British Astronomical Association

Variable Star Section Circular

No 79, March 1994

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ISSN 0267-9272

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Variable Star Alerts	Gary Poyner 021-6053716 E-mail: GP@UK.AC.BHAM.SR.STAR BHVAD::GP

Charges for VSS Publications

The following charges are made for the Circulars. These cover one year (4 issues). Make cheques out to the BAA. Send to the Director.

	UK	Europe	Rest of World
BAA Members	£2-50	£3-50	£6-00
Non-Members	£4-50	£5-50	£8-00

The charges for other publications are as follows. Make cheques out to the BAA and please enclose a large SAE with your order.

	Order from	Charge
Telescopic Charts	Chart Secretary	30p each
Binocular Charts	Chart Secretary	10p each
Eclipsing Binary Charts	Eclipsing Binary Secretary	10p each
Leaflets	Section Secretary	30p each
Observation Report Forms	Section Secretary	No Charge

Editorial

Everyone that I spoke to during and after the Cambridge Meeting seemed to agree that it was a tremendous success. Most of the credit for this should be given to Paul McLaughlin and the other CUAS members who organised and ran the meeting. All that the VSS officers did was to turn up on the day. For the benefit of those who couldn't be there, a brief summary of the talks will be given in two instalments in this circular and the next. I hope to publish a fuller account in the BAA Journal at a later date.

If you look inside the front cover you will notice that the subs have been increased slightly. This is to cover an increase in the printing costs and the abolition of the lower weight bands for the printed paper rates (the Royal Mail slipped this one in just before the last circular was sent out).

A week before the Cambridge Meeting, I finally finished writing a set of beginners leaflets. These are intended to give newcomers to the VSS an idea of what the Section can offer them, details of how to make observations, and a selection of charts for stars especially suitable for beginners. The following titles are available:

L01 - An Introduction to the Variable Star Section
L02 - Making Visual Observations for the Variable Star Section
L03 - Chart Catalogue
L04 - Sample Charts for the Naked-Eye and Binoculars
L05 - Sample Charts for Smaller Telescopes
L06 - Sample Charts for Larger Telescopes

The idea is that each new member gets a free copy of L01, L02, L03 and one of either L04, L05 or L06 according to the instruments they have available. Other people who would like copies can purchase them at 30p each. However, the text of L03 (the Chart Catalogue) is reprinted in this circular and I intend to print the text of L02 (Making Visual Observations...) in the next one.

L02 might seem a bit idiosyncratic to some of you. I wrote it between 6pm and 6am one night - I was determined to get it finished in time for Cambridge. It is a few years since I last stayed up all night and I had forgotten that warm, drowsy feeling of satisfaction you get after a good night's work (that is before the headache sets in!). I just wanted to get something down on paper - if it needs polishing up then that can be done later. I made a bit of a blunder in including the chart for Z Cam in L06. At the time I compiled it, I didn't know that Z Cam had been in standstill for over a year. A star in standstill would not be a very good object to give to a beginner to observe. Luckily, the standstill cameto an end in January and Z is now varying properly again. Even so, I intend to produce a new version of L06 with the more reliable SU UMa in place of Z Cam.

The next circular, VSSC 80, should be out in early June. I already have quite a bit of material for it (inluding a Pro-Am Exchange Report by Guy Hurst) but if anyone has any comments, questions, complaints, letters, short articles, light-curves they would like me to include then I would be only too pleased to do so. In particular, I would be interested to hear whether you think that the circulars are too full of 'dry' lists (for example: the IBVS summaries). It is all to easy for those of us who have computers to generate this sort of material but does anybody read it?

The Cambridge Variable Star Meeting

The joint Cambridge University Astronomical Society - BAA meeting on variable stars was held at the Cambridge Astronomical Institute on Saturday, 19th February 1994. Over 80 people attended.

The first speaker was Dr Allan Chapman who gave a History of Variable Star Astronomy from about 1600 to the 1920's. He explained that, for most of this time, variable stars were viewed as a minor puzzle on the edge of astronomy. However, in the early years of this century their significance increased when they were used to give answers to some of the central problems of astronomy.

The supernova of 1572 was the first variable star widely to be recognised as such in the West. It made Tycho Brahe into an astronomer and his observations of it dealt a severe blow to the Aristotelean view of the universe. In 1596, David Fabricius discovered Mira. At first it was thought to be a nova but it was later found to have reappeared and in the 1670's it was realised that its variations were periodic. By the middle of the 18th century about half a dozen variable stars were known. These could be divided into two types: those which flared up suddenly and then faded away again to disappear for good (the 'flashers') and those in which the variations recur in some form or another (the 'winkers').

In 1782 John Goodricke discovered the periodicity in the variations of Algol and proposed a model in which the visible star was being periodically eclipsed by a dim star orbiting it. Unfortunately, this model was not widely accepted. William Herschel was against it because he was unable to see the dim companion with his 20-foot telescope ("Astronomy is about seeing things"). Another reason for the rejection of the eclipsing binary model for Algol was that it could not be generalised to explain the variations of other stars such as Delta Cephei. The Newtonian style was to go for universal explanations and, at that time, the eclipsing binary model would have seemed rather ad-hoc.

In the early 19th century more and more variable stars were being discovered. Argelander suggested that observing them would be good work for amateurs as most professional astronomers were busy with routine positional work. In the meantime binary star models were becoming more popular. In 1842 Bessel predicted the existence of an unseen companion to Sirius. This was later found by Alvan Clark. However, it wasn't until 1889, when advances in photography and spectroscopy allowed Voegel to detect the periodic shift in the spectral lines of Algol, that the eclipsing binary model was confirmed and became widely accepted.

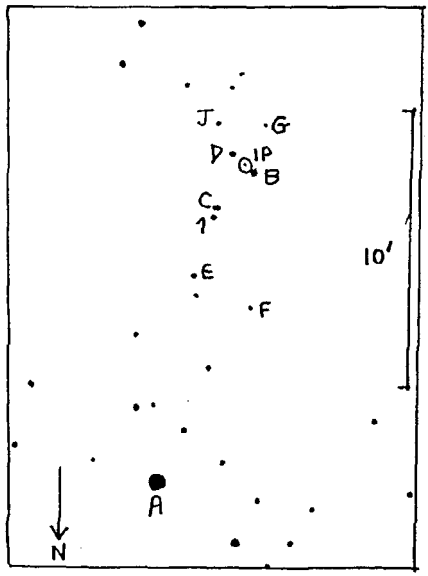
In the early 20th century variable stars started to become useful in astronomy. The key event in bring this about was Henrietta Leavitt's discovery of the Cepheid period-luminosity law in 1912. This offered the possibility of determining the scale of the universe for the first time. However, in order to do this, the zero-point of the period-luminosity law had to be determined and, unfortunately, not even a single Cepheid was close enough for its distance to be known. Harlow Shapley set about trying to find the luminosity of galactic Cepheids statistically from their proper motions. He then used the result to measure the distances of globular clusters. From these results, and the distribution of these clusters over the sky, he proposed that the Galaxy had a diameter of 300,000LY (light-years) and its centre lay 50,000LY in the direction of Sagittarius. There still remained the question of whether our Galaxy was the whole of the universe. It was not clear whether objects like M31 were within our Galaxy or else were separate galaxies in their own right. This was sorted out in 1924 when Edwin Hubble found a Cepheid in M31 and was able to derive a distance of 750,000LY, placing it well outside our own Galaxy.

(B)

231817 IP PEGASI

RA $23^h 20^m 39^s.5$ DEC $+18^\circ 08' 42''$ (1950)

Magn: 12.0 — 18.6B. U Gem.



Sequence:		Source:-
A	7.8 v	F, G, : Goranskij, V.P IBVS 2653.
B	10.5 v	Remainder AAVSO Circular 177.
C	12.3 v	
1	12.5 v	Report:
D	12.2 v	See detailed notes in TA 260
E	12.9 v	regarding eclipses.
F	13.62 V	C & D estimates by Tales (1988)
G	13.80 V	
J	15.0	Stamford Observatory

B. GRANSLO 85.06.25.
Revision:
G. HURST 86.01.18.
Revised 88 10 21
Revised 94 01 30.

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After Dr Chapman's talk Bill Worraker gave a short description of an observing campaign he was coordinating on the dwarf nova IP Pegasi. This star normally varies between mags 12.0 and 15.5 with a mean interval between outburst of 95 days. however, it also shows eclipses at intervals of 3h 46m. At minimum these are about 3 mags deep and last about 42 minutes. During outburst they are still well over a magnitude deep. Bob explained that the aim of the campaign is to gather good quality timing and photometric data on these eclipses during an outburst. A secondary aim is to demonstrate the coordination of visual and CCD observations of such eclipses. He suggested that all observers interested in taking part should start monitoring the field of IP Peg as soon as possible so as to become familiar with the comparison stars. When an outburst is detected an alert will be put out and predictions for the eclipses will be issued. The outbursts only last about a week and each observer should attempt to cover one complete eclipse on each clear night. Magnitude estimates should be made at 1 minute intervals. The results should then be sent in for analysis and possible publication (If you are interested in taking part in this project then write to Bill at 65 Wantage Rd, Didcot, Oxon, OX11 OAE, giving details of your instruments).

The last speaker of the morning was Tony Markham, the director of the Variable Star Section of the SPA (the Society for Popular Astronomy - the new name for the Junior Astronomical Society). He said that in the past the JAS VSS program had mainly consisted of naked-eye variables. It was though that these were easier to observe than fainter stars. However, ther are problems with finding comparison stars and with atmospheric absorbtion and there are so few naked-eye variables anyway. Tony had decided to add several binocular stars to the program. These included RZ Cas, u Her and 7 Mira stars. The latter could only be observed when near maximum but they were proving very popular with the members because of their large clear variations. Tony pointed out that the SPA council had stated that the aim of the sections was to get people interested in observing and that the collection of scientifically useful data was only of secondary importance. Tony went on to show light-curves of many of the stars on the SPA VSS program. He pointed out the presence of large systematic differences between observers in the light-curve of Beta Pegasi. He also mentioned that their light-curve of Alpha Orionis showed that star to be faint each August. This was probably due to the influence of atmospheric absorbtion as the star can only be observed at low altitude at that time of year.

To be continued

Availability of the Krakow Yearbook for 1995

The Krakow Yearbook, alias Rocznik Astronomiczny, alias SAC, contains up-to-date light elements and predictions for 880 eclipsing binaries, and can be very useful to serious observers of these stars. The price of the next issue (SAC 66) which covers 1995 is US $18-00 air mail or $15-00 surface mail. Payment can either be made directly to the account of the Jagiellonian University (at Bank Depozytowo-Kreditowy II Krakow No 333401-592-151-4787, be sure to mark the payment "Rocznik Astronomiczy - subscription" and send a separate letter to the Editors) in the form of a cheque made out to the Astronomical Observatory of the Jagiellonian University. In both case the payment should arrive before the end of September. The address of the Editors is Jagiellonian University Astronomical Observatory, ul. Orla 171, 30-244 Krakow, POLAND. They can also be contacted on E-mail via Internet: KROSNIAK@OA.UJ.EDU.PL or UOKROSNI@IF.UJ.EDU.PL.

VSS Computerisation: Progress in 1993
Dave McAdam

21 people contributed files for the database during 1993;

Herbert Joy	59878 (+977)	Jonathan Shanklin	3320
Dave McAdam	38363	Phillip Barnard	2132
Mike Carson-Rowland	36021	E James W West	1648
David Swain	10427 (+13339)	John Moran	639
Bill Bingham	8316	Vic Garvey	603
David Lloyd	7168	James Lancashire	527
Gary Poyner	6680	Tosh Lubek	350
Nicola & Emma Britton	6546	Tristram Brelstaff	276
Ian Howard-Duff	4574	Gavin Ramsey	206
John C Fairweather	3939	Roger Pickard	11

Total for 1993:	191624	(+14316)
Full archive total:	361038	"

The figures in brackets are approximate numbers of observations in keyed files which await more information on sequences before inclusion in the database. David Swain's contribution was the BSS records for 1971-72 which he entered several years ago. The total contributors should have been 22 but Guy Hurst e-mailed his observations in the first couple of days of 1993 and they were included in the figures for the previous year. From now on, the totals are to be taken exactly on each calendar year.

The entry work requires a special kind of self motivation and I again applaud the diligent work of Herbert Joy in beating us all by a large margin for the second year running! Mike Carson-Rowland undertook the full lists 1921 to 1982 on R CrB which accounted for about three quarters of his total. He also wrote up an article for the circular explaining his short-cut methods for speeding up the entries. Nicola and Emma Britton make joint entries using the same wordprocessing software as Mike and say his methods really do save some time. Up to the present, 7 observers have sent results on disk or by e-mail and these have extra importance because no one else need key them. Personal files for earlier years have also been provided, partially replacing entries made by others. On the "straight from the horse's mouth" principle, the replacements were better because they included full instrumentation details. A couple of contributors to the keying-in have also mentioned starting making observations themselves and I am happy to accept these on disk. However, new observers should contact the secretary, Melvyn Taylor, for advice on main programme stars that might be observed, and John Toone supplies sequence charts.

Some other details of the database may be of interest: at the end 1993 there were 3115 annual records (ranging from 1 to over a thousand observations) on 398 variables. However I have only been able to enter 293 sets of comparison star sequences so far, so more work needs to be done on these. A total of 2461 input files have been parsed, checked, and archived - 1433 files entered in 1993. Multiple variables on observer reports and a couple of dozen re-processes added up to 4219 update operations on annual files. The records for a number of variables have been brought up to date and the following table shows the distribution of the totals:

>9999	: 3	2000-2999	: 18
5000-9999	: 9	1000-1999	: 26
4000-4999	: 11	500-999	: 34
3000-3999	: 13	<500	: 284

As can be seen, three quarters of the variables have small totals, many being comprised solely of observations from machine-readable observer reports. As the work of entering paper records proceeds, we shall fill out more annual and full records. The 23 variables with 4000+ observations entered are:

Index	Object	Type	Per	max	min	Total	Yrs	1st	Last
00005	RX And	UGZ	14d	9.83	14.72	4047	13	1971	1993
00012	R Aql	M	284d	4.90	12.70	6293	55	1939	1993
00031	SS Aur	UGSS	56d	10.23	15.30	4865	14	1978	1993
00039	U Boo	SRB	201d	9.48	13.23	4517	69	1923	1993
00042	V Boo	SRA	258d	6.77	11.20	7598	71	1923	1993
00054	V Cam	M	522d	7.47	15.70	4083	65	1925	1992
00057	XX Cam	RCB?		6.60	7.95	5947	23	1971	1993
00058	Z Cam	UGZ	22d	9.95	14.17	11833	54	1926	1993
00066	UV Cas	RCB		10.20	11.50	4204	20	1974	1993
00107	R CrB	RCB		5.20	14.50	35954	73	1921	1993
00109	S CrB	M	360d	5.90	13.80	5472	53	1939	1993
00111	T CrB	NR	29000d	3.00	11.50	9456	45	1946	1993
00118	CH Cyg	ZAND+SR		5.93	10.30	4777	14	1971	1993
00135	SS Cyg	UGSS	50d	7.70	12.81	14361	25	1906	1993
00160	AB Dra	UGZ	13d	11.61	16.80	5527	25	1969	1993
00226	X Leo	UGSS	17d	10.80	16.40	4069	13	1981	1993
00243	U Mon	RVB	91d	5.50	8.23	4659	29	1964	1992
00244	RS Oph	NR		5.40	12.60	4034	35	1958	1993
00292	S Per	SRC	822d	7.59	12.73	9374	67	1920	1992
00336	SU Tau	RCB		9.20	16.60	5260	32	1962	1993
00341	CH UMa	UGSS	204d	10.50	15.40	4224	19	1972	1993
00347	SU UMa	UGSU	19d	10.40	14.70	9699	59	1926	1993
00348	SW UMa	UGSU	460d	9.60	16.30	4957	31	1963	1993

Of the 3 highest totals, R CrB is practically up to date, Z Cam needs a few more years, and SS Cyg is only about 30% complete - its full total will probably exceed that of R CrB.

In talking with several section members, I get the impression that everyone seems to have different ideas on what should be done about section records. The job I have undertaken is primarily to try and store them in a computer database - this is not simply my own whim - the massive amount of paperwork increases each year, and proper analysis can only be done from full records on a particular variable. Hence, building and maintaining a computer database is essential for the running of the section:- there is no alternative! Once variables are brought up to date, it becomes easy to make copy listings or plot light curves. (At least 4 people have been supplied copies of the data for RX Cephei - a star that does not even vary!) Even having a simple light-curve available is useful, Bill Worraker has predicted a possible outburst of RS Oph during 1994 using the complete section records for this star.

Those observers who are able to provide machine-readable reports can also include non-programme stars which they observe on a regular basis. These represent a small amount of extra work on my part but may save a lot of time should the variable be placed "officially" on the programme at a later date. However, you should supply details of the sequences for any such non-program stars so that the systematic checks can be carried out on the observations.

Another point is that, although it would be easier to store just the deduced magnitudes rather than the full estimates, the section has always encouraged observers to report the ful light estimate for each observation. In fact, we have the identity of the comparison stars on about 95% of the observations of R CrB. The proportions for other program stars are likely to be similar. This means that we are able to re-reduce a large proportion of observations

to a common sequence despite revision of charts and where multiple sequences are used concurrently on a variable. A second advantage is that we can check the estimates against the deduced mags during processing. This shows up some typographical errors which have occurred during keying in. Both result in the stored data being more accurate.

The growing database is in every way public domain. Hence, as well as asking for more assistance on past records and more disk reports from observers (I still argue that keying observations into a computer should not take longer than writing reports by hand). I also point out that those members who can do analyses and want data should contact the director. Full lists of the database contents are getting rather large to print out, but they can easily be provided on MSDOS floppy disk. As well as the format in the list above, a larger list of annual archived totals on each star can be produced. If you are interested in having up-to-date copies, please send me a formatted disk together with return postage stamps.

Possible Eclipses of HD 221670

HD 226170 is a 7th magnitude spectroscopic binary about 5 degrees north-preceding Beta Cas. It forms a pair with HD 221639, a similar but apparently unconnected star. The catalogued details for these two stars are:

	RA (1950) h m	Dec o ,	RA (2000) h m	Dec o ,	V m	B-V m	Spectrum
HD 221639	23 31.0	+60 08	23 33.3	+60 25	7.18	0.92	K0III-IV
HD 221670	23 31.3	+60 12	23 33.6	+60 28	7.34	0.99	G9III

In a recent article (The Observatory, 113, 294-300, 1993), R.F.Griffin has suggested that it is possible that HD 221670 might show eclipses. Although the probability is not very high, photoelectric photometrists might like to make a few measures around the time of conjunction. The next dates are 1994 May 10 and 1995 Dec 7. These times are accurate to only a few days, and an eclipse should last several days if central, so only one measure per night should be adequate.

A Discrepancy in the U Orionis Sequence

Tony Markham writes that Michael Clarke has recently queried the magnitude assigned to comparison star G on the BAA VSS chart for U Ori (chart 059.01). Michael sees G as equal to or fainter than star H but brighter than J. Tony also sees G as slightly fainter than H. Guy Hurst has identified G as SAO 77726 (05h 52.7m +20° 28' [1950], 05h 55.6m +20° 28' [1950], approx mag 8.2v, spec K5). The star is not listed in the GCVS nor in the NSV.

While it is possible that G (or even H) is variable, it is much more likely that it has simply been assigned a wrong magnitude. If this is so then it is not all that critical to correct it. Observers can continue to make observations using it, so long as they record what they see, and not what they think they ought to see. The observations can be re-reduced at a later date using the correct magnitude (Dave McAdam's programs can already do this). If observers of U Ori could make a few estimates of G and H relative to the rest of the sequence, and send them to me then we will be able to correct the sequence when the chart is next up-issued.

Recent Papers on Variable Stars

The following outlines are based on the summaries given in Physics Abstracts. The latter can be very useful if you want to find out about recent variable star research without having to read through masses of journals. Check out your local university library to see if they receive it (you don't have to be a student to use university libraries). Photocopies of the complete papers can be obtained through the inter-library loan scheme in the same way as IBVS's.

Speckle Observations of Mira's Companion (M. Karovska et al, Astrophys. J., 402, 311 - 313 + plate, 1993) - Describes the results of using speckle interferometry to observe the hot companion of Mira. Knowing the separation of the two stars is crucial for an accurate determination of the rate at which the hot star accretes matter from Mira. Measures made since 1983 show the separation to be much larger than previously thought.

Detecting Faint Echoes in Stellar Flare Light Curves (B. C. Bromley, Publ. Astron. Soc. Pacific, 104, 1049 - 1053, 1992) - Considers the possibility of detecting light echoes produced by stellar flares reflecting off the photosphere of the flaring star or off the surfaces of stellar or planetary companions.

UV Persei - A New SU UMa Type Dwarf Nova (A. Udalski and W. Bych, Acta Astron., 42, 285 - 294, 1992) - Reports the detection of a 95.6-minute periodicity ('superhumps') in the light-curve during the outburst in 1989 October. This indicates that the star should be reclassified as an SU UMa star.

The Database of the French Association of Variable Star Observers (AFOEV) (E. Schweitzer and J. Vialle, Bull. Inf. Centre Donnees Astron. Strasbourg, No 43, 51 - 53, 1993) - Describes the database of 539720 visual observations (going back to 1923) which is now stored in the computer files of the Centre de Donnee Astronomiques de Stasbourg.

Modelling of the CO Emission around the Carbon Star S Scuti (P. Bergman et al, Astron. Astrophys., 268, 685 - 693, 1993) - Model the circumstellar CO emission towards S Sct. Best fit to observations given by large, but geometrically thin, clumpy shell. Possibly caused by short episode of high mass loss about 10,000 years ago.

High Angular Resolution Measurements of Algol (X. P. Paan et al, Astrophys. J. Lett., 413, L129 - L131, 1993) - Use long-baseline optical interferometry to determine properties of the Algol AB-C system with greater precision than ever before. Period is 680.05 days. Derive distance for Algol of 28.2 ±0.8pc.

WZ Sge as a Dwarf Nova (J. Smak, Acta Astron., 43, 101 - 119, 1993) - Reviews and re-evaluates current ideas on this long-period dwarf nova. Derives distance of 48pc and masses of 0.45 and 0.06 solar masses for the components. The mass-transfer rate is about 2×10^{15}g/s at minimum and rose to about 3×10^{18}g/s during the 1978 outburst. The light-curves of both the 1946 and 1978 outbursts show dips about 30 days after maximum as the

accretion rate decreased below the critical dwarf nova instability level.

Periodic Variations and Outburst Behaviour of U Gem (J. Smak, Acta Astron., 43, 121 - 126, 1993) - The times of the eclipses which this dwarf nova exhibits at minimum show variations on a time-scale of about 10 years. The outburst frequency and the mean radiation flux in the visual wave-band also seem to indicate that mass-transfer varies on a similar time-scale. However the two variations are only weakly correlated.

A New Type of Cataclysmic Variability: FG Serpentis and QW Sagittae (N. E. Kurochkin, Astron. Astrophys. Trans., 3, 295 - 301, 1993) - Presents and analyses observations of FG Ser and QW Sge. Proposes that a new class of cataclysmic variable should be created for those symbiotic stars which show outbursts and other phenomena characteristic of cataclysmic variables.

IN MEMORIAM WALTER SCOTT HOUSTON (1912-1993)

On 23rd December last year a legend in the astronomical world passed away - Walter Scott Houston.He died at the age of 81 at Cancum,Mexico,while on a trip with his wife Miriam.Born at Tippecanoe,Winsconsin, on 12th May,1912 "Scotty" was a giant in the amateur astronomical scene in the States and I think the forthcoming tributes which will appear in the literature over the next few months will be very warm and generous to his memory.

While a student in Madison he was introduced to variable star observing but this was not his sole interest for he made many telescopes,closely observed the Sun,monitored meteors with radio techniques,followed most other astronomical fields and recorded artificial satellites.His Moonwatch backyard station near Manhattan was the first to spot Explorer 1,the USA's first man-made satellite.He instigated "The Great Plains Observer" an amateur newsletter which had over a thousand subscribers. From his election to the American Association of Variable Star Observers in 1931 until 1983 he had made some 12,500 estimates. Variables remained his major interest in amateur astronomy but for many people his writings in particular the Deep Sky Wonders in "Sky & Telescope" were wonderful.He first started these in 1946 and the March,1993 issue of this magazine notes that articles written by him in advance will continue to appear into the summer.Much of his deep sky observing was done from a dark site in Kansas with a 10-inch reflector and 4-inch refractor. His articles are mixed with all sorts of hints,tips,asides and above all enthusiasm.

In Brussels,Belgium,(1990 July) at the first European meeting of the American Association of Variable Star Observers I had an opportunity to meet him and his remarkable knowledge and love of astronomy came across in his stories.

Melvyn Taylor

Summaries of Information Bulletins on Variable Stars Nos 3927 to 3975

In the UK, at least, photocopies of IBVS's can be obtained through the inter-library loan scheme. Just fill out a requisition form at your local branch library. Be as explicit as possible about what you want, for example, if you are interested in the photometry of V1500 Cygni then you should supply the following details:

Title of Book/Journal: Information Bulletin on Variable Stars, No 3963
Title of Paper: CCD Photometry of V1500 Cygni in 1993
Name of Author: DeYoung
Year of Publication: 1993

This will take a few weeks and will cost you a few tens of pence. You can also obtain copies of other papers in this way, even foreign language ones.

3927 *Photometric Investigation of the Semidetached System V836 Cygni (Zhukov & Markova, 1993)* - Mag 9 Beta Lyrae star.
3928 *Light Variations of KU Hya (Guangjie Wu et al, 1993)* - Microvariable.
3929 *A New W UMa Variable in the Field of AN Gru (Cieslinski & Jablonski, 1993)* - Mag 15. AN Gru is a possible cataclysmic variable.
3930 *UBV Photometry of HR 1099 in 1992 (Rong-xian Zhang et al, 1993)* - Alias V711 Tau, a mag 6 RS CVn type binary (star spots), P=2.8d, Amp about 0.1V.
3931 *HIPPARCOS Measurements of the Nearest Bright Eclipsing Binaries (Dworak & Oblak, 1993)* - Prospects for new results from the high-precision positional measurements of eclipsing binaries observed by the HIPPARCOS satellite.
3932 *UBVRI Magnitudes for Cataclysmic Variables, AF Vul and Comparison Stars (Andronov et al, 1993)* - CM Del, VW Vul, EW Aql, V603 Aql, QQ Vul, MV Lyr.
3933 *UBVRI Magnitudes for Four Margoni & Stagni Variables and Comparison Stars and Comparison Stars for Them (Andronov et al, 1993)* - 9 stars mags 11-15.
3934 *VZ Cygni: A New Spectroscopic Binary Cepheid (Samus et al, 1993)*
3935 *New Times of Minima of W UMa Type Stars (Hobart et al, 1993)* - 14 times for ER Ori, YY Eri and RZ Tau.
3936 *Spot Photometry of AD Leo in 1992 and 1993 (Panov, 1993)* - Mag 9 flare star. Possible 2.7d periodicity at min due to star spots.
3937 *The Low State of Z CMa (Miroshnichenko et al, 1993)* - UBVRI photometry and polarimetry of this mag 9-11 nebular variable.
3938 *Changes in the Light Curves of AP Leonis (Ji-tong Zhang & Rong-xian Zhang, 1993)* - Mag 9 W UMa star. BV light-curves for 1985, 1991 and 1993.
3939 *Data Base on the UV Ceti Type Flare Stars and Related Objects (Gershberg et al, 1993)* - Appeal for help in compilation.
3940 *UBV Photometry of FK Com during 1990 (Marchev & Kjurkchieva, 1993)* - Mag 8, small-amp, variability due to star spots.
3941 *New Photoelectric Observations of BF Aurigae (Rong-xian Zhang et al, 1993)* - Mag 9 Beta Lyrae star between Eta and Zeta Aur.
3942 *Rapid Change of Period of AP Aurigae (Agerer & Splittgerber, 1993)* - Mag 11 Beta Lyrae star.
3943 *A Catalogue of Short Period Pulsating Variable Stars of A and F Spectral Classes (Szatmary, 1993) - Description of catalogue of 415 stars.*
3944 *Improved Positions of Southern NSV Stars I (Lopez & Lepez, 1993)* - Accurate positions for 37 suspected variables south of -40°.
3945 *A Null Detection of Rapid Oscillations in the Ap Star ET And (Kreidl, 1993)* - Search for microvariability.
3946 *NSV 7457 Her: A Probable W UMa Star (Vandenbroere, 1993)* - Range 9.85 - 10.45V, period 0.4190306 days.
3947 *EF Draconis is a Triple System (Wenxian Lu, 1993)* - Spectroscopic evidence for third body in W UMa type binary.
3948 *Times of Minima of Southern Eclipsing Binaries (Cerruti, 1993)* - 11 minima of AG Phe and LT Pav.

3949 *BVRI and Spectroscopic Observations of SY Cnc (Spogli et al, 1993)* - Z Cam star (range 10.8 - 14.5v). Observations cover fade from max.

3950 *Photoelectric Minima Times of the Eclipsing Variables AB Andromedae, 44i Bootis and GO Cygni (Rovithis et al, 1993)* - 19 minima.

3951 *CH Cygni in 1992-1993: High Level of Activity (Leedjarv, 1993)* - Photometry and spectroscopy.

3952 *Improved Period for BH CMi (Zakrzewski & Zola, 1993)* - W UMa star.

3953 *1992 Photometry of UZ Librae (Heckert, 1993)* - Mag 9, star spots.

3954 *1992 UBVRI Photometry of FK Comae (Heckert, 1993)* - Mag 8, star spots.

3955 *vZ1140 - A New Unusual Variable Star in M3 (Yao Bao-an et al, 1993)* - Mag 15 multi-period pulsating star in globular cluster.

3956 *UBV Photometry for Three New Variable Stars (Yang Tinggao et al, 1993)* - Mag 7 red giants. Includes details of comparison stars.

3957 *AO Aquarii and its GCVS Chart Reference (Predom, 1993)* - Mag 11 W UMa star. Chart by Tsessevitch is misleading (GCVS position OK though).

3958 *The Massive Eclipsing Be Star Binary V505 Monocerotis (Vogt & Sterken, 1993)* - PEP of long period (54 days), mag 8, Beta Lyrae star.

3959 *FG Sagittae has been a Carbon Star since 1981 (Iijima & Strafella, 1993)* - Detection of C2-Swan bands in old spectra of this peculiar variable which underwent an 'R CrB like' fade in 1992.

3960 *The Period and Light Curve of V1028 Ori (Mandushev et al, 1993)* Beta Lyrae star, 9.74 - 9.93V, period 3.011428 days.

3961 *H-alpha Profile in the Spectrum of Pleione in the Beginning of the New Be Phase (Menchenkova & Luthardt, 1993)* - Spectroscopy.

3962 *vZ1055=AQ - A New Horizontal Branch Variable Star Redward of the RR Lyrae Gap in the Globular Cluster M3* - Mag 16, short period pulsating star.

3963 *CCD Photometry of V1500 Cygni in 1993 (DeYoung, 1993)* - Sinusoidal variations 17.3 - 18.3V, period 0.1396 days. Includes chart.

3964 *First Announcement of IAU Colloquium No 151 "Flares and Flashes" (Duerbeck & Greiner)* - To to be held at Sonneberg in Dec 1994 in honour of the 65th birthdays of Richter & Wenzel.

3965 *Seasonal light Curve and New Ephemeris of VW Cephei (Vinko et al, 1993)* BV photometry in Aug and Sep 1993. Agrees reasonably well with the results of Lloyd, Watson and Pickard in IBVS 3704 (see VSSC 73).

3966 *Discovery of 10.5-minute Oscillations in the Ap SrEu Star HD 9289 (Kurtz & Martinez, 1993)* - Microvariability.

3967 *Photometry of Stars in the Field of the Mira V418 Cassiopeiae (Skiff, 1993)* - Chart and V-mags for 7 AAVSO comparison stars (10.9 - 13.3V).

3968 *Photometry of Stars in the Fields of AV Cygni and DV Cygni (Skiff, 1994)* - Charts and V-mags for 9 AAVSO comparison stars (9.0 - 13.8V) for AV Cyg (SRd) and for 8 AAVSO comparison stars (7.5 - 13.5V) for DV Cyg (Mira).

3969 *Optical Light Variability of LS 3074 (Haefner et al, 1994)* - Mag 12 small amplitude Beta Lyrae star in the Coal-Sack

3970 *New Times of Light Maxima for CY Aqr (Fu Jian-ning, 1994)* - Mag 11, short-period (0.06 days) pulsating star with large amplitude (0.7 mag).

3971 *Photometry of Stars in the Field of the Mira YZ Draconis (Skiff, 1994)* - Chart and V-mags for 11 AAVSO comparison stars (8.6 - 15.0V).

3972 *Photometry of Stars in the Field of the Mira XY Aquilae (Skiff, 1994)* - Chart and V-mags for 12 AAVSO comparison stars (8.9 - 14.9V).

3973 *Photometry of Stars in the Field of the Mira EL Lyrae (Skiff, 1994)* - Chart and V-mags for 10 AAVSO comparison stars (10.2 - 13.7V).

3974 *Photometry of Stars in the Field of WZ Cassiopeiae (Skiff, 1994)* - Chart and V-mags for 7 AAVSO comparison stars (6.5 - 8.6V).

3975 *Short Period Photometric Oscillations in V795 Herculis (Zwitter et al, 1994)* - CCD photometry of mag 12 cataclysmic variable in the 'period gap'.

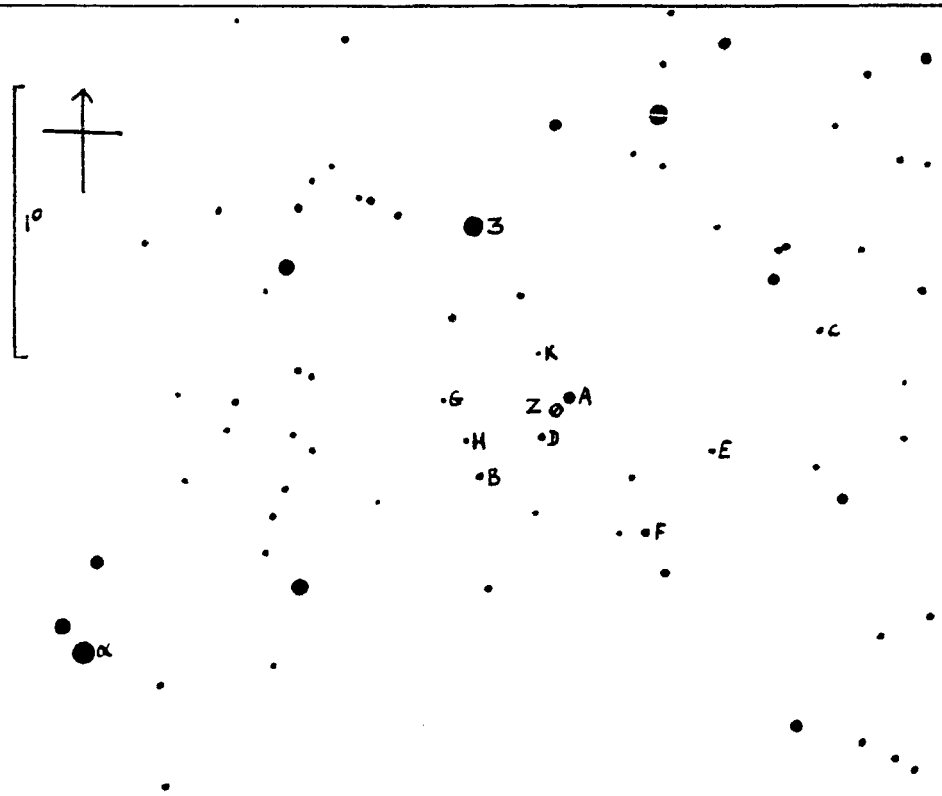
Eclipsing Binary Predictions

The following predictions are calculated for an observer at 53 degrees north, 1.5 degrees west but should be usable for observers throughout the British Isles. The times of mid-eclipse appear in parentheses with the start and end times of visibility on either side. The times are hours GMAT, that is UT-12h. 'D' and 'L' are used to indicate where daylight and low altitude, respectively, prevent part of the eclipse from being visible. Charts for all of the stars included in these predictions (17 in all - see VVSC 75 for a list) are available from the Director at 10p each (please enclose a large SAE).

1994 Apr 1 Fri
RW Tau D08(05)10
RZ Cas D08(07)09
X Tri D08(08)09L
1994 Apr 2 Sat
X Tri D08(07)09L
Z Dra D08(07)10
U Cep D08(11)16
SW Cyg L08(09)15
RZ Cas 09(12)14
Z Vul L11(16)16D
U Sge 12(18)16D
1994 Apr 3 Sun
V640 Ori D08(05)08
X Tri D08(06)09L
Z Dra 14(16)16D
RZ Cas 14(16)16D
TW Dra 16(21)16D
1994 Apr 4 Mon
X Tri D08(06)08
1994 Apr 5 Tue
V640 Ori D08(06)08
1994 Apr 6 Wed
TX UMa D08(03)08
ST Per D08(09)11L
Z Dra D08(09)12
TW Dra 11(16)16D
1994 Apr 7 Thu
V640 Ori D08(06)09L
RZ Cas D08(06)09
U Cep D08(11)16
RW Gem 09(15)12L
Z Vul L11(14)16D
Z Dra 15(18)16D
1994 Apr 8 Fri
RZ Cas 09(11)13
S Equ L14(19)16D
1994 Apr 9 Sat
TX UMa D08(05)09
V640 Ori D08(07)09L
TW Dra D08(11)16D
RW Tau 08(13)10L
U Sge L11(12)16D
RZ Cas 13(16)16D
1994 Apr 10 Sun
RW Gem D08(11)12L
Z Dra 09(11)13
1994 Apr 11 Mon
V640 Ori D08(07)08L
SW Cyg D08(12)16D
1994 Apr 12 Tue
Z Per D08(03)08
TX UMa D08(06)11
TW Dra D08(07)12
RW Tau D08(07)10L
U Cep D08(11)16
Z Vul L11(12)16D
U Sge 15(21)16D
1994 Apr 13 Wed
RZ Cas D08(06)08
V640 Ori D08(08)08L
RW Gem D08(08)11L
1994 Apr 14 Thu
ST Per D08(08)10L
RZ Cas 08(11)13
Z Dra 10(13)15
1994 Apr 15 Fri
Z Per D08(05)10
TX UMa D08(08)12
V640 Ori D08(08)08L
RZ Cas 13(15)16D
S Equ L14(16)16D
1994 Apr 16 Sat
SW Cyg D08(02)08
RW Gem D08(05)10
U Sge L11(06)12
1994 Apr 17 Sun
Z Dra D08(06)08
U Cep D08(10)15
Z Vul L10(10)15
1994 Apr 18 Mon
Z Per D08(06)10L
TX UMa D08(09)14
Z Dra 12(14)16D
1994 Apr 19 Tue
U Sge L11(15)16D
Z Vul 15(20)16D
1994 Apr 20 Wed
RZ Cas D08(10)12
SW Cyg 10(16)16D
TW Dra 12(17)16D
1994 Apr 21 Thu
Z Per D08(07)10L
Z Dra D08(08)10
TX UMa D08(11)15
RZ Cas 12(15)16D
1994 Apr 22 Fri
ST Per D08(06)10L
U Cep D08(10)15
Z Vul L10(07)13
S Equ L13(13)16D
Z Dra 14(16)16D
1994 Apr 23 Sat
RW Tau D08(09)09L
TW Dra D08(12)15D
1994 Apr 24 Sun
Z Per D08(09)10L
TX UMa D08(12)15D
Z Vul 13(18)15D
1994 Apr 25 Mon
SW Cyg D08(06)12
Z Dra D08(09)12
1994 Apr 26 Tue
TW Dra D08(08)13
RZ Cas D08(09)12
U Sge L10(10)15
1994 Apr 27 Wed
U Cep D08(10)15
Z Per D08(10)10L
TX UMa 09(14)15D
ST Per 09(13)10L
Z Vul L10(05)11
RZ Cas 12(14)15D
Z Per L15(10)15
1994 Apr 29 Fri
Z Dra 09(11)13
Z Vul 11(16)15D
S Equ L13(10)15D
U Sge 13(19)15D
SW Cyg 13(19)15D
1994 Apr 30 Sat
ST Per D09(05)09
Z Per D09(11)10L
RW Gem D09(13)10L
TX UMa 10(15)15D
Z Per L14(11)15D
1994 May 2 Mon
RZ Cas D09(09)11
U Cep D09(09)14
1994 May 3 Tue
RW Gem D09(10)10L
Z Per D09(13)09L
Z Dra 10(13)15D
RZ Cas 11(13)15D
TX UMa 12(17)15D
Z Per L14(13)15D
1994 May 4 Wed
SW Cyg D09(09)15D
Z Vul L09(14)15D
TW Dra 13(18)15D
1994 May 5 Thu
ST Per D09(12)09L
1994 May 6 Fri
RW Gem D09(06)10L
U Sge L10(13)15D
TX UMa 14(18)15D
Z Per L14(14)15D
1994 May 7 Sat
U Cep D09(09)14
TW Dra D09(13)15D
Z Dra 12(15)15D
1994 May 8 Sun
RZ Cas D09(08)11
1994 May 9 Mon
Z Vul D09(12)15D
RZ Cas 11(13)15D
S Equ L12(17)15D
Z Per L14(16)15D
1994 May 10 Tue
Z Dra D09(08)10
TW Dra D09(08)13
1994 May 11 Wed
Z Dra 14(16)15D
1994 May 12 Thu
U Cep D09(09)14
Z Per L14(17)15D
1994 May 13 Fri
SW Cyg D09(13)15D
U Sge L09(07)13
ST Per L14(11)15D
1994 May 14 Sat
RZ Cas D09(08)10
Z Dra D09(09)12
Z Vul D09(10)15D
Y Psc L14(14)15D
1994 May 15 Sun
RZ Cas 10(12)15D
Z Per 13(18)15D
1994 May 16 Mon
U Sge 11(16)15D
S Equ L12(14)15D
1994 May 17 Tue

191725 Z Vulpeculae 7.6 - 9.4 EA 2.45d

(1950) $19^h\ 19.^m6$, $+25^\circ 29'$ $D = 11^h$



A = 7.3	D = 8.5	G = 9.2
B = 7.9	E = 8.7	H = 9.3
C = 8.2	F = 8.9	K = 9.7

Sequence derived from SAOC and photovisual plate by W.E.P.

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JEI 72.02.05

U Cep D09(08)13
1994 May 18 Wed
Z Dra D09(11)14
TW Dra 13(18)14D
ST Per L14(18)14D
1994 May 19 Thu
Z Vul D09(07)13
1994 May 20 Fri
RZ Cas D09(07)09
1994 May 21 Sat
TW Dra D09(14)14D
RZ Cas 09(12)14
Z Vul 13(18)14D
1994 May 22 Sun
U Cep D09(08)13
SW Cyg 10(16)14D
Z Dra 10(13)14D
RZ Cas 14(16)14D
1994 May 23 Mon
U Sge D09(11)14D
S Equ L11(11)14D
1994 May 24 Tue
Z Vul D09(05)11
TW Dra D09(09)14
1994 May 26 Thu
Z Vul 11(16)14D
Z Dra 12(15)14D
ST Per L14(17)14D
U Sge 14(20)14D
1994 May 27 Fri
SW Cyg D10(06)12
U Cep D10(08)13
RZ Cas D10(11)14
X Tri L14(16)14D
1994 May 28 Sat
RZ Cas 13(16)14D
X Tri L14(15)14D
1994 May 29 Sun
Z Dra D10(08)10
Y Psc L13(15)14D
X Tri L14(15)14D
1994 May 30 Mon
U Sge D10(05)11
S Equ L11(08)14
X Tri L14(14)14D
Z Dra 14(16)14D
1994 May 31 Tue
TX UMa D10(06)11
Z Vul D10(14)14D
SW Cyg 14(20)14D
X Tri L14(13)14D
1994 Jun 1 Wed
U Cep D10(07)12
X Tri L14(13)14D
1994 Jun 2 Thu
Z Dra D10(10)12
RZ Cas D10(11)13
U Sge D10(14)14D
Y Psc L13(10)14D
S Equ 13(19)14D
X Tri L14(12)14D
1994 Jun 3 Fri
TX UMa D10(08)13
RZ Cas 13(15)14D
ST Per L13(15)14D
X Tri L14(11)14
1994 Jun 4 Sat
TW Dra D10(15)14D
1994 Jun 5 Sun
SW Cyg D10(09)14D
Z Vul D10(12)14D
1994 Jun 6 Mon
U Cep D10(07)12
TX UMa D10(09)14D
Z Dra D10(11)14
S Equ L11(05)11
1994 Jun 7 Tue
TW Dra D10(10)14D
1994 Jun 8 Wed
RZ Cas D10(10)12
1994 Jun 9 Thu
U Sge D10(08)14D
TX UMa D10(11)14D
S Equ 10(16)14D
RZ Cas 12(15)14D
1994 Jun 10 Fri
TW Dra D10(05)10
Z Vul D10(10)14D
Z Dra 11(13)14D
1994 Jun 11 Sat
U Cep D10(07)12
ST Per L13(14)14D
1994 Jun 12 Sun
TX UMa D10(12)14D
U Sge 12(17)14D
1994 Jun 13 Mon
Y Psc L12(17)14D
1994 Jun 14 Tue
RZ Cas D10(10)12
SW Cyg D10(13)14D
Z Dra 12(15)14D
1994 Jun 15 Wed
Z Vul D10(08)13
TX UMa D10(14)14D
Z Per L11(08)13
RZ Cas 12(14)14D
1994 Jun 16 Thu
U Cep D10(06)11
S Equ D10(13)14D
1994 Jun 17 Fri
Z Dra D10(08)10
Y Psc L12(11)14D
Z Vul 13(19)14D
1994 Jun 18 Sat
TW Dra 10(15)14D
TX UMa 11(15)14D
Z Per L11(09)14D
U Cep 13(18)14D
1994 Jun 19 Sun
U Sge D10(12)14D
ST Per L12(13)14D
1994 Jun 20 Mon
Z Vul D10(05)11
RZ Cas D10(09)11
1994 Jun 21 Tue
U Cep D10(06)11
Z Dra D10(10)12
TW Dra D10(11)14D
Z Per L11(10)14D
RZ Cas 11(14)14D
TX UMa 12(17)14D
1994 Jun 22 Wed
Z Vul 11(16)14D
1994 Jun 23 Thu
S Equ D10(10)14D
SW Cyg 10(16)14D
U Cep 13(18)14D
1994 Jun 24 Fri
TW Dra D10(06)11
Z Per L11(12)14D
1994 Jun 25 Sat
Z Dra D10(11)14
1994 Jun 26 Sun
U Cep D10(06)11
U Sge D10(06)12
RZ Cas D10(08)11
1994 Jun 27 Mon
Z Vul D10(14)14D
Z Per L11(13)14D
RZ Cas 11(13)14D
ST Per L11(11)14D
1994 Jun 28 Tue
SW Cyg D10(06)12
U Cep 13(18)14D
Y Psc 14(18)14D
1994 Jun 29 Wed
U Sge D10(15)14D
Z Dra 11(13)14D
1994 Jun 30 Thu
S Equ D10(06)12
Z Per L10(14)14D
X Tri 14(16)14D
1994 Jul 1 Fri
U Cep D10(05)10
X Tri 13(16)14D
RW Tau L14(14)14D
1994 Jul 2 Sat
RZ Cas D10(08)10
Z Vul D10(12)14D
Y Psc L11(13)14D
TW Dra 11(16)14D
X Tri 12(15)14D
1994 Jul 3 Sun
RZ Cas 10(12)14D
Z Per 11(16)14D
S Equ 12(17)14D
X Tri 12(14)14D
Z Dra 12(15)14D
U Cep 12(17)14D
1994 Jul 4 Mon
X Tri L12(14)14D
1994 Jul 5 Tue
TW Dra D10(12)14D
ST Per L11(10)14D
X Tri L12(13)14D
1994 Jul 6 Wed
Z Dra D10(08)10
U Sge D10(09)14D
Y Psc L11(07)11
X Tri L11(12)14D
Z Per 12(17)14D
1994 Jul 7 Thu
SW Cyg D10(10)14D
Z Vul D10(10)14D
X Tri L11(11)14
1994 Jul 8 Fri
TW Dra D10(07)12
X Tri L11(11)13
U Cep 12(17)14D
1994 Jul 9 Sat
RZ Cas D10(12)14D
X Tri L11(10)13
U Sge 13(19)14D
Z Per 14(19)14D
1994 Jul 10 Sun
Z Dra D10(10)12
S Equ D10(14)14D
X Tri L11(09)12
ST Per 13(17)14D
1994 Jul 11 Mon
X Tri L11(09)11
1994 Jul 12 Tue
Z Vul D10(08)13
RW Tau L13(16)14D
1994 Jul 13 Wed
ST Per L10(09)13
U Cep 12(17)14D
1994 Jul 14 Thu
Z Dra D10(11)14
Z Vul 13(19)14D
1994 Jul 15 Fri
RZ Cas D10(11)14
RW Tau L13(10)14D
1994 Jul 16 Sat
TX UMa D10(05)10
U Sge D10(13)14D
SW Cyg D10(13)14D
TW Dra 12(17)14D
RZ Cas 14(16)14D
1994 Jul 17 Sun
Z Vul D10(06)11
S Equ D10(11)14D
Y Psc L10(14)14D
1994 Jul 18 Mon
Z Dra 11(13)14D
U Cep 11(16)14D
ST Per 12(16)14D
1994 Jul 19 Tue
TX UMa D10(07)11
TW Dra D10(12)14D

Z Vul 11(16)14D
1994 Jul 21 Thu
RZ Cas D10(11)13
ST Per L10(07)11
Y Psc L10(08)13
1994 Jul 22 Fri
TW Dra D10(08)13
TX UMa D10(08)13
Z Dra 13(15)14D
RZ Cas 13(15)14D
1994 Jul 23 Sat
U Sge D09(07)13
U Cep 11(16)15D
RW Tau 13(18)15D
1994 Jul 24 Sun
S Equ D09(08)13
Z Vul D09(14)15D
1994 Jul 25 Mon
Z Dra D09(08)10
TX UMa D09(10)13L
SW Cyg 11(17)15D
1994 Jul 26 Tue
ST Per 10(14)15D
U Sge 11(16)15D
RW Tau L12(12)15D
Z Dra 14(17)15D
1994 Jul 27 Wed
RZ Cas D09(10)13
S Equ 13(18)15D
1994 Jul 28 Thu
TX UMa D09(11)13L
U Cep 11(16)15D
RZ Cas 12(15)15D
1994 Jul 29 Fri
Z Dra D09(10)12
Z Vul D09(12)15D
ST Per L09(06)10
1994 Jul 30 Sat
SW Cyg D09(07)13
TW Dra 13(18)15D
1994 Jul 31 Sun
S Equ D09(05)10
TX UMa D09(13)13L

The Variable Star Section Chart Catalogue

This catalogue lists all of the stars the Section's Telescopic, Binocular and Eclipsing Binary Programs. Charts for these stars can be ordered from the Chart Secretary (Telescopic and Binocular Programs) or from the Eclipsing Binary Secretary (Eclipsing Binary Program). Telescopic charts cost 30p each, Binocular and Eclipsing Binary ones, 10p each. Make payments out to the BAA and please enclose a large SAE with your order.

The following abbreviations are used in the 'Type' column:

BLLac	BL Lac object
E	Eclipsing binary [EA - Algol type, EB - Beta Lyr type, EW - W UMa type]
Gal	Galaxy (with variable nucleus)
GCas	Gamma Cas type eruptive variable
In	Irregular nebular variable [Ina - hot, Inb - cool]
L	Red irregular pulsating variable [Lb - giant, Lc - supergiant]
M	Mira type pulsating variable
N	Nova [Na - fast, Nb - slow, Nc - very slow, Nr - recurrent]
QSO	Quasi-stellar object (Quasar)
RCB	R CrB type eruptive variable
RV	RV Tau type pulsating variable [RVa - constant mean mag, RVb - varying mean mag]
SDor	S Dor type eruptive variable
SR	Semiregular pulsating variable [SRa - stable periodicity, SRb - loose periodicity, SRc - supergiant, SRd - yellow]
UG	U Gem type cataclysmic variable (dwarf nova) [UGSS - SS Cyg type, UGSU - SU UMa type, UGZ - Z Cam type]
UV	UV Cet type (flare star)
X	X-ray binary [Xp - X-ray pulsar]
ZAnd	Z And type cataclysmic binary (symbiotic variable)

The 'Max' and 'Min' magnitudes are all visual except where the 'Min' is followed by a 'p', in which case they are both photographic.

In the Eclipsing Binary Program list, the 'D' column gives the duration of the eclipse in hours. This is only well-defined for Algol type (EA) stars. 'EB' or 'EW' in this column indicates that the star is a Beta Lyrae or W UMa star.

The 'Chart' column gives the identifier or date of the latest version of the chart. A star name in this column indicates that the star is included on a combined chart under the name of another star.

Star	RA (1950) h m	Dec ° ′	RA (2000) h m	Dec ° ′	Type	Max m	Min m	Period d	Chart
R And	00 21.4	+38 18	00 24.0	+38 35	M	5.6	14.9	409	053.01
W And	02 14.4	+44 04	02 17.6	+44 18	M	6.7	14.6	396	035.01
Z And	23 31.3	+48 33	23 33.7	+48 49	ZAnd	8.0	12.4p		095.01
RW And	00 44.6	+32 25	00 47.3	+32 41	M	7.9	15.7	430	022.01
RX And	01 01.8	+41 02	01 04.6	+41 18	UGZ	10.3	14.0	14	001.02
R Aqr	23 41.2	-15 34	23 43.8	-15 17	M	5.8	12.4	387	096.01
VY Aqr	21 09.5	-09 02	21 12.1	-08 50	UGSU	8.4	17.2p		1987Oct25
R Aql	19 04.0	+08 09	19 06.4	+08 14	M	5.5	12.0	284	030.01
UU Aql	19 54.6	-09 27	19 57.3	-09 19	UGSS	11.0	16.8p	50	002.02
UW Aql	18 55.0	+00 23	18 57.6	+00 27	Lc	8.9	9.5		028.01
V603 Aql	18 46.4	+00 32	18 48.9	+00 35	Na+E+X	-1.1	12.0		1986Oct24
SS Aur	06 09.6	+47 45	06 13.4	+47 45	UGSS	10.3	15.8	56	003.02
UV Aur	05 18.5	+32 28	05 21.8	+32 31	M	7.4	10.6	394	074.02
U Boo	14 52.0	+17 54	14 54.3	+17 39	SRb	9.8	13.0	201	036.01
V Boo	14 27.7	+39 05	14 29.8	+38 52	SRa	7.0	12.0	258	037.01
V Cam	05 56.0	+74 30	06 02.5	+74 31	M	7.7	16.0	522	027.01
X Cam	04 39.2	+75 01	04 45.7	+75 06	M	7.4	14.2	144	038.01
Z Cam	09 19.7	+73 16	08 25.3	+73 07	UGZ	10.0	14.5	22	004.02
XX Cam	04 04.8	+53 14	04 08.6	+53 22	RCB?	7.3	8.7		068.01
SU Cnc	08 10.7	+13 57	08 13.5	+13 48	M	12.0	[16p	187	1973Mar
U CVn	12 44.9	+38 39	12 47.3	+38 23	M	7.0	[13	346	1983Mar
RT CVn	13 46.5	+33 56	13 48.7	+33 41	M	10.0	14	254	1971May
TX CVn	12 42.3	+37 02	12 44.7	+36 46	ZAnd	9.2	11.8p		078.01
NGC4151 CVn	12 08.0	+39 41	12 10.5	+39 24	Gal	10.8	12.7		1984Jul15
Gamma Cas	00 53.7	+60 27	00 56.7	+60 43	GCas	1.6	3.0		064.01
Rho Cas	23 51.9	+57 13	23 54.4	+57 30	SRd	4.1	6.2	320	GammaCas
S Cas	01 16.0	+72 21	01 19.7	+72 37	M	7.9	16.1	612	054.01
T Cas	00 20.5	+55 31	00 23.2	+55 48	M	6.9	13.0	445	067.01
UV Cas	23 00.2	+59 20	23 02.2	+59 37	RCB	10.5	15.2		061.01
Omicron Cet	02 16.8	-03 12	02 19.4	-02 59	M	2.0	10.1	332	039.02
R Com	12 01.7	+19 04	12 04.3	+18 47	M	7.1	14.6	363	1946
R CrB	15 46.5	+28 18	15 48.6	+28 09	RCB	5.7	14.8		041.02
S CrB	15 19.4	+31 33	15 21.4	+31 22	M	5.8	14.1	360	043.01
T CrB	15 57.4	+26 04	15 59.5	+25 55	Nr	2.0	10.8		025.01
V CrB	15 47.7	+39 43	15 49.5	+39 34	M	6.9	12.6	358	057.01
W CrB	16 13.6	+37 55	16 15.4	+37 48	M	7.8	14.3	238	044.01
Chi Cyg	19 48.6	+32 47	19 50.6	+32 55	M	3.3	14.2	408	045.01
R Cyg	19 35.5	+50 05	19 36.8	+50 12	M	6.1	14.4	426	031.01
S Cyg	20 04.4	+57 50	20 05.5	+57 59	M	9.3	16.0	323	032.01
V Cyg	20 39.7	+47 58	20 14.3	+48 09	M	7.7	13.9	421	034.01
W Cyg	21 34.1	+45 09	21 36.0	+45 22	SRb	5.0	7.6	131	062.02
SS Cyg	21 40.7	+43 21	21 42.7	+43 35	UGSS	7.7	12.4	50	005.02
BC Cyg	20 19.8	+37 22	20 21.7	+37 32	SRc	9.6	10.5	700?	BICyg
BF Cyg	19 21.9	+29 35	19 23.9	+29 40	ZAnd	9.3	13.4p		088.01
BI Cyg	20 19.5	+36 46	20 21.4	+36 56	Lc	8.4	9.9		065.01
CI Cyg	19 48.4	+35 33	19 50.2	+35 41	EA+ZAnd	9.1	11.5	855	006.01
V482 Cyg	19 57.8	+33 50	19 59.7	+33 58	RCB	11	[15		JBAA88Apr
V1016 Cyg	19 55.3	+39 42	19 57.1	+39 50	Nc+M	10.1	17.5p		092.01
V1329 Cyg	20 49.0	+35 24	20 51.0	+35 35	E+Nc	12.1	18p	950	093.01
HR Del	20 40.1	+18 59	20 42.3	+19 10	Nb	3.5	12.0		1972Nov
T Dra	17 55.6	+58 13	17 56.4	+58 13	M	7.2	13.5	422	046.01
AB Dra	19 51.1	+77 37	19 49.1	+77 45	UGZ	11.0	15.3	13	007.03
AG Dra	16 01.4	+66 56	16 01.7	+66 48	ZAnd	8.9	11.8p	554	080.01
U Gem	07 52.1	+22 08	07 55.1	+22 00	UGSS+E	8.2	14.9	105	008.02
IR Gem	06 44.5	+28 08	06 47.7	+28 05	UGSU	10.7	[17.5	75	042.01
RU Her	16 08.2	+25 12	16 10.3	+25 04	M	6.8	14.3	485	060.01

Telescopic Program

Star	RA (1950) h m	Dec ° ′	RA (2000) h m	Dec ° ′	Type	Max m	Min m	Period d	Chart
SS Her	16 30.5	+06 58	16 32.9	+06 51	M	8.5	13.5	107	047.01
YY Her	18 12.4	+20 58	18 14.6	+20 59	ZAnd	11.1	[14.0p		084.01
AC Her	18 12.4	+21 50	18 30.3	+21 52	RVa	6.8	9.0	75	048.03
AH Her	16 42.1	+25 21	16 44.2	+25 15	UGZ	10.9	14.7p	20	009.03
V443 Her	18 20.1	+23 25	18 22.2	+23 27	ZAnd	11.4	11.7		086.01
R Hya	13 27.0	-23 01	13 29.7	-23 17	M	3.5	10.9	389	049.02
RW Hya	13 31.5	-25 07	13 34.3	-25 23	ZAnd	8	9	370	079.01
SU Lac	22 21.0	+55 16	22 22.9	+55 31	M	11	15	302	069.01
X Leo	09 48.4	+12 07	09 51.0	+11 53	UGSS	11.1	15.7	17	010.01
RS Leo	09 40.6	+20 05	09 43.4	+19 52	M	10.7	16.0p	208	1971Mar
RY Leo	10 01.6	+14 14	10 04.3	+13 59	SRb	9.0	11.8	115	1942Feb17
U LMi	09 51.6	+36 20	09 54.7	+36 05	SRa	10.0	13.3	272	1942
W LMi	10 41.9	+26 18	10 44.7	+26 02	SRd	10.5	13.5	117	1976Apr
W Lyn	08 13.4	+40 17	08 16.8	+40 08	M	7.5	14.0	295	1971Jul
X Lyn	08 22.3	+35 34	08 25.5	+35 24	M	9.5	16	321	1982Feb
AY Lyr	18 42.7	+37 57	18 44.4	+38 00	UGSU	12.5	18.4p	24	011.01
U Mon	07 28.4	-09 40	07 30.8	-09 47	RVb	5.9	7.8	91	029.03
BX Mon	07 22.9	-03 30	07 25.4	-03 36	Unique	9.5	13.4p		076.01
RS Oph	17 47.5	-06 42	17 50.2	-06 43	Nr	4.3	12.5		024.01
Hen1341 Oph	17 05.7	-17 23	17 08.6	-17 27	ZAnd?	12.9	var?		081.01
U Ori	05 52.8	+20 10	05 55.8	+20 11	M	4.8	13.0	368	059.01
CN Ori	05 49.7	-05 26	05 52.1	-05 25	UGZ	11.0	16.2	16	012.02
CZ Ori	06 13.9	+15 25	06 16.7	-15 24	UGSS	11.2	15.6	26	013.02
RU Peg	22 11.6	+12 27	22 14.1	+12 42	UGSS	9.0	13.2	74	014.02
S Per	02 19.2	+58 22	02 22.8	+58 35	SRc	7.9	12.0	822	050.01
RS Per	02 18.8	+56 53	02 22.4	+57 07	SRc	7.8	10.0	244	BUPer
TZ Per	02 10.3	+58 09	02 13.9	+58 23	UGZ	12.0	15.6	17	015.02
UV Per	02 06.7	+56 57	02 10.2	+57 12	UGSS	11.0	17.5	320	016.03
AX Per	01 33.1	+54 00	01 36.3	+54 16	ZAnd	8	13	682	073.01
BU Per	02 15.4	+57 12	02 18.9	+57 25	SRc	9.0	10.0	367	063.01
GK Per	03 27.8	+43 44	03 31.2	+43 54	Na+Xp	0.2	14.0		1977Aug
SV Sge	19 06.0	+17 33	19 08.2	+17 38	RCB	10	15		071.01
WZ Sge	20 05.3	+17 33	20 07.6	+17 42	UGSU+E	7.0	15.0p		023.01
HM Sge	19 39.7	+16 38	19 41.9	+16 45	Nc+M	10	17		090.01
QW Sge	19 43.6	+18 29	19 45.8	+18 37	ZAnd	11	12		091.01
AS245 Sge	17 49.0	-22 19	17 52.0	-22 20	ZAnd?	11	12		082.01
R Sct	18 44.8	-05 46	18 47.5	-05 42	RVa	4.2	8.6	146	026.03
FR Sct	18 20.6	-12 43	18 23.4	-12 41	ZAnd	10	12		087.01
_ R Ser	15 48.4	+15 17	15 50.7	+15 08	M	5.2	14.4	356	033.01
FG Ser	18 12.5	-00 20	18 15.1	-00 19	ZAnd	9	13		085.01
AS289 Ser	18 09.6	-11 41	18 12.4	-11 40	ZAnd?	12.8	var?		083.01
RV Tau	04 44.0	+26 05	04 47.1	+26 11	RVb	8.8	11	77	056.01
SU Tau	05 46.1	+19 03	05 49.1	+19 04	RCB	9.1	16.9		017.02
T UMa	12 34.1	+59 46	12 36.4	+59 29	M	6.6	13.5	257	066.01
SU UMa	08 08.1	+62 45	08 12.5	+62 37	UGSU	10.8	15.0	19	018.02
SW UMa	08 33.0	+53 39	08 36.7	+53 29	UGSU	9.7	16.5	460	019.02
CH UMa	10 03.2	+67 47	10 07.0	+67 33	UGSS	10.6	16.0	204	020.02
Mark421 UMa	11 01.7	+38 29	11 04.5	+38 12	BLLac	11.0	13.8		1984Sep09
3C273 Vir	12 26.6	+02 20	12 29.1	+02 03	QSO	12.4	13.2		1984Jul15
V Vul	20 34.4	+26 26	20 36.5	+26 36	RVa	8.1	9.5	76	058.01
PU Vul	20 19.0	+21 25	20 21.2	+21 34	Nc	8.7	16.6p		052.01

Star	RA (1950) h m	Dec ° '	RA (2000) h m	Dec ° '	Type	Max m	Min m	Period d	Chart
RS And	23 52.8	+48 22	23 55.4	+48 38	SRa	7.0	9.1	136	TZAnd
SU And	00 02.0	+43 16	00 04.6	+43 33	Lc	8.0	8.5		TZAnd
TZ And	23 48.4	+47 14	23 50.9	+47 31	SRb	7.6	9.0		1977Sep10
AQ And	00 24.9	+35 19	00 27.5	+35 35	SR	8.0	8.9		1982Aug16
BZ And	00 34.9	+45 20	00 37.6	+45 36	Lb	7.5	8.4		1982Aug16
EG And	00 41.9	+40 24	00 44.6	+40 41	ZAnd	7.1	7.8		072.01
V Aql	19 01.7	-05 46	19 04.4	-05 41	SRb	6.6	8.4	353	R Sct
V450 Aql	19 31.3	+05 21	19 33.8	+05 28	SRb	6.3	6.7	64	070.01
V1293 Aql	19 30.6	+04 55	19 33.1	+05 02	SRb	6.7	7.4		V450Aql
V1294 Aql	19 31.1	+03 39	19 33.6	+03 46	GCas	6.8	7.2		V450Aql
V Ari	02 12.3	+12 00	02 15.0	+12 14	SRb	7.8	8.8	77?	1984Oct26
Psi1 Aur	06 21.1	+49 19	06 24.9	+49 17	Lc	4.8	5.7		1973Jul14
UU Aur	06 33.1	+38 29	06 36.5	+38 27	SRb	5.1	6.8	234	1984Apr09
AB Aur	04 52.6	+30 28	04 55.8	+30 33	Ina	6.9	8.4p		TTTau
W Boo	14 41.2	+26 44	14 43.4	+26 32	SRb?	4.7	5.4	450?	Undated
RV Boo	14 37.1	+32 45	14 39.3	+32 32	SRb	6.3	8.0	137	104.01
RW Boo	14 39.1	+31 47	14 41.2	+31 34	SRb	6.4	7.9	209	RVBoo
RX Boo	14 21.9	+25 56	14 24.2	+25 42	SRb	6.9	9.1	160	1972Aug12
U Cam	03 37.5	+62 29	03 41.8	+62 39	SRb	7.7	8.7		100.01
RY Cam	04 26.1	+64 20	04 30.8	+64 26	SRb	7.3	9.4	136	UVCam
ST Cam	04 46.0	+68 05	04 51.2	+68 10	SRb	6	8	300?	111.01
UV Cam	04 01.5	+61 40	04 05.9	+61 48	SRb	7.5	8.1	294?	1972Jul29
ZZ Cam	04 13.3	+62 13	04 17.7	+62 21	Lb	7.1	7.9		UVCam
X Cnc	08 52.6	+17 25	08 55.4	+17 14	SRb	5.6	7.5	195	1984Apr08
RS Cnc	09 07.6	+31 10	09 10.6	+30 58	SRc	5.1	7.0	120?	1984Apr12
RT Cnc	08 55.6	+11 02	08 58.3	+10 51	SRb	7.1	8.6	60?	1972Jul29
V CVn	13 17.3	+45 47	13 19.5	+45 32	SRa	6.5	8.6	192	YCVn
Y CVn	12 42.8	+45 43	12 45.1	+45 26	SRb	5.2	6.6	157	1984Apr12
TU CVn	12 52.7	+47 28	12 54.9	+47 12	SRb	5.6	6.6	50	YCVn
W CMa	07 05.7	-11 51	07 08.1	-11 55	Lb	6.4	7.9		1982Nov07
WZ Cas	23 58.7	+60 05	00 01.3	+60 21	SRb	6.9	8.5	186	1982Aug16
V391 Cas	01 52.5	+69 58	01 56.5	+70 12	Lb	7.6	8.4		1978May15
V393 Cas	01 58.5	+71 03	02 02.6	+71 18	SRa	7.0	8.0	393	V391Cas
V465 Cas	01 15.1	+57 32	01 18.2	+57 48	SRb	6.2	7.2	60	1983Oct01
Mu Cep	21 42.0	+58 33	21 43.5	+58 47	SRc	3.4	5.1	730	112.01
W Cep	22 34.6	+58 10	22 36.5	+58 26	SRc	7.0	9.2		RWCep
RU Cep	01 14.4	+84 52	01 20.9	+85 08	SRd	8.2	9.8	109	ARCep
RW Cep	22 21.2	+55 43	22 23.1	+55 58	SRd	6.2	7.6	346?	1983Oct01
SS Cep	03 41.6	+80 10	03 49.5	+80 19	SRb	6.7	7.8	90	1972Nov04
AR Cep	22 52.6	+84 47	22 51.6	+85 03	SRb	7.0	7.9		1985May06
DM Cep	22 07.4	+72 31	22 08.3	+72 46	Lb	6.9	8.6		Undated
FZ Cep	21 18.2	+55 14	21 19.7	+55 27	SR	7.0	7.6		1983Oct01
RR CrB	15 39.6	+38 43	15 41.4	+38 33	SRb	7.1	8.6	61	SWCrB
SW CrB	15 38.9	+38 53	15 40.8	+38 43	SRb	7.8	8.5	100?	1984Jan04
P Cyg	20 16.0	+37 53	20 17.8	+38 02	SDor	3	6		1972Jul29
RU Cyg	21 39.0	+54 06	21 40.6	+54 19	SRa	8.0	9.4	233	FZCep
RV Cyg	21 41.2	+37 47	21 43.3	+38 01	SRb	7.1	9.3	263	V460Cyg
TT Cyg	19 39.0	+32 30	19 40.9	+32 37	SRb	7.4	8.7	118	1972Sep06
AF Cyg	19 28.7	+46 02	19 30.2	+46 09	SRb	6.4	8.4	92	1983Oct02
CH Cyg	19 23.2	+50 08	19 24.6	+50 15	ZAnd+SR	5.6	9.5		089.01
V460 Cyg	21 39.9	+35 17	21 42.0	+35 31	SRb	5.6	7.0	180?	1983Sep18
V973 Cyg	19 43.1	+40 36	19 44.8	+40 43	SRb	6.2	7.0	40?	AFCyg
U Del	20 43.2	+17 54	20 45.5	+18 06	SRb	5.6	7.5	110?	EUDel
EU Del	20 35.6	+18 06	20 37.9	+18 16	SRb	5.8	6.9	60	1983Oct01
RY Dra	12 54.5	+66 16	12 56.4	+66 00	SRb?	6.0	8.0	200?	VYUMa
TX Dra	16 34.3	+60 34	16 35.0	+60 28	SRb	6.8	8.3	78?	AT Dra

Star	RA (1950) h m	Dec ° '	RA (2000) h m	Dec ° '	Type	Max m	Min m	Period d	Chart
UW Dra	17 56.5	+54 40	17 57.5	+54 40	Lb	7.0	8.2		1974Jul27
UX Dra	19 23.4	+76 28	19 21.6	+76 34	SRa?	5.9	7.1	168	1982Nov07
VW Dra	17 15.9	+60 43	17 16.5	+60 40	SRd?	6.0	7.0	170?	1972Jan25
AH Dra	16 47.4	+57 54	16 48.3	+57 49	SRb	7.1	7.9	158	ATDra
AT Dra	16 16.4	+59 52	16 17.3	+59 45	Lb	5.3	6.0		106.01
TU Gem	06 07.8	+26 02	06 10.9	+26 01	SRb	7.4	8.3	230	1972Nov11
TV Gem	06 08.8	+21 53	06 11.9	+21 52	SRc	6.6	8.0		TUGem
WY Gem	06 08.9	+23 13	06 11.9	+23 12	Lc+E?	7.2	7.9		TUGem
BN Gem	07 34.2	+17 01	07 37.1	+16 54	GCas	6.8	6.9		1972Jul29
BQ Gem	07 10.5	+16 15	07 13.4	+16 10	SRb	5.1	5.5	50?	1972Sep16
BU Gem	06 09.3	+22 55	06 12.3	+22 55	Lc	5.7	8.1		TUGem
DW Gem	06 27.8	+27 29	06 31.0	+27 27	Lb	8	10		1985Mar18
IS Gem	06 46.4	+32 40	06 49.7	+32 36	SRc	5.3	6.0	47?	1972Jun10
NQ Gem	07 28.9	+24 37	07 31.9	+24 30	SR+ZAnd	7.4	8.0	70?	077.01
g Her	16 27.0	+41 59	16 28.6	+41 53	SRb	4.3	6.3	89	XHer
X Her	16 01.2	+47 23	16 02.7	+47 14	SRb	6.3	7.4	95	1982Feb07
ST Her	15 49.3	+48 38	15 50.8	+48 29	SRb	7.0	8.7	148	1971May01
SX Her	16 05.3	+25 02	16 07.5	+24 55	SRd	8.0	9.2	103	113.01
UW Her	17 12.6	+36 25	17 14.4	+36 22	SRb	7.8	8.7	104	107.01
IQ Her	18 15.7	+17 58	18 17.9	+17 59	SRb	7.0	7.5	75	ACHer
OP Her	17 55.4	+45 21	17 56.8	+45 21	SRb	5.9	6.7	120	1984Apr12
V566 Her	18 06.3	+41 43	18 07.9	+41 43	SRb	7.1	7.8	137	OPHer
U Hya	10 35.1	-13 07	10 37.6	-13 23	SRb	4.3	6.5	450?	109.01
SX Lac	22 53.6	+34 56	22 56.0	35 12	SRd	7.7	8.7	190	1974Jul28
RX Lep	05 09.0	-11 55	05 11.4	-11 51	SRb	5.0	7.4	60?	110.01
SS Lep	06 02.8	-16 29	06 05.0	-16 29	ZAnd	4.8	5.1		075.01
Y Lyn	07 24.6	+46 06	07 28.2	+45 59	SRc	6.9	8.0	110	1978Jul14
SV Lyn	08 00.4	+36 29	08 03.7	+36 21	SRb	6.6	7.5	70?	108.01
R Lyr	18 53.8	+43 53	18 55.3	+43 57	SRb	3.9	5.0	46?	1972Nov11
XY Lyr	18 36.4	+39 37	18 38.1	+39 40	Lc	5.8	6.4		1972Sep16
RV Mon	06 55.7	+06 14	06 58.4	+06 10	SRb	6.8	8.3	132	SXMon
SX Mon	06 49.3	+04 50	06 52.0	+04 46	SR	7.3	8.5	100	1987Dec30
X Oph	18 36.0	+08 47	18 38.3	+08 50	M	5.9	9.2	328	099.01
V2048 Oph	17 57.8	+04 22	18 00.3	+04 22	GCas+UV?	4.6	4.9		1978Jul14
W Ori	05 02.8	+01 07	05 05.4	+01 11	SRb	5.9	7.7	212	105.01
BL Ori	06 22.6	+14 45	06 25.5	+14 43	Lb	6.3	6.9		1983Oct03
BQ Ori	05 54.1	+22 50	05 57.1	+22 50	SR	6.9	8.9	110	YTau
CK Ori	05 27.7	+04 10	05 30.3	+04 12	SR?	5.9	7.1	120?	1972Aug12
AG Peg	21 48.6	+12 24	21 51.0	+12 38	Nc	6.0	9.4		094.01
GO Peg	22 52.6	+19 18	22 55.0	+19 34	Lb	7.1	7.8		103.01
X Per	03 52.2	+30 54	03 55.4	+31 03	GCas+Xp	6.0	7.0		1984Apr08
SU Per	02 18.6	+56 23	02 22.1	+56 36	SRc	7.0	8.5	533	ADPer
AD Per	02 17.0	+56 46	02 20.5	+57 00	SRc	7.7	8.4	362	1974Jan13
KK Per	02 06.8	+56 19	02 10.3	+56 34	Lc	6.6	7.9		ADPer
PR Per	02 18.1	+57 38	02 21.7	+57 52	Lc	7.6	8.3		ADPer
Z Psc	01 13.4	+25 30	01 16.1	+25 46	SRb	7.0	7.9	144	1969Nov10
TV Psc	00 25.4	+17 37	00 28.0	+17 54	SR	4.7	5.4	49	1972Sep09
TX Psc	23 43.8	+03 13	23 46.4	+03 29	Lb	4.8	5.2		1972May27
S Sct	18 47.6	-07 58	18 50.3	-07 54	SRb	7.0	8.0	148	R Sct
Y Tau	05 42.7	+20 41	05 45.7	+20 42	SRb	6.5	9.2	242	1984Apr12
TT Tau	04 44.8	+28 27	04 51.5	+28 32	SRb	8.1	8.8	166	1983Oct01
BU Tau	03 46.2	+23 59	03 49.2	+24 08	GCas	4.8	5.5		1983Oct03
CE Tau	05 29.3	+18 34	05 32.2	+18 36	SRc	4.2	4.5	165	1972May27
W Tri	02 38.4	+34 18	02 41.5	+34 31	SRc	7.5	8.8	108	114.01
Z UMa	11 53.9	+58 09	11 56.5	+57 52	SRb	6.2	9.4	196	1984Apr12
RY UMa	12 18.1	+61 35	12 20.5	+61 19	SRb	6.7	8.3	310?	ZUMa

Binocular Program

Star	RA (1950) h m	Dec ° ′	RA (2000) h m	Dec ° ′	Type	Max m	Min m	Period d	Chart
ST UMa	11 25.1	+45 28	11 27.8	+45 11	SRb	6.0	7.6	110?	102.01
TV UMa	11 43.0	+36 10	11 45.6	+35 54	SRb	6.8	7.3	42	1982Aug16
VW UMa	10 55.6	+70 15	10 59.0	+69 59	SR	6.9	7.7	610	VYUMa
VY UMa	10 41.6	+67 40	10 45.1	+67 25	Lb	5.9	7.0		1983Jun11
V UMi	13 37.8	+74 34	13 38.7	+74 19	SRb	7.2	9.1	72	101.01
RW Vir	12 04.7	-06 29	12 07.2	-06 46	Lb	6.7	7.4		RXVir
RX Vir	12 02.2	-05 20	12 04.7	-05 46	SRd?	8.0	8.4	200?	1982Feb05
SS Vir	12 22.7	+01 03	12 25.3	+00 48	SRa	6.0	9.6	364	097.01
SW Vir	13 11.5	-02 33	12 14.1	-02 48	SRb	6.4	7.9	150?	098.01
BK Vir	12 27.8	+04 42	12 30.4	+04 25	SRb	7.3	8.8	150?	1974Jan21

Eclipsing Binary Program

Star	RA (1950) h m	Dec ° ′	RA (2000) h m	Dec ° ′	Max m	MinII m	MinI m	Period d	D h	Chart
TW And	00 00.7	+32 34	00 03.3	+32 51	8.8	8.9	10.9	4.12	13	1984Dec22
WW And	23 42.4	+45 25	23 44.9	+45 41	10.3		11.4	23.28	39	1984Dec22
AB And	23 09.2	+36 37	23 11.5	+36 54	9.5	10.2	10.3	0.33	EW	1984Dec22
AD And	23 34.3	+48 24	23 36.7	+48 40	10.9	11.6	11.6p	0.99	EB	1984Dec22
BX And	02 06.0	+40 34	02 09.0	+40 48	8.9	9.2	9.6p	0.61	EW	1984Dec22
CD And	01 23.5	+44 06	01 26.6	+44 22	9.8		10.3p	34.44	29	1984Dec22
DS And	01 54.8	+37 50	01 58.7	+38 05	10.4	10.7	10.9p	1.01	EB	1984Dec22
ST Aqr	22 18.4	-07 13	22 21.0	-06 58	9.2	9.4	9.7	0.78	EB	1984Dec23
SU Aqr	22 49.4	-13 13	22 52.1	-12 57	10.2	10.5	10.8p	1.04	EB	1984Dec23
OO Aql	19 45.8	+09 11	19 48.2	+09 18	9.2	9.8	9.9	0.51	EW	1984Dec23
V346 Aql	20 07.6	+10 12	20 10.0	+10 21	9.0	9.1	10.1p	1.11	5	1984Dec23
V822 Aql	19 28.7	-02 13	19 31.3	-02 07	6.9	7.1	7.4	5.29	EB	1972Feb06
R Ara	16 35.6	-56 54	16 39.7	-57 00	6.0	6.2	6.9p	4.43	10	1984Dec23
SS Ari	02 01.4	+23 46	02 04.7	+24 00	10.4	10.8	10.9	0.41	EW	1984Dec23
SX Aur	05 08.2	+42 06	05 11.7	+42 10	8.4	8.9	9.1	1.21	EB	1984Dec23
TT Aur	05 06.3	+39 31	05 09.5	+39 36	8.6	9.0	9.5p	1.33	EB	1984Dec24
WW Aur	06 29.2	+32 30	06 32.5	+32 27	5.8	6.4	6.5	2.53	6	ISGem
AM Aur	04 53.4	+32 08	04 56.6	+32 13	10.9	11.0	12.0p	13.62	46	1984Dec23
AR Aur	05 15.0	+33 43	05 18.3	+33 46	6.2	6.7	6.8	4.13	7	1984Dec24
BF Aur	05 01.6	+41 13	05 05.0	+41 18	8.8	9.5	9.5	1.58	EB	1984Dec23
CQ Aur	06 00.7	+31 20	06 03.9	+31 20	9.0	9.1	9.4	10.62	36	1984Dec24
EO Aur	05 15.0	+36 35	05 18.3	+36 38	7.6	7.9	8.1	4.07	12	ARAur
HL Aur	06 15.3	+49 44	06 19.2	+49 43	10.8	11.0	11.9p	0.62	EB	1984Dec23
IM Aur	05 11.8	+46 21	05 15.5	+46 25	7.9	8.1	8.5	1.25	6	1972Feb04
IU Aur	05 24.6	+34 45	05 27.8	+34 47	8.2	8.7	8.8	1.81	EB	1984Dec24
IY Aur	05 44.9	+43 04	05 48.5	+43 05	9.4		10.1p	2.79		1984Dec24
LY Aur	05 26.4	+35 20	05 29.7	+35 23	6.7	7.3	7.4	4.00	EB	ARAur
SS Boo	15 11.7	+38 45	15 13.6	+38 34	10.3	10.4	11.0	7.60	18	1984Dec23
ZZ Boo	13 53.9	+26 10	13 56.1	+25 55	6.8	7.4	7.4	4.99	7	1972Feb06
AC Boo	14 54.7	+46 34	14 56.5	+46 22	10.0	10.6	10.6	0.35	EW	1984Dec24
AD Boo	14 33.0	+24 51	14 35.2	+24 38	9.8	9.9	10.4p	1.03	EB	1984Dec23
SV Cam	06 30.6	+82 19	06 41.4	+82 17	8.4	8.6	9.3	0.59	3	1984Dec23
AN Cam	03 59.3	+76 45	04 05.6	+76 55	10.4		11.2p	21.00	35	1984Dec23
RZ Cnc	08 36.1	+31 58	08 39.1	+31 48	8.7	9.2	10.0	21.64	78	1985Jun08
TW Cnc	08 26.9	+12 37	08 29.6	+12 27	8.5	8.6	9.0	70.76	51	1985Jun08
UU Cnc	07 59.7	+15 19	08 02.5	+15 11	8.7	9.2	9.4	96.71	EB	1985Jun08
WY Cnc	08 59.0	+26 53	09 01.9	+26 41	9.5	9.6	10.1	0.83	3	1985Jun08
XZ Cnc	08 26.6	+13 23	08 29.3	+13 13	9.8	10.2	10.2p	1.11	EB	TWCnc
ZZ Cnc	07 54.4	+11 07	07 57.1	+11 00	9.4		10.9p	25.60	49	1985Jun08

Star	RA (1950) h m	Dec ° '	RA (2000) h m	Dec ° '	Max m	MinII m	MinI m	Period d	D h	Chart
NSV4441 Cnc	09 14.9	+16 55	09 17.6	+16 55	8.3		8.8p			1984Jun08
RS CVn	13 08.3	+36 12	13 10.6	+35 56	7.9	8.2	9.1	4.80	13	1972Feb06
UW CMa	07 16.6	-24 28	07 18.7	-24 34	4.8	5.3	5.3	4.39	EB	1985Jun08
AD Cap	21 37.1	-16 14	21 39.6	-16 00	9.8		10.4	2.96		1984Jun08
RX Cas	03 03.3	+67 23	03 07.8	+67 35	8.6	9.5	9.5	32.31	EB	1985Jun08
RZ Cas	02 44.4	+69 26	02 48.9	+69 38	6.2	6.3	7.7	1.20	5	1971Jul17
TV Cas	00 16.6	+58 52	00 19.3	+59 08	7.2	7.3	8.2	1.81	8	WZCas
TW Cas	02 41.7	+65 31	02 45.9	+65 44	8.3	8.4	9.0	1.43	5	1985Jun08
TX Cas	02 48.3	+62 35	02 52.2	+62 47	9.2	9.6	9.8	2.93	EB	1985Jun08
YZ Cas	00 42.3	+74 43	00 45.7	+74 59	5.7	5.8	6.1p	4.47	16	1986Jul05
AB Cas	02 32.9	+71 05	02 37.5	+71 18	10.1	10.3	11.9	1.37	6	1986Jul05
BM Cas	00 51.7	+63 49	00 54.8	+64 05	8.8	9.0	9.3	197.28	EB	1986Jul05
DO Cas	02 37.6	+60 20	02 41.4	+60 33	8.4	8.6	9.0	0.68	EB	1986Jul05
V523 Cas	00 37.3	+49 58	00 40.1	+50 14	10.6	11.3	11.5	0.23	EW	1986Jul05
U Cep	00 57.8	+81 36	01 02.3	+81 53	6.8	6.9	9.4	2.49	9	1971Jul18
VW Cep	20 38.1	+75 25	20 37.4	+75 36	7.2	7.6	7.7	0.28	EW	1972Mar21
CW Cep	23 02.0	+63 08	23 04.0	+63 24	7.6	8.0	8.0	2.73	9	1986Jul06
EG Cep	20 17.3	+76 39	20 16.0	+76 49	9.3	9.6	10.2	0.54	EB	1986Jul05
EI Cep	21 28.7	+76 11	21 28.5	+76 24	7.5	8.0	8.1	8.44	12	VWCep
GK Cep	21 30.4	+70 36	21 31.0	+70 49	6.9	7.4	7.4	0.94	EB	1971Dec02
NN Cep	23 00.1	+62 15	23 02.1	+62 31	8.2	8.5	8.6	2.06	6	CWCep
SS Cet	02 46.0	+01 33	02 48.6	+01 46	9.4		13.0	2.97	9	1982Jun08
VV Cet	00 53.2	-02 22	00 55.7	-02 06	10.3	11.0	11.0p	0.52	EW	1986Jul06
RS Cha	08 45.0	-78 53	08 43.3	-79 04	6.0	6.5	6.7	1.67	6	1983Mar25
RW Com	12 30.5	+27 00	12 33.0	+26 43	11.0	11.6	11.7	0.24	EW	1986Jul06
RZ Com	12 32.6	+23 37	12 35.1	+23 20	10.4	11.1	11.1	0.34	EW	1986Jul06
SS Com	12 47.2	+18 59	12 49.6	+18 42	11.3	11.9	11.9p	0.41	EW	1986Jul06
CC Com	12 09.6	+22 49	12 12.1	+22 32	11.3	12.1	12.2	0.22	EW	1986Jul06
U CrB	15 16.2	+31 50	15 18.2	+31 39	7.7	7.7	8.8	3.45	12	1986Jul06
Y Cyg	20 50.1	+34 28	20 52.1	+34 39	7.3	7.8	7.9	3.00	7	1986Jul06
SW Cyg	20 05.4	+46 09	20 07.0	+46 18	9.2	9.3	11.8	4.57	13	1986Jul06
BR Cyg	19 39.4	+46 40	19 40.9	+46 47	9.4	9.6	10.6	1.33	6	1986Jul06
KU Cyg	20 11.2	+47 15	20 12.8	+47 24	10.7	11.2	12.4	38.44	72	1986Jul06
V367 Cyg	20 46.1	+39 06	20 48.0	+39 17	6.7	7.2	7.6	18.60	EB	Y Cyg
V448 Cyg	20 04.3	+35 15	20 06.2	+35 23	7.9	8.4	8.7	6.52	EB	1986Jul06
V453 Cyg	20 04.7	+35 36	20 06.6	+35 44	8.3	8.7	8.7	3.89	14	V448Cyg
V466 Cyg	19 52.6	+32 52	19 54.6	+33 00	10.8	11.4	11.7p	1.39	4	1986Jul06
V477 Cyg	20 03.5	+31 50	20 05.5	+31 58	8.5	8.7	9.3	2.35	4	1972Feb05
V1143 Cyg	19 37.6	+54 51	19 38.7	+54 58	5.9	6.1	6.4	7.64	4	1986Jul06
BI Del	20 25.3	+14 10	20 27.6	+14 20	11.4		13.3p	7.25	12	1986Jul06
Z Dra	11 42.7	+72 32	11 45.5	+72 15	10.8	11.0	14.1p	1.36	5	1993Jan10
TW Dra	15 33.1	+64 04	15 33.8	+63 54	7.3	7.4	8.9	2.81	11	1993Oct23
AI Dra	16 55.2	+52 47	16 56.3	+52 42	7.1	7.2	8.1	1.20	5	1971Jul17
BH Dra	19 02.8	+57 23	19 03.7	+57 27	8.0	8.1	8.6	1.82	5	1972Apr10
S Equ	20 54.7	+04 53	20 57.2	+05 05	8.0	8.1	10.1	3.44	11	1972Jun10
RW Gem	05 58.4	+23 08	06 01.5	+23 09	9.5	9.7	11.8	2.87	10	1981Oct25
GW Gem	07 49.4	+27 16	07 52.5	+27 09	10.5	10.7	11.5	0.66	EB	1986Jul06
68u Her	17 15.5	+33 09	17 17.3	+33 06	4.7	4.9	5.4	2.05	14	1971Aug27
Z Her	17 55.9	+15 09	17 58.1	+15 08	7.3	8.2	8.2	3.99	11	1972Feb06
RX Her	18 28.3	+12 35	18 30.7	+12 37	7.3	7.7	7.9	1.78	6	V451Oph
TX Her	17 17.0	+41 56	17 18.6	+41 53	8.5	9.0	9.3	2.06	4	1986Jul06
AK Her	17 11.7	+16 25	17 14.0	+16 21	8.3	8.6	8.8	0.42	EW	1986Jul06
TT Hya	11 10.8	-26 12	11 13.2	-26 28	7.3	7.7	9.0	6.95	18	1985Jan03
SW Lac	22 51.4	+37 40	22 53.7	+37 56	8.5	9.3	9.4	0.32	EW	1987Nov
VX Lac	22 38.8	+38 04	22 41.0	+38 19	10.9		13.0p	1.07	4	1987Nov
AR Lac	22 06.7	+45 30	22 08.7	+45 45	6.1	6.4	6.8	1.98	7	1971Feb13

Eclipsing Binary Program

Star	RA (1950) h m	Dec ° '	RA (2000) h m	Dec ° '	Max m	MinII m	MinI m	Period d	D h	Chart
AW Lac	22 16.1	+54 13	22 18.0	+54 28	10.6	11.2	11.3p	1.14	EB	1987Nov
CM Lac	21 58.1	+44 19	22 00.1	+44 33	8.2	8.5	9.2	1.60	4	1987Nov
RT Leo	09 42.6	+20 08	09 45.4	+19 54	10.3	10.5	11.6p	7.45	23	1987Nov
UV Leo	10 35.7	+14 32	10 38.4	+14 16	8.9	9.5	9.6	0.60	3	1987Nov
UZ Leo	10 37.9	+13 50	10 40.6	+13 34	9.6	10.1	10.2	0.62	EW	UVLeo
AP Leo	11 02.5	+05 25	11 05.1	+05 09	9.3	9.9	9.9	0.43	EW	1987Nov
Delta Lib	14 58.3	-08 19	15 01.0	-08 31	4.9	5.0	5.9	2.33	13	1987Nov
GG Lup	15 15.7	-40 36	15 18.9	-40 47	5.5	5.8	6.0p	2.16	EB	1987Nov
NSV4031 Lyn	08 19.5	+45 37	08 23.0	+45 28	8.0		8.8			1987Nov
Beta Lyr	18 48.2	+33 18	18 50.0	+33 22	3.3	3.9	4.4	12.91	EB	1993Dec03
TT Lyr	19 26.0	+41 36	19 27.6	+41 30	9.3	9.4	11.4	5.24	18	1987Nov
TZ Lyr	18 14.2	+41 06	18 15.8	+41 07	10.6	10.8	11.3	0.53	EB	1987Nov
UZ Lyr	19 19.4	+37 51	19 21.2	+37 56	9.9		11.0	1.89	7	1987Nov
HP Lyr	19 20.0	+39 50	19 21.7	+39 56	10.5	11.0	11.0	140.75	EB	1987Nov
TY Men	05 31.8	-81 37	05 26.8	-81 35	8.1	8.5	8.6	0.46	EB	TZ Men
TZ Men	05 39.9	-84 49	05 30.2	-84 48	6.2	6.4	6.9	8.57	8	1987Nov
V505 Mon	06 43.2	+02 33	06 45.8	+02 30	7.2	7.6	7.7	53.78	EB	1971Aug22
U Oph	17 14.0	+01 16	17 16.5	+01 13	5.8	6.5	6.6	1.68	6	1971Dec12
V451 Oph	18 26.9	+10 51	18 29.2	+10 53	7.9	8.3	8.5p	2.20	6	1972Jun12
V566 Oph	17 54.4	+05 00	17 56.9	+04 59	7.5	7.9	8.0	0.41	EW	1972Jun11
DN Ori	05 57.7	+10 13	06 00.5	+10 13	9.8	9.9	11.1p	12.97	25	1987Nov
ER Ori	05 08.9	-08 37	05 11.2	-08 33	9.3	10.0	10.0	0.42	EW	1987Nov
EY Ori	05 28.9	-05 44	05 31.3	-05 42	9.4	9.5	10.1	16.79	23	1987Nov
FO Ori	05 25.5	+03 35	05 28.2	+03 38	9.5	9.7	10.3p	18.80	9	1987Nov
V530 Ori	06 02.1	-03 12	06 04.6	-03 12	10.6		11.3p	6.11	9	1987Nov
V640 Ori	05 52.6	-09 23	05 55.0	-09 22	11.2		13.5p	2.02	5	1987Nov
V643 Ori	06 04.5	-02 55	06 07.0	-02 55	10.7		11.5p	52.42	126	1987Nov
EE Peg	21 37.6	+08 57	21 40.0	+09 11	6.9	7.1	7.5	2.63	6	1972Feb16
Beta Per	03 04.9	+40 46	03 08.2	+40 57	2.1	2.2	3.4	2.87	10	1971Jul17
Z Per	02 36.9	+41 59	02 40.0	+42 12	9.7	9.8	12.4p	3.06	10	1984Aug30
ST Per	02 56.9	+39 00	03 00.1	+39 12	9.4	9.5	10.9	2.65	8	1983Aug30
DM Per	02 22.4	+55 53	02 26.0	+56 06	7.9	8.0	8.6	2.73	11	1972Apr09
IQ Per	03 56.1	+48 01	03 59.7	+48 09	7.7	7.9	8.7	1.74	5	1972Nov07
IZ Per	01 28.9	+53 46	01 32.1	+54 01	7.8	8.3	9.0	3.69	11	1972Feb14
Y Psc	23 31.9	+07 39	23 34.4	+07 56	10.1		13.1p	3.77	9	1982Jun06
SZ Psc	23 10.9	+02 24	23 13.4	+02 41	7.2	7.4	7.7	3.97	10	1972Jun11
U Sge	19 16.6	+19 31	19 18.8	+19 37	6.5	6.7	9.3	3.38	14	1993Jan24
Lambda Tau	03 57.9	+12 21	04 00.7	+12 29	3.4	3.5	3.9	3.95	14	1993Oct22
RW Tau	04 00.8	+27 59	04 03.9	+28 08	8.0	8.1	11.2	2.77	9	1984Dec18
BV Tau	05 35.6	+22 53	05 38.6	+22 55	11.7	11.9	12.4p	0.93	EB	1985Jan31
CD Tau	05 14.6	+20 05	05 17.5	+20 08	6.8	7.3	7.3	3.44	7	1972Feb04
HU Tau	04 35.3	+20 35	04 38.3	+20 41	5.9	5.9	6.7	2.06	7	1971Aug27
X Tri	01 57.7	+27 39	02 00.6	+27 53	8.9	9.1	11.3	0.97	4	1982Jan01
W UMa	09 40.3	+56 11	09 43.7	+55 57	7.8	8.4	8.5	0.33	EW	1972Feb04
TX UMa	10 42.4	+45 50	10 45.3	+45 34	7.1	7.1	8.8	3.06	9	1993Jan10
Z Vul	19 19.6	+25 29	19 21.7	+25 34	7.3	7.6	8.9	2.45	11	1972Feb05