.5	+62 29	SRB	7.7 - 8.7V		B*	1972 Nov 4
V Cam	05 56.0	+74 30	M	7.7 - 16.0V	522	T	027.01
X Cam	04 39.2	+75 01	M	7.4 - 14.2V	144	T	038.01
Z Cam	09 19.7	+73 16	UGZ	10.0 - 14.5V	22	T	004.02
RY Cam	04 26.1	+64 20	SRB	7.3 - 9.4V	136	B*	UV Cam
ST Cam	04 46.0	+68 05	SRB	6 - 8 V	300?	B	1976 Jun 2
UV Cam	04 01.5	+61 40	SRB	7.5 - 8.1V	294?	B	1972 Jul 29
XX Cam	04 04.8	+53 14	RCB?	7.3 - 9.7V		T*	068.01
ZZ Cam	04 13.3	+62 13	LB	7.1 - 7.9V		B	UV Cam
X Cnc	08 52.6	+17 25	SRB	5.6 - 7.5V	195?	B	1984 Apr 8
RS Cnc	09 07.6	+31 10	SRC?	5.1 - 7.0V	120?	B	1984 Apr 12
RT Cnc	08 55.6	+11 02	SRB	7.1 - 8.6V	60?	B*	1972 Jul 29
SU Cnc	08 10.7	+13 57	M	12.0 -[16 P	187	T	1973 Mar
U CVn	12 44.9	+38 39	M	7.0 -[13 V	346	T	1983 Mar
V CVn	13 17.3	+45 47	SRA	6.5 - 8.6V	192	B*	Y CVn
Y CVn	12 42.8	+45 43	SRB	5.2 - 6.6V	157	B	1984 Apr 12
RT CVn	13 46.5	+33 56	M	10.0 - 14 V	254	T	1971 May
TU CVn	12 52.7	+47 28	SRB	5.6 - 6.6V	50	B	Y CVn
TX CVn	12 42.3	+37 02	ZAND	9.2 - 11.8P		T	078.01
W CMa	07 05.7	-11 51	LB	6.4 - 7.9V		B	1982 Nov 7
S Cas	01 16.0	+72 21	M	7.9 - 16.1V	612	T	054.01
T Cas	00 20.5	+55 31	M	6.9 - 13.0V	445	T	067.01
UV Cas	23 00.2	+59 20	RCB	10.5 - 15.2V		T	061.01
WZ Cas	23 58.7	+60 05	SRB	6.9 - 8.5V	186	B*	1982 Aug 16
V391 Cas	01 52.5	+69 58	LB	7.6 - 8.4V		B	1978 May 15
V393 Cas	01 58.5	+71 03	SRA	7.0 - 8.0V	393	B	V391 Cas
V465 Cas	01 15.1	+57 32	SRB	6.2 - 7.2V	60	B	1983 Oct 1
Gamma Cas	00 53.7	+60 27	GCAS	1.6 - 3.0V		T*	064.01
Rho Cas	23 51.9	+57 13	SRD	4.1 - 6.2V	320	T*	Gam Cas
W Cep	22 34.6	+58 10	SRC	7.0 - 9.2V		B*	RW Cep
RU Cep	01 14.4	+84 52	SRD	8.2 - 9.8V	109	B*	RX Cep
RW Cep	22 21.2	+55 43	SRD	6.2 - 7.6V	346?	B	1983 Oct 1
RX Cep	00 45.9	+81 42	SRD?	7.2 - 8.2V	55?	B	1985 May 6
SS Cep	03 41.6	+80 10	SRB	6.7 - 7.8V	90	B	1972 Nov 4
AR Cep	22 52.6	+84 47	SRB	7.0 - 7.9V		B	RX Cep
DM Cep	22 07.4	+72 31	LB	6.9 - 8.6V		B	undated
FZ Cep	21 18.2	+55 14	SR	7.0 - 7.6V		B	1983 Oct 1
Mu Cep	21 42.0	+58 33	SRC	3.4 - 5.1V	730	B	1973 Jul 14
Omicron Cet	02 16.8	-03 12	M	2.0 - 10.1V	332	T*	039.01
R Com	12 01.7	+19 04	M	7.1 - 14.6V	363	T	1946
R CrB	15 46.5	+28 18	RCB	5.7 - 14.8V		T*	041.01
S CrB	15 19.4	+31 33	M	5.8 - 14.1V	360	T	043.01

Binocular and Telescopic Programme Stars 1991

Star	*R.A. (1950)*	*Dec*	*Type*	*Range*	*Period*	*Pr*	*Chart*
T CrB	15 57.4	+26 04	NR	2.0 - 10.8V	29000	T	025.01
V CrB	15 47.7	+39 43	M	6.9 - 12.6V	358	T	057.01
W CrB	16 13.6	+37 55	M	7.8 - 14.3V	238	T	044.01
RR CrB	15 39.6	+38 43	SRB	7.1 - 8.6V	61	B	SW CrB
SW CrB	15 38.9	+38 53	SRB	7.8 - 8.5V	100?	B	1984 Jan 4
R Cyg	19 35.5	+50 05	M	6.1 - 14.4V	426	T	031 01
S Cyg	20 04.4	+57 50	M	9.3 - 16.0V	323	T	032.01
V Cyg	20 39.7	+47 58	M	7.7 - 13.9V	421	T	034.01
W Cyg	21 34.1	+45 09	SRB	5.0 - 7.6V	131	T*	062.01
RU Cyg	21 39.0	+54 06	SRA	8.0 - 9.4V	233	B*	FZ Cep
RV Cyg	21 41.2	+37 47	SRB	7.1 - 9.3V	263	B*	V460 Cyg
SS Cyg	21 40.7	+43 21	UGSS	7.7 - 12.4V	50	T	005.02
TT Cyg	19 39.0	+32 30	SRB	7.4 - 8.7V	118	B*	1972 Sep 16
AF Cyg	19 28.7	+46 02	SRB	6.4 - 8.4V	92	B	1983 Oct 2
BC Cyg	20 19.8	+37 22	SRC	9.6 - 10.5V	700?	T	BI Cyg
BF Cyg	19 21.9	+29 35	ZAND	9.3 - 13.4P		T	088.01
BI Cyg	20 19.5	+36 46	LC	8.4 - 9.9V		T	065.01
CH Cyg	19 23.2	+50 08	ZAND+SR	5.6 - 8.5V		B	089.01
CI Cyg	19 48.4	+35 33	EA/G+ZAND	9.1 - 11.5V	855		06.01
V460 Cyg	21 39.9	+35 17	SRB	5.6 - 7.0V	180?	B	1983 Sep 18
V482 Cyg	19 57.8	+33 50	RCB	11 - [15 V		T	JBAA 88 Apr
V973 Cyg	19 43.1	+40 36	SRB	6.2 - 7.0V	40?	B	AF Cyg
V1016 Cyg	19 55.3	+39 42	NC+M	10.1 - 17.5B		T	092.01
V1329 Cyg	20 49.0	+35 24	E+NC	12.1 - 18 B	950	T	093.01
V1819 Cyg	19 52.8	+35 34	N	8.7 - 19 V		T	1987 Oct 3
Chi Cyg	19 48.6	+32 47	M	3.3 - 14.2V	408	T	045.01
P Cyg	20 16.0	+37 53	SDOR	3 - 6 V		B	1972 Jul 29
U Del	20 43.2	+17 54	SRB	5.6 - 7.5V	110?	B	EU Del
EU Del	20 35.6	+18 06	SRB	5.8 - 6.9V	60	B	1983 Oct 1
HR Del	20 40.1	+18 59	NB	3.5 - 12.0V		T	1972 Nov
T Dra	17 55.6	+58 13	M	7.2 - 13.5V	422	T	046.01
RY Dra	12 54.5	+66 16	SRB?	6.0 - 8.0V	200?	B	Y UMa
TX Dra	16 34.3	+60 34	SRB	6.8 - 8.3V	78?	B	AT Dra
UW Dra	17 56.5	+54 40	LB	7.0 - 8.2V		B	1974 Jul 27
UX Dra	19 23.4	+76 28	SRA?	5.9 - 7.1V	168	B	1982 Nov 7
VW Dra	17 15.9	+60 43	SRD?	6.0 - 7.0V	170?	B	AT Dra
AB Dra	19 51.1	+77 37	UGZ	11.0 - 15.3V	13	T	007.03
AG Dra	16 01.4	+66 56	ZAND	8.9 - 11.8P	554	T	080.01
AH Dra	16 47.4	+57 54	SRB	7.1 - 7.9V	158	B	AT Dra
AT Dra	16 16.4	+59 52	LB	5.3 - 6.0V		B	1972 Jan 25
U Gem	07 52.1	+22 08	UGSS+E	8.2 - 14.9V	105	T	008.02
TU Gem	06 07.8	+26 02	SRB	7.4 - 8.3V	230	B*	1972 Nov 11
TV Gem	06 08.8	+21 53	SRC	6.6 - 8.0V		B	TU Gem
WY Gem	06 08.9	+23 13	LC+E?	7.2 - 7.9V		B	TU Gem
BN Gem	07 34.2	+17 01	GCAS	6.8 - 6.9V		B	1972 Jul 29

Binocular and Telescopic Programme Stars 1991

Star	*R.A. (1950)*	*Dec*	*Type*	*Range*	*Period*	*Pr*	*Chart*
BQ Gem	07 10.5	+16 15	SRB	5.1 - 5.5V	50?	B	1972 Sep 16
BU Gem	06 09.3	+22 55	LC	5.7 - 8.1V		B	TU Gem
DW Gem	06 27.8	+27 29	LB	8 - 10 V		B*	1985 Mar 18
IR Gem	06 44.5	+28 08	UGSU	10.7 - [14.5V	75	T	042.01
IS Gem	06 46.4	+32 40	SRC	5.3 - 6.0V	47?	B	1972 Jun 10
NQ Gem	07 28.9	+24 37	SR+ZAND	7.4 - 8.0V	70?	B*	077.01
X Her	16 01.2	+47 23	SRB	6.3 - 7.4V	95	B	1982 Feb 7
RU Her	16 08.2	+25 12	M	6.8 - 14.3V	485	T	060.01
SS Her	16 30.5	+06 58	M	8.5 - 13.5V	107	T	047.01
ST Her	15 49.3	+48 38	SRB	7.0 - 8.7V	148	B*	1971 May 1
SX Her	16 05.3	+25 02	SRD	8.0 - 9.2V	103	B*	VSSC 65 p.9
UW Her	17 12.6	+36 25	SRB	7.8 - 8.7V	104	B*	1973 Aug 30
YY Her	18 12.4	+20 58	ZAND	11.1 - [14.0B		T	084.01
AC Her	18 12.4	+21 50	RVA	6.8 - 9.0V	75	T*	048.02
AH Her	16 42.1	+25 21	UGZ	10.9 - 14.7P	20	T	009.03
IQ Her	18 15.7	+17 58	SRB	7.0 - 7.5V	75	B	AC Her
OP Her	17 55.4	+45 21	SRB	5.9 - 6.7V	120	B	1984 Apr 12
V443 Her	18 20.1	+23 25	ZAND	11.4 - 11.7V		T	086.01
V566 Her	18 06.3	+41 43	SRB	7.1 - 7.8V	137	B	OP Her
g Her	16 27.0	+41 59	SRB	4.3 - 6.3V	89	B	X Her
R Hya	13 27.0	-23 01	M	3.5 - 10.9V	389	T*	049.01
U Hya	10 35.1	-13 07	SRB	4.3 - 6.5V	450?	B	1982 Nov 14
RW Hya	13 31.5	-25 07	ZAND	8 - 9 V	370	T*	079.01
SU Lac	22 21.0	+55 16	M	11 - 15 V	302	T	069.01
SX Lac	22 53.6	+34 56	SRD	7.7 - 8.7V	]90	B*	1974 Jul 28
X Leo	09 48.4	+12 07	UGSS	11.1 - 15.7V	17	T	010.01
RS Leo	09 40.6	+20 05	M	10.7 - 16.0P	208	T	1971 Mar
RY Leo	10 01.6	+14 14	SRB	9.0 - 11.8V	115	T	1942 Feb 17
U LMi	09 51.6	+36 20	SRA	10.0 - 13.3V	272	T	1942
W LMi	10 41.9	+26 18	SRD	10.5 - 13.5V	117	T	1976 Apr
RX Lep	05 09.0	-11 55	SRB	5.0 - 7.4V	60?	B	1972 Sep 16
SS Lep	06 02.8	-16 29	ZAND	4.8 - 5.1V		B	075.01
W Lyn	08 13.4	+40 17	M	7.5 - 14.0V	295	T	1971 Jul
X Lyn	08 22.3	+35 34	M	9.5 - 16 V	321	T	1982 FeB
Y Lyn	07 24.6	+46 06	SRC	6.9 - 8.0V	110	B	1978 Jul 14
SV Lyn	08 00.4	+36 29	SRB	6.6 - 7.5V	70?	B	1981 Jun 18
R Lyr	18 53.8	+43 53	SRB	3.9 - 5.0V	46?	B	1972 Nov 11
XY Lyr	18 36.4	+39 37	LC	5.8 - 6.4V		B	1972 Sep 16
AY Lyr	18 42.7	+37 57	UGSU	2.5 - 18.4B	24	T	011.01
U Mon	07 28.4	-09 40	RVB	5.9 - 7.8V	91	T*	029.02
RV Mon	06 55.7	+06 14	SRB	6.8 - 8.3V	132	B	SX Mon
SX Mon	06 49.3	+04 50	SR	7.3 - 8.5V	100	B*	1987 Dec 30
BX Mon	07 22.9	-03 30	*	9.5 - 13.4P		T	076.01
X Oph	18 36.0	+08 47	M	5.9 - 9.2V	328	B*	1972 Nov 4
RS Oph	17 47.5	-06 42	NR	4.3 - 12.5V		T	024.01

Binocular and Telescopic Programme Stars 1991

Star	*R.A. (1950)*	*Dec*	*Type*	*Range*	*Period*	*Pr*	*Chart*
V2048 Oph	17 57.8	+04 22	GCAS+UV?	4.6 - 4.9V		B	1978 Jul 14
Hen 1341 Oph	17 05.7	-17 23	ZAND?	12.9 V		T	081.01
U Ori	05 52.8	+20 10	M	4.8 - 13.0V	368	T	059.01
W Ori	05 02.8	+01 07	SRB	5.9 - 7.7V	212	B	1972 Nov 4
BL Ori	06 22.6	+14 45	LB	6.3 - 6.9V		B	1983 Oct 3
BQ Ori	05 54.1	+22 50	SR	6.9 - 8.9V	110	B*	Y Tau
CK Ori	05 27.7	+04 10	SR?	5.9 - 7.1V	120?	B	1972 Aug 12
CN Ori	05 49.7	-05 26	UGZ	11.0 - 16.2V	16	T	012.02
CZ Ori	06 13.9	+15 25	UGSS	11.2 - 15.6V	26	T	013.02
RU Peg	22 11.6	+12 27	UGSS+ZZ?	9.0 - 13.2V	74	T	014.02
AG Peg	21 48.6	+12 24	NC	6.0 - 9.4V		B*	094.01
GO Peg	22 52.6	+19 18	LB	7.1 - 7.8V		B	1971 Jul 28
S Per	02 19.2	+58 22	SRC	7.9 - 12.0V	822	T	050.01
X Per	03 52.2	+30 54	GCAS+XP	6.0 - 7.0V		B	1984 Apr 8
RS Per	02 18.8	+56 53	SRC	7.8 - 10.0V	244	T	BU Per
SU Per	02 18.6	+56 23	SRC	7.0 - 8.5V	533	B	AD Per
TZ Per	02 10.3	+58 09	UGZ	12.0 - 15.6V	17	T	015.02
UV Per	02 06.7	+56 57	UGSU	11.0 - 17.5V	320	T	016.03
AD Per	02 17.0	+56 46	SRC	7.7 - 8.4V	362	B*	1974 Jan 13
AX Per	01 33.1	+54 00	ZAND	8 - 13 V	682	T	073.01
BU Per	02 15.4	+57 12	SRC	9.0 - 10.0V	367	T	063.01
GK Per	03 27.8	+43 44	NA+XP	0.2 - 14.0V		T	1977 Aug
KK Per	02 06.8	+56 19	LC	6.6 - 7.9V		B	AD Per
PR Per	02 18.1	+57 38	LC	7.6 - 8.3V		B*	AD Per
Z Psc	01 13.4	+25 30	SRB	7.0 - 7.9V	144	B	1969 Nov 10
TV Psc	00 25.4	+17 37	SR	4.7 - 5.4V	49	B	1972 Sep 9
TX Psc	23 43.8	+03 13	LB	4.8 - 5.2V		B	1972 May 27
SV Sge	19 06.0	+17 33	RCB	10 - 15 V		T	071.01
WZ Sge	20 05.3	+17 33	UGSU+E+ZZ	7.0 - 15.0P		T	023.01
HM Sge	19 39.7	+16 38	NC+M	10 - 17 V		T	090.01
QW Sge	19 43.6	+18 29	ZAND	11 - 12 V		T	091.01
AS 245 Sgr	17 49.0	-22 19	ZAND?	11 - 12 V		T	082.01
N Sco 1989	17 48.6	-32 31	N	9.4 - V		T	N014.01
R Sct	18 44.8	-05 46	RVA	4.2 - 8.6V	146	T*	V Aql
S Sct	18 47.6	-07 58	SRB	7.0 - 8.0V	148	B	V Aql
FR Sct	18 20.6	-12 42	ZAND	10 - 12 V		T	087.01
V443 Sct	18 47.0	-06 15	N	8.5 - [21 V		T	N013.01
R Ser	15 48.4	+15 17	M	5.2 - 14.4V	356	T	033.01
FG Ser	18 12.6	-00 20	ZAND	9 - 13 V		T	085.01
AS 289 Ser	18 09.6	-11 41	ZAND?	12.8 - V		T	083.01
Y Tau	05 42.7	+20 41	SRB	6.5 - 9.2V	242	B*	1984 Apr 12
RV Tau	04 44.0	+26 05	RVB	8.8 - 11 V	77	T	056.01
SU Tau	05 46.1	+19 03	RCB	9.1 - 16.9V		T	017.02
TT Tau	04 44.8	+28.27	SRB	8.1 - 8.8V	166	B*	1983 Oct 1
BU Tau	03 46.2	+23 59	GCAS	4.8 - 5.5V		B	1983 Oct.3

Binocular and Telescopic Programme Stars 1991

Star	*R.A. (1950)*	*Dec*	*Type*	*Range*	*Period*	*Pr*	*Chart*
CE Tau	05 29.3	+18 34	SRC	4.2 - 4.5V	165	B	1972 May 27
W Tri	02 38.4	+34 18	SRC	7.5 - 8.8V	108	B*	1973 Jul 8
T UMa	12 34.1	+59 46	M	6.6 - 13.5V	257	T	066.01
Z UMa	11 53.9	+58 09	SRB	6.2 - 9.4V	196	B*	1984 Apr 12
RY UMa	12 18.1	+61 35	SRB	6.7 - 8.3V	310?	B	Z UMA
ST UMa	11 25.1	+45 28	SRB	6.0 - 7.6V	110?	B	1972 Jun 10
SU UMa	08 08.1	+62 45	UGSU	10.8 - 15.0V	19	T	018.02
SW UMa	08 33.0	+53 39	UGSU	9.7 - 16.5V	460	T	019.02
TV UMa	11 43.0	+36 10	SRB	6.8 - 7.3V	42	B	1982 Aug 16
VW UMa	10 55.6	+70.15	SR	6.9 - 7.7V	610	B	VY UMa
VY UMa	10 41.6	+67 40	LB	5.9 - 7.0V		B	1983 Jun 11
CH UMa	10 03.2	+67 47	UGSS	10.6 - 16.0B	204	T	020.02
V UMi	13 37.8	+74 34	SRB	7.2 - 9.1V	72	B*	1981 May 10
RW Vir	12 04.7	-06 29	LB	6.7 - 7.4V		B	RX Vir
RX Vir	12 02.2	-05 30	SRD?	8.0 - 8.4V	200?	B*	1982 Feb 5
SS Vir	12 22.7	+01 03	SRA	6.0 - 9.6V	364	B*	1972 Aug 12
SW Vir	13 11.5	-02 33	SRB	6.4 - 7.9V	150?	B	1974 Jan 21
BK Vir	12 27.8	+04 42	SRB	7.3 - 8.8V	150?	B*	1974 Jan 21
V Vul	20 34.4	+26 26	RVA	8.1 - 9.5V	76	T	058.01
PU Vul	20 19.0	+21 25	NC	8.7 - 16.6P		T	052.01
PW Vul	19 24.1	+24 16	N	6.4 - 17: V		T	N008.01
QU Vul	20 24.7	+27 41	NA	5.6 - 19 V		T	1987 Oct 3
QV Vul	19 02.5	+21 42	NA	7.0 - 19 V		T	N007.02
Mark 421	11 01.7	+38 39	BLLAC	11.0 - 13.8V		T	1984 Sep 9
NGC 4151	12 08.0	+39 41	GAL	10.8 - 12.7V		T	1984 Jul 15
3C 373	12 26.6	+02 20	QSO	12.4 - 13.2V		T	1984 Jul 15

Key to abbreviations for Types of Variable

BLLAC BL Lac: variable starlike galaxy nucleus with flat radio spectrum and no strong emission lines
E Eclipsing binary star
EA Algol-type eclipsing binary, with contact times identifiable from light-curve. the suffix /G signifies giant component(s)
GAL Optically variable galaxy nucleus
GCAS Gamma Cas: shell star with temporary fades
INA Orion variable of early spectral type: young object in diffuse nebula with irregular variations and occasional abrupt Algol-like fades
LB Slow irregular variable of late spectral type
LC Slow irregular supergiant variable of late spectral type
M Mira: long-period variable star
N Nova: thermonuclear runaway on white-dwarf component of close binary
NA Fast nova, fading 3m in 100d or less
NB Slow nova, fading 3m in 150d or more
NC Very slow nova, at max. for more than 10 years; often classed with ZAND
NR Recurrent nova
QSO Optically variable quasar
RCB R CrB: cyclic pulsations and irregular deep fades

RVA RV Tau star (pulsating supergiant with alternating primary and secondary minimum) with constant mean magnitude
RVB RV Tau star (pulsating supergiant with alternating primary and secondary minimum) with constant mean magnitude
SDOR S Dor: high luminosity star, usually in diffuse nebula and with expanding shell
SR Semiregular
SRA Semiregular red giant with persistent periodicity
SRB Semiregular red giant with poorly expressed periodicity
SRC Semiregular red supergiant
SRD Semiregular giant or supergiant of intermediate spectral type
UG U Gem: dwarf nova, with pulsed release of gravitational energy from accretion disk around white dwarf component of close binary
UGSS SS Cyg: dwarf nova with outbursts lasting several days
UGSU SU UMa: dwarf nova with short outbursts like UGSS, and occasional supermaxima 2m brighter and five times longer
UGZ Z Cam: dwarf noave with cyclic outburst interrupted by standstills
UV UV Cet: flare star
X X-ray binary containing compact object (white dwarf, neutron star or black hole)
XP X-ray pulsar, with period 1 sec. to 100 min., and slower light change due to rotation of ellipsoidal component
ZAND Z And: symbiotic star, a close binary comprising a cool star and a hot one exciting an extended envelope
ZZ ZZ Cet: non-radially pulsating white dwarf
* Unique variable

Analysis of Observations using Spearman's Rank Correlation Test

Tony Markham

In *VSSC* **67**, John Isles suggested using Spearman's Rank Correlation Test in order to test whether a series of observations provides evidence for variation in suspected variables. In this test, the observations are ranked in order of decreasing brightness and the ranks of consecutive observations are compared in order to calculate the rank correlation coefficient:

$$r_s = 1 - \frac{(6 \times SSRD)}{n(n^2 - 1)}$$

where SSRD is the sum of the squared rank differences and n is the number of observations. The calculated value of r_s is then compared with critical values in order to test how likely it is that the result could be produced by chance. For example, there is a 1 in 20 probability of obtaining, purely by chance, a value of r_s greater than the critical value for the significance level of 5%.

Using the method as described in *VSSC* **67**, I have analysed my observation of three suspected variables and nine recognised variables for the period 1987 Sep. 04 to 1990 Nov. 20. Class 3 observations were excluded. The results may be summarised as follows:

Star	Type	Obs	Scatter	r_s	Critical values 5%	1%
SAO 37652 And	Suspect	26	6.5-6.8	0.33	0.34	0.47
Rho Cas	SRD	31	4.8-5.1	0.05	0.31	0.42
R CrB	RCB	37	6.1-8.6	0.68	0.28	0.38
CH Cyg	ZAND	18	7.6-9.1	0.67	0.41	0.56
V1070 Cyg	SR	13	7.3-7.5	-0.21	0.48	0.67
Chi Cyg	M	13	4.5-8.4	0.40	0.48	0.67
TX Dra	SRB	26	7.1-7.9	0.13	0.34	0.47
SAO 78074 Gem	Suspect	22	6.8-7.3	0.20	0.37	0.51
Alpha Her	SR	8	3.2-3.4	-0.10	0.64	0.83
Beta Lyr	EB	34	3.2-3.9	0.02	0.29	0.40
Epsilon Peg	Suspect	20	2.6-2.8	-0.35	0.38	0.53
R Sct	RVA	24	5.4-6.9	0.03	0.35	0.49

SAO 37652 is a star labelled NWV 015140 on a chart for BS 551 And that I obtained from Colin Henshaw. SAO 78074 is comparison H on the BAA VSS chart for TV Gem. All three suspects fail the test at the 5 % significance level - but so do seven of the nine recognised variables!

Two factors that almost certainly affected the results are:

(i) The observations were made from a variety of observing sites: Cholsey (Oxon.), Leven (E. Yorks.), Bath (Avon), and Leek (Staffs.).

(ii) The observations were not uniformly distributed throughout the three-year period. The majority were made late in 1987. Observations were sparse in 1988 and 1989. Thus, for example, an observation of TD Dra near minimum in 1988 Dec. was followed chronologically by one near maximum in 1989 Apr., which was then followed by one near minimum in 1989 Aug. This led to large rank differences and reduced the value of r_s calculated for TX Dra.

In order to obtain results with a reduced contribution from the above factors, a similar analysis of my observations was made for the period 1985 July to 1986 May 12. These observations were almost all made from Cholsey, Oxon. The results are summarised below:

Star	Type	Obs	Scatter	r_s	Critical values 5%	1%
SAO 37652 And	Suspect	17	6.5-6.8	-0.36	0.42	0.59
Rho Cas	SRD	26	4.9-5.1	-0.26	0.34	0.47
R CrB	RCB	30	6.2-7.1	0.74	0.31	0.43
CH Cyg	ZAND	35	7.6-8.3	0.77	0.29	0.40
V1070 Cyg	SR	17	7.3-7.5	0.23	0.42	0.59

Star	Type	Obs	Scatter	r_s	Critical values 5%	1%
Chi Cyg	M	8	5.8-8.9	0.26	0.64	0.83
TX Dra	SRB	21	7.1-7.8	0.73	0.37	0.52
SAO 78074 Gem	Suspect	17	6.8-7.2	0.56	0.42	0.59
Alpha Her	SR	18	3.3-3.6	0.26	0.40	0.56
Beta Lyr	EB	43	3.3-3.9	-0.12	0.24	0.34
Epsilon Peg	Suspect	16	2.4-2.8	0.36	0.43	0.60
R Sct	RVA	24	5.4-8.2	0.79	0.35	0.49

Eight of the stars score higher than in the first analysis. Now only seven of the twelve stars fail the test at the 5 % significance level. It is, however, rather disturbing to see that SAO 78074 Gem, with an observed amplitude of 0.4 mag., passes the test, but Chi Cygni, with an observed amplitude of 3.1 mag., fails! The Chi Cygni observations were made as the star faded from maximum during the summer of 1985. The low value of r_s is a consequence of including the rank difference between the first and last observations - in this case, the brightest and faintest observations.

Four other recognised variables fail the test. Of these, three are semi-regular variables with small observed amplitudes and the fourth is an eclipsing binary.

Although, as the results for Chi Cygni show, stars with large observed amplitudes do not fare well in Spearman's Rank Correlation Test, stars with small observed amplitudes generally fare poorly. In such cases there will often be many observations of the same magnitude and thus even if a particular observation is of the same magnitude as the previous and next observations, when such observations are ranked randomly, large rank differences are probable.

The results for Beta Lyrae illustrate another limitation of the test. The period of Beta Lyrae is much shorter than the periods of the other stars and the number of observations in each cycle is small. Minima, if observed, are usually marked by a single observation. Thus clustering of fainter observations is unlikely to be seen.

Beta Lyrae would probably have scored higher if observations had been made more frequently. Similarly, Chi Cygni would probably have scored higher if a longer series of observations was available.

Results for some stars will inevitably be time-dependent. If there had been no minima of R CrB in the analysis periods, it is likely that the values of r_s calculated would have been somewhat lower. Similarly, many semiregular variables show episodes of little activity lasting months or years interspersed with episode of higher activity. The values of r_s in the low-activity periods are likely to be somewhat lower than those calculated during the high-activity periods.

A further complication may arise from the method used to 'randomly' assign ranks to observations of equal magnitudes. Assigning ranks 'randomly' via two different methods or even by applying the same method twice could lead to widely differing values of r_s. Indeed, the relatively high values of r_s for Epsilon Peg and SAO 78074 Gem in the second analysis may have arisen from what look like favourable

distributions of 'randomly' distributed ranks among the observations of equal magnitudes.

The above results and comments should not be taken as implying that Spearman's Rank Correlation Test should not be used - they just demonstrate how using the test in isolation could lead to misleading results and incorrect conclusions regarding variability.

John Isles comments: I agree that, like any test, this one can give misleading results if the distribution of observations is unfortunate, the sample size is small, or the test is applied in inappropriate cases (such, perhaps, as the Chi Cyg and Beta Lyrae data mentioned). A negative result does not imply that the star is not variable, but only that the observations as processed in the test did not show evidence for variation.

Tristram correctly points out that the result can vary according to how tied observations are randomized, especially if there are many ties. A way round the problem is to take the mean of several test results with different randomizations. This is easy with a computer program, like that given in *Apex*, **1** (4), 16 (1983).

VSS Reports

(The full text of these reports has been, or will be published in the BAA *Journal*. Offprints may be obtained from the Assistant Director.)

The Multi-periodicity of W Cygni (J. J. Howarth)

The behaviour of the variable star W Cygni has been analysed from the past 89 years of BAA observations. Periods of approximately 131 and 234 days are evident, both being subject to apparently random shifts in phase and amplitude.

Eclipsing Binaries, Pegasus to Sagittarius, in 1972-1987 (J. E. Isles)

Photoelectric and visual observations of 34 known and suspected eclipsing binaries are discussed. Revised light elements are derived for DM Per and Beta Per. EL Sge is confirmed to vary with a period of approximately 0.333 d. Large deviations from the published elements are reported for BG Peg, AB Per, LS Per, SU Psc, SZ Psc and TU Sge. The catalogue period of BQ Peg is probably incorrect.

Symbiotic Stars in 1988-1989 (J. E. Isles)

Visual observations of 28 stars are discussed. These represent the first BAA contribution to an international campaign of long-term photometric monitoring of symbiotic stars.

[The following four pages show plots of raw, uncorrected data covering a period of ten years' observations of one of the first stars to be computerized: AH Dra.]

PRO-AM LIAISON COMMITTEE (PALC-VS)
NEWSLETTER No.3

Readers' attention is called to the Notice about the forthcoming Variable Star Section Meeting in the accompanying *Circular* (p.1), and to the list of unpublished data held by the Section (p.27).

Call for Campaign of Long-term Photometry of Symbiotic Stars

Dr Ladislav Hric and Dr Augustin Skopal
Astronomical Institute of the Slovak Academy of Sciences, 059 60 T. Lomnica, Czechoslovakia

We suggest the launching of an observing campaign of photometry of 28 selected symbiotic stars (SS).

SS are characterized by the combination of an absorption spectrum of a cool star and an emission spectrum of highly excited lines. A model of an interacting binary with orbital period longer than 200 days, and consisting of a cool red giant and a hot compact component embedded in a circumstellar envelope, is generally accepted as an explanation of the behaviour of SS. Long-term (weeks to decades) variations of the brightness (amplitudes 2 to 7 mag), related to the outbursts of SS and sometimes also to orbital motion of the components, are commonly observed in SS. In some cases, short-term (minutes to hours) variations (amplitudes 0.001 to 1 mag) are seen, very probably caused by physical effects in the accreted material around the compact component. The changes of brightness are sudden and unexpected, being the outcome of strong interaction between the components, although their true cause could be different for particular systems.

Detailed information on SS may be found in the quoted references and also in the volume "The Symbiotic Phenomenon", Proceedings of the 103rd Colloquium of the IAU, Torun, Poland, 1987 August 18-20, edited by Mikolajewska, J., Friedjung, M., Kenyon, S.J., and Viotti, R., Dordrecht, Holland.

The proposed programme is aimed at long-term photometry mainly in the Johnson UBV system. Its purposes are:

(i) compilation and publication of the original photometric data; and
(ii) making sense of the observations of long-term variations of brightness for various SS and also for a single observer.

The aims of the programme could be well fulfilled by rather short (an hour) observations and therefore it is quite suitable for filling in the gaps between other planned observations. Thus participation in the campaign could enhance the efficiency of using your instrument without disturbing your main research programme. Everybody who wishes to participate could select an arbitrary SS (not only those that are proposed by the writers) that could be most easily added to his or her own programme.

All contributions will be gathered by the writers and subsequently published in Contr. Astron. Obs. Skalnaté Pleso annually (September deadline). All astronomers who submit good quality data will become co-authors of the paper and will receive a reprint of it.

The proposed list contains SS accessible from the northern hemisphere and bright enough for photometry in a small telescope. The data in our list were taken from the book by Kenyon (1986). The values of V magnitudes and spectral types serve for orientation only and describe predominantly the cold components of SS. In addition we have prepared finding charts for every programme SS after Becvar (1962, 1964), POSS (1953), Dixon et al. (1985) and Allen (1984). We selected the comparison stars following the catalogue by Blanco et al. (1968) and the *SAO Star Catalog* (1966).

In all cases the comparison star S1 was measured in all colours of the UBV system. We recommend observers to derive secondary comparison stars in cases when the angular distance between SS and S1 is rather large. The observations should be reduced to the international colour system.

We are ready to submit complete campaign instructions to the participants upon request. Of course, all additions and suggestions from the participants are most welcome.

References

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Becvar, A., 1962, *Atlas Borealis*, Praha.
Becvar, A., 1964, *Atlas Eclipticalis*, Praha.
Blanco, D.M., Demers, S., Douglas, G.G., Fitzgerald, M.P., 1968, Publ. U.S. Naval Obs., 2nd ser., 21.
Dixon, R.S., Gearhart, M.R., Schmidtke, P.C., 1985, *Atlas of Sky Overlap Maps (for the POSS)*, 2nd edition, Ohio State University Radio Observatory.
Kenyon, S.J., 1986, *The Symbiotic Stars*, University Press, Cambridge.
Smithsonian Astrophysical Observatory Star Catalogue, 1966, vols 1, 2, 3.

Editorial Note. The list of selected symbiotic stars was published in IBVS 3364 and in BAA *Circular* 697. The above article refers mainly to photoelectric photometry, and observers able to undertake this work are invited to contact Roger Pickard who holds copies of the finding charts and comparison star sequences (for PEP observers only). In a covering letter to the Director, Dr Hric states that visual observations will also be very useful. See the article by John Isles in the accompanying VSS Circular for further information.

Pro-Am Exchanges Report 1989

Guy M Hurst

This report (covering the period 1989 January 1 to 1989 April 30) includes 96 major exchanges logged during 1989, virtually all using electronic-mail. Of these 49 related to variable stars or potential discoveries of novae/supernovae. In addition to the above

list there were numerous minor exchanges of data on most days throughout the year. Report 1 (1988 June - Dec) listed 43 exchanges. Thus the total logged to date amounts to 139.

	Date	Subject	Professional

001) 890105 Comet 1989a Brian Marsden, USA
Astrometry by D.Buczynski and B.Manning enabling first orbital elements to be derived (IAUC 4700).

002) 890105 UG Stars Phil Charles/Mark Kidger, Tenerife
Observations RX And and YZ Cnc relayed from P.Schmeer (Germany) and M.Westlund (Sweden). This continuing programme involved about 30 e-mail messages from amateurs all over Europe relayed to Tenerife.

003) 890106 Eruptive in Crater Brian Marsden, USA
Observations of newly discovered UG star in Crater secured by the discoverer, Richard Fleet in Zimbabwe relayed to Bureau.

004) 890109 Chiron Occultation Dave Tholen, Hawaii
Enquiry from Swedish amateurs wanting to try for occultation event. Data from Dave Tholen relayed to them.

005) 890109 Nova And 1988 Mark Kidger, Tenerife
Photoelectric photometry of nova and nearby sequence stars confirming object has returned to minimum near 18.2 on 1988 July 20.

006) 890110 Fadars David Pike
Further exchanges on this continuing program

007) 890110 Satellite Russell Eberst, Scotland
Identifies object reported in TA 1988/11 as 75-91B, Centaur rocket.

008) 890111 NSV 01098 Brian Marsden, Central Bureau
Rediscovery of NSV 01098 by Mike Collins, Sandy relayed for publication in IAUC. (IAUC 4712)

009) 890112 Lunar eclipses Graeme Waddington, oxford
Naked eye observations of umbra/penumbra boundary when close to horizon.

010) 890113 Asteroid 1989 AC Graeme Waddington, Oxford
Data from Oxford helped amateur Paul Leyland to observe this newly-discovered asteroid.

011) 890115 Nova And 1988 Phil Charles, Tenerife
P.Leyland had reported possible second outburst but this was not confirmed by professionals at Tenerife.

012) 890118 YZ Cnc Phil Charles, Tenerife
Feedback to our YZ Cnc results is star varying about 0.5 mags in 2h4m orbital period, also 1.4mag in infrared in 2 hours.

013) 890113 Nova And Phil Charles, Tenerife
Spectra obtained with INT at our request. Phil suggests it is WZ-Sge type.

014) 890131 SN 1988B Phil Charles, Tenerife
We alerted Phil re SN before IAUC thanks to e-mail from Bob Evans in Australia (discoverer). Phil obtained spectrum on WHT.

015) 890201 Fadars D. Pike, ESO, Madrid.
INT spectroscopy time confirmed for David. We agree continued visual coverage.

	Date	Subject	Professional

016) 890202 SN 1988B Brian Marsden, USA
Independent discovery by Alan Kane, Exeter relayed to Central Bureau.

017) 890211 YZ Cnc M. Kidger, P.Charles,Tenerife
Outburst of YZ Cnc reported to Tenerife in joint programme on these stars.

018) 890208 760 Massinga Larry Wasserman
Preliminary details of occultation but no date or time!!

019) 890216 Optics Richard Hook, ESO, Germany
Advice requested on optics for small telescope!

020) 890302 LL And P. Wild, Switzerland
Request to Paul for finder as chart for this recurrent object not published. He duly supplied this with encouragement to monitor.

021) 890306 UGs P. Charles, M.Kidger
Draft paper supplied on the 1988 International Time Project: Accretion Disc Evolution in Cataclysmic Variables in response to our obs.

022) 890309 Fadars D. Pike, ESO, Madrid.
VX Cas, SV Cep, V586 Ori, V351 Ori, UX Ori, V346 Ori to be monitored. Six amateurs scheduled to assist.

023) 890311 RZ Leo Brian Marsden, USA
Outburst detected by S.Korth & P.Schmeer, Germany relayed to Bureau. Confirmed by G.Hurst. Published IAUC 4757.

024) 890311 SN 1989B M.Kidger, Tenerife
Data exchanged on light curve to date.

025) 890313 3C 345 M.Kidger, Tenerife
Request for astrophotographers to monitor this quasar.

026) 890315 Z Cam AAVSO, Ohio State University
Message of standstill seen by Schmeer (Germany) relayed via AAVSO to professional astronomers in Ohio. Published IAUC 4757.

027) 890328 CY UMa Brian Marsden, USA
Rare outburst detected by P.Schmeer (Germany) and relayed to Bureau. Published IAUC 4763/4765

028) 890331 Eruptive in Crater Bruce Margon, Cerro Tololo
Planning spectroscopy of Fleet's object. All info to date duly supplied.

029) 890401 Titan Occultation Larry Wassermann
Requested full details as it looks like a good event for Europe.

030) 890404 Eruptive in Crater Brian Marsden, USA
Outburst detected by J. Toone, relayed to Bureau.

031) 890404 Pos SN in NGC 4494 Brian Marsden, Mark Kidger
Request to investigate possible SN from Central Bureau. Lubbock and Hurst check visually and deconfirm.

032) 890408 Fadars D.Pike, ESO
First observations by Crayford team relayed. First of many messages relating to this project.

033) 890419 Pro-AM Meeting Brian Marsden, USA
We agree meeting in UK to discuss mutual cooperation with Central Bureau on a variety of matters.

	Date	Subject	Professional

034) 890419 Eruptive in Crater Bruce Margon
Bruce confirms spectra obtained and results to appear shortly.

035) 890422 LL And Paul Wild, Switzerland
Unpublished chart of this object received to aid monitoring.

036) 890501 Pos SN in NGC 3147 Brian Marsden, USA
Possible SN report received at Central Bureau. Stephen Lubbock checked as recently as Apr 24 but no intruder. (Q1989/28) Subsequently Denis Buczynski obtained photo May 4 with 0.55-m refl. and finds no new object.

037) 890503 SN 1989B Mark Kidger, Tenerife
Photoelectric photometry of 3 comparison stars supplied to check our sequence.

038) 890506 Sungrazers Brian Marsden, USA
Brian Marsden agrees to give a talk at the TA AGM on June 24 regarding new research he has carried out on sungrazing comets.

039) 890507 Pos SN in M51 Brian Marsden, USA
French claim SN in M51 on May 6, mag 13. Photos by Martin Mobberley and Denis Buczynski on May 7.9UT show no new object to mag 15.

040) 890509 Pos SN in M88 Brian Marsden, USA
We ask Brian to check for possible asteroid or a possible SN seen by Paul Davies in UK as normal computer access 'down'. SN not confirmed.

041) 890511 Fadars David Pike (RLVAD)
We relay observations of SV Cep by Margareta Westlund of Sweden.

042) 890517 Possible SN in N5195 Brian Marsden USA/R. Kushida (Japan)
May 15 mag 12 visual SN from Japan. Martin Mobberley says no new object to mag 15 on May 7 and D.Greenwood nothing new May 17. D.Buczynski also reports nothing to mag 15 on May 18/19 photos.

043) 890523 PRO-AM Exchanges Chein-Shiu Kuo, Taiwan
Wishes to receive TA e-mail bulletins to keep him informed of vs activity. Based National Central University, Chung-Li, Taiwan

044) 890527 GS2023+338 Brian Marsden, USA
Brian asks if this object = V404 Cygni (=Nova Cyg 1938)? Martin Mobberley photographed May 26.99UT and agrees V404 in outburst. This confirmation published on IAUC 4783.

045) 890601 Pos SN N6207 Brian Marsden, USA
Amateur in N.Carolina suspects SN mag 11-12. Photos June 1 by Martin Mobberley and Denis Buczynski showed no new object.

046) 890603 V404 Cyg Brian Marsden, USA
Photovisual magnitudes May 26 -29 by Martin Mobberley relayed to Central Bureau and published on IAUC 4790.

047) 890604 WX Ceti Brian Marsden/Bruce Margon USA
Unconfirmed outburst report relayed from Andrew Pearce, Australia. Confirmation obtained by A. Jones (New Zealand). Published IAUC 4792. Bruce Margon et al subsequently obtained spectra at Anglo-Australian Obsy and CTIO.

048) 890604 V404 Cygni Phil Charles, La Palma
Thanks received for alert. Photometry and spectroscopy obtained.

	Date	Subject	Professional

049) 890612 Brorsen-Metcalf Dan Green, USA
P. Birtwhistle asks for probable T error in connection with analysis and this is supplied promptly by CBAT.

050) 890619 SN 1989B Mark Kidger, Tenerife
Further measures of sequence stars supplied to us.

051) 890626 WX Ceti Bruce Margon, USA
Report from Rob McNaught, Australia on second fade to 15.6 on June 25.8 relayed to Bruce Margon. Published IAUC 4814.

052) 890704 Titan Occultation Brian Marsden, USA
Timings by G. Hurst and M. Hurst relayed to CBAT same night! Published IAUC 4801

053) 890706 Titan Occultation Mark Kidger, Tenerife
Detailed report received from Tenerife/La Palma observers. Relayed to CBAT and published IAUC 4803.

054) 890718 Jupiter SEB fade Brian Marsden, USA
Report from S.Torrell et al Barcelona of SEB fade relayed to Central Bureau and key planetary observers. R.Moseley and D.Buczynski confirmed July 18.11-18.14UT. Published IAUC 4815.

055) 890725 Algol Predictions Robert Smith, Sussex
We supply data on these predictions obtained from BAA Sources.

056) 890726 Fadars David Pike, RLVAD
Requests continued monitoring of SV Cep, VX Cas, V351, V346, V586 and UX Ori by our group.

057) 890728 GK Persei Brian Marsden, USA
Report from W.Worraker of minor outburst of GK Per relayed to CBAT. Confirmation by P.Schmeer, Germany. Published IAUC 4819.

058) 890812 VY Aquarii Brian Marsden, USA
D.Buczynski, deputising during my holidays, reports to CBAT details of an outburst of VY Aqr by K.Medway (Soton) and P.Schmeer (Germany). Published IAUC 4834.

059) 890820 1989 PB Brian Marsden, USA
Astrometry by Brian Manning for Aug 17 sent to CBAT in response to their 'high-priority' appeal. This, coupled with results from McNaught, used for radar-bouncing at Arecibo.

060) 890828 Comet 1989r Brian Marsden, USA
Astrometry of 1989r by Brian Manning supplied to CBAT.

061) 890830 Eclip.Binary Mark Kidger, Tenerife
Asks us to search GCVS, NSV re possible new vs. Nothing found.

062) 890812 VS Discoveries C.J. Skinner, I.P.Griffin, London
List of discoveries by M.Collins supplied in view of professional interest in Extreme Carbon Stars. Response from ZUVAD::CJS suggesting Mike continues to relay data on his discoveries to them.

063) 890914 Asteroid Search Rob McNaught/Brian Marsden
Article from R.McNaught suggesting British observers look for new asteroids!!

064) 890914 Comet 1989r Brian Marsden, USA
Astrometry by Brian Manning Aug 31 sent to CBAT.

065) 890918 Pos Nova Sgr Brian Marsden, USA
CBAT relay report from W.Albrecht, USA of possible nova in Sgr. R.McNaught finds it is a field star simply missing from AAVSO chart! IAUC 4856.

	Date	Subject	Professional

066) 890922 Fadars David Pike, RLVAD
David reports spectra obtained in 4 nights during 1989 Aug. Requests continued coverage by ouyr group.

067) 891005 New Asteroids!! Brian Marsden, USA
Two probable new asteroids discovered by Brian Manning - astrometry for Oct 4 relayed to CBAT.

068) 891006 New Asteroids Brian Marsden, USA
CBAT advises us that the last minor planet discovered in UK which was numbered was (676) Melitta (1909 January!).

069) 891006 New Asteroids Brian Marsden, USA
Confirmation with further astrometry of first 2 Manning asteroids relayed to CBAT.

070) 891007 New Asteroids Brian Marsden, USA
Two 'new'asteroids designated A0001 and A0002. Later 1989 TE and 1989 TF. Vaisala orbits supplied by CBAT.

071) 891010 1989 TF Brian Marsden, USA
CBAT link 1989 TF with 1985 object and latter takes principal discovery. Effectively Brian Manning has recovered a lost object.

072) 891011 Modems M.White, RGO
Advice on modems sought and supplied.

073) 891012 Hubble Nebula J.Lightfoot, REVAD::JFL
Monitoring of changing appearance of this variable nebula requested. Relayed to BAA Deep Sky Section but no apparent subsequent response.

074) 891013 1989 TF=1968 OF. Brian Marsden, USA
Conrad Bardwell and Brian Marsden supplied detailed data on the linkage of Brian Manning's new object with 1968 OF.

075 891016 Asteroids IDs. Brian Marsden, C. Bardwell, USA
Detailed guidance given on complex procedures for identifying asteroids and assessing priority claims.

076) 891016 UV Persei Brian Marsden, USA
Outburst of UV Per by G.Poyner Oct 16.8UT relayed to CBAT.

077) 891017 UV Persei Brian Marsden, USA
Confirmation of current outburst by J. Isles, Cyprus and G. Hurst Basingstoke sent to CBAT. Published IAUC 4880. Superhumps subsequently detected and reported by A. Udalski, Toronto on IAUC 4885.

078) 891018 Manning 3 & 4 Brian Marsden, USA
Two further new asteroids found by Brian Manning on discovery photos for objects 1 & 2. Astrometry relayed to CBAT. R.McNaught confirms object 4 on previous photo of Oct 8.

079) 891019 1989 TE Brian Marsden, USA
CBAT reports that 1989 TE also photographed as Klet 146 and also may be same as 1982 TB.

080) 891024 Brorsen-Metcalf Mark Kidger, Tenerife.
Good photo of this comet requested and supplied by Martin Mobberley.

081) 891025 1989 TE=1982 TB Brian Marsden, USA
Brian Manning's asteroid found on UKSTU plates of 1978 May 7 and linkage with 1982 TB confirmed. ID for 1978 by Alan Pickup, ROE.

	Date	Subject	Professional

082) 891026 British Asteroids Brian Marsden, USA
Brian provides full list of British Asteroid Discoveries at our request which cover 7 Iris (1847 Aug 13) to (2506) A910HA = 1910 KB (1910 Apr 27) for numbered objects. Also mentions 1986 Dec 1 and 6 objects 1986 XP5 and 1986 XQ5 by F. Vincent of St Andrews which are one-night stands and unnumbered.

083) 891029 Lost Recurrent VS Graeme Waddington, Oxford.
We request copies of Palomar Sky Survey Fields for 'lost' recurrent variable stars: FN And; PR Her; CI Aql; V1113 Cyg; V725 Aql; TY Vul; V1060 Cyg. Duly supplied.

084) 891106 Manning 5-8 Brian Marsden, USA
New asteroidal discoveries objects 5,6,7,8 found Oct 31-Nov 4 relayed to CBAT.

085) 891109 BHVAD/Manning Bill Wilson, BHVAD
To assist with rapid exchanges on asteroidal discoveries, Brian Manning granted STARLINK at BHVAD today.

086) 891114 Asteroids Brian Marsden, USA
Astrometry by Brian Manning and measures by him of plates obtained by D.Buczynski relayed to CBAT.

087) 891117 New Comet Query Brian Marsden, USA
Reports from Norway and N. Carolina of new comet relayed by CBAT. They ask us to check direction which is ambiguous on reports so far. R.Bouma, Netherlands, responded to our alert with confirmation on 1989 Nov 18.2UT. Object announced IAUC 4907 as Aarseth-Brewington (1989a1).

088) 891119 Comet 1989a1 Brian Marsden, USA
Appeal for astrometry as no precise positions at all at CBAT!

089) 891120 DX And Brian Marsden, USA
Outburst of DX And found by P.Schmeer, Germany on Nov 19 and relayed to CBAT. Published IAUC 4908.

090) 891122 Comet 1989a1 Brian Marsden, USA
Astrometry by G.Marsh and D.Buczynski for Nov 22 relayed to CBAT.

091) 891127 Yugoslavia Ralph Martin, RGO
RGO say first contact with Yugoslavia when we received news from Herman Mikuz and B.Dintinjana. They carry out tests and set us up to communicate regularly.

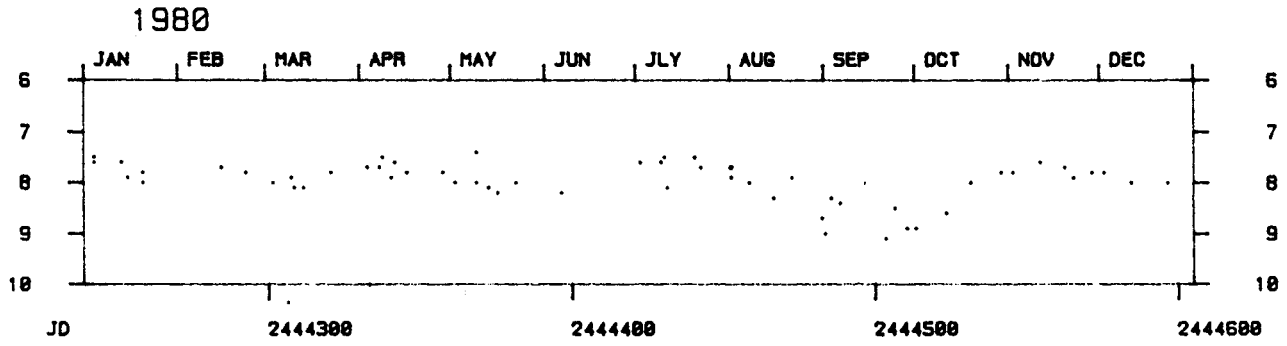
092) 891208 Asteroid Brian Marsden, USA
Discovery of new asteroid by Brian Manning on Nov 22 relayed to CBAT.

093) 891213 Asteroid Orbits Brian Marsden, USA
Detailed orbits and earlier identifications for Brian Manning's discoveries supplied by CBAT.

094) 891224 New Comet Brian Marsden, USA
R. McNaught Anglo-Australian Observatory asks me to relay astrometry of new comet recorded on Dec 21 to 24 to CBAT which was arranged. Published IAUC 4930 as Comet McKenzie-Russell (1989f1).

095) 891228 Asteroids Brian Marsden, USA
Astrometry of various asteroids found by Brian Manning relayed to CBAT.

096) 891229 Comet 1989e1 Brian Marsden, USA
Astrometry of this comet by D.Buczynski on 1989 Dec 25-27 relayed to CBAT.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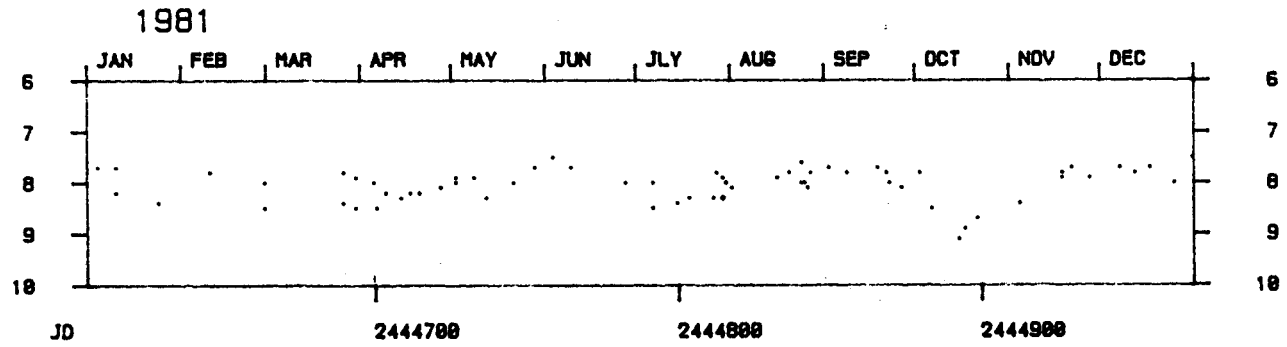
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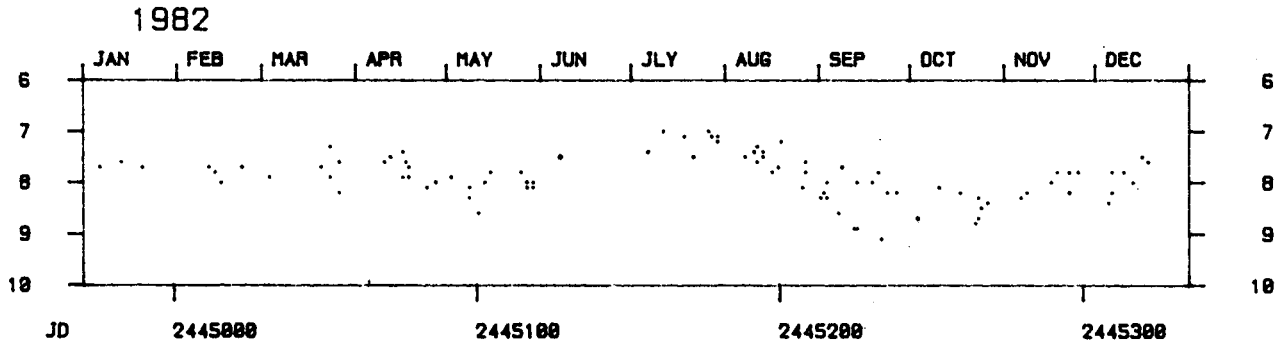
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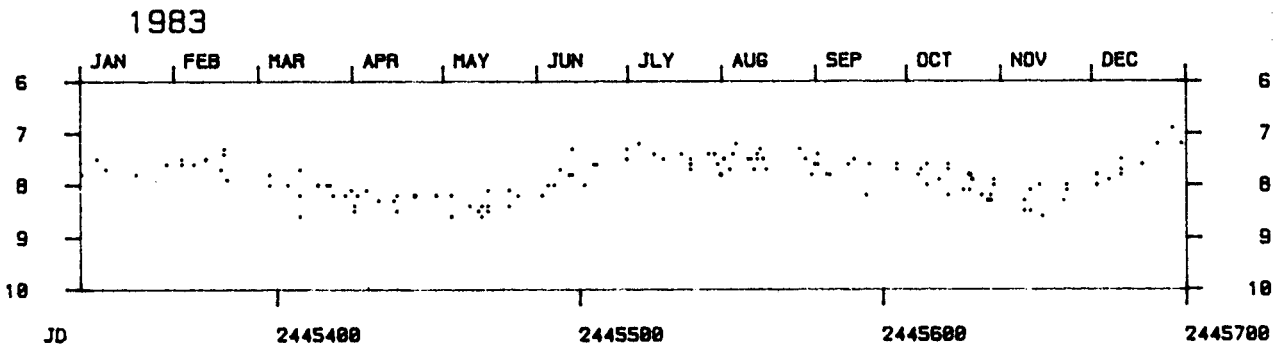
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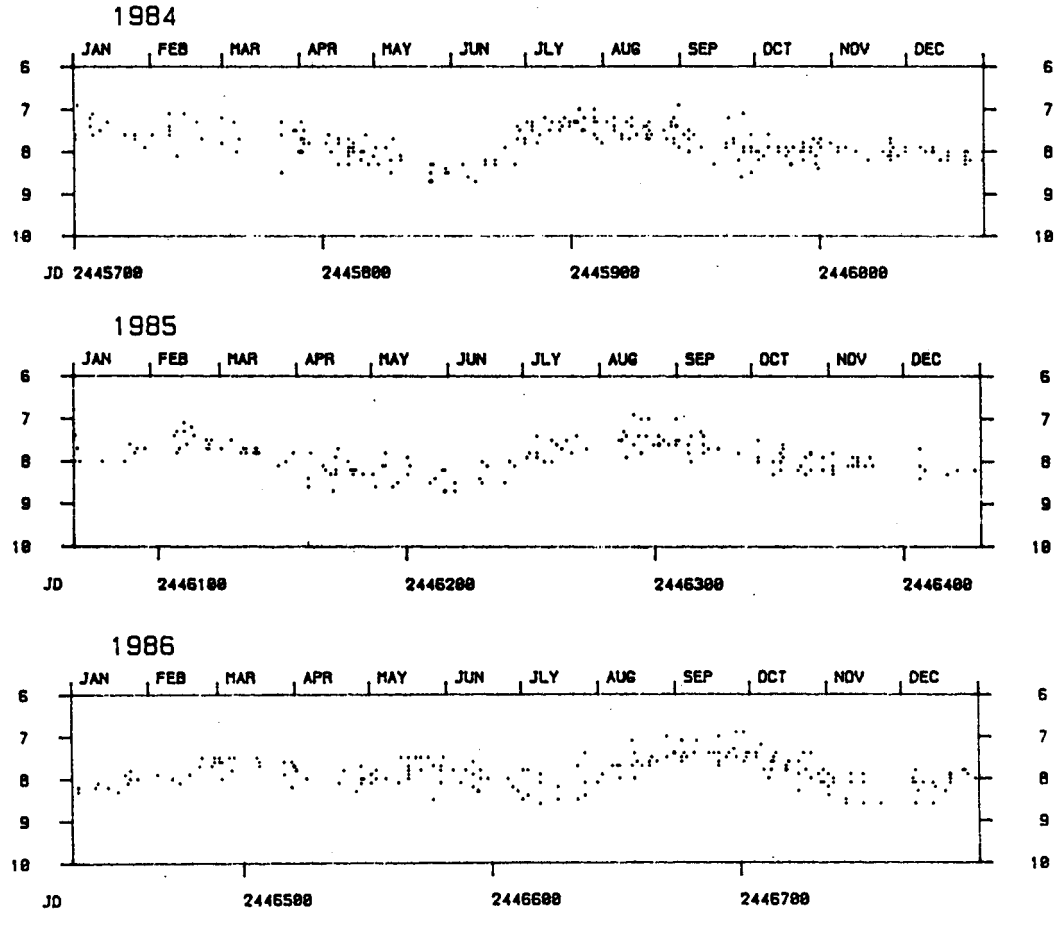
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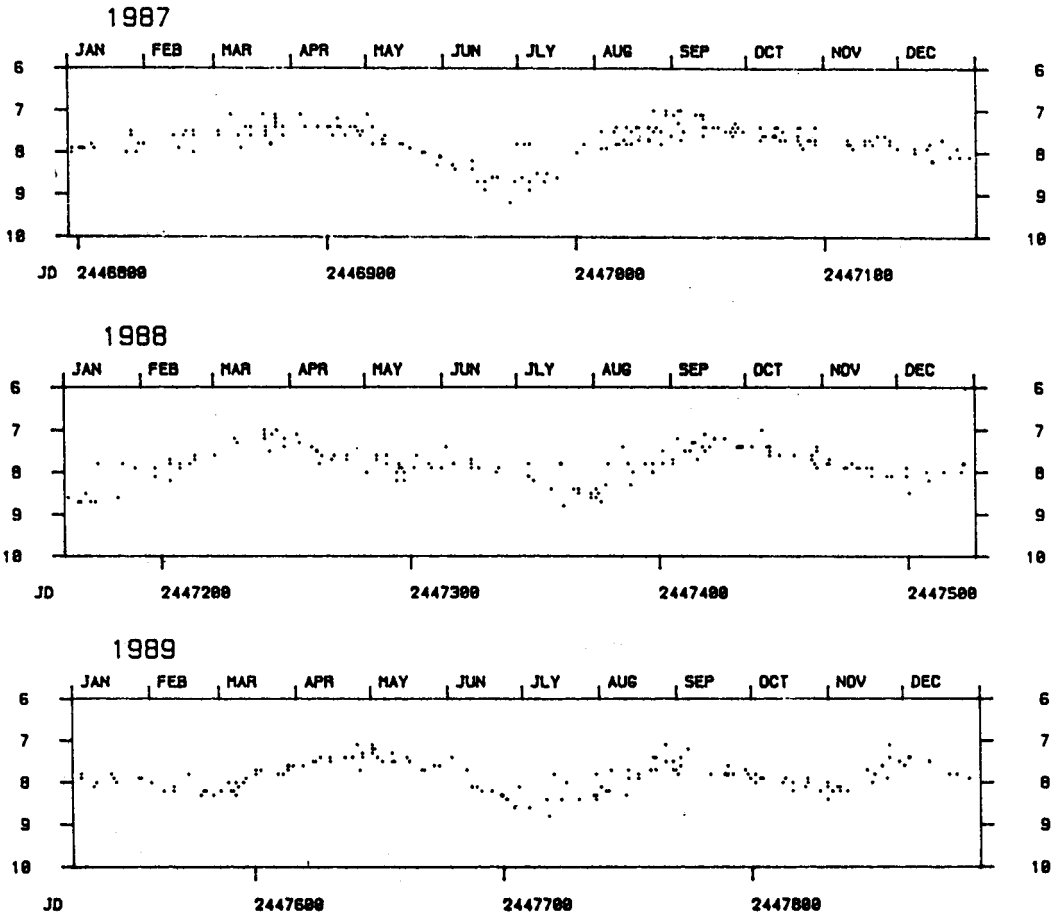
6 7 8 9 10
JD 2445700 2445800 2445900 2446000
1985
JAN FEB MAR APR MAY JUN JLY AUG SEP OCT NOV DEC
6 7 8 9 10
JD 2446100 2446200 2446300 2446400
1986
JAN FEB MAR APR MAY JUN JLY AUG SEP OCT NOV DEC
6 7 8 9 10
JD 2446500 2446600 2446700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1988
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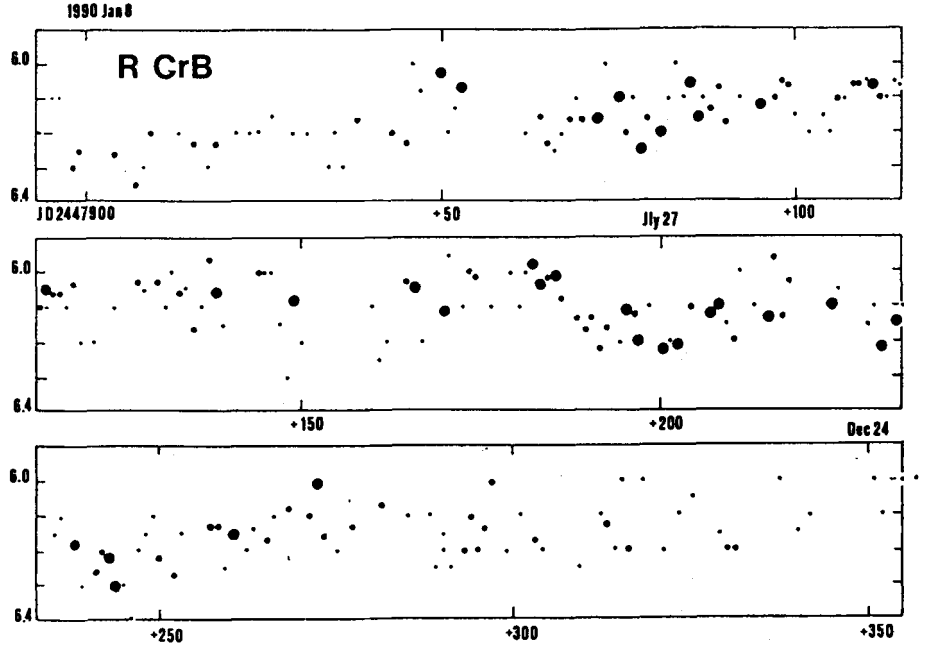
6 7 8 9 10
JD 2447200 2447300 2447400 2447500
1989
JAN FEB MAR APR MAY JUN JLY AUG SEP OCT NOV DEC
6 7 8 9 10
JD 2447600 2447700 2447800

R CrB in 1990

Melvyn Taylor

Peculiar activity had been reported during last year so a preliminary look at VSS data submitted up to the end of January 1991 seemed appropriate. Only estimates made by observers who had covered R CrB for ten months or more of the year were used; a total of 609 made on 238 days. From these 158 daily mean magnitudes were found. The light-curve is drawn with the following conventions: the smallest dot is a single estimate or the mean of two; the intermediate size dot a mean magnitude of three or four estimates; and the largest dot a mean of from five to eight estimates. The typical standard error of a single estimate was determined as 0.14 mag. The mean magnitude of R CrB from the daily means is 6.14 (s.d. 0.09 mag.) for the year. Extreme variation is 5.94 to 6.4 for the daily means with four individual estimates outside this range: Jly 5, 5.9; Aug 14, 5.6; Oct 9, 5.8; and Dec 27, 6.5. There has been no attempt to account for differences in observers' personal equations from the daily means or single estimates. It appears that variations of about 0.2 mag over 2 day or so are seen in the data. Longer-term changes show the star rising from about 6.3 at the beginning of the year with four brighter phases appearing in late February (6.0); early July (6.0), mid-August (6.1) and early October (6.0). Periodic phases took the star to either 6.2 or 6.3 between these maxima. At year's end R CrB's magnitude was about 6.0. The observations from Albrighton, Brundle, Dryden, Fraser, R., Fraser, J., Gainsford, Gavine, Kiernan, Pointer, Poyner, Ramsay, Shanklin, Taylor and Worraker have all been used.



Minima of Eclipsing Binaries, 1988

John Isles

The numbers of observations received for known and suspected eclipsing variables in 1988, including estimates reserved for separate discussion, are given below.

	Observations	Timings
Photoelectric:		
J Ells (EJ)	3294	42
J Watson (TW)	40	3
Total	3334	45
Visual:		
N Bone (B1)	33	1
T Brelstaff	834	11
A Chapman (C1)	34	2
D Conner (C2)	71	5
H Duncan (DH)	392	10
R Fraser	6	-
J Isles (IS)	600	5
G Kirby (KG)	122	9
G Maris	31	-
K Marshall	5	-
I Middlemist (MM)	76	6
J Peck	4	-
G Pointer (P1)	123	5
A Smeaton	28	-
J S Smith	10	-
S Srinivasan (S1)	80	2
M D Taylor (TY)	136	10
P Wheeler (WH)	90	5
W Williams	3	-
K Xylaris	17	-
Composite timings	-	2
Total	2734	73
Grand total	5068	118

The codes B1, C1, C2, P1 and S1 are temporary, pending the allocation of final VSS codes to these observers by the Computer Secretary. The code EJ indicates timings made with the Jack Ells Automatic Photoelectric Telescope, including runs in which other observers assisted, usually either D. J. Ells or P. E. Ells. In the accompanying list of observed minima, photoelectric determinations are distinguished by "(pe)" after the observer abbreviation. The times of minima were derived using a computer

program analogous to the tracing-paper method, except for some minima by EJ which were found by fitting a parabola by least-squares. The quoted numbers of observations are those used in the analysis, which may be fewer than the total number actually made. A colon indicates uncertainty and has exactly the same meaning as a question mark in some earlier lists. For further explanations, see VSSC 58.

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

UW Ori: The GCVS elements are incorrect. Epoch and O-C are calculated using the elements of IBVS 3409.

For certain stars, all estimates made in the year were folded onto a single cycle in order to derive the timings. The dates covered by the observations were as follows: ST Aqr 7442-524, OO Aql 7440-73, V822 Aql 7347-486, GK Cep 7163-524 (DH) and 7388-465 (P1), V367 Cyg 7163-524, 68u Her 7226-503 (BS) and 7206-496 (DH), Beta Lyr 7163-524, V1010 Oph 7344-97, UW Ori 7167-471.

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 follows.

Star	Date	No	Other dates
AB And	7470	4	7466-94
	7486	14	7466-508
IM Aur	7465	7	7183-480
RZ Cas	7369	8	7290-382
	7480	4	7222-468
TV Cas	7417	1	7388
RZ Com	7275	5	7315
AR Lac	7523	15	7434-521
	7526	9	7435-524
U Oph	7353	12	7348-410
	7411	9	7416-68
Beta Per	7181	5	7198
	7347	2	7350
	7393	5	7413
	7436	7	7442
	7462	9	7416
	7502 (BS)	3	7505
	7505	8	7465-502
BV Tau	7206	10	7204-8
HU Tau	7487	2	7483

Observed Minima

Star	Epoch	Hello JD 244...	O - C	No	Observer	
AB And	34231	7470.573:	-0.006:	6	C2	*
	34278.5	7486.346	+0.001	17	C2	*
	34345	7508.410	-0.005	7	C2	
BX And	17875	7434.5779	-0.0115	28	EJ (pe)	
ST Aqr	7991	7477.244	-0.005	15	S1	*
OO Aql	17419.5	7441.226:	+0.002:	9	S1	*
V346 Aql	4937	7380.498	0.000	10	C2	
	4965	7411.476	-0.001	20	KG	
V822 Aql	905	7369.309:	+0.047:	24	DH	*
SX Aur	5822	7207.4215	-0.0009	26	EJ (pe)	
TT Aur	19677	7466.4738	-0.0092	24	EJ (pe)	
WW Aur	5750.5	7465.6626	+0.0003	20	EJ (pe)	
	5769	7512.388	+0.013	12	TY	
AR Aur	2193	7469.508	-0.061	7	B1	
EO Aur	6457	7442.5895	+0.0284	75	EJ (pe)	
IM Aur	5572	7465.384	-0.095	10	WH	*
	5597	7496.6167	-0.0455	31	EJ (pe)	
	5612	7515.3262	-0.0455	38	EJ (pe)	
	5612	7515.336	-0.035	9	TY	
SV Cam	7776	7206.332	+0.005	10	KG	
AW Cam	11344	7488.6050	-0.0051	26	EJ (pe)	
	11379	7515.6040	-0.0032	49	EJ (pe)	
RZ Cas	3350	7204.379	-0.005	6	KG	
	3350	7204.426	+0.043	5	DH	
	3488	7369.359	+0.031	9	DH	*
	3545	7437.467	+0.010	9	C1	
	3570	7467.344	+0.006	6	WH	
	3570	7467.346	+0.008	9	P1	
	3570	7467.3493	+0.0112	17	EJ (pe)	
	3575	7473.331	+0.017	6	WH	
	3581	7480.490	+0.004	10	WH	*
	3591	7492.461	+0.023	13	TY	

Star	Epoch	Hello JD 244...	O - C	No	Observer	
TV Cas	1553	7417.389	-0.026	4	P1	*
	1563	7435.5408	+0.0005	39	EJ (pe)	
	1607	7515.309	+0.015	9	TY	
TW Cas	3820	7464.5779	-0.0071	34	EJ (pe)	
DO Cas	19773	7464.3617	+0.0016	32	EJ (pe)	
	19786.5	7473.6054	+0.0023	50	EJ (pe)	
V523 Cas	26386	7386.480	+0.014	14	KG	
	26420	7394.419	+0.007	6	KG	
VW Cep	11192.5	7272.4109	-0.0383	14	EJ (pe)	
	11193	7272.4597	-0.0387	19	EJ (pe)	
	11803.5	7442.4613	-0.0382	12	TW (pe)	
	11814	7445.3769	-0.0449	13	TW (pe)	
WX Cep	6611	7423.4991	+0.0060	55	EJ (pe)	
ZZ Cep	9111	7442.3864	-0.0044	36	EJ (pe)	
CQ Cep	9112.5	7412.4897	-0.0598	103	EJ (pe)	
CW Cep	4430	7463.5122	-0.0276	31	EJ (pe)	
	4435.5	7478.5605:	+0.0104:	24	EJ (pe)	
EI Cep	1256.5	7424.5150	+0.0253	40	EJ (pe)	
	1263	7479.3746:	+0.0293:	22	EJ (pe)	
GK Cep	9260	7363.608:	+0.087:	52	DH	*
	9260.5	7364.022:	+0.034:	40	DH	*
	9316.5	7416.4823	+0.0693	23	EJ (pe)	
	9317.5	7417.384:	+0.034:	4	P1	*
	9373	7469.3716	+0.0657	23	EJ (pe)	
	9373	7469.391	+0.085	11	MM	
	9374	7470.349	+0.107	8	MM	
GT Cep	4448	7462.5279	+0.1312	61	EJ (pe)	
RZ Com	36744	7275.477	-0.009	9	KG	*
CC Com	34850	7224.446	-0.054	7	KG	
GO Cyg	18864	7470.3398	+0.0375	32	EJ (pe)	
MR Cyg	8372	7436.5339	+0.0016	61	EJ (pe)	
V367 Cyg	537	7377.27	-0.56	33	DH	*
	537.5	7387.57	+0.44	34	DH	*
V453 Cyg	2075	7411.4698	+0.0099	75	EJ (pe)	

Star	Epoch	Hello JD 244...	O - C	No	Observer	
V548 Cyg	1669	7469.408	-0.022	11	MM	
V836 Cyg	4002	7468.4515	+0.0056	16	EJ (pe)	
V1143 Cyg	680	7408.4784	-0.0044	29	EJ (pe)	
V1425 Cyg	5626.5	7447.5035	+0.0040	46	EJ (pe)	
DM Del	3509	7465.3185	-0.0402	49	EJ (pe)	
AI Dra	3334	7288.4796	+0.0047	33	EJ (pe)	
	3504	7492.285	+0.012	11	TY	
Z Her	8591	7388.494	-0.052	11	KG	
68u Her	20249	7361.277	-0.001	52	BS	*
	20249.5	7362.296:	-0.008:	26	BS	*
	20258	7379.791:	+0.054:	20	DH	*
SW Lac	6713.5	7428.4963	-0.0011	12	EJ (pe)	
	6841	7469.404	+0.005	11	MM	
	6844	7470.354	-0.007	6	MM	
VX Lac	2094	7508.471:	+0.014:	9	C2	
AR Lac	2990	7523.403	-0.053	17	BS	*
	2991.5	7526.364	-0.067	10	BS	*
RR Lyn	1445	7524.4924	-0.0090	50	EJ (pe)	
Beta Lyr	3028.5	7392.87	+35.37	182	6	*
	3028	7386.44	+35.40	175	6	*
U Oph	1751	7353.421	+0.002	15	BS	*
	1785.5	7411.302	+0.014	14	BS	*
	1804	7442.316	-0.003	7	BS	
V451 Oph	1185	7437.3303	-0.0011	33	EJ (pe)	
V1010 Oph	12764	7380.232	+0.020	7	DH	*
	12764.5	7380.589	+0.046	10	DH	*
UW Ori	139.5	7456.578	-0.009	10	IS	*
U Peg	29304.5	7494.364	-0.087	5	TY	
EE Peg	725	7469.359	+0.012	10	MM	
DM Per	2038	7479.5959	+0.0020	46	EJ (pe)	
	2046	7501.381	-0.035	4	WH	
IZ Per	784.5	7470.5664	-0.0005	50	EJ (pe)	

Star	Epoch	Hello JD 244...	O - C	No	Observer	
Beta Per	537	7181.271	+0.015	14	TY	*
	595	7347.595	+0.036	6	IS	*
	611	7393.454	+0.017	12	IS	*
	619	7416.392	+0.018	8	IS	
	626	7436.475	+0.029	10	BS	*
	634	7459.414	+0.030	8	IS	
	635	7462.295	+0.043	9	P1	*
	642	7482.319	-0.004	7	BS	
	649	7502.401	+0.007	11	BS	*
	649	7502.404	+0.010	12	C1	
	649	7502.406	+0.012	11	TY	
	650	7505.300	+0.039	11	P1	*
SZ Psc	2963	7492.280	-0.202	7	TY	
BV Tau	1240	7206.366	-0.010	12	KG	*
HU Tau	2880	7197.474	+0.010	7	TY	
	3021	7487.427	+0.024	6	BS	*
V781 Tau	10422	7469.5941	-0.0119	16	EJ (pe)	
W UMa	4354	7218.3869	-0.0054	15	EJ (pe)	
	4525	7275.4389	-0.0090	13	EJ (pe)	
	4561	7287.4506	-0.0092	15	TW (pe)	

Index of Unpublished BAA Observations of Variable Stars, 1906-89

Following discussion at meetings of the Pro-Am Liaison Committee, an index of unpublished visual observations has been set up on a microcomputer. The full index records the numbers of observations in the Section's files for each star in each year. The following table derived from the database summarizes the information.

Successive columns give:

- Star name, in constellation order. Supernovae and active galaxies are listed at the end.
- GCVS type.
- BAA programme (B = binocular, R = recurrent objects, T = telescopic) in which the observations were reported.
- First year of observation.
- Latest year of observation. Most stars with "1989" are still under observation.
- Approximate number of observations, including negative reports for variables below the limit of the observer's telescope. The figures were not immediately available for all stars in all years, but the totals include an allowance for this.

- An indication of the quality of coverage, as follows:

  1 = fairly even spread in all or most years, allowing a well-defined light curve to be drawn, except perhaps for very rapid changes in certain stars.
  2 = good coverage but with seasonal gaps.
  3 = well observed when bright, but many negative observations.
  4 = fragmentary data, with large gaps in coverage.

The index is complete up to the end of 1989, except for:

- Published observations, for example those of long-period variables for 1900-29 in BAA Memoirs, and early observations of SS Cyg and R Sct.
- Eclipsing binaries (a separate programme since 1972).
- JAS observations of naked-eye variables since 1959.
- Stars observed fewer than 100 times each. (An exception has been made for several novae, and a few recently added stars for which we may expect data to accumulate.)

All requests for access to historical VSS data should be addressed to the Director. At present most data are available as paper copies, but work is in progress to make them all available in machine-readable form.

Star	Type	Programme	First year	Last year	No of estimates	Quality
R And	M	T	1930	1989	7500	1
W And	M	T	1930	1989	5500	1
Z And	ZAND	T	1987	1989	60	1
RS And	SRA	B	1970	1989	800	1
RW And	M	T	1977	1989	1600	1
RX And	UGZ	T	1926	1989	11600	1
SU And	LC	B	1970	1989	500	1
TZ And	SRB	B	1970	1989	800	1
VX And	SRA	T	1988	1989	300	1
AQ And	SR	B	1968	1989	1300	1
BZ And	LB	B	1970	1989	600	1
DX And	UGSS	R	1989	1989	10	4
DZ And	?	T	1974	1986	1300	1
EG And	ZAND	B	1987	1989	40	1
EU And	SR	T	1988	1989	100	1
HP And	UG?	R	1988	1989	30	4
LS And	NA	R	1988	1989	30	4
OS And	N	T	1986	1988	500	1
R Aqr	M	T	1987	1989	50	2
VY Aqr	UGSU	T	1983	1989	900	3
R Aql	M	T	1930	1989	8200	2
S Aql	SRA	T	1930	1972	3200	2
V Aql	SRB	B	1968	1989	1900	2
UU Aql	UGSS	T	1963	1989	2500	3

Star	Type	Programme	First year	Last year	No of estimates	Quality
UW Aql	LC	T	1973	1989	1700	2
V356 Aql	N	T	1936	1937	60	2
V368 Aql	N	T	1936	1937	10	4
V450 Aql	SRB	B	1968	1989	1600	2
V528 Aql	N	T	1945	1948	40	2
V603 Aql	NA/E+X	T	1981	1989	200	2
V1293 Aql	SRB	B	1974	1989	1300	2
V1294 Aql	GCAS	B	1987	1989	90	2
NSV 12088 Aql	-	B	1974	1988	900	2
R Ari	M	T	1930	1974	3700	2
V Ari	SRB	B	1975	1989	600	2
SV Ari	N?	R	1989	1989	20	4
R Aur	M	T	1930	1974	3200	1
X Aur	M	T	1930	1974	4400	1
RW Aur	INT	T	1929	1981	600	4
SS Aur	UGSS	T	1920	1989	23400	3
SU Aur	INSB	T	1974	1981	1000	1
UU Aur	SRB	B	1967	1989	4400	1
UV Aur	M	T	1988	1989	30	1
AB Aur	INA	B	1971	1989	3200	1
AE Aur	INA	B	1968	1988	4400	1
CO Aur	CEP(B)	B	1974	1984	1600	1
NO Aur	LC	B	1974	1988	900	1
Psi^1 Aur	LC	B	1970	1989	600	1
NSV 2537 Aur	?	B	1967	1988	6800	1
R Boo	M	T	1930	1974	4700	1
S Boo	M	T	1930	1974	4100	1
U Boo	SRB	T	1930	1989	5600	1
V Boo	SRA	T	1930	1989	8900	1
W Boo	SRB?	B	1981	1989	500	1
RV Boo	SRB	B	1974	1989	800	1
RW Boo	SRB	B	1974	1989	900	1
RX Boo	SRB	B	1968	1989	1900	1
UV Boo	CST?	B	1969	1988	1600	1
UZ Boo	UG	R	1988	1989	10	4
Nova Boo 1962	N?	R	1989	1989	10	4
R Cam	M	T	1930	1969	3400	1
U Cam	SRB	B	1968	1989	1300	1
V Cam	M	T	1930	1989	4400	1
X Cam	M	T	1930	1989	8200	1
Z Cam	UGZ	T	1926	1989	15200	1
RY Cam	SRB	B	1971	1989	1400	1
ST Cam	SRB	B	1972	1989	2100	1
TW Cam	RVB	T	1974	1975	400	1
UV Cam	SRB	B	1971	1989	1600	1
UX Cam	LB	B	1972	1979	100	1
VZ Cam	SR	B	1968	1988	1700	1
XX Cam	RCB?	T	1972	1989	4900	1
ZZ Cam	LB	B	1971	1989	1600	1
AF Cam	UG	T	1969	1974	500	3

Star	Type	Programme	First year	Last year	No of estimates	Quality
+61 668 Cam	?	B	1972	1988	1200	1
R Cnc	M	T	1963	1971	200	2
X Cnc	SRB	B	1967	1989	2300	2
RS Cnc	SRC?	B	1971	1989	2600	2
RT Cnc	SRB	B	1972	1989	600	2
SU Cnc	M	T	1985	1989	90	4
EG Cnc	NL	R	1988	1989	20	4
U CVn	M	T	1985	1989	200	1
V CVn	SRA	B	1968	1989	3700	1
Y CVn	SRB	B	1968	1989	3700	1
RT CVn	M	T	1985	1989	50	4
TU CVn	SRB	B	1968	1989	3500	1
TX CVn	ZAND	T	1987	1989	60	1
W CMa	LB	B	1968	1989	300	2
R Cas	M	T	1930	1974	4800	1
S Cas	M	T	1930	1989	5900	1
T Cas	M	T	1930	1989	8500	1
W Cas	M	T	1930	1974	4800	1
UV Cas	RCB	T	1974	1989	3300	1
WZ Cas	SRB	B	1968	1989	2900	1
HT Cas	UGSS+EA	T	1969	1989	300	4
V377 Cas	DSCT?	B	1970	1988	2200	1
V391 Cas	LB	B	1972	1989	1700	1
V393 Cas	SRA	B	1972	1989	2000	1
V465 Cas	SRB	B	1969	1989	4400	1
V630 Cas	UG?	R	1988	1989	20	4
Gamma Cas	GCAS	T	1970	1989	12000	1
Rho Cas	SRD	T	1964	1989	9600	1
NSV 21 Cas	?	B	1971	1988	700	1
NSV 436 Cas	LB	B	1974	1988	1500	1
NSV 650 Cas	IA?	B	1972	1988	1800	1
+59 2816 Cas	?	B	1983	1988	200	1
S Cep	M	T	1930	1974	4200	1
T Cep	M	T	1930	1974	7400	1
W Cep	SRC	B	1967	1989	3100	1
RU Cep	SRD	B	1968	1989	1900	1
RW Cep	SRD	B	1970	1989	3100	1
RX Cep	SRD?	B	1968	1989	2600	1
SS Cep	SRB	B	1967	1989	2600	1
AR Cep	SRB	B	1968	1989	4200	1
DM Cep	LB	B	1981	1989	1300	1
FZ Cep	SR	B	1970	1989	500	1
OV Cep	SR	B	1968	1985	700	1
Mu Cep	SRC	B	1967	1989	2800	1
NSV 13656 Cep	?	B	1967	1988	2500	1
NSV 13729 Cep	?	B	1967	1988	1200	1
NSV 14680 Cep	-	B	1972	1988	1300	1
WX Cet	UG	R	1988	1989	30	4
Omicron Cet	M	T	1930	1989	7400	2
NSV 422 Cet	L?	B	1969	1984	200	2
R Com	M	T	1985	1989	200	2

Star	Type	Programme	First year	Last year	No of estimates	Quality
AL Com	UGSS	R	1988	1989	30	4
R CrB	RCB	T	1921	1989	31800	1
S CrB	M	T	1930	1989	7400	1
T CrB	NR	T	1946	1989	8000	1
V CrB	M	T	1977	1989	1700	1
W CrB	M	T	1930	1989	5600	1
RR CrB	SRB	B	1968	1989	1800	1
SW CrB	SRB	B	1968	1989	1800	1
R Cyg	M	T	1930	1989	7100	1
S Cyg	M	T	1930	1989	4600	1
T Cyg	LB?	B	1968	1988	2000	1
U Cyg	M	T	1930	1974	5300	1
V Cyg	M	T	1930	1989	6300	1
W Cyg	SRB	T	1930	1989	16600	1
RS Cyg	SRA	B	1968	1979	200	1
RU Cyg	SRA	B	1968	1989	800	1
RV Cyg	SRB	B	1969	1989	1500	1
SS Cyg	UGSS	T	1906	1989	39000	1
TT Cyg	SRB	B	1968	1989	1600	1
AF Cyg	SRB	B	1968	1989	5200	1
BC Cyg	SRC	T	1972	1989	2700	1
BF Cyg	ZAND	T	1987	1989	40	4
BI Cyg	LC	T	1972	1989	2900	1
CH Cyg	ZAND+SR	B	1968	1989	8400	1
CI Cyg	EA/G+ZAND	T	1973	1989	3900	1
DF Cyg	RVB	T	1974	1975	200	1
EY Cyg	UGSS	T	1931	1989	400	4
V460 Cyg	SRB	B	1971	1989	1800	1
V778 Cyg	LB	T	1988	1989	200	1
V973 Cyg	SRB	B	1969	1989	2000	1
V1016 Cyg	NC+M	T	1988	1989	20	1
V1251 Cyg	UG?	R	1988	1989	10	4
V1329 Cyg	E+NC	T	1988	1989	10	4
V1351 Cyg	LB	B	1974	1988	200	1
V1500 Cyg	NA	T	1975	1979	1300	1
V1624 Cyg	SXARI	B	1969	1988	2100	1
V1668 Cyg	NA	T	1978	1980	200	1
V1819 Cyg	N	T	1986	1989	500	1
Chi Cyg	M	T	1930	1989	10400	1
P Cyg	SDOR	B	1967	1989	6000	1
NSV 12247 Cyg	LB	B	1969	1988	400	1
NSV 12439 Cyg	SR	B	1969	1988	1000	1
NSV 13784 Cyg	?	B	1979	1988	400	1
NSV 13857 Cyg	LB	B	1970	1988	700	1
+47 2801 Cyg	?	B	1974	1988	900	1
S Del	M	T	1964	1974	600	1
U Del	SRB	B	1967	1989	5000	1
EU Del	SRB	B	1967	1989	5100	1
HR Del	NB	T	1967	1989	6700	1
NSV 13150 Del	?	B	1968	1988	1500	1
R Dra	M	T	1930	1974	5000	1

Star	Type	Programme	First year	Last year	No of estimates	Quality
T Dra	M	T	1930	1989	3700	1
RY Dra	SRB?	B	1967	1989	6300	1
TX Dra	SRB	B	1972	1989	2900	1
UW Dra	LB	B	1971	1989	1200	1
UX Dra	SRA?	B	1967	1989	2100	1
VW Dra	SRD?	B	1972	1989	1200	1
AB Dra	UGZ	T	1969	1989	4500	1
AG Dra	ZAND	T	1987	1989	200	1
AH Dra	SRB	B	1972	1989	1800	1
AT Dra	LB	B	1972	1989	1700	1
DO Dra	UG	R	1988	1989	100	3
69 Dra	?	B	1974	1988	600	1
R Gem	M	T	1930	1974	4700	2
U Gem	UGSS+E	T	1932	1989	15200	2
SS Gem	RVA	T	1974	1975	500	2
SU Gem	RVB	T	1974	1975	200	2
SW Gem	SRA	T	1966	1972	200	2
TU Gem	SRB	B	1968	1989	1100	2
TV Gem	SRC	B	1967	1989	2600	2
WY Gem	LC+E?	B	1968	1989	2100	2
BM Gem	SRB	T	1988	1989	200	2
BN Gem	GCAS	B	1972	1989	1700	2
BQ Gem	SRB	B	1968	1989	900	2
BU Gem	LC	B	1967	1989	2900	2
DW Gem	LB	B	1969	1989	400	2
IR Gem	UGSU	T	1981	1989	2200	3
IS Gem	SRC	B	1969	1989	1100	2
NQ Gem	SR+ZAND	B	1971	1989	100	4
+23 1192 Gem	?	B	1985	1988	200	2
S Her	M	T	1930	1971	3300	1
T Her	M	T	1930	1974	4300	1
U Her	M	T	1930	1974	4100	1
X Her	SRB	B	1967	1989	4000	1
RU Her	M	T	1977	1989	1400	1
SS Her	M	T	1963	1989	2600	1
ST Her	SRB	B	1971	1989	700	1
SX Her	SRD	B	1972	1989	500	1
UW Her	SRB	B	1974	1989	1400	1
YY Her	ZAND	T	1987	1989	40	1
AC Her	RVA	T	1974	1989	5000	1
AH Her	UGZ	T	1970	1989	4100	1
DQ Her	NB	T	1934	1959	1500	1
IQ Her	SRB	B	1971	1989	800	1
OP Her	SRB	B	1968	1989	3100	1
V443 Her	ZAND	T	1987	1989	40	1
V446 Her	NA	T	1960	1961	400	1
V533 Her	NA	T	1963	1968	1200	1
V566 Her	SRB	B	1971	1989	1300	1
V827 Her	NA	T	1987	1988	200	1
g Her	SRB	B	1967	1989	4300	1
R Hya	M	T	1930	1989	3000	2

Star	Type	Programme	First year	Last year	No of estimates	Quality
U Hya	SRB	B	1968	1989	600	2
RW Hya	ZAND	T	1987	1988	10	4
SU Lac	M	T	1974	1989	1400	3
SX Lac	SRD	B	1971	1989	600	1
CP Lac	NA	T	1936	1944	500	1
DK Lac	NA	T	1950	1952	80	1
NSV 14213 Lac	L	B	1968	1988	1600	1
NSV 14260 Lac	?	B	1969	1988	1700	1
R Leo	M	T	1930	1974	6900	2
X Leo	UGSS	T	1920	1989	7900	3
RS Leo	M	T	1985	1989	100	2
RY Leo	SRB	T	1985	1989	300	2
RZ Leo	UG?	R	1987	1989	80	3
TU Leo	UG?	R	1988	1989	20	4
R LMi	M	T	1975	1977	200	2
U LMi	SRA	T	1985	1989	200	2
W LMi	SRD	T	1985	1989	40	2
RX Lep	SRB	B	1967	1989	900	2
SS Lep	ZAND	B	1987	1989	20	2
R Lyn	M	T	1930	1974	4000	1
W Lyn	M	T	1985	1989	60	1
X Lyn	M	T	1985	1989	200	1
Y Lyn	SRC	B	1968	1989	2300	1
SV Lyn	SRB	B	1971	1989	900	1
NSV 3597 Lyn	-	B	1968	1988	500	1
R Lyr	SRB	B	1967	1989	3600	1
W Lyr	M	T	1930	1974	5000	1
XY Lyr	LC	B	1968	1989	2900	1
AY Lyr	UGSU	T	1931	1989	5300	3
Delta^2 Lyr	SRC?	B	1968	1988	2200	1
S Mon	IA?	B	1967	1988	900	2
U Mon	RVB	T	1964	1989	3800	2
RV Mon	SRB	B	1974	1989	800	2
SX Mon	SR	B	1974	1989	600	2
BX Mon	*	T	1987	1989	10	4
V616 Mon	XND+ELL?	R	1987	1989	80	3
X Oph	M	B	1968	1989	1900	2
RS Oph	NR	T	1958	1989	3900	2
RY Oph	M	T	1930	1971	2300	2
V2048 Oph	GCAS+UV?	B	1970	1989	4200	2
Hen 1341 Oph	ZAND?	T	1988	1988	10	4
T Ori	INSA	T	1926	1977	500	4
U Ori	M	T	1930	1989	8000	2
W Ori	SRB	B	1968	1989	1400	2
BL Ori	LB	B	1967	1989	1500	2
BQ Ori	SR	B	1969	1989	1600	2
CK Ori	SR?	B	1968	1989	1300	2
CN Ori	UGZ	T	1963	1989	3000	3
CT Ori	RV?	T	1974	1975	200	2
CZ Ori	IJGSS	T	1930	1989	4400	3
DY Ori	RV?	T	1974	1975	200	2

Star	Type	Programme	First year	Last year	No of estimates	Quality
GW Ori	INST	T	1974	1977	100	2
IU Ori	INSB	T	1968	1977	300	2
KS Ori	INA	T	1968	1977	300	2
KX Ori	INA?	T	1974	1977	200	2
LP Ori	INSA?	T	1968	1977	400	2
MX Ori	INB	T	1968	1977	300	2
NU Ori	INSA	T	1968	1979	600	2
NV Ori	INSB	T	1968	1977	300	2
V359 Ori	SXARI	T	1974	1977	200	2
V361 Ori	INSA	T	1968	1977	400	2
V372 Ori	INA	T	1968	1977	400	2
V566 Ori	INSA	T	1974	1977	100	2
NSV 2271 Ori	?	T	1974	1977	200	2
NSV 2386 Ori	?	T	1968	1977	400	2
NSV 2917 Ori	LC?	B	1967	1988	1200	2
R Peg	M	T	1930	1974	3500	1
X Peg	M	T	1930	1972	2800	1
RU Peg	UGSS+ZZ?	T	1927	1989	8600	1
AG Peg	NC	B	1970	1989	3600	1
EF Peg	UG	R	1988	1989	40	4
GO Peg	LB	B	1971	1989	1000	1
R Per	M	T	1930	1974	3300	1
S Per	SRC	T	1920	1989	9100	1
X Per	GCAS+XP	B	1967	1989	5000	1
RS Per	SRC	T	1972	1989	3200	1
SU Per	SRC	B	1970	1989	1000	1
TZ Per	UGZ	T	1930	1989	8200	1
UV Per	UGSU	T	1926	1989	7500	3
UW Per	UG?	R	1988	1989	100	3
AD Per	SRC	B	1970	1989	1000	1
AX Per	ZAND	T	1987	1989	100	1
BU Per	SRC	T	1972	1989	3100	1
GK Per	NA+XP	T	1966	1989	2800	1
KK Per	LC	B	1970	1989	700	1
PR Per	LC	B	1970	1989	900	1
NSV 895 Per	UG?	R	1988	1989	20	4
T Psc	SRB	T	1926	1960	1700	2
Z Psc	SRB	R	1967	1989	900	2
TV Psc	SR	B	1967	1989	1700	2
TX Psc	LB	B	1967	1989	1500	2
R Sge	RVB	T	1974	1975	200	1
V Sge	E+NL	T	1926	1989	400	4
SV Sge	RCB	T	1987	1989	200	1
WZ Sge	UGSU+E+ZZ	T	1973	1989	2900	3
HM Sge	NC+M	T	1988	1989	20	1
HS Sge	NA	T	1977	1979	70	1
QW Sge	ZAND	T	1988	1989	10	4
V1017 Sgr	ZAND	R	1987	1989	100	4
U Sco	NR	R	1987	1989	100	4
V977 Sco	N	T	1989	1989	10	4
R Sct	RVA	T	1921	1989	16500	1

Star	Type	Programme	First year	Last year	No of estimates	Quality
S Sct	SRB	B	1968	19&9	1200	1
FR Sct	ZAND	T	1988	1989	10	4
V368 Sct	NA	T	1970	1973	70	1
V373 Sct	NA	T	1975	1975	100	1
V443 Sct	N	T	1989	1989	60	1
Nova Sct 1981	N?	R	1987	1989	70	3
R Ser	M	T	1930	1989	5800	2
CT Ser	NA	T	1948	1959	100	2
FG Ser	ZAND	T	1988	1989	10	4
FH Ser	NA	T	1970	1974	300	2
AS 289 Ser	ZAND?	T	1988	1989	20	2
Z Sex	LB	T	1974	1975	200	2
T Tau	INT	T	1931	1981	1600	4
V Tau	M	T	1930	1972	2500	2
Y Tau	SRB	B	1968	1989	1600	2
RV Tau	RVB	T	1950	1989	4400	2
RY Tau	INT	T	1974	1977	200	2
SU Tau	RCB	T	1962	1989	4500	2
TT Tau	SRB	B	1971	1989	900	2
BU Tau	GCAS	B	1967	1989	3100	2
CE Tau	SRC	B	1968	1989	1300	2
HW Tau	UGSS	R	1988	1989	20	4
NSV 1280 Tau	IS?	B	1691	1988	1100	2
NSV 1702 Tau	?	13	19677	1988	800	2
R Tri	M	T	1963	1974	1100	2
W Tri	SRC	B	1968	1989	1000	2
R UMa	M	T	1930	1974	4900	1
S UMa	M	T	1930	1974	8700	1
T UMa	M	T	1930	1989	8800	1
V UMa	SRB	T	1934	1972	1700	1
Z UMa	SRB	B	1968	1989	4100	1
RY UMa	SRB	B	1967	1989	3900	1
ST UMa	SRB	B	1968	1989	2400	1
SU UMa	UGSU	T	1926	1989	9600	3
SW UMa	UGSU	T	1963	1989	4100	3
TV UMa	SRB	B	1974	1989	800	1
VW UMa	SR	B	1967	1989	3000	1
VY UMa	LB	B	1968	1989	3200	1
BC UMa	UG	R	1987	1989	60	3
BZ UMa	UG	R	1987	1989	100	3
CH UMa	UGSS	T	1972	1989	4300	1
CY UMa	UG	R	1987	1989	10	4
R UMi	SRB	T	1921	1972	5300	1
S UMi	M	T	1930	1974	3900	1
V UMi	SRB	B	1968	1989	1800	1
RR UMi	SRB	B	1981	1988	800	1
S Vir	M	T	1930	1974	3100	2
RS Vir	M	T	1975	1977	100	2
RW Vir	LB	B	1968	1989	400	2
RX Vir	SRD?	B	1968	1989	300	2
SS Vir	SRA	B	1969	1989	600	2

Star	Type	Programme	First year	Last year	No of estimates	Quality
SW Vir	SRB	B	1974	1989	400	2
BK Vir	SRB	B	1974	1989	400	2
HV Vir	N?	R	1988	1989	10	4
R Vul	M	T	1930	1972	2800	1
V Vul	RVA	T	1974	1989	3000	1
LV Vul	NA	T	1968	1973	1000	1
NQ Vul	NB	T	1976	1979	6 00	1
PU Vul	NC	T	1979	1989	2600	1
PW Vul	N	T	1984	1989	600	1
QU Vul	NA	T	1984	1989	400	1
QV Vul	NA	T	1987	1989	300	1
Mark 421	BLLAC	T	1981	1989	500	2
NGC 4151	GAL	T	1981	1989	900	2
SN 1974 (N4414)	SN	T	1974	1974	20	1
SN 1979 (M100)	SN	T	1979	1979	10	4
SN 1980K	SN	T	1980	1980	100	1
SN 1989B (M66)	SN	T	1989	1989	80	1
3C 273	QSO	T	1981	1989	500	2

UV Aurigae

Members are urged to send any observations of this star to Melvyn Taylor as soon as possible. Recent coverage indicates that the star has exceeded its normal range and that covered by the sequence on chart 074.01. We hope to make an extended sequence available in the near future.

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