COMMISSION 27 OF THE I.A.U.

INFORMATION BULLETIN ON VARIABLE STARS

Nos. 2801 - 2900

1985 October - 1986 June

EDITORS: B. SZEIDL and L.SZABADOS, KONKOLY OBSERVATORY

1525 BUDAPEST, Box 67, HUNGARY

HU ISSN 0374-0676

C O N T E N T S

2858 IMPROVED EPHEMERIS FOR THE SHORT PERIOD ECLIPSING CATACLYSMIC VARIABLE V1315 AQUILAE
James T. Annis
5 February 1986

2859 LQ And (HD 224559): THE 0.62-DAY (OR THE 0.31-DAY) PERIOD CONFIRMED
Petr Harmanec
5 February 1986

2860 ON THE PERIOD OF YY GEMINORUM
E. Zsoldos
7 February 1986

2861 REVISED ELEMENTS FOR THREE ECLIPSING BINARIES
Thomas Berthold
7 February 1986

2862 AX URSAE MAJORIS
G. Romano
11 February 1986

2863 BP MUSCAE - UBV LIGHT CURVE AND EPHEMERIS
Zdenek Kviz
13 February 1986

2864 THE PROPER MOTION OF CR Gem
Carlos E. Lopez
14 February 1986

2865 A PHOTOELECTRIC LIGHT CURVE AND PERIOD STUDY FOR CZ Aqr
James R. Bruton
14 February 1986

2866 CH CYGNI IN ECLIPSE? AN APPEAL FOR OBSERVATIONS
T. Tomov
17 February 1986

2867 A NEW BLUE VARIABLE STAR
Mario Hamuy, J. Maza
17 February 1986

2868 THE ECLIPSING BINARY V651 CASSIOPEIAE
Wenxian Lu
20 February 1986

2869 ON THE LIGHT CURVE OF AI Scl
Hartmut Schneider, W. Kollatschny
25 February 1986

2870 VARIATION OF THE CP2 STAR BD +24d3675
Hartmut Schneider
25 February 1986

2871 SPECTROSCOPY OF NOVA SCORPII 1985
Tom Richtler, W. Liller
26 February 1986

2872 U CEPHEI: AN UNUSUAL DEVELOPMENT
J.B. Rafert, E. Smith, N.L. Markworth
3 March 1986

2873 PHOTOELECTRIC LIGHT CURVES OF RR LEPORIS
Beverly B. Bookmyer, D.R. Faulkner, R.G. Samec
3 March 1986

2874 VARIABLE STARS IN LYNDS 810
David G. Turner
6 March 1986

2875 PHOTOELECTRIC UBV OBSERVATIONS OF AQ Tau AND THE PROBLEM OF ITS PERIOD
Liu Xuefu, Tan Huisong
12 March 1986

2876 PHOTOMETRIC BEHAVIOR OF HR 8752 = V 509 Cas II.
E.M. Halbedel
13 March 1986

2877 A BRIGHTENING OF THE Be STAR HD 46380
E.M. Halbedel
13 March 1986

2878 NEW VARIABLE STARS IN CASSIOPEIA
Lennart Dahlmark
14 March 1986

2879 THE SPECTRUM OF RS OPHIUCHI 2-1/2 YEARS PRIOR TO ITS RECENT OUTBURST
V.V. Smith, G. Wallerstein
14 March 1986

2880 THE HISTORICAL OPTICAL VARIATION OF DO Dra (= 3A1148+719)
Martha L. Hazen
17 March 1986

2881 THE Mg II LIGHT CURVE OF AR Lac
E. Derman, U. Kiziloglu, F. Tokdemir
17 March 1986

2882 SEVEN NEW VARIABLE STARS IN THE FIELD OF 2 LACERTAE
H. Gessner
18 March 1986

2883 CORRECT PERIOD OF THE MIRA STAR BV CYGNI
E. Splittgerber
18 March 1986

2884 THE VARIABILITY OF BD +60d562
E.M. Halbedel
24 March 1986

2885 CURRENT MICROVARIABILITY FOR THE Be STAR Phi PERSEI
E.M. Halbedel
24 March 1986

2886 AH CEPHEI: A NEW PHOTOMETRIC TRIPLE STAR
Pavel Mayer, M. Wolf
9 April 1986

2887 OBSERVATIONS OF W SERPENTIS STARS
N.L. Markworth, R.L. Gann, J.B. Rafert, E. Smith, R.E. Wilson
10 April 1986

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2801

Konkoly Observatory
Budapest
1 October 1985

HU ISSN 0374 - 0676

OBSERVATIONS OF θ CORONAE BOREALIS IN SUMMER 1984

(BAV-Mitteilungen Nr.41)

Harmanec (1983) suspected the Be star θ CrB to be a long-periodic spectroscopic binary with an orbital period of 510.87 days. The predicted time of a hypothetical primary eclipse from the orbital solution was found to coincide remarkably well with the $0^m_.7$ deep photometric minimum observed by Roark (1971). The next primary eclipse was expected to occur on May 25 – June 15, 1984.

Here we present photometric and spectroscopic observations obtained during May, June and July 1984. M. Fernandes observed with a 10 inch Schmidt-Cassegrain and a Schnitzer type photometer furnished with an (uncooled) EMI 9781B tube and filters for B and V. At the same time, spectrograms of θ CrB were obtained with the Universal-Astro grating spectrograph at the 106 cm Cassegrain of the Hoher List Observatory (dispersion: 32.5 Å/mm, projected slit dimensions: 0.014 x 0.28 mm, wavelength range: λλ 3700-4800, emulsion: IIaO).

The photometric data are shown in Table I. Primary comparison star was η CrB while HD 138341 served as check star. The mean magnitude difference (in the sense 'Comp minus Check') was found to be $-1^m_.15$ in B, and $-1^m_.46$ in V, with no significant variations. The standard deviation of a single differential magnitude, corrected for atmospheric extinction and transformed to the standard system, is ± $0^m_.015$. Assuming (V = 4.98, B-V = 0.58) for η CrB (Nicolet 1978), we get B = 4.04, V = 4.13 and B-V = -0.09 for θ CrB, in the interval JD 2445 844 ... 879. We may state that the star has remained constant within a few hundredth mag during this time. In July, a mild blueing occurred whereupon the star became slightly fainter. No check star observations were made at these dates, but on July 22, θ CrB was additionally compared with υ CrB (V = 5.78, B-V = +0.07), φ Boo (V = 5.24, B-V = +0.88), and HR 5741 (V = 5.46, B-V = +1.40) (Nicolet 1978), resulting in V = 4.20, B-V = -0.11. It is improbable that we should have missed the eclipse since its duration should be some 10 to 13 days. So presumably there was none.

Radial velocity data are presented in Table II. All measurements were made on a computer supported Abbé comparator with oscilloscopic setting at OHL .

Table I

HJD 2400000+	Phase	Var minus Comp ΔB	ΔV	Δ(B-V)	Var minus Check ΔB	ΔV	Δ(B-V)	Obs.
45 844.520	0.976	-1.530	...	...	-2.663	...	...	Fd
45 847.425	0.982	-1.521	-0.868	-0.653	-2.634	-2.289	-0.345	Fd
45 848.556	0.984	-1.459:	-0.852	-0.607:	-2.661	-2.300	-0.361	Fd
45 853.392	0.994	-1.519	-0.852	-0.667	-2.669	-2.332	-0.337	Fd
45 854.471	0.996	-1.511	-0.851	-0.660	-2.713:	-2.379:	-0.334:	Fd
45 855.409	0.998	-1.500	-0.830	-0.670	-2.666	-2.307	-0.359	Fd
45 857.407	0.001	-1.537:	...	...	-2.703:	...	...	Fd
45 862.514	0.011	-1.518	-0.865	-0.653	-2.671	-2.301	-0.370	Fd
45 863.453	0.013	-1.535	-0.865	-0.670	-2.689	-2.310	-0.379	Fd
45 869.507	0.025	-1.506	-0.825	-0.681	-2.652	-2.300	-0.352	Fd
45 871.431	0.029	...	-0.860	...	...	-2.320	...	Se
45 879.422	0.045	-1.513	-0.828	-0.685	...	...	...	Fd
45 889.458	0.064	-1.571	-0.843	-0.728	...	...	...	Fd
45 892.503	0.070	-1.486	-0.777	-0.709	...	...	...	Fd
45 904.5	0.094	-1.466	-0.808	-0.658	...	...	...	Fd

Photometric observations of θ CrB in 1984. Observers are M. Fernandes (Fd) and B. Schlereth (Se). Comparison star was η CrB, check star HD 138341. Phases are computed according to the ephemeris Min I = JD 2412 650.1 + $510^{d}.87$ E (Harmanec 1983). ":" denotes less reliable measurements. They were ignored in forming the mean values given in the text.

The dispersion curve for each plate is computed as a 4th-order polynomial fitted by least squares to reference line measurements (about 20 iron arc lines, wavelengths taken from standard sources). Stellar lines measured were Hγ to H11, and the He I lines λ4026 and λ3819, but only the Balmer lines were usable for radial velocity determination. All lines are quite broad and shallow so that the errors are rather large. Internal mean measurement errors range from ± 5 km/s to ± 15 km/s. A cursory look at the spectrograms does not reveal anything unusual, like emission peaks; however, such features as weak shell lines or absorption cores (noticed in some spectra) presumably have influenced the results. Systematic effects show up also in the radial velocities derived from different lines in the same spectrum, which become more negative with increasing Balmer number. Nevertheless, mean values formed from the same

Table II

Plate No.	HJD 2400000+	Phase	Hγ	Hδ	Hε	H8	H9	H10	H11	$\overline{RV}$
CS 7696	45 838.408	0.964	- 19.5	- 25.1	- 37.1	- 24.6	- 29.4	- 49.7	- 33.1	- 31.2
CS 7699	45 841.592	0.971	- 24.4	- 19.3	- 32.1	- 13.4	- 48.2	- 34.4	- 55.9	- 32.5
CS 7700*	45 841.599	0.971	+ 7.9	- 9.1	- 4.2	- 29.2	- 14.4	- 26.0	- 25.2	(- 14.3)
CS 7710	45 843.639	0.975	- 11.3	- 5.9	- 27.4	- 20.7	- 50.2	- 41.1	- 36.0	- 27.5
CS 7711	45 843.648	0.975	- 12.1	- 22.4	- 23.5	- 46.4	- 39.2	- 41.9	- 53.6	- 34.2
CS 7713*	45 848.517	0.984	- 11.1	- 46.4	- 93.2	- 19.5	- 61.1	- 97.4	-104.9	(- 61.9)
CS 7715	45 863.487	0.013	+ 2.5	- 37.7	- 35.8	- 49.4	+ 1.7:	- 52.9	- 44.0	- 30.8
CS 7716	45 863.498	0.013	- 15.4	- 22.4	- 39.3	- 42.9	- 45.0	- 25.2	- 31.7	- 31.7
CS 7726	45 866.458	0.019	- 2.8	- 21.1	- 30.7	- 33.2	- 18.6	- 52.3	- 54.1	- 30.4
CS 7728	45 869.398	0.025	- 27.9	- 6.8	- 24.9	- 48.0	- 49.0	- 18.3	- 32.1	- 29.6
CS 7745	45 870.407	0.027	- 13.5	- 6.8	- 36.6	- 28.5	- 34.5	- 54.9	- 38.0	- 30.4
CS 7763*	45 871.388	0.029	+ 19.8	- 14.9	- 18.5	- 26.0	- 7.2	- 33.6	- 47.5	(- 18.3)
CS 7784	45 880.500	0.047	- 6.8	- 7.7	- 32.9	- 44.2	- 47.3	- 72.7	- 79.5	- 41.6
CS 7790	45 894.400	0.074	+ 0.8	- 30.2	- 28.0	- 36.1	- 15.7	- 10.2	- 22.6	- 20.3
CS 7804	45 911.389	0.107	- 28.2	- 33.3	- 36.4	- 44.4	- 42.5	- 47.4	+ 3.3:	- 32.7
< RV >	45 865	0.017	- 13.2	- 19.9	- 32.1	- 36.0	- 38.1	- 41.8	- 43.7	- 31.1
σ			± 10.5	± 11.0	± 5.2	± 11.9	± 12.2	± 17.4	± 16.0	± 4.8

Measurements of the radial velocity (in km/s) of θ CrB in 1984. The spectrograms CS 7700, CS 7713 and CS 7763 were disregarded in forming the averages of Table 2. σ is the standard deviation of the values in the respective column.

set of lines for each spectrum should at least contain information about radial velocity changes. If we condense successive radial velocity measurements into group averages, we obtain

RV = -31.4 ± 1.4 km/s at Phase 0.971
-30.6 ± 0.3 km/s at Phase 0.019
-31.5 ± 6.2 km/s at Phase 0.076

i.e. no significant change in radial velocity, whereas the spectroscopic orbit of Harmanec (1983) predicts a rapid decrease of about 30 km/s during the time interval covered by our observations. Incidentally, let us note, that the most reliable RV determinations of θ CrB available in the literature — those of Poeckert and Duric (1980) — are also consistent with the assumption of constant radial velocity (at about -29 km/s). We therefore conclude that the orbit given by Harmanec is not real.

Acknowledgements: Thanks are due to B. Schlereth, Hassfurt, for communicating his measurements of θ CrB. B.-C. Kämper would like to thank Prof. E. H. Geyer for hospitality at the Hoher List Observatory.

M. FERNANDES B.-C. KÄMPER

Berliner Arbeitsgemeinschaft
für Veränderliche Sterne e.V. (BAV)

Munsterdamm 90, D - 1000 Berlin 41

B. NELLES *

Observatorium Hoher List
der Universitätssternwarte Bonn

D - 5568 Daun/Eifel, F.R.G.

*) Now at ZEISS, Abt. P-AP, Postfach 1369, D-7082 Oberkochen, F.R.G.

References:

Harmanec, P.: 1983, Bull. Astron. Inst. Czechoslovakia 34, 324.
Nicolet, B.: 1978, Astron. Astrophys. Suppl. 34, 1-49.
Poeckert, R., Duric, N.: 1980, Publ. Dom. Astrophys. Obs. 15, 327.
Roark, T.P.: 1971, Astron. J. 76, 634.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2802

Konkoly Observatory
Budapest
1 October 1985

HU ISSN 0374 - 0676

ON THE O-C DIAGRAM AND PERIOD BEHAVIOUR OF CY Aqr

(BAV-Mitteilungen Nr.42)

The observational material on CY Aquarii, an ultra-short period dwarf cepheid discovered 50 years ago by Hoffmeister (1934) was recently reviewed by Mahdy and Szeidl (1980). They found strong evidence of a sudden period change ($\Delta P = -0\overset{s}{.}016$) in 1952, whereas the period appeared constant before and after this date, apart from small yet notable fluctuations. It could not be decided whether these resulted from systematic differences between different observers (e.g., in time resolution, or in the method of determining times of maximum light) or, possibly, from the cumulative character of period noise (cf. Balázs-Detre and Detre 1965). Some authors also noticed apparent phase shifts of 0.003 d around 1944 and 1972 (Ashbrook 1954, Bohusz and Udalski 1980).

Close examination of the rather dense observational series established by Sanwal (1962) and Zissell (times of maximum light as quoted by Fitch (1973)) revealed further significant phase jumps ($\Delta\phi = 0\overset{d}{.}001$) between groups of observations only some weeks apart from each other. This fact prompted us to look for a correlation between phase shifts of maximum light and amplitude of individual cycles. Such a correlation was indeed found in photoelectric data of different observers, and its typical effect amounts to a phase lag of about half a minute per $0\overset{m}{.}05$ decrease in amplitude.

In this context, it should be recalled that in contrast to other results Zissell (1968) stated that the period of CY Aqr had been essentially constant, at least between 1953 and 1966 ($P = 0\overset{d}{.}0610383405 \pm 22$). Zissell's conclusion was based on the study of epochs of the critical magnitude on the rising branch, at which the rising and descending branches were separated by 0.220 period. The light curve passes through this point at the time of its steepest rise, approximately. — It is well known that the epochs obtained in such a way are more accurately determined than those of maximum light (Oosterhoff, 1930). Moreover, Fig.2 of Zissell's paper demonstrated that the light curve is more stable at this point than near maximum light.

Unfortunately, later investigators didn't follow this procedure, thus introduced apparent and fictitious scattering in the O-C diagram which may obscure real variations in the star's period. We therefore decided to carry on the work of Zissell (1968), who already provided a homogeneous set of 77 epochs of critical magnitude over an interval of 33 yr (see Tab. III of his paper). From available photographic and photoelectric observations we graphically derived further 80 epochs by using the method described above. Results of determinations in different colours have been averaged (their difference being less than $0^d.0003$ and of unsystematic nature). These times are given in Table I below, extending Zissell's compilation until 1984. Cycle numbers and O-C(1) refer to the ephemeris given by Wesselink (1941):

$$\text{phase} = 16.3831079\ (\text{JD hel} - 2428725.4177) \qquad (1)$$

(phase reckoned from the critical point). They may be compared directly to the values given in Zissell's Table 3. In constructing the O-C diagram, we used the ephemeris chosen for the same purpose by Mahdy and Szeidl (1980):

$$C = \text{HJD}\ 2434\,308.4310 + 0^d.061038395\ (E - 91467) \qquad (2)$$

which leaves the residuals O-C(2) of Table I. In order to allow for comparison, we have given in Column 2 the values ΔJD_{max} of the difference between the published moment of maximum light and the moment of steepest rise given in this paper. For the latest photoelectric series reported by Peña et al.(1985) we can only give a preliminary normal epoch derived from the published maxima.

Unfortunately, the extensive photoelectric series established by Sanwal (1962) and Karetnikov and Medvedev (1966) could not be included in this study because neither the individual observations nor light curves were accessible. Nevertheless, it is possible to draw some interesting conclusions. Figure 1 shows the O-C diagram for the present data (including Zissell's). Residuals calculated for the quoted times of maximum light and the corresponding moments of steepest rise are displayed in the same diagram. When both representations are compared, it becomes obvious that Oosterhoff's procedure succeeded in reducing the internal variance (within groups) by about 60% and also yielded much better external agreement (between different groups of observations). One should note in particular the disappearance of (spurious) phase shifts at JD 37000, 39400 or 42100. Also, the O-C diagram for moments of steepest rise does not support the reality of the questionable $0^d.003$ phase shift around 1944 suggested by Ashbrook (1954). On the other hand, our O-C diagram

Table I

$JD_{crit.}$ hel.	ΔJD_{max}	Epoch(1)	O-C(1)	O-C(2)	O-C(3)	Type	W	Ref.
2427658.4040	0.0056	− 17481	0.0000	-0.0159		vN	1	Je
27671.5273	0.0044	− 17266	0.0000	-0.0159		pg	1	BD
27688.4965	0.0045	− 16988	+0.0005	-0.0154		pg	1	BD
27690.3889	0.0051	− 16957	+0.0007	-0.0152		pg	1	BD
27692.6460	0.0060	− 16920	-0.0006	-0.0165		pg	1	Ga
27695.4549	0.0051	− 16874	+0.0005	-0.0153		pg	1	BD
27712.3019	0.0050	− 16598	+0.0009	-0.0149		pg	1	BD
27744.2861	0.0048	− 16074	+0.0009	-0.0149		pg	1	BD
28045.3879	0.0045	− 11141	-0.0001	-0.0155		pg	1	MS
28046.3028	0.0043	− 11126	-0.0008	-0.0161		pg	1	Ku
28046.4857	0.0044	− 11123	-0.0010	-0.0164		pg	1	Ku
28047.2796	0.0030	− 11110	-0.0006	-0.0160		pg	1	Ku
28047.3408	0.0056	− 11109	-0.0004	-0.0158		pg	1	Ku
28047.4622	0.0046	− 11107	-0.0011	-0.0165		pg	1	Ku
28048.3790	0.0043	− 11092	-0.0009	-0.0162		pg	1	Ku
28074.3820	0.0040	− 10666	+0.0007	-0.0146		pg	1	MS
28090.3149	0.0040	− 10405	+0.0026	-0.0127		pg	(1)	Sc
28090.3765	0.0035	− 10404	+0.0031	-0.0122		pg	(1)	Sc
28094.2828	0.0032	− 10340	+0.0030	-0.0123		pg	(1)	Sc
28397.5199	0.0034	− 5372	+0.0009	-0.0140		pg	1	MS
30592.3426	0.0051	+ 30586	+0.0020	-0.0099		vs	.2	Ts
30592.4642	0.0048	+ 30588	+0.0015	-0.0104		vs	.2	Ts
30601.2536	0.0021	+ 30732	+0.0013	-0.0105		vs	.2	Ts
30601.3139	0.0029	+ 30733	+0.0006	-0.0112		vs	.2	Ts
30601.4358	0.0031	+ 30735	+0.0004	-0.0114		vs	.2	Ts
31742.4298	0.0059	+ 49428	+0.0021	-0.0081		pg	1	Mi
32091.3854	0.0060	+ 55145	+0.0007	-0.0090		pg	1	LM
32091.4490:	0.0042	+ 55146	+0.0033	-0.0065		pg	.5	LM
32092.3640:	0.0040	+ 55161	+0.0027	-0.0070		pg	.5	LM
32092.4241	0.0034	+ 55162	+0.0018	-0.0080		pg	1	LM
32093.4015	0.0041	+ 55178	+0.0026	-0.0072		pg	1	MS
32440.4654	0.0046	+ 60864	+0.0017	-0.0076		pg	1	MS
32445.7153	0.0045	+ 60950	+0.0023	-0.0070		vN	1	As
33860.5261	0.0049	+ 84129	+0.0021	-0.0052		pg	1	MS
33861.5637	0.0042	+ 84146	+0.0021	-0.0052		pg	1	MS
37524.5381	0.0044	+ 144157	-0.0037	-0.0059		pe	2	PO
38680.7257	0.0043	+ 163099	-0.0070	-0.0076		pe	2	Fi
38680.7867	0.0043	+ 163100	-0.0070	-0.0076		pe	2	Fi
40779.7745	0.0038	+ 197488	-0.0105	-0.0082	+0.0034	pe	(3)	El
40779.8352	0.0038	+ 197489	-0.0108	-0.0085	+0.0031	pe	(3)	El
40779.8966	0.0039	+ 197490	-0.0105	-0.0082	+0.0034	pe	(3)	El
40894.6463	0.0044	+ 199370	-0.0131	-0.0106	+0.0011	pe	3	NW
41126.5914	0.0046	+ 203170	-0.0142	-0.0114	+0.0006	pe	2	Lu
41623.2602	0.0045	+ 211307	-0.0156	-0.0121	+0.0006	pe	3	MS
41623.3214	0.0037	+ 211308	-0.0154	-0.0119	+0.0008	pe	3	MS
41959.3370	0.0035	+ 216813	-0.0166	-0.0127	+0.0004	pe	3	GH
41959.3976	0.0042	+ 216814	-0.0171	-0.0131	-0.0000	pe	3	GH
41959.4592	0.0042	+ 216815	-0.0165	-0.0125	+0.0005	pe	3	GH
41959.5204	0.0030	+ 216816	-0.0163	-0.0124	+0.0007	pe	3	GH

Table I (cont'd)

$JD_{crit.}$ hel.	ΔJD_{max}	Epoch(1)	O-C(1)	O-C(2)	O-C(3)	Type	W	Ref.
42302.5562	0.0045	+ 222436	-0.0168	-0.0124	+0.0012	pe	1	FR
42303.4703	0.0075	+ 222451	-0.0183	-0.0138	-0.0003	pe	1	FR
42304.4476	0.0057	+ 222467	-0.0176	-0.0131	+0.0004	pe	1	FR
42304.5085	0.0041	+ 222468	-0.0177	-0.0133	+0.0002	pe	1	FR
43401.3660	0.0046	+ 240438	-0.0217	-0.0157	-0.0008	pe	1	FR
43401.4280	0.0047	+ 240439	-0.0207	-0.0148	+0.0001	pe	1	FR
43401.4882	0.0055	+ 240440	-0.0216	-0.0156	-0.0007	pe	1	FR
43402.3441	0.0037	+ 240454	-0.0202	-0.0143	+0.0006	pe	1	FR
43402.4044	0.0042	+ 240455	-0.0210	-0.0150	-0.0001	pe	1	FR
43402.4653	0.0046	+ 240456	-0.0211	-0.0151	-0.0002	pe	1	FR
43402.5264	0.0047	+ 240457	-0.0210	-0.0151	-0.0002	pe	1	FR
43425.4159	0.0048	+ 240832	-0.0210	-0.0150	-0.0000	pe	3	BU
43425.4766	0.0048	+ 240833	-0.0213	-0.0153	-0.0004	pe	3	BU
43482.2424	0.0030	+ 241763	-0.0213	-0.0152	-0.0002	pg	1	Pp*
43490.2388	0.0046	+ 241894	-0.0209	-0.0148	+0.0002	pe	3	BU
43490.2996	0.0042	+ 241895	-0.0212	-0.0151	-0.0001	pe	3	BU
43815.3286	0.0039	+ 247220	-0.0221	-0.0155	-0.0001	pe	3	BU
43815.3898	0.0049	+ 247221	-0.0219	-0.0154	+0.0000	pe	3	BU
44158.3029	0.0040	+ 252839	-0.0230	-0.0160	-0.0001	pe	3	MS
45621.3307	0.0044	+ 276808	-0.0265	-0.0175	+0.0002	pe	2	PS
45629.3263	0.0038	+ 276939	-0.0269	-0.0179	-0.0002	pe	2	PS
45631.2796	0.0047	+ 276971	-0.0269	-0.0178	-0.0001	pe	2	PS
45631.3406	0.0047	+ 276972	-0.0269	-0.0179	-0.0002	pe	2	PS
45635.3081	0.0041	+ 277037	-0.0269	-0.0179	-0.0001	pe	3	PS
45635.3693	0.0039	+ 277038	-0.0268	-0.0177	+0.0000	pe	3	PS
45641.2900	0.0040	+ 277135	-0.0268	-0.0177	0.0000	pe	3	PS
45641.3508	0.0042	+ 277136	-0.0270	-0.0180	-0.0002	pe	3	PS
45645.2575	0.0046	+ 277200	-0.0268	-0.0177	+0.0000	pe	3	PS
45645.3186	0.0039	+ 277201	-0.0267	-0.0177	+0.0001	pe	3	PS
45661.2496	0.0036	+ 277462	-0.0268	-0.0177	+0.0001	pe	2	PS
45662.2873	0.0047	+ 277479	-0.0267	-0.0176	+0.0001	pe	2	PS
46062.5764	(0.0042)	+ 284037	-0.0280	-0.0183	-0.0001	peN	3	Pe

*) Present paper, determined from a multiple exposure plate taken with the large double refractor at the Hoher List Observatory, Daun (F.R.G.).

gives some evidence for a further period change around 1966 and possibly also in 1977, period changes hitherto not noticed by other investigators.

We divided the whole data into three segments whose borderlines were marked by the abrupt period changes in 1953 and 1966, computed best linear approximations over these intervals (using weighted Least Squares) and investigated the residuals for the influence of cumulative and noncumulative random errors according to a method described by Sterne (1934). Our results indicate the presence of random fluctuations in pulsation frequency characterized by a rms value of $\sigma \cong 0.0056\%$. This is very small compared to mean σ-values quoted

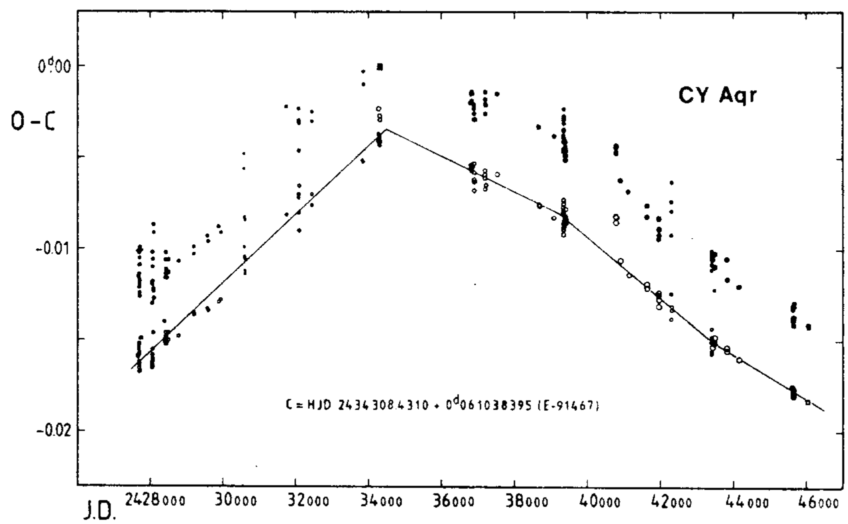


Figure 1: O-C diagram for CY Aqr, constructed with times of maximum light (filled circles) and moments of steepest rise (open circles).

for other types of pulsating variables (Miras 1.6 %, W Virginis stars 1.6 %, δ Cepheids 0.3 ... 0.08 %, RR Lyrae stars 0.11 ... 0.04 %, after Balázs-Detre and Detre, 1965). From our data we derived the following mean periods:

1934 - 1953 :	$\overline{P} = 0\overset{d}{.}061038509 \pm 11$	
		$\Delta\overline{P} = -0\overset{s}{.}0149 \pm 18$
1953 - 1966 :	$\overline{P} = 0\overset{d}{.}061038336 \pm 18$	
		$\Delta\overline{P} = -0\overset{s}{.}0037 \pm 20$
1970 - 1977 :	$\overline{P} = 0\overset{d}{.}061038293 \pm 19$	
		$\Delta\overline{P} = +0\overset{s}{.}0023 \pm 23$
1977 - 1984 :	$\overline{P} = 0\overset{d}{.}061038320 \pm 18$	

The main contribution to the estimated mean error of these quantities comes from the intrinsic noise process. The column "O-C(3)" of Table I refers to the instantaneous elements computed for the last interval, with $E_0 = 2445641.2900$. Since random superposition of small steps can lead to data which display apparent slope discontinuities, the last "period change" cannot be regarded as statistically significant and might as well be part of the noise.

As the mean period of CY Aqr has remained constant within ± 0.003 s since 1953, the parabolic representation of the O-C diagram suggested by some authors seems to be inadequate. Thus, a simple evolutionary interpretation of the observed period changes is not possible. But it is interesting to note, that CY Aqr is a member of the small subgroup of low mass metal poor Pop. II dwarf cepheids (Frolov and Irkaev, 1984). The explanation of abrupt period changes in RR Lyrae stars through random mixing events in the semiconvective zone proposed by Sweigart and Renzini (1979) might apply here, too.

The author is grateful to Dr. E.H. Geyer for hospitality at the Hoher List Observatory, for useful discussions and his encouragement to complete this study. Dr. A. Schnell kindly made available the numerous photoelectric observations of CY Aqr obtained by her and Dr. A. Purgathofer during October / November, 1983.

B.-C. KÄMPER

Berliner Arbeitsgemeinschaft
für Veränderliche Sterne e.V. (BAV)

Munsterdamm 90, D-1000 Berlin 41

References:

(As) Ashbrook, J.: 1949, Astron. J. 54, 168.
Ashbrook, J.: 1954, Astron. J. 59, 6.
(BD) Balâzs, J., Detre, L.: 1935, Astron. Nachr. 256, 87.
Balâzs-Detre, J., Detre, L.: 1965, Kl. Veröff. Bamberg IV.40, 184.
(BU) Bohusz, E., Udalski, A.: 1980, Acta Astr. 30, 359.
(El) Elst, E.W.: 1972, Astron. Astrophys. 17, 148.
(FR) Ficarotta, F.M., Romoli, C.: 1979, Mem. Soc. astr. Italiana 50, 261.
(Fi) Fitch, W.S., Wiśniewski, W.Z., Johnson, H.L.: 1966, Comm. Lunar Planetary Lab. No. 71, Vol. 5, Part 2.
Fitch, W.S.: 1973, Astron. Astrophys. 27, 161.
Frolov, M.S., Irkaev, B.N.: 1984, Inf. Bull. Var. Stars No. 2462
(Ga) Gaposchkin, S.: 1935, Harv. Bull. 898, 9.
(GH) Geyer, E.H., Hoffmann, M.: 1974, Inf. Bull. Var. Stars No. 936.
1975, Astron. Astrophys. Suppl. 21, 177.
Hoffmeister, C.: 1934, Astron. Nachr. 253, 91.
(Je) Jensch, A.: 1934, Astron. Nachr. 253, 443.
Karetnikov, V.G., Medvedev, Yu.A.: 1966, Fizika Zvezd i Mezhzvezdnoj Sredy, Izd. "Naukova Dumka" Kiev, p.140 (not accessible to the author)
(Ku) Kulikovsky, P.G.: 1937, Abastumani Astrophys. Obs. Bull. No. 1, 47.
(LM) Lohmann, W., Miczaika, G.R.: 1947, Veröff. Landesstw. Heidelberg 14, 121.
(Lu) Lub, J.: 1977, Astron. Astrophys. Suppl. 29, 345.
(MS) Mahdy, H.A., Szeidl, B.: 1980, Mitt. Sternw. Budapest Nr. 74.
(Mi) Miczaika, G.R.: 1947, Veröff. Landessternw. Heidelberg 14, 117.
(NW) Nather, R.E., Warner, B.: 1972, Monthly Not. Roy. Astr. Soc. 156, 321.
Oosterhoff, P.Th.: 1930, Bull. Astron. Inst. Netherlands 6, 39.
(Pe) Peña, J.H., Peniche, R., Hobart, M.A.: 1985, Inf. Bull. Var. Stars No. 2672.
(PO) Ponsen, J., Oosterhoff, P.Th.: 1966, Bull. Astron. Inst. Neth. Suppl. 1, 3.
(PS) Purgathofer, A., Schnell, A.: 1984, Inf. Bull. Var. Stars No. 2500.
Sanwal, N.B.: 1962, The Observatory 82, 24.
(Sc) Schneller, H.: 1936, Astron. Nachr. 259, 11.
Sterne, T.E.: 1934, Harv. Coll. Obs. Circ. No. 386-387.
Sweigart, A.V., Renzini, A.: 1979, Astron. Astrophys. 71, 66.
(Ts) Tsesevich, V.P.: 1948, Odessa Izv. 1.2, 15.
Wesselink, A.J.: 1941, Bull. Astron. Inst. Netherlands 9, 217.
Zissell, R.: 1968, Astron. J. 73, 696.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2803

Konkoly Observatory
Budapest
2 October 1985
HU ISSN 0374 - 0676

FAR ULTRAVIOLET PHOTOMETRIC VARIABILITY IN α Eri

The Be star α Eri has been observed with the ultraviolet spectrometers on board the Voyager 1 and 2 spacecraft. These spectrometers are sensitive in the 500 - 1700 A wavelength region and have an effective resolution of 20 A. The instruments and their calibration and performance have been discribed in Broadfoot et al. (1977) and Holberg et al. (1982).

Extensive observations of α Eri were obtained with the Voyager spectrometers in 1979 and 1980 with additional isolated observations obtained in 1983 and 1984. Figure 1 shows the integrated 950-1150 flux with 1 σ error bars for the 1979-80 epoch. As can be seen from Figure 1 the Far-UV flux from α Eri was statistically constant until approximately JD 2444325 (Mar. 25, 1980). After that date significant variations in the UV flux level was observed. The 1983 and 1984 data have flux levels consistent with the mean of the pre-"outburst" 1979/80 data.

Spectroscopic observations of Hα obtained by de Freitas Pacheco (1982) on JD2444243 (Jan. 2, 1980) show a "rotationally broadened photospheric profile with a slight central emission and a small central absorption" Slettebak (1982) reports an observation obtained in Oct, 1980 that shows Hβ to be "weak relative to standard star spectra, and filling in by emission likely".

Additional spectroscopic and/or photometric observations of α Eri during 1979-1981 would be appreciated. Voyager observations of this star are continuing.

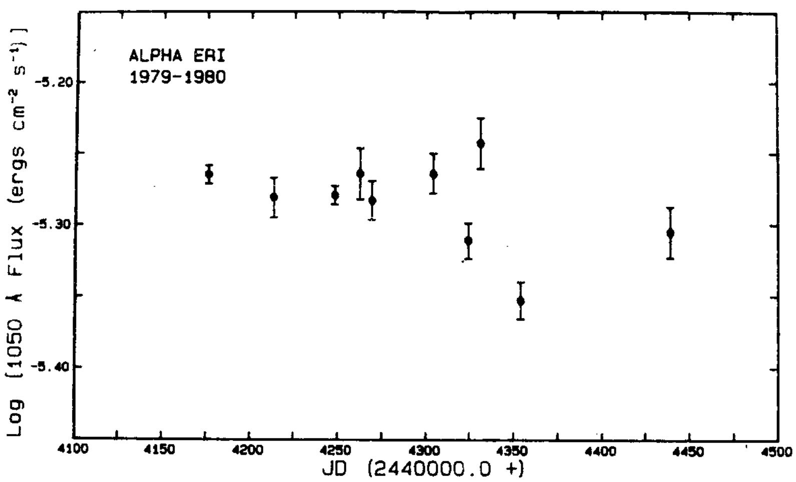


Fig. 1.—Far-UV (1050 A ± 100 A) integrated flux measurements with ±1 σ errors in α Eri for 1979/80. The logarithm of the weighed far-UV flux for the six observations prior to JD 2444325 is -5.273 ± 0.004. Observations of α Eri in 1983 (JD 2445579.2) and 1984 (JD 2445894.2) yield log F_{1050} values of -5.252 ± 0.009 and -5.270 ± 0.013 respectively.

R.S. POLIDAN
Lunar and Planetary Lab.
University of Arizona
3625 E. Ajo Way
Tucson, Arizona 85713
USA

G.J. PETERS
Space Sciences Ctr.
and Dept. of Astronomy
Univ. of So. California
Los Angeles, CA 90089
USA

R. STALIO
Departimento di Astron.
Universita' di Trieste
Trieste
Italy

References:

Broadfoot, A. L., 1977, Space Sci. Rev., 21, 183.
de Freitas Pacheco, J. A., 1982, Mon. Not. R. Astr. Soc., 199, 591.
Holberg, J. B., 1982, Ap. J., 257, 656.
Slettebak, A., 1982, Ap. J. Supp., 50, 55.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2804

Konkoly Observatory
Budapest
4 October 1985

HU ISSN 0374 - 0676

PHOTOELECTRIC EPOCHS OF MINIMUM LIGHT OF SY HOROLOGII

The first photoelectric observations of SY Horologii (= S 4832 = CoD - 46° 1350) were obtained in January 1981 with the 0.6-m telescope at Cerro Tololo Inter-American Observatory in Chile. Differential measurements in B and V were made on seven nights resulting in 540 individual observations in each bandpass. Each observation is an average of two ten second integrations.

An interative process based on the method of Hertzsprung (1928) was applied to the present observations to determine the epochs of minimum light listed in Table I. Earlier visual and photographic timings of minimum light of SY Hor have been published by Hoffmeister (1956).

The O-Cs were computed from the ephemeris

$$\text{Min I (Hel. J.D.)} = 2444613.6335 + 0^{d}.31164361\ E$$
$$\pm \quad .0011 \pm \quad .00000005\ \text{(p.e.)}$$

which was derived by a least squares analysis using all the available data and weighting the times of minima 10 to 3 to 1, photoelectric to photographic to visual.

The observations, period study, and analyses of the light curves are being published separately.

TABLE I

TIMES OF MINIMA FOR SY Hor

HEL. J.D.	MIN	EPOCH	O-C	FILTER
2444609.58233	I	-13.0	-0.0002	B,V
2444611.60752	II	-6.5	0.0003	B,V
2444613.63385	I	0.0	-0.0004	B,V
2444615.65874	II	6.5	0.0004	B,V
2444618.62002	I	16.0	-0.0002	B,V

J. R. KERN* and BEVERLY B. BOOKMYER
Dept. of Physics and Astronomy
Clemson University
Clemson, SC 29631, U.S.A.

*Present Address:
Dept. of Physics
Rochester Institute of Technology
Rochester, NY 14623, U.S.A.

References:

Hertzsprung, E., 1928, Bull. Astr. Inst. Netherlands 4, 179.
Hoffmeister, C., 1956, Veröff. Sonneberg, 3, (1), 7, 17.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2805

Konkoly Observatory
Budapest
7 October 1985

HU ISSN 0374 - 0676

NEW EPHEMERIDES FOR FOUR SOUTHERN HEMISPHERE ECLIPSING BINARIES

Times of minimum light were obtained for four southern hemisphere eclipsing binaries, and these enabled us to obtain new ephemerides for these stars. The observations were made during 1984 with the 40 cm reflector of the Black Birch Station of the Carter Observatory, which is located near Blenheim, New Zealand. A d. c. amplifier was used, and usually the observations were made in only one bandpass. All times quoted in this paper are heliocentric. The ephemerides were obtained from least squares solutions, and unless otherwise noted, all times of minimum light were given unit weight.

V535 ARAE

V535 Arae (formerly BV 419) was previously observed by Chambliss (1967) and by Schöffel (1970). Both of these investigators calculated ephemerides and orbital elements for this system. The observations of Chambliss were made in 1966, while those of Schöffel were made in the following year. An additional time of minimum light observed in 1980 was reported by Wolf et al. (1982), but this time was of lower precision than that of the earlier ones or of the two obtained in this investigation, and consequently it was given a lower weight (one-tenth instead of unit weight) in the least squares solution.

A least squares solution using all available photoelectric times of minimum light for V535 Arae yields the following ephemeris:

$$\text{JD } 2439292.9351 + 0\overset{d}{.}62930098 \text{ E}$$
$$\pm 3 \quad \pm 9 \text{ p.e.}$$

The times of minimum light together with their residuals are as follows:

JD Hel.	E	O-C	Observer
2439292.9332	0	$-0^{d}.0019$	Chambliss
293.2508	0.5	+0.0011	"
296.0828	5	+0.0012	"
315.9076	36.5	+0.0030	"
319.0525	41.5	+0.0014	"
328.1751	56	-0.0008	"
329.1191	57.5	-0.0008	"
2439608.5313	501.5	+0.0018	Schöffel
610.4180	504.5	+0.0006	"
611.3619	506	+0.0005	"
619.5416	519	-0.0007	"
620.4857	520.5	-0.0005	"
625.5208	528.5	+0.0002	"
626.4639	530	-0.0007	"
627.4075	531.5	-0.0011	"
628.3522	533	-0.0003	"
629.6105	535	-0.0006	"
630.5541	536.5	-0.0010	"
643.4545	557	-0.0012	"
2444458.533	8208.5	-0.0192	Wolf
2445908.1485	10512	+0.0015	this paper
920.1039	10531	+0.0002	"

The residuals show no systematic trends, and thus there is no evidence for a variation of period over the interval in which this system has been observed photoelectrically. The period given above falls within the range implied by the mean error given by Schöffel, but this period is now much more precisely known, since the time baseline is now very much longer than was previously the case.

RR CENTAURI

RR Centauri has been known to be variable for many years, but the first photoelectric investigation of this system was made by Knipe (1965). This was followed by an investigation by Chambliss (1971). RR Centauri has long been known to have a variable period, and both Knipe and Chambliss discussed this fact in their respective papers. Knipe's observations were obtained in 1960, while those of Chambliss were made in 1969. Sistero (1970) also reported times of minimum light for RR Centauri, and two times of minimum light were obtained in the present investigation.

A linear least squares solution for all eight photoelectric times of minimum light yields the following ephemeris:

$$\begin{array}{lll} \text{JD } 2437092.3206 & + & 0^{d}.60569243\ E \\ \pm\ 22 & \pm & 26 \text{ p.e.} \end{array}$$

The times of minimum light together with their residuals are as follows:

JD Hel.	E	O-C	Observer
2437092.326	0	$+0^{d}.0054$	Knipe
7132.301	66	+0.0047	"
2440410.6002	5478.5	-0.0064	Chambliss
417.5652	5490	-0.0069	"
2440761.6003	6058	-0.0051	Sistero
762.5158	6059.5	+0.0019	"
2445914.8376	14566	+0.0010	this paper
917.8703	14571	+0.0053	"

The residuals for this solution are not random, and thus they indicate that a systematic change of period has taken place for this system. A quadratic least squares solution yields the following ephemeris:

$$\begin{array}{lllll} \text{JD } 2437092.3256 & + & 0^{d}.60568992\ E & + & 1.64 \times 10^{-10}\ E^2 \\ \pm\ 17 & \pm & 54 & \pm & 0.34 \quad \text{p.e.} \end{array}$$

The sum of the squares of the residuals for the linear solution is 1.97×10^{-4}; for the quadratic solution it is 0.63×10^{-4}, implying a better fit to the data. The latter solution indicates that the period of RR Centauri has increased by about $0^{s}.2$ during the 24 years in which this system has been under photoelectric investigation.

V716 CENTAURI

Despite its brightness (V = 5.96 at maximum) the eclipsing binary V716 Centauri (formerly BV 516) has received very little attention from astronomers. In 1966 Chambliss (1969) obtained four photoelectric times of minimum light for this system, and an additional time of minimum light was obtained in this investigation. These seem to be the only photoelectric times of minimum light reported for this star.

A least squares solution for the five times of minimum light yields the following ephemeris:

$$\begin{array}{l} \text{JD } 2439262.0045 + 1\overset{d}{.}49009305 \text{ E} \\ \qquad\quad \pm \quad 34 \pm \qquad\quad 55 \text{ p.e.} \end{array}$$

The times of minimum light together with their residuals are as follows:

JD Hel.	E	O-C	Observer
2439262.0070	0	$+0\overset{d}{.}0025$	Chambliss
264.9801	2	-0.0046	"
282.8659	14	+0.0001	"
291.8084	20	+0.0020	"
2445907.8195	4460	0.0000	this paper

The period given above falls within the range implied by the mean error previously given by Chambliss, and thus there is no evidence for any change of period over the interval in which this system has been observed photoelectrically.

V701 SCORPII

V701 Scorpii was observed photoelectrically in 1966 by Leung (1974), and one time of minimum light was obtained in the present investigation. The ephemeris quoted by Leung was based on his own observations as well as on the earlier photographic observations of Plaut, which were made between 1934 and 1937. The time of minimum light observed in this investigation was 1.5 hours later than it would be according to Leung's ephemeris. This implies a significant increase in the period of V701 Scorpii over the interval in which this system has been observed photoelectrically.

A least squares solution for all photoelectric times of minimum light yields the following ephemeris:

$$\text{JD } 2439329.6674 + 0\overset{d}{.}76187804\ E$$
$$\pm\ 25\ \pm\ 55 \text{ p.e.}$$

The times of minimum light together with their residuals are as follows:

JD Hel.	E	O-C	Observer
2439330.0455	0.5	$-0\overset{d}{.}0029$	Leung
331.9516	3	-0.0015	"
341.8572	16	-0.0003	"
2445918.0107	8647.5	+0.0029	this paper

The period quoted in this paper is about $0\overset{s}{.}6$ longer than that quoted by Leung, and thus it appears that the period of V701 Scorpii has increased by that amount over the past 18 years. Wilson and Leung (1977) consider V701 Scorpii to be an overcontact system. Such systems have considerable amounts of material flowing between the two components, and consequently significant changes of period are to be expected.

We would like to express our sincere thanks to Dr. Edwin Budding of the Carter Observatory, Wellington, New Zealand, for providing us with observing time, accommodations, and advice at the Black Birch Station of Carter Observatory.

JAMES R. BRUTON
Dyer Observatory
Vanderbilt University
Nashville, Tennessee
USA 37235

CARLSON R. CHAMBLISS
Kutztown University
Kutztown, Pennsylvania
USA 19530

References:

Chambliss, C. R.: 1967, Astron. J. 72, 512

Chambliss, C. R.: 1969, Inf. Bull. Var. Stars No. 408

Chambliss, C. R.: 1971, Astron. J. 76, 64

Knipe, G. F. G.: 1965, Astrophys. J. 142, 1068

Leung, K. C.: 1974, Astron. Astrophys. Suppl. Ser. 13, 315

Schöffel, E.: 1970, Veröff. der Remeis-Sternwarte Bamberg 8, No. 88

Sistero, R. F. and Castore de Sistero, M. E.: 1970, Inf. Bull. Var. Stars No. 453

Wilson, R. E. and Leung, K. C.: 1977, Astron. Astrophys. 61, 137

Wolf, G. W. et al.: 1982, Inf. Bull. Var. Stars No. 2185

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2806

Konkoly Observatory
Budapest
9 October 1985
HU ISSN 0374 - 0676

PHOTOELECTRIC MINIMA OF BZ ERIDANI

The observations of the eclipsing binary BZ Eridani (BD - 6° 841) were initiated long back in 1928, but it was discovered as an Algol type eclipsing binary system by Hoffmeister (1934). Since its discovery it has remained neglected photoelectrically till 1975 when Srivastava collected photoelectric observations of BZ Eri in the 1975-76 observing season, and the first photoelectric results were published by Srivastava and Sinha (1981).

The photoelectric minima of BZ Eri are lacking in the literature. Since the publication of Srivastava and Sinha (1981) one photoelectric minimum has only appeared in the literature (cf. Wolf et al., 1982). Considering this situation Srivastava reobserved this system in December 1980 using the same set of instrument, filters and the comparison star as described earlier (cf. Srivastava and Sinha, 1981), and in all six nights of observations have been secured which include two primary and three secondary minima. The times of minima of JD 244 4835 have been determined using the graphical method due to scanty coverage of the minima, while the times of remaining minima have been derived using the method of Kwee and van Woerden (1952).

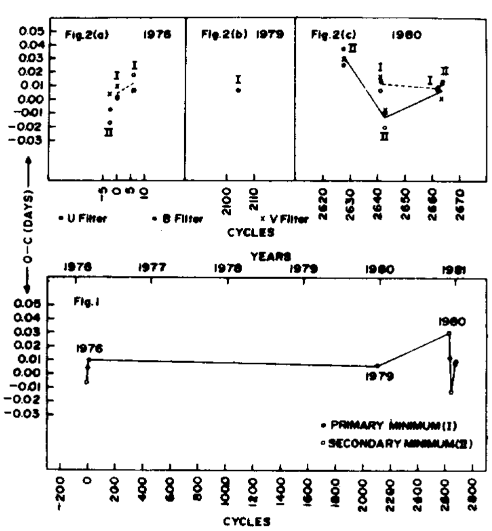
The purpose of this communication is to present all the available photoelectric minima of BZ Eri and to make some comments on their behaviour with respect to the O-C values or the orbital period of the system. In all, twenty five photoelectric minima of BZ Eri in different filters are so far available and are presented in Table I along with the O-C values based on Srivastava and Sinha's (1981) epoch and period, viz.:

$$\text{Min.I} = \text{JD}\,244\,2836.1605 + 0\overset{d}{.}664\,1700 \cdot E$$

The mean O-C values of U,B and V filters are plotted in Figure 1 against cycles, while the individual O-C values of U, B and V filters for the years 1976, 1979 and 1980 are plotted in Figures 2a, 2b and 2c, respectively. Figure 1 shows that the period of the system BZ Eri has slightly decreased from 1976 to 1979 as suggested by Srivastava (1985), and from 1979 it increased up to JD 244 4835 (the first minimum of 1980). Although the observations are lacking

Table I. Photoelectric minima of BZ Eri

J.D.Hel.	Error	Min.	Filter	Cycle	O–C	Reference
2442835.1813	±0.0007	II	U	−2.5	$-0\overset{d}{.}0170$	Srivastava and
.1729	7	II	B	−2.5	−0.0086	Sinha (1981)
.1604	7	II	V	−2.5	+0.0039	"
836.1605	7	I	U	0	0.000	"
.1619	7	I	B	0	+0.0014	"
.1702	7	I	V	0	+0.0097	"
840.1628	7	I	U	6	+0.0173	"
.1517	7	I	B	6	+0.0062	"
.1517	7	I	V	6	+0.0062	"
2444233.5800	-	I	uvbyβ	2104	+0.0058	Wolf et al. (1982)
581.3037	7	II	U	2627.5	+0.0365	present paper
.2919	7	II	B	2627.5	+0.0247	"
.2960	7	II	V	2627.5	+0.0288	"
590.2395	6	I	U	2641	+0.0060	"
.2459	5	I	B	2641	+0.0124	"
.2494	4	I	V	2641	+0.0159	"
591.2086	16	II	U	2642.5	−0.0211	"
.2198	32	II	B	2642.5	−0.0099	"
.2215	5	II	V	2642.5	−0.0082	"
604.1902	2	I	U	2662	+0.0092	"
.1880	4	I	B	2662	+0.0070	"
.1882	10	I	V	2662	+0.0072	"
605.1899	72	II	U	2663.5	+0.0126	"
.1895	8	II	B	2663.5	+0.0122	"
.1777	±0.0007	II	V	2663.5	+0.0004	"



Figures 1 and 2

between 1976 and 1979, and 1979 and 1980, yet for the sake of visual inspection we have drawn straight lines assuming that the period of BZ Eri was constant in these time intervals.

In 1980 the period also shows one sharp decrease and one slow increase. In Figures 2a and 2c the points of the average O-C values of U, B and V filters of the primary and the secondary minima are connected by solid and dashed lines, respectively. Figure 2c reveals an important fact that the primary minima show little variation in the O-C values or the orbital period of the system with respect to O-C value of $0^d.00$, while the secondary minima show large variation in the O-C values. Figure 2a also suggests that the O-C values of the secondary minimum show steeper slope that the primary minimum with respect to O-C value $0^d.00$. Recently, Srivastava and Uddin (1985) derived the geometrical elements of BZ Eri and found that the secondary minimum is subjected to wave-like distortion. It may be possible that some physical change is taking place in the system at the time of the secondary minimum as suggested by Srivastava and Uddin (1985). We mean that more photoelectric minima of BZ Eri are desired to understand the O-C fluctuations of the secondary minima and to confirm their reality.

R.K. SRIVASTAVA and WAHAB UDDIN

Uttar Pradesh State Observatory
Manora Peak, Naini Tal, 263 129 ,
India

References:

Hoffmeister, C., 1934, Astr. Nachr., 253, 196.
Kwee, K.K., and van Woerden, H., 1956, Bull. Astr. Inst. Netherlands, 12, 327.
Srivastava, R.K., and Sinha, B.K., 1981, Inf. Bull. Var. Stars, No.1919.
Srivastava, R.K., 1985, in press.
Srivastava, R.K., and Uddin, W., 1985, in press.
Wolf, G.W., Kern, J.T., Hayes, T.L., and Chaffin, C.R., 1982, Inf. Bull. Var. Stars, No.2185.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2807

Konkoly Observatory
Budapest
10 October 1985
HU ISSN 0374 - 0676

LIGHT VARIABILITY OF HD 220 140, OPTICAL COUNTERPART OF THE X-RAY SOURCE H 2311 + 77

By means of an EXOSAT imaging observation, the star HD 220 140 (SAO 010 697, G5) was indicated by Pravdo et al. (1985) as the optical counterpart of the bright X-ray source H 2311 + 77. Available spectra show typical features of RS CVn variables, and it is well known that these stars are often X-ray emitters.

In order to confirm this identification, B and V photometry of HD 220 140 was carried out with the 50 cm Marcon telescope at Merate Observatory. Differential measurements were made with respect to SAO 010 663 (8.6, G0) and SAO 010 653 (8.3, F8). As a period of about 10 days was expected (Pravdo et al., 1985), hence HD 220 140 was observed performing 8-10 measurements per night, which were grouped into B and V normal points. The 12 points so collected from 13 August to 8 September gave a scattered light curve suggesting a short term variability. Three 6-hour runs in B colour were carried out in the nights 10, 11, and 12 September and three segments of a sine-shaped light curve were obtained, clearly indicating a shorter period than 1 day.

These measurements were also grouped into normal points which were put together with the previous observations. The resulting time-series was analysed by means of the least squares power technique and a period of 0.5767 day was derived with a variance reduction of 76% . No other period seems to be plausible. The application of the PDM method (Stellingwerf, 1978) gave the same period. The B-full amplitude is about 0.04 mag., however, as for many other RS CVn variables, it seems to be variable. The eclipsing binaries RT And ($P=0^d.6289$, F8V+G5 (or K0)V) and SV Cam ($P=0^d.5930$, G2-3V+K4V) have similar characteristics but in the case of HD 220 140 no eclipse has been observed.

E. PORETTI, L. MANTEGAZZA and E. ANTONELLO
Osservatorio Astronomico di Brera
22055 Merate (CO), Italy

References:
Pravdo, S.H., White, N.E., and Giommi, P., 1985, M.N.R.A.S., 215, 11P.
Stellingwerf, B.F., 1978, Ap.J., 224, 953.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 2808

Konkoly Observatory
Budapest
14 October 1985

HU ISSN 0374 - 0676

THE PERIODICITY OF THE PHOTOMETRIC VARIATIONS OF HR 7671 (HD 190390)

HR 7671 (HD 190390) has been classified as a F-type giant by Cowley (1976), but evidence is accumulating now that the colors and the spectrum of this star are those of a supergiant (e.g. Olsen, 1983; Sasselov, 1985; Eggen, 1985). Since its galactic latitude is rather high ($b^{II} = -21.5°$), HD 190390 is then a rather uncommon object. Additionally, it has recently been found that the star is a photometric variable. Olsen (1983) observed a steady decrease of the brightness of HD 190390 in data covering five nights and later on observed similar variations but with another range.

Our interest in HD 190390 arose from the large scatter of its data in the Geneva photometric system (Rufener, 1981). We have been collecting new observations of this object in the Geneva system since late 1982, using the Swiss photometric telescope at the European Southern Observatory. In the present paper, we report on the discovery of a stable periodicity in our data, that cover 1040 days, from September 1982 till July 1985.

The visual brightness variations during September-October 1982 and May-July 1985 are shown in Figure 1. The time is expressed in Julian Days - 2440000. A time scale of the order of a month can clearly be recognized in the variations. A similar time scale is present in the 45 measurements made in 1983 and in the 22 measurements made in 1984. Fourier analysis of the whole set of 123 data points reveals a most significant period of 28.49 days. A least-square cosine fit with this period has an amplitude of 0.11 mag and accounts for 80% of the total variance. The number of cycles covered is 36. The phase diagrams for the color indices [U-B] and [B-V] and for the visual brightness m_V are given in Figure 2.

It is apparent from Figure 1 that the amplitude and the shape of the light curve vary from cycle to cycle. Indeed, the residual scatter around the mean light curve in Figure 2, σ_{res} = 0.038 mag, is much larger than the estimated observational error, which is 0.004 mag. However, no reduction with any other period can remove a significant fraction of the remaining variance. The scatter thus reflects irregular cycle-to-cycle variations.

The [U-B] and [B-V] variations are respectively in antiphase and in phase with the light variations. Such color variations are reminiscent of the behavior of variables in the Cepheid instability strip. The spectral type of HD 190390 and the length of the period are two other arguments which naturally lead us to discuss the properties of this variable in terms of what is known about the Cepheids.

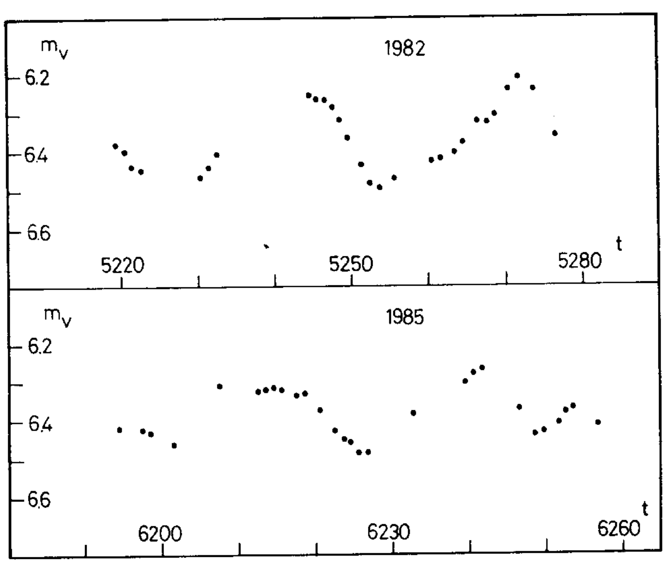


Figure 1: Light variations of HD 190390 during 1982 and 1985.

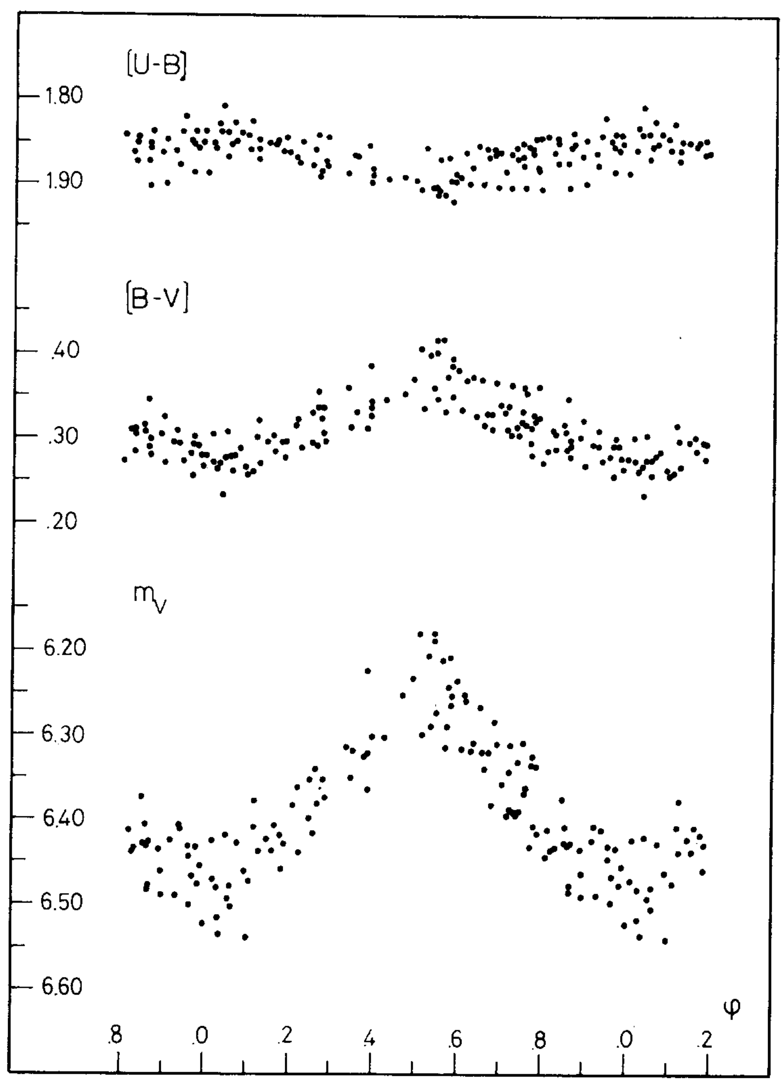


Figure 2: Phase diagrams for the color and light variations of HD 190390 during the period 1982–1985.

It is highly unlikely that HD 190390 is a bona fide population I Cepheid. The light variations show irregularities and the colors are much bluer than those of the known long period Cepheids. Third, the galactic latitude of the star and the absolute magnitude it would have if the period-luminosity relation were valid for it would imply a distance of more than 1 kpc from the galactic plane, clearly uncompatible with the known scaleheight of the population I Cepheids.

A high vertical distance is not uncompatible with HD 190390 being a population II Cepheid. Also, there are indications that it is a metal-weak star (Sasselov, 1985). On the other hand, the kinematics of the star do not indicate a pronounced population II character (Eggen, 1985). Moreover, the irregularity and the shape of the light curve are atypical even for long-period population II Cepheids.

A third possibility is that HD 190390 is similar to HD 161796 and to HD 163506 (Burki et al., 1980), stars that belong to a group of variable supergiants at high latitude, labeled "UU Her stars" by Sasselov (1984). The exact evolutionary stage of these stars is unknown, but it might be that they are in rapid evolutionary phase. HD 190390 would be the first strictly periodic member of the group. The study of the secular variations of its period is of high interest for the constraints it imposes on the evolutionary stage of the star and, incidentally, on that of the whole group.

We therefore plan to continue monitoring this star. A program of simultaneous radial velocity observations with CORAVEL has now been started. The results of this program will be published together with a quantitative discussion of all photometric data.

C. WAELKENS* and M. BURNET**

(*) Astronomisch Instituut
Celestijnenlaan 200B
B-3030 Heverlee (Belgium)

(**) Observatoire de Genève
CH-1290 Sauverny (Switzerland)

References:

Burki, G., Mayor, M., Rufener, F.: 1980, Astron.Astrophys.Suppl.Ser. 42, 383.
Cowley, A.P.: 1976, Publ.Astron.Soc.Pacific 88,95.
Eggen, O.J.: 1985, Astron.J. 90, 1260.
Olsen, E.H.: 1983, Astron.Astrophys.Suppl.Ser. 54, 55.
Rufener, F.: 1981, Astron.Astrophys.Suppl.Ser. 45, 207.
Sasselov, D.D.: 1984, Astrophys.Space Sci. 102, 161.
Sasselov, D.D.: 1985, Inf.Bull.Variable Stars No. 2776.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 2809

Konkoly Observatory
Budapest
15 October 1985
HU ISSN 0374 - 0676

LIGHT VARIATION OF THE ECLIPSING SYSTEM UV LEONIS

UV Leonis (BD+15°2230) is one of the few short period eclipsing systems which show no complication and whose components are not close to the Roche limiting surface (McCluskey, 1966). The primary star is slightly larger and brighter than the secondary component. It is a double lined spectroscopic binary.

UV Leonis was first announced as a variable star by Hoffmeister (1934). Its light curve was classified as an Algol type by Jensch (1935).

UV Leonis was observed photoelectrically during the last five nights of March 1985 using the one beam photometer attached to the Cassegrain focus (f/18) of the 74" telescope at Kottamia Observatory, Egypt (latitude N 29°55'.9 longitude E 31°49'.5). A total of 213 yellow and 285 blue magnitudes of UV Leo were obtained. The comparison star observed with UV Leonis was BD+ 14° 2777 and during the observations the nights were of good photometric quality.

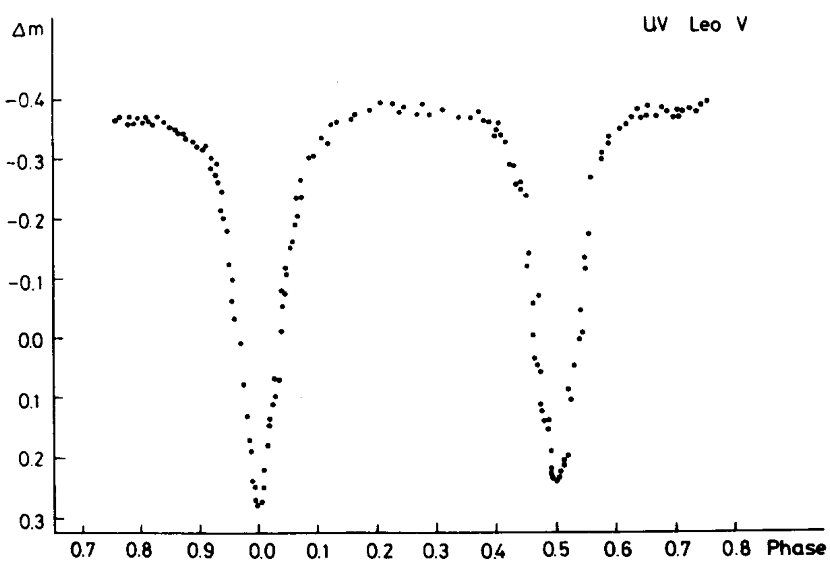


Figure 1

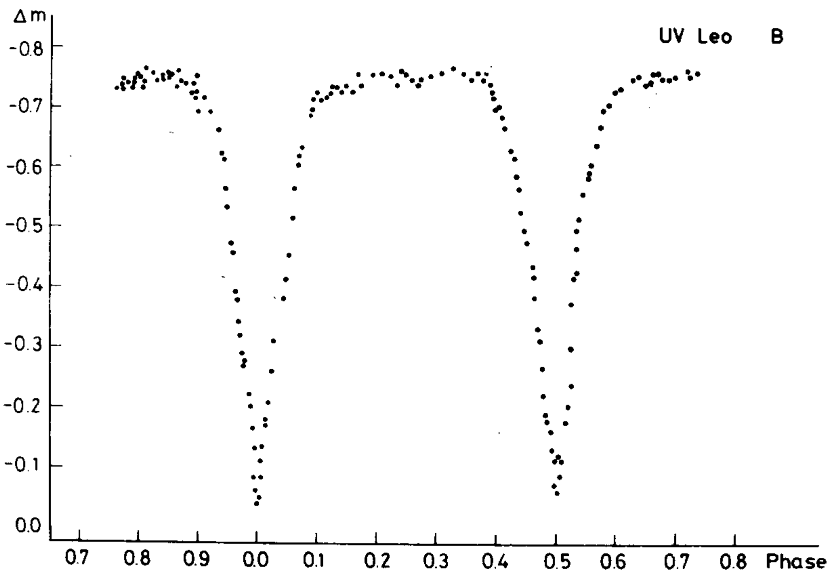


Figure 2

The light curves obtained in yellow and blue colours are shown in Figures 1 and 2 respectively. It is clearly seen that the system has two nearly equal minima.

Four times of minima, two primary and two secondary in both B and V colours were obtained. The residuals were calculated using the following ephemeris:

$$\text{Hel.Min. I} = 2438440.7275 + 0^{d}.6000855\,E$$

The times of minima are given in Table I.

Table I

Hel.Min.JD.	Min.	Filter	E	0-C
2446152.4263	I	B	12851	0.0000
.4258		V		-0.0004
2446153.3263	II	B	12852.5	-0.0001
.3267		V		+0.0003
2446155.4264	I	B	12856	-0.0003
.4269		V		+0.0002
2446156.3268	II	B	12857.5	+0.0001
.3268		V		0.0000

M.A. SOLIMAN, M.A. HAMDY, H.A.MAHDY
Helwan Observatory, Egypt

References:
Hoffmeister,C., 1934, Astron.Nachr. 253, 195.
Jensch,A., 1935, Astron.Nachr. 257, 139.
McCluskey,G.E., 1966, Astron.J. vol. 71, No.6., 536.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2810

Konkoly Observatory
Budapest
15 October 1985
HU ISSN 0374 - 0676

NEW PHOTOELECTRIC LIGHT CURVES OF EH Lib

EH Lib (BD -0° 2911) was first discovered to be variable in light by A.N.Vyssotsky and since this time it attracts the attention of many investigators and a large number of photographic and photoelectric observations were obtained, e.g., Code (1950), Ashbrook (1952), Alania (1954), Fitch (1957), Burnicki and Krygier (1958), Sanwal and Pande (1961), Harding and Penston (1966), Fitch et al. (1966), Epstein (1969), Boardman and Heiser (1972), Terzan and Rutily (1974), McNamara and Feltz (1976), Broglia and Conconi (1977), Garrido et al. (1979) and finally by Mahdy and Szeidl (1980).

EH Lib was observed during four nights in March 1985, (21, 22, 23, and 26) at Kottamia Observatory in B and V colours.

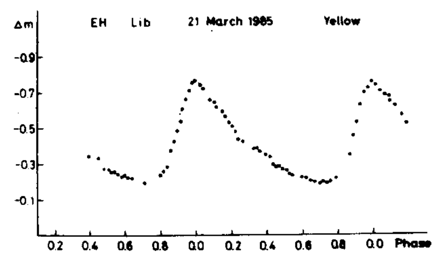
The observations were carried out with the one beam photoelectric photometer using standard B and V filters, and an EMI 9558 B photomultiplier cooled by a propeller fan. During the observations a number of standard stars of known magnitudes from Johnson's et al.. Catalogue (1966) were frequently observed to determine the extinction coefficients. The comparison star observed with EH Lib was the star BD -0°2909.

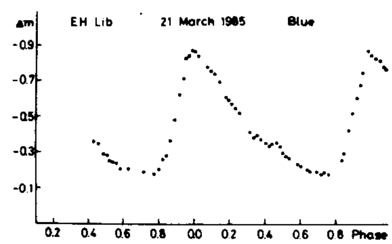
The observations obtained in the present work yielded to 8 light curves, 4 in each colour (Figures 1-8) and seven times of maxima in both B and V colours. The times of maxima obtained are listed in Table I.

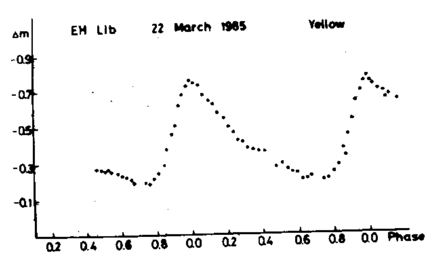
The results obtained clearly show that the star EH Lib has a constant period and its light curves are characterised by constant shape which is repeated successively. This is in agreement with the results obtained by Mahdy and Szeidl (1980).

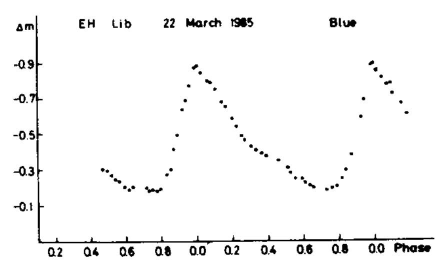
Table I
New observed times of maxima of star EH Lib

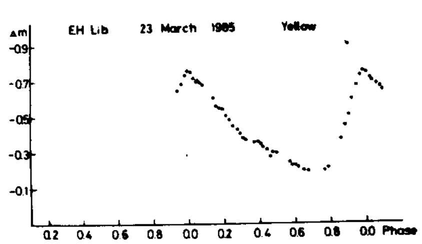
Hel.Max.J.D.	Filter	E	O-C
2446146.5086	B	143733	+0.0001
.5084	V		-0.0001
.5967	B	143734	-0.0002
.5967	V		-0.0002
2446147.4811	B	143744	+0.0001
.4814	V		+0.0004
.5696	B	143745	+0.0002
.5694	V		0.0000

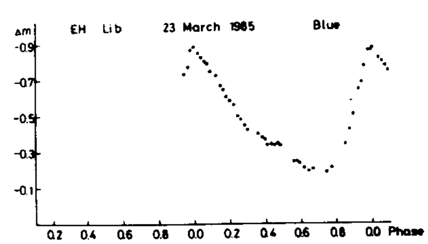

Δm
EH Lib 21 March 1985 Yellow
Phase

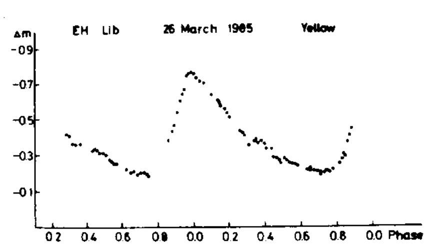

Δm
EH Lib 21 March 1985 Blue
Phase

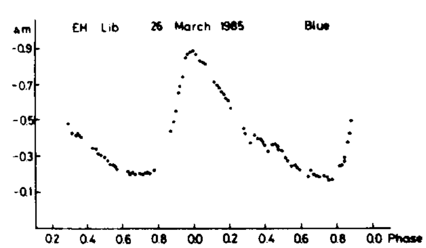

Δm
EH Lib 22 March 1985 Yellow
Phase


Δm
EH Lib 22 March 1985 Blue
Phase


Δm
EH Lib 23 March 1985 Yellow
Phase


Δm
EH Lib 23 March 1985 Blue
Phase


Δm
EH Lib 26 March 1985 Yellow
Phase


Δm
EH Lib 26 March 1985 Blue
Phase

Figures 1-8

Table I (cont.)

Hel.Max.JD.	Filter	E	O-C
2446148.4533	B	143755	- .0002
.4537	V		+ .0002
.5420	B	143756	0.0000
.5419	V		-0.0001
2446151.5479	B	143790	-0.0001
.5482	V		+0.0002

M.A. HAMDY
Helwan Observatory, Egypt

References:

Alania, I.F., 1954, Astron.Circ., 146, 14.
Ashbrook,K.J., 1952, Astron.J.57, 64.
Boardman,W.J., and Heiser,A.M., 1972, P.A.S.P., 84,680.
Broglia,P., and Conconi,P., 1977, Astron.Astrophys.Suppl. 29, 231.
Burnicki,A., and Krygier,B., 1958, Acta Astr. 8, 21.
Code,A.D., 1950, P.A.S.P., 62, 166.
Epstein,I., 1969, Astron.J., 74, 1131.
Fitch,W.S., 1957, Astron.J. 62, 108.
Fitch,W,S,, Wisniewski,W.Z., Johnson,H.L., 1966 Commun Lunar Planetary Lab., 5, No. 71.
Garrido,R. et al., 1979, Astron.Astrophys.Suppl. 36, 51.
Harding,G.A., and Penston,M.J., 1966, Roy.Obs.Bull. No.115.
Johnson, H.L., Mitchell,R.I., Iriarte,B., Wisniewski,W.Z., 1966, Commun Lunar Planet.Lab. 4, No.63.
Mahdy,H.A. and Szeidl,B.,1980,Commun.Konkoly Obs.Hung.Acad.Sci.,Budapest,No.74.
McNamara,D.H. and Feltz,K.A. 1976, P.A.S.P. 88, 164.
Sanwal,N.B. and Pande,M.C., 1961, The Observatory 81, 99.
Terzan,A., and Rutily,B., 1974, Astron.Astrophys.Suppl. 16, 155.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 2811

Konkoly Observatory
Budapest
15 October 1985

HU ISSN 0374 - 0676

PHOTOELECTRIC PHOTOMETRY OF THE W UMa TYPE VARIABLE STAR FG HYDRAE

The variable FG Hydrae (BD+3°1979) was discovered by Hoffmeister (1934). It was classified as a cluster type by Tsesevich (1949) using visual observations. FG Hydrae was considered by Smith (1954, 1955) as one of the short period binaries that undergoes complete eclipses. Inspite of the fact that the observations taken by Smith did not cover a complete cycle of variation his data help to define quite well a relatively early epoch. His observations obtained in 1963 (Smith, 1963) which consist of 306 blue and 246 yellow observations of FG Hydrae including data from 11 nights gave a complete light curve of FG Hydrae and 3 times of minima which are given in Table I.

Table I
Times of minima of FG Hydrae obtained by Smith (1963)

JD.Hel	Min.	O-C
2434056.7184	II	+0.0001
4057.7018	II	0.0000
4084.5842	II	0.0000

Observations made by Binnendijk (1963) led to a complete light curve and improved period determination.

FG Hydrae was included in the programme of short period variables running out at Kottamia Observatory using the 74" reflector.

The observations were carried out by a one beam photoelectric photometer which was attached at the cassegrain focus (f/18). Standard B and V filters with EMI 9558 B photomultiplier tube with S-20 photocathode cooled by a propeller fan, were used through all the intervals of observations. The amplified output of the tube was fed into a Brown recorder. The times of observations were estimated from the starting point and the moving mean speed of the strip chart recorder. Table II lists the pertinent data regarding the variable and comparison stars.

Table II

Star	BD	Spectral type
FG Hydrae	+°3 1979	GOV
Comparison	+°4 1979	G5V

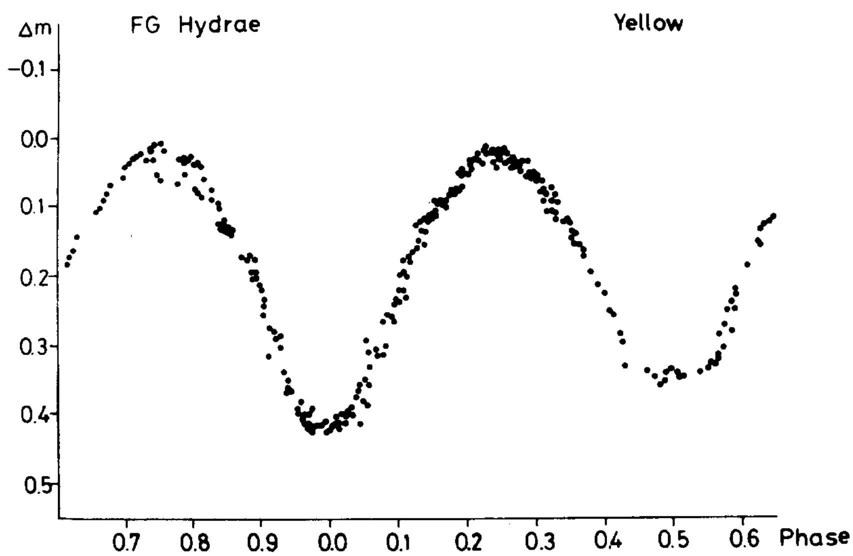


Figure 1

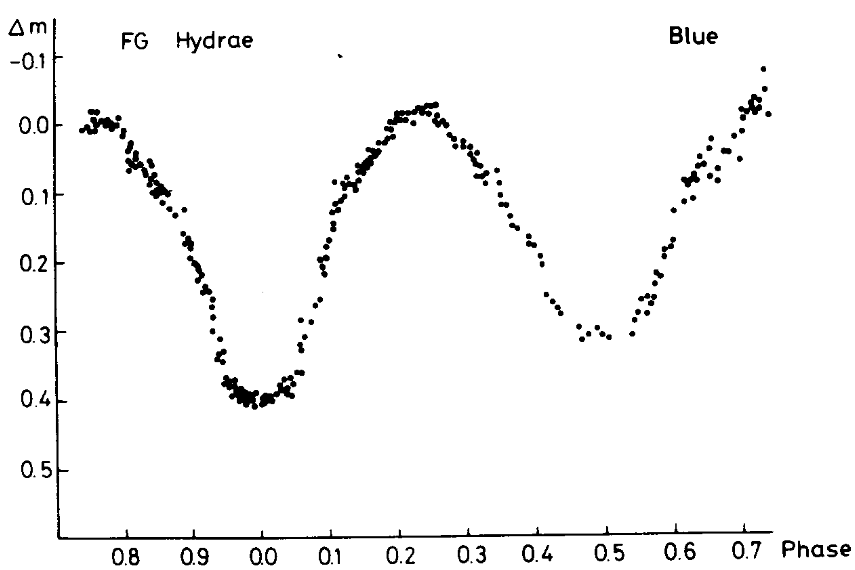


Figure 2

A total of 395 observations in B and 385 observations in V were obtained including the data of 4 nights during Jan and Feb. 1985. The light curves of FG Hydrae obtained in both B and V colours are shown in Figures 1 and 2.

Five times of primary minima and one time of secondary minima were determined in both B and V colours. Three times of minima are given in Table III.

Table III

J.D.Hel.	Min.	Filter	E	O-C
2446089.3543	I	V	27821.0	- .0017
89.3546		B		- .0014
90.3678	I	V	27824.0	- .0013
90.3679		B		- .0012
90.5316	II	V	27824.5	- .0014
.5312		B		- .0010
2446109.3822	I	V	27882.0	- .0013
.3821		B		- .0014
10.3654	I	V	27885.0	- .0016
.3655		B		- .0015
11.3491	I	V	27888.0	- .0014
.3493		B		- .0012

The residuals were computed from the following ephemeris

$$\text{Min.I} = 2436968.7067 + 0^{d}.32783433\ E$$

H.A. MAHDY, M.A. HAMDY, M.A. SOLIMAN
Helwan Observatory, Egypt

References:

Binnendijk,K.I., 1963, Astron.J. 68, 30.
Hoffmeister,C., 1934, Astr.Nachr. 253, 199.
Smith,H.J., 1954, Astron.J., 59, 196.
Smith,H.J., 1955, Thesis, Harvard University, Cambridge, Massachusetts.
Smith,H.J., 1963, Astron.J., 68, 39.
Tsesevich,V.P., 1949, Peremennye Zvezdy, 7, 8.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2812

Konkoly Observatory
Budapest
23 October 1985
HU ISSN 0374 - 0676

PHOTOMETRIC AND POLARIMETRIC VARIATIONS OF THE SYMBIOTIC STAR CI CYGNI

After the outburst in June 1971 (Lowder, 1971) the star CI Cygni exhibited a transformation in the optical range. The lines of high excitation disappeared together with a weakening of TiO bands. In December 1971 a P Cygni profile for HI, HeI predominated. In November 1975 near the minimum (V=11.05) emission lines of high excitation and TiO bands reappeared. Numerous spectra were taken by Audouze et al. (1981) when the star (V=8.6) exhibited an F type spectrum.

Photometric and polarimetric observations were made at the Observatoire de Haute-Provence in October 1975 and July 1976 with the polarimeter II of Martel (Chevreton et al. 1977) attached to the 193 cm Cassegrain telescope. The results are given in Table I.

The broad-band filters accounted are U (λ 3200 - 3900 Å), B (λ 3800 - 4700 Å), V (λ 5000 - 5900 Å). An E.M.I. type 9789 QA tube with an S11 photocathode was utilized. All the observations were obtained with a diaphragm of angular aperture 14 arcsec. The instrumental polarization was determined from the observations of standard stars in the Hiltner catalogue. The most significant variations in the polarization of CI Cygni were observed after the minimum (V = 9.4). The position of the vibration plane does not change notably during the polarization variations contrary to R Aquarii. Fig.1 shows the dependence of the polarization rate with λ^{-1} quite typical of linear polarization. Szkody et al. (1982) have obtained U : 0.70%, B : 0.50%, V : 0.30% for the ratio of linear polarization of CI Cygni in January 1977 between two minima (V = 9.9) and show that the source of the polarization is explained by Rayleigh scattering.

The strong polarization discovered in July 1976 cannot be attributed entirely to Rayleigh scattering of nebular emission lines.

The maximum polarization found in the blue region might come from the absorption resonance line λ 4227 Å.

The drop in polarization in the V band is certainly due to the strong TiO bands (Aspin et al., 1985).

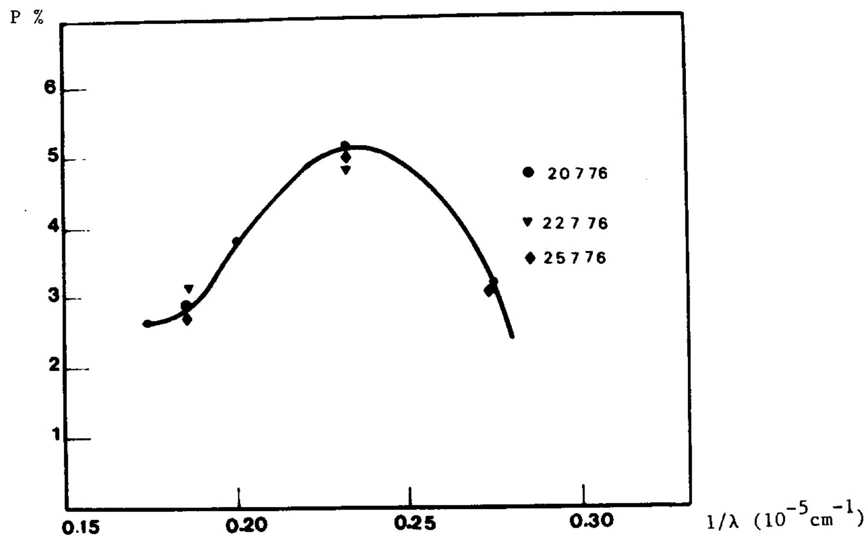


Figure 1

Degree of polarization as a function of the wavelength

Table I

Photometric and polarimetric data for CI Cygni

J.D.	V	V P±ΔP	V θ±Δθ	B	B P±ΔP	B θ±Δθ	U P±ΔP	U θ ± Δθ
2442 714	11.05	2.73 ±0.15	114°7 ± 0.8					
2442 980	9.40	2.82 ±0.19	100°0 ± 1°0	10.18	5.22 ±0.14	104°4 ± 0°3	3.05 ±0.17	104°8 ± 0°8
2442 982	9.41	3.17 ±0.09	104°3 ± 0°4	10.23	4.84 ±0.48	106°9 ± 1°4		
2442 985	9.43	2.86 ±0.12	103°6 ± 0°6	10.24	4.88 ±0.13	108°6 ± 0°4	3.06 ±0.19	105°0 ± 0°9

The existence of correlations between the polarization and other parameters should help to explain the nature of symbiotic stars.

R. GRAVINA and M.T. MARTEL
Observatoire de Lyon
69230 Saint-Genis-Laval
France

References:

Aspin,C., Schwarz,H.E., McLean,I.S., Boyle,R.P., 1985, Astron. Astrophys. 149, L 21 - L 23.
Audouze,J., Bouchet,P., Fehrenbach,Ch., Woszczyck,A., 1981, Astron, Astrophys. 93, (1-7).
Chevreton,M., Gravina,R., Martel,M.T., Vanderiest,Ch., 1977, Astron. Astrophys. 54, 627.
Lowder,W.R., 1971, I.A.U. Circ. No. 2335.
Szkody,P., Michalsky,J., Stockes,G.M., 1982, Publ. Astron. Soc. Pac., 94, 137.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2813

Konkoly Observatory
Budapest
23 October 1985
HU ISSN 0374 - 0676

NSV 470 AND NSV 12665

The star NSV 470=BV 637=CoD $-48^{\circ}338$=HD 8093 at $01^{h}17^{m}.4$, $-48^{\circ}33'$ (1950) was reported by Strohmeier et al. (1965) as photographically variable with m_{pg}=8.8, A_{pg}=0.3, type A2. Kholopov (1982) and Diethelm and Tjemkes (1984, =DT) give type F0. The latter found, from eight photoelectric 5-colour observations within 10 days, V=8.74, B-V=0.36, and no variability.

We collected two photoelectric observations with the 20" of the South African Astronomical Observatory at Sutherland. For the transformation to the UBV system we used E region stars of the list of Menzies et al. (1980). The results (Table I) agree with those of DT if similar transformation differences are assumed as in the case of NSV 14164 which we also observed (Pfleiderer and Marx 1985). That is, we cannot confirm photoelectric variability but rather find constancy within about $0^{m}.01$.

The star was measured with a cat's eye photometer on 305 exposures of the Sonneberg archive taken between 1934 and 1959. Figure 1 gives a histogram of the results. From the variance, we estimate the accuracy to be $0^{m}.13$ for m_{pg} and $0^{m}.06$ for m_{pv}. The corresponding normal distributions fit the data reasonably well except that a significant number of additional faint observations occurs. We consider this as a verification of the variability. The amplitude is estimated to be $0^{m}.4$ in m_{pg} and perhaps less in m_{pv}.

All attemps to find a period failed however. The number of data when the star was dim (about 15 of 221 for m_{pg}, about 6 of 84 for m_{pv}) suggests a minimum duration of about 1/15 of the period. Half of these data are preceded or followed by another plate taken within about 1 hour. In no case another low brightness is found. In three cases, three plates per night exist of which only the middle one gives low brightness. This suggests that the minimum does not last longer than about 2 hours, and that the period is quite short. Contrarily, the constant off-minimum brightness would suggest a detached eclipsing system the period of which must be at least several days. Our only explanation is that some of the low brightness data do not indicate a minimum but are rather erroneous. This is not surprising in view of the fact that due to an unsuitable position of the star on the exposures its images are more or less distorted.

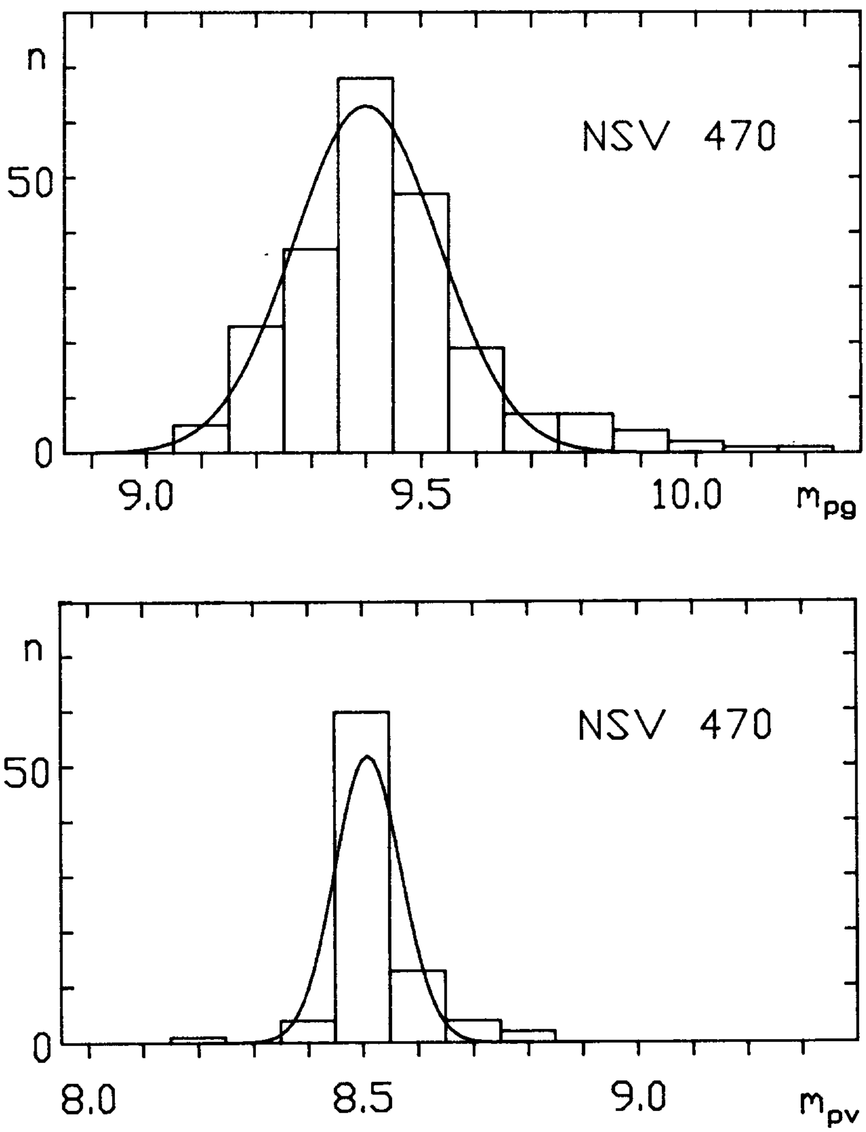


Figure 1a and b: Histograms of photographic data of NSV 470, with Σn (pg) = 221, Σn (pv) = 84. The widths of the normal distributions drawn are $0^m_.13$ (pg) and $0^m_.06$ (pv).

Table I. Photoelectric observations of NSV 470

HJD	V	B–V	U–B	V–R	V–I
2445906.690	8.764	0.328	0.018	0.190	0.382
18.659	8.787	0.324	0.013	-	-

Table II. Photoelectric observations of NSV 12665

HJD	V	B–V	U–B
2445905.257	8.222	0.425	0.022
.271	8.217	0.431	0.031

The star NSV 12665=BV 1477 Sgr=CoD $-42^{\circ}14615$ ($8^{m}_{.}8$)= CAP $-42^{\circ}8972$ ($7^{m}_{.}6$)= HD 189306 (F2) at $19^{h}57^{m}_{.}6$, $-42^{\circ}18'$ (1950) was reported by Strohmeier (1971) to be photographically variable with $A_{pg}=0^{m}_{.}3$. Kholopov (1982) gives $m_{max}=8.0$. DT found, from 11 photoelectric 5-colour observations within 11 days, V=8.16 (with slight variability within a few hunredth of a magnitude), and B-V=0.47 (constant).

Our two photoelectric observations with the above-mentioned telescope (Table II) confirm the differences between DT and us in the transformation to the UBV system. Applying these, it seems that B-V agrees with DT within $0^{m}_{.}01$, while we find V to be dim by $0^{m}_{.}02$ or $0^{m}_{.}03$, corroborating the slight variability found by DT.

Acknowledgement: We thank the SAAO for granting observing time and J.Fröber for measuring the photographic plates.

J. and M. PFLEIDERER

Institut für Astronomie
der Universität Innsbruck
Universitätsstr. 4
A - 6020 Innsbruck

B. FUHRMANN

Sternwarte Sonneberg
Zentralinstitut für Astrophysik
der Akademie der Wissenschaften
der DDR
DDR-6400 Sonneberg-Neufang

References:

Diethelm,R., Tjemkes,S., 1984, Inf.Bull.Var. Stars No. 2503
Kholopov,P.N., (ed.), 1982, New catalogue of suspected variable stars, Nauka, Moscow
Menzies,J.W., Banfield,R.M., Laing,J.D., 1980, SAAO Circ. No. 5.p.149
Pfleiderer,M., Marx,S., 1985, Mitt.Astron. Ges. 63, 201
Strohmeier,W., 1971, Inf.Bull.Var.Stars, No. 562
Strohmeier,W., Knigge, R., Ott,H., 1965, Inf.Bull.Var.Stars, No.107

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2814

Konkoly Observatory
Budapest
28 October 1985
HU ISSN 0374 - 0676

REPEATED FLARE-UPS ON FLARE STARS IN NGC 7000 REGION

In the program of systematic search for flare stars in different stellar aggregates, series of ultraviolet multiple exposure plates have been obtained with the 40" Schmidt telescope of Byurakan Observatory. The centre of observed field is : 20^h52^m; Dec = $+43^\circ00'$ (1950). The observations were made on Orwo ZU-2 emulsion through a Schott UG-1 filter.

In the course of a re-examination of the photographic plates taken between 1979 and 1980 (IBVS No. 2339) four flare-ups were discovered on already known flare stars. The data for registered flare repetitions are presented in Table I. The Tonantzintla or Byurakan designation is also given.

Table I

Design.	RA(1950)	Dec(1950)	m_u	Δm_u	Date
T2	$20^h57^m.3$	$42^\circ26'$	$15^m.6$	$1^m.6$	16.10.1979
B12	20 56.2	43 41	18.0	2.0	19.10.1979
B16	20 40.1	40 03	19.0	2.8	17.10.1979
B43	20 51.7	41 33	20.5	6.4	24.10.1979

New series of observations were carried out in this Cygnus region in 1981 and 1984 with an effective coverage of 40 hours. During the examination of this photographic material, however, we did not discover any flare-ups.

H.S. CHAVUSHIAN
Byurakan Observatory
Byurakan, U.S.S.R.

I. JANKOVICS
Konkoly Observatory
Budapest, Hungary

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2815

Konkoly Observatory
Budapest
4 November 1985
HU ISSN 0374 - 0676

THREE-COLOUR PHOTOELECTRIC LIGHT CURVES OF THE ECLIPSING BINARY RS VULPECULAE

The eclipsing binary RS Vul (BD+22°3647) was observed photoelectrically between 19 June and 12 November, 1982 on 50 nights with the 30 cm Maksutov telescope of Ankara University Observatory. A total of 178 (181 in U colour) observations was obtained in ultraviolet, blue, and yellow lights. An RCA 1P21 photomultiplier and UBV filters, which are close to the standard UBV system, were used.

BD+21°3740 and BD+21°3719 were used as comparison and check stars, respectively. The light curves are shown in the Figures 1, 2, 3, where the individual magnitude differences were formed in the sense comparison minus variable, have been plotted against the phases which were calculated with the light elements given below :

$$\text{Min I} = \text{JD Hel. } 2445\ 229.298 + 4\overset{d}{.}4776635 \cdot E$$

where the value of T_o was determined from the present observations, and the period was taken from G.C.V.S. (1969).

A glance at the light curves clearly indicates that the depth of the secondary minimum becomes more pronounced towards longer wavelengths. The observations are relatively deficient at about phases 0.94, 0.04, and 0.52. The depths of the primary minima are about $1\overset{m}{.}10$, $1\overset{m}{.}07$, and $1\overset{m}{.}00$ in the U, B, V colours, respectively. Due to the relative scattering of the observations at U, the depth of the secondary minimum could not be determined properly. However, the depths of the secondary minima at B and V were observed to be $0\overset{m}{.}10$ and $0\overset{m}{.}11$, respectively. The observed depths of the primary minima of the system from the present light curves are in good agreement with the earlier ones except given by Popper (1957) (ΔB and $\Delta V \approx 0\overset{m}{.}65$).

Figures 4 and 5 show the colour variations of RS Vul with respect to the comparison star.

I would like to express my thanks to Dr.Zeki Aslan, for his helpful suggestions and valuable advice.

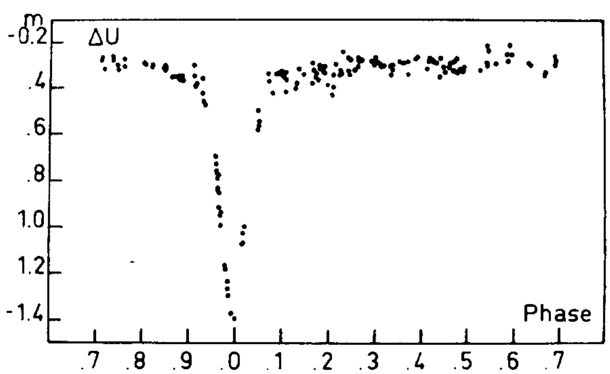


Figure 1. The U light curve of RS Vul

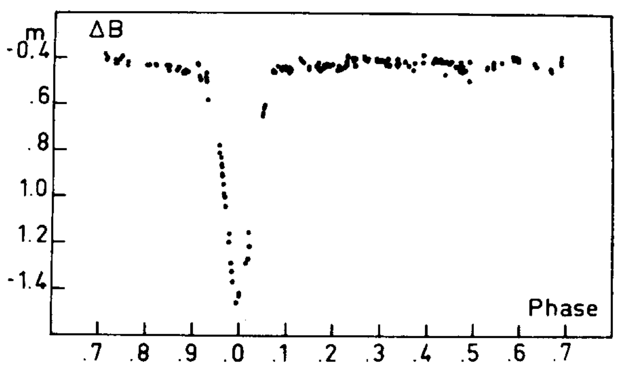


Figure 2. The B light curve of RS Vul

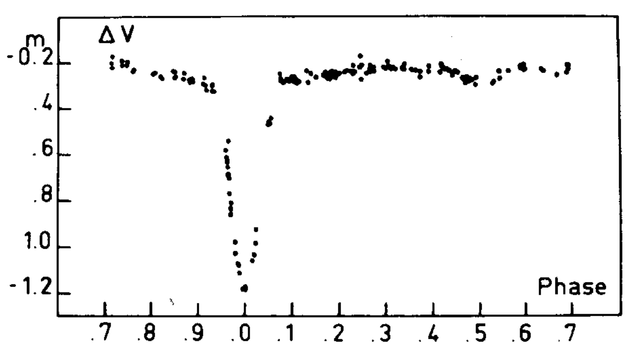


Figure 3. The V light curve of RS Vul

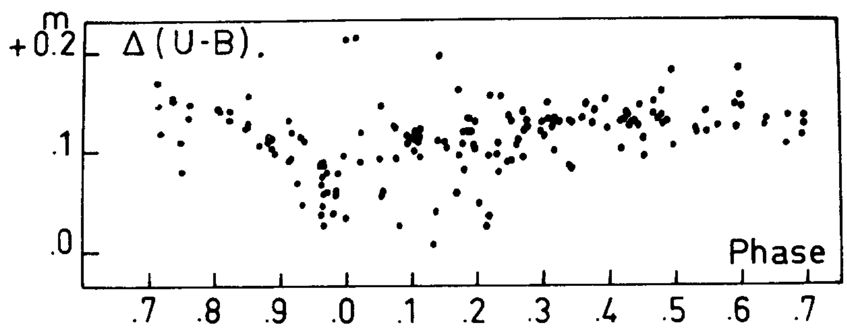


Figure 4. The (U-B) variation of RS Vul

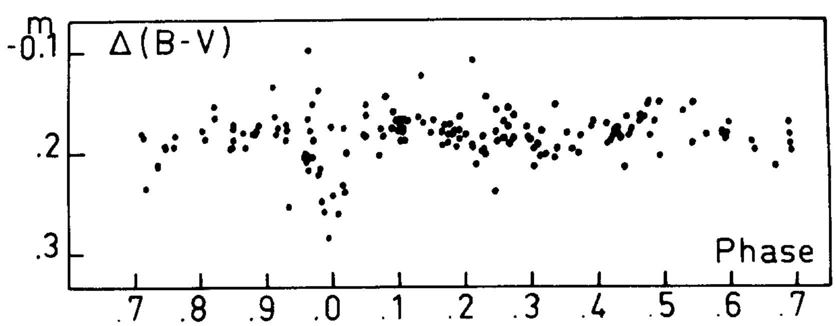


Figure 5. The (B-V) variation of RS Vul

V. KESKIN

1746 Sokak No. 8
Kat. 2, Daire 4
Karsiyaka, IZMIR
Turkey

References:

Hutchings, J.B., and Hill, G., 1971, Ap. J., 166, 373.
Popper, D.M., 1957, Astrophys. J., Suppl., 3, 107.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 2816

Konkoly Observatory
Budapest
6 November 1985
HU ISSN 0374 - 0676

NEW TIMES OF MAXIMUM LIGHT OF THE DELTA SCUTI STAR DY Peg

DY Peg, which was discovered in 1934 (Morgenroth, 1934) has been extensively studied. (See Mahdy and Szeidl, 1980, for a review of previous references on this star up to 1979). Since new determinations of maximum light would help in the determination of its period of pulsation, as well as of its period variation, further observations were carried out.

The observations were made with the 1 m telescope at the Observatorio de Tonantzintla, Mexico, with a high speed, two-channel photometer that allows the observation of the variable and the references stars simultaneously. A description of the photometer can be found in Nather and Warner (1971). White light and an integration time of 10 seconds were employed. Table I lists all the new times of maxima determined and the O-C residuals calculated with the ephemeris found by Peña and Peniche (1985). With 683 times of maximum light covering a time span of 46 years they found the following light elements:

$$T_{max} = 2437178.3729+0^{d}.07292633E-2.20x10^{-13}E^{2}$$

An analysis of the whole data set of the times of maximum light, that would allow an accurate ephemeris of this star will be published elsewhere.

Table I

Times of maximum light of the Delta Scuti star DY Peg observed in 1984

Date	Time of Maxima (HJD-2440000.0)	O-C (d)	Observer
Nov. 3	6007.7784	-0.0008	JHP, RP
14	6018.7999	0.0039	AQ, AP
15	6019.5916	-0.0016	AQ, AP
	6019.6634	-0.0027	AQ, AP
17	6021.6357	0.0001	JHP, RP
18	6022.5835	0.0003	JHP, RP
Dec. 18	6052.6290	0.0002	JHP
20	6054.6000	0.0022	MAH, JHP
21	6055.6180	-0.0008	MAH
22	6056.6393	-0.0005	MAH

We would like to acknowledge for the assistance of the following people: D. Flores fro the heliocentric corrections, R. Escamilla for the typing, and J. Miller for proofreading.
This is Contribution 184 of the Instituto de Astronomia, UNAM, Mexico.

M.A. HOBART

Facultad de Física
Universidad Veracruzana
Ap. Postal 270
Xalapa, Ver.

A. QUINTERO, A. PANI, R. PENICHE,
J.H. PEÑA

Instituto de Astronomia
U.N.A.M.
Ap. Postal 70-264
México, D.F.

References:

Mahdy,H.A., and Szeidl,B., 1980, Comm.Konkoly Obs. No. 74
Morgenroth,O., 1934, A.N. 252, 394
Nather,R.E. and Warner,B., 1971, Mon.Not.Roy.Astr.Soc. 152, 209
Peña,J.H. and Peniche,R., 1985, Submitted

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2817

Konkoly Observatory
Budapest
11 November 1985
HU ISSN 0374 - 0676

BRUN 276, A YOUNG STAR BELOW THE MAIN-SEQUENCE?

Brun 276 is a faint object in the vicinity of the Orion Nebula. We have secured a MEPSICRON (Firmani et al., 1984) spectrum of B276 with the 2.1 m telescope at San Pedro Mártir Observatory of the University of Mexico, on October 17, 1985 (U.T.). This spectrum covers the spectral range λλ 3700 - 6900 Å (1024 pixels); although it is under-exposed ($V \gtrsim 18.0$ during the observation) and it is also contaminated by the nebula, it is possible to see stellar lines of calcium II (H and K) and hydrogen Balmer lines in emission (probably Hβ is as strong as Hα). Altogether the spectrum indicates T Tauri star, possibly of early K-type.

Walker (1969) gives V=18.04, B-V=+0.73 and U-B=-0.99. Haro (1976) gives $I \gtrsim 17$. These values indicate that B276 is neither heavily obscured by interstellar extinction, nor with a large infrared- excess, probably. If we use a mild infrared colour excess of a T Tauri star (Mendoza, 1966) for B276, then we derive $M_{bol} \approx 9$. The (B-V) colour-index and the spectral type yield $T_e \approx 4800\ ^{\circ}K$. If these values are not very wrong, then B276 lies below the main-sequence, at least one magnitude.

We conclude that B276 is a pre-main-sequence star embedded in the Orion Nebula, which lies below the main sequence because

1) It is a variable star (Brun, 1935)
2) It has a variable Hα -emission line (Haro, 1976, 1980; Parsamian and Chavira, 1982)
3) The spectrum is of a T Tauri star
4) The combined observational data locates it below the main sequence, most likely.

E.E MENDOZA, C. FIRMANI, and G. HARO

Instituto de Astronomia
Universidad Nacional Autónoma de Mexico
Ap. Postal 20 - 158
01000 Mexico D.F.

References:

Brun,A., 1935, Pub. Obs. Lyon, Vol. 1, No. 12
Firmani,C., Gutiérrez,L., Ruiz,E., Bisiacchi,G.F., Salas,L., Paresce,F., Carlson,C.W., Lampston, M., 1984, Astron. Astrophys. 134, 251
Haro,G., 1976, Bol. Inst. Tonantzintla 2, 3
Haro,G., 1980, Dissertation, Colegio Nacional , México, D.F.
Mendoza,E.E., 1966, Ap. J. 143, 1010
Parsamian,E.S., and Chavira,E., 1982, Bol. Inst. Tonantzintla, 3, 69
Walker,M.F., 1969, Ap. J. 155, 447

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2818

Konkoly Observatory
Budapest
14 November 1985
HU ISSN 0374 - 0676

PHOTOELECTRIC LIGHT CURVE AND TIMES OF MINIMA OF V 1010 Oph

The star V 1010 Oph (BV 544, HD 151676) is an eclipsing binary of Beta Lyrae type. The variability of this star was discovered by Strohmeier, Knigge and Ott (1964). Spectroscopic investigations revealed that it could be classified as a single lined A3 star (Popper, 1966).

V 1010 Oph was observed photoelectrically by Leung (1974). He found that the eclipse was complete and the primary minimum was a transit. He also found that the primary star in the system was larger, hotter and had a spectral type of A3, while the spectral type of the secondary component is around G8.

Extensive photoelectric observations for star V 1010 Oph were carried out in two colours (B and V) in the second half of July 1985, in order to determine any variations in period or shape of the light curve of this star.

Photoelectric observations of this star were obtained using the 74 inch reflector of Kottamia observatory, Egypt. The photometer used was a single beam photoelectric photometer attached to the Cassegrain focus (f/18). Standard B and V filters with EMI 9558 B photomultiplier type with S-20 photocathode cooled by a propeller fan were used throughout. The variable star V 1010 Oph was observed more or less continuously through B and V filters with only occasional measurements of the comparison star (HD 151527, sp. type A0). During the interval of observations the nights were of good photometric quality.

From the individual observations, six moments of minima were obtained in each colour. Epochs of minimum light were determined by the method of bisecting chords. The derived epochs are listed in Table I.

O - C residuals were computed from the following ephemeris given by Leung (1974)

$$\text{J.D.Hel.Min.I.} = 2438937.7690 + 0\overset{d}{.}6614272\,E$$

This ephemeris was also used for the reductions of the observations to give a

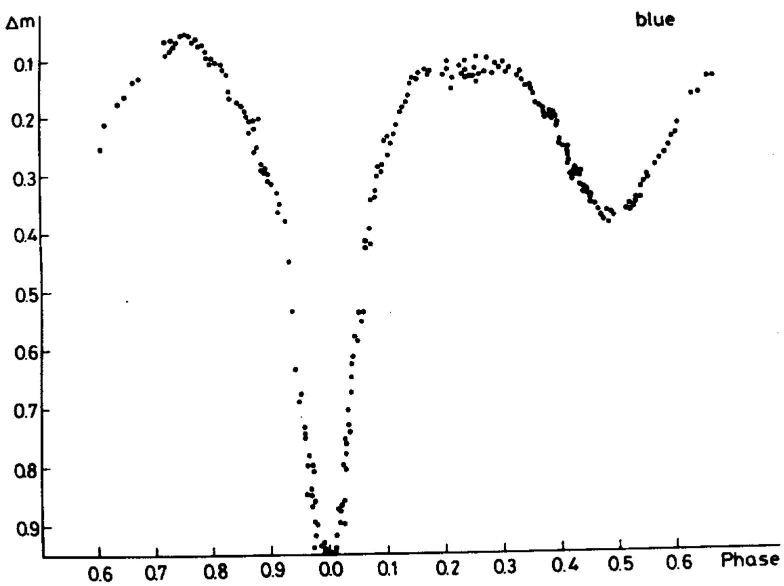


Figure 1

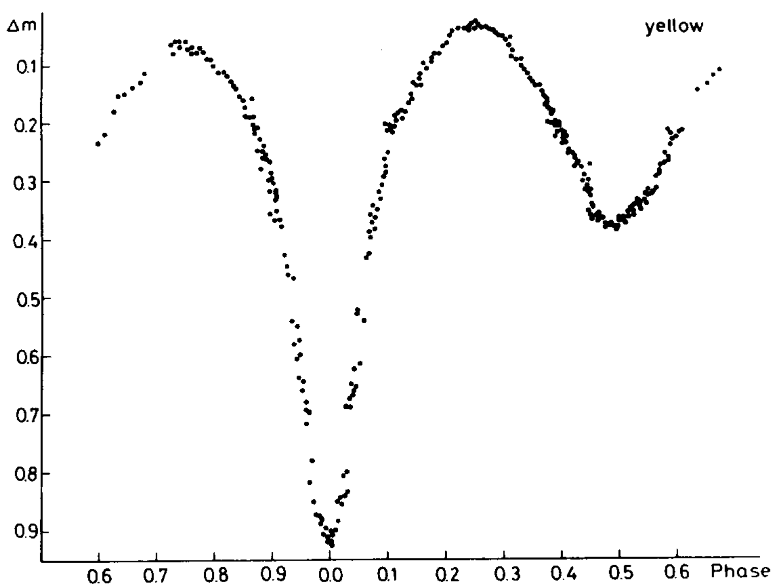


Figure 2

Table I

Times of minima of V 1010 Oph

J.D. observed	filter	Min.	E	O - C
2446268.3681	V	I	11083	+0.0014
2446268.3680	B			+0.0013
2446269.3599	V	II	11084.5	+0.0011
2446269.3597	B			+0.0009
2446270.3523	V	I	11086	+0.0014
2446270.3524	B			+0.0015
2446272.3361	V	I	11089	+0.0009
2446272.3362	B			+0.0010
2446273.3289	V	II	11090.5	+0.0015
2446273.3287	B			+0.0013
2446274.3195	V	I	11092	+0.0013
2446274.3207	B			+0.0012

complete light curve for B and V measurements. These light curves are shown in Figures 1 and 2, where Δm is the magnitude difference between the variable and the comparison star.

From these complete light curves we can conclude that no appreciable variations occur in the shape of the light curves of the system as compared with the previously obtained light curves.

M.A. HAMDY, H.A. MAHDY, M.A. SOLIMAN
Helwan Observatory, Egypt

References:

Leung,K.C., 1974, Ap.J. 79, No.8, 852.

Popper,D.M., 1966, I.B.V.S. No. 154.

Strohmeier,W., Knigge,R., Ott,H., 1964, I.B.V.S. No. 74.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2819

Konkoly Observatory
Budapest
15 November 1985

HU ISSN 0374 - 0676

FLARE MONITORING OF THE ACTIVE LATE-TYPE SYSTEM YY GEMINORUM

In response to a request by Patrick A. Wayman, Dunsink Observatory, for securing simultaneous optical flare monitoring of YY Gem during the period the object was under observation with EXOSAT and IUE satellites, the variable was set on the observing schedule of Hoher List Observatory. Unfortunately, unfavourable weather conditions did not permit simultaneous observations, and the only successful observing run, which started on 1984, Nov 12/13 at 23:58 UT, had to be terminated at 3:42 UT, just before the onset of the IUE observations.

The instrumentation used was a double beam photometer attached to the Nasmyth focus of the 106 cm Cassegrain telescope. The photometer is especially suited for observations of the light curves of rapid variables and allows the simultaneous monitoring of the variable and a comparison star within the field of the telescope (Geyer and Hoffmann, 1975).

Due to the bright moonlit sky and strong stray light from Castor AB, the U and B bands yielded a very low S/N ratio, which forced us to do the monitoring in the V band only. So we could expect only small flare amplitudes, nevertheless detectable with the superior performance of a double beam photometer. The observing strategy was to monitor variable and comparison star (BD+31°1611) as continuous as possible, with breaks for casual sky measurements (every 15 minutes on the average) and centering controls. Measurements were recorded with a strip chart recorder, time constant was 1 sec.

The reductions presented some unexpected difficulties. In the raw magnitudes minor drift effects (typically about $0^{m}.01$ or $0^{m}.02$), accumulated during the rather long phases of unattendedness, became apparent and forced us to do a lot of data editing. Second, there was the problem of light contamination from Castor AB. Sky readings taken in the vicinity of the variable were on the the average ten times higher than near the comparison star. Moreover, due to the strong forward scattering and (presumably) some minor inconsistencies in making the sky offset, those high sky deflections are more variable than they ought to be. So we decided to use only the sky deflections taken at the com-

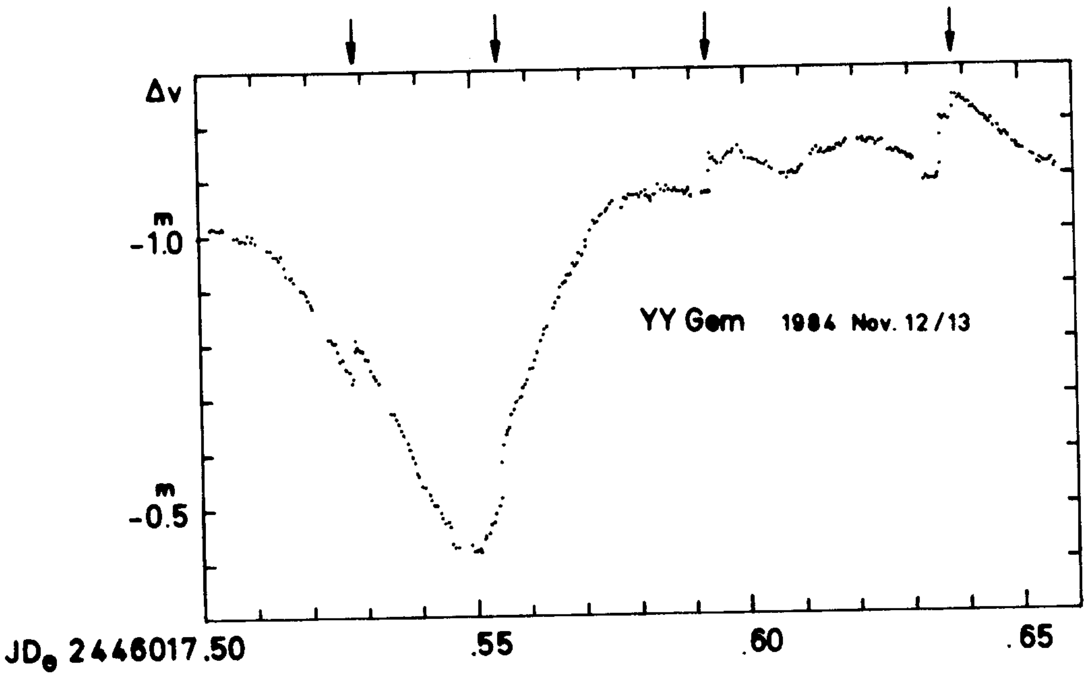


Figure 1. Visual light curve of YY Gem, obtained during 3.5 hours of flare monitoring while secondary eclipse was in progress. Flare events are indicated by arrows. Differential magnitudes, Δv are given in the sense "YY Gem minus BD +31°1611".

Table I. Characteristics of observed flares of YY Geminorum on Nov 12/13, 1984 (23:58 - 03:42 UT).

No.	Start (UT)	JD hel	Rise time	total duration	Δm
1	$00^h36^m08^s$	0.5280	0.4 min	~ 17 min	0^m09
2	01 14 28	0.5546	0.1 min	~ 20 min	0.09
3	02 09 52	0.5931	0.3 min	~ 20 min	0.07
4	03 10 44	0.6354	0.3 min	27 min	0.15

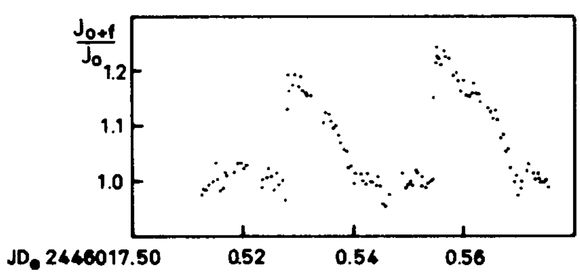


Figure 2. Intensity curves for flare events 1 and 2

parison, scaled up with an appropriate factor when applied to the variable. For the subtraction of the sky background, the measured deflections were interpolated with splines. Obviously, the variable sky background remains a major source of potential systematic errors. For flare monitoring, this should not be very serious because any effects must show up in both the variable and the comparison star deflections. Finally, the differential V magnitudes were evaluated. In order to preserve the internal accuracy of the light curve (the S/N ratio was better for the variable than for the comparison star), smoothed comparison star magnitudes were subtracted. Due to the proximity of the comparison and the use of the V band no extinction corrections were necessary .

Figure 1 shows the light curve obtained. The observations cover the whole secondary minimum, a total phase is indicated. The moment of minimum light ,

$$\text{Min II} = \text{HJD } 2446017.5488$$

was evaluated graphically, using only the undisturbed phase interval from JD .5425 to .5545. There is evidence for strong light curve distortion, presumably due to star spot activity; see, e.g., Kron (1952). During 3.5 hours of observing we noticed four flarelike events whose characteristics are presented in Table I. Intensity curves of flare events 1 and 2 (that were recorded on the descending and ascending branch of the minimum, resp.) are displayed in Figure 2.

The individual observations will be deposited in the I.A.U. Archives of Unpublished Observations of Variable Stars.

E. H. GEYER B.-C. KÄMPER

Observatorium Hoher List
der Universitätssternwarte Bonn

D - 5568 Daun/Eifel, F.R.G.

References:

Geyer, E.H., Hoffmann, M.: 1975, Astron. Astrophys. 38, 359.

Kron, G.E.: 1952, Astrophys. J. 115, 301.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2820

Konkoly Observatory
Budapest
20 November 1985
HU ISSN 0374 - 0676

NEW MINIMUM TIMES AND PERIOD OF SW LACERTAE

The W UMa-type star SW Lac.(BD+37°4717) is well known to have a variable period (see e.g. Panchatsaram and Abhyankar, 1981). The system was observed on September 30 and October 1-4, 1983, at Kryonerion Observatory, Greece. The observations were made with a 48-inch Cassegrain reflector and a two-beam multi-mode photometer. The two intermediate pass-band filters used were selected to be in close accordance with the standard U,B,V colour system.

Six times of minima observed during this season were calculated by the folding paper method and they are listed in Table I. The successive columns contain the heliocentric times of minima, the differences $(O-C)_1$ and $(O-C)_2$, the filter used and remarks.

Table I

HJD 2440000+	$(O-C)_1$	$(O-C)_2$	Filter	Rem.
5608.4174	-0.0445	+0.0002	B,V	Min II
5609.3794	-0.0447	+0.0001	B,V	Min II
5611.3038	-0.0446	+0.0001	B,V	Min II
5611.4638	-0.0450	-0.0002	B,V	Min I
5612.2660	-0.0446	+0.0002	B,V	Min II
5612.4259	-0.0450	-0.0003	B,V	Min I

The $(O-C)_1$ values have been calculated with the ephemeris of Kreiner and Frasinska (1977)

$$\text{Min I} = \text{JD Hel } 2442697.404 + 0^d.320724716.E \qquad (1)$$

while the $(O-C)_2$ values have been computed with a new ephemeris

$$\text{Min I} = \text{JD Hel } 2444499.5264 + 0^{d}.3207204.E \qquad (2)$$
$$\pm 6 \qquad\qquad \pm 2$$

which has been determined by least squares method and by using the times of minima listed in Table I , the ephemeris given by equation (4) of Mikolajewska and Mikolajewski (1981) and the last three mean minimum times of those given by Hopp et al. (1982).

It results from the above equations (1) and (2) and equation (4) of Mikolajewska and Mikolajewski (1981) that the period of SW Lac is undergoing fluctuations around an average value. A sudden period change in 1977 announced by Mikolajewska and Mikolajewski (1981) and another jump in the period in 1979 was noticed by Evren et al. (1985). Our computations show that the new ephemeris given by equation (2) holds good for the time interval 1980-83. A discussion of the light curves and the determination of the elements of the system will be given elsewhere.

P.G. NIARCHOS
Department of Astronomy
University of Athens
Panepistimiopolis
GR-15771 Zografos
Athens, Greece.

References :

Evren, S., Akan, M.C. and Ibanoglu, C. : 1985, I.B.V.S No. 2781.
Hopp, U., Hoffmann, M. and Witzigmann, S. : 1982, I.B.V.S No. 2142.
Kreiner, J.M., Frasinska, Z. : 1977, I.B.V.S No. 1285.
Mikolajewska, J. and Mikolajewski, M. : 1981, I.B.V.S No. 1953.
Panchatsaram, T. and Abhyankar, K.D. : 1981, Bull. astr. Soc. India 9, 31.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2821

Konkoly Observatory
Budapest
21 November 1985
HU ISSN 0374 - 0676

PHOTOMETRY OF THE WOLF-RAYET STAR HD191765

The star HD191765 (WN6) is known to be a photometric and spectroscopic variable with a period of $7^d.44$ (Antokhin et al., 1982). It has been suggested that it is a binary system consisting of a WR and a neutron star (Antokhin et al. 1982) i.e. is one of the so-called WR+ compact companion (Moffat, 1983). In a recent paper one of us (Vreux, 1985) has drawn the attention on the peculiar distribution of the published periods of the members of that family and has suggested that some of these periods could be aliases of the true ones which would be much shorter and would have been missed due to the distribution of the observations. HD191765 is one of the candidate to be reinvestigated in search of shorter periods.
Observations spanning an interval of 14 days were carried out in August 85 at the 1 m. telescope of the Mont Chiran station of the Haute Provence Observatory (France). The photometer (PAM II) was used in a classical one-channel configuration.
The photomultiplier was not cooled.

In an attempt to separate the respective contributions of the lines and of the continuum, three filters were used.

1 - central wavelength 4060 Å, $\Delta\lambda$ = 70 Å (= IHW C_3 filter) isolating the NIV line (the reason for the choice of that line is given in Vreux et al., 1985);
2 - C.W. 4100 A, $\Delta\lambda$ = 180 Å (= Strömgren v) covering lines of HeII, NIV, NIII...;
3 - C.W. 4260 A, $\Delta\lambda$ = 65 Å (IHW CO^+ filter) practically line free.

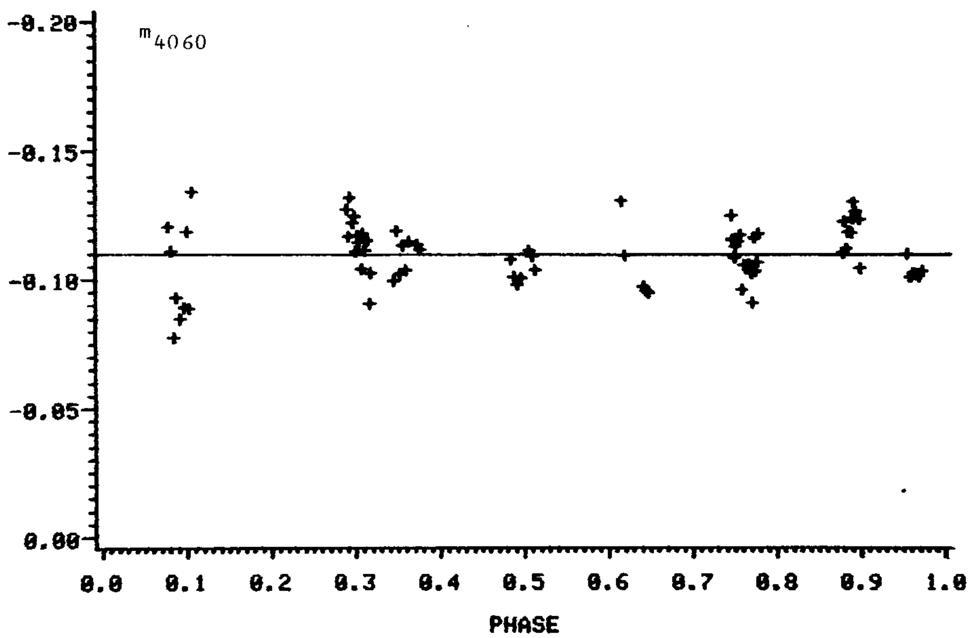


Fig. 1. Phase diagram of HD191765 with a period of 7.44 days. The comparison stars are HD192536 and HD192537. The y axis is m_{4060}.

3 comparison stars were observed: HD192020 (G8V), HD192536 (Am) and HD192537 (B8V) with the hope that at least the Am star would prove to be constant. The observations were made in rapid sequences so as to cancel as much as possible instrumental and atmospheric variations.

The comparison HD192020 has shown small variations. On the other hand, the pair HD192536, HD192537 remained quite constant.

All measurements were therefore compared to those stars in a differential manner.
Instrumental problems prevented us to observe more than five nights with all three filters. The remaining of the observing run

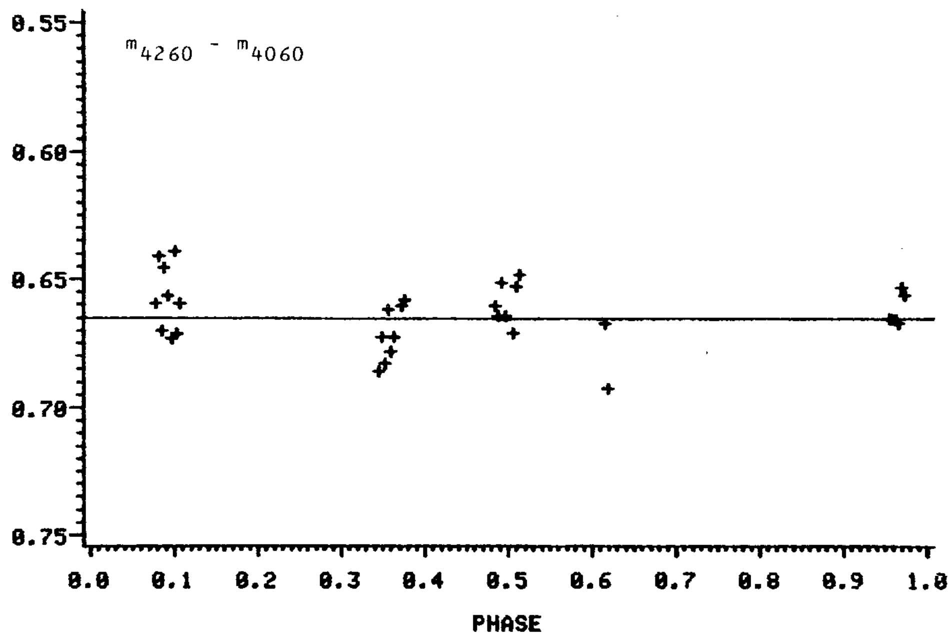


Fig. 2. Same as Fig. 1. for the color index m_{4260}-m_{4060}.

had to be done with the 4060 Å filter only. The residual noise of the data was much higher than expected, again because of instrumental reasons. Nevertheless, the data relative to the comparison stars demonstrated that night to night variations as small as 0.01 magn. could be detected.

The data presented in Figures 1 and 2 are plotted as a function of the phase for a period of 7.44 days. (Period suggested by Antokhin, Aslanov and Cherepashchuk, 1982).

Fig. 1 shows the 4060 Å (NIV) magnitude compared to 1/2 (HD192536 + HD192537). The magnitudes of the comparison stars were smoothed with a time scale of 30 minutes. The resulting differences were binned in intervals of about 30 minutes. If one forgets the noise within each night, our data suggest variations not larger than 0.01 or 0.02. The color index (m_{4260} - m_{4060}) plotted in Fig. 2, and based on only five nights, indicates variations of about 0.02 magn.

Although the sampling is less than complete, we have to conclude that our data do not support the light curve determined by Antokhin et al. (1982). Unfortunately we are not able to suggest another period: our time base is not sufficient due to the instrumental problems encountered.

J.M. VREUX
J.MANFROID
Institut d'Astrophysique
B-4200 Liège
BELGIUM

References:

Antokhin, I.I., Aslanov, A.A., Cherepashchuk, A.M., 1982, Pis'ma Astron. Zh. 8, 290.

Moffat, A.F.J., 1983, in WR Stars: Progenitors of Supernova, Proceedings of the Workshop held at the Observatoire de Paris-Meudon, April 20-22, 111, 13.

Vreux, J.M., 1985, Publ. Astron. Soc. Pac., 97, 274-279.

Vreux, J.M., Andrillat, Y., Gosset, E., 1985, Astron. Astrophys., 149, 337-342.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2822

Konkoly Observatory
Budapest
21 November 1985
HU ISSN 0374 - 0676

PHOTOMETRY OF THE G8V STAR HD192020

During an observing run devoted to Wolf-Rayet stars, the G8V star HD192020 was used as a comparison. The observational conditions are described in our previous paper (I.B.V.S., No. 2821).

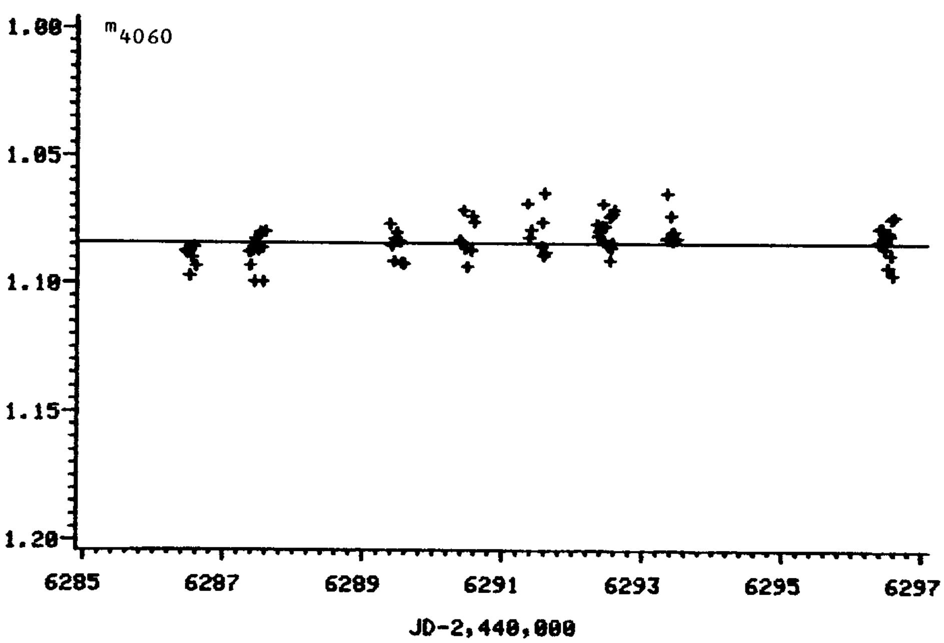


Fig. 1. Variations of HD192020 as a function of the heliocentric Julian Date. The comparison stars are HD192536 and HD192537.

Comparison with the two constant stars HD192536 and HD192537 revealed a clear continuous variation. The range of amplitude in the three filters used is of about .02 magn. A period (if the variations are periodic) cannot be established, of course, but it could be of about 10 to 20 days. A shorter alias close to 1 day seems to be ruled out despite the noise in our data.

No indication on the origin of those variations can be given. Further investigations, photometrically and spectroscopically are clearly needed.

Fig. 1 shows the variation of m_{4060} as a function of the heliocentric Julian date. The data are HD192020 - 1/2 (HD192536 + HD192537) smoothed with a time scale of 30 minutes.

J.M. VREUX
J. MANFROID
Institut d'Astrophysique
B-4200 Liège
BELGIUM.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2823

Konkoly Observatory
Budapest
26 November 1985
HU ISSN 0374 - 0676

A SEQUENCE OF COMPARISON STARS IN THE NEIGHBOURHOOD OF TT ARIETIS

In linking to the photoelectric UBV sequence in SA 71 given by Purgathofer (1969) and to the UBV magnitudes of Fuhrmann's star c (1981) given by Shafter (1985) on the plates of the Schmidt camera 50/70/172 cm and with the photoelectric 60 cm telescope I of Sonneberg Observatory a sequence of comparison stars in UBV in the neighbourhood of TT Arietis was established.

The individual stars which were measured are marked in Figure 1. The objects of the brighter part of the sequence are identical with known comparison stars given in the finding charts of the AAVSO (capital letters) and Fuhrmann (1981) (small letters from a to f). The designation of those stars has been retained. My own designation of stars is beginning with the letter g.

Photoelectric UBV measurements of the comparison stars given by Fuhrmann (1981) were obtained by W. Wenzel by linking them to Shafter's star ($V=10\overset{m}{.}99$, $B-V=0\overset{m}{.}69$, $U-B=0\overset{m}{.}23$).

The measurements on the photographic plates are extended to fainter stars

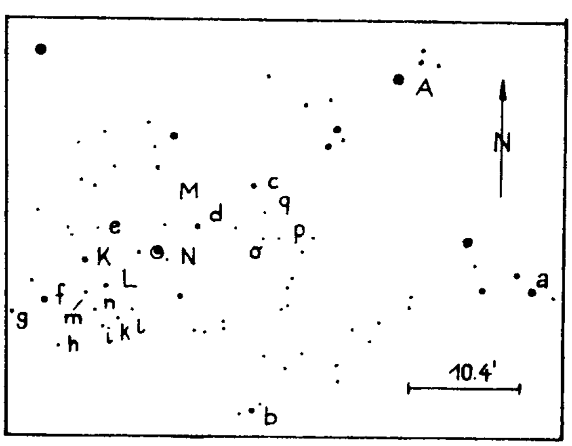


Figure 1

and to those given in the AAVSO finding chart. The individual magnitudes and colour indices of the comparison stars are listed in Table I. Comparing there

Table I

Comparison star	V	B	U	B–V	U–B	Remarks
a	$9^{m}.73$	$10^{m}.26$	$10^{m}.23$	$0^{m}.53$	$-0^{m}.03$	pe
b	10.50	11.13	11.33	0.63	+0.20	pe
c	10.99	11.68	11.91	0.69	+0.23	pe
d	11.02	12.17	13.38	1.15	+1.21	pe
e	11.76	12.34	12.42	0.58	+0.08	pe
f	12.01	13.01	13.80	1.00	+0.79	pe
g	13.80	14.67	15.20	0.87	+0.53	pg
h	14.15	14.94	15.30	0.79	+0.36	pg
i	13.95	14.63	15.05	0.68	+0.42	pg
k	14.55	15.26	15.90	0.71	+0.64	pg
l	15.10	15.74	16.05	0.64	+0.31	pg
m	15.75	15.88	16.05	0.13	+0.17	pg
n	15.75	16.24	16.30	0.49	+0.06	pg
o	15.95	16.12	16.40	0.17	+0.28	pg
p	16.20	16.42	16.25	0.22	-0.17	pg
q	15.75	16.27	16.50	0.52	+0.23	pg
A	9.20	9.55	9.25	0.35	-0.30	pg
K	12.55	13.24	13.65	0.69	+0.41	pg
L	13.25	13.54	13.85	0.29	+0.31	pg
M	13.86	14.37	15.20	0.51	+0.83	pg
N	14.85	15.27	15.60	0.42	+0.33	pg

the magnitude in B with those given by Fuhrmann, it can be seen that the stars a, b and c are brighter than published previously.

W. GÖTZ

Akademie der Wissenschaften
der DDR, Zentralinstitut für
Astrophysik, Sternwarte Sonneberg
DDR

References:

Fuhrmann, B., 1981, Mitt. Veränderl. Sterne Sonneberg, 9, 14.
Purgathofer, A.Th., 1969, Lowell Obs. Bull., Vol.VII, 98.
Shafter, A.W., 1985, Astrophys. J., 290, 707.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2824

Konkoly Observatory
Budapest
26 November 1985
HU ISSN 0374 - 0676

THE VARIABILITY OF HD 224 559

HD 224 559 = HR 9070 = LQ And is classified as a B3 IV star of Beta Cep type (Borgman, 1960). Provin (1953) used it as a check star for HD 224 801. Percy (1979) and Percy et al. (1981) observed HD 224 559 on nine nights altogether. They found short time-scale light variations for all single runs with amplitudes of 0.01 to 0.06 mag. The periodogram analysis shows possible time scales of 0.20 to 0.29 day with an average value of $P = 0.238 \pm 0.003$ day.

During 1978 we used this object as a second comparison star for the investigation of the Ap star HD 224 801. The observations were carried out with our twin telescope stationed at the observatory Shemakha of the Aserbaidshanian Academy of Sciences (Hildebrandt et al., 1985). During the search for short time light variations of HD 224 801 we also obtained five measurement series (HD 3 - HD 224 559) in the U, B, V region. The observations (Table I) were subjected to a frequency analysis using Deeming's (1975) method within the interval of periods 0.15 - 0.4 day. In all three spectral regions (U, B, V) we were able to localize two periods at the same point of the power spectrum. The best fit of the theoretical curve to the observations was realized by formula (1) when the two periods determined and their first overtones were used.

$$\Delta m(t) = A + \sum_{k=1}^{2} \sum_{j=1}^{2} (B_{kj} \cdot \sin(k \cdot 2 \cdot \pi \cdot \nu(j)t) + C_{kj} \cdot \cos(k \cdot 2 \cdot \pi \cdot \nu(j)t)) \qquad (1)$$

The results of the calculations for the V spectral region are summarized in Table II. For this region we obtained the smallest error for the theoretical curve.

The five measurement series for the V spectral region are shown in Figure 1. The full line is the theoretical curve of the light variations of this star. Time is given in minutes of Julian day, the latter being written at the top of each figure. These results are in agreement with those of Percy.

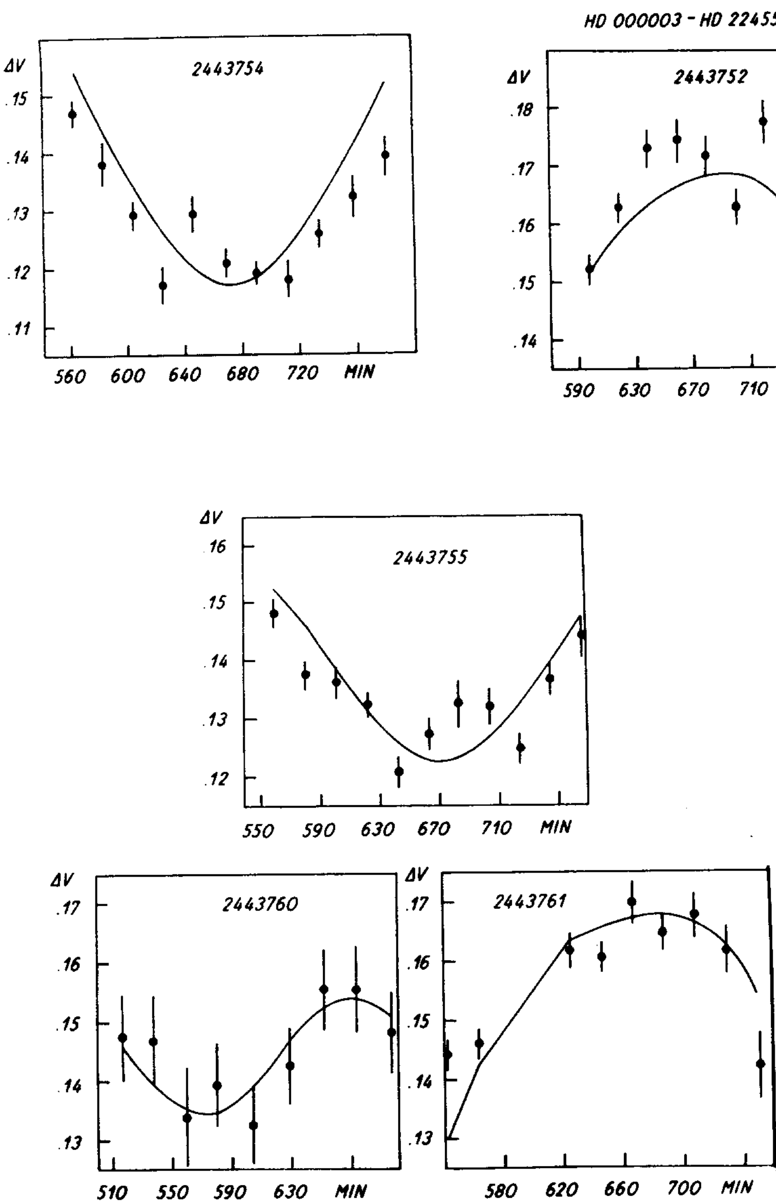


Figure 1. Short time light variations of HD 224 559

Table I. Measurement series (HD 3 - HD 224 559)

Julian Date	ΔV	ΔΔV	ΔB	ΔΔB	ΔU	ΔΔU
43752.4151	0.1522	0.0027	0.3205	0.0030	1.0421	0.0030
43752.4301	0.1627	0.0027	0.3240	0.0029	1.0407	0.0039
43752.4436	0.1730	0.0033	0.3420	0.0034	1.0528	0.0043
43752.4580	0.1744	0.0038	0.3401	0.0026	1.0500	0.0040
43752.4722	0.1717	0.0033	0.3341	0.0025	1.0475	0.0039
43752.4869	0.1628	0.0031	0.3278	0.0036	1.0387	0.0039
43752.5008	0.1774	0.0037	0.3410	0.0036	1.0607	0.0034
43752.5149	0.1727	0.0030	0.3360	0.0035	1.0484	0.0036
43752.5300	0.1701	0.0029	0.3331	0.0026	1.0447	0.0035
43754.3903	0.1468	0.0023	0.3090	0.0031	1.0230	0.0034
43754.4048	0.1381	0.0038	0.3027	0.0035	1.0134	0.0034
43754.4194	0.1292	0.0025	0.2911	0.0023	0.9996	0.0039
43754.4336	0.1172	0.0031	0.2831	0.0030	0.9942	0.0039
43754.4484	0.1294	0.0031	0.2928	0.0032	1.0061	0.0031
43754.4646	0.1209	0.0024	0.2862	0.0029	1.0026	0.0029
43754.4794	0.1191	0.0020	0.2858	0.0025	0.9957	0.0036
43754.4941	0.1180	0.0030	0.2850	0.0025	0.9927	0.0026
43754.5098	0.1258	0.0024	0.2889	0.0030	1.0015	0.0035
43754.5261	0.1321	0.0035	0.2912	0.0037	0.9992	0.0034
43754.5425	0.1389	0.0033	0.2985	0.0034	1.0128	0.0027
43755.3885	0.1481	0.0027	0.3104	0.0024	1.0181	0.0029
43755.4028	0.1375	0.0025	0.2971	0.0020	1.0169	0.0033
43755.4176	0.1362	0.0028	0.2939	0.0026	1.0042	0.0027
43755.4320	0.1324	0.0022	0.2929	0.0024	1.0106	0.0032
43755.4461	0.1208	0.0027	0.2904	0.0029	1.0035	0.0029
43755.4604	0.1273	0.0026	0.2915	0.0021	1.0035	0.0022
43755.4743	0.1324	0.0041	0.2943	0.0032	1.0076	0.0037
43755.4886	0.1319	0.0031	0.2942	0.0030	1.0108	0.0031
43755.5025	0.1247	0.0025	0.2946	0.0030	1.0073	0.0021
43755.5176	0.1365	0.0028	0.3030	0.0022	1.0101	0.0026
43755.5324	0.1439	0.0035	0.3086	0.0025	1.0180	0.0030
43760.3588	0.1475	0.0072	0.3156	0.0063	1.0301	0.0079
43760.3739	0.1470	0.0077	0.3116	0.0064	1.0278	0.0076
43760.3886	0.1339	0.0083	0.2997	0.0065	1.0193	0.0073
43760.4028	0.1394	0.0070	0.3036	0.0069	1.0271	0.0071
43760.4191	0.1326	0.0064	0.3073	0.0067	1.0217	0.0081
43760.4368	0.1426	0.0065	0.3076	0.0059	1.0218	0.0075
43760.4525	0.1555	0.0069	0.3202	0.0065	1.0375	0.0076
43760.4682	0.1555	0.0073	0.3243	0.0058	1.0365	0.0077
43760.4843	0.1482	0.0069	0.3205	0.0066	1.0332	0.0077
43761.3763	0.1443	0.0026	0.3128	0.0024	1.0295	0.0029
43761.3911	0.1461	0.0027	0.3164	0.0029	1.0210	0.0039
43761.4340	0.1618	0.0029	0.3269	0.0029	1.0430	0.0029
43761.4484	0.1605	0.0024	0.3287	0.0022	1.0482	0.0034
43761.4631	0.1698	0.0035	0.3335	0.0040	1.0404	0.0032
43761.4774	0.1647	0.0029	0.3405	0.0029	1.0450	0.0038
43761.4915	0.1676	0.0038	0.3348	0.0028	1.0391	0.0030
43761.5060	0.1617	0.0039	0.3248	0.0028	1.0292	0.0037
43761.5207	0.1422	0.0056	0.3114	0.0041	1.0166	0.0033

Table II. Results of calculations for the V spectral region

P [d]	Amplitude (V) [mag] fundamental period	Amplitude (V) [mag] first overtone
0.2365	0.033	0.006
0.2647	0.028	0.010

The scatter of the period and the amplitude found by him can be interpreted as a beat effect resulting from the two periods. No significant colour variation in (B-V) and (U-B) was found. The ratio of the above periods $P_1/P_2 = 0.89$ points to a non-radial pulsation but this needs confirmation by further observations.

G. HILDEBRANDT

Zentralinstitut für Astrophysik
Rosa-Luxemburg-Str. 17 a,
DDR-1502 Potsdam-Babelsberg

References:

Borgman, J., 1960, Bull. Astron. Inst. Neth., 15, 255.
Deeming, T.J., 1975, Astrophys. Space Sci., 36, 137.
Hildebrandt, G., Schöneich, W., Lange, D., Zelwanowa, E., Hempelmann, A., 1985, Potsdamer Publ., 112, Bd.32,5.
Percy, J.R., 1979, Inf. Bull. Var. Stars, No. 1530.
Percy, J.R., Jakate, S.M., Matthews, J.M., 1981, Astron. J., 86, 53.
Provin, S.S., 1953, Astrophys. J., 118, 489.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2825

Konkoly Observatory
Budapest
27 November 1985
HU ISSN 0374 - 0676

THE VARIABILITY OF ET And

The peculiar star ET And (= HD 219 749 = HR 8861) has been observed photoelectrically in the National Astronomical Observatory (Bulgaria) in 1981-1984 using the 60 cm telescope and the UBV photoelectric photometer. Our photometric observations reveal two different types of variability: periodic light variations with $P = 1^{d}.61887$, probably resulting from the rotation of the star, and $0^{d}.0994$ period light variations (with an amplitude of 0.01 - 0.02 mag) the origin of which is still uncertain. One possible origin of this variability could be pulsational instability.

The standard UBV magnitudes obtained in October 1984 are: V = 6.45 , B-V = -0.02 , and U-B = -0.25 . These values are in good agreement with Crawford's (1963) photometry. Using the standard reddening law E(U-B)/E(B-V) = 0.72 we obtained E(B-V) = 0.06 and E(U-B) = 0.03. The unreddened colours of ET And therefore are: $(B-V)_0 = -0.08$ and $(U-B)_0 = -0.28$. The UBV data seem to indicate a location for ET And near or on the main sequence of B8 but UBV photometry is not well suited for determining the luminosity class. Crawford's (1963) Hβ photometry indicates a main sequence position of ET And, while other spectroscopic criteria (Scholz, 1985, private communication) show a position above the main sequence. The luminosity class of ET And is, therefore, still uncertain. Indirect evidence could be obtained from the photometric period of 1.6 days. We believe that this variation is due to the rotation of the star. From the 1.6 day period and the value of $v \cdot \sin i = 79$ km/s (Barylak and Rakos, 1983) the radius of the star can be derived: $R \approx 3R_{\odot}$ which is consistent with the main sequence position. In order to determine the T_{eff} of this star, we used the calibration of peculiar stars by Stepien and Muthsam (1980). Our photometry gives $T_{eff} = 10700^{o} - 10900^{o}K$, i.e. the star lies clearly outside the instability strip. This finding makes it difficult to interpret the 0.0994 day light variability as a pulsation (radial?) of the star. Furthermore, there are indications of rapid light variability with periods of the order of minutes. Fourier analysis of B and U data, obtained on four nights in November 1982 shows possible existence of

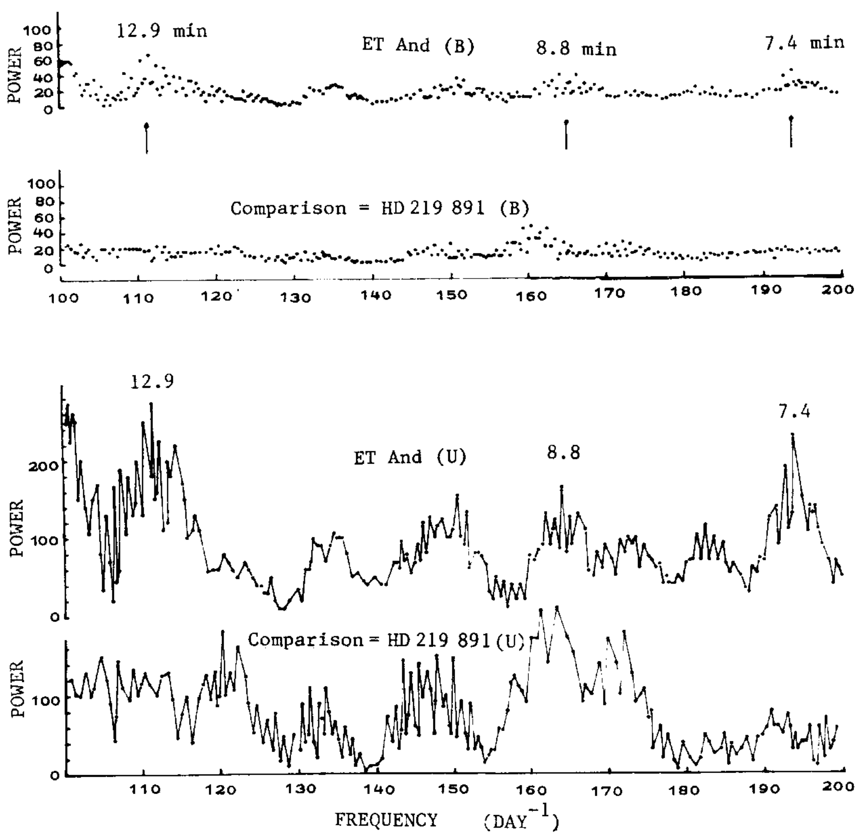


Figure 1

rapid light oscillations at f = 194 day^{-1} , corresponding to 7.4 min period (amplitudes: 0.002 mag in B, and 0.006 mag in U). In order to account for atmospheric effects the comparison star HD 219 891 was observed alternatively with ET And. For each star the total monitoring time was 11.5 hours and for each of them 199 points were obtained (in both B and U filters). We plotted the Fourier spectra for the frequency interval 100 - 200 day^{-1} separately for ET And and the comparison star in Figure 1. The method of Deeming (1975) was used. Since the comparison star was observed in the same conditions as ET And, all possible disturbances due to atmospheric and instrumental effects should be contained in the "comparison spectra". From Figure 1 another possible frequency of rapid light oscillations appears at about 13 min. Considering the small amplitudes of the rapid light oscillations, a confirmation of these results is needed. Rapid light oscillations in several Ap stars have been discovered by Kurtz (1982) and can be interpreted as non-radial pulsations at high overtones.

K.P. PANOV

Department of Astronomy and
National Astronomical Observatory
Bulgarian Academy of Sciences
72 Lenin Blvd, Sofia - 1184
Bulgaria

References:

Barylak, M., and Rakos, K.D., 1983, Astron. Astrophys., 127, 366.
Crawford, D.L., 1963, Astrophys. J., 137, 530.
Deeming, T.J., 1975, Astrophys. Space Sci., 36, 137.
Kurtz, D.W., 1982, Mon. Not. R. astr. Soc., 200, 807.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2826

Konkoly Observatory
Budapest
27 November 1985
HU ISSN 0374 - 0676

PHOTOELECTRIC OBSERVATIONS OF EV Lac IN 1984

Photoelectric monitoring observations of the flare star EV Lac in the U bandpass have been carried out in the National Astronomical Observatory of the Bulgarian Academy of Sciences, using the 60 cm telescope and the one-channel photoelectric photometer.

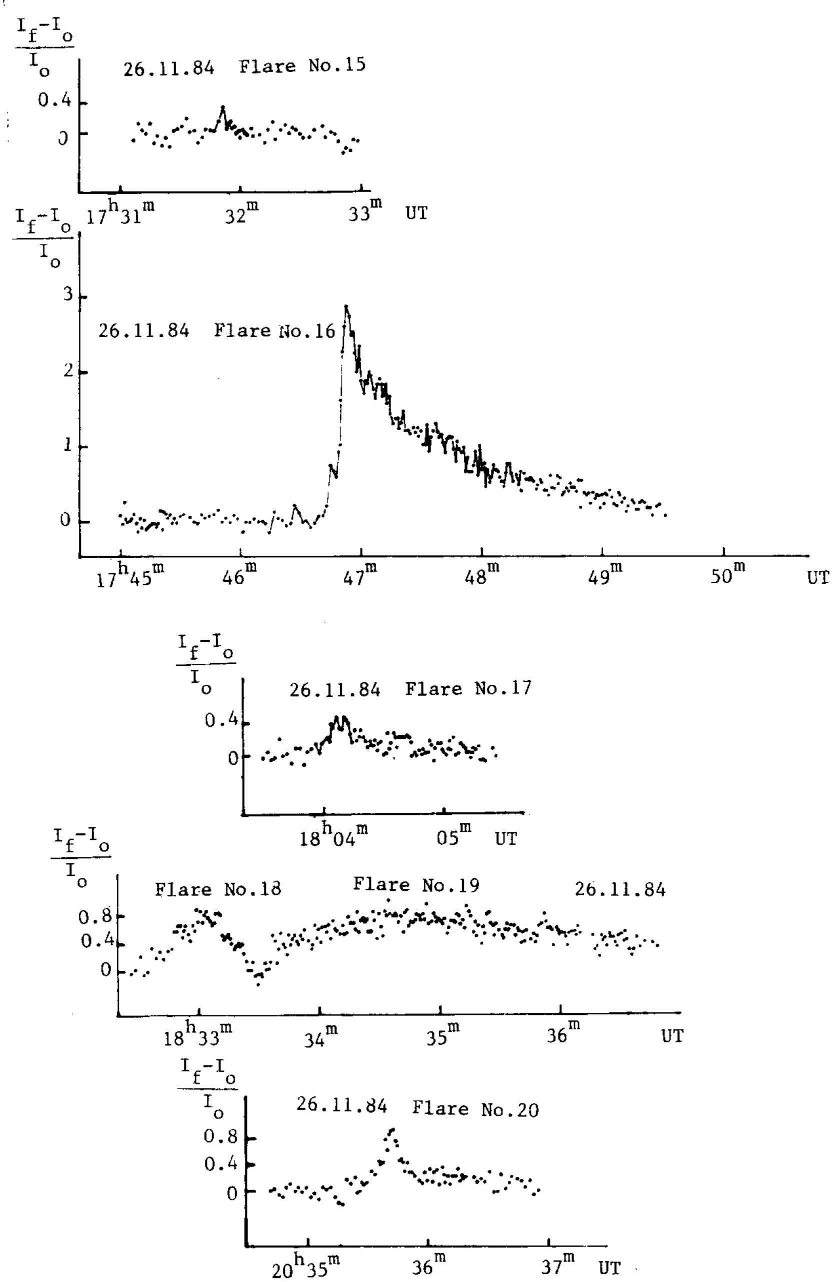
Table I gives the monitoring intervals in UT, number of flares observed and mean errors (σ/I_o) for the respective run. The characteristics of the individual flares observed are given in Table II:

a) Date and Universal Time of maximum;

b) Flare rise time;

Table I. Coverage of the flare star EV Lac in 1984

Date 1984	Monitoring intervals UT	Total monit. time	Number of flares	σ/I_o
July 24/25	$23^h50^m28^s$ - $00^h25^m53^s$, 00 26 42 - 00 51 00.	$0^h59^m43^s$	3	0.11
July 31/ Aug. 1	23 39 36 - 00 13 21, 00 14 15 - 00 35 42, 00 36 30 - 01 07 42.	1 26 24	2	0.12
Aug. 29	22 06 45 - 22 24 19, 22 25 58 - 22 46 50.	0 38 26	1	0.07
Aug. 30	22 45 36 - 23 08 34, 23 09 27 - 23 49 12.	1 02 43	1	0.11
Oct. 1	18 15 06 - 19 32 38.	1 17 32	3	0.10
Nov. 23	18 34 15 - 18 48 07, 18 51 21 - 18 57 37, 18 58 37 - 19 44 02.	1 05 33	1	0.09
Nov. 24	18 37 53 - 19 43 06, 19 45 43 - 20 06 14.	1 25 44	2	0.08
Nov. 25	16 24 16 - 16 41 15, 16 46 14 - 16 48 09, 16 49 18 - 19 00 46, 19 05 54 - 19 44 16.	3 08 44	1	0.09
Nov. 26	17 22 42 - 18 52 09, 18 55 43 - 19 13 38, 20 16 25 - 21 01 14.	2 32 11	6	0.10
	Total:	$13^h37^m00^s$	20	



$\frac{I_f - I_o}{I_o}$
26.11.84 Flare No.15
0.4
0
17h31m
32m
33m
UT
26.11.84 Flare No.16
3
2
1
0
17h45m
46m
47m
48m
49m
50m
UT
26.11.84 Flare No.17
0.4
0
18h04m
05m
UT
Flare No.18
Flare No.19
26.11.84
0.8
0.4
0
18h33m
34m
35m
36m
UT
26.11.84 Flare No.20
0.8
0.4
0
20h35m
36m
37m
UT

Figure 1

Table II. Characteristics of the flares observed

Flare No.	Date 1984	UT max.	t_{rise} sec	$t_{0.5}$ sec	Duration sec	$(I_f-I_o)/I_o$	σ/I_o	log E ergs
1	25 July	$00^h14^m25^s$	2	3	12	0.43	0.10	29.39
2	25 July	00 24 11	71	7	300	3.10	0.11	31.13
3	25 July	00 38 26	26	10	80	0.49	0.11	30.27
4	1 Aug.	00 09 52	4	8	52	0.63	0.12	30.23
5	1 Aug.	00 32 37	7	8	80	0.88	0.13	30.36
6	29 Aug.	22 12 24	144	155	1740	3.47	0.07	32.31
7	30 Aug.	22 49 55	20	4	35	0.49	0.11	29.98
8	1 Oct.	18 53 50	13	50	163	0.55	0.11	30.67
9	1 Oct.	19 12 29	2	4	23	0.48	0.11	29.85
10	1 Oct.	19 17 21	5	1	20	0.54	0.09	29.75
11	23 Nov.	18 35 44	15	26	121	0.58	0.08	30.59
12	24 Nov.	18 42 57	4	3	8	0.23	0.07	29.07
13	24 Nov.	19 57 53	10	3	22	0.36	0.10	29.71
14	25 Nov.	17 43 56	34	44	108	0.56	0.09	30.49
15	26 Nov.	17 31 51	4	1	13	0.33	0.10	29.44
16	26 Nov.	17 46 53	36	22	643	2.91	0.09	31.37
17	26 Nov.	18 04 10	18	10	98	0.50	0.12	30.42
18	26 Nov.	18 32 59	30	21	61	0.87	0.10	30.49
19	26 Nov.	18 34 35	65	65	390	0.99	0.10	31.40
20	26 Nov.	20 35 43	23	5	160	0.92	0.08	30.61

Remark: the optical companion of EV Lac has been excluded

c) Flare decline time to 0.5 of the maximum;

d) Total flare duration;

e) Intensity of the flare radiation at maximum, $(I_f-I_o)/I_o$, where I_f is the intensity of star plus flare (reduced for background) and I_o is the quiet-state star intensity (reduced for background);

f) Random noise σ/I_o;

g) Total flare energy, estimated by integration of the flare intensity over the total duration of the flare.

Fig. 1 shows 6 flares of EV Lac, observed on November 26, 1984 in the U-filter.

During the total of 13.62 hours monitoring time 20 flares were registered. Therefore the frequency of flares for our patrol is: $f = 1.47 \pm .33$ flares per hour. Comparing this frequency with previously reported for EV Lac by Moffett, 1974 (22 flares in 66.3 hours) we come to the conclusion, that during August-November 1984 EV Lac was in an enhanced activity state.

K. P. PANOV

Department of Astronomy and
National Astronomical Observatory
Bulgarian Academy of Sciences
72 Lenin Blvd
1184 Sofia
Bulgaria

V. PIIROLA

Observatory and
Astrophysics Laboratory
University of Helsinki
Tähtitorninmäki
SF-00130 Helsinki
Finland

T. KORHONEN

Turku University
Observatory
Tt. Pitkäkatu 1
20520 Turku 52
Finland

Reference :

Moffett, T.J.: 1974, Astrophys. J. Suppl. Ser. 29, No. 273.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2827

Konkoly Observatory
Budapest
29 November 1985
HU ISSN 0374 - 0676

PHOTOELECTRIC LIGHT CURVES AND EPHEMERIS OF FM VELORUM

The variability of the twelfth magnitude short period eclipsing binary FM Velorum ($\alpha_{1985} = 9^h47^m11^s$, $\delta_{1985} = -53^o24'06''$) was first announced by Van Houten (1951). He classified this variable as a W UMa type system and obtained, on the basis of his photographic measurements, the following ephemeris:

$$\text{Min.I.} = \text{J.D.hel. } 2429043.238 + 0^d.3895262 \cdot E$$

So far, no other data have been published on this star. During an observing run at Las Campanas Observatory (LCO), Chile, FM Velorum was observed photoelectrically in the UBV system using the 60-cm telescope of the David Dunlap Observatory. An RCA 1P21 photomultiplier refrigerated by dry ice, photon-counting electronics and standard UBV filters were used. The measurements were made differentially with respect to the comparison star which is designated with number 2 in our finding chart (Figure 1).

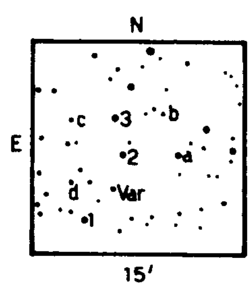


Figure 1. Finding chart of FM Velorum

All the observations have been corrected for first and second-order differential extinction. Standard stars were also observed at LCO during four different nights so the data could be converted into the standard UBV system. No variation in the light of the comparison star was detected. This star was found to have the following mean values:

$V = 11\overset{m}{.}314$, $B-V = 0\overset{m}{.}521$, $U-B = 0\overset{m}{.}255$

FM Velorum was found to have the following magnitude and colours at maximum light:

$V = 12\overset{m}{.}431$, $B-V = 0\overset{m}{.}561$, $U-B = 0\overset{m}{.}025$

The location of the variable in the colour - colour diagram (Schmidt-Kaler, 1965) is consistent with an unreddened main sequence star with an F8 spectral type.

A total of 1683 individual observations (561 in each band) has been obtained. The bisection-of-chords procedure was used to determine 9 times of primary minimum and 6 of the secondary one. A linear least squares solution using our photoelectric data yields the following updated ephemeris:

$$\text{Min.I.} = \text{J.D.hel. } 2446117.7481 + 0\overset{d}{.}389580 \cdot E \qquad (1)$$
$$\pm 0.0001 \quad \pm 0.000021$$

Table I lists the 15 times of minimum light reported in this note. The last two columns give the epoch numbers and the (O - C) residuals calculated from equation (1). Because of the shortness of the period and the large amount of time elapsed without observations, it is difficult to join unambiguously our minima with the older photographic ones. Consequently, no variability of the period can be asserted.

Orbital phases for all the observations have been calculated from the ephemeris given in equation (1) and hence, light and colour curves have been obtained. The differential light curves in the V-magnitude and (B-V) colour

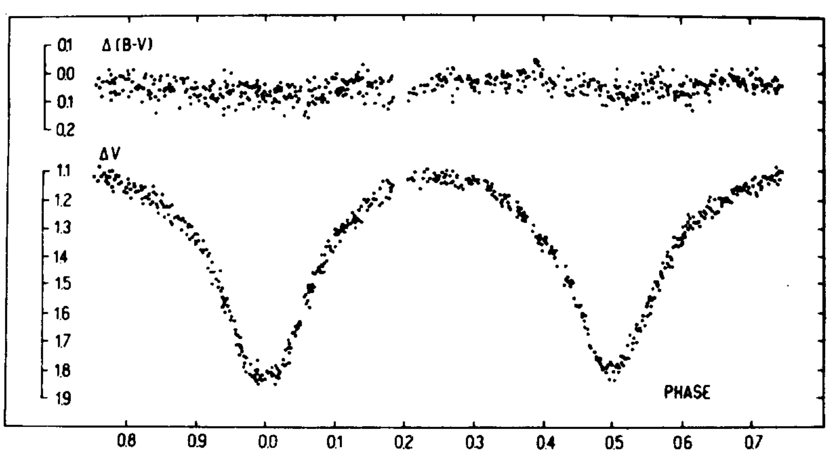


Figure 2. V and B-V light curves of the eclipsing binary FM Velorum

Table I. Times of minimum light of FM Velorum

Min.	Colour	J.D. Hel. 2440000.0 +	E	(O-C)
II	V	6116.7736	-2.5	-0.0005
II	B	6116.7734	-2.5	-0.0007
II	U	6116.7745	-2.5	0.0004
I	V	6117.7490	0.0	0.0009
I	B	6117.7485	0.0	0.0004
I	U	6117.7485	0.0	0.0004
II	V	6118.7220	2.5	-0.0001
II	B	6118.7220	2.5	-0.0001
II	U	6118.7219	2.5	-0.0001
I	V	6119.6957	5.0	-0.0003
I	B	6119.6956	5.0	-0.0004
I	U	6119.6959	5.0	-0.0001
I	V	6121.6436	10.0	-0.0003
I	B	6121.6441	10.0	0.0002
I	U	6121.6442	10.0	0.0003

are shown in Figure 2. The differences ΔV and $\Delta(B-V)$ are in the sense variable minus comparison star. Similar behaviours are shown by the remaining B, U and (U-B) curves. The colour indices remain nearly constant all over the orbital cycle, while the light curves show the typical configurations of W UMa type stars. Depths of primary and secondary minima are about 0.7 magnitudes. In particular, the primary minimum appears to be slightly flattened (total eclipse) in which the light remains constant for about 27 minutes. This would be indicating that we are dealing with a W-type of the contact binaries (Binnendijk, 1970).

A detailed analysis of FM Velorum by means of the Wilson and Devinney (1971) computer procedure will be developed and published elsewhere.

We are very grateful to Dr. R. Garrison for the observing time and facilities at LCO. This work was partially supported by the CONICET of Argentina.

E. LAPASSET*

J.J. CLARIA

Observatorio Astronómico
Laprida 854, 5000 Córdoba
Argentina

References:

Binnendijk, L., 1970, Vistas in Astronomy, 12, 217.
Schmidt-Kaler, Th., 1965, In: Landolt Bornstein, Numerical Data and Functional Relationships in Science and Technology, Group VI, I, Ed.: H. Voigt, Springer-Verlag , Berlin, p. 302.
Van Houten, C.T., 1951, Annals Sterrewacht Leiden, 20, 243.
Wilson, R.E., and Devinney, E.J., 1971, Astrophys. J., 166, 605.

* Visiting astronomer, University of Toronto (David Dunlap Observatory) 24-inch telescope at Las Campanas Observatory

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2828

Konkoly Observatory
Budapest
29 November 1985

HU ISSN 0374 - 0676

1985 - UBV LIGHT CURVES OF V508 OPHIUCHI

V508 Oph (BD+13°3496) is an uncommon eclipsing binary. Its variability was first detected by Hoffmeister (1935) and Jacchia (1936), who classified the star as a W UMa type eclipsing binary. Karetnikov (1963, 1977) obtained photographic and photovisual light curves with amplitudes of the order of $1^{m}.1$ in B and $0^{m}.7$ in V. Further BV photoelectric observations by Rovithis and Rovithis-Livaniou (1983) confirmed the mentioned peculiar amplitudes of light variations. More recently, Lapasset and Funes (1985) could not corroborate the previous photometric behaviour of V508 Oph from UBV data. Their 1984-observations showed normal W UMa type light curves with depths of minima of about $0^{m}.80$, $0^{m}.86$ and $0^{m}.94$ in V, B and U, respectively. The few observations made only partially covered the orbital cycle.

In this note, new photoelectric data obtained at El Leoncito Observatory (San Juan, Argentina) during the 1985 - winter season are presented. They were performed by means of a 76-cm reflector telescope, an RCA 34031(A) photomultiplier refrigerated by Peltier effect and photon-counting electronics. Standard UBV filters were also employed. The measurements were made differentially with respect to the comparison star BD+ 13°3495. All the observations were corrected for first and second order differential extinction using mean coefficients for El Leoncito.

A total of 249 UBV observations were derived and from them four new times of minima were calculated. The total of 11 photoelectric minima derived from Rovithis-Livaniou and Rovithis (1983), Lapasset and Funes (1985) and the present data, were used to deduce the following linear least squares ephemeris:

$$\text{Min.I. (JDhel.)} = \underset{\pm .0005}{2444785.3251} + \underset{\pm .00000019}{0^{d}.34479444} \cdot E \qquad (1)$$

Comparing this equation with the older ephemeris given by Karetnikov (1977):

$$\text{Min.I. (JDhel.)} = \underset{\pm .0002}{2428416.3342} + \underset{\pm .000000012}{0^{d}.344791922} \cdot E \qquad (2)$$

there seems to be a small increment in the orbital period. This will be studied in detail and published elsewhere.

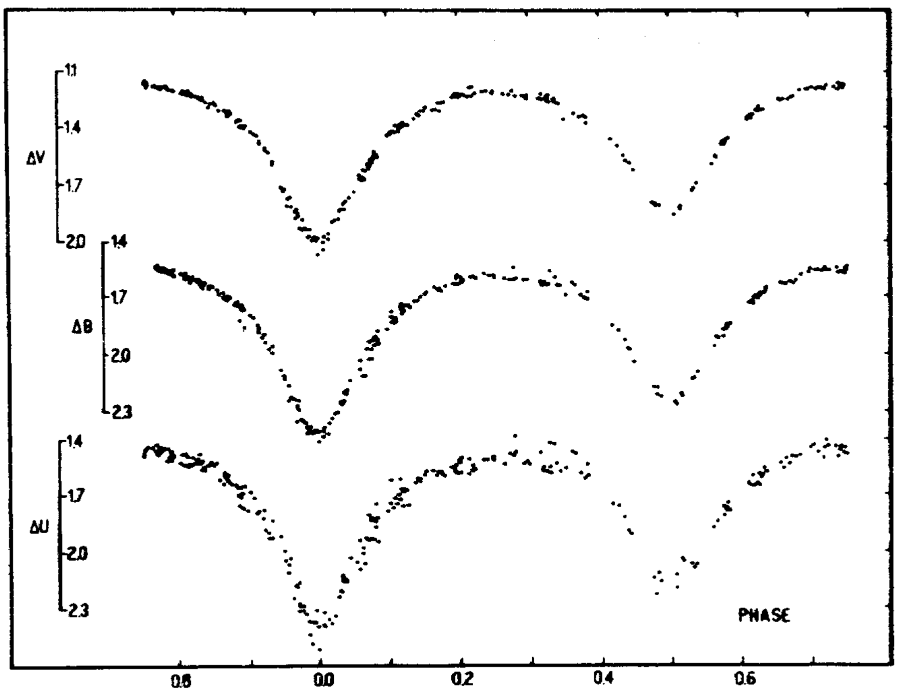


Figure 1. UBV light curves of V508 Ophiuchi

Table I. Photoelectric times of minimum of V508 Oph

Min.	JDhel. 2440000.+	E	O–C	Reference
II	4783.4265	-5.5	-0.0022	A
II	4784.4623	-2.5	-0.0008	A
I	4785.3283	0.0	0.0032	A
II	4785.4958	0.5	-0.0017	A
I	4786.3623	3.0	0.0028	A
I	4864.2816	229.0	-0.0014	A
I	5915.5615	3278.0	0.0003	B
I	6239.6684	4218.0	0.0003	C
I	6240.7035	4221.0	0.0011	C
II	6241.5635	4223.5	-0.0009	C
I	6241.7362	4224.0	-0.0006	C

References to Table I:

A: Rovithis-Livaniou and Rovithis (1983)

B: Lapasset and Funes (1985)

C: Lapasset (this work)

Equation (1) was used to calculate the phases of all the observations and the residuals (O–C) listed in Table I. The light curves of V508 Oph derived from 1984–85 observations are shown in Figure 1. The presumptions exposed by Lapasset and Funes (1985) are here confirmed: the present UBV data show the normal behaviour of W UMa type stars. Depths of primary minima are about $0^m\!.81$, $0^m\!.85$ and $0^m\!.92$ in V, B and U, respectively. The differences between primary and secondary minima are about $0^m\!.10$. Thus the conclusions of the mentioned paper are still valid: since errors can be assumed for neither the older nor the present data, it has to be believed that a sudden change has actually occurred to V508 Oph between 1981 and 1984.

The author is very grateful to the Director of the Felix Aguilar Observatory (San Juan) for granting the running time at El Leoncito Observatory.

E. LAPASSET

Observatorio Astronómico
de Córdoba and CONICET
Laprida 854
5000-Córdoba - Argentina

References:

Hoffmeister, C., 1935, Astron. Nachr., 255, 405.
Jacchia, L., 1936, Astron. Nachr., 261, 212.
Karetnikov, V.G., 1963, Perem. Zvezdy, 14, 348.
Karetnikov, V.G., 1977, Perem. Zvezdy, Suppl., 3, 247.
Lapasset, E., and Funes, J.G., 1985, Astrophys. Space Sci., (in press)
Rovithis, P., and Rovithis-Livaniou, H., 1983, Astrophys. Space Sci., 96, 283.
Rovithis-Livaniou, H., and Rovithis, P., 1983, Inf. Bull. Var. Stars., No.2317.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2829

Konkoly Observatory
Budapest
3 December 1985
HU ISSN 0374 - 0676

A NEW PERIOD FOR AP SERPENTIS

The variable AP Ser, discovered by Hoffmeister (1935), is an RR Lyrae star of type c, with a short period. The first known reference on the determination of the period is to Solovyev (1940). This is made in the first edition of the General Catalogue of Variable Stars by Kukarkin & Parenago (1948). They mention a period of 0.254464 days; subsequent editions give only minor corrections. No recent attempts seem to have been made to verify this period, although the available lightcurves are clearly irregular, even for an RRc type variable suffering from the Blazhko effect. See for example Varsavsky (1960) or even Lub (1977).

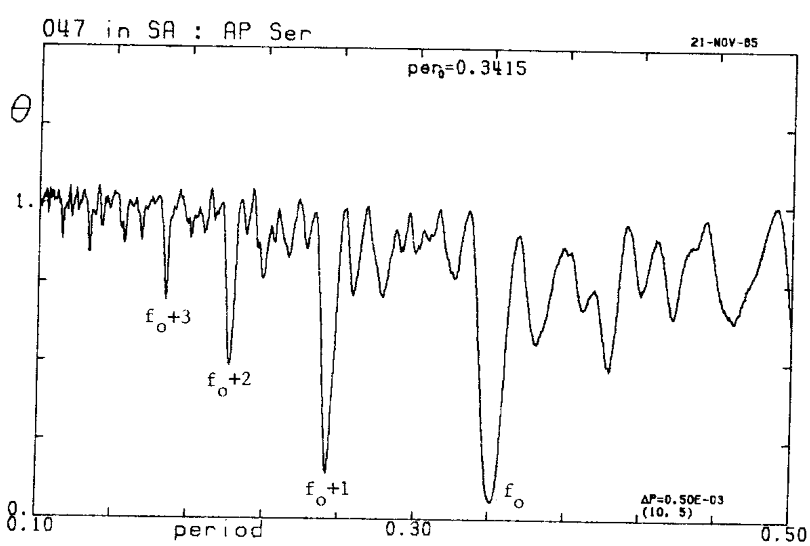


Figure 1

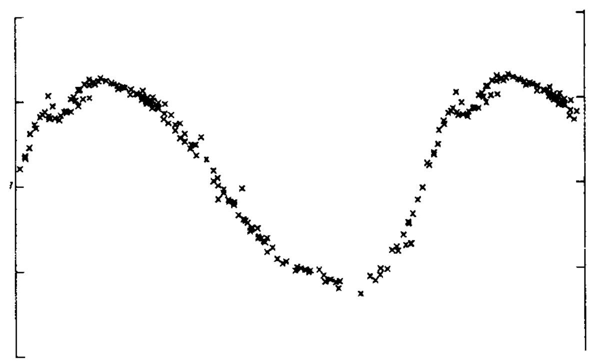


Figure 2

142 new measurements, made in the VBLUW-system by A.M. van Genderen in 1975 as part of a programme to study light-curve variations (as yet unpublished), were analyzed with the aid of a computer programme based on the method described by Stellingwerf (1978), which seeks to minimize the dispersion at constant phase. From this analysis a new period of 0.341320 days has been derived. The theta-transform of the data shows several major dips, which are identified in Figure 1. It is clear that the formerly assumed period is an alias of the correct one with the sidereal day. The B-light-curve, shown in Figure 2, is now typical for a c-type RR Lyrae star.

J.W. DE BRUIJN
and
J. LUB

Sterrewacht Leiden
Wassenaarseweg 78
Leiden, Holland

References :

Hoffmeister, C. (1935), Astronomische Nachrichten 255, 401.
Kukarkin, B.V., Parenago, P.P. (1948), Obshchy Katalog Peremennykh Zvyozd.
Lub, J. (1977), Astronomy & Astrophysics Suppl. 29, 345.
Solovyev, A.V. (1940), Astronomichesky Tsirkulyar 2.
Stellingwerf, R.F. (1978), Astrophysical Journal 224, 953.
Varsavsky, C.M. (1960), Astrophysical Journal 131, 623.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2830

Konkoly Observatory
Budapest
4 December 1985
HU ISSN 0374 - 0676

PERIOD CHANGES IN R Leo

R Leo is one of the best known Mira-variables. Since its discovery in 1782 this star was continuously observed by thousands of observers.

Irregularities in the period of R Leo were first discussed by Argelander (1869). Since then some other authors (e.g. Turner and Blagg, 1915) reported changes in the period. Later instantaneous elements were introduced in order to satisfy the observer's needs (for a short review on instantaneous elements, see Hoffmeister et al., 1984). During the last few years molecules, such as SiO, OH and H_2O, have been found in the circumstellar shell (see e.g. Hjalmarson and Olofsson, 1979) and the interrelations with the period (Ukita, 1982) and light variations (Le Squeren and Sivagnanam, 1985) were discussed. Recently Wood (1979) and Wood and Zarro (1981) studied the general problem of period changes in Miras in the context of stellar evolution.

Because of the comprehensive material published on R Leo (see Hoeppe, 1986), this star was chosen to prepare a study of its long-term variations. Due to the topical significance first results are given here.

The author collected all the literature on R Leo available to him (see Hoeppe, 1986).

The resulting (O-C)-diagram which covers 201 years of observation (1782-1983) is shown in Figure 1. In obtaining the O-C residuals, the elements as described by Kukarkin et al. (1969) were used in the slightly modified form

$$\text{Max.} = \text{J.D. } 2362947 + 312^{d}.57 \text{ E.}$$

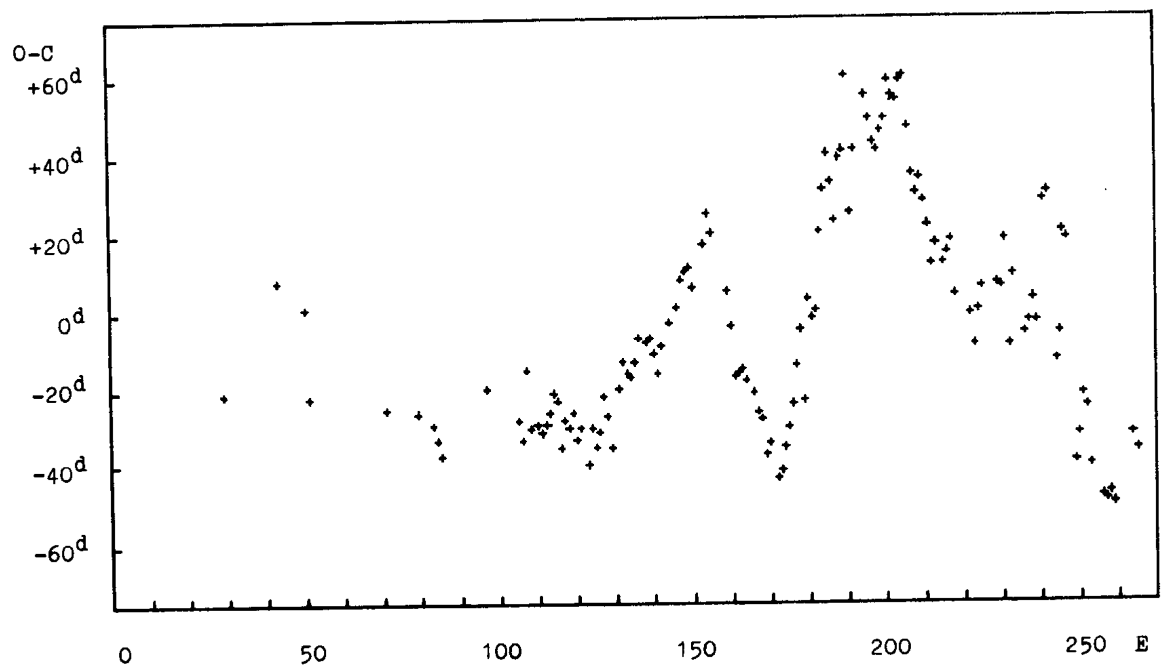


Figure 1

The residuals' large variations are clearly visible. As S Her, which was studied by Wood and Zarro (1981), R Leo shows abrupt period changes, although the amplitude of the O-C residuals is increasing in R Leo and is smaller than in S Her. The graph seems to be nearly linear between the residuals maxima (at epochs 153 and 206) and minima (at epochs 123 and 172).

In addition to Figure 1 some other results were derived from the data. These are given in the following compilation:

mean max. brightness	$= 5^m_.76 \pm 0^m_.44$	(n = 116)
mean min. brightness	$= 9^m_.96 \pm 0^m_.34$	(n = 81)
mean amplitude	$= 4^m_.14 \pm 0^m_.54$	(n = 51)
mean period	$= 312^d_.96 \pm 15^d_.86$	(n = 112)
mean M-m	$= 138^d_.23 \pm 13^d_.05$	(n = 64)

In this list the second value in each row indicates the standard deviation.

In regard to the current research on helium-shell flashes in Miras (see Wood and Zarro, 1981) extensive and continuous (O-C)-diagrams will provide a useful basis for further studies.

More data and a more extensive discussion including a study of some other long-term variations and the complete list of references to Figure 1 will be given in a forthcoming paper (Hoeppe, 1986).

Acknowledgement

It is a pleasure for me to thank Professor Dr. Voigt (Universitätssternwarte Göttingen) for his continuous help, the valuable suggestions and comments, and for the permission to use the library of Göttingen Observatory.

G.R. HOEPPE

Rudolf-Herzog Weg 9
3430 Witzenhausen 1
West Germany

References:

Argelander, F.W.A.: 1869, Astron. Beob. Sternw. Bonn 7, 361
Hjalmarson, A., Olofsson, H.: 1979, Astrophys. J. 234, L199
Hoeppe, G.R.: 1986, in preparation
Hoffmeister, C., Richter, G., Wenzel, W.: 1984, Veränderliche Sterne, 2nd ed., Springer, Berlin, p.73
Kukarkin, B.V., Kholopov, P.N., Efremov, Yu.N., Kukarkina, N.P., Kurochkin, N.E., Medvedeva, G.I., Perova, N.B., Fedorovich, V.P., Frolov, M.S.: 1969, General Catalogue of Variable Stars, 3rd ed., Moscow, Nauka
Le Squeren, A.M., Sivagnanam, P.: 1985. Astron. Astrophys. 152, 85
Turner, H.H., Blagg, M.A.: 1915, Mon. Not. R. Astron. Soc. 76, 169
Ukita, N.: 1982, Astron. Astrophys. 112, 167
Wood, P.R.: 1979, Astrophys. J. 227, 220
Wood, P.R., Zarro, D.M.: 1981, Astrophys. J. 247, 247

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2831

Konkoly Observatory
Budapest
9 December 1985
HU ISSN 0374 - 0676

1984 UBVR LIGHT CURVES OF ER Vul

The star ER Vul (SAO 089396) was discovered as a spectroscopic binary by Northcott and Bakos (1956), and included in the Hall (1976) list of short period RS CVn stars.

The system ER Vul was observed during 8 nights, on the 13th and from the 22nd to the 27th of August 1984, from the Observatorio del Roque de Los Muchachos at La Palma (Canary Islands), using the People's Photometer, a two channel photoelectric photometer and UBVR filters of Cousins system, (1976), at the Cassegrain focus of the 1m JK Telescope.

The stars SAO 089378 and SAO 089381 were used as comparisons. The results are given in Figures 1, 2, 3 and 4 where the differential magnitude is plotted against the phase, calculated using the ephemerides of Al-Naimiy (1981).

$$HJD = 2440182.3212 + 0\overset{d}{.}698082 \cdot E$$
$$\pm 8 \qquad \pm 2$$

The curves show irregularities which have already been commented in previous studies, Northcott and Bakos (1967), Al-Naimiy (1981), Kadouri (1981), Hrivnak (1982) and Zeilik et al. (1982).

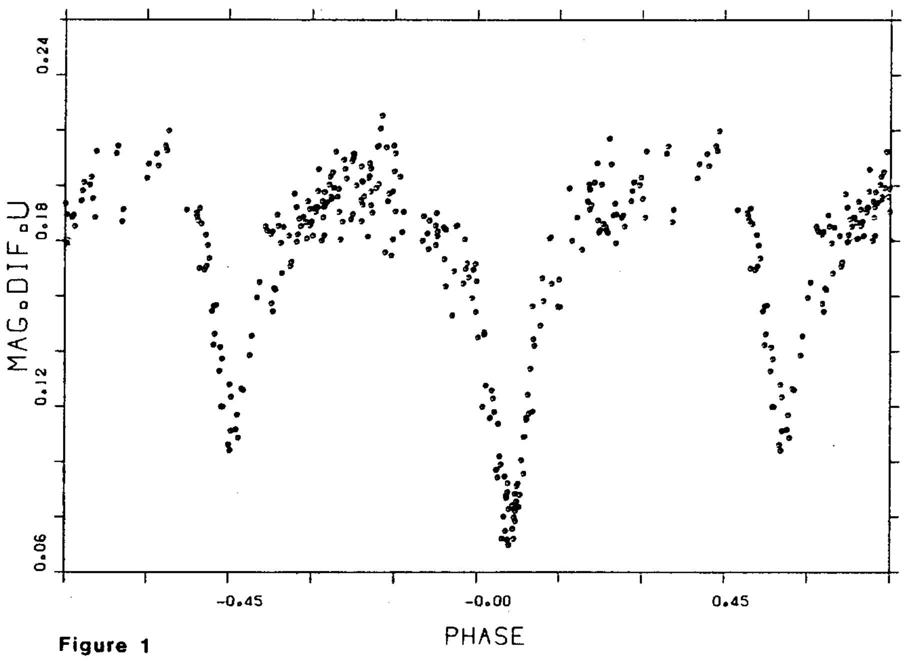


Figure 1

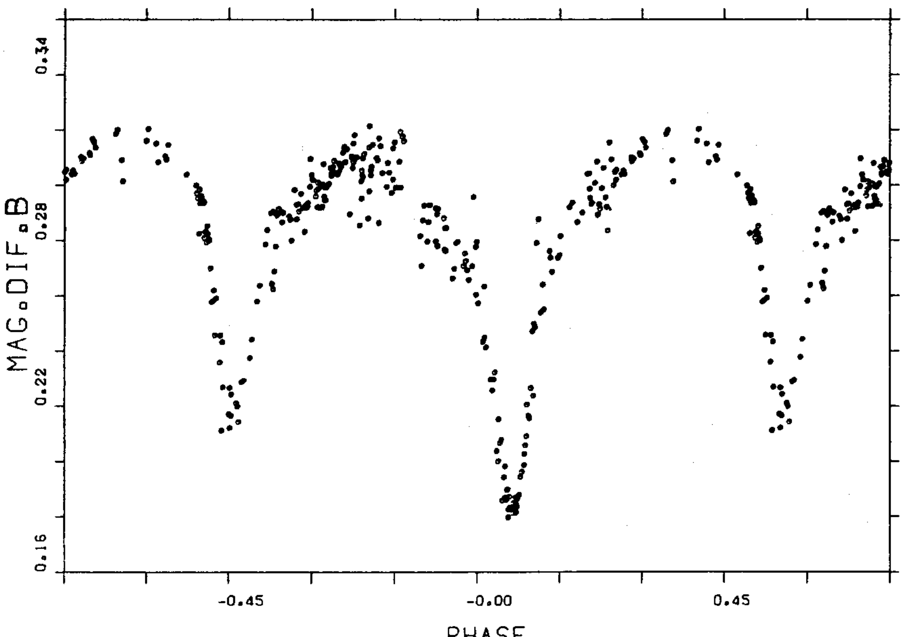


Figure 2

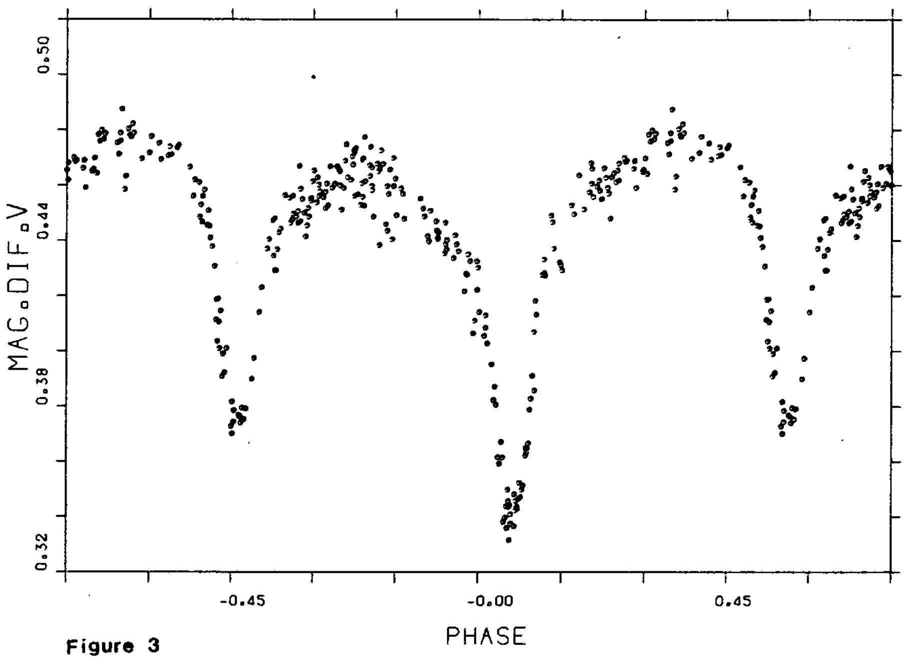


Figure 3

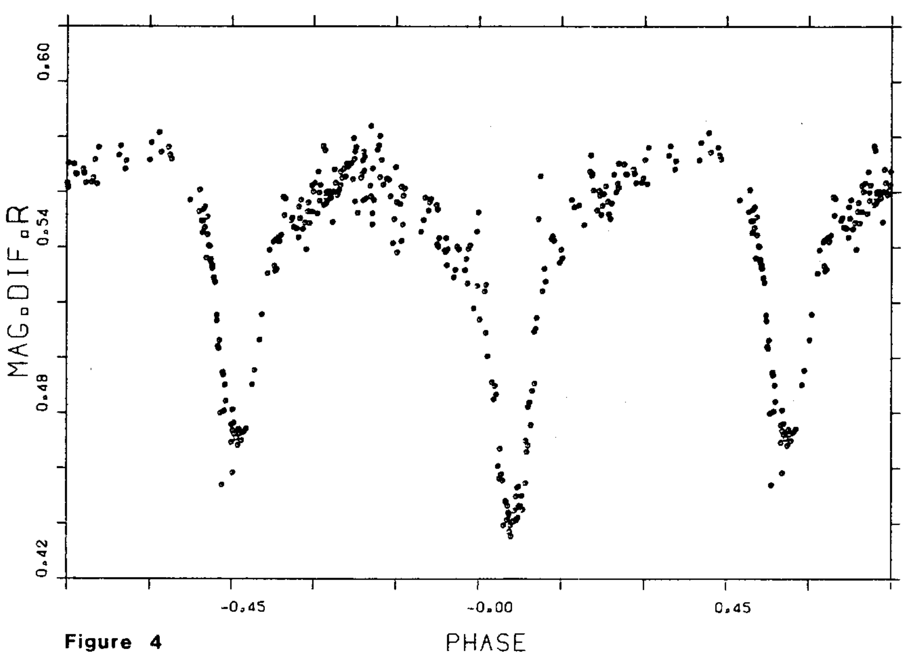


Figure 4

We agree with Zeilik et al. (1982) in the assumption that there is higher dispersion of the measurements outside the eclipses than during these. Second, the shoulder at phase 0.25 is still depressed and more symmetrical than that at 0.75, as well as variations shorter than one week. A more detailed study of these curves is being prepared for publication.

M.J. AREVALO and J.J. FUENSALIDA

Instituto de Astrofísica de Canarias,
38071 La Laguna,
Tenerife,
Spain

References:

Al-Naimiy, H.M.: 1981, Astron. Astrophys. Suppl. Ser. 43, 85-90.

Cousins, A.W.J.: 1976, Mem. Roy. Astron. Soc. 81, 25.

Hall, D.S.: 1976, Proc. of IAU Coll. No. 29 (Budapest) Part 1, 287.

Hrivnak, B.J.: 1982, 159th meeting of the American Astronomical Society, Boulder, Colorado.

Kadouri, T.H.: 1981, IBVS No. 2057.

Northcott, R.J., and Bakos, G.A.: 1956, Astron. J. 61, 188.

Northcott, R.J., and Bakos, G.A.: 1967, Astron. J. 72, 89.

Zeilik et al.: 1982, IBVS No. 2107.

Zeilik et al.: 1982, IBVS No. 2221.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2832

Konkoly Observatory
Budapest
11 December 1985
HU ISSN 0374 - 0676

HT CASSIOPEIAE AS AN SU URSAE MAJORIS TYPE DWARF NOVA

In the existing catalogues (P.N. Kholopov et al., GCVS 4th ed., 1985; H. Ritter, Garching MPA 106, 1983; R.F. Webbink, Urbana IAP 6, 1984) HT Cas is listed as one of the very few SS Cygni type dwarf novae (sometimes also called U Geminorum stars in the narrower sense) with orbital periods shorter than two hours. Most of the dwarf novae in this period domain are SU Ursae Majoris variables, in general exhibiting "supermaxima" from time to time, which can be distinguished from the ordinary maxima by their greater brightness and longer duration.

In order to clarify the nature of HT Cas I checked a sample of about 1000 Sonneberg sky patrol plates taken between 1949.0 and 1985.0 mainly by P. Ahnert and H. Huth of fields centred at 0^h +60° (65°), Gamma Cas, and 1^h +60° (65°).

The brightness of what now may be classified as "normal" eruptions of the star was reported as being only slightly higher than $14^m.0$ (J.S. Glasby, The Dwarf Novae, p.177, 1970; C. Hoffmeister, Veröff. Sternw. Sonneberg, 1, p.61, 1947), and a cycle length for these maxima of 30 to 35 days was clearly visible (Glasby, l.c.). From the very beginning it was therefore obvious that on our plate material we would be able to detect only "supermaxima" (if present at all), the threshold of good-quality exposures being $14^m.2$ at the position of the variable.

Altogether 905 suitable plates yielded 16 cases when the star was brighter than or equal to 12.8 pg (system of Bergedorfer Spektraldurchmusterung of SA 8). These observations belong to eight eruptions. We conclude that in this way we have discovered "supermaxima" of the star. None of these maxima are, to the best of my knowledge, identical with findings reported by the AAVSO, AFOEV, or SUAA. On the other hand, three outbursts brighter than $13^m.0$ vis. not present in our material have been found by the observers of these organizations. J. Patterson (Astrophys.J.Suppl., 45, 517, 1981) measured one further bright maximum accidentally; the outburst of January 1985 (J. Mattei et al., IAU Circ., Nos. 4027 and 4037, 1985) is outside the time interval covered by the inspected plates.

The supermaximum of October 1959 lasted $L = 9$ days at least (visibility above the plate limit), that of January 1985 about 10 days, but much shorter eruptions of this kind also seem to occur ($L \leq 3$ days: July 1963).

It should be noted that on many a good plate faint traces at the position of the star can be perceived, caused by the combined light of HT Cas at or near normal maximum (14^m) and a star $14\overset{m}{.}6$ just to the south of the variable. These observations were of course ignored.

The mean cycle length C of the supermaxima can be evaluated in various ways (W. Wenzel, G.A. Richter, Astron. Nachr., in press, 1986):

i) by Poisson distribution of bright observations independently recorded,

ii) by means of the (known or estimated) mean duration of the outbursts, or by averaging the observed outburst interval with (iii) or without (iv) taking into account sun and moon gaps.

Clearly the last method (iv) yields the largest value for C. From the procedures i)-iii) follows

$$C \text{ (supermaxima)} \approx 430^d \quad \dots \quad 660^d$$

where values near the lower one are more trustworthy.

A listing of all supermaxima known up to now and some further details will be given in a forthcoming issue of Mitteil. Veränd. Sterne Sonneberg.

W. WENZEL
Sternwarte Sonneberg
Zentralinstitut für Astrophysik
der Akademie der Wissenschaften
der DDR

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2833

Konkoly Observatory
Budapest
11 December 1985
HU ISSN 0374 - 0676

SUPERMINIMUM OF MV LYRAE

As a continuation of our paper of 1983 (W. Wenzel and B. Fuhrmann, Mitteil. Veränd. Sterne Sonneberg, 9, p.175) I report here on subsequent observations of the cataclysmic binary MV Lyr. On 110 plates of the Sonneberg four-lens astrographs (40/190 cm and 40/160 cm) taken mainly by G.A. Richter, G. Hacke and the author between 1983 July 2 and 1985 Nov. 17 the star varied irregularly from $15^{m}.8$ to $17^{m}.3$ pg (system of paper cited). The star was definitely brighter, $15^{m}.2$, only in one occasion (1985 Oct. 13.8 UT). The variable was never seen on the sky patrol plates taken by H. Huth since the onset of the deep minimum in 1979, with the exception of a possible faint trace at the date just mentioned.

B. FUHRMANN
Sternwarte Sonneberg
Zentralinstitut für Astrophysik
der Akademie der Wissenschaften
der DDR

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2834

Konkoly Observatory
Budapest
13 December 1985
HU ISSN 0374 - 0676

PHOTOMETRY AND SPECTROPHOTOMETRY OF SYMBIOTIC STARS :
CI Cyg, Z And, V 1016 Cyg, HM Sge, HBV 475

Plates of the above mentioned symbiotic stars which were taken in July and October 1982 at the Observatoire de Haute Provence, were spectrophotometrically reduced. The S20 Image tube RCA was used in conjunction with the spectrograph. The II aO plates which were taken with a grating spectrograph covered the region λ 3700 - 5200 Å. The reciprocal dispersion was 93 Å mm^{-1} at Hγ. The II aO calibration plates were taken on the same nights as those of the symbiotic stars. The symbiotic stars' spectra were recorded using the Chalonge Microphotometer at the Lyon Observatory. The latter converted the plate transmission to intensities using the characteristic curves. The width of the Microphotometer slit was set at 25 μm.

The position of the continuous spectrum is not well defined for symbiotic stars on account of the presence of absorption bands (TiO) and emission lines.

The continuum energy distribution has been compared to the standard star δ Cyg in the blue spectral range, but the measurements do not fit well; neither do they agree with the nature of the M star.

Relative intensities of emission lines were measured on the spectrograms. The spectrophotometric corrections were made by using an intensity trace spectrum of δ Cyg taken on the same night.

Table I

		V	B-V	U-B
CI Cyg	22.7.82	10.51 ± 0.04	+ 1.20	- 0.26
	15.10.82	11.24 ± 0.01	+ 1.95	- 0.52
V1016 Cyg	27.7.82	11.23 ± 0.01	- 0.03	- 0.86
HM Sge	26.7.82	11.45 ± 0.02	+ 0.13	- 0.40
Z And	23.7.82	10.54 ± 0.01	+ 1.37	- 0.39
HBV 475	21.10.82	11.12 ± 0.04	+ 2.34	- 0.91

The photometric observations of these stars were carried out with the Polarimeter II described by Chevreton et al. (1977). The magnitudes and colour indices are given in Table I and photoelectric observations are plotted on a two-colour diagram (Figure 1).

HBV 475 : the line of HeII λ 4686 Å is very strong whereas λ 3760 Å of [FeVII] is absent λ 5007 Å > λ 4363 Å ; HeI triplets < singlets HI lines are conspicuous up to HII.

Z And : Most emission lines of FeII and HeI (singlets + triplets) appear. HI lines are strong. HeII λ 4686 Å < Hβ and [OIII] lines are absent.

V 1016 Cyg : the strong emission lines are always present. The strongest lines are those of HI, HeI, HeII, [OIII], [NeIII], [FeVII] and [FeVI] .

HM Sge : strong emission lines corresponding to V 1016 Cyg. We note that the [FeVII] and FeII lines were absent on 27th October.

CI Cyg : the forbidden lines of [NeIII] λ 3868 Å , [FeVII] λ 3760 Å , [OIII] λ 4363 Å , N1 and N2 and HeII λ 4686 Å are not affected by eclipse effects. (B-V) varied from +1.20 (out of the eclipse) to 1.88 (middle of the eclipse) while (U-B) varied from -0.26 to 0.11 (Martel, 1982).

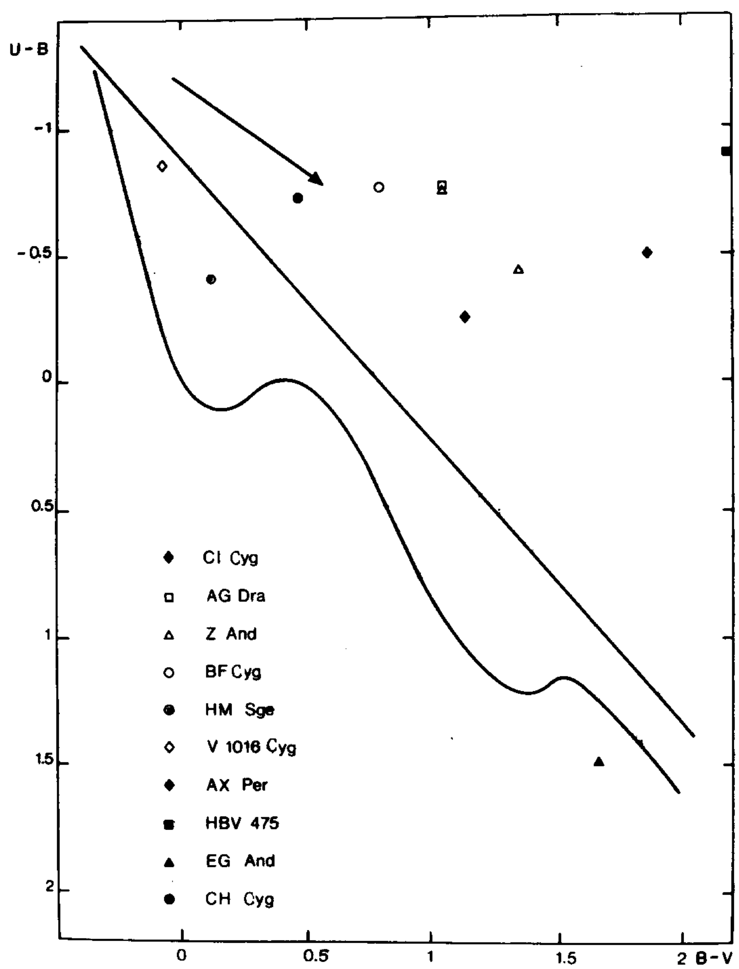

U - B
-1
-0.5
0
0.5
1
1.5
2
0
0.5
1
1.5
2 B-V
CI Cyg
AG Dra
Z And
BF Cyg
HM Sge
V 1016 Cyg
AX Per
HBV 475
EG And
CH Cyg

Figure 1

The spectra have been de-reddened by Mikolajewska et al. (1983). We have taken E(B-V) = 0.45 in agreement with measurements derived from low resolution I.U.E. spectra E(B-V) = 0.40).

The M star varied from M5V on 22.7.82 to M6III on 15.10.82 TiO bands (1-0, 2-0, 0-0) are weak.

Treating the sources as blackbody radiators, we obtain approximate temperatures as follow : 4550°K for CI Cyg, 11000°K for V1016 Cyg and 13500°K for HBV 475; all three observed on the night of 15.7.82 .

The ionized gas cloud (with an electron density $n_e \sim 10^7$ cm^{-3}) suggests a temperature somewhere in the range 12000°K < Te < 20000°K for CI Cyg, HM Sge, V 1016 Cyg and HBV 475.

R. GRAVINA
Observatoire de Lyon
69230 Saint-Genis-Laval
France

References:

Chevreton, M., Gravina, R., Martel, M.T., Vanderriest, Ch., Astron. & Astrophys. 54, 627, (1977).

Martel, M.T., private communication (1982).

Mikolajewska, J., Mikolajewska, M., Acta Astron., 33, (1983).

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2835

Konkoly Observatory
Budapest
17 December 1985

HU ISSN 0374 - 0676

PHOTOELECTRIC OBSERVATIONS OF R CrB

The star R CrB was observed photoelectrically with the 165 mm Newtonian reflector at Nessa Observatory using standard UBV filters. δ CrB ($V = 4^m.63$, $B-V = 0^m.80$, $U-B = 0^m.37$) and SAO 084 005 ($V = 7^m.45$, $B-V = 0^m.44$, $U-B = 0^m.02$) were used as comparison stars. These observations are the continuation of those published in IBVS No.2646.

Table I. Photoelectric observations of R CrB

J.D. 244 0000 +	V	B-V	U-B	J.D. 244 0000 +	V	B-V
6159.346	$5^m.85$	$0^m.56$		6287.383	$5^m.82$	$0^m.63$
6173.354	6.02	0.68		6289.371	5.97	0.47
6177.363	5.99	0.69	$0^m.37$	6298.354	5.92	0.54
6199.375	5.77	0.59	0.04	6299.338	5.89	0.60
6207.379	5.90	0.68		6306.321	6.01	0.77
6212.417	5.99	0.62	0.28	6307.372	6.06	0.64
6247.396	5.67	0.55		6311.342	6.11	0.66
6250.408	5.82	0.50	0.06	6320.308	6.52	0.78
6251.388	5.83	0.49		6321.299	6.61	0.74
6252.425	5.79	0.55	0.30	6327.302	7.04	0.98:
6262.367	5.95	0.65		6328.292	7.24	0.79
6264.396	5.95	0.70		6336.277	8.13	
6266.420	5.97	0.61		6373.250	7.64	1.13
6270.375	5.82:	0.73:		6374.250	7.74	1.13
6271.396	5.87	0.67		6376.279	7.67	1.13
6286.398	5.82	0.61		6382.217	7.51	1.14

D. BÖHME

4851 Nessa No. 11
German Democratic Republic

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2836

Konkoly Observatory
Budapest
19 December 1985
HU ISSN 0374 - 0676

A FURTHER UPDATE ON THE PERIOD OF V 566 OPHIUCHI

V 566 Ophiuchi (BD + 5°3547, HD 163 611) is an A-type W Ursae Majoris system with a period that remained essentially constant at 0.40964091 day from 1952 to 1966 (Binnendijk, 1959; Bookmyer, 1969). Beginning about Julian Date 2440000 (1968) the O-C values begin to show a steep positive trend indicating an increase in period (Maddox and Bookmyer, 1981, hereafter MB). Since that time observations suggest that the period may be continuing to change at a slow rate.

Table I shows the results of solutions for the period using data from different Julian date ranges. Column six in this table lists the period increase (in seconds) relative to the pre-1968 period published by Bookmyer (1969).

The general trend of values in Table I suggests a small, continuous period change since 1968. However, attempts to fit a quadratic in E to the times of minimum (Dawson and Narayanaswamy, 1977; MB; Kennedy, 1984) have generated only very small second-order terms. Also, Dawson and Narayanaswamy (1977), fitting all data from 1952 to 1975, concluded that two linear fits, one to observations made before 1968 and one to observations made after 1968, were better than a single quadratic fit to the entire data set.

Table II lists nine newly published times of minima for V 566 Oph. Six of these were obtained with the 40 centimeter Boller and Chivens reflector at the Joseph R. Grundy Observatory of Franklin and Marshall College using a thermoelectrically cooled 1P21 tube and DC electronics. The observation on J.D. 2445928 was made with the same telescope using a thermoelectrically cooled RCA C31034A-02 photomultiplier tube and pulse counting electronics. The observations on Julian dates 2445925 and 2445943 were made with the 40 centimeter Boller and Chivens reflector at The Mount Laguna Observatory of San Diego State University using a dry ice cooled 1P21 tube and a charge integration photometer. The differential accuracy of these observations was better than 0.01 magnitude.

In all cases, the observations were made through V filters close to the UBV system. Photometry was taken differentially against BD + 4°3558. No corrections for differential extinction were made as the comparison star lies within

Table I

Previous Solutions

Year	Source	Data Range	Epoch	Period	dP(sec)	Rem.
1959	Bi	2434179-2436010	2435245.5440	0.40964101	0.009	
1969	Bo	2442579-2442590	2436744.4200	0.40964091	0.000	
1976	Bm	2440047-2442877	2441835.8617	0.40964387	0.26	
1976	Bm	2440047-2442203	2441835.8618	0.40964399	0.26	
1977	DN	2440000-2442590	2440418.4931	0.40964431	0.29	
1978	Sc	2441119-2442987	2441835.8617	0.409645	0.35	
1981	MB	2442600-2443677	2443281.5034	0.40964660	0.49	
1981	MB	2440000-2443677	2441863.7179	0.40964506		*
1981	MB	2440000-2443677	2441863.7188	0.40964504	0.36	
1984	Ke	2440400-2445197	2441119.8016	0.40964579	0.42	**
1985	SD	2440000-2445943	2440047.3478	0.40964600	0.44	
1985	SD	2440000-2445943	2440047.3542	0.40964392		***

Bi=Binnendijk 1959, Bm=Bookmyer 1976, Bo=Bookmyer 1969, DN=Dawson, Narayanaswamy 1977, Ke=Kennedy 1984, MB=Maddox and Bookmyer 1981, Sc=Scarfe and Barlow 1978, SD=Seeds and Dawson (present paper).

* Quadratic term: 5.6×10^{-10}

** Quadratic term:"negligible"

*** Quadratic term: 1.3×10^{-10}

Table II

Photoelectric Epochs of Minimum Light, V566 Oph

JD Hel.	Min	O-C	Source	JD Hel.	Min	O-C	Source
2443662.4770	I	+0.0032	PG	2445144.5759	I	+0.0029	SD
4406.8073	I	+0.0067	Sc	5169.9749	I	+0.0038	Ke
4448.7922	II	+0.0029	Sc	5170.9988	II	+0.0036	Ke
4750.4901	I	-0.0035	MS	5172.6355	II	+0.0017	SD
4751.5162	II	-0.0015	MS	5175.7085	I	+0.0024	SD
4780.8121	I	+0.0047	Sc	5183.4926	I	+0.0032	Po
4781.8357	II	+0.0042	Sc	5196.6001	I	+0.0020	SD
4795.3461	II	-0.0037	Ni	5197.0117	I	+0.0040	Ke
4796.3698	I	-0.0041	Ni	5207.6598	I	+0.0013	SD
4797.3946	II	-0.0034	Ni	5512.8463	I	+0.0015	Sc
4798.4191	I	-0.0030	Ni	5513.8700	II	+0.0011	Sc
4799.4434	II	-0.0029	Ni	5554.6307	I	+0.0020	SD
4825.2510	II	-0.0030	MS	5925.7694	I	+0.0014	SD
4826.2739	I	-0.0042	MS	5928.6376	I	+0.0021	SD
4827.2992	II	-0.0030	MS	5943.7952	I	+0.0028	SD

Ke=Kennedy 1984, MS=Mahdy and Soliman 1982, Ni=Niarchos 1983, PG=Pohl et al. 1981, Po=Pohl et al. 1983, Sc=Scarfe et al. 1984, SD=Seeds and Dawson (present paper).

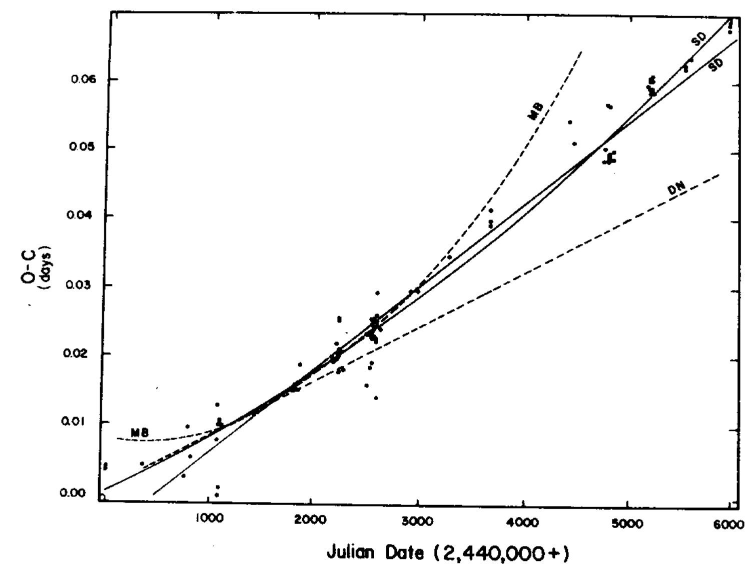


Figure 1. Observed minus computed heliocentric times of minimum for V566 Oph versus Julian Date. The computed times of minimum are based upon the linear elements of Bookmyer (1969). Curve MB: quadratic solution of Maddox and Bookmyer (1981). Curve DN: linear solution of Dawson and Narayanaswamy (1977). Straight line and curve labeled SD: linear and quadratic solutions based upon the present data.

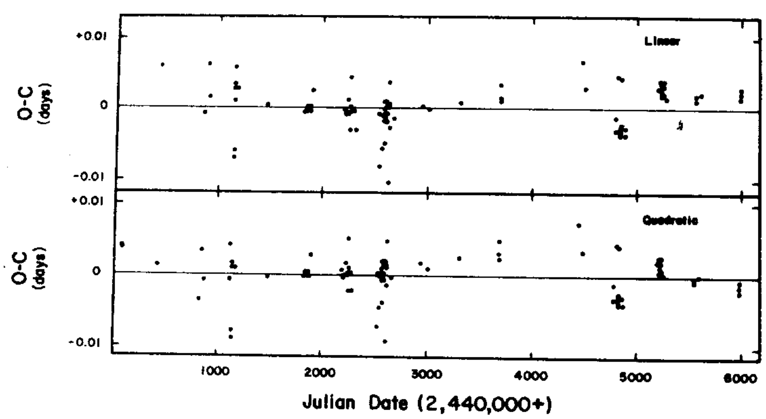


Figure 2. O-C residuals for the authors' linear and quadratic fits to the data of Table II. The s.e. is ±0.0034 day for the linear fit and ±0.0029 day for the quadratic fit.

10 arc-minutes of the variable and is of nearly identical spectral type.

Times of minimum were found using the tracing paper method or by bisection of times of equal brightness on declining and rising light.

In addition to our new observations, Table II includes twenty-one recent times of minimum collected from the literature. All of these times are derived from photoelectric observations using V filters. The O-C values in the table were computed from the linear elements derived in this paper.

The total data base for this analysis includes the times of minimum listed in Table II of this paper plus those since Julian Date 2440000 as listed in Table II of MB. Three minima in their tabulation (Julian Dates 2442225.4170, 2442230.3329, 2442621.3892) were not included in our analysis because they fell beyond three standard deviations from any reasonable solution. The omission of these three data points has little effect on the final solutions.

We applied first and second order least squares solutions to the data described above. The results of these solutions are shown in Figure 1, which is a continuation of Figure 1 of MB, in which the (O-C)s of observations and solutions are calculated using the linear solution given by Bookmyer (1969). The curve labeled "MB" represents their second-order solution, and the straight line labeled "DN" represents the linear solution of Dawson and Narayanaswamy (1977).

Our linear solution to these data yields the following ephemeris:

$$\text{J.D. Hel.Min. I} = \underset{\pm\ 7}{2440047.3478} + \underset{\pm\ \ \ \ 9}{0^{d}.40964600}\cdot E$$

The errors given are standard errors. The scatter of points about this solution is ±0.0034 day. Our linear solution is the straight line labeled "SD" in Figure 1.

A quadratic solution to the same data produces the following ephemeris:

$$\text{J.D. Hel.Min. I} = \underset{\pm\ 3}{2440047.3542} + \underset{\pm\ \ \ \ 9}{0^{d}.40964392}\cdot E + \underset{\pm\ 11}{1.32\times10^{-10}}\times E^{2}$$

The point scatter about this solution is ±0.0029 day. The quadratic solution is represented in Figure 1 by the curve labeled "SD".

The linear and quadratic solutions are further compared in Figure 2. The quadratic solution is slightly better than the linear fit. This suggests that the period could be changing gradually by about 2.6×10^{-10} day/cycle. These data do not permit a conclusive identification of this continuing period change, nor do they permit analysis by higher order solutions. All data in these analyses have been equally weighted (except for omitted points which have effective weights of zero); Without a detailed knowledge of the observers' methods of observation and reduction, further tests of significance do not seem warranted.

Future observations of V 566 Oph are desirable to confirm a continuing change in the period and to detect additional sudden changes in period such as that which evidently occurred in 1968.

This material is based upon work supported by the National Science Foundation under Grant No. PRM-8214360.

MICHAEL A. SEEDS and DENNIS W. DAWSON*

Department of Mathematics and Astronomy
Franklin and Marshall College, P.O. Box 3003
Lancaster, Pennsylvania 17604-3003, U.S.A.

References:

Binnendijk, L., 1959, A.J., 64, 65.
Bookmyer, B.B., 1969, A.J., 74, 1197.
Dawson, D.W., and Narayanaswamy, J., 1977, Pub.A.S.P., 89, 47.
Hoffmeister, C., 1935, A.N., 255, 401.
Hoffmeister, C., 1943, Kleinere Veröff. Berlin-Babelsberg, No.28, 81.
Kennedy, H.D., 1984, Inf. Bull. Var. Stars, No. 2613.
Maddox, W.C., and Bookmyer, B.B., 1981, Pub. A.S.P., 93, 230.
Mahdy, H.A., and Soliman, M.A., 1982, Inf. Bull. Var. Stars, No. 2154.
Mochnacki, S.W., and Doughty, N.A., 1972, M.N.R.A.S., 156, 243.
Niarchos, P.G., 1983, Inf. Bull. Var. Stars, No. 2451.
Pohl, E., and Gülmen, O., 1981, Inf. Bull. Var. Stars, No. 1924.
Pohl, E., Hamzaoğlu, E., Güdür, N., and Ibanoğlu, C., 1983, Inf. Bull. Var. Stars, No. 2385.
Scarfe, C.D., and Barlow, D.J., 1978, Inf. Bull. Var. Stars, No. 1379.
Scarfe, C.D., Forbes, D.W., Delaney, P.A., and Gagne, J., 1984, Inf. Bull. Var. Stars, No. 2545.

* Now at San Diego State University, Department of Astronomy
San Diego, CA 92182-0334

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2837

Konkoly Observatory
Budapest
19 December 1985
HU ISSN 0374 - 0676

IMPROVED POSITIONS OF DWARF NOVAE

One of the first problems that any investigator of variable stars has to deal with is the inaccuracy of the coordinates of the object under consideration.

A brief search through the literature shows that the astrometric papers related to variable stars are rather scarce. In order to provide accurate positions for variable stars, the plate collection of the observatory has been searched and some results are herein presented.

Table I gives accurate coordinates for 32 dwarf novae for which the finder charts have been taken from Vogt and Bateson (1982). The reference stars were taken from the SAOC given an average mean error of ± 0".74 in RA and ± 0".50 in DEC. For those objects south of -60° Yale Transactions Vol 31 and 32 Part II were used as a source for the calibration stars; in this case the average mean error is ± 0".77 in RA and ± 0".48 in DEC.

The first column of Table I gives the object; the second and third the RA and DEC for 1950.0; the fourth and fifth columns list the differences in RA and DEC with the positions quoted in the Special Supplement to the Third Edition of the GCVS in the sense GCVS minus this note.

I would like to thank M.R.Cesco and J.Vicentela for measuring some of the plates involved in this note.

CARLOS E. LOPEZ
Observatorio "Felix Aguilar"
Benavidez 8175 (O)
5407 Marquesado - San Juan
Argentina.

Reference:

Vogt,N. and Bateson,F.M. (1982). Astron. Astrophys. Suppl. Ser. 48, 383

TABLE I

OBJECT	RA (1950.0)	DEC	ΔRA	ΔDEC
	h m s	° ' "	s	"
UY Phe	01 20 58.73	-42 34 12.8	+ 0.27	+11.2
WX Hyi	02 08 29.42	-63 32 47.8	- 1.42	-18.2
VW Hyi	04 09 32.98	-71 25 27.2	- 2.98	+ 3.2
AQ Eri	05 03 43.95	-04 12 03.6	- 0.05	+ 3.6
BI Ori	05 21 16.94	+00 57 48.5	+ 0.06	+ 0.5
CW Mon	06 34 20.72	+00 04 52.9	+ 0.28	+ 7.1
WZ CMa	07 16 47.71	-27 02 09.7	+ 0.29	+ 3.7
BV Pup	07 46 57.45	-23 26 25.2	+ 0.55	+ 1.2
Z Cha	08 08 49.63	-76 23 09.0	-11.63	-21.0
BB Vel	08 35 11.61	-47 12 06.2	+ 0.39	-11.8
CU Vel	08 56 44.57	-41 36 09.8	- 7.57	-14.2
V436 Cen	11 11 36.87	-37 24 26.3	- 1.87	+ 2.3
T Leo	11 35 52.77	+03 38 45.4	+ 0.23	+ 8.6
MU Cen	12 10 16.80	-44 11 34.3	+ 1.20	+34.3
V373 Cen	12 23 23.91	-45 32 58.8	- 2.90	- 1.2
EX Hya	12 49 42.38	-28 58 38.2	+ 0.38	-33.8
BV Cen	13 28 09.54	-54 43 05.9	+ 0.46	+ 5.9
EK TrA	15 09 40.88	-64 54 31.0	- 0.88	-35.0
HP Nor	16 16 55.51	-54 46 13.9	- 3.51	+61.9
IK Nor	16 21 27.10	-55 13 12.1	+ 0.90	- 5.9
V422 Ara	16 54 45.78	-61 38 59.2	+ 0.22	+11.2
CSV 7612 *	17 12 01.35	-65 29 42.6	- 5.35	+12.6
BF Ara	17 34 35.87	-47 08 58.6	-10.87	- 1.4
UZ Ser	18 08 33.31	-14 56 17.6	- 0.31	- 0.4
DP Pav	18 21 24.14	-64 59 22.8	- 0.14	- 1.2
V800 Aql	18 54 10.98	+10 44 42.9	- 0.98	-18.9
UU Aql	19 54 35.23	-09 27 26.4	+ 0.77	+ 8.4
V794 Aql	20 14 56.51	-03 49 11.7	- 1.51	+ 5.7
TU Ind	20 29 43.09	-45 36 15.9	- 1.09	-20.1
VY Aqr	21 09 28.38	-09 01 57.7	+ 0.62	- 8.3
VZ Aqr	21 27 48.59	-03 12 29.7	- 0.59	- 0.3
AN Gru	23 05 04.51	-47 41 53.8	- 0.51	+41.8

*Numbered 8383 in the New Catalogue of Suspected Variables

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2838

Konkoly Observatory
Budapest
20 December 1985
HU ISSN 0374-0676

PHOTOELECTRIC OBSERVATION OF DK CYGNI

The variable DK Cygni was discovered by Guthnick and Prager (1927). Their photographic light curve indicates that the system is of W Ursae Majoris type. Visual light curves were published later and photoelectric observation were made by Hinderer (1960) and by Binnendijk (1964). Rucinski and Kaluzny (1981) obtained five photoelectric observations of DK Cyg during a survey of W UMa-type systems.

In the present study the variable was observed photoelectrically in U,B,V colours with the 50 cm Cassegrain telescope of Konkoly Observatory. A total of 213 observations in yellow light, 211 observations in blue light and 211 observations in ultraviolet light were made on five nights during 1985. The composite light curves in different colours are displayed in Fig.1. The time of minimum for both the primary and secondary minimum was determined by the method of Hertzsprung (1928). A time of the primary minimum, which is rather uncertain, was determined from Rucinski and Kaluzny's observations using our mean light curve. The times of minima are listed in Table I. The O - C's were computed from Binnendijk's ephemeris:

$$\text{J.D.Hel.Min.I} = C_I = 2437999.5838 + 0\overset{d}{.}47069055 \cdot E \qquad (1)$$

Our parabolic fit of the O - C diagram (Fig.2) shows that the orbital period of the system is increasing. Binnendijk (1964) has already pointed out the variability of the period, but did not mention any detail about its nature.

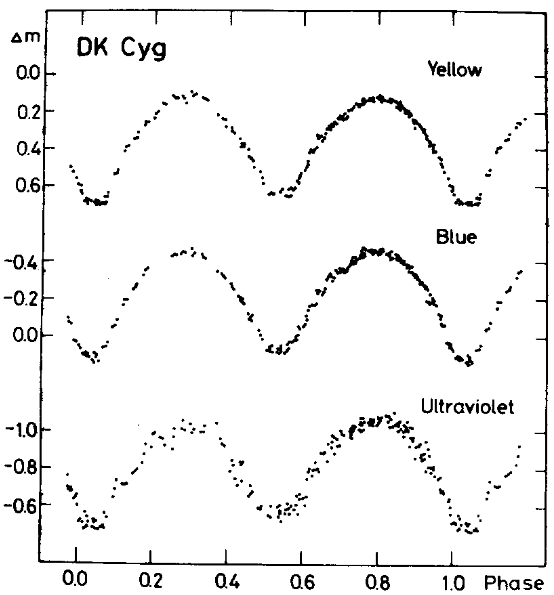


Figure 1. The composite light curves of DK Cygni in different colours

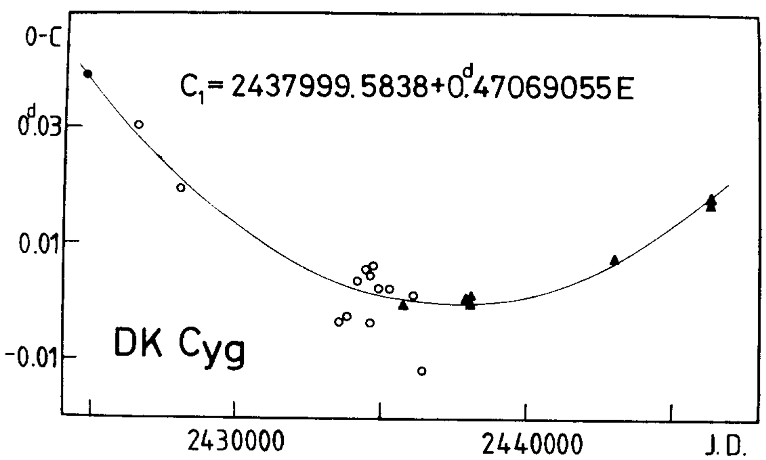


Figure 2. O-C diagram of DK Cygni

Table I

J.D.Min.	Type of min.	E	$(O-C)_1$	$(O-C)_2$	Type of obs.	weight	Rem.	Ref.
24760.039	I	-28129	+.039	0.000	pg	2	G,P	1
26568.423	I	-24286	+.030	+.002	v	1	Ts	2
28068.5032	I	-21099	+.0193	-.001	v	1	Pi	3
33539.316	I	- 9476	-.004	-.007	v	1	Sz	4
33889.511	I	- 8732	-.003	-.005	v	1	Sz	4
34179.462	I	- 8116	+.003	+.001	v	1	Sz	5
34458.584	I	- 7523	+.005	+.004	v	1	Sz	6
34606.380	I	- 7209	+.004	+.003	v	1	Sz	6
34668.503	I	- 7077	-.004	-.005	v	1	Kl	7
34702.402	I	- 7005	+.006	-.005	v	1	Sz	6
34988.578	I	- 6397	+.002	+.001	v	1	Sz	6
35303.470	I	- 5728	+.002	+.002	v	1	Sz	8
35762.391	I	- 4753	-.001	0.000	pe	3	Hi	9
36163.421	I	- 3901	+.001	+.002	v	1	Sz	10
36453.353	I	- 3285	-.012	-.012	v	1	Sz	11
37995.5831	II	- 8.5	+.0002	+.001	pe	3	Bi	12
37999.5838	I	0	0.000	+.001	pe	3	Bi	12
38000.5257	I	+ 2	+.0005	+.002	pe	3	Bi	12
43081.6367:	I	+10797	+.007:	+.001:	pe	3	pp	13
46300.4635	II	+17635.5	+.0165	-.001	pe	3	pp	-
46303.5245	I	+17642	+.0180	0.000	pe	3	pp	-

G,P=Guthnick and Prager 1 (1927); Ts=Tsesevich 2 (1950); Pi=Piotrowski 3 (1936); Sz=Szafraniec 4 (1952), 5 (1953), 6 (1955), 8 (1956), 10 (1958), 11 (1959); Kl=Klepikova, see Tsesevich 7 (1954); Hi=Hinderer 9 (1960); Bi=Binnendijk (1964) ; Rucinski and Kaluzny 13 (1981).

The second-order weighted least-squares solution of the O - C values calculated by eq. (1) yielded the following ephemeris:

$$\text{J.D.Hel.Min.I} = C_2 = 2437999.5828 + 0.47069066\,E + 5.39 \times 10^{-11}\,E^2 \qquad (2)$$
$$\pm .0007 \quad \pm .00000005 \quad \pm .26$$

The steady increase of the period is: 1.078×10^{-10} days/cycle $\pm .052$

The secondary minimum observed on 2446300 is $0^m.05$ brighter than the primary one. Comparing our observations with those of Binnendijk (1964) one can see that the maximum light before the secondary minimum is brighter by about $0^m.05$ in our light curve. This part of our light curve was observed on 2446250. A systematic difference at this phase of the light curve was already noted by Binnendijk (1964).

M. PAPARO
Konkoly Observatory
HUNGARY

M.A. HAMDY
Helwan Observatory
EGYPT

I. JANKOVICS
Konkoly Observatory
HUNGARY

References:

Binnendijk, L., 1964, Astron. J. 69, 157.
Guthnick, P., Prager, R., 1927, Astron. Nachr. 229, 455.
1927, Kleinere Veröff. Berlin-Babelsberg No. 4,9.
Hertzsprung, E., 1928, Bull. Astron. Inst. Neth. 4, 179.
Hinderer, F., 1960, J. des Observateurs 43, 161.
Piotrowski, S., 1936, Bull. Obs. Astron. Belgrade 1, 9.
Rucinski, S.M., Kaluzny, J., 1981, Acta Astronomica 31, 409.
Szafraniec, R., 1952, Acta Astronomica Ser. c. 5, 8.
1953, ibid. 5, 52.
1955, ibid. 5, 190.
1956, ibid. 6, 142.
1958, ibid. 8, 190.
1959, ibid. 9, 48.
Tsesevich, V.P., 1950, Astron. Circ. USSR No. 100, 18.
1954, Odessa Izv. 4, 258.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2839

Konkoly Observatory
Budapest
20 December 1985

HU ISSN 0374 - 0676

HIGH SPEED PHOTOMETRY OF SS CYGNI AFTER AN OUTBURST

The cataclysmic variable SS Cygni has been investigated in great detail by a number of authors over the past ninety years. During July and August 1984, a co-ordinated ultraviolet and optical monitoring of the source had been planned, using instruments operating onboard IUE and Voyager spacecrafts and with ground-based optical telescopes (Polidan et al., 1984). Outbursts of the source were predicted to occur approximately around July 1 and August 25, 1984, with an uncertainty of ±5 days in each case. The star did not, however, flare up exactly as predicted. It reached a maximum on 26 June as per prediction. It flared again in late July 1984, considerably earlier than the 25 August prediction (Mattei, 1984). In order to follow-up the object as per the earlier prediction, and as a target of opportunity in our program of high speed photometry of optical counterparts of X-ray sources, we carried out a relatively short observation of SS Cygni on 27 August 1984.

The observations reported here were conducted with a high speed single photon counting photometer attached to the one meter telescope of the Kavalur Observatory. The star was monitored with an integration time of either 0.5 sec or 1 sec from 19^h14^m UT to 20^h24^m UT. A 12 arcsec diaphragm was used. The star SAO 051 224 was used as the comparison star.

Figures 1 and 2 show the light curves in blue filter and unfiltered light respectively of SS Cygni, after subtracting the sky background. Extreme level of flickering activity is evident throughout our observations. The decline from the outburst appears to have been not very calm. Large flares seen in unfiltered light curves have amplitudes as large as 0.7 magnitude and durations of 3 to 4 minutes. The V magnitude estimated at 19^h50^m UT is $12.^m0$. Figure 3 shows the average light curve of the outburst based on our observation in association with published results in IAU Circulars as indicated. It is seen from the figure that although the star had almost reached its low luminosity state at the time of our observations, the flare activity had continued unabated.

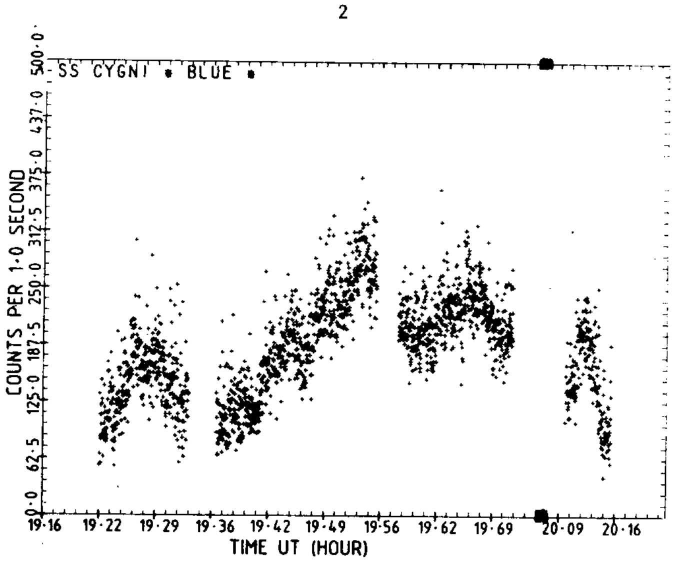


Figure 1. Blue filtered light curve of SS Cygni

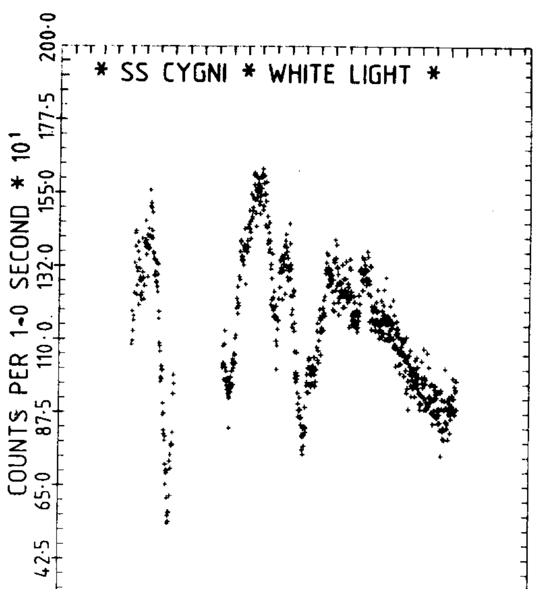


Figure 2. Unfiltered light curve of SS Cygni

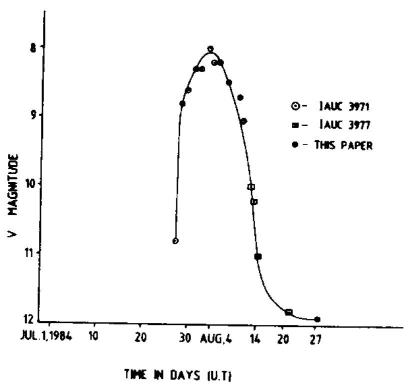


Figure 3. V magnitude profile of July-Aug 1984 outburst

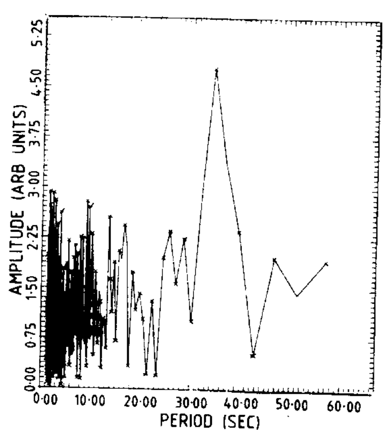


Figure 4. FFT output of the blue run started at 19^h13^m

Coherent optical pulsations in SS Cyg with periods between 8.2 and 10.6 sec during outbursts have been reported by a number of authors (Patterson et al., 1978; Horne and Gomes, 1980 ; Hildebrand et al., 1981). Quasi-periodic oscillations with a mean period in the range of 32 - 36 sec and mean amplitudes of about 0.1% have also been reported (Patterson, 1981). In order to search for these periodicities in our data, we have carried out an FFT and a period folding analysis. The results of this analysis (shown partly in Figure 4) with the long blue filter starting at 19^h21^m UT and the unfiltered run starting at 20^h15^m UT are consistent with the presence of oscillations with a period of 34 ± 1 sec.

S. SEETHA, V.N. PADMINI, T.M.K. MARAR,
K. KASTURIRANGAN and U.R. RAO
ISRO Satellite Centre
Airport Road
Bangalore - 560 017, India

J.C. BHATTACHARYYA
Indian Institute of Astrophysics
Sarjapura Road
Bangalore - 560 034
India

References:

Hildebrand, R.H., Spillar, E.J., and Stiening, R.F., 1981, Ap.J., 243, 223.
Horne, K., and Gomes, R., 1980, Ap.J., 237, 845.
Mattei, J.A., 1984, IAU Circ., No. 3971.
Patterson, J., Robinson, E.L., and Kiplinger, A.L., 1978, Ap.J., Letters, 226, L137.
Patterson, J., 1981, Astrophys. J., Suppl., 45, 517.
Polidan, R.S., Holberg, J.B., Holm, A.V., and Mattei, J.A., 1984, IAU Circ., No. 3945.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2840

Konkoly Observatory
Budapest
27 December 1985
HU ISSN 0374 - 0676

1984 UBVRI PHOTOMETRY OF II Peg

The II Peg (HD224085, SAO 091578) is a spectroscopic binary with a spectral type K2-3IV-V, Rucinski (1977), considered to be a member of RS CVn stars. As is well known, its light curves are highly variable in amplitude , phase and mean light level, Hartmann et al.(1979).

Our observations were made during 14 nights, between August and September 1984, from the Observatorio del Roque de los Muchachos at La Palma (Canary Islands), using the People's Photometer a two-channel photoelectric photometer and UBVRI filters of Cousins system (1976) at the Cassegrain focus of 1 m JK Telescope , and on the Swedish 60 cm Cassegrain Telescope with a single channel photon counting photoelectric UBV Johnson photometer.

The stars SAO 091577 and SAO 091574 were used as comparison. The nightly means of individual differential magnitudes (source-comparison) in UBVRI are listed in Table I, as well the Julian date of the observation.

Table I

J.Date 2445000+	ΔU	ΔB	ΔV	ΔR	ΔI
936.712	-1.708	-0.971	-0.709	-0.682	-0.692
937.712	-1.614	-0.915	-0.661	-0.633	-0.642
938.712	-1.657	-0.969	-0.698	-0.672	-0.698
940.713	-1.701	-0.999	-0.745	-0.714	-0.737
945.712			-0.762		
951.723	-1.578	-0.965	-0.681		
953.578	-1.648	-0.921	-0.687		
954.713		-0.913	-0.708		
955.578		-1.056	-0.801		
955.713	-1.761	-1.052	-0.787		
959.578	-1.676	-0.924	-0.702		
960.713	-1.667	-0.951	-0.715		
961.713	-1.713	-1.030	-0.779		
966.599	-1.640		-0.647		

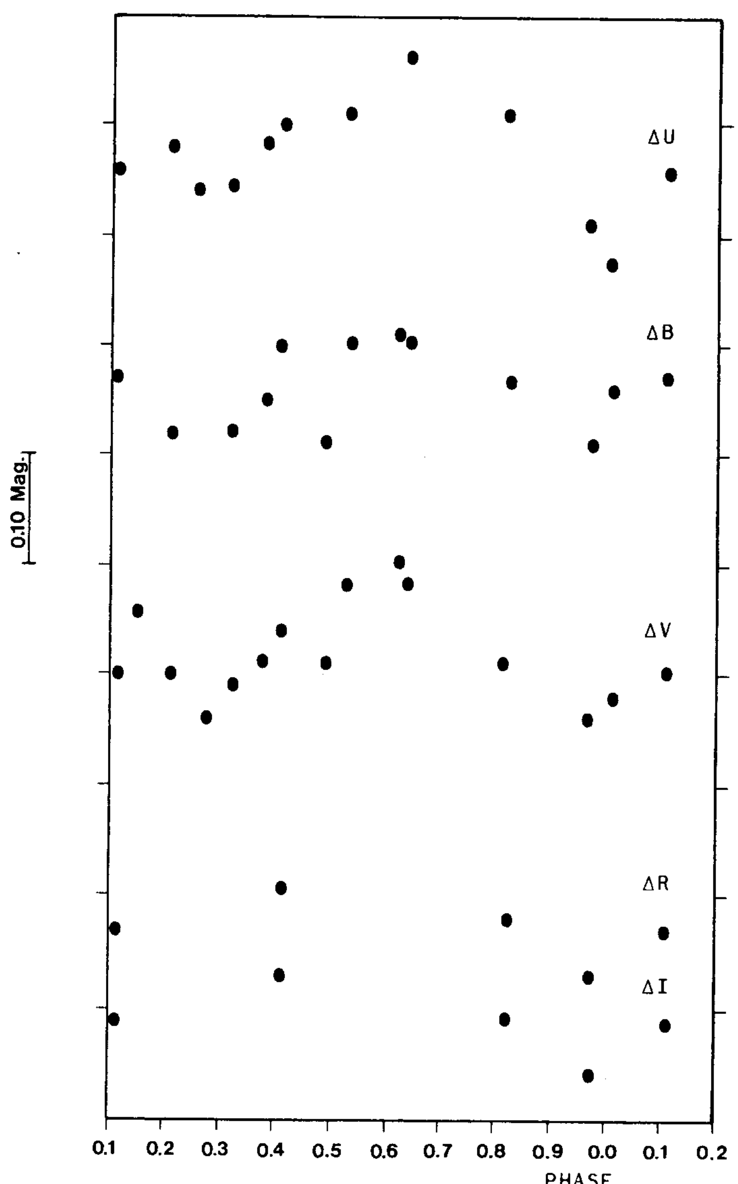


Figure 1

The results are also given in Figure 1, where the differential magnitude is plotted against the phase calculated using the ephemerides of Rucinski (1977)

$$JD = 2443033.10 + 6^{d}.724183E$$

From the light curves we observed two minima at about 0.26 and 0.97 phases with similar amplitude, approximately 0.15 mag. These new observations are markedly different from those previously reported by Zeilik et al. (1982), Hall and Henry (1983) Lines et al. (1983) and Henry (1983). If compared to the light curve obtained by Nations and Ramsey (1981) it seems to show some similitude since they found two maxima at 0.55 separation in phase although of different amplitude.

M.J. ARÉVALO, C. LÁZARO and J.J. FUENSALIDA

Instituto de Astrofísica de Canarias
38071 La Laguna
Tenerife, SPAIN

References:

Cousins, A.W.J.: 1976, Mem. Roy. Astron. Soc., 81, 25.
Hall, D.S. and Henry, G.W.: 1983, I.B.V.S. No.2307.
Hartmann, L., Londoño, C. and Phillips, M.J.: 1979, Astrophys.J., 229, 183.
Henry, G.W.: 1983, I.B.V.S. No 2309.
Lines, R.D., Louth, H., Stelzer, H.J. and Hall, D.S.: 1983, I.B.V.S. No.2308.
Nations, H.L. and Ramsey, L.W.: 1981, Astron.J., 86, 433.
Rucinski, S.M.: 1977, Publ. Astron. Soc. Pac., 89, 280.
Zeilik, M., Elston, R., Henson, G., Schmolke, P. and Smith, P.: 1982, I.B.V.S. No.2177.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2841

Konkoly Observatory
Budapest
27 December 1985
HU ISSN 0374 - 0676

SOME COMMENTS ON THE MINIMA OF THE RS CVn TYPE ECLIPSING BINARIES CQ Aur, RU Cnc, VV Mon AND SZ Psc

In recent years a considerable effort has been made to describe in the most comprehensive way the features of the photometric wave-like distortions shown by the RS CVn type binaries. However, there are some problems that, on the contrary, have received less attention; among them we should like to quote the effects produced by the migrating wave on the epochs of minimum light (changes in the slopes of ascending and descending branches) and on the levels at the bottoms of primary and secondary minima (related to size and position of the perturbed regions). In this work we report on some results obtained from the extensive V photometry carried out at the Astronomical Observatory of Torino in the interval 1975 - 1984 on the systems CQ Aur, RU Cnc, VV Mon and SZ Psc.

CQ Aurigae ($P = 10^{d}.62$)

Most of the epochs of primary minimum (Kurotschkin, 1940) seem to be quite uncertain; therefore, in order to minimize the large scatter shown by them, we assumed, as representative of the oldest epochs, the mean value as deduced by Kurotschkin (1940), i.e. JD 2429558.78. More recently, timings were determined by O'Connell (1978) (JD 2440000.281) and by us (JD 2443814.05 $\pm$0.01 and JD 2445396.850 $\pm$0.004). The weighted period as derived from these four epochs is $P = 10^{d}.62251 \pm 0.00004$. We suggest that the following ephemeris:

$$\text{Min.I(Hel.)} = 2443814.05 + 10^{d}.62251 \cdot E$$

can be used to predict future epochs of minimum light with a good reliability.

From our photometry, spread over the interval 1978 - 1985, we infer no appreciable variations in the luminosity level at the bottom of the secondary minimum; on the contrary, an increase larger than the experimental error (up to about 0.1 mag) occurs near phase 0.0 (when only the cooler active component is visible) at the epochs 1978.02 and 1980.96.

RU Cancri ($P = 10^{d}.17$)

The oldest photographic and visual estimates can be found in Hall and Kreiner (1980). We are able to add the epochs: JD 2441775.856 ±0.001 (as derived from the data kindly sent to us by Dr. D.M. Popper (see also Popper and Dumont, 1977)) and JD 2445356.713 ±0.001 from our own photometry. Both linear and parabolic fits to the (O-C)'s have been calculated; the best agreement has been found using the following light elements:

$$\text{Min.I (Hel.)} = \underset{\pm 0.0024}{2422650.7152} + \underset{\pm 0.00000005}{10^{d}.17298843} \cdot E - \underset{\pm 0.05}{2.25} \cdot 10^{-8} \cdot E^2$$

No clear evidence can be drawn about the bottoms of primary and secondary minima even if a quite large spread (up to about 0.06 mag) suggests possible variations in the luminosity levels.

Assuming an inclination $i = 90^{\circ}$, the durations of the eclipse ($0^{d}.894 \pm 0.020$) and of the totality ($0^{d}.314 \pm 0.016$) allow to determine the fractional radii of the components, $R_S = 0.089 + 0.006$ and $R_L = 0.186 + 0.010$.

VV Monocerotis ($P = 6^{d}.05$)

For this binary the ephemeris found by Scaltriti (1979) proved to be satisfactory also for the new epoch JD 2444189.440 ±0.003 . A weighted linear least squares fit led to:

$$\text{Min.I (Hel.)} = \underset{\pm 0.010}{2442834.110} + \underset{\pm 0.000006}{6^{d}.050592} \cdot E$$

As far as the luminosity levels at the bottoms of minima are concerned, the same conclusions drawn for RU Cnc are valid in the case of VV Mon.

SZ Piscium ($P = 3^{d}.97$)

As pointed out in Catalano et al. (1978) and Hall and Kreiner (1980), this system shows one of the largest amplitudes in the O-C curve (up to about $0^{d}.6$) among the eclipsing binaries. In Table I we collected all the epochs we could find in the literature. In order to minimize the uncertainty in the older determinations of Jensch (1934) and Gaposchkin (1943, 1952), we have constructed normal minima wherever some epochs a few cycles apart were present. The $(O-C)_1$ values calculated by means of the linear ephemeris by Catalano et al. (1978) (see Table I) are plotted in Figure 1.

Quadratic fits to this trend were calculated by Hall and Kreiner (1980) and Tunca (1984); however, unacceptable deviations (up to about $0^{d}.13$) suggest different approximations to the observed (O-C)'s; we find that the curve

$$(O-C) = 0^{d}.4 \cdot \sin((360^{\circ}/7200)(E + 4000)) \qquad (1)$$

represent quite well the $(O-C)_1$ values; the $(O-C)_2$'s listed in Table I have

Table I. Times of minimum of SZ Psc

JD(Hel.)	E	$(O-C)_1$	$(O-C)_2$	Source
2425576.836	-4219	-0.119	-0.022	Jensch(1934)
25854.410	4149	-0.157	-0.084	Jensch(1934)
26262.943	4046	-0.107	-0.070	Jensch(1934)
27036.365	3851	-0.030	+0.042	Jensch(1934)
27409.322	3757	+0.136	+0.072	Jensch(1934)
28000.255	3608	+0.155	+0.040	Gaposchkin(1943)
29935.858	3120	+0.415	+0.154	Gaposchkin(1952)
35741.819	1656	+0.348	+0.003	Jakate et al.(1976)
36114.574	-1562	+0.311	-0.018	Jakate et al.(1976)
42308.767	0	-0.179	-0.038	Jakate et al.(1976)
43117.822	+ 204	-0.161	+0.043	From Eaton (1977)
43498.502	300	-0.204	+0.028	Catalano et al.(1978)
43815.707	380	-0.268	-0.014	From Hall and Kreiner(1980)
43823.674	382	-0.233	+0.021	Present paper
44069.544	444	-0.247	+0.024	Tunca(1984)
44073.51	445	-0.25	+0.03	From Tumer et al.(1980)
44184.529	473	-0.272	+0.006	Present paper
44573.16	571	-0.30	+0.01	Present paper
2444827.005	+ 635	-0.266	+0.049	Tunca(1984)

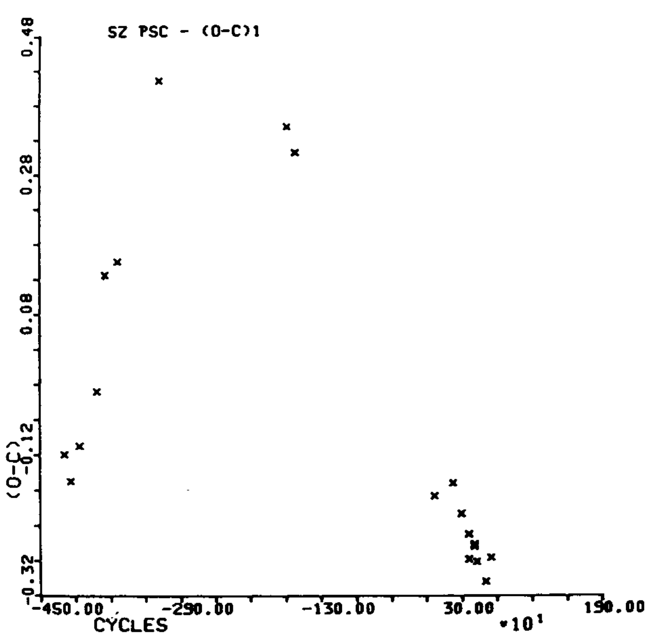


Figure 1. O-C values of SZ Psc

been calculated taking into account the contribution of formula (1); the resulting period of the cycle is about 78 years, which is longer than the estimation reported by Ahn (1982) (66 years).

It is clear that only determinations of future epochs can prove the long-term validity of the new ephemeris. In fact, we may notice that the last epoch in Table I gives $(O-C)_2 = 0.049$, a quite large value for a photoelectric timing; moreover, the periodicity of formula (1) might imply:

i) a light-time effect in a triple system, that would require a very massive third body ($M > 50\ M_\odot$); a similar phenomenon seems to be present in the RS CVn type system SV Cam (Cellino et al., 1985),

ii) an apsidal motion in an orbit with $e \cong 0.15$, far larger than found by Jakate et al. (1976) from a spectroscopic orbit solution ($e \cong 0.04$).

Perhaps we are witnessing just a long-term cyclic variation similar to those characterizing other RS CVn and W UMa type binaries.

Eventually, we notice that the epochs with $E > -1656$ can also be fitted by a linear least squares approximation, leading to the ephemeris:

$$\text{Min.I (Hel.)} = \underset{\pm 0.007}{2442308.817} + \underset{\pm 0.0000096}{3^{d}.9655847} \cdot E$$

F. SCALTRITI, M. BUSSO and A. CELLINO

Osservatorio Astronomico de Torino
Strada Osservatorio 20
I-10025 Pino Torinese (Torino) - Italia

References:

Ahn, Y.S., 1982, Publ. Korean Nat. Astron. Obs., 5, 25.
Catalano, S., Frisina, A., Rodono, M., and Scaltriti, F., 1978, Inf. Bull. Var. Stars, No. 1427.
Cellino, A., Scaltriti, F., and Busso, M., 1985, Astron. Astrophys., 144, 315.
Eaton, J.A., 1977, Inf. Bull. Var. Stars, No. 1297.
Gaposchkin, S., 1943, Harvard Annals, 113, No.2.
Gaposchkin, S., 1952, Harvard Annals, 118, No.6.
Hall, D.S., and Kreiner, J.M., 1980, Acta Astron., 30, 387.
Jakate, S., Bakos, G.A., Fernie, J.D., and Heard, J.F., 1976, Astron. J., 81, 250.
Jensch, A., 1934, Astron. Nachr., 252, 393.
Kurotschkin, N.E., 1940, Variable Stars, 8, 362.
O'Connell, D.J.K., 1978, Ric. Astr. Spec. Vaticana, 8, No.30.
Popper, D.M., and Dumont, P.J., 1977, Astron. J., 82, 216.
Scaltriti, F., 1979, Astron. Astrophys. Suppl. Ser., 35, 291.
Tumer, O., Kurutac, M., Tunca, Z., Evren, S., Ertan, A.Y., and Ibanoglu, C., 1980, Inf. Bull. Var. Stars, No. 1741.
Tunca, Z., 1984, Astrophys. Space Sci., 105, 23.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2842

Konkoly Observatory
Budapest
28 December 1985
HU ISSN 0374 - 0676

MINIMA TIMES OF GO CYGNI

The short period eclipsing binary GO Cygni was photoelectrically observed during July and September 1985. The observations were made using a two-beam, multi-mode, nebular-stellar photometer attached to the 48-inch Cassegrain reflector at the Kryonerion Astronomical Station of the National Observatory of Athens.

Reduction of the observations was made using Hardie's (1962) method, while the B and V filters used are in close accordance to the standard ones. Our observations and light curves of GO Gyg will be appeared and analysed elsewhere. Here, we shall give only the five new minima times which were derived from our observations. They are presented in the following Table, the successive columns of which give : the heliocentric Julian date, the residuals $(O-C)_K$ and $(O-C)_S$ - where the C's were found using Kukarkin's et al. (1976) and Sezer's et al. (1985) ephemeris formulae, respectively and the type of minimum.

The minima times have been calculated using the Kwee and Van Woerden method (1956) and are the mean values of B and V observations. Moreover, it must be pointed out that the minima times for secondary minima were found as usually, although it seems from our observations that there is a very small eccentricity.

Table I

Hel. J. D. 2440000.+	$(O-C)_K$ days	$(O-C)_S$ days	Min Type
6264.4795	+0.0428	-0.0046	I
6325.4892	+0.0426	-0.0037	I
6327.2790	+0.0370	-0.0117	II
6328.3597	+0.0421	-0.0057	I
6329.4275	+0.0338	-0.0155	II

H. ROVITHIS - LIVANIOU
Section of Astrophysics-
Astronomy and Mechanics
Dept. of Physics,
Athens University
Panepistimiopolis, GR 157 71
ZOGRAFOS, GREECE

P. ROVITHIS
Astronomical Institute,
National Observatory of Athens
Athens 118 51,
GREECE

References :

Hardie, R. H. : 1962, in W.A. Hiltner (ed.), Stars and Stellar Systems Vol. II, Astronomical Techniques, The University of Chicago Press, Chicago.

Kukarkin, B. V. et al. : 1976, Third Supplement to the Third Edition of the General Catalogue of Variable Stars, Moscow.

Kwee, K.K. Van Woerden, H. : 1956, Bull. Astron. Inst. Neth. 12, 327.

Sezer, C., Gülmen, Ö. and Güdür, N. : 1985, I.B.V.S. No. 2743.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2843

Konkoly Observatory
Budapest
28 December 1985
HU ISSN 0374 - 0676

NEW PHOTOMETRIC OBSERVATIONS OF THE β CMa STARS γ Peg , 12 Lac AND β Cep

Recents studies demonstrated the existence of secular changes in periods and amplitudes in most of β CMa stars (Chapellier, 1985, 1986). In these papers the importance of regular observations of these stars were underlined.

Three of the classical β CMa stars, i.e. γ Peg , 12 Lac and β Cep were observed in October 1985, at Pico del Veleta, (Spain), with the 60 cm telescope of the Nice Observatory. The Geneva type photometer described in Le Contel et al. (1974) was changed from analogical to photon counting system. The photomultiplier was a 9816Q EMI tube with a S20 photocathode. Its temperature was regulated at -13° C ± 0.1. Filters 4 and 5 (respectively UV and blue) described in Sareyan et al. (1976) were used. For the brightest stars, γ Peg and β Cep , a neutral filter (d = 1.2) was used. One comparison and a check star were observed in sequence with the variable. In Table I we listed for each variable the comparison star, the heliocentric dates of observed maxima on the different nights and the corresponding amplitudes in the two filters. When we were unable to give a precise determination of a light maximum we only give in column 3 the Julian day.

γ Pegasi

The observed maxima are in agreement with the two latest ephemerides published by Sareyan et al. (1975) and Koubsky et al. (1981). As the phase lag between radial velocity maxima and light maxima is different from one study to another, (0.25 P in Sareyan et al., 0.18 in Koubsky et al.), we reanalysed separately all the published photoelectric and spectrographic data and derived the following ephemeris :

$$M_{V_\Theta} = \underset{\pm 26}{2426000.1106} + \underset{\pm 3}{0^d\!.15175022}\, E$$

Table I : Light maxima dates and amplitudes

Star	Filter	M_{ℓ_Θ} (2400000+)	Amplitudes (mag)	Comparison star
γ Peg	blue	46351	0.025	HR 26
-	uv	46351.367	0.04	-
-	uv	46351.529	-	-
-	b	46354.39:	0.02	-
-	b	46354.560	-	-
-	uv	46354.409	0.03	-
-	uv	46354.560	-	-
12 Lac	b	46348	0.02	HR 8603
-	uv	46348	0.03	-
-	b	46353.420	0.09	-
-	uv	46353.424	0.14	-
β Cep	b	46349.51:	0.045	HR 8227
-	uv	46349.501	0.055	-
-	b	46352.38:	0.03	-
-	uv	46352.379	0.04	-

The corresponding mean phase lag is 0.24 ± 0.03 P.

In conclusion the period and amplitudes of γ Peg appear to have remained constant over the last fifty years.

12 Lacertae

This multiperiodic variable was observed at two different phases of the beat period. The amplitude seems to be constant. Only one maximum could be determined on the night when the amplitude of the beat period is larger. Its date is in good agreement with the ephemeris determined by Chapellier (1985) assuming a constant primary period since 1939. On the contrary it departs (Δ T = 0.0230 d) from the ephemeris which assumes that the primary period is decreasing at a rate of 0.21 s/c.

β Cephei

The amplitude in both filters is almost twice that of our last observations performed in 1983 (Chapellier, 1983). The cyclic variation of this parameter pointed out by Chapellier (1986) is confirmed. The period remains constant.

Acknowledgements: We thank J. Colin and D. Ducatel for technical assistance.

J.C. VALTIER, E. CHAPELLIER, P.J. MOREL,
J.M. LE CONTEL

Observatoire de Nice - L.A. 128
B.P. 139 - 06003 NICE CEDEX

References:

Chapellier, E. : 1985 Astron. Astrophys. 147, 135

Chapellier, E. : 1986, Astron. Astrophys. Suppl. in press

Koubsky, P., Harmanec, P., Krpata, J., Zdarsky, F. : 1981, Workshop on Pulsating B stars, eds. G.E.V.O.N. and C. Sterken, p. 161, Nice

Le Contel, J.M., Valtier, J.C., Sareyan, J.P., Zribi, G., Baglin, A. : 1974, Astron. Astrophys. Suppl. 15, 115

Sareyan, J.P., Le Contel, J.M., Valtier, J.C. : 1976, Astron. Astrophys. Suppl. 25, 129

Sareyan, J.P., Valtier, J.C., Le Contel, J.M. : 1975, Astron. Astrophys. 44, 215

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2844

Konkoly Observatory
Budapest
6 January 1986
HU ISSN 0374 - 0676

EVOLUTION OF THE SPECTRA OF THE SYMBIOTIC STAR Z And

All the spectra were recorded using a D spectrograph mounted on the T 80 cm of the O.H.P. (1979-1982) giving a dispersion of 93 Å/mm at Hγ. The wavelength region of interest was λ 3700 to λ 5000 Å and heated Kodak IIaO plates were used.

The emission spectrum is very rich: the following lines were observed, their intensities varying with time during which they were observed.

He II λ4686 Å was always present;

He I lines were weak in 1979 (September) and in 1982 (January);

[O III] λ 4363 Å was absent during these periods;

Fe II , [Fe II], [Fe VII] were seen when He II λ4686 was very strong likewise N III λ 4640 Å.

TiO bands (α system) were very weak in July 1981 and in October 1982.

In October 1982, the predominant feature of the spectrum was a band having a wide range of ionization energy.

We also note the absence of [O III] 5007 Å in all spectra, implying that there was no development of a nebulosity.

Measurements in UBV were carried out by other authors: Taranova and Yudin (1981), Martel and Gravina (1985), and Belyakina (1985). These data can be interpreted that the star shows oscillations of varying amplitude caused by explosions of the hot star.

The oscillations are damping and occur with a period of roughly 700 days. Colour index measurements suggest that the cold star might be an M6 type giant, and the hot star might be enveloped in He I , explaining the transformation of UV light to visible frequencies.

We were not able to discover any level of linear polarization which leads us suppose that there is no favoured direction for the ejection of matter.

R. GRAVINA

Observatoire de Lyon
F-69230 Saint-Genis-Laval, France

References:

Belyakina, I.S., 1985, Inf. Bull. Var. Stars, No.2698.

Martel, M.T., and Gravina, R., 1985, Inf. Bull. Var. Stars, No. 2750.

Taranova, O.G., and Yudin, B.F., 1981, Astron. Zhu., 58, 1051.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2845

Konkoly Observatory
Budapest
7 January 1986
HU ISSN 0374 - 0676

OBJECTIVE-PRISM DISCOVERIES IN A REGION OF THE MILKY WAY

An inspection of twelve 8°-prism plates taken with the 70-cm meniscus telescope of the Abastumani Astrophysical Observatory (USSR) has yielded a number of hitherto unrecognized peculiar or otherwise interesting stars. The region surveyed is of about 60 square degrees, its center being in the association Vulpecula OB4. The reciprocal dispersion of the spectrograms is 166 Å/mm at Hγ and the spectra are widened to 0.4 mm. The exceptional seeing at Abastumani together with the high quality of the spectra allows peculiar star discoveries with a great certainty (Kharadze, E.K., and Bartaya, R.A., 1973, IAU Symp., 50, 91). Many of these are of sufficient interest to justify early publications.

The stars suspected of being either of type Ap or Am, as well as two composite objects are listed in Table I. The BD numbers and magnitudes are given; the numbers in the SAO catalogue are also noted if they exist. In the last column the observed peculiarities in the spectra are indicated; a semicolon is added for stars whose peculiarity is discerned on a single plate.

Most of the peculiar stars found are of the classical varieties but some may represent something new. Nevertheless, a higher-resolution study of these and other objects in the list is obviously desirable in order to check their peculiarity and to assign to them a more precise type.

TSVETANKA RADOSLAVOVA
Department of Astronomy and
National Astronomical Observatory
Bulgarian Academy of Sciences
72 Lenin Blvd., 1784 Sofia, Bulgaria

Table I

BD No.	m	SAO No.	Remarks and type
$+20^{\circ}4159$	9.5	-	Ap or F0p, λλ4128, 4077
4191	8.7	087400	Ap, λλ4128, 4077
4330	9.2	-	Ap, λ4128
$+21^{\circ}3798$	9.4	-	Am
3910	8.9	087721	Am:
3977	9.5	-	A + F composite
3983	9.3	-	A + G: composite
3996	9.3	-	Ap: , λλ4128, 4077
$+22^{\circ}3827$	8.5	-	Am:
3858	9.4	-	Am
$+24^{\circ}3769$	9.2	087298	Ap, λλ4128, 4077
3780	8.8	087366	Ap, λλ4128, 4077
3810	9.0	087452	Ap, λ4128
$+25^{\circ}3918$	9.1	087547	Ap: or Am:, λ 4128
3942	9.4	-	Am or Ap
4028	9.5	-	Ap, λλ4128, 4077
$+26^{\circ}3581$	9.5	-	Am
3698	8.9	087849	Am:
$+27^{\circ}3439$	9.4	-	Am
3515	9.0	087724	Am
3567	9.3	-	Am:
$+28^{\circ}3421$	9.3	087502	Am

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2846

Konkoly Observatory
Budapest
13 January 1986
HU ISSN 0374 - 0676

THE VARIABILITY OF HD 17433

We find that HD 17433 is variable; the timescale of variation is on the order of a few weeks. Its light variation and color suggest that it is a spotted variable, possibly an RS CVn-type star, with spots 800 K cooler than the photosphere covering at least 6% of the surface.

During a program to study changes in light curves of RS CVn variables, we observed the K star HD 17433. As far as we can determine, it was suggested to us as a possible spotted variable by Gregory W. Henry, who heard it has strong Ca II H & K emission from Francis C. Fekel. Twenty observations were obtained in the BVRI system (Cape R and I) on 10 nights in September 1984 with the No. 4 16-inch telescope at Kitt Peak Natonal Observatory. The comparison star was HD 17395, and HD 17329 was observed as a check. These data have been deposited in the IAU Commission 27 Archive for Unpublished Observations of Variables Stars (Breger 1982) as file 147.

HD 17433 was found to have the following colors, (B-V) = 0.97, $(V-R)_C$ = 0.55, and $(V-I)_C$ = 1.08, which are consistent with a middle K star. These values, in fact, lie quite close to the expected colors of a K3-4 dwarf on the standard relation of Bessell (1979). If the star is actually a giant, it would be too blue in (B-V) by ~ 0.15 mag for the (B-V)--$(V-I)_C$ relation for giants. The photometry is plotted in Figure 1. The star is clearly variable in both light and color, the variation being at least consistent with a rotating spotted star. Variations in V and (V-I) are greater than the 0.01 mag errors assumed. The period is something on the order of three weeks, although we do not seem to have observed a complete cycle and cannot give a definitive value. Clearly, it cannot be shorter. Likewise, the timescale for a large spot to move across the disk of a star, 0.4-0.55 rotational cycle, is not consistent with a period much longer.

Assuming a period of 20 days, we have calculated a rough spot model with the techniques used in Poe and Eaton (1985). The calculated light variation is shown by the solid curves in Figure 1. Values of parameters are as follows: i = 60° (assumed), T_{eff} = 4280 K, and T_{spot} = 3500 K. Two spots were necessary to

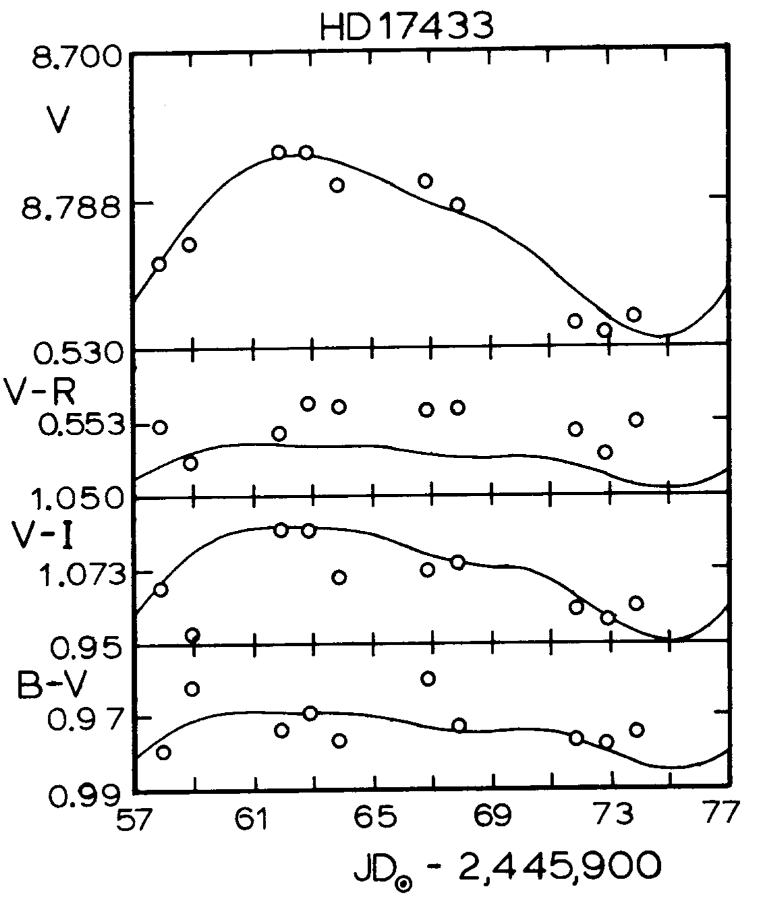


Figure 1. BVRI photometry of HD 17433. Nightly means are plotted against time. The star is obviously variable by ~ 0.1 mag in V and by ~ 0.03 mag in $(V-I)_c$. The solid curves show the calculated light and color variation for a two-spot model having spots 800 K than the surrounding photosphere on a single star rotating once in 20 days. The fit with this model is good, although there seems to be a systematic error in calculated $(V-R)_c$ color. If the spot were completely black, the variation in $(V-I)_c$ would be only 0.01 mag, considerably less than observed.

reproduce the asymmetry of the light variation. Both were taken to be at latitude 40°, their centers thus coming within 10° of the center of the disk as they transit, and they had angular radii of 10° and 17°, facing Earth at epochs JD 2,445,969.0 and JD 2,445,975.0, respectively, in Figure 1. So the spots are on the order of 800 K cooler than the photosphere and cover at least ~ 6% of the surface of the star. Since we cannot be sure we detected the light curve's minimum, the larger of the two spots could be even bigger than we have found. Also, since the inclination of the rotation axis and the latitude of a spot are not determined here, and since the latitudes of the two spots are likely different, the coverage is probably greater than 6%.

JOEL A. EATON

Astronomy Department
Indiana University
Bloomington, IN 47405 U.S.A.

CLINT H. POE

Washburn Observatory
475 North Charter Street
Madison, WI 53706 U.S.A.

References:

Bessell, M. S. 1979, Pub. A.S.P., 91, 589.

Breger, M. 1982, Inf. Bull. Var. Stars, No. 2246.

Poe, C. H., and Eaton, J. A. 1985, Ap. J., 289, 644.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2847

Konkoly Observatory
Budapest
14 January 1986
HU ISSN 0374 - 0676

DISCOVERY OF AN ATMOSPHERIC ECLIPSE OF τ PER

We report the discovery of an atmospheric eclipse of the 4.15 year spectroscopic binary τ Per. This G5 III + A2 V system has a highly eccentric orbit ($e = 0.74$) and is oriented such that superior conjunction of the secondary occurs near periastron. The astrometric orbit by McAlister (1981) from speckle observations indicates the inclination is high ($i = 95^\circ \pm 2\overset{\circ}{.}4$). Using an updated spectroscopic orbit kindly provided by M. Fletcher (D.A.O.), we predicted that the A star companion would pass within a projected distance of 2 stellar radii of the G-type primary and behind it on 21.04 November 1984 (JD 2446025.54). This distance is small enough to observe an eclipse of the A star passing behind the outer atmosphere of the primary. With the appulse occurring near periastron, the event would be less than two days long. Since the eclipse depth would be strongly wavelength dependent, being deepest in the ultraviolet region where the A star dominates the composite light, a monitoring program with both the *International Ultraviolet Explorer* satellite and various optical observers was arranged soon after the eclipse predictions from the Fletcher elements were calculated.

Daily observations with the *IUE* began on 17 November 1984, sharing time with other observing programs so that various exposures with the LWP ($\lambda\lambda$3200 – 2000) and SWP ($\lambda\lambda$2000 – 1200) cameras were obtained each day depending on the configuration of the spacecraft. The data are absolutely calibrated to flux levels at the earth. Fine Error Sensor (FES) measurements made in acquiring the star were transformed to broadband V magnitudes to supplement the groundbased optical data.

Broadband photoelectric photometry began at several observatories, weather permitting, on 18-19 November 1984, the same night the eclipse prediction was made known. The telescope apertures were 14-inch for Barksdale, 16-inch for Fried, 8-inch for Hopkins, 8-inch for Landis, and 11-inch for Louth. Differential

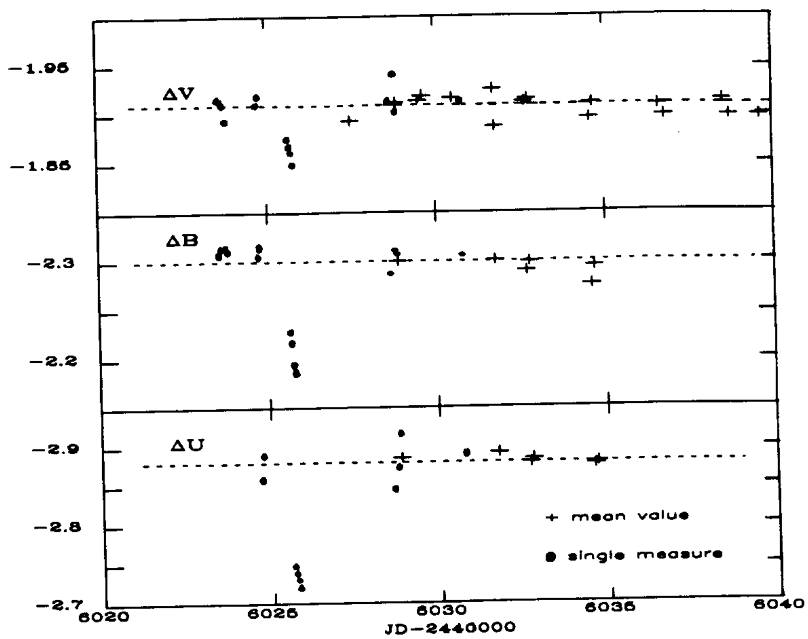


Figure 1

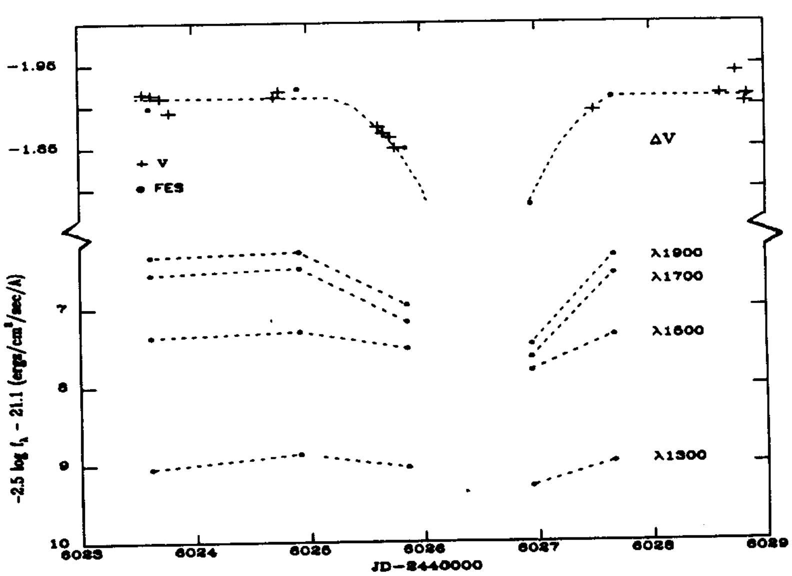


Figure 2

measures were made with either HR 787 or γ Per as comparison stars. The resulting differential magnitudes, corrected for extinction and transformed to the *UBV* system, have been sent to the *I.A.U. Commission 27 Archive for Unpublished Observations of Variable Stars* (Breger 1982), where they are available as file no. 140.

Figure 1 shows the light curve in *UBV* from JD 2446022 to 2446040, although observations continued through 2446057. The mean differential magnitude outside eclipse was $\Delta V = -1\overset{m}{.}91$, $\Delta B = -2\overset{m}{.}30$, and $\Delta U = -2\overset{m}{.}88$ for the observations using HR 787 as the comparison star; the corresponding values for those using γ Per were $\Delta V = +1\overset{m}{.}00$, $\Delta B = +1\overset{m}{.}06$, and $\Delta U = +1\overset{m}{.}11$. These differences (all consistent, within a couple of hundredths of a magnitude, with those derived from *UBV* magnitudes in the 1982 *Yale Bright Star Catalogue*) were used to plot all differential magnitudes on the same ordinate in figure 1, even though two different comparison stars were used. For those points which are means of 2 to 4 individual differential measures, the internal errors are typically $\pm 0\overset{m}{.}004$; the external errors of course are larger, but probably no more than about $\pm 0\overset{m}{.}01$. FES measurements were transformed to magnitudes using the dead-time correction in Holm and Rice (1981) and were plotted with the differential *V* observations by requiring the first three pre-eclipse measures to average $\Delta V = -1\overset{m}{.}91$. Internal errors are $\pm 0\overset{m}{.}01$, but the repeatibility of the FES is known to be only about $\pm 0\overset{m}{.}03$.

It is clear from figure 1 that a portion of the descending branch was observed on one night, with the eclipse depth increasing with decreasing wavelength. As of JD 2446025.764, the lowest ingress point, the light had dropped by $0\overset{m}{.}06$ in *V*, $0\overset{m}{.}12$ in *B*, and $0\overset{m}{.}16$ in *U*. With the FES measures, the *V* light curve shows 2 and perhaps 3 points on the ascending branch prior to fourth contact. On JD 2446026.94, the eclipse depth is at least $0\overset{m}{.}13$ in *V*. If we require the eclipse to be symmetric, the center occurred on JD 2446026.48 $\pm 0\overset{d}{.}05$ and the total duration lasted between 2.3 and 3.1 days. The central part was insufficiently covered to discover whether it was total or partial.

In the ultraviolet continuum, the eclipse depth (figure 2) increases from $0\overset{m}{.}35$ at 3200 Å to $1\overset{m}{.}15$ at 2500 Å, where it remains constant until 1600 Å. Shortward of this, the eclipse becomes shallower with decreasing wavelength, being only $0^{m}.25$ deep at 1250 Å. The UV spectra during eclipse are found to have added line absorption due to the atmosphere of the G star superimposed on the A-type spectrum. Low-excitation lines of Mg I, Cr II, Mn II, Fe I and Fe II have been identified, which are characteristic of atmospheric eclipsing systems such as 22 Vul (Ake, Parsons, and Kondo 1985). In such a situation, we would expect that the eclipse *duration* should increase towards the ultraviolet, but our observations are insufficient to show this was the case. By themselves, the *UBV* data alone are no inconsistent with the eclipse being strictly geometric.

T. B. AKE[1]
Computer Sciences Corporation
Space Telescope Science Institute
Baltimore, MD 21218 U.S.A.

F. C. FEKEL, JR.[1] and D. S. HALL
Dyer Observatory
Vanderbilt University
Nashville, TN 37235 U.S.A.

W. S. BARKSDALE
633 Balmoral Road
Winter Park, FL 32789 U.S.A.

H. J. LANDIS
A. A. V. S. O.
50 Price Road, West
Locust Grove, GA 30248 U.S.A.

R. E. FRIED
Braeside Observatory
P. O. Box 906
Flagstaff, AZ 86002 U.S.A.

H. LOUTH
2199 Hathaway Road
Seeho Woolley, WA 98284 U.S.A.

J. L. HOPKINS
Hopkins-Phoenix Observatory
7812 West Clayton Drive
Phoenix, AZ 85033 U.S.A.

[1] Guest Observer, *International Ultraviolet Explorer*

References :

Ake, T. B.,Parsons, S. P. and Kondo, Y. 1985, ***Astrophys. J.***, **298**, 772.
Breger, M. 1982, *I.B.V.S.* No. 2246.
Holm, A. and Rice, G. 1981, *NASA I.U.E. Newsletter*, **15**, 74.
McAlister, H.A. 1981, ***Astron. J.*** **86**, 1397.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2848

Konkoly Observatory
Budapest
15 January 1986
HU ISSN 0374 - 0676

HD174853 - A NEW ECLIPSING BINARY

HD174853 = HR7109 was found to be a spectroscopic binary by one of us (Hube, 1970) who noted spectral line doubling on one of eleven low dispersion plates. The star has also long been suspected as a photometric variable (Hoffleit, 1964). In this note we briefly describe recent observations which confirm that HD174853 is a double-lined spectroscopic binary, and that the suspected photometric variations are real and due to two nearly-equal eclipses in each short period orbital cycle.

Spectroscopic observations have been made intermittently during the past fifteen years at the Dominion Astrophysical Observatory, Victoria, using the Cassegrain spectrograph on the 1.88-m telescope at a dispersion of 1.5 nm mm^{-1}. Due to very severe blending of the rotationally broadened lines of the two components very little progress has been made. Even using an oscilloscopic-setting comparator it was never possible to confidently and unambiguously resolve the lines and measure the radial velocities of each component.

Recently, we have scanned most of the spectrograms on a PDS microdensitometer and reduced the data using the cross-correlation procedures developed at the DAO (Hill, 1982) and which are proving invaluable in resolving secondary spectroscopic components (c.f. Gulliver, et al, 1985). Spectroscopically, the two components are quite similar though sufficiently different to permit one to distinguish the primary from the secondary in the cross-correlation functions. The semi-amplitude of the velocity variation of each component is approximately 170 km s^{-1}. Over a time interval as short as 2 hours on a given night the radial velocities changed markedly, suggesting a very short orbital period and the possibility that the previously detected photometric variations are due to eclipses.

Using a 0.45-m telescope and a 1P21 PMT-equipped single channel photometer built by one of us (A.M.), HD174853 was observed on twelve nights between May and December 1985. HD175592 was the comparison star and HD176232 (see following note) served as a rough check star. Corrections were made for differential extinction. A total of approximately 200 observations was obtained with a V filter.

We find that HD174853 is, indeed, an eclipsing binary with two nearly-equal minima occurring in an orbital period of approximately 1.3907 days. The observations are plotted with this period in Figure 1 where phases are measured from JD(⊙) = 2446201.161. There is substantial uncertainty in both the orbital period and epoch of primary minimum due to the paucity of data. Due to an unfortunate distribution of clear nights almost an entire half-cycle has gone unobserved. In addition, what we take to be the secondary minimum was observed on only one night, and sky conditions were deteriorating rapidly toward the end.

Cowley, et al. (1969) classified the star as B8Vnn and list colour indices which imply reddening of at most a few

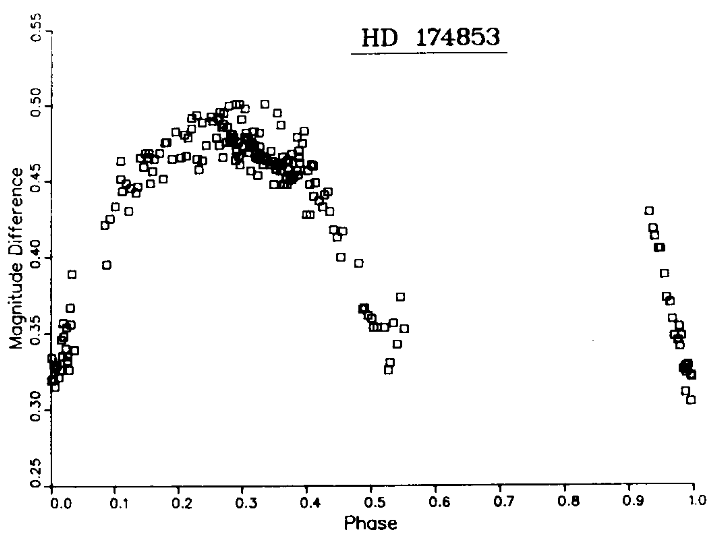


Figure 1

hundredths of a magnitude. The photometry of Crawford, et al. (1973) is also consistent with a very small amount of reddening. The measured β-index implies an absolute magnitude of approximately +0.3 (Crawford, 1978) which is appropriate for a normal B8 dwarf (Allen, 1973; Underhill and Doazan, 1982). In the β-c_1 diagram HD174853 is close to the zero-age main sequence.

In summary, HD174853 appears to be a relatively young, contact or near-contact binary with similar components.

We plan to obtain a complete light curve during the next observing season. The spectroscopic observing and analysis are being done in collaboration with Graham Hill and Wes Fisher, Dominion Astrophysical Observatory, from whom we have obtained the benefit of preliminary discussions on this system. A complete discussion and analysis of all the data will be presented elsewhere.

DOUGLAS P. HUBE
Department of Physics

MARK ANDERSON
Department of Electric Engineering
University of Alberta
Edmonton, Alberta, Canada

References:

Allen, C.W., 1973, Astrophysical Quantities (3rd edition), The Athlone Press.

Cowley, A., Cowley, C., Jaschek, M. and Jaschek, C., 1969, Astron. J. 74, 375.

Crawford, D.L., 1978, Astron. J. 83, 48.

Crawford, D.L., Barnes, J.V., Golson, J.C. and Hube, D.P., 1973, Astron. J. 78, 738.

Gulliver, A.F., Hube, D.P. and Hill, G., 1985, Astron. Astrophys. 151, 254.

Hill, G., 1982, Publ. Dom. Astrophys. Obs. 16, 59.

Hoffleit, D., 1964, Catalogue of Bright Stars (3rd edition), Yale University Observatory.

Hube, D.P., 1970, Mem. Roy. Astron. Soc. 72, 233.

Underhill, A. and Doazan, V., 1982, B Stars with and Without Emission Lines, NASA SP-456.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2849

Konkoly Observatory
Budapest
15 January 1986
HU ISSN 0374 - 0676

A NOTE ON V1286 AQUILAE

V1286 Aql = 10 Aql = HD176232 = HR7167 is a bright peculiar A-type star about which there is confusion in the literature regarding the amplitude and period of the photometric variation.

The latest edition of The Bright Star Catalogue (Hoffleit and Jaschek, 1982) records a variation between V = 5.83 and 5.93, or a total range of 0.1 magnitude, and an uncertain period of 6.05 days. The source for that information appears to have been the data file for the latest edition of the General Catalogue of Variable Stars (Kholopov, 1985). The primary reference for the latter is listed as Guerrero and Mantegazza (1973). In fact, we find no evidence in the published data on this star for an amplitude of variation as large as $0\overset{m}{.}1$. Our own observations are consistent with others in indicating an amplitude of order $0\overset{m}{.}01$.

Stępień (1968) found a variation between V = 5.888 and 5.907 and a period of 9.78 days with, however, a rather large scatter. Preston (1970) concluded on the basis of his spectroscopic observations and the earlier work of Babcock that, if the oblique rotator model applies, the period of the star must be "measured in years". Wolff and Morrison (1973) could find no significant photometric variations during one season. Guerrero and Mantegazza (1973) found a range of approximately $0^{m}.015$ in V over 27 nights in one season but did not find the 9.78 day periodicity. The best period found by them was 6.05 days but the scatter in the light curve was so large as to lead them to conclude that "the $6^{d}.05$ period is not true".

The most convincing evidence for short period variations was found by Winzer (1974) whose observations in two runs in two successive years revealed a total range of $0^{m}.01$ in V and a period of $6^{d}.5386$. That period also satisfies Stępień's data. We find, however, that the data of Guerrero and Mantegazza are _not_ satisfied by this period.

During 12 nights between May and December 1985, we observed V1286 Aql with a single channel photometer employing an uncooled 1P21 PMT on a 0.45-m telescope, all the equipment having been built by one of us (M.A.). The star was observed in a sequence with HD174853 (see preceding contribution) and using HD175592 as the comparison star. Corrections have been applied for differential extinction. On a given night observations extended over 1.1 to 4.4 hours. The nightly averaged heliocentric Julian Dates, magnitude differences (in the sense V1286 Aql minus HD175592), and standard errors of the nightly means are given below:

JD (⊙) (2440000+)	ΔV	s.e.
6213.871	0.7015	0.0012
6217.865	0.7066	0.0015
6230.823	0.7017	0.0013
6242.854	0.7066	0.0011
6251.826	0.7047	0.0028
6256.800	0.7073	0.0023
6262.836	0.7076	0.0015
6273.856	0.7110	0.0020
6333.718	0.7155	0.0019
6336.779	0.7064	0.0030
6337.693	0.7071	0.0020
6401.561	0.7085	0.0038

We find a total range of less than $0\overset{m}{.}015$. Our data are not inconsistent with the $6\overset{d}{.}5386$ period though the scatter about the resultant curve is larger than it was for Winzer's data.

Various of the observers cited above have compared the published values of seasonally averaged V magnitudes for V1286 Aql. The total range of approximately $0\overset{m}{.}06$ could easily be due for the most part to external errors associated with the use by different observers of different equipment, comparison stars, and reduction procedures.

On the basis of our observations and others published previously, we draw the following conclusions:

1. V1286 Aql does not vary in either the long or short term by as much as $0^m.1$. The range given in the GCVS and repeated in the BSC is either due to a misprint in the former or to a misreading of the published data;

2. The star probably does vary on a short time scale with an amplitude of approximately $0^m.01$. It would not be the first such star known in which photometric variations have a shorter time scale than the magnetic field variations;

3. The period of variation remains unknown. Of the various periods which have been proposed, none satisfies all the published data.

In order to determine unambiguously the true nature of the photometric variability of this star - and of others like it - repeated observations must be made over many successive nights and successive years using the same equipment, comparison stars and reduction procedures.

DOUGLAS P. HUBE
Department of Physics

MARK ANDERSON
Department of Electrical Engineering
University of Alberta
Edmonton, Alberta, Canada

References:

Guerrero, G. and Mantegazza, L., 1973, Mem. Soc. Astron. Ital. 44, 377.

Hoffleit, D. and Jaschek, C., 1982, The Bright Star Catalogue (4th edition), Yale University Observatory.

Kholopov, P.N., 1985, General Catalogue of Variable Stars (4th Edition), Moscow.

Preston, G.W., 1970, Publ. Astron. Soc. Pacific 82, 878.

Stępień, K., 1968, Astrophys. J. 154, 945.

Winzer, J.E., 1974, Unpublished Ph.D. Thesis, University of Toronto.

Wolff, S.C. and Morrison, N.D., 1973, Publ. Astron. Soc. Pacific 85, 141.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2850

Konkoly Observatory
Budapest
20 January 1986
HU ISSN 0374 - 0676

PHOTOELECTRIC TIMES OF MINIMUM LIGHT OF BL ERIDANI

The first photoelectric observations of BL Eridani (= HV 6227) were obtained in December 1980 and January 1981 with the 0.6-m telescope at Cerro Tololo Inter-American Observatory in Chile. Differential measurements made on five nights in B and V resulted in 520 individual observations in each bandpass. Each observation is the average of two ten-second integrations.

The times of minimum light shown in Table I were determined by an iterative process using the method of Hertzsprung (1928). Visual times of minimum light were previously published by Locher (1978a, 1978b, 1978c).

The O-C values in Table I were computed from the following ephemeris:

$$\text{Min I (Hel. J.D.)} = 2444606.5914 + 0.41696010\,E$$
$$\pm \quad .0085 \pm \quad .00001013 \quad \text{(p.e.)}$$

which was derived by a least squares analysis utilizing all the available data. The epochs of minimum light were weighted 10 to 1, photoelectric to visual.

The observations, period study, and analyses of the light curves are being published separately.

Table I. Times of minimum light for BL Eri

HEL. J.D.	MIN	EPOCH	O-C	FILTER
2444603.67091	I	-7.0	0.0018	B,V
2444604.71459	II	-4.5	0.0005	B,V
2444606.58936	I	0.0	0.0021	B,V
2444607.63275	II	2.5	0.0011	B,V

J. R. KERN* and BEVERLY B. BOOKMYER
Dept. of Physics and Astronomy
Clemson University
Clemson, SC 29631, U.S.A.

*Present Address:
Dept. of Physics
Rochester Institute of Technology
Rochester, NY 14623, U.S.A.

References:

Hertzsprung, E., 1928, Bull. Astr. Inst. Netherlands 4, 179.
Locher, K., 1978a, BBSAG Bull. 36, 4.
Locher, K., 1978b, BBSAG Bull. 38, 3.
Locher, K., 1978c, BBSAG Bull. 39, 4.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2851

Konkoly Observatory
Budapest
21 January 1986
HU ISSN 0374 - 0676

OPTICAL BEHAVIOUR OF THE POLAR AM Her IN 1985

In linking to the sequence of comparison stars given by Hudec and Meinunger (1977) the star was measured on 115 blue-sensitive (ORWO-ZU 21 + GG13 + BG 12) and 10 photovisual (ORWO-RP1 + GG14) plates from 42 nights taken with the 50/70/172 cm Schmidt camera of Sonneberg Observatory covering the time interval between 16 February and 5 December 1985. On 29 nights more than one blue plate per night was obtained. The individual observations will be published in MVS, Sonneberg.

In addition, 12 B-V colour indices on 8 nights could be derived. They complete the colour-magnitude diagram (m_B – B-V) given by Götz (1984b) and are in agreement with the behaviour shown there. The individual colour indices are listed in Table I.

Table I

J.D. hel. 244....	B	B-V
6175.456	$15^m.55$	$0^m.52$
6175.501	15.25	0.35
6200.408	15.60	0.50
6200.448	15.45	0.40
6327.337	15.47	0.32
6327.358	15.50	0.35
6328.345	15.55	0.35
6328.366	15.55	0.35
6374.238	15.05	0.50
6385.243	15.34	0.39
6386.259	15.45	0.63
6387.282	15.35	0.45

The long-time light curve in B and V (open circles) is given in Figure 1. As in the series of other years (1982, 1983, 1984 - see Götz, 1982, 1984a) two different states of brightness behaviour of AM Her can be seen there. But most of the observations are from the low state which is characterized in 1985 by two long-lasting minima of 55^d and more than 120^d, respectively. The observations of the high state which is caused by X-ray heating are start-

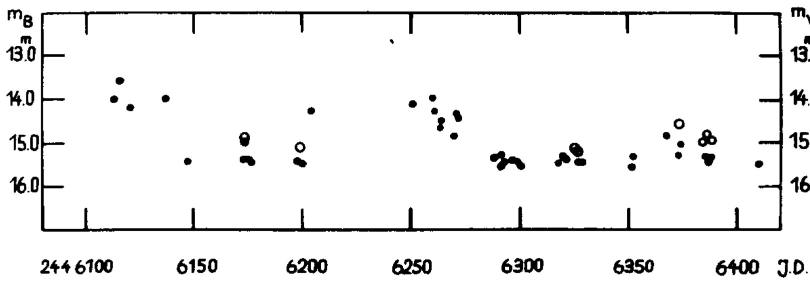


Figure 1

ing from the mean brightness $\bar{B} \approx 14\overset{m}{.}0$ on the way down to the low state in two cases.

The occultation light changes from the high state observations superimposed on the long-time behaviour of AM Her are in agreement with the improved orbital elements given by Götz (1984b).

W. GÖTZ

Zentralinstitut für Astrophysik
der Akademie der Wissenschaften
der DDR
Sternwarte Sonneberg

References:

Götz, W., 1982, IBVS, No. 2226.
Götz, W., 1984a, IBVS, No. 2459.
Götz, W., 1984b, IBVS, No. 2649.
Hudec, R., and Meinunger, L., 1977, MVS, 7, 194.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2852

Konkoly Observatory
Budapest
22 January 1986
HU ISSN 0374 - 0676

NOVA SCORPII 1985

On 24 Sept. 1985, Liller (1985), Vina del Mar, Chile, discovered a nova in Scorpius ($17^h53^m19^s.4$; $-31^\circ49'09''$ (1950)). The object was of 10.5 mag.

I started photographing parts of the Milky Way near Baade's windows in the constellations of Sco and Sgr, to find faint novae in outburst in July 1981. I worked with the GPO at La Silla (ESO). In July 1981 I photographed 20 fields on Kodak IIaO 160x160 mm plates. The field was $2^\circ x 2^\circ$. In the same year I photographed the fields three times and treated the plates with a blink-comparator. In June 1982 Dr. Duerbeck from Muenster photographed a part of the fields, and then in August 1985 I observed once more.

With the Optronics of ESO in Garching I found the pre-nova and could identify this object on some plates. The field No.9 in my numeration with the coordinates of midpoint 17^h53^m and -31° (1985) shows the pre-nova near the center of the plate. I estimated the following magnitudes:

Date	Plate No.	mag. of the pre-nova
23 July 1981	4853 GPO	16
7 Aug. 1981	4892 GPO	17
19 June 1982	5684 GPO	(17
27 June 1982	5705 GPO	(17
11 Aug. 1985	8649 GPO	16
17 Aug. 1985	8671 GPO	17.5

On the plate No.456 of SRC (J) one can easily identify the pre-nova as a star of 17th mag. The identification chart of the nova is shown in Figure 1.

I thank the ESO for using the instruments and stay at La Silla and Garching.

RAINER LUKAS

Wilhelm-Foerster-Observatory
Munsterdamm 90, D-1000 Berlin 41

Reference:
Liller, W., 1985, IAU Circ., No. 4118.

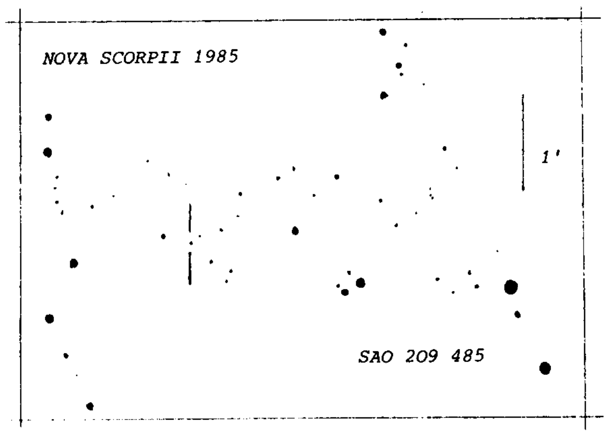


Figure 1. Identification chart of the Nova Scorpii 1985. It is reproduced from the plate No. 8671 GPO

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2853

Konkoly Observatory
Budapest
22 January 1986
HU ISSN 0374 - 0676

IAU ARCHIVES OF UNPUBLISHED PHOTOELECTRIC OBSERVATIONS OF VARIABLE STARS (1985/6)

Summary of changes for 1986

1. Generally, each file should contain data for only one variable star. A cover sheet (see format) should be supplied by the author.

2. More than one variable star can be put in a file, if all the variable stars are discussed together elsewhere in a widely available journal. The cover sheet should give the full reference of the published paper.

3. Lengthy data can also be submitted on computer tape or diskettes.

Introduction

The Archives of Unpublished Photoelectric Observations of Variable Stars was created to provide permanent archives in different parts of the world. The archives can replace lengthy and expensive tables in scientific publications by a single reference to the archival file number. Furthermore, many valuable observations are never used for scientific publication, and the archives make such observations available to other astronomers at a time when they might become very important.

The Publications of the Astronomical Society of the Pacific kindly publishes the summaries of recent files. Detailed reports can be found in Pub.Astr.Soc.Pac. 91, 408 (1979), Pub.Astr.Soc.Pac. 93, 528 (1981), and Pub.Astr.Soc.Pac. 97, 85 (1985).

Retrieval of existing files

Astronomers who wish to obtain copies of deposited data, can do so by requesting whole files (not partial files) from one of the three archives:

P.D. Hingley, Librarian, Royal Astronomical Society, Burlington House, London, W1V 0NL, Great Britain;

Dr. C. Jaschek, Centre de Données Stellaires, Observatoire de Strasbourg, 11, Rue de l'Université, F-67000 Strasbourg, France; or

Dr. E. Makarenko, Odessa Astronomical Observatory, Shevchenko Park, Odessa 270014, U.S.S.R.

The requested file number should be specified. There is no charge for short files.

Submission of new files

If the new data is not discussed in a scientific paper published in a widely available astronomical journal, three copies of the data and five copies of the cover sheet should be sent to the Coordinator, who will forward the data with the cover sheet to the three archives. One copy of the cover sheet will be returned to the author with the assigned file number. Each variable star should be in a separate file, unless there are compelling reasons for combining stars.

If the data will be discussed or used in a widely available astronomical journal, a file number can be requested in advance of publication from the Coordinator. It might be useful to mention the file number in the publication. After publication of the paper, three copies of the data and five copies of the cover sheet should be sent to the Coordinator. The cover sheet should contain the full reference of the publication, in which the data is discussed or used. It may not be necessary to repeat observational details on the cover sheet. We recommend that all the stars discussed in a single publication be combined in a single file.

New files must be printed or handwritten in black ink. We would like to draw attention to the fact that some computer output or copies may not have enough contrast to be legible after further copying for retrieval. The printed part should be no larger than 8 by 10 inches (20 by 25 cm).

The cover sheet could be of the following form:

IAU COMMISSION 27 UNPUBLISHED DATA FILE xxx

x pages, including cover sheet Date

TITLE INCLUDING STAR NAME

Observational details or reference to a published paper.

Name and full address.

Lengthy data can also be submitted by computer tape (ASCII) or diskettes to the Centre de Donnêes Stellaires in Strasbourg after informal consultation with the Coordinator and the Centre. Computer files will have special file numbers with the prefix "C" and will, at the present time, only be stored in Strasbourg. There are no computer files at present. Should the paperless transmission of data become popular among the users of the archives, we expect to expand this new service.

MICHEL BREGER

IAU Archives
Institute for Astronomy
Türkenschanzstr. 17
A 1180 WIEN, Austria

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2854

Konkoly Observatory
Budapest
23 January 1986
HU ISSN 0374 - 0676

A POSSIBLE VARIABLE STAR NEAR
THE GAMMA RAY BURST SOURCE GBS 0526 - 66

180 sky patrol plates of the years 1934-1938 and 1952-1953 existing in the Sonneberg Observatory archive were examined for optical flashes in the very small error box of the famous gamma ray burst of 5 March 1979 (GB790305). This error box overlaps with the supernova remnant N49 in the Large Magellanic Cloud. The exposure times of the plates range from 30 to 60 minutes giving a limiting magnitude of the plates of $13^m.5$. No optical event in the gamma burst source GBS 0526 - 66 could be found.

There was, however, a flash-like event on the plate 722 of 17 Dec. 1952 at the position $\alpha_{1950.0} = 5^h27^m47^s \pm 4^s$, $\delta_{1950.0} = -66^\circ06'45'' \pm 30''$ (on the charts 44V and 42B of Hodge and Wright, The Large Magellanic Cloud, Smithsonian Press, 1967, there are two or three stars at this position which are just separated on the charts but not at all on our plates, cf. Fig. 1). The optical flash reached $\approx 11^m.5$ and the limiting magnitude of the respective plate is $\approx 12^m.5$. The brightness of the possible eruptive star declined

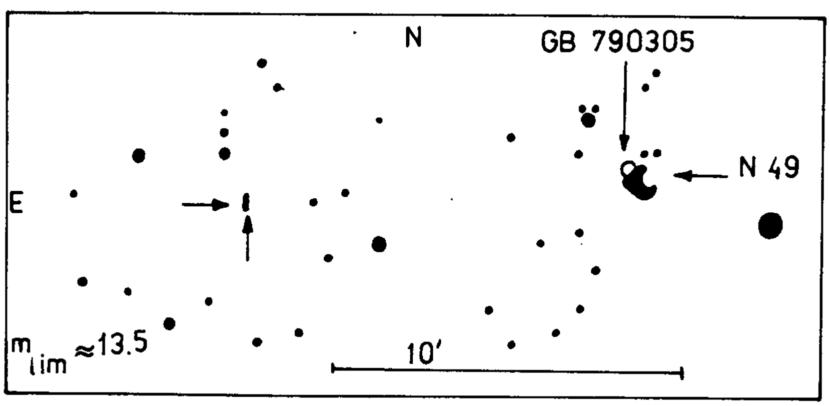


Figure 1. The identification chart of the possible variable star

during the following weeks up to 10 Febr. 1953 to the pre-outburst level of $\approx 13^m$ with some fluctuations superimposed. The star also seems to reach the brightness of $\approx 12\overset{m}{.}5$ on plates of Nov.-Dec. 1937 and Jan.-Feb. 1938.

Unfortunately the photographic brightness of the suspected images is near the limiting magnitude of the plates examined. So we cannot conclude with certainty if the possible variability is real or else caused by a statistical effect of e.g. grain noise.

We thank Dr. Wenzel of Sonneberg Observatory for kind support in performing this work.

J. FLOHRER and J. GREINER
Institut für Kosmosforschung
DDR - 1199 Berlin
Rudower Chaussee 5

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2855

Konkoly Observatory
Budapest
28 January 1986
HU ISSN 0374 - 0676

S 10804 Boo - RR LYRAE STAR NOW CONFIRMED

The variability of the star S 10804 Boo ($14^h03^m.6$, $+24^\circ48'$, 1950.0) was discovered by Gessner (1978). She suspected that the object was an RR Lyrae star of subtype c.

The star was observed photoelectrically in 9 nights during the years 1984 (4 nights) and 1985 (5 nights) with the Sonneberg 60 cm telescope II. Altogether 333 single measurements in the V region could be discussed. The light curve computed with the elements

$$\text{Max. J.D. hel.} = 244\ 5820.400 + 0^d.553386 \cdot E$$

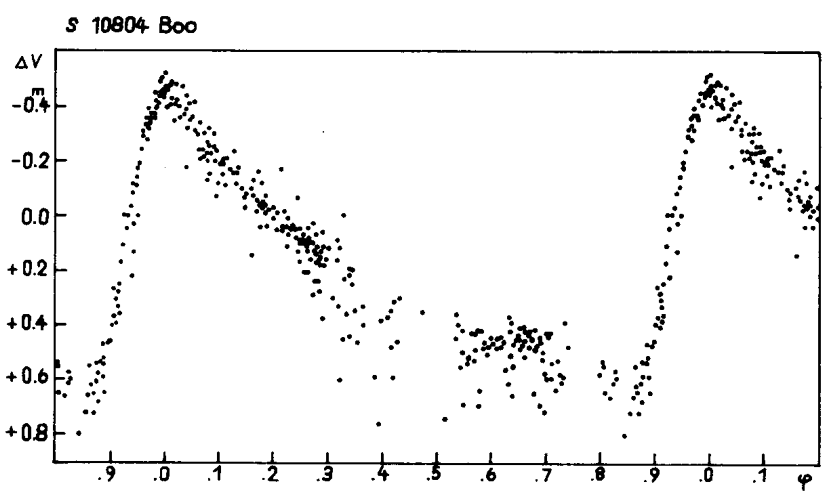


Figure 1

now clearly shows that the object is an RR Lyrae star of subtype ab with an amplitude of about 1.0 mag in V.

S. RÖSSIGER

Sternwarte Sonneberg
Zentralinstitut für Astrophysik
der Akademie der Wissenschaften
der DDR

Reference:

Gessner, H., 1978, Mitt. Veränderl. Sterne, 8, 65.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2856

Konkoly Observatory
Budapest
28 January 1986

HU ISSN 0374 - 0676

ON THE TYPE OF VARIABILITY OF S Vul

Visual observations carried out by Beyer (1930) indicated a variation in the form of the light curve and amplitude from cycle to cycle. The photoelectric observations (Fernie, 1970; Mahmoud and Szabados, 1980), however, indicated that S Vul was a classical cepheid. On the other hand, the 25 year cycle in the O-C diagram in the last paper reminds us of UU Her variables separated as a new type by Sasselov (1984). The aim of this paper is to discuss the type of variability of S Vul.

The variable S Vul was observed photoelectrically in the UBVR Johnson-system by one of us (L.N.B.) with the 60 and 48 cm telescopes of the Mount Majdanak observatory at Tashkent Astronomical Institute. The mean accuracy of the observations is $\sigma = \pm 0\overset{m}{.}01$. The observations carried out in the period 1983 - 1985 are listed in Table I. The individual light curves are plotted in Figure 1. The variations of the light curve from cycle to cycle do not exceed $0\overset{m}{.}04$ which fall in the interval $\pm 2\sigma$. We consider that these variations are not real. The mean light and colour curves are shown in Figure 2. The period of $68\overset{d}{.}78$ was obtained by the observational data listed in Table I. The observational properties of S Vul are given in Table II. The variable S Vul is a member of the Vul OB association and probably of a new small unstudied open cluster (Turner, 1985). The absolute magnitude obtained by Turner (1980) from the distance modulus of Vul OB2 association is given in Table II.

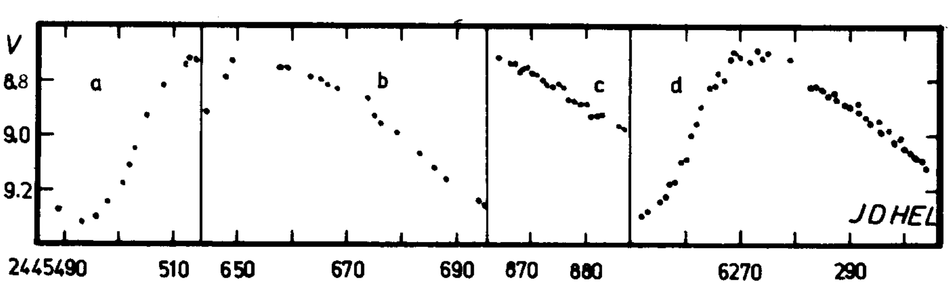


Figure 1

Table I

J.D.Hel. 2440000+	V	U-B	B-V	V-R
5489.301	9.27	1.86	2.10	1.62
5493.262	9.32	1.86	2.14	1.61
5496.430	9.30	1.83	2.08	1.60
5498.453	9.24	1.75	2.02	1.58
5501.441	9.18	1.58	1.97	1.56
5502.457	9.11	1.59	1.93	1.54
5503.457	9.05	1.58	1.89	1.52
5505.457	8.93	1.52	1.82	1.49
5508.457	8.82	1.36	1.78	1.43
5512.453	8.74		1.72	1.42
5513.445	8.72	1.39	1.70	1.40
5514.445	8.73	1.30	1.71	1.40
5644.219	8.91		1.82	
5646.183				1.41
5648.148	8.78	1.43	1.73	1.42
5649.176	8.72	1.34	1.73	1.43
5658.113	8.75	1.43	1.77	1.44
5659.113	8.75	1.44	1.81	1.44
5663.113	8.78	1.49	1.86	1.50
5665.129	8.80	1.46	1.88	1.47
5666.101	8.81	1.52	1.90	1.49
5667.129		1.57	1.89	1.46
5668.117	8.83	1.55	1.94	1.49
5674.125	8.86	1.66	1.99	1.54
5675.113	8.92	1.64	2.02	1.56
5676.098	8.95	1.60	2.03	1.55
5679.125	8.98	1.76	2.06	1.56
5683.105	9.06	1.74	2.08	1.59
5686.090	9.11		2.11	1.60
5688.113	9.16			1.62
5694.074	9.23		2.07	1.62
5695.070	9.25		2.08	1.64
5864.304	8.72	1.46	1.75	1.42
5866.348	8.74	1.49	1.78	1.43
5867.320	8.74	1.51	1.79	1.44
5868.250	8.77	1.51	1.80	1.46
5869.304	8.76	1.59	1.80	1.47
5870.289	8.78	1.56	1.82	1.46
5871.258	8.78	1.60	1.82	1.47
5872.277	8.80	1.62	1.84	1.49
5873.270	8.81	1.62	1.86	1.49
5874.265	8.82	1.63	1.88	1.49
5875.258	8.82	1.68	1.88	1.48
5876.258	8.83	1.68	1.89	1.50
5877.281	8.88	1.71	1.88	1.54
5878.254	8.88	1.74	1.90	1.52
5879.262	8.89	1.74	1.92	1.53
5880.270	8.89	1.75	1.93	1.54
5881.250	8.94	1.82	1.92	1.55

J.D.Hel. 2440000+	V	U-B	B-V	V-R
5882.258	8.93	1.84	1.95	1.54
5883.262	8.92	1.80	1.95	1.54
5886.258	8.97	1.88	1.98	1.56
5887.250	8.98	1.98	1.99	1.56
6252.192	9.29	2.01	2.04	1.60
6253.194	9.28	2.00	2.03	1.61
6255.263	9.25	1.90	2.00	1.59
6256.248	9.23	1.86	1.98	1.57
6257.261	9.18	1.81	1.97	1.56
6258.192	9.17	1.80	1.95	1.54
6259.222	9.10	1.72	1.91	1.54
6260.197	9.09	1.70	1.90	1.51
6261.225	9.00	1.63	1.86	1.50
6262.190	8.96	1.58	1.82	1.49
6263.196	8.90	1.53	1.80	1.46
6264.195	8.83	1.49	1.79	1.47
6265.183	8.82	1.49	1.76	1.45
6266.199	8.78	1.45	1.75	1.44
6267.207	8.80	1.44	1.74	1.43
6268.213	8.73	1.45	1.73	1.40
6269.197	8.71	1.43	1.72	1.41
6270.463	8.72	1.45	1.71	1.42
6272.465	8.73	1.42	1.71	1.42
6273.461	8.68	1.44	1.72	1.39
6274.464	8.72	1.48	1.70	1.44
6275.470	8.71	1.49	1.76	1.43
6279.459	8.73		1.77	1.45
6283.267	8.83	1.58	1.86	1.48
6285.234	8.84	1.63	1.87	1.50
6286.218	8.86	1.64	1.89	
6287.212	8.86	1.67	1.90	1.50
6288.251	8.87	1.70	1.90	1.52
6289.250	8.89	1.69	1.92	1.52
6290.223	8.90	1.71	1.94	1.50
6291.210	8.89	1.76	1.95	1.52
6292.230	8.92	1.75	1.96	1.53
6293.350	8.94	1.79	1.96	1.55
6294.208	8.95	1.76	1.96	1.55
6295.191	8.95	1.79	1.99	1.54
6296.191	8.99	1.84	1.97	1.55
6297.199	8.98	1.84	1.99	1.55
6298.220	9.03	1.89	1.98	1.57
6299.187	9.02	1.87	2.00	1.56
6300.187	9.05	1.89	2.03	1.56
6301.209	9.07	1.94	2.02	1.59
6302.216	9.08	1.86	2.06	1.57
6303.180	9.09	1.94	2.03	1.59
6304.160	9.12	1.91	2.05	1.58

Table II

P	V	U-B	B-V	V-R	A_V	A_B	E_{B-V}	Sp.type	M_V	Radius
68.78	8.96	1.57	1.87	1.52	0.60	1.11	0.78	F8-G8	-6.9	250 $R_\odot$

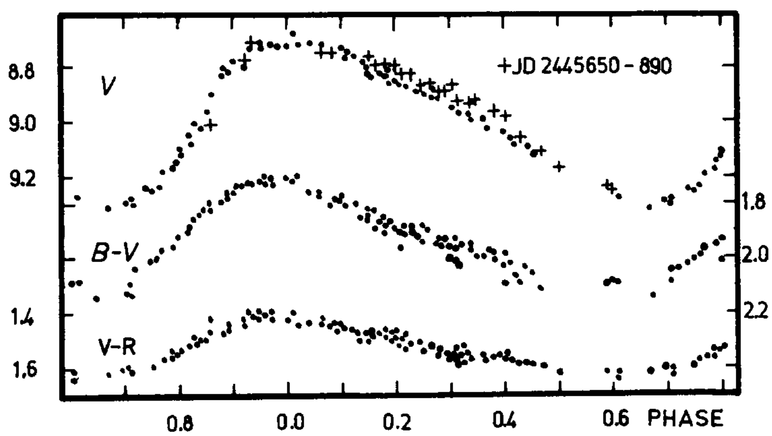


Figure 2

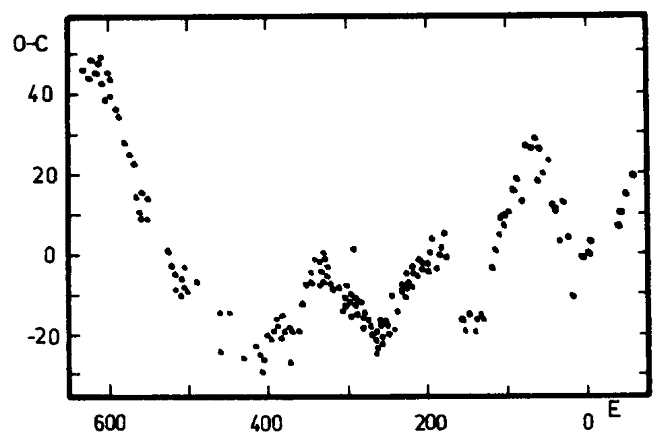


Figure 3

The radius of S Vul is obtained by Wesselink method (Ivanov, 1984). The observational data in Table II do not contradict the period - luminosity, period - radius and period - colour relations for the classical cepheids. The spectral type in the maximum and minimum is also in the cepheid spectral region. The position of S Vul in the period - amplitude diagram is near the extension of the envelope of the period - amplitude diagram to the long period region (Berdnikov and Ivanov, 1986). Consequently all the properties in Table II are typical of the cepheid variables.

Figure 3 represents the O-C diagram constructed by Mahmoud and Szabados (1980). We added the last four points based on observations in Table I. The new photoelectric observations support the presence of a 25 year long cycle. Such instabilities in the period are similar to the variables of UU Her type. It is possible that instability in the period is inherent to the classical cepheids with very long period.

We emphasize that S Vul is a classical cepheid and not a semiregular SRd star as classified in the General Catalogue of Variable Stars. We are planning further observations of S Vul.

L.N. BERDNIKOV

University of Saratov
Saratov, U.S.S.R.

G.R. IVANOV

Department of Astronomy
University of Sofia
Sofia, Bulgaria

References:

Berdnikov, L.N., and Ivanov, G.R., 1986, in preparation.
Beyer, M., 1930, Astron. Abh. Erg.-H. Astron. Nachr., 8, 3, C44.
Fernie, J.D., 1970, Astron. J., 75, 244.
Ivanov, G.R., 1984, Astrophys. Space Sci., 105, 369.
Mahmoud, F., and Szabados, L., 1980, Inf. Bull. Var. Stars, No. 1895.
Sasselov, D.D., 1984, Astrophys. Space Sci., 102, 161.
Turner, D.G., 1980, Astrophys. J., 235, 146.
Turner, D.G., 1985, preprint.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2857

Konkoly Observatory
Budapest
31 January 1986
HU ISSN 0374 - 0676

PHOTOMETRY OF COMPARISON STARS

As part of a photometric program to check the fluctuation of selected known variable stars in the H-Beta photometric system, comparison stars have been observed for constancy. Observations were made in the Johnson UBV passbands, as well as with H-Beta narrow and wide interference filters. The broadband filters provide a well-defined measure of comparison for the H-Beta measurements of the variable stars. All observations were performed on the No. 4 16-inch telescope at Kitt Peak National Observatory in 1983 and 1984.

Observations and reductions of UBV data were done using techniques and formulae presented by Hardie (1962). Standard stars were chosen from the equatorial network of Landolt (1973). Additional extinction stars were selected from the list of Priser (1966) for the reduction of program stars at high northern declinations. Standard stars and H-Beta observation and reduction techniques were taken from the work of Crawford and Mander (1966). Secondary faint standards were selected from photometry of the prominent open clusters Praesepe (Crawford and Barnes 1969a), Coma (,1969b), and IC 4665 (,1972). Approximately 12 H-Beta standards and 16 UBV standards were observed on a typical complete night.

Table I presents the available photometric data for the comparison stars, and includes the corresponding variable star. A description of each of the data columns is given under the table. All variables are short period eclipsing binaries (Algol-type), except for the dwarf Cepheid VZ Cnc. Previous photometric data for the comparison stars was located in the SKYMAP Catalog Version 3.1 (McLaughlin 1983) for only two stars, and is presented for comparison in Table II.

Table I-A : Derived Magnitudes for Comparison Stars

ID	HD	SAO	RA (2000)	DEC	V	B-V	U-B	Beta
1002	25679	76440	4 05 29	27 52 47	8.422	0.417	0.192	2.797
2002	25488	76419	4 03 58	27 42 34	8.801	0.376	0.060	2.758
2005	-	131124	4 20 16	- 6 10 04	9.469	0.580	0.068	2.637
1009	46536	114066	6 34 17	9 05 00	8.701	-0.061	-0.205	2.791
2009	46199	114019	6 32 17	8 49 06	6.977	0.285	0.123	2.745
1016	85030	61706	9 50 00	33 36 07	7.940	0.458	0.136	2.645
1017	89369	178651	10 18 23	-22 45 22	8.288	0.265	0.185	2.818
2017	89473	178673	10 19 05	-23 10 53	8.533	0.437	0.015	2.666
1020	115390	157833	13 17 07	-17 54 09	9.417	0.467	-0.034	2.629
2020	114945	157804	13 14 03	-17 25 36	9.584	0.592	0.071	2.597
1023	139549	16777	15 35 07	64 05 40	9.112	0.403	-0.060	2.675
2023	-	16752	15 30 17	64 00 46	9.440	0.319	-0.005	2.733
1024	152761	30134	16 52 29	52 55 47	8.465	0.268	0.090	2.794
2024	154199	30200	17 01 14	52 36 17	6.894	0.074	0.051	2.898
1026	180401	124450	19 16 07	9 19 41	7.689	0.156	-0.276	2.690
3026	181122	124497	19 18 53	9 37 05	6.294	1.053	0.880	2.549
1028	181361	104720	19 19 26	19 43 07	8.175	0.063	-0.106	2.782
2028	181523	104723	19 20 02	19 23 20	8.517	0.139	0.106	2.891
2029	182256	87134	19 22 47	25 19 34	8.612	0.436	0.038	2.666
1030	73295	97982	8 37 58	10 02 53	9.412	0.101	0.131	2.896
2030	73411	116986	8 38 38	9 23 59	8.805	0.327	0.075	2.737

Description of Columns:

ID	: Star Identification, internal
HD	: Henry Draper Number
SAO	: Smithsonian Astrophysical Observatory number
RA,DEC	: Epoch 2000 coordinates
V B-V U-B	: Standard Johnson magnitudes derived from mean of observations
Beta	: Standard H-Beta magnitudes from mean of observations

Table I-B : Derived Magnitudes for Comparison Stars

ID	Sv	Nv	Sbv	Nbv	Sub	Nub	Sbt	Nbt	Nts	Var
1002	0.008	13	0.004	13	0.012	13	0.008	13	2	RW Tau
2002	0.005	12	0.004	12	0.011	12	0.010	12	2	RW Tau
2005	0.007	2	0.002	2	0.041	2	0.021	2	1	TZ Eri
1009	0.003	11	0.004	11	0.010	11	0.008	11	1	RW Mon
2009	0.003	12	0.004	12	0.008	12	0.004	11	2	RW Mon
1016	0.005	11	0.001	11	0.002	11	0.005	11	1	T LMi
1017	0.008	14	0.005	14	0.006	14	0.004	14	4	VY Hya
2017	0.006	21	0.004	21	0.004	21	0.004	21	4	VY Hya
1020	0.005	11	0.007	10	0.004	11	0.012	11	1	UW Vir
2020	0.007	12	0.005	12	0.005	12	0.013	12	1	UW Vir
1023	0.004	17	0.005	18	0.008	17	0.008	18	2	TW Dra
2023	0.006	10	0.004	10	0.009	10	0.013	10	2	TW Dra
1024	0.003	27	0.003	27	0.003	27	0.004	27	4	AI Dra
2024	0.004	28	0.003	28	0.004	28	0.004	27	4	AI Dra
1026	0.009	9	0.007	9	0.008	8	0.008	9	2	V342 Aql
3026	0.004	4	0.003	4	0.002	4	0.009	4	1	V342 Aql
1028	0.005	6	0.003	6	0.005	6	0.007	6	1	U Sge
2028	0.011	2	0.005	2	0.004	2	0.004	2	1	U Sge
2029	0.000	2	0.003	2	0.003	2	0.005	2	1	Z Vul
1030	0.008	13	0.003	13	0.003	13	0.011	13	2	VZ Cnc
2030	0.006	20	0.003	20	0.002	20	0.006	20	2	VZ Cnc

Description of Columns:

- ID : Star identification, internal
- S : Mean standard deviation of each of the 4 derived magnitude/color fields
- N : Number of values of each of the derived fields used for mean
- Nts : Number of nights each star was observed
- Var : Associated variable star for which these stars served as comparisons

Table II : Previous Photoelectric Photometry

ID	V	B-V	U-B
2024	6.82	0.09	0.07
3026	6.32	1.05	0.89

The author thanks Dr. C.C. Wu and Dr. P. Perry of Computer Sciences Corporation for assistance in funding these observations, the staff of Kitt Peak National Observatory for their assistance, and Dr. C. Sturch and E. Medeiros for several helpful discussions.

STEVEN F. MCLAUGHLIN *
Astronomy Programs
Computer Sciences Corporation
8728 Colesville Rd.
Silver Spring, MD 20910 USA

References:

Crawford, D.L. and Mander, J. (1966). Astron.J. 71, 114.

Crawford, D.L. and Barnes, J.V. (1969a). Astron.J. 74, 818.

Crawford, D.L. and Barnes, J.V. (1969b). Astron.J. 74, 407.

Crawford, D.L. and Barnes, J.V. (1972). Astron.J. 77, 862.

Hardie, R.H. (1962). in Astronomical Techniques, W.A. Hiltner, ed. (U. of Chicago Press), p. 178.

Landolt, A.U. (1973). Astron.J. 78, 959.

McLaughlin, S.F. (1983). Astron.J. 88, 1633.

Priser, J.B. (1966). Publ. Astron. Soc. Pac. 78, 474.

* Visiting Astronomer, Kitt Peak National Observatory, National Optical Astronomy Observatories, operated by the Association of Universities for Research in Astronomy, Inc. under contract with the National Science Foundation

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2858

Konkoly Observatory
Budapest
5 February 1986
HU ISSN 0374 - 0676

IMPROVED EPHEMERIS FOR THE SHORT PERIOD, ECLIPSING CATACLYSMIC VARIABLE V1315 AQUILAE

V1315 Aquilae (= SVS 8130 = KPD 1911+1212) was identified as an eclipsing binary by Downes *et al.* 1986. On the basis of the strengths of the He II and C III/N III lines they classified it as a member of a subset of cataclysmic variables, old novae with high excitation lines.

V1315 Aql has a V magnitude, at light maximum, of ≈ 14.4 and a B-V of ≈ +.4. The eclipse is quite deep, 1.7 magnitudes, and lasts about thirty minutes. It is symmetric, though there seems to be a light peak just after the eclipse. There is no evidence for a secondary eclipse. Fig. 1 shows the typical light curve. There is strong variability of the emission lines during the eclipse. The Balmer lines also have the peculiar property of absorption cores occasionally appearing during the inferior conjunction of the emission line source.

The interpretation of this object is of a secondary losing mass to a white dwarf primary. Most of the observed light is produced by the accretion disc, so the variations in spectral line strengths during the eclipse are probes of the accretion disc structure.

Downes *et al.* observed nine eclipses in 1984, eight with the 0.9m telescope of the Manastash Ridge Observatory, and one with the Kitt Peak 1.3m telescope. During 1985, three more eclipses were obtained at MRO, and the entire data set reanalyzed. The highly symmetric eclipses lend themselves to least squares parabolic fits. Light minima were derived analytically from the fitted parabolas and the minima were then least squares linear fitted to yield the period. The observations are presented in Table I.

Table I Eclipses of SVS 8130

Observer	Location	HJD(2,445,900+)	cycle	O-C(seconds)
Mateo	MRO	002.84065	1	0.3
Downes	KPNO	006.75183	29	-12.1
Jenner	MRO	028.82167	187	-111.7
Jenner	MRO	044.74821	301	52.2
Jenner	MRO	044.88748	302	15.8
Jenner	MRO	045.72697	308	132.2
Jenner	MRO	045.86486	309	-22.9
Jenner	MRO	071.70714	494	-52.0
Meakes	MRO	395.78815	2814	-0.3
Annis	MRO	424.70424	3021	25.6
Annis	MRO	444.67928	3164	-26.6

The long baseline of observations, covering 3100 cycles, allows determination of the period with a formal error of two milliseconds. The improved ephemeris is :

$$\text{HJD(light minimum)} = 2{,}445{,}902.700964 \pm .000084 + .139689832E \pm .000000017$$

There is no evidence for a changing period to the level of less than one second over the course of more than a year. The position of this object near the edge of the 'period gap'

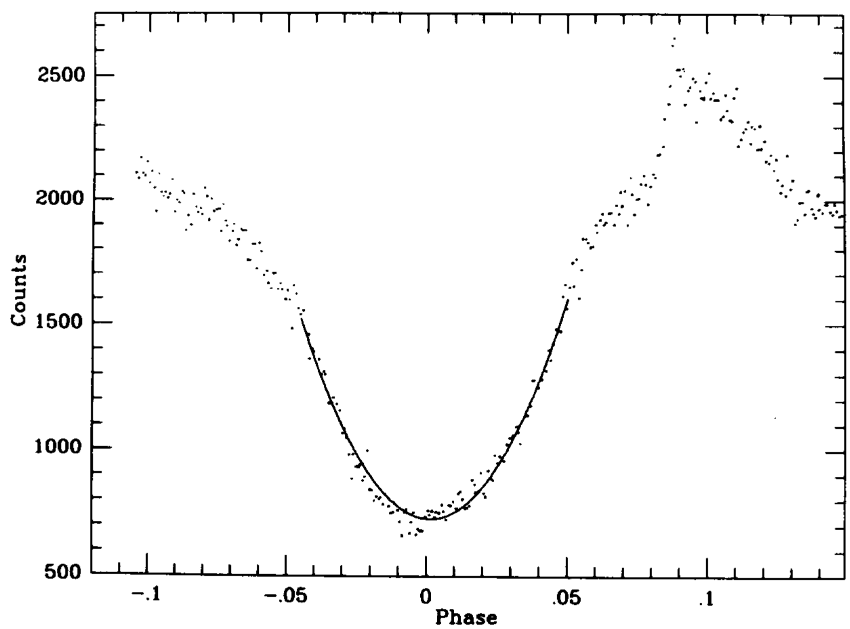


Figure 1. The light curve of V1315 Aql, taken during eclipse cycle 2184 at the Manastash Ridge Observatory. The solid line is the fitted parabola used for light minimum determination.

for cataclysmic variables at 2-3 hours (Patterson 1984), where a decrease in mass transfer dims the system considerably, makes the determination of whether V1315 Aql is edging into the gap interesting.

JAMES T. ANNIS

Department of Physics and
Department of Astronomy
University of Washington
Seattle, Washington USA

References:

Downes, R. A., Mateo, M., Szkody, P., Jenner, D. C., and Margon, B. 1986, *Ap. J.*, **301**, in press.

Patterson, J. 1984, *Ap. J. Suppl.*, **54**, 443.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2859

Konkoly Observatory
Budapest
5 February 1986
HU ISSN 0374 - 0676

LQ And /HD 224559/: THE 0.62-DAY /OR THE 0.31-DAY/ PERIOD CONFIRMED

In a recent issue of this Bulletin, Hildebrandt /1985/ published 49 differential UBV observations of LQ And, a B3Ve star, secured during five observing nights in a period of 11 days in 1978. Analyzing the data by means of Deeming's /1975/ power-spectrum technique, he concluded that LQ And is probably a non-radial pulsator pulsating with periods of $0^d.2365$, and $0^d.2647$.

Light variability of LQ And was discovered by Provin /1953/. The variable has very intensively been studied by Percy and his collaborators /see Percy and Lane 1977, Percy 1979, 1981, 1983, and Percy et al. 1981/. Percy originally suspected a period of about $0^d.24$, but later he concluded that a period of $0^d.307$, with an amplitude of about $0^m.03$, was present in all B and uvby colours, and in all observing runs. Harmanec /1984a/ re-analyzed all the observations by Percy et al. using Stellingwerf's /1978/ phase dispersion minimization technique. He found that it was possible to fold all the data with a period of $0^d.310049$, with an uncertainty of some ± 2 cycles over the time interval covered by the data. He thus proved that the variation was truly periodic, since the data spanned an interval of several years. However, the main finding of Harmanec's study was that a better fit was obtained for a double-wave light curve with a period of $0^d.622832$. He called attention to three cases of rapidly variable Be stars with double-wave light curves / σ Ori E, EM Cep, and LQ And/ and proposed that their light variations were connected with rotation of non-uniformly bright objects rather than with pulsation. The existence of the group recognized by Harmanec has firmly been established by subsequent

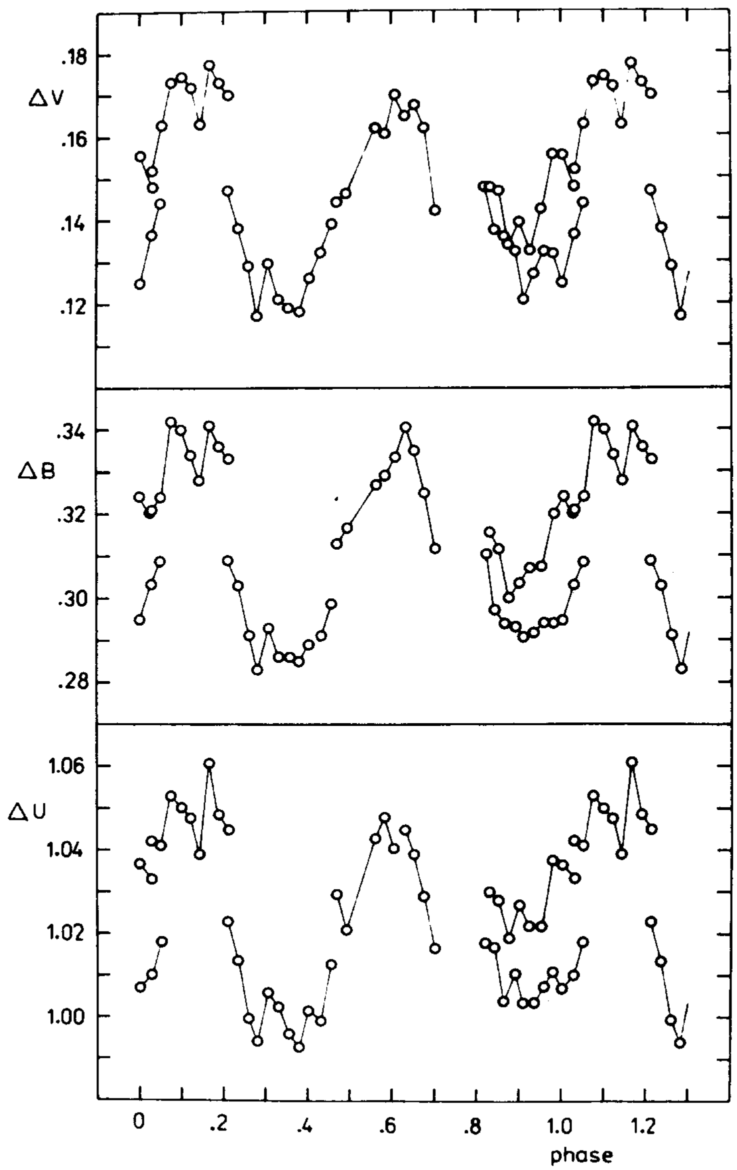


Figure 1. The light curve of LQ And for the 0.6206-day period

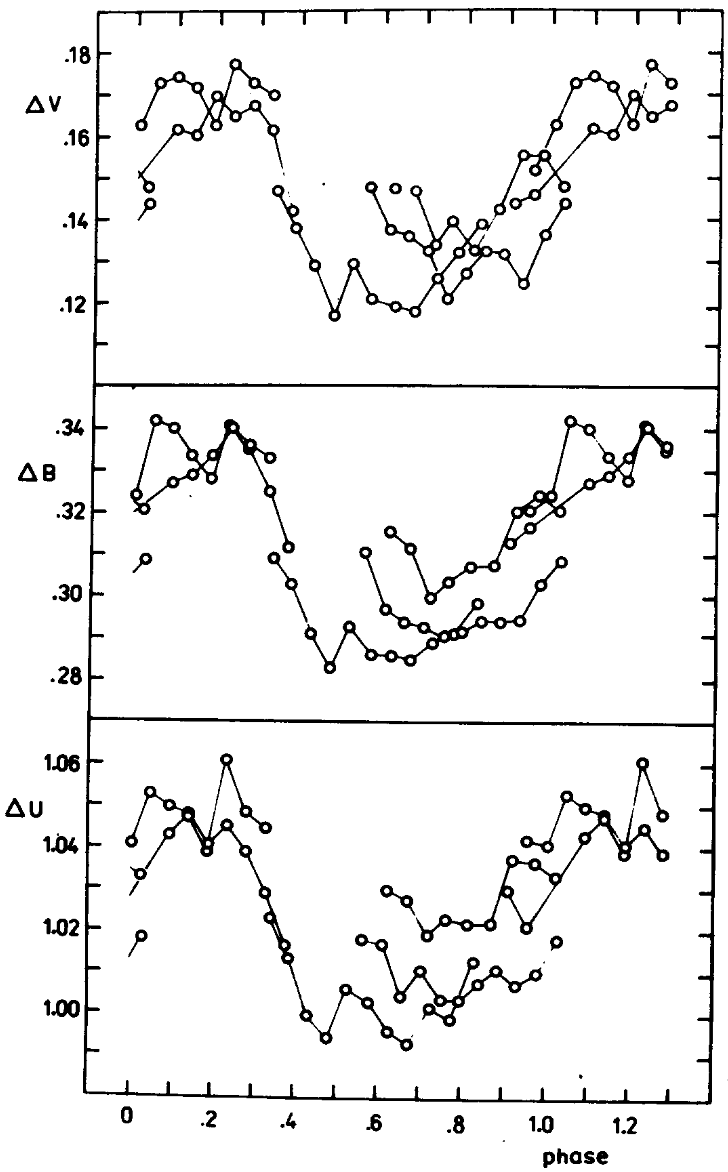


Figure 2. The light curve of LQ And for the 0.3095-day period

discoveries of about fifteen Be variables with the double-wave light curves - so far the most systematic work being carried out by Balona and Engelbrecht /1985/. Lists of confirmed or suspected rapidly variable Be stars have recently been compiled by them, and by Percy /1986/.

Hildebrandt /1985/ was clearly unaware of the recent studies of LQ And. As his data represent a good series of observations, I decided to undertake their independent period analysis using Stellingwerf's technique. The analysis clearly showed that a period of $0^{d}.6206$ /or $0^{d}.3095$ / is present also in Hildebrandt's data with a high significance - undisputably much higher than any periods near $0^{d}.25$ - in all three colours. The phase diagrams for both possible periods are shown in Figs. 1 and 2, respectively. Observations obtained on each particular night are connected by a broken line.

Although also these data seem to give a slightly better fit for the 0.62-day period, the ambiguity between a double-wave and a single-wave light curve for LQ And still persists. Baade et al. /1984/ analyzed RV and profile variations of a series of rather noisy 18 Å/mm photographic spectrograms of LQ And and preferred - somewhat surprisingly - the $0^{d}.31$ /and a very short $0^{d}.12$ / periods, although the $0^{d}.62$ period, and <u>not</u> the $0^{d}.31$ period, was clearly detected in their analyses of several of the best defined parameters /e.g. in radial velocities of H6 and higher Balmer lines or in estimated strength of He I lines/ - see their Fig. 1. Also Percy /1986/ still clearly prefers the $0^{d}.31$ period. Considering the fact that practically all well studied rapidly variable Be stars known to date exhibit double-wave light curves, I am personally almost convinced that also LQ And will be of the same type. However, it is extremely important to prove or to disprove such a conclusion observationally beyond any doubt. To this end, new very accurate narrow-band photoelectric observations, or spectroscopic observations with signal-generating detectors may be decisive, and should be carried out.

The following methodological remarks seems to be appropriate:

1. In my experience, the power spectrum analysis of observational data containing non-sinusoidal variations is a rather debatable, and often misleading technique, which should be avoided.

2. In spite of mathematically founded warnings, many astronomers still continue to search for multiperiodicity using very limited strings of observational data. They are often apparently successful in their effort, but the periods thus found need not reflect a true pattern of variations of the star in question. Quite often, even finding a true period in a short string of data is uneasy or impossible. For instance, the above-discussed Hildebrandt's data for LQ And can also be fitted with periods of $0^{d}.4483$, $0^{d}.8195$, $1^{d}.281$, $1^{d}.652$, $2^{d}.215$, $4^{d}.314$, etc. Without knowing the results of independent analyses of longer data sets, one would be unable to indicate a correct period.

3. When searching for periodicity in astronomical data, a possibility of a more complicated curve should always be kept in mind, and checked, before concluding that two or more periods are present in the data.

What conclusions can be made about the physical model of the rapid light variations of Be stars? As the situation appears now, it may turn out that all rapidly variable Be stars have double-wave light curves with periods in the range of possible rotational periods. This is not to say that rotation must be the ultimate cause of the variations observed, but some connection seems to be indicated anyhow. Another important piece of evidence arises from the fact that both the amplitude and the shape of the double-wave light curves of Be stars were found to vary gradually with time. At the same time, it appears that these variations are causally connected with the long-term spectral variations of the H I emission. Probably the first recognized, and the best documented case of such behaviour is o And /see Archer 1959, Harmanec 1983, 1984b, and references therein/. Also spectroscopic observations with a sufficiently high S/N ratio led to discoveries of rapidly variable Be stars, the first such cases being 28 CMa /Baade 1982a,b/, ζ Oph /Walker et al. 1979, 1981, Vogt and Penrod 1983/, and λ Eri /Bolton 1982/. Baade and Bolton advocated non-radial pulsations as the cause of the variations observed, while Walker et al. considered inhomogeneities in the Be envelope carried across the stellar disk by rotation to interpret their data. Vogt and Penrod applied both models and found both - inhomogeneities in the form of spokes separated by about 45^{o}, and high-order non-radial pulsations - to give good fits to observed line--profile variations. Using somewhat debatable photometric evidence, they refuted the former model, however. Since then, their paper became quite famous and their modelling of profile variations of one star is amazingly often quoted as a firm proof of the fact that Be stars are non-radial pulsators. However, 28 CMa and λ Eri are known to exhibit the double-wave light curves, and the light of ζ Oph is suspected to vary on time scales of $0^{d}.98$ and $0^{d}.14$ /Balona and Engelbrecht 1985, Percy 1986, and references therein/. It is interesting to note that the two periods of ζ Oph - if confirmed - could be identified with the rotational period, and with occultation effects of 7 rotating spokes. These facts should not be neglected, I think.

The only possible conclusion is that future observational and theoretical studies should be carried out without too a strong preconception for one particular model. The nature of rapid variations of Be stars has not satisfactorily been explained so far, and various concepts are still possible.

Acknowledgements

I thank Drs. I. Hubený and S. Štefl for their valuable comments, and Drs. L.A. Balona, C.A. Engelbrecht and J.R. Percy, who kindly gave their results at my disposal in advance of publication.

PETR HARMANEC
Astronomical Institute
Czechoslovak Academy of Sciences
251 65 Ondřejov, Czechoslovakia

References:

Archer S.: 1959 Observatory 79, 99

Baade D.: 1982a Astron.Astrophys. 105, 65

------- : 1982b Astron. Astrophys. 110, L15

Baade D., Bellas Y., Eichendorf W., Tomov T.: 1984 Astron. Astrophys. 139, 521

Balona L.A., Engelbrecht C.A.: 1985 Mon. Not. Roy. Astron. Soc. /in press/ and priv. comm.

Bolton C.T.: 1982 IAU Symp. 98, 181

Deeming T.J. 1975 Astrophys. Spa. Sci. 36, 137

Harmanec P.: 1983 Hvar Obs. Bull. 7, 55

---------- : 1984a Bull. Astron. Inst. Czechosl. 35, 193

---------- : 1984b Inf. Bull. Var. Stars 2506

Hildebrandt G.: 1985 Inf. Bull. Var. Stars 2824

Percy J.R.: 1979 Inf. Bull. Var. Stars 1530

--------- : 1981 in "Workshop on Pulsating B Stars", Nice Obs. Publ., p. 227

--------- : 1983 Astron. J. 88, 427

--------- : 1986 in "Highlights of Astronomy" Vol. 7 Dordrecht, Reidel /in press/

Percy J.R., Lane M.C.: 1977 Astron. J. 82, 353

Percy J.R., Jakate S.M., Matthews J.M. 1981 Astron. J. 86, 53

Provin S.S.: 1953 Astrophys. J. 118, 489

Stellingwerf R.F.: 1978 Astrophys. J. 224, 953

Vogt S.S., Penrod G.D.: 1983 Astrophys. J. 275, 661

Walker G.A.H., Fahlman G.G., Yang S.: 1979 Astrophys. J. 233, 199

------ : 1981 in "Workshop on Pulsating B Stars", Nice Obs. Publ., p. 261

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2860

Konkoly Observatory
Budapest
7 February 1986
HU ISSN 0374 - 0676

ON THE PERIOD OF YY GEMINORUM

YY Gem (=Castor C) is an eclipsing binary consisting of two M1 dwarfs. The system was monitored by IUE and EXOSAT on 14/15 November, 1984 (see e.g. Geyer and Kämper 1985). I observed YY Gem on the same night with the 1-m telescope of Konkoly Observatory at Piszkéstető. The comparison star was BD+31° 1627, a star near enough the variable to make the corrections for differential extinction unnecessary. The background measurements were taken about halfway between the variable and comparison. The full moon and the nearness of Castor made the U observations useless. Table I below shows the Julian date and the magnitude and colour differences (variable-comparison).

Table I

J.D.2446019+	V	B-V	J.D.2446019+	V	B-V
.5274	-0.738	0.082	.5758	-0.385	-0.093
.5287	-0.736	0.069	.5770	-0.382	-0.088
.5299	-0.734	0.074	.5783	-0.377	-0.099
.5352	-0.737	0.084	.5835	-0.341	-0.092
.5364	-0.736	0.080	.5847	-0.345	-0.101
.5377	-0.738	0.082	.5860	-0.343	-0.100
.5433	-0.748	0.084	.5919	-0.452	-0.060
.5446	-0.740	0.073	.5932	-0.470	-0.057
.5459	-0.738	0.067	.5944	-0.490	-0.062
.5513	-0.685	0.054	.5997	-0.560	-0.004
.5526	-0.675	0.034	.6010	-0.570	-0.004
.5538	-0.668	0.032	.6022	-0.580	-0.009
.5599	-0.612	0.001	.6075	-0.650	0.022
.5612	-0.594	-0.004	.6088	-0.659	0.022
.5624	-0.586	-0.004	.6101	-0.677	0.038
.5678	-0.508	-0.054	.6154	-0.716	0.020
.5691	-0.485	-0.087	.6167	-0.751	0.026
.5703	-0.468	-0.072	.6180	-0.761	0.021

There is a controversy concerning the period of YY Gem. Leung and Schneider (1978) found a period different from that given in the GCVS. Later, however, Mallama (1980) could not confirm this new period, his time of minimum was in agreement with that predicted by the catalogue elements.

Therefore it is interesting to construct the O-C diagram for YY Gem. The times of the primary and secondary minima found in the literature are listed in Table II (the letters p and s after J.D. mean primary and secondary, respectively).

Table II

J.D.		E	O-C	Reference
2424500.55	p	5527	0.00684	van Gent (1926)
2424573.42	s	5616.5	0.00586	van Gent (1926)
2424584.41	p	5630	0.00195	van Gent (1926)
2424591.34	s	5638.5	0.00293	van Gent (1926)
2424595.41	s	5643.5	0.00781	van Gent (1931)
2424619.43	p	5673	0.00684	van Gent (1926)
2424639.39	s	5697.5	0.01074	van Gent (1926)
2424791.65	s	5884.5	0.00879	van Gent (1931)
2424848.65	s	5954.5	0.00879	van Gent (1931)
2424875.53	s	5987.5	0.00977	van Gent (1931)
2424916.65	p	6038	0.00879	van Gent (1931)
2424920.31	s	6042.5	0.00879	van Gent (1931)
2424921.53	p	6044	0.00781	van Gent (1931)
2424922.34	p	6045	0.00586	van Gent (1931)
2424961.43	p	6093	0.00781	van Gent (1931)
2425230.55	s	6423.5	0.00781	van Gent (1931)
2425234.62	s	6428.5	0.00586	van Gent (1931)
2425242.36	p	6438	0.00684	van Gent (1931)
2425687.37	s	6984.5	0.00977	van Gent (1931)
2425698.36	p	6998	0.00684	van Gent (1931)
2427158.36	p	8791	0.00684	Binnendijk (1950)
2427160.40	s	8793.5	0.00781	Binnendijk (1950)
2428545.49	s	10494.5	0.00488	Binnendijk (1950)
2428571.55	s	10526.5	0.00879	Binnendijk (1950)
2428596.39	p	10557	0.00488	Binnendijk (1950)
2429639.48	p	11838	0.00586	Binnendijk (1950)
2430466.39	s	12853.5	0.00488	Binnendijk (1950)
2432605.91	p	15481	0.00684	Kron (1952)
2432695.83	p	15923	0.00684	Kron (1952)
2440969.00	s	25751.5	0.00000	Leung and Schneider (1978)
2440969.82	s	25752.5	0.00586	Leung and Schneider (1978)
2440970.63	s	25753.5	0.00781	Leung and Schneider (1978)
2440971.86	p	25755	0.00976	Leung and Schneider (1978)
2442829.63	s	28036.5	0.00195	Mallama et al. (1977)
2443949.68	p	29412	0.00098	Mallama (1980)
2443960.67	s	29425.5	0.00293	Mallama (1980)
2443969.63	s	29436.5	0.00000	Mallama (1980)
2446017.55	s	31951.5	0.00000	Geyer and Kämper (1985)
2446019.58	p	31954	0.00000	present paper

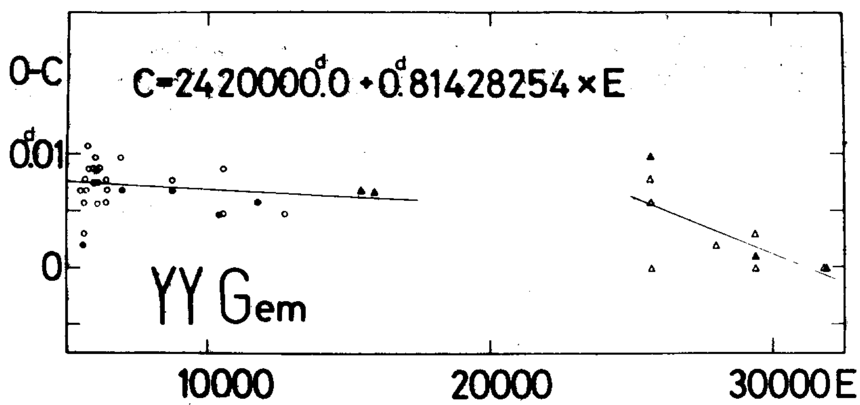


Figure 1

The O-C diagram of YY Gem is plotted in the Figure. Full symbols mean primary, the empty ones mean secondary minima. The O-C values were calculated using the elements

$$2420000.00+0^{d}.81428254*E \ .$$

The Figure shows that the period of YY Gem slightly differs from that given in the GCVS. According to the Figure, the period of YY Gem was $0^{d}.81428242$ between J.D. 2424500 and J.D. 2433000, and $0^{d}.81428155$ from J.D. 2440968.

E. ZSOLDOS

Konkoly Observatory
Budapest XII, P. B. 67
1525 HUNGARY

References:

Binnendijk, L. 1950, B.A.N. 11,203
Geyer, E. H. and Kämper, B.-C. 1985, IBVS No. 2819
Kron, G. E. 1952, Astrophys. J. 115,301
Leung, K. C. and Schneider, D. P. 1978, Astron. J. 83,618
Mallama, A. D. 1980, P.A.S.P. 92,468
Mallama, A. D.; Skillman, D. R.; Pinto, P. A. and Krobusek, B. A. 1977, IBVS No. 1249
van Gent, H. 1926, B.A.N. 3,121
1931, B.A.N. 6,99

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2861

Konkoly Observatory
Budapest
7 February 1986
HU ISSN 0374 - 0676

REVISED ELEMENTS FOR THREE ECLIPSING BINARIES

V 646 Cas

Photoelectric observations made by Faulkner (1985) indicated that the preliminary elements published by the present author (1982) were incorrect. The elements given by Faulkner could be confirmed and refined from new observations made at Hartha (1965-1975) and Sonneberg (1956-1959 and 1974-1983) (altogether 289) sky-patrol plates and a rediscussion of the former material.

A weighted least squares analysis of 8 normal minima and the secondary minimum of Faulkner's paper yields the following elements:

$$\text{Min.hel.} = \text{J.D. } 2446028.040 + 6^{d}.162491 \cdot E \quad (\text{EB}) \quad (10^{m}.04-10^{m}.55/10^{m}.33 \text{ ph})$$
$$\pm.015 \quad \pm.000019$$

V 450 Her

This star has been known for its variable period since the paper of Geyer (1968). To cover the last years, 367 sky-patrol plates made at Sonneberg Observatory during the years 1962-1983 were used.

A least squares solution of the 11 newly found minima and the visual epoch of minimum given by Brelstaff (1985) has yielded the refined elements:

$$\text{Min.hel.} = \text{J.D.} 2444635.591 + 0^{d}.9127152 \cdot E \quad (\text{EA}) \quad (D = 0^{P}.18)$$
$$\pm.009 \quad \pm.0000011$$

BV Tau

The 12.349 days period given in the GCVS is doubtful (Kaho, 1958). Extended visual observations made by Brelstaff (1985) showed a 0.93044 day period for this EB-type binary. To confirm Brelstaff's results, the magnitudes on 140 Hartha sky-patrol plates (1959-1977) were derived. Eight new times of minimum were found and a least-squares solution (including the epoch given in Brelstaff's paper) has yielded the improved linear elements:

$$\text{Min.hel.} = \text{J.D. } 2446052.618 + 0^{d}.9304536 \cdot E \quad (\text{EB})$$
$$\pm.017 \quad \pm.0000023 \quad (11.^{m}10-11^{m}.95/11^{m}.55 \text{ ph})$$

Further particulars will be published in the Mitteilungen der Bruno-H.-Bürgel Sternwarte Hartha.

THOMAS BERTHOLD

Bruno-H.-Bürgel Sternwarte
DDR-7302 Hartha

References:

Berthold, T., 1982, Mitt. Bruno-H.-Bürgel-Stw. Hartha, 17, 14.
Brelstaff, T., 1985, Brit. Astron. Ass. V.S.S. Circ., 59.
Faulkner, D.R., 1985, Inf. Bull. Var. Stars, No. 2702.
Geyer, E.H., 1968, Mitt. Remeis-Stw. Bamberg, VII, 72.
Kaho, S., 1958, Tokyo Bull. (II), 30.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2862

Konkoly Observatory
Budapest
11 February 1986

HU ISSN 0374 - 0676

AX URSAE MAJORIS

The elements of AX Ursae Majoris, an RR Lyrae variable (RRab) discovered in 1958 (Romano, 1958) in the field of Chi Ursae Majoris, were published in 1964 (Romano, 1964). The ephemeris:

$$\text{Max.} = 2435951.354 + 0\overset{d}{.}53510 \cdot E \qquad (1)$$

satisfied the photographic observations taken during the period March 1957 - May 1963.

In a recent GEOS note, Boninsegna (1985) determined new elements of this star considering only the visual estimates of three GEOS observers

Table I

max. 24...	E	O-C	max. 24...	E	O-C
38737.637	5207	$+0\overset{d}{.}070$	42541.549	12317	$+0\overset{d}{.}067$
849.431	5416	+ .039	870.504	12932	+ .017
39201.432	6074	- .015	43161.521	13476	+ .014
323.389	6302	- .047	191.544	13532	+ .079
448.573	6536	- .060	459.513	14033	+ .035
614.477	6846	- .016	512.488	14132	+ .049
40270.465	8072	+ .034	688.462	14461	+ .024
326.556	8177	- .051	966.532	14981	- .078
416.419	8345	- .071	986.446	15018	+ .043
563.567	8620	- .051	44017.484	15076	+ .054
621.395	8728	- .004	203.570	15424	- .019
943.443	9330	- .030	406.420	15803	+ .089
41057.438	9543	+ .009	668.498	16293	+ .050
119.450	9659	- .038	45029.484	16968	- .040
302.462	10001	+ .004			
417.459	10216	- .023	45074.440	17052	- .017
42044.513	11388	+ .025	075.522	17054	- .005
066.381	11429	- .041	382.563	17628	- .009
120.417	11530	- .038	402.355	17665	- .008
158.537	11601	+ .098	406.622	17673	- .020
190.533	11661	- .004	698.689	18219	- .016
373.532	12003	+ .032	809.409	18426	- .022
511.527	12261	+ .004	818.524	18443	- .001

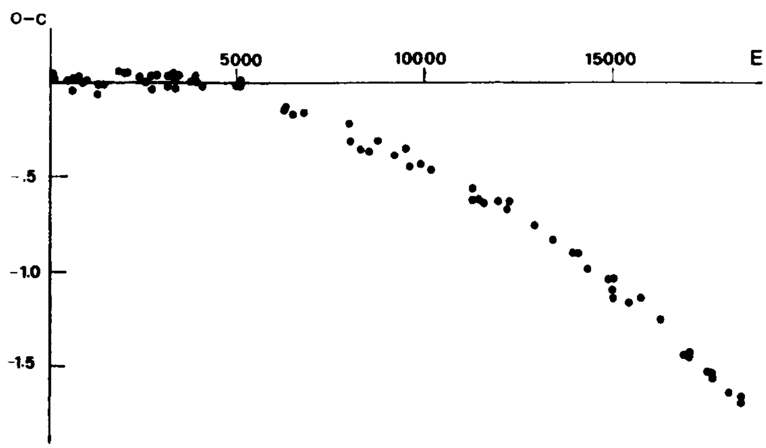


Figure 1

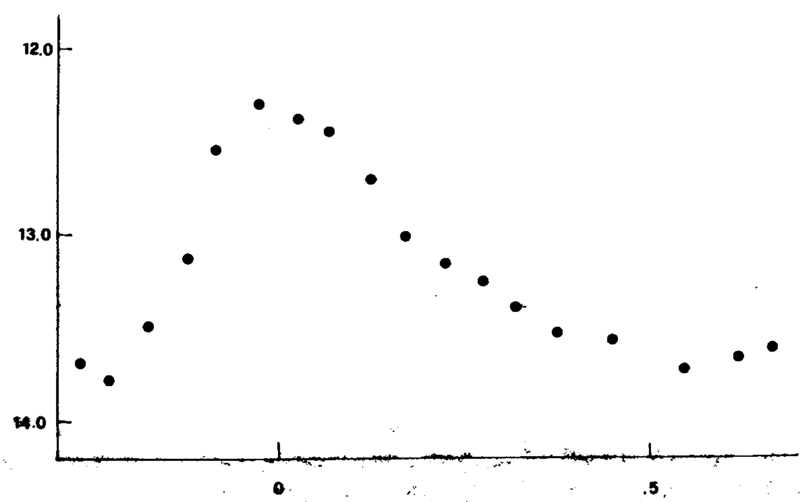


Figure 2

Table II

m	phase	n	m	phase	n
13.70	0.730	13	13.03	0.173	8
13.79	.768	10	13.18	.225	17
13.50	.827	14	13.25	.276	9
13.14	.875	16	13.40	.321	10
12.56	.915	12	13.53	.375	10
12.32	.975	11	13.56	.451	20
12.41	.251	10	13.73	.546	21
12.45	.702	12	13.65	.623	12
12.71	.127	11	13.59	.665	11

(ten maxima between J.D. 2445074 and 2445818) but the period derived by him does not agree with the observations made during the years 1958 - 1964.

A continuous survey of the Chi Ursae Majoris field made at Asiago Astrophysical Observatory with the Schmidt telescopes (67/90/210 cm and 40/50/100 cm) during the period May 1964 - December 1983 produced 227 photographic plates (103aO+GG13). These plates were used for determining the magnitudes of this variable star.

Using the list of the observed maxima (also those of Boninsegna) I derived the variation of the O-C using the elements (1). In some cases it exceeded the double of the period. Figure 1 gives the O-C curve. As one can see in this figure, the period of AX UMa had remained nearly constant over the first 5000 epochs, then it decreased continuously.

Analysing the O-C curve I derived the following new improved elements that were valid for the interval between J.D. 2438522 - 2445818:

$$\text{Max.} = 2435951.441 + 0\overset{d}{.}5351002 \cdot E - 0.52 \cdot 10^{-8} E^2$$

The average light curve is shown in Figure 2 and Table I lists all the maxima, the epochs and the residuals obtained with the new elements. Table II lists the magnitudes, the phases and epochs plotted in Figure 2.

G. ROMANO

Istituto di Astronomia, Università
di Padova, Padova, Italy

References:

Boninsegna, R., 1985, GEOS Circ., RR8, May 1985.
Romano, G., 1958, Specola Ariel, Pub. n.12.
Romano, G., 1964, Specola Ariel, Pub. n.33

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2863

Konkoly Observatory
Budapest
13 February 1986
HU ISSN 0374 - 0676

BP MUSCAE - UBV LIGHT CURVE AND EPHEMERIS

BP Mus (CPD -71° 1392, CoD -71° 0884) has been included in my programme of neglected Southern eclipsing binaries in 1975. At that time the depth of the primary minimum was not known and neither was the existence of the secondary minimum. First reasonably successful observations were made in 1978 and 1979. Present results are based on photoelectric measurements in the UBV system made with the 41 cm reflecting telescope and the 1P21 photomultiplier on Siding Spring. Observations during 13 nights in May 1978, February 1979 and June-July 1979 are of variable quality and many measurements had to be rejected as unreliable because of cloudiness, equipment malfunction or full moon at the time of primary minimum. Nevertheless, these observations of such a little known star as BP Mus yielded the following interesting results.

1. A possible variation in the length of period since the primary minimum occured 23 hours earlier than would be expected from the ephemeris in the GCVS (see Kviz 1979). Individual observations in the UBV filters are plotted in Fig. 1. using the ephemeris T-min(HJD) = 43928.138 + 3.32046.E .

2. A secondary minimum with depth of 0.1 magnitude in V has been detected close to the phase 0.5.

3. The brightness of the star outside minima seems to have dropped by nearly 1 magnitude since the first Hoffmeister (1943a,b) observations (1936-38).

4. The flat bottom of the primary minimum seems to be distorted. (See Fig. 2, 3, and 4). The distortion occured mainly in B and is probably an indication of gaseous streams or a disk in the system.

Table I

Filter	16/17 Feb. 1979		8/9 July 1979			
	a - b	BP Mus	a - b	BP Mus	Min I	Min II
V	0.433	10.200	0.433	10.190	12.97	10.27
B	0.570	10.525	0.568	10.491	14.23	10.54
U	1.272	10.785	1.278	10.786	15.45	10.79

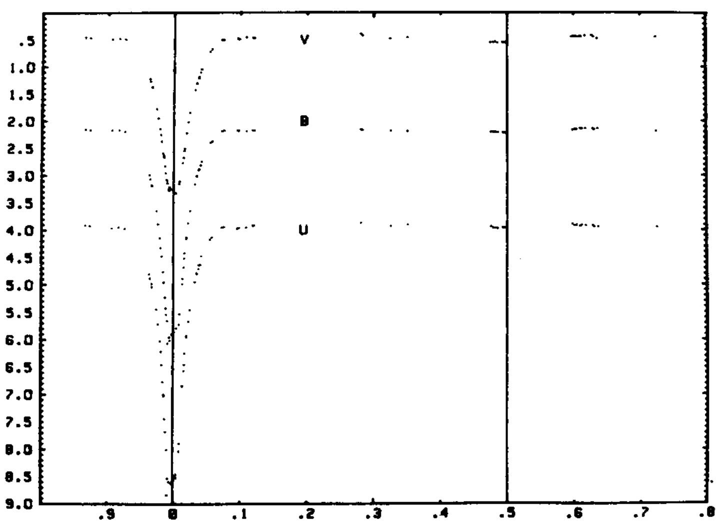


Fig.1. Light curve for BP Mus in the UBV system. Abscissae: Phase. Ordinates: Differential magnitudes (variable minus comparison a), scale is exact for B, -1.5 shift for V, +1.5 shift for U.

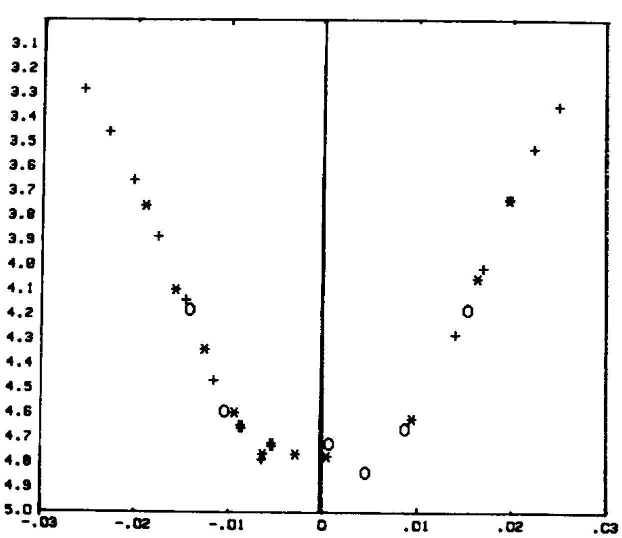


Fig.2. Minimum of BP Mus in V, # 13/14 Feb. 79, + 23/24 Feb. 79, * 26/27 June 79, O 6/7 July 79.

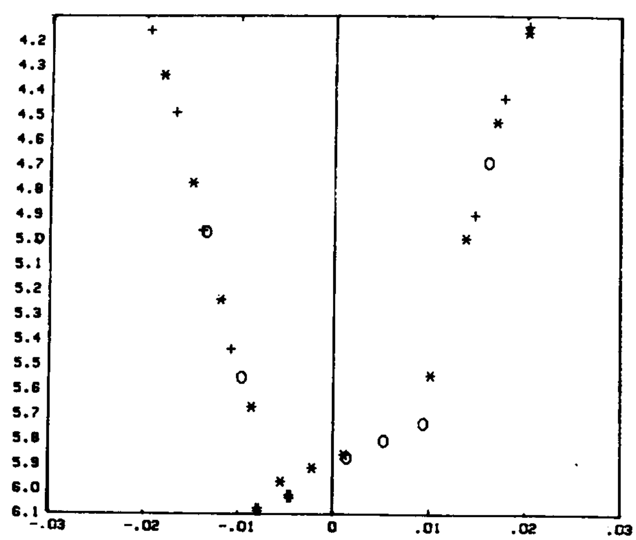


Fig.3. Minimum of BP Mus in B. Symbols as in Fig. 2. Distortion of the bottom is clearly visible.

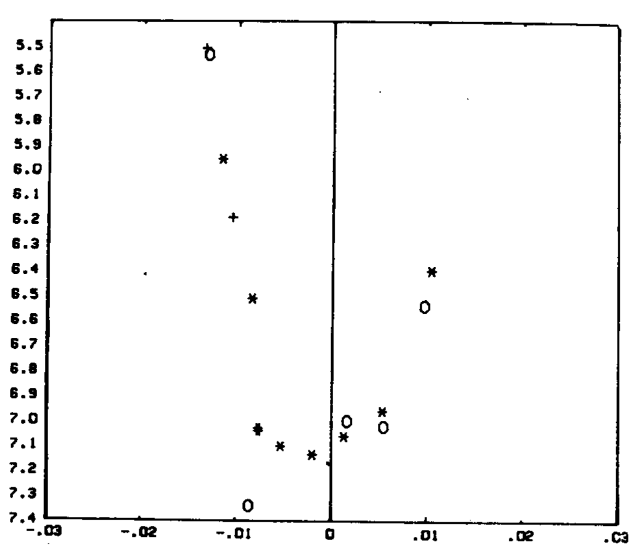


Fig. 4. Minimum of BP Mus in U. Symbols as in Fig. 2.

The measurements of BP Mus and comparison stars, a=HD111442, sp. B9.5 V and b=HD111290., sp. B1 Ib/II were tied-in to the UBV system by measurement of standard stars in the E and F Harvard regions. Table I shows the differences in magnitudes between comparisons a and b, UBV magnitudes for BP Mus on these two nights and the UBV magnitudes at primary and secondary minima.

The photographic magnitude given in GCVS is 9.6 and in the fifth edition of the Finding List (Wood et al. 1980) it is 9.5. Although during minimum the equipment used was working at its limits, the observations from 4 different nights agree reasonably well and in B they indicate the distortion of the flat part of the primary minimum. (Raw estimates of spectral types from colours give A5 V and K2 III).

Further observations of BP Mus are being carried out in other photometric systems (UBVRI, Geneva) and some have already been reduced. These will be published elsewhere. Individual numerical values of the observations used in this paper may be obtained from the author or from the archives in London (Royal Astronomical Society), Strassbourg (Centre de Donnees Stellaires) or Odessa (Odessa Astronomical Observatory). File numbers will be published in the PASP.

Observations at Siding Spring Observatory were partly supported by the Australian Research Grant Commission which is greatly appreciated. I wish to thank Mr. K. J. Murray and Mrs. A. E. Harris for their assistance with observations. I am also greatfull to the director and the staff of Mt.Stromlo and Siding Spring Observatories for facilitating the observations.

ZDENEK KVIZ
School of Physics
University of New South Wales
P.O.Box 1, KENSINGTON, N.S.W.
AUSTRALIA

References:

Hoffmeister C. (1943a), Kleinere Veröff. Berlin-Babelsberg No. 27
(1943b), AN 273, 88.
Kviz Z. (1979), IBVS 1702.
Wood F.B. (1980), Pub. Univ. Pennsylvania, Astr. Ser.12
(= Pub. Dpt. Astronomy, Univ. Florida 1.)

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2864

Konkoly Observatory
Budapest
14 February 1986
HU ISSN 0374 - 0676

THE PROPER MOTION OF CR Gem

CR Gem = AGK3 +16 639 = BD +16 1194 is an Lb type variable star with photographic magnitudes in the range 10.9-11.8 (GCVS) and spectrum N (Stephenson, 1973).

During the use of the AGK3 stars as a reference frame for the reduction of some plates, it was noticed that the proper motion of AGK3 +16 639 (-0".126 in RA and 0".600 in DEC) seemed to be too large and it was decided to attempt the redetermination of the proper motion.

The first-epoch position is based on the published material of the Bordeaux Astrographic Catalogue where CR Gem was identified with object 556 on plate 614 (zone +17° and epoch 1902.0). The plate was rereduced using AGK3 stars as the reference system; the least-squares adjustment gave a standard error of ± 0".32 in both, RA and DEC.

The second-epoch position was obtained from a new plate (epoch 1985.9) taken with the Double Astrograph of the El Leoncito station. The reduction, performed using AGK3 stars, gave a standard error of ± 0".38 in RA and ± 0".24 in DEC.

The resulting annual proper motion is:

RA = 0".000 ± 0".006(se) ; DEC = -0".048 ± 0".005(se)

Even though this result is based on one first-epoch position and one second-epoch position, it seems to be in agreement with Stephenson´s (1978) hypothesis referring to the possible occurrence of systematic errors in the proper motions of the reddest stars of the AGK3.

CARLOS E. LÓPEZ
Observatorio "FELIX AGUILAR"
Benavídez 8175 (oeste)
5407 Marquesado - San Juan
Argentina.

References:

Stephenson, C.B.(1973).Publ.Warner & Swasey Obs. 1,1 (No.4)
Stephenson, C.B.(1978).Astron.J. 83, 816

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2865

Konkoly Observatory
Budapest
14 February 1986
HU ISSN 0374 - 0676

A PHOTOELECTRIC LIGHT CURVE AND PERIOD STUDY FOR CZ Aqr

CZ Aqr is a relatively neglected short-period eclipsing binary of the Algol type in the southern sky. Its magnitude range has been given variously as $9^m.5$ - $11^m.0$ (Hoffmeister 1933) and $11^m.10$ - $12^m.03$ (Payne-Gaposchkin 1953). Its spectral type is A5 (Payne-Gaposchkin 1953) and Table I gives its coordinates.

The variability of the system was discovered by Hoffmeister back in 1932. The most recent determination of the period, $0^d.8627540$ by Gaposchkin (1953), is not recent at all. No previous photoelectric photometry of CZ Aqr has been published, but there are three light curves in the literature: one photographic (Gaposchkin 1953) and two visual (Tsesevich 1953, Szafraniec 1970). Also, one previous period study has been published, by Szafraniec (1970), but there has been no solution of the light curve.

Photoelectric observations were made at the Mt. John University Observatory in New Zealand in 1984 on the nights of September 1, 3, and 6 (UT). A pulse-counting photometer was used with filters selected to match the UBV photometric system. The telescope was a 0.6-meter Optical Craftsmen reflector. Each observation required a 20-second integration time, and three successive integrations were averaged for one measurement. The comparison star was BD $-16^{\circ}6271$, the coordinates of which are given in Table I.

The results include approximately 90 measurements in each bandpass. The differential magnitudes were reduced to the UBV system, using a program written by C. R. Chambliss, and have been sent to the I.A.U. Commission 27 Archive of Unpublished Observations of Variable Stars (Breger 1985) where they are available as file no. 152. There was one complete run through minimum light, and the entire light curve in blue is plotted in Figure 1.

A time of mid eclipse, for which there was no obvious indication of a flat bottom, was determined graphically from the light curve. A mean from the three bandpasses was JD(hel.) = 2,445,945.056, uncertain by approximately one minute.

Table I

Coordinates

Star	BD	α (1984)	δ (1984)
CZ Aqr	$-16^{\circ}6270$	$23^{h}21^{m}33^{s}$	$-16^{\circ}01'.1$
Comp.	$-16^{\circ}6271$	23 21 37	-16 04.0
Check	$-16^{\circ}6266$	23 20 27	-16 02.0

Table II

Times of Primary Minimum for CZ Aqr

JD (hel.)	E	O–C	Type	Observer
2420773.36	-17392	0.00852	pg	Soloviev
20786.34	-17377	.04722	pg	"
25506.46	-11906	.04196	pg	Hoffmeister
25512.45	-11899	-.00732	pg	"
25864.46	-11491	-.00081	pg	"
25883.47	-11469	.02861	pg	"
25909.33	-11439	.00600	pg	"
26242.37	-11053	.02309	pg	Soloviev
26267.36	-11024	-.00677	pg	Hoffmeister
26625.38	-10609	-.02954	pg	"
26651.30	-10579	.00785	pg	"
27413.972	-9695	.00562	pg	Kanda & Kanamori
30003.117	-6694	.02690	pg	Gaposchkin
30969.370	-5574	-.00420	v	Tsesevich
30976.269	-5566	-.00723	v	"
31001.288	-5537	-.00808	v	"
32823.422	-3425	-.00981	v	Szafraniec
33514.487	-2624	-.01049	v	"
33539.513	-2595	-.00434	v	"
33872.528	-2209	-.01226	v	"
34576.541	-1393	-.00624	v	"
35011.366	-889	-.00908	v	"
35401.333	-437	-.00674	v	"
35721.416	-66	-.00534	v	Tsesevich
35778.357	0	-.00608	v	Szafraniec
43371.472	8801	.01398	v	Locher
2445945.056	11784	0.00382	pe	Bruton

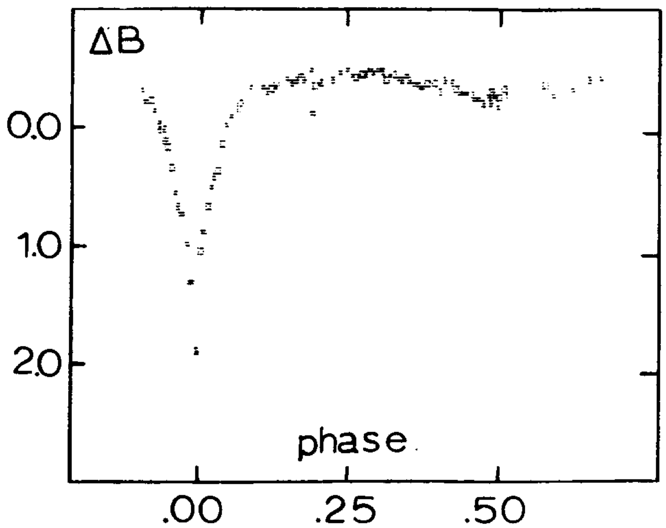


Figure 1

The light curve of CZ Aqr, where the ordinate is differential magnitude in the blue bandpass and the abscissa is orbital phase.

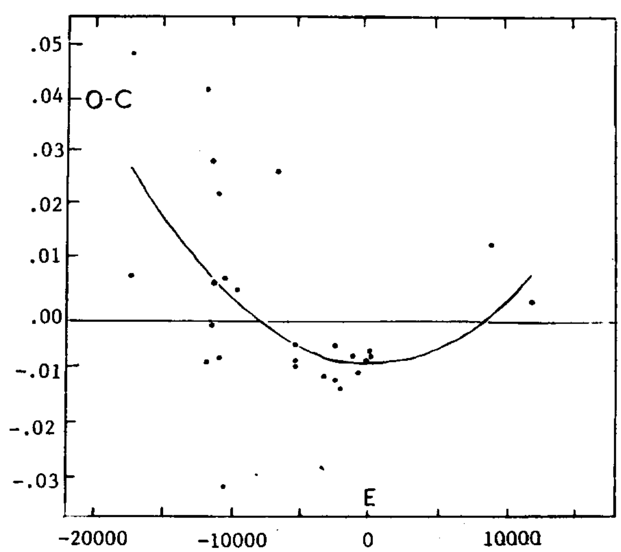


Figure 2

The O–C residuals from Table 2 plotted against E. The curve represents the best quadratic fit to the data, as explained in the text.

An analysis of O-C residuals shows that the period may be changing. Table II tabulates all available times of primary minimum: those appearing in Szafraniec (1970), one determined by Locher (1977), and the recent one determined in this paper. The O-C residuals have been computed with the ephemeris

$$\text{JD (hel.)} = 2{,}435{,}778.3631 + 0^{d}.86275366\ E\ , \qquad (1)$$

which is the best linear fit to those residuals using weights of 20, 3, and 1 for the photoelectric, visual, and photographic times, respectively.

Figure 2 shows the contents of Table II plotted with O-C as the ordinate and E as the abscissa. The solid curve in that figure represents the best quadratic fit using the same weights. When the corrections

$-0^{d}.007485$ (constant term)
-3.12×10^{-8} (first power term)
$+1.164 \times 10^{-10}$ (second power term)

are made to the linear ephemeris in equation (1), the result is

$$\text{JD (hel.)} = 2{,}435{,}778.3536 + 0^{d}.86275363\ E + 1^{d}.164 \times 10^{-10}\ E^{2}. \qquad (2)$$

The correlation coefficient in this fit was 0.61.

While it would seem at this point that the system's period is probably increasing in some fashion, the quadratic solution above is only a tentative approximation. More data, in the form of photoelectric times, are needed.

The author wishes to thank Dr. Edwin E. Budding, Dr. Carlson R. Chambliss, Dr. Douglas S. Hall, Dr. John Hearnshaw, and Dr. Richard L. Walker.

JAMES R. BRUTON

Dyer Observatory
Vanderbilt University
Nashville, Tennessee 37235
U.S.A.

References:

Breger, M. 1985, P.A.S.P. 97, 85.
Gaposchkin, S. 1953, Harvard Ann. 113, no. 2, 69.
Hoffmeister, C. 1933, Astr. Nachr. 247, no. 5919, 286.
Locher, K. 1977, B.B.S.A.G. no. 34.
Payne-Gaposchkin, C. 1953, Harvard Ann. 115, no. 10, 121.
Szafraniec, R. 1970, Acta Astr. 20, 29.
Tsesevich, W. 1953, Odessa Isvestia 4, 56.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2866

Konkoly Observatory
Budapest
17 February 1986
HU ISSN 0374 - 0676

CH CYGNI IN ECLIPSE?

AN APPEAL FOR OBSERVATIONS

Eighteen months ago, after the decrease in the brightness and variations in the spectrum of CH Cygni, we assumed that the active phase of the star was coming to an end (Tomov, 1984). The observations till November 1985 completely confirmed the activity of the star. The magnitude in the V reached $7^m.6 - 7^m.8$, while in the B-V and U-B it was $1^m.4$ and $0^m.7$ respectively. In September, 1985 the rapid light variations typical of CH Cygni during an active phase were not observed (Luud et al., 1986). At the same time, the spectrum resembled more the spectrum observed during the quiet phases of the star. The hot continuum and shell-absorption lines disappeared. In the absorption spectrum only the lines and bands of TiO typical of the M6III star were observed. The central width of the CaI 4227 Å line was ~0.9 . The emission lines of HI, FeII and the forbidden lines of [OI], [O III], [NeIII], [SII] and [FeII] were present. The emission lines of HI and FeII were very weak, the Balmer lines being practically one-component and very narrow as compared to those in the period from August to December, 1984. The intensity only of the forbidden lines and above all of the lines of [OIII] 4959 Å and 5007 Å, and [NeIII] 3868 Å has increased (Mikolajewski and Tomov, 1986; Luud et al., 1986).

Since the beginning of November, 1985 the observations of the star have shown new interesting variations in the brightness and spectrum. From the photometric measurements carried out at the Tartu Observatory in November and December it is obvious that the slight changes in the V filter correspond to the considerable changes in the B-V and U-B (Luud et al., 1986). In November M. and J. Mikolajewski (1985) also observed a slight increase in the brightness in the V of about $0^m.2$ as compared to the summer of 1985. The two spectra of the star obtained at one and the same time show that the Balmer emission lines have increased their intensity and are again two-component, the short-wave component being more intense. It is interesting that the Balmer lines have broad emission wings again.

On December 25, 1985 we obtained one spectrum in the blue and one in the red region with the coudé spectrograph of the 2-m telescope at the Rozhen National Astronomical Observatory with dispersion 18 Å/mm (unfortunately the red spectrum is underexposed). The analysis of the two spectra confirms the results of M. and J. Mikolajewski (1985). The half-width of the emission wings of H$\beta \sim$ 1200 km/s measured by us actually coincides with the half-width measured by them. In addition to the Balmer lines in the spectrum, there are also emissions of [OIII], [OI], [NeIII], [SII], [FeII], FeII and HeI. The emissions of FeII which were very weak in August and September, 1985 and showed very narrow and sharp profiles (similar to forbidden lines) have now increased their intensity and are much wider than the Balmer lines.

Significant changes have occurred in the absorption spectrum of CH Cygni as well. The absorption lines of FeI, VI, TiI, ScI, MnI, etc. and the TiO bands have strongly weakened. The hot continuum filling the absorption lines in the spectrum of the M6III star has appeared again. The central depth of CaI 4227 Å is about 0.5 . This value may serve as an indicator of the intensity of the hot continuum. Figure 1b shows the variation from mid-July 1984 to the end of December 1985. It can be seen that before the decrease in the brightness the hot continuum filled nearly the whole of the CaI 4227 Å line. After that, with the decrease in the intensity of the hot continuum, its central depth reaches the value typical of red giants. The line is now very weak which indicates an enhanced intensity of the filling continuum. For comparison, Figure 1a shows a part of the spectrum around CaI 4227 Å in May and December, 1985. Both spectra have approximately equal density and Figure 1a is an actual illustration of the changes which have occurred.

Another important fact is that some of the strongest shell absorption lines of TiII, SrII and ScII which had been most intense in the spectrum till the abrupt decrease in the brightness in 1984, have appeared again.

The photometric and spectral observations of CH Cygni in the end of 1985 showed a new increase in the activity of the star. The question is whether this is a new increased activity or the brightness and spectrum variations of the star after July 1984 are the result of an eclipse in the system of CH Cygni.

This was a suggestion of Mikolajewski and Biernikowicz (1985) which was brought back again by Mikolajewski and Wikierski (1986). We agree with them that a great part of the brightness and spectrum variations of CH Cygni can

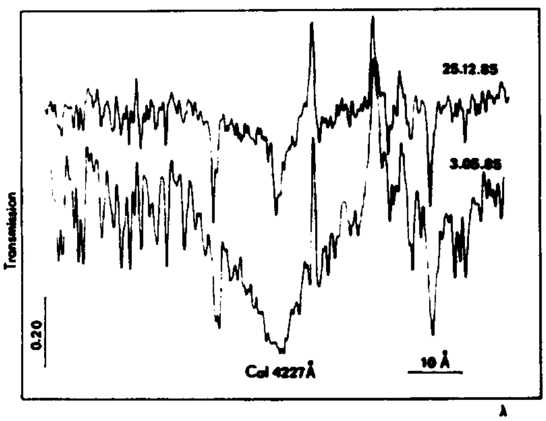


Figure 1a

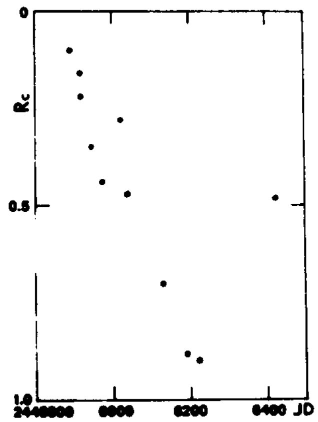


Figure 1b

be explained with the eclipse of the hot component and accretion disc of the red giant. The spectrum of the star obtained in December, 1985 is very close to that observed in the end of 1984 and, like Mikolajewski and Wikierski (1986), we think that the variations now are repeated in a reversed order as compared with those observed about a year ago.

On the other hand, the measured radial velocities of the main star and the companion after the decrease in the brightness in 1984 also show that it is possible CH Cygni to have been in eclipse during the past eighteen months. The radial velocities reduced in accordance with the orbital elements of Yamashita and Maehara (1979) show values about the γ velocity of the system.

If this is really an eclipse and the present variations in the spectrum repeat in a reversed order those observed in the beginning, then we can expect that the eclipse will be over in the period from March to May, 1986. It would be very interesting to follow in detail the spectral and photometric behaviour of the star during the next few months. Unfortunately it will be very difficult to observe the star from our latitude. Observations from observatories of a more favourable location will certainly contribute to the better understanding of the reasons for the brightness and spectrum variations of CH Cygni.

T. TOMOV

Department of Astronomy
National Astronomical Observatory
Bulgarian Academy of Sciences

References:

Luud, L., Tomov, T., Vennik, J., and Leedjarv, L., 1986, in press.
Mikolajewski, M., and Biernikowicz, 1985, In: "Recent results on cataclysmic variables", Proc. ESA Workshop, p. 105.
Mikolajewski, M., and Mikolajewska, J., 1985, IAU Circ., No.4145.
Mikolajewski, M., and Tomov, T., 1986, in press.
Mikolajewski, M., and Wikierski, 1986, personal communication.
Tomov, T., 1984, Inf. Bull. Var. Stars, No. 2610.
Yamashita, Y., and Maehara, H., 1979, Publ. Ast. Soc. Japan, 31, 307.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2867

Konkoly Observatory
Budapest
17 February 1986
HU ISSN 0374 - 0676

A NEW BLUE VARIABLE STAR

While working on a photoelectric sequence around Seyfert 1 galaxy Arakelian 120, one of us (M.H.) found a very blue star. The object is shown in Figure 1. M. Wischnjewsky kindly measured for us a plate we had, taken with the Maksutov astrographic camera at the Cerro El Roble Astronomical Station of the University

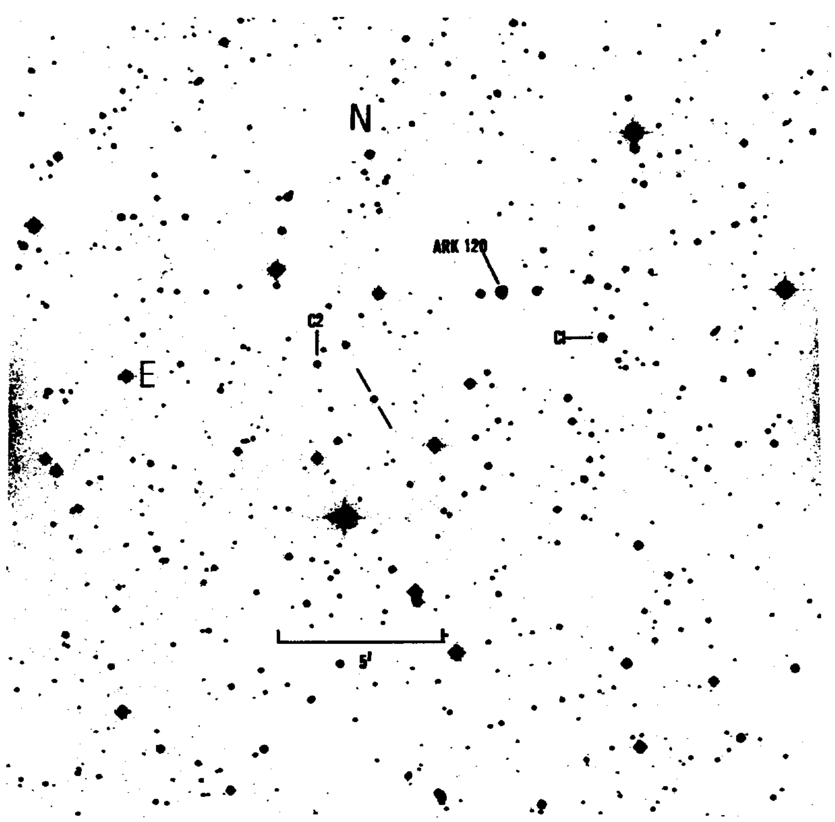


Figure 1

Table I. UBVRI photometry of the variable star

U-B	B-V	V	V-R	R-I	Date	U.T.
-0.70	0.06	14.24	0.09	0.12	85.Feb.23	2.043
-0.74	0.02	14.11	0.12	0.06	85.Feb.24	2.326
-0.74	0.02	14.28	0.09	0.14	85.Feb.25	1.902
-0.83	0.06	14.03	0.13	0.14	86.Jan.09	4.254
-0.87	0.04	14.05	0.07	0.09	86.Jan.10	4.728
-0.83	0.06	14.13	0.08	0.11	86.Jan.10	4.888
-0.93	0.04	13.95	0.04	0.05	86.Jan.11	4.687
-0.79	0.05	14.07	0.06	0.13	86.Jan.11	4.906
-0.83	0.06	14.03	0.11	0.16	86.Jan.12	4.306
-0.82	0.06	14.10	0.05	0.11	86.Jan.12	4.622
-0.89	0.01	14.01	0.07	0.06	86.Jan.12	4.861
-0.82	0.10	14.10	0.11	0.12	86.Jan.13	2.671
-0.85	0.07	13.96	0.03	0.09	86.Jan.13	4.230
-0.82	0.02	14.10	0.09	0.11	86.Jan.13	4.836
-0.89	0.05	14.09			86.Jan.14	2.840
-0.88	0.07	14.07			86.Jan.14	2.974
-0.89	0.01	14.06			86.Jan.14	3.133
-0.84	0.06	14.16			86.Jan.14	3.244
-0.97	0.03	14.07			86.Jan.14	3.399
-0.84	0.04	14.07			86.Jan.14	3.513
-0.85	0.05	14.12			86.Jan.14	3.657
-0.89	0.05	14.08			86.Jan.14	3.766
-0.88	0.05	14.08			86.Jan.14	3.910
-0.78	0.05	14.08			86.Jan.14	4.021
-0.85	0.01	14.06			86.Jan.14	4.162
-0.79	0.07	14.20			86.Jan.14	4.266
-0.95	0.02	14.08			86.Jan.14	4.414
-0.90	0.03	14.05			86.Jan.14	4.518
-0.94	0.05	14.02			86.Jan.14	4.651
-0.80	0.08	14.11			86.Jan.14	4.744
-0.85	0.07	14.12			86.Jan.14	4.883
-0.84	0.03	14.05			86.Jan.14	4.980
-0.89	0.05	14.09			86.Jan.14	5.074

of Chile. Using 22 reference stars from the Perth-70 catalogue, the following 1950.0 coordinates were obtained for the object: R.A. = $5^h13^m53\overset{s}{.}16$ and Dec. = $-0^\circ15'28\overset{''}{.}5$.

We carried out UBVRI photoelectric photometry during February 1985 and January 1986 using the 1 m, 0.91 m and 0.61 m telescopes of Cerro Tololo Inter-American Observatory, equipped with a dry-ice cooled Hamamatsu Ga-As photomultiplier and the standard Tololo set of UBVRI filters as described by Graham (1982). We determined the standard magnitudes and colors from observations of at least 20 standard stars from the list published by Graham (1982) during several moonless photometric nights. The observations are listed in Table I. Typical errors are smaller than 0.02 mag., except in (R-I) whose error is smaller than 0.03 mag. Appreciable variability is seen in V magni-

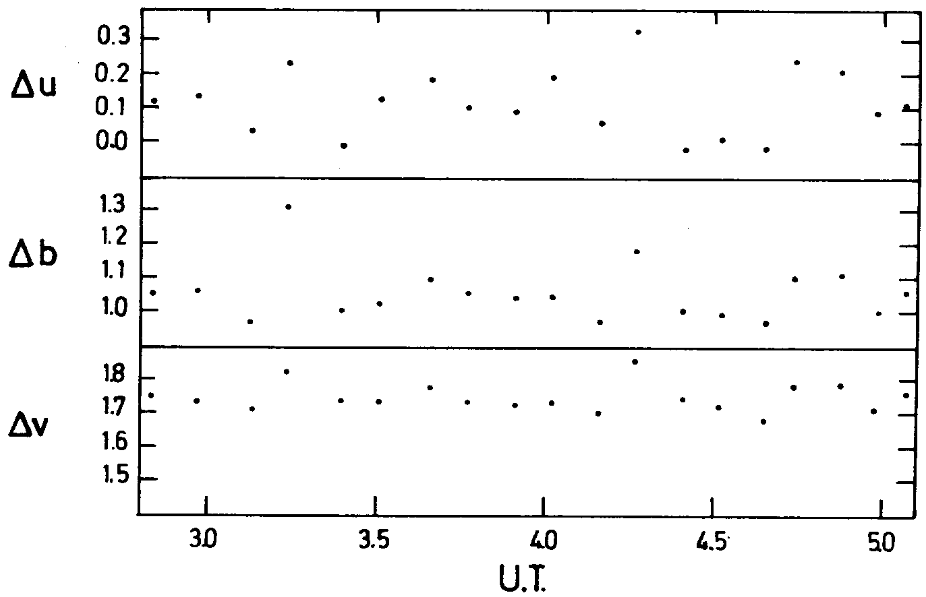


Figure 2

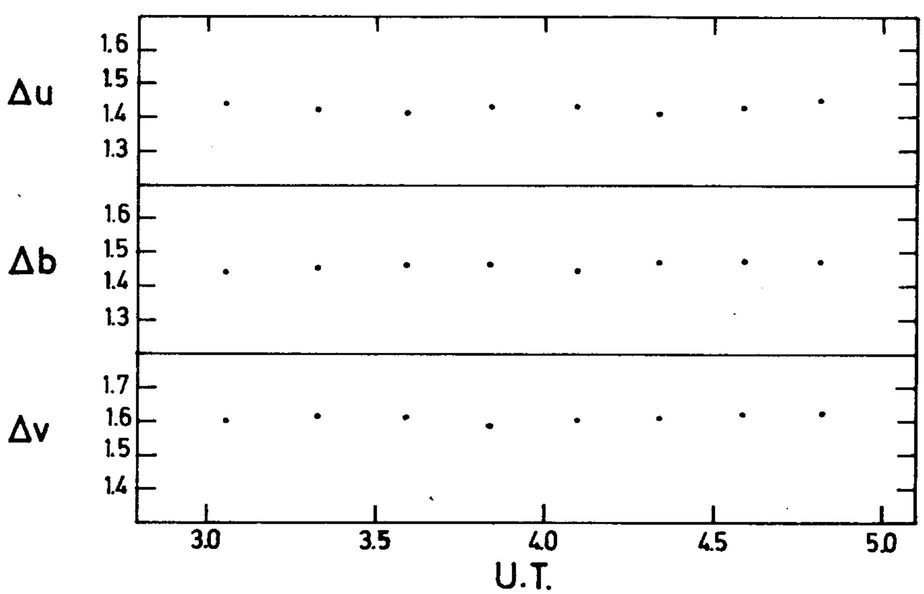


Figure 3

tude as well as in colors. The formal average of all observations leads to a mean visual magnitude of 14.09 and the following mean colors: U-B = -0.85, B-V = 0.05, V-R = 0.08 and R-I = 0.11.

On January 14th, 1986 we observed the object and two comparisons (shown in Figure 1) for two hours, following the sequence C_1, var, C_2, var, ... etc. These observations were made with a statistical accuracy of 1 % in U, B and V. Figure 2 shows the instrumental magnitude differences, corrected for atmospheric extinction, between the variable star and the brightest comparison (C_1), versus Universal Time. Figure 3 shows the difference C_2-C_1. It is clear that, within the accuracy of the data, C_2 remains constant while the variable star changes its luminosity very fast, even from one observation to the next, typically 5 minutes. The range of variability during the two hours is as large as 0.3 mag. in the U and B bands and 0.15 mag. in the visual. It is also clear that the light curves have approximately the same shape for all three filters, although the amplitude looks much larger in the U band. In order to illustrate this, Figure 4 shows the visual magnitudes versus the U-B color (error bars show typical errors of 0.02 mag. in (U-B) and 0.015 mag. in V). On the average the star gets bluer when it gets brighter.

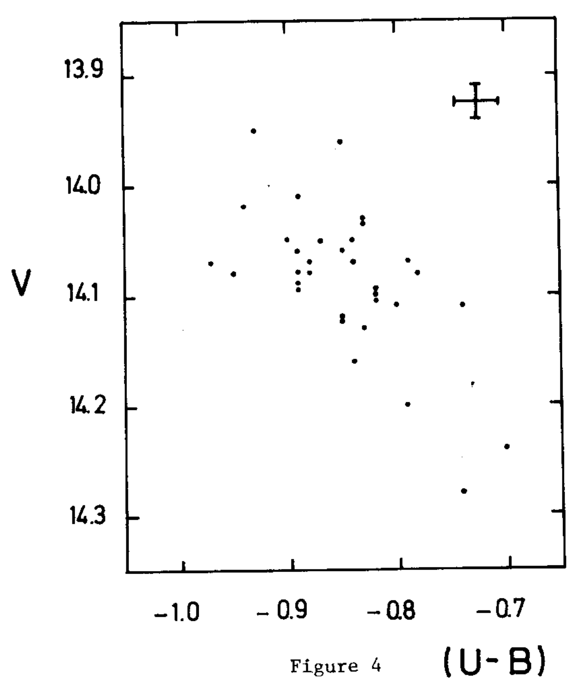


Figure 4

A spectrogram obtained at CTIO using the 1.5-m telescope and the SIT-Vidicon in April 26, 1985 by M.T. Ruiz and one of us (J.M.), shows a featureless blue continuum. Neither emission nor absorption lines can be inferred from this rather noisy spectrogram covering from 4000 Å to 7000 Å .

This object bears some resemblance to CD $-42^{o}14462$, a dwarf nova in permanent outburst discovered by Bond and Landolt (1971). Their colors are very similar and CD $-42^{o}14462$ also shows rapid variations over 0.2 mag. in V within a few days. The broad and shallow Balmer lines in absorption, the weak absorption of HeI line at 4471 Å , as well as the faint Balmer emission lines shown by CD $-42^{o}14462$ (Bond, 1978; Cowley et al., 1977) cannot be confirmed or ruled out for our variable from the spectrogram we have. New spectroscopic observations are needed to understand the unusual nature of this object.

We are very grateful to Dr. H. Bond and Dr. W. Krzeminski for valuable conversations. Thanks are also due to the staff of CTIO for being very helpful during our observing runs there. This research was possible thanks to a grant from "Fondo Nacional de Desarollo Cientifico y Tecnologico".

MARIO HAMUY* and JOSÉ MAZA*

Department of Astronomy
University of Chile
Casilla 36-D
Santiago, Chile

References:

Bond, H.E., and Landolt, A.U., 1971, Publ. A.S.P., 83, 485.
Bond, H.E., 1978, Publ. A.S.P., 90, 216.
Cowley, A.P., Crampton, D., and Hesser, J.E., 1977, Ap.J., 214, 471.
Graham, J.A., 1982, Publ. A.S.P., 94, 244.

* Visiting astronomers, Cerro Tololo Inter-American Observatory operated by AURA Inc., under contract with the National Science Foundation

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2868

Konkoly Observatory
Budapest
20 February 1986
HU ISSN 0374 - 0676

THE ECLIPSING BINARY V651 CASSIOPEIAE

The binary V651 Cassiopeiae (also known as BV 326, CSV 8883 and NSV 14717) was discovered by Strohmeier and Knigge (1960), although they published only a finding chart. Using 193 Hartha Sky-patrol-plates, Berthold (1982) derived ephemerides of JD2,437,016.435+$0^{d}.4900267$.E for the interval from JD2,436,637 - 2,439,029 and JD2,443,015.413 + $0^{d}.4900322$.E for the interval from JD2,439,052 - 2,443,016. He claimed that an abrupt period change in October 1965 had been detected. He also classified the star as a W UMa variable and gave photographic magnitudes of 10.5 - 11.0. The variable received its current name recently (Kholopov _et al_. 1985).

The binary was put on the program of spectroscopic orbital determinations of short-period eclipsing binaries. Since July 1985, forty-one spectrograms have been obtained with the 1.8-m telescope of the Dominion Astrophysical Observatory (DAO) at a dispersion of 15 Å mm^{-1}. Twenty-three of them were secured with the intensified Reticon detector and measured by the program VCROSS (Hill 1982); while the rest were obtained with the shectograph and measured by the software package RETICENT (Pritchet, Mochnacki and Yang 1982).

The velocities obtained do not agree with the period of $0^{d}.49$. A new period of $0^{d}.9969$, a little longer than double the old one, has been derived. The new ephemeris is:

$$\text{Min. HJD} = \underset{22}{2,446,430.3159} + \underset{41}{0^{d}.996864}.E$$

Preliminary orbital solutions were tried with circular orbits assumed and the systemic velocity of -30 km s^{-1} fixed. This value was estimated from the spectrogram taken at HJD2,446,442.6299, which looked single-lined. Radial-velocity curves are shown in Figure 1. These curves must be very preliminary since only one node is covered. However, the minimum mass of the system can be estimated to be 1.61 (0.83 + 0.78) $M_{\odot}$. The mass ratio then is close to unity (0.94), which is significantly different from those of the W UMa group.

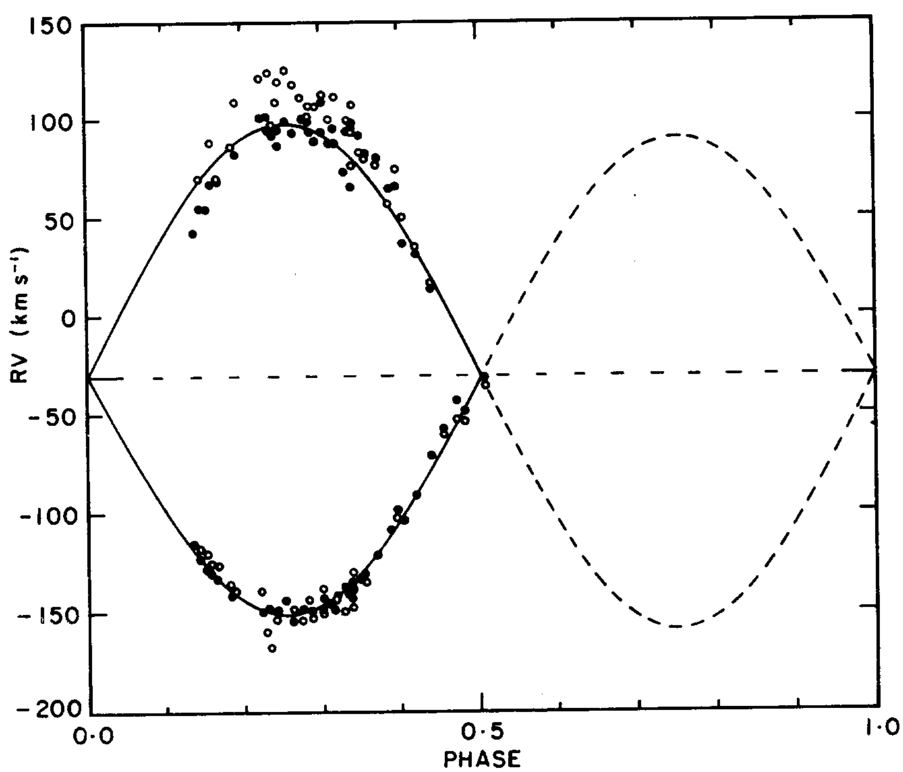


Figure 1. Incomplete radial-velocity curves of V651 Cas. Dots denote absorption-line velocities and open circles CaII H and K emission-line velocities.

Absorption features in the spectrum are quite sharp and not distorted. This also indicates that the binary is probably not a member of the W UMa group, whose spectral features are usually severely broadened, diffused and distorted. Both components clearly show H and K lines in emission, the velocities of which (also shown in Figure 1) agree well with the absorption line velocities arising from the same component. In the MK system, the components of the binary can be assigned to G5V (more luminous component) and G8-K0 with some uncertainty. In addition, the line-strength ratio was measured to be about two.

These properties suggest that the binary may be a member of the RS CVn group (Hall 1976). If it is, the period of about one day (if correct) is very important because it fills the period gap between the long and short-period RS CVn groups.

Further observations will be continued in future observing seasons at DAO. Both photoelectric and spectroscopic observations at other longitudes would be useful.

I am grateful to Dr. A.H. Batten for his help in the analysis. I would also like to thank Drs. D. Crampton, G. Hill, C.L. Morbey, and C.J. Pritchet for placing their reduction programs at my disposal.

WENXIAN LU*

Dominion Astrophysical Observatory, Herzberg Institute of Astrophysics,
5071 W. Saanich Road, Victoria, B.C., Canada V8X 4M6

* On leave of absence from Shanghai Observatory, Academia Sinica,
Shanghai, People's Republic of China

References:

Berthold, T. 1982, Comm. 27 I.A.U. Inf. Bull. Var. Stars No. 2192.
Hall, D.S. 1976, in Multiple Periodic Variable Stars, I.A.U. Colloq. No. 29, W.S. Fitch, ed. (D. Reidel Publishing Company), p. 287.
Hill, G. 1982, Pub. Dominion Astrophys. Obs. 16, 59.
Kholopov, P.N., Samus, N.N., Kazarovets, E.N., and Perova, N.B. 1985, Comm. 27 I.A.U. Inf. Bull. Var. Stars No. 2681.
Pritchet, C.J., Mochnacki, S., and Yang, S. 1982, Pub. A.S.P. 94, 733.
Strohmeier, W. and Knigge, R. 1960, Veröff. d. Remeis-Sternw. Bamberg, Band V(5).

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2869

Konkoly Observatory
Budapest
25 February 1986
HU ISSN 0374 - 0676

ON THE LIGHT CURVE OF AI Scl *

The possible δ Scuti star AI Scl (HR359,HD7312) is only little investigated. In the 'Third Supplement to the Third Edition of the General Catalog of Variable Stars' AI Scl is listed as a possible δ Scuti star with a period of approximately 70min. This is based on Eggen's (1973) observations who called the star an ultrashort-period Cepheid and presented two short parts of the light curve. In 1976 Eggen mentioned that spectrograms suggest the existence of a binary. Radial velocities are given in Buscombe and Morris (1958) and Buscombe (1963). Morris and DuPuy (1980) investigated AI Scl photometrically in the UBV system. They found two periods of 64min and 134min, respectively.

The observations were carried out on 23./24.11.1984 with the Danish 50cm telescope at La Silla/Chile equipped with the 4-channel Stömgren photometer. The integration time was 30sec per channel. Although no comparison star was used the quality of the measurements are quite good.

After the transformation into the standard system the averages were calculated and subtracted from the data. Then the remaining residuals were fitted simultaneously with two periods. The function fit was :

$$M(t) = ZP \cdot \sum (ampl_i \cdot \sin(2 \cdot f_i t + 2\pi\varphi_i)), \ i=1,2$$

Afterwards the estimated frequencies were weighted and the means yielded two periods of :

$$P = 116.4 \pm 3.5 \text{min} \quad \text{and} \quad P = 60.0 \pm .1 \text{min}$$

----

* Based on observations collected at the European Southern Observatory (ESO), L a Silla/Chile.

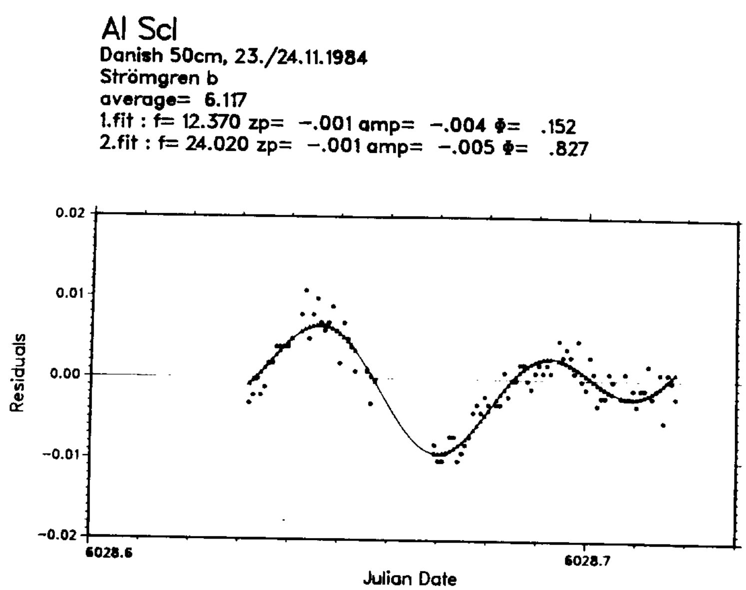


Figure 1

Fig.1 shows the residuals from the b-channel. The solid line presents the fit, while the triangles are drawn in order to make time gaps in the observations visible.

There exists some indications for a third period, but the time base is too short to confirm this.

HARTMUT SCHNEIDER

and

WOLFRAM KOLLATSCHNY

Universitäts-Sternwarte
Geismarlandstr. 11
D-3400 Göttingen
F.R.G.

References :

Buscombe,W. Mon.Not.R.Astron.Soc. 126,29 (1963)
Buscombe,W.,Morris,P.M. Mon.Not.R.Astron.Soc. 118,609 (1958)
Eggen,O.J. Astrophys.J 180,857 (1973)
Eggen,O.J. Publ.Astron.Soc.Pac. 88,402 (1976)
Morris,S.,DuPuy,D. Publ.Astron.Soc.Pac. 92,303 (1980)

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2870

Konkoly Observatory
Budapest
25 February 1986
HU ISSN 0374 - 0676

VARIATION OF THE CP2 STAR BD+24° 3675 *

The star BD+24°3675 was found to be a CP2 star by Bidelman (1983). He classified it as a Si type by means of objective-prism plates. For this reason the star was placed on a list of CP2 stars to obtain Strömgren, Hβ and Δa indices (Schneider (1986)). The Δa index was introduced by Maitzen (1976) to measure the flux depression at λ5200 which characterizes chemically peculiar early type (CP2) stars.

The observations were carried out in August 1985 with the 1m telescope of the Wise Observatory/Israel. For details of the instrumentation and reduction see Schneider (1986).

After three nights it was found that this star has the most outstanding Δa value ever measured, but with a scatter larger than expected. This indicated variability, therefore, the observations were continued until the end of the campaign.

Although no comparison star was measured the accuracy of the absolute photometry is very good.

First the average of the magnitudes and the indices were calculated. Then the means was subtracted from the data and a sine fit was placed through the residuals to estimate the frequency for each channel. A mean frequency was calculated by averaging the single frequencies weighted with the deviation from the fits. This yielded a period of 7.52±.3days.

----

* Based on observations collected at The Florence and George Wise Observatory, Tel Aviv University, Israel.

variations of star BD+24°3675

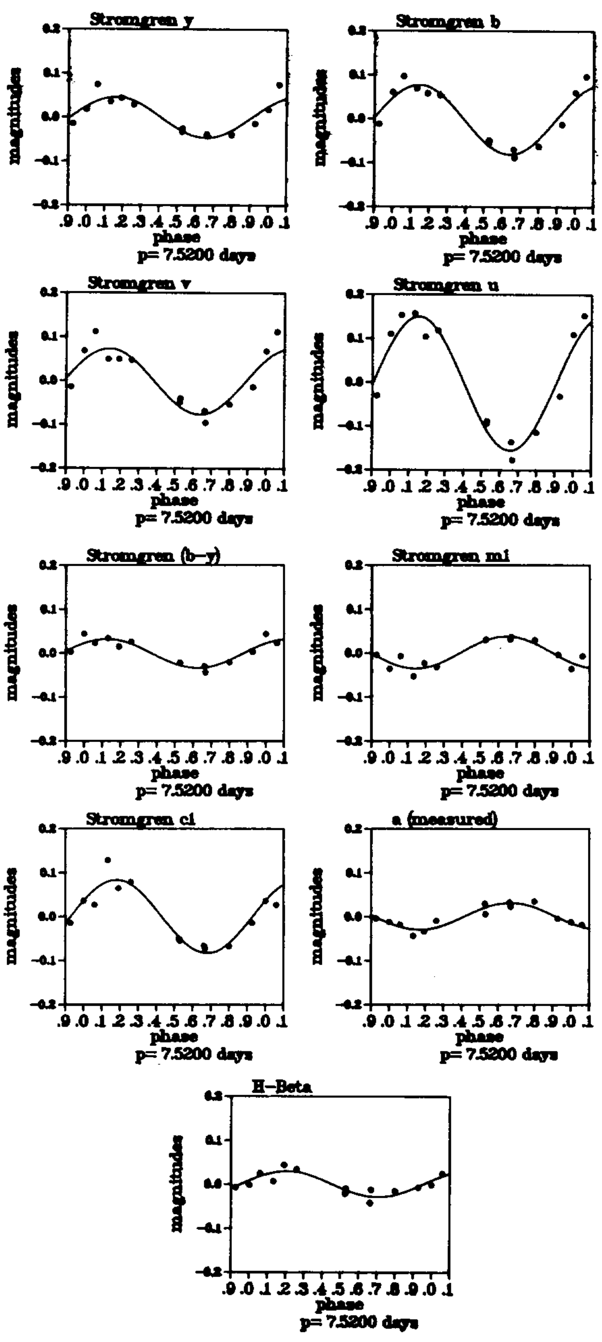


Figure 1

Table I

	mean	ampl	average
y :	9.941	.093	.014
b :	9.996	.158	.016
v :	10.230	.150	.023
u :	11.015	.152	.026
b-y :	.54	.066	.010
m_1 :	.180	.074	.011
c_1 :	.551	.167	.020
Hβ :	2.767	.059	.011
a :	.101	.062	.010

Table II

y	b	v	u	b-y	m_1	c_1	a	Hβ	J.D.	φ
17	61	68	110	43	36	35	-13	-1	6302.306	.00
35	69	49	157	33	53	128	-45	7	6303.297	.13
28	54	47	118	25	32	78	-10	35	6304.256	.26
-34	-56	-49	-94	-23	30	-52	29	-21	6306.265	.53
-26	-48	-40	-88	-23	31	-56	05	-10	6306.235	.53
-39	-69	-69	-136	-31	31	-67	32	-42	6307.290	.66
-44	-88	-96	-177	-45	37	-73	22	-12	6307.328	.67
-41	-62	-54	-114	-22	30	-68	34	-15	6308.314	.80
-15	-12	-14	-31	2	4	-15	-5	-7	6309.272	.93
74	97	112	153	22	7	26	-19	25	6310.270	.06
43	58	49	104	14	23	64	-35	44	6311.262	.19

Table I gives the mean values and the amplitudes derived from the fit with the mean period. In the third column the average of the residuals after pre-whitening is listed, which is a criterion for the quality of the fit. Table II shows the residuals (mean-obs.) in millimag, Julian Date of the observations and the derived phase. The phases were calculated by using

$$J.D. = 2446302.306 + 7.52 \cdot E$$

In Fig.1 all residuals were plotted against the phase. Note that the m and the a index is in antiphase with the other quantities.

HARTMUT SCHNEIDER
Universitäts-Sternwarte
Geismarlandstr. 11
D-3400 Göttingen
F.R.G.

References :

Bidelman,W.P. Astron.J. 88,1182 (1983)
Maitzen,H.M. Astron,Astropys. 51,223 (1976)
Schneider,H. Astron,Astropys. in press (1986)

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2871

Konkoly Observatory
Budapest
26 February 1986
HU ISSN 0374 - 0676

SPECTROSCOPY OF NOVA SCORPII 1985

Following the discovery on 24 September 1985 of this nova by one of us (W.L.), the other author (T.R.) was able to obtain spectrograms on 3 successive nights: 7, 8, and 9 October, using the ESO 1.52 m telescope equipped with an image dissector scanner.

A reproduction of one of the spectrograms taken on the middle night is shown in Figure 1. The scale of the ordinate is in units of relative intensity; no appreciable changes can be seen over the span of three nights.

The average intensity ratio Hβ / Hγ over the three nights is 4.0 ± 0.1, indicating considerable interstellar extinction. (The unreddened value should be close to 2.15). We calculate that E(B-V) = 1.3, and combining this value

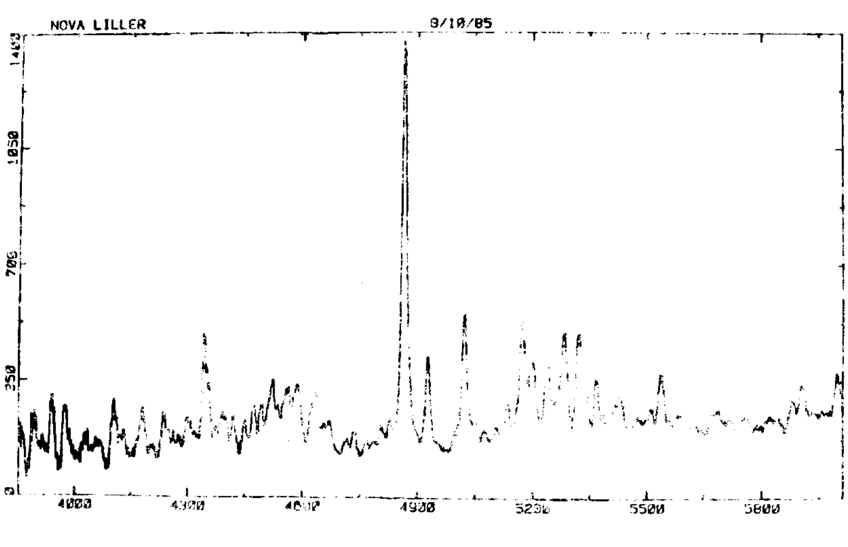


Figure 1

with the apparent magnitude at discovery of 10.5 (Liller, 1985) and assuming that the absolute magnitude of the nova was -7.5 at time of discovery, we derive a distance of 6.3 kpc.

Other prominent lines in the spectra are [OIII] at 4959, 5007 Å, and numerous [FeII] lines between 5100 and 5400 Å. Other lines include CaII at 3933 and 3969 Å , Hδ, [OI] at 5577 Å , and the NaI D-lines.

An objective prism photograph taken by W.L. on 5 October (which was used to confirm that the star was indeed a nova) shows Hα strongly; no continuum is apparent.

TOM RICHTLER

Observatorium Hoher List
BRD-5568 Daun/Eifel

WILLIAM LILLER

Instituto Isaac Newton
Casilla 8-9, Correo 9
Santiago, Chile

Reference:

Liller, W., 1985, IAU Circ., No.4118.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2872

Konkoly Observatory
Budapest
3 March 1986
HU ISSN 0374 - 0676

U CEPHEI: AN UNUSUAL DEVELOPMENT

The eclipsing binary U Cephei, BD+81 25, was observed on the night of August 13, 1985 at the Stephen F. Austin State University Observatory. The observations were made with the 46cm reflector, which uses a Starlight-1 photometer with an uncooled EMI 9798A phototube. The observations of U Cephei were made as part of our study of the W Serpentis star systems, described elsewhere (Wilson, Rafert and Markworth, 1985).

During that night, 208 observations in the natural V and R system of the telescope/photometer combination were made, centered approximately on mid-eclipse. Normals of these observations, which are presented in Figures 1 and 2, were used to determine two new timings of primary minimum. The comparison star used was BD +81 30. The observations were automatically recorded with our digital data acquisition system, which uses a Commodore C-64 for photometer control, and a Rockwell AIM-65 for telescope control. The two computers communicate over a parallel data link in order to synchronize their operation.

As the eclipses of U Cephei are rather asymmetric, the quoted timings of minimum below were calculated by fitting the bottom of the eclipse curve (i.e., before the inflexion points) by a parabola (Method I). As can be seen in either of the figures, the total portion of primary minimum appears to have a slight slope, so we also calculated timings of minimum with the data at the bottom of the eclipse excluded (Method II). The excluded data was centered upon the timing of minimum found by Method I +/- 0.015 in phase. For these

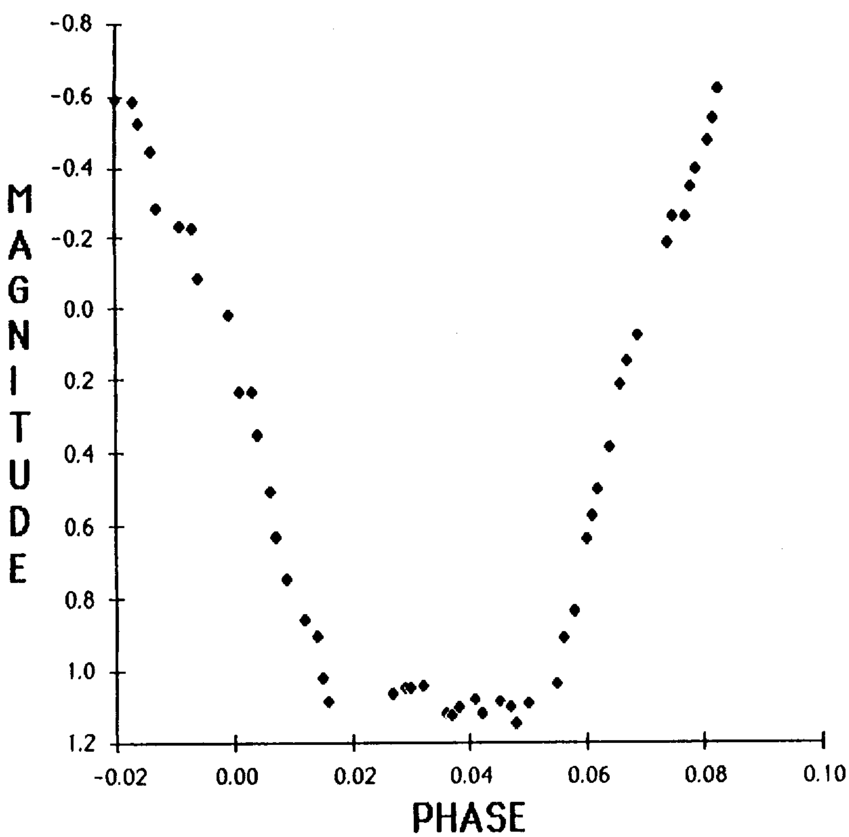


FIGURE 1. The differential V magnitudes for U Cephei in the sense (variable-comparison). Each point is a normal of two observations.

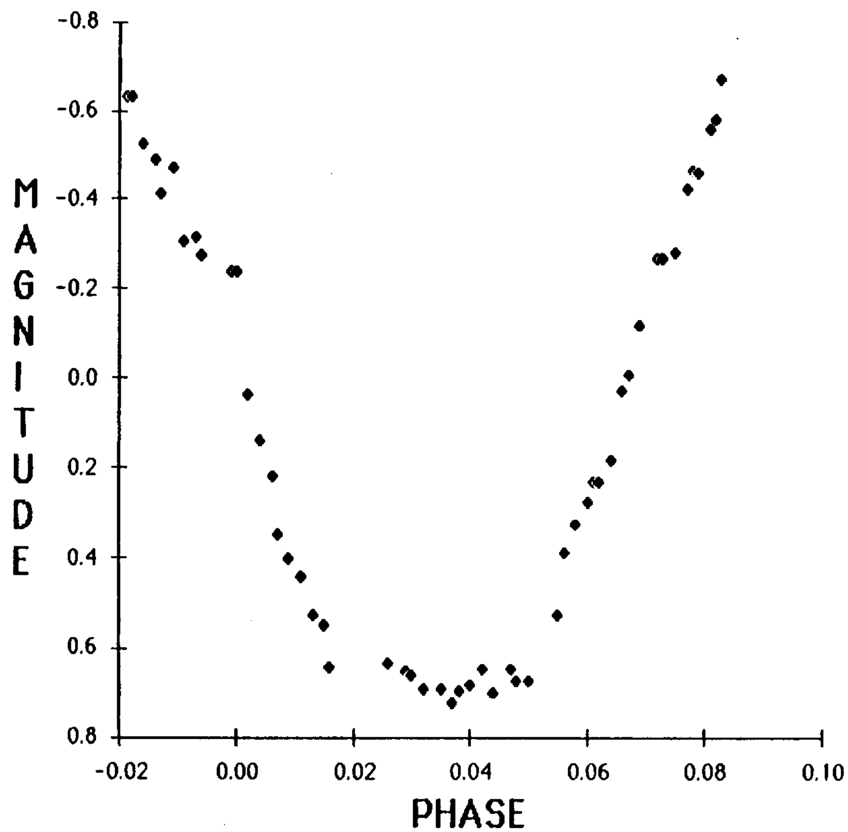


FIGURE 2. The differential R magnitudes for U Cephei in the sense (variable-comparison). Each point is a normal of two observations.

least squares fits, the quoted error was determined by standard error propagation techniques. For either method, we obtain rather sizeable residuals (O-C) from the ephemeris 2438291.5330 +2.4930475 quoted by Olson, et.al. (1981). O-C´s were calculated from Method I. Numerical results are presented in Table I.

Because of the apparent slope to the data in the extreme bottom of the eclipse, we also applied a linear least squares

Table I

Filter	JD (2440000+) Method I	JD(2440000+) Method II	O-C
V	6291.7430 .0099	6291.7428 .0184	0.0206
R	6291.7414 .0097	6291.7541 .0084	0.0190

fit to just this data. Surprisingly, the slope (delta mag/delta phase) of this portion of the light curve is 1.34 in the Visual, and 0.91 in the Red. These slopes are larger than the error in the slopes (as determined from the errors of the coefficients) by a factor of about 3. Alternatively, the total portion of primary eclipse can be considered to have both a "high" and a "low" part, although this is not so clear in the Red. Nonetheless, in the Visual, there is a fairly well defined drop of 0.06 magnitudes.

This evidence suggests that U Cephei could be involved in a high level of mass transfer, during which a gas stream from secondary to primary, or an uneclipsed portion of a gas disk around the primary component may have been visible following second contact.

This material is based upon work supported by the National Science Foundation under Grant Number AST840-1479.

J.B. RAFERT
E. SMITH

Florida Institute of Technology
Department of Physics and Space Sciences
Melbourne, Florida 32901
USA

N.L. MARKWORTH

Stephen F. Austin State University
Department of Physics and Astronomy
Nacogdoches, Texas 75962
USA

References:

Olson, E.C., Crawford, R.C., Hall, D., Louth, H., Markworth, N.L., and Piirola, V., 1981, Publ. Astron. Soc. Pacific, 93, 464.

Wilson, R.E., Rafert, J.B., and Markworth, N.L., 1985, "The W Serpentis Stars", Communications of the I.A.P.P.P., No.16, 1.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2873

Konkoly Observatory
Budapest
3 March 1986

HU ISSN 0374 - 0676

PHOTOELECTRIC LIGHT CURVES OF RR LEPORIS

The eclipsing binary system RR Lep (BD-13°1086) was first discovered by Hoffmeister (1931). Although there have been subsequent visual and photographic reports, no photoelectric work has been done on the system. For this reason, RR Lep was selected for observation on seven nights during December, 1979. The number two 41cm telescope at Cerro Tololo Inter-American Observatory was used with standard B, V filters and an RCA 1P21. The comparison and check stars were BD-13°1090 and BD-12°1091, respectively. Approximately 700 observations were obtained at each effective wavelength. Two epochs of minimum light were determined from the observations made during one primary and one secondary eclipse. These are shown in Table I.

TABLE I

JD Hel 2444200+	Minimum	(O-C)
26.66347	I	+0.0000
31.69675	II	-0.0015

The times of minimum light in Table 1 along with 27 other epochs by Erleksova (1953, 1966), Orion 122, 124 and 129 (1971, 1972) and BBSAG #6 (1973) were introduced with varying weights into a least squares solution to obtain the ephemeris:

$$\text{JD Hel Min.I} = 2444226.6634 + 0.91542787\,E$$
$$\pm \qquad 44 \pm \qquad 42 \text{ p.e.}$$

This was used to calculate the O-C's in Table I.

The B and V light curves of RR Lep defined by the individual observations are shown in Figure 1 as Δm versus phase. The analysis of the observations is underway.

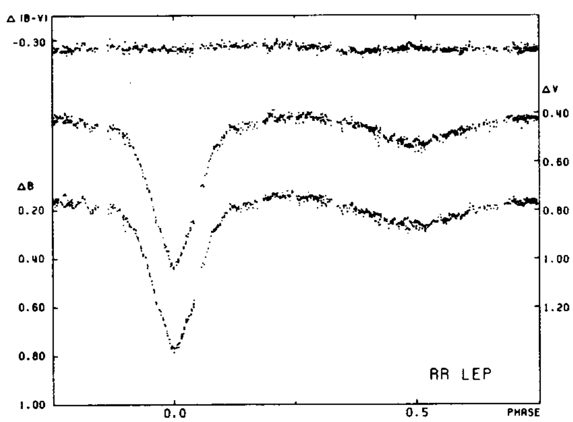


Fig. 1 - Light curve of RR Lep defined by the individual observations.

BEVERLY B. BOOKMYER
DANNY R. FAULKNER*
RONALD G. SAMEC
Dept. of Physics & Astronomy
Clemson University
Clemson, S.C. 29634-1911 USA

*Dept. of Astronomy
Indiana University
Bloomington, IN 47405

References:

Erleksova, G. E. 1953, Peremennye Zvezdy 9, 152.
Erleksova, G. E. 1966, Bull. Astrophysics No. 41-42, Acad. Science Tadjik, p. 61.
Hoffmeister, C. 1931, Astr. Nach. 242, 129.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2874

Konkoly Observatory
Budapest
6 March 1986

HU ISSN 0374 - 0676

VARIABLE STARS IN LYNDS 810

The large dark globule Lynds 810 located on the Vulpecula-Cygnus border is unusual in containing a centrally-located nebula as well as several bright superimposed stars (Herbst and Turner 1976). Most of the latter are foreground stars which lie along the ∿ 2.5 kpc line of sight to Lynds 810 (Turner 1986), but a few faint objects appear to be nebulous knots or stars that are possibly embedded in the globule (Herbst and Turner 1976). Neckel et al. (1985) have recently discussed the status of four of these, and have noted that one (number 7 in their identification system) is a variable star which coincides with an infrared source and with the end of a luminous jet running across the densest portions of the globule. The three others (numbers 8, 9 and 10) are nebulous condensations according to Neckel et al. This notes presents information pertaining to possible variability of all four objects as inferred from magnitude estimates from photographs of Lynds 810.

Figure 1 is a reproduction of a 60^m exposure of Lynds 810 using an 098-04 emulsion and OG610 filter obtained on the night of August 22, 1977 (JD 2443377.629) by Alan Dressler with the 2.5-m Dupont telescope on Cerro Las Campanas. The plate-filter combination for this exposure has a wavelength response similar to that of the POSS E-plate of the field obtained in July 1951 (JD 2433835.867), reproductions of which have been published by Herbst and Turner (1976) and Neckel et al. (1985). Star identifications in Figure 1 correspond to the numbering systems of these authors.

Stellar magnitudes were derived from the POSS E-plate of Lynds 810 using image diameters measured from a photographic enlargement of a glass copy of the plate in conjunction with a calibrated UBV sequence of nine stars from Turner (1986). The relation (B-R) = 1.6 (B-V) was adopted to obtain R magnitudes for the calibration stars (which span the interval R = 10.9 to 13.6), and the resulting image diameter-magnitude relation was determined to be linear over the interval R = 11.4 to 13.6. The results of Schaefer (1981) were used to justify linear extrapolation of this relation to R ≃ 17.5, thereby making possible magnitude estimates (to ± $0^m.2$) for a number of stars in the field brighter than this. Many of these stars were then used to calibrate the relation between image diameter and magnitude for stars measured from Figure 1.

Table I summarizes the information from Figure 1 and the POSS E-plate pertaining to the four nebulous objects 7, 8, 9 and 10 of Neckel et al. (1985). They are indicated by crosses in Figure 1. Their positions were determined with reference to SAO stars in the field, and their magnitudes were estimated with some allowance made for their non-stellar appearance. For comparison purposes, the R magnitudes of stars 6, 11 and 12 are estimated to be 12.5, 16.9 and 15.4 respectively. Information on each object is discussed below:

Object 7. This object has clearly varied by $\sim 2^m$ from R = 15.7 in 1951 to R > 17.5 in 1977, and appears at an intermediate brightness level (R ≃ 16.8) in the 0.66 μm CCD image published by Neckel et al. Although the star is absent from Figure 1, some of the surrounding nebulosity is clearly visible. Similarly, the star is faintly visible in a 0.9 μm CCD image and not visible in a 0.85 μm CCD image published by Neckel et al. Since no dates are provided for these CCD images, the time scale of variability is uncertain, although it might be on the order of days. The infrared spectrum of this object has been described by Neckel et al. (1985) and has been demonstrated to be equivalent to a total luminosity of about 350 $L_{\odot}$. It is clearly the dominant heating source of Lynds 810 (Neckel et al. 1985), but its spectral type is unknown. The amplitude of variability and the close connection with Lynds 810 indicate that it belongs to the In class of Orion variables. A more specific designation must await further study of the object.

Object 8. This nebulous knot appears to be at roughly the same brightness in the 1951 and 1977 photographs, as well as in the 0.66 μm CCD image published by Neckel et al. (1985). It is apparently not a light variable, although like object 7 it lies in the densest portions of Lynds 810. Since it is distinctly bluer than object 7 and also bluer than expected for an object this faint at the distance of Lynds 810 (Turner 1986), it is most likely a reflection nebula associated with object 7.

Object 9. This nebulous object is the brightest of the four on the POSS E-plate, but is not visible on any later photographs. Its absence from the POSS O-plate implies (B-V) > 4, indicating heavy reddening. The possibility arises that it is simply a plate flaw, although two larger images northwest of Lynds 810 on the POSS E-plate are obvious emulsion flaws of different character from object 9. Alternatively, it may be a large amplitude variable, possibly a nova, which lies

Table I

Object	α_{1950}	δ_{1950}	R(1951)	R(1977)
7	$19^h\ 43^m\ 22^s.2$	+27° 43' 39"	15.7	>17.5
8	$19^h\ 43^m\ 21^s.9$	+27° 43' 52"	17.5	17.5
9	$19^h\ 43^m\ 21^s.1$	+27° 41' 11"	15.2	>17.5
10	$19^h\ 43^m\ 20^s.0$	+27° 41' 32"	16.9	>17.5

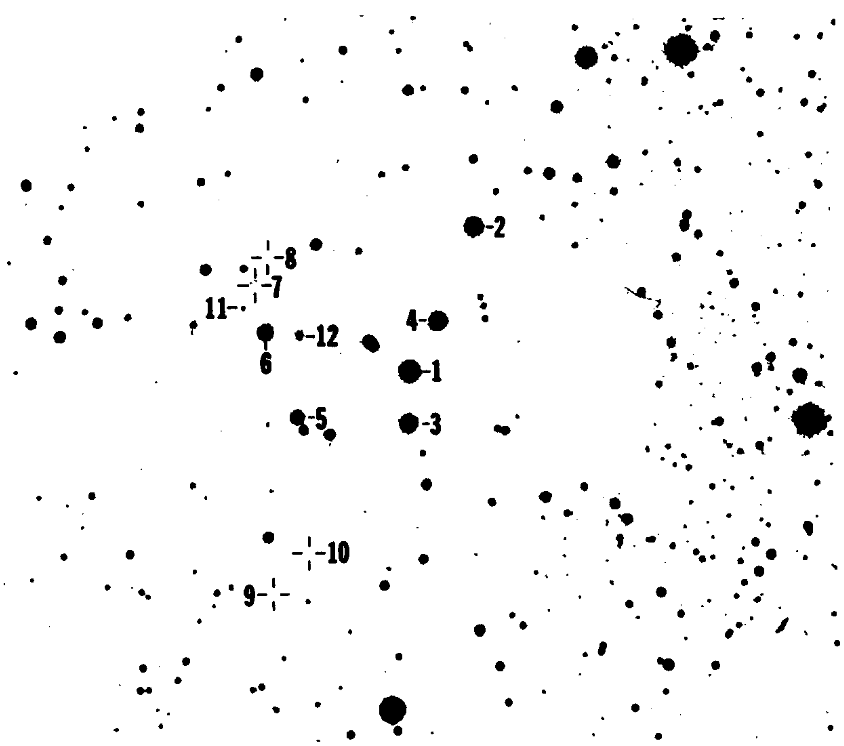


Figure 1

beyond Lynds 810. Objects 9 and 10 lie on the optical boundaries of the cloud and seem unlikely to be directly associated with it. However, the extremely red colour and nebulous appearance of object 9 on the POSS both argue that it lies on the far side of Lynds 810. Additional observations of this object are needed to properly classify it.

Object 10. This nebulous knot is clearly visible on the POSS E-plate but is not visible in Figure 1 or in the POSS O-plate. The latter result implies that (B-V) > 3. A faint object appears at its location in the 0.9 μm CCD image published by Neckel et al. (1985), so it is presumably not a plate flaw. Like object 9 its extremely red colour and nebulous appearance argue that it lies beyond Lynds 810. It also requires additional observations for proper classification.

DAVID G. TURNER
Department of Astronomy
Saint Mary's University
Halifax, Nova Scotia, B3H 3C3
Canada

References:

Herbst, W., and Turner, D.G. 1976, Publ. Astron. Soc. Pacific 88, 308.

Neckel, T., Chini, R., Güsten, R., and Wink, J.E. 1985, Astron. Astrophys. 153, 253.

Schaefer, B.E. 1981, Publ. Astron. Soc. Pacific 93, 253.

Turner, D.G. 1986, Astron. Astrophys. submitted.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2875

Konkoly Observatory
Budapest
12 March 1986

HU ISSN 0374 - 0676

PHOTOELECTRIC UBV OBSERVATIONS OF AQ Tau AND THE PROBLEM OF ITS PERIOD

The variability of this star was discovered by Hoffleit (1939). Kurochkin (1951) lists this star as having an Algol type light curve and light elements: J.D. hel. 2429651.348 + $1^d.215904 \cdot E$. According to the GCVS its spectral type is A5.

UBV photoelectric observations of AQ Tau were made using the 0.91 m reflector and a photoelectric photometer at McDonald Observatory from Nov. 1984 to Jan. 1985.

The comparison star a was used according to the chart given by Kurochkin (1951) (see Figure 1). Over 1494 observations in U, B, and V for 17 nights have been obtained and delta magnitude curves are shown in Figure 2. The light curves indicate that the components form an Algol type binary.

Figure 1. Identification chart

It is noteworthy that we hardly find any secondary minimum according to the period of $1^d.215933$ which was listed in the GCVS.

According to the light curves we consider that the period of AQ Tau is $2^d.431808$, i.e. two times longer than the original period. The two components are almost equal in temperature.

The light elements are as follows:

$$\text{Min.} = \text{J.D. Hel. } 2446012.94513 + 2^d.431808 \cdot E$$

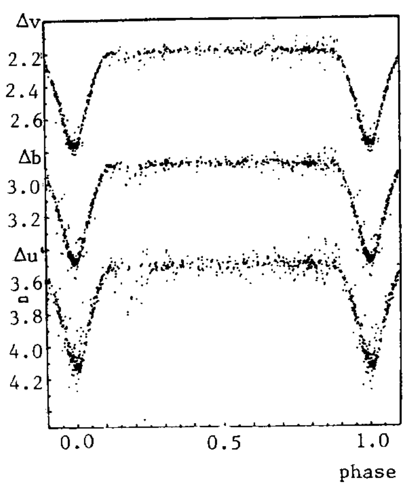


Figure 2
The light curves of AQ Tau with P_o

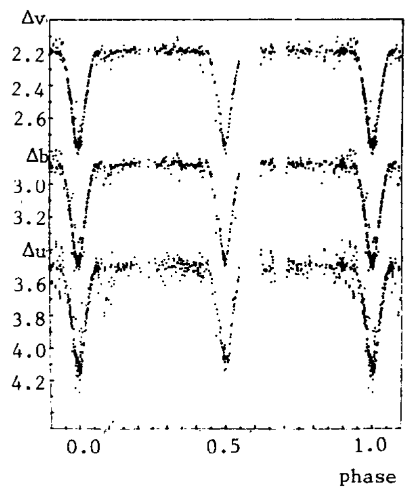


Figure 3
The light curves of AQ Tau with $2P_o$

LIU XUEFU

Department of Astronomy
Beijing Normal University
Beijing, China

TAN HUISONG

Yunnan Observatory
Academia Sinica
Kunming, China

References:
Hoffleit, D., 1939, Harvard Bull., Nos. 901-911.
Kurochkin, H.E., 1951, Perem. Zvezdy, 8, 351.
Kukarkin, B.V. et al., 1969, General Catalogue of Variable Stars.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2876

Konkoly Observatory
Budapest
13 March 1986

HU ISSN 0374 - 0676

PHOTOMETRIC BEHAVIOR OF HR 8752 = V 509 Cas II.

The highly luminous supergiant V509 Cas is known to be moderately variable in both spectrum and magnitude. Observed spectral types have ranged from late F to K2-5 Ia (Lambert and Luck, 1978). The V magnitude range has been observed to be approximately +4.6 to +5.4 while (B-V) colors have ranged from +1.3 to +1.7 (Walker, 1983 and Luck, 1975). The star is probably binary with a B1V companion but the suggested period of 4 years (Stickland and Harmer, 1978) does not correlate with the photometric behavior which remains non-periodic and of unknown type.

V 509 Cas was observed in B and V magnitudes on 23 nights from September, 1985 to January, 1986 with the 0.6-m telescope of the Corralitos Observatory and its automated single channel photon-counting photometer and uncooled EMI 9924A photomultiplier tube. The observations utilized the same comparison stars as the previous season (reported in Paper I, Halbedel, 1985): HR 8761 (V = 6.20 ; B-V = +1.50) and HR 8778 (V = 6.43 ; B-V = +0.90). Extinction and transformations to BV magnitudes were accomplished by observations of standard stars. No changes larger than ±0.01 magnitudes were evident in the measurements of the standard stars either night-to-night or season-to-season.

Table I

JD (2440000+)	V	(B-V)	JD (2440000+)	V	(B-V)
6329.7520	4.79	+1.24	6377.7006	4.83	+1.28
6331.7743	4.82	----	6391.6520	4.87	1.29
6333.7076	4.79	1.23	6392.6479	4.87	1.29
6334.7784	4.79	1.24	6409.6618	4.87	1.31
6335.7500	4.78	1.25	6410.5604	4.86	1.29
6347.7437	4.78	1.25	6427.5666	4.94	1.33
6350.7854	4.79	1.24	6428.5715	4.94	1.32
6351.8020	4.79	1.26	6432.5694	4.94	1.31
6352.7944	4.80	1.25	6449.5736	4.99	1.36
6353.7458	4.79	1.27	6450.5749	4.96	1.35
6357.6881	4.81	1.27	6455.5687	4.97	1.38
6376.7076	4.87	1.26			

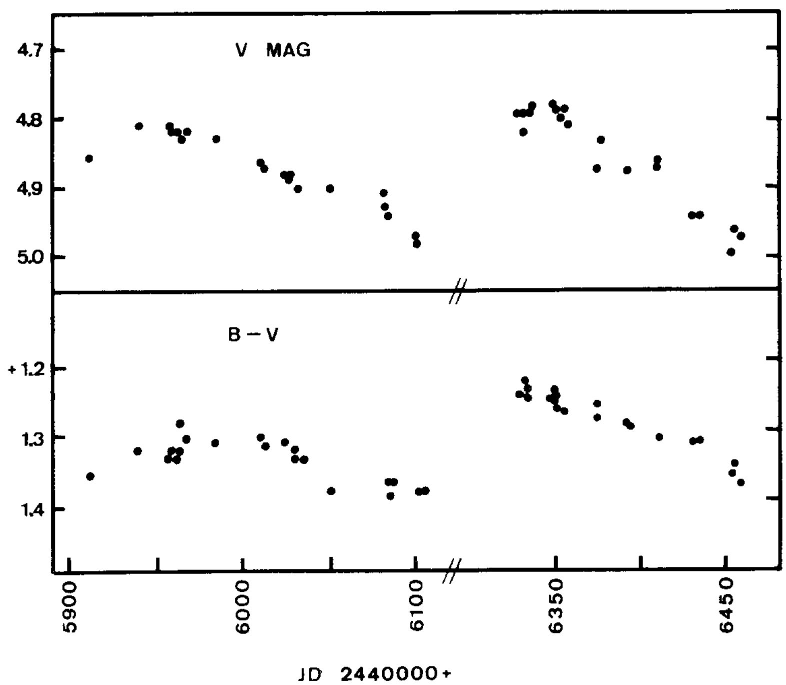


Figure 1. Variations in V and B-V magnitudes for HR 8752 = V 509 Cas

Table I shows the magnitudes obtained and Figure 1 the variations as compared to those from Paper I. It may be seen that V 509 Cas became slightly brighter and bluer in the second observing season and declined in magnitude rather more rapidly. A period of approximately a year is suggested although past photometric behavior indicates that this will not persist for very long.

Special thanks are rendered to B. Goodrich for the automation of the photometric system.

E.M. HALBEDEL

Corralitos Observatory
P.O. Box 16314
Las Cruces, NM 88004
USA

References:
Halbedel, E.M., 1985, Inf. Bull. Var. Stars, No. 2718.
Lambert, D.L., and Luck, R.E., 1978, Mon. Not. Roy. Astr. Soc., 184, 405.
Luck, R.E., 1975, Astrophys. J., 202, 743.
Stickland, D.J., and Harmer, D.L., 1978, Astron. Astrophys., 70, L53.
Walker, E.N., 1983, Mon. Not. Roy. Astr. Soc., 203, 403.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2877

Konkoly Observatory
Budapest
13 March 1986

HU ISSN 0374 - 0676

A BRIGHTENING OF THE Be STAR HD 46380

HD 46 380 (=BD -7° 1462) has been observed to be brightening in V magnitude over the period November, 1984 to the present. Originally observed as one of the comparison stars for HD 46 282 (an eclipsing binary, data on which will be published later), it soon became obvious that it was too unstable to serve as such.

HD 46 380 was observed in B and V magnitudes on 43 nights from November, 1984 to January, 1986 with the 0.6-m telescope of the Corralitos Observatory and its automated single channel photon-counting photometer and uncooled EMI 9924A photomultiplier tube. Comparison stars were HD 46 283 (V = 7.27 ; B-V = +0.25) and HD 46 282 outside of eclipse (V = 8.21 ; B-V = 0.00), both of which

Table I

JD (2440000+)	V	(B-V)	JD (2440000+)	V	(B-V)
6025.9125	7.99	+.44	6331.9673	7.94	+.44
6031.8674	8.03	.42	6335.9479	7.94	.44
6033.8302	8.00	.38	6350.9826	7.97	.45
6034.8326	7.97	.47	6351.9534	7.93	.45
6050.8139	7.99	.40	6353.9600	7.95	.45
6081.7236	8.00	.45	6357.9722	7.96	.45
6082.8222	7.99	.42	6376.9000	7.96	.45
6083.7990	8.02	.43	6377.9000	7.94	.45
6084.7337	8.01	.42	6391.9381	7.95	.44
6085.7649	7.98	.46	6392.8437	7.92	.44
6098.8330	7.99	.41	6409.9300	7.93	.44
6102.7833	8.00	.40	6410.8125	7.94	.45
6113.7569	7.98	.44	6427.8277	7.91	.47
6121.7007	7.98	.42	6428.7465	7.95	.42
6122.6847	7.95	.44	6429.8017	7.90	.44
6125.7056	7.98	.43	6432.7375	7.94	.45
6128.6667	7.99	.41	6449.8180	7.93	.47
6129.6625	7.98	.41	6450.7986	7.95	.45
6143.6712	7.98	.43	6455.7631	7.94	.41
6147.6208	7.96	.43	6456.7534	7.93	.43
6148.6330	7.98	.43	6457.7194	7.95	.49
6171.6104	7.95	.43			

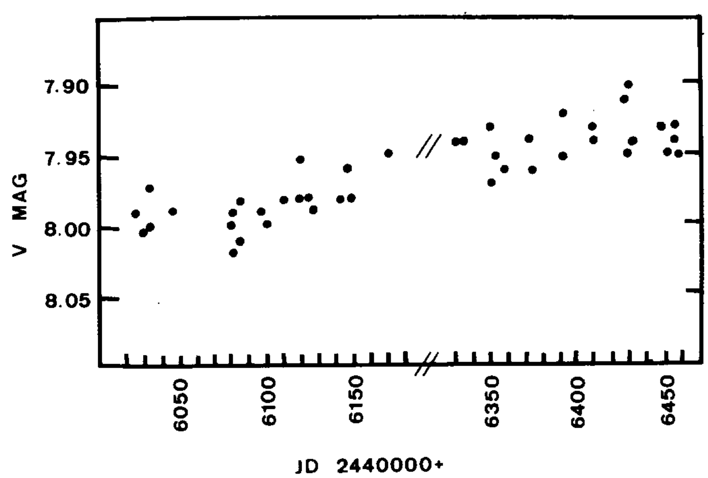


Figure 1. Variations in V magnitude for HD 46 380

were found to be stable to within ±0.01 magnitudes. Transformation to BV magnitudes was accomplished by observations of standard stars.

Table I gives the observations and Figure 1 the variations. Clearly there exists microvariability as well as long-term brightening, though no color changes seem to be occurring. Page (1982) compiles spectral types of B2, B2e and B2 Vne . Previous mean magnitude measurements of V = 8.00 and B-V = +0.43 have been published by Nicolet (1978), in good agreement with the values observed at the beginning of the data collection. It seems likely that an emission episode may be occurring and therefore, it is suggested that spectroscopic observations of HD 46 380 be carried out by those with access to such facilities.

Special thanks are rendered to B. Goodrich for automation of the photometric system.

E.M. HALBEDEL

Corralitos Observatory
P.O. Box 16314
Las Cruces, NM 88004
USA

References:

Nicolet, B., 1978, Astron. Astrophys. Suppl., 34, 1.
Page, A.A., 1982, Catalogue, Spectrum and Magnitude Data Bank of B(e), B(p) and B(pe) Stars; Cent. de Données Stellaires, Obs. de Strasbourg.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2878

Konkoly Observatory
Budapest
14 March 1986

HU ISSN 0374 - 0676

NEW VARIABLE STARS IN CASSIOPEIA

In a previous report (Dahlmark, 1982) 58 new variables in Cygnus were presented. The present work is a continuation of that survey in an area $20^{\circ} \times 15^{\circ}$ centered at $1^{h}06^{m} + 60^{\circ}01'$. Seventeen plate pairs exposed in the period 1967 to 1981 were collected and treated in the same way as described in the previous report. These observations provide approximate B and V magnitudes. In addition, six exposures were obtained in the period August 8 to September 23, 1985 on Technical Pan film. During the period 1982 to 1985 all variables were observed 4 to 9 times using a Newton 21/166 cm reflector, equipped with a Varo S20 image intensifier camera (IC) for 35 mm film. The calibrations of magnitude scales were obtained from Hoag et al. (1961) for the cluster NGC 225, which was observed with the IC at the beginning and end of each observing night.

In this survey 39 new variable stars were found. They are presented in Table I together with information on V 485 Cas (LD 68). Most of the variables are red - 20 could not be traced on the B-plates. The IC is equipped with a Schott BG 12 (2 mm) filter for the B band and GG 495 (1 mm) + BG 38 (2 mm) filters for the V band. With this system approximate B-V colors were derived for 10 variables. Since these B-V values are about 0.2 magnitudes smaller than those derived from the photographic plates we emphasize that the B-V colors given below should be regarded only as rough estimates.

In Table I the first column gives the provisional designation of the star, columns 2 and 3 the position, column 4 the range in visual magnitude, column 5 the approximate B-V color and column 6 approximate V magnitude of a close neighbour star that may influence magnitude estimations made with an instrument with small focal length. The notes in the last column refer to: 1. observed only with IC (nine observations 1982-1985): 2. LD 68 = V 485 Cas; 3. B-V from IC observations; 4. flare star?

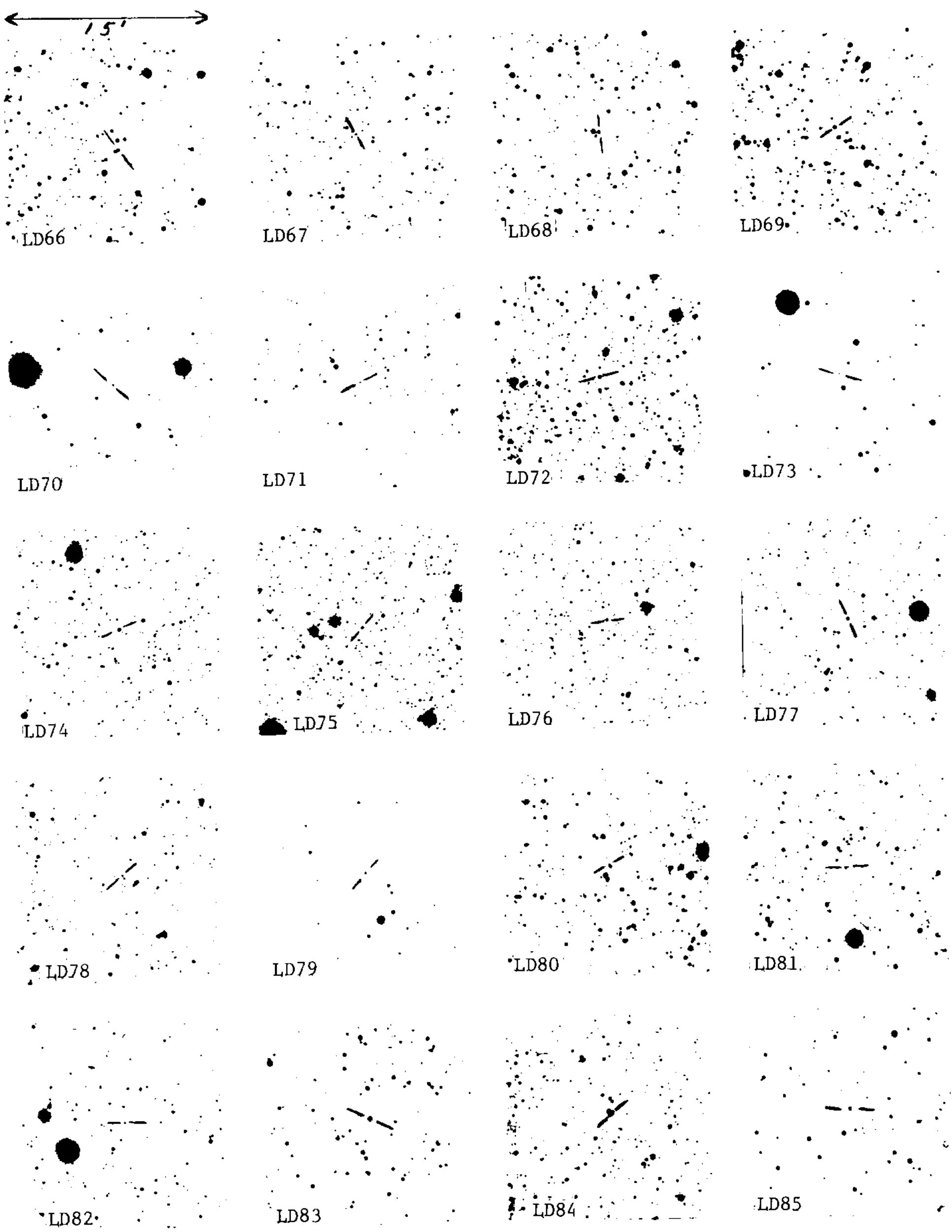

15'
LD66
LD67
LD68
LD69
LD70
LD71
LD72
LD73
LD74
LD75
LD76
LD77
LD78
LD79
LD80
LD81
LD82
LD83
LD84
LD85

Figure 1

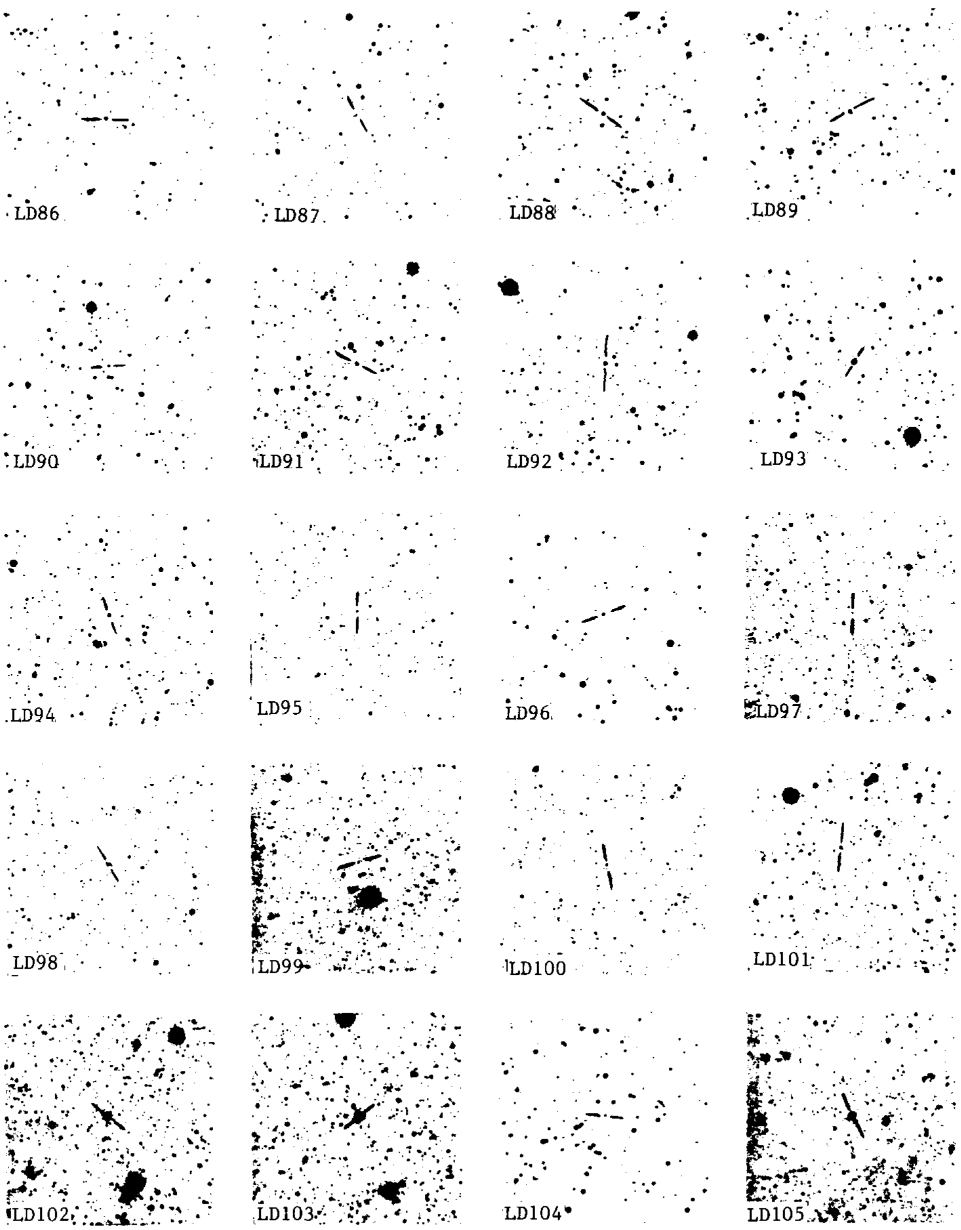


Figure 1 continued.

Table I. New variables in Cassiopeia Plate centre $1^h06/+60^o$

No	R.A. (1950)	Decl. (1950)	m_V max min	B-V color	n.s.	notes	No	R.A. (1950)	Decl. (1950)	m_V max min	B-V color	n.s.	notes
LD 66	$23^h48^m32^s$	$60^o39'$	13.0-(16.5	-	13.6	1	LD 86	$00^h32^m49^s$	$63^o53'$	12.3- 14.7	)2		
LD 67	23 56 33	61 47	13.5- 16.0	)1	13.8		LD 87	00 46 43	66 12	13.5- 14.3	0.5	14.5	
LD 68	23 59 35	64 38	13.0- 15.5	0.5	12.0	2	LD 88	00 48 03	58 20	12.6- 13.6	)1.8		
LD 69	23 59 45	57 49	13.3- 14.5	)1			LD 89	00 50 21	64 46	13.0- 15.5	)1	14.0	
LD 70	00 00 43	66 52	13.6- 15.0	)0.7			LD 90	00 53 27	59 24	12.2-(15.0	)2		
LD 71	00 01 10	59 28	13.6- 15.8	-			LD 91	00 53 40	66 59	12.2- 14.0	2.0	15.5	3
LD 72	00 01 37	60 32	13.8- 15.0	)1			LD 92	00 54 12	67 05	13.0-(15.0	)1.5		
LD 73	00 01 40	65 02	13.6- 14.5	)0.5			LD 93	00 56 03	63 32	10.9- 13.2	2.7		3
LD 74	00 04 33	61 32	11.5- 14.0	2			LD 94	00 56 21	60 28	11.9- 14.7	1.8		3
LD 75	00 04 52	63 04	12.4- 13.4	0.6			LD 95	01 11 01	56 05	12.7- 13.8	0.1		
LD 76	00 05 00	64 27	12.0- 16.0	2.2		3	LD 96	01 11 39	63 21	10.8- 16.2	3.0		
LD 77	00 05 40	52 29	11.6- 16.8	2.4			LD 97	01 15 51	53 12	13.5- 16.0	)1		
LD 78	00 08 40	64 03	11.5- 16.5	2.7	14.0	3	LD 98	01 16 55	64 12	12.7- 13.7	1.7	15.0	3
LD 79	00 13 51	65 45	12.0-(16.4	)0.7			LD 99	01 30 47	61 56	13.5- 14.5	0.1		4
LD 80	00 14 12	58 02	13.0- 14.3	0	13.7		LD 100	01 40 00	59 45	11.5- 13.0	1		3
LD 81	00 15 20	58 53	13.5-(17.0	)1	14.5		LD 101	01 53 12	59 42	12.8- 15.0	1.2		3
LD 82	00 17 14	56 19	12.5-(16.5	)0.5			LD 102	01 57 35	58 22	11.3- 13.5	2.2	15.5	
LD 83	00 24 38	59 03	11.4- 13.2	2			LD 103	01 57 53	58 03	9.8- 12.0	3.8		3
LD 84	00 31 33	64 16	12.8- 15.0	1.8	13.5	3	LD 104	01 59 13	62 48	13.0- 14.7	)1.5		
LD 85	00 32 25	52 37	12.2-(15.0	2.3			LD 105	02 26 40	62 19	12.0- 14.0	2	13.8	

The finding charts, Figure 1, were obtained with the IC without filter connected to the Newton 21/166 cm reflector. Individual magnitude estimates can be delivered upon request.

LENNART DAHLMARK

Montlaux
F-04230 St. Etienne les Orgues
France

References:

Dahlmark, L. 1982, Information Bull. on Variable Stars, No 2157.

Hoag, A.A., Johnson, H.L., Iriarte, B., Mitchell, R.I., Hallam, K.L. and Sharpless, S. 1961, Publ. U.S. Naval Obs. 17, 1.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2879

Konkoly Observatory
Budapest
14 March 1986
HU ISSN 0374 - 0676

THE SPECTRUM OF RS OPHIUCHI 2-1/2 YEARS PRIOR TO ITS RECENT OUTBURST

On 7 August 1982 one of us (V.V.S.) obtained a 19 A/mm spectrum of RS Ophiuchi with the three-stage image tube spectrograph on the 1.9m telescope of the Dominion Astrophysical Observatory. The exposure is useful only for emission lines, whose wavelengths were measured by G.W. using the Arcturus machine at the DAO.

The emission spectrum is similar to that described by Wallerstein and Cassinelli (1968) for RS Oph during the three-year interval prior to the 1967 outburst. Within the interval of 4100 to 4650 Å emission lines of H I, He I, Fe II and [Fe II] are present. The hydrogen line emission is not nearly as strong observed in 1964 and 1967. Radial velocities are: H I, -51 kms^{-1}; He I, -31 kms^{-1}; Fe II, -60 ± 4 kms^{-1} ($n = 15$); [Fe II], -38 kms^{-1}. The Fe II lines show significantly negative velocities as compared to the other lines, as seen in 1961-64 and to a lesser extent in 1966 and 1967 (Wallerstein and Cassinelli, 1968).

In summary, it appears that the spectrum of RS Oph prior to the 1985 outburst was not very different from its state prior to the 1967 outburst.

V. V. SMITH*
University of Texas

G. WALLERSTEIN*
University of Washington

Reference: Wallerstein, G. and Cassinelli, J. P. 1968, *Pub. Astron. Soc. of the Pac.*, **80**, 589.

---

* Guest Investigators, Dominion Astrophysical Observatory, Herzberg Institute for Astrophysics, National Research Council of Canada.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2880

Konkoly Observatory
Budapest
17 March 1986

HU ISSN 0374 - 0676

THE HISTORICAL OPTICAL VARIATION OF DO Dra (=3A1148+719)

A search of the Harvard College Observatory plate collection for outbursts of this CV encompassed the following numbers of plates and epochs (all magnitudes are blue):

1) very-wide-angle patrol series: 223 plates with limiting magnitudes of 13.7 mag or fainter, and more than 200 additional plates of limit 12.2 mag or fainter, 1899-1951;
2) wide-angle patrol series: 118 plates with limit 13.7 mag or fainter, 1928-1951;
3) recent very-wide-angle patrol series: 91 plates with limit 13.7 mag or fainter, 1968-1984;
4) other, non-patrol series: 100 plates with limit 13.7 mag or fainter, 1890-1944.

Only three outbursts were detected, with data given in the table below. At other times the variable, when

Table: Outbursts of the CV DO Dra

Julian Date (2,400,000+)	Mag (B)	
28262.7	>12.2	invisible
28266.7	10.8:	
28267.7	11.1	
28273.7	>12.2	invisible
31498.7	>14.5	invisible
31499.7	>12.2	invisible
31504.7	10.0:	
31505.8	10.8:	
31506.7	11.2	
31511.6	>12.2	invisible
31519.9	>13.7	invisible
33242.9	11.2	
33279.8	>14.4	invisible

seen on the plates, had magnitudes between 16 and 17, with occasional points brighter than 16 mag.

Clearly, from the table, the outbursts are of short duration, lasting no more than ten days and probably even less. Thus, many outbursts would be quite easy to miss entirely. However, the number of outbursts observed, coupled with the number of plates searched, suggests that outbursts of this object are relatively infrequent.

MARTHA L. HAZEN

Harvard-Smithsonian Center
for Astrophysics
60 Garden Street
Cambridge, MA 02138
U.S.A.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2881

Konkoly Observatory
Budapest
17 March 1986

HU ISSN 0374 - 0676

THE Mg II LIGHT CURVE OF AR Lac

AR Lac (HD 210 334) is one of the most important binary systems of the RS CVn type. Numerous observations have been performed in the ultraviolet wavelength (1100 Å - 3200 Å) by the IUE satellite. Presently we are working on the long wavelength images of AR Lac released from the IUE archive. Preliminary results of a limited number of observations have been reported previously (Kiziloglu, 1983). We want to thank all astronomers who made the observations and also the IUE project team who made the archive data available to us. In this work, 23 high resolution and 16 low resolution long wavelength (2000 Å - 3000 Å) images are used. The images cover the observation period of about five years between 1979 and 1984.

In Figure 1b, variation of fluxes obtained from the Mg II h+k resonance lines as a function of the orbital phase is shown. During the calculation of the fluxes, the main problem was the systematic difference of the flux values between the high and low resolution spectra. To our knowledge, no clear calibration analysis has been given in the literature for this discrepancy. To remove this systematic difference, all the high resolution Mg II spectra were degraded using the 8 Å Gaussian instrumental profile. The Mg II fluxes calculated from the degraded spectra are then compared to the fluxes calculated from the low resolution Mg II fluxes. For this comparison, images with the observation times close to each other are considered only to avoid a possible time variability of the activity. This process indicated that the low resolution fluxes were smaller than the high resolution Mg II h+k fluxes by a factor of 1.6 . Thus all the low resolution fluxes multiplied by this correction factor are plotted accordingly in Figure 1b.

A close inspection of the figure after this correction reveals the following:

i) The depths of the eclipse features of the Mg II light curve at the phases 0.0 and 0.5 are almost the same. The flux values at mid eclipses are about 70 % of that at the quadratures. This suggests that the Mg II emission from both components is the same for unit area on their surfaces.

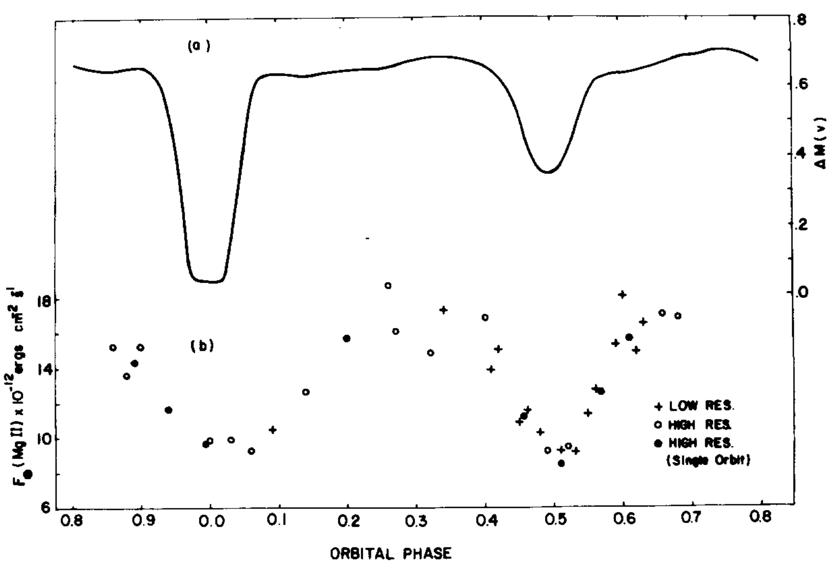


Figure 1. (a) Visual light curve of AR Lac (Ertan et al., 1982); (b) The Mg II h+k light curve of AR Lac between 1979 and 1984. Filled circles represent flux values observed in a single orbit (5-7 October 1983). Phases were calculated using Min I = J.D.Hel.2443672.0917 + $1^{d}.98318235$ E.

ii) Eclipse features do not show large flux variations globally during the observation period of about 5 years indicating the presence of quite stable chromospheres of both components.

iii) The eclipse profile is highly symmetrical at the phase 0.5 whereas asymmetry is observed at the phase 0.0 . The fluxes are scattered around the latter phase. A noticeable variation is also observed at the quadratures. The reason for this variation can be the change of the chromospheric activity within the five years of observations or short time scale activities during the observations. In the case of asymmetry several suggestions can be made; however, the small number of the observations prevents further comments.

iv) Comparing the V light curve (Figure 1a, Ertan et al., 1982) and the Mg II h+k light curve (Figure 1b) we notice that the eclipse durations are longer for the Mg II light curve. This points out that each companion has an extended chromosphere. Assuming that only the photosphere of one component can eclipse the chromosphere of the other, thicknesses of the chromospheres can be estimated geometrically. Results of such an analysis including all observational points show that the chromospheric radii of the G and K stars of the AR Lac are 4.2 ± 1.0 and 5.7 ± 1.1 $R_\odot$ respectively. The photospheric radii for the G and K stars are 1.54 and 2.81 $R_\odot$ respectively (Chambliss, 1976). On the other hand, if the same procedure is applied to the points observed on a single orbit (day 278 in 1983, filled circles), 3.2 ± 0.4 and 4.6 ± 0.3 $R_\odot$ are obtained as the chromospheric radii for the G and K stars respectively. These values show that the chromospheres possibly extend to the first Lagrange point of the binary system. The above values agree with the values given by Naftilan and Drake (1977) but disagree with those given by Walter et al. (1983). Since the radii of the chromospheres of the binary components of the AR Lac calculated in this work are based on the observational fluxes within the accuracy of the IUE satellite, these values should be considered more reliable.

Detailed results will be published elsewhere.

E. DERMAN

Department of Astronomy and Space
Sciences, University of Ankara
Ankara, Turkey

Ü. KIZILOGLU and F. TOKDEMIR

Physics Department
Middle East Technical University
(ODTU), Ankara, Turkey

References:

Chambliss, C.R., 1976, Publ. Astron. Soc. Pacific, 88, 762.
Ertan, A.Y., Tümer, O., Tunca, Z., Ibanoglu, C., Kurutac, M., and Evren, S., 1982, Astrophys. Space Sci., 87, 255.
Kiziloglu, Ü., Derman, E., Ögelman, H., and Tokdemir, F., 1983, Astron. Astrophys., 123, 17.
Naftilan, S.A., and Drake, S.A., 1977, Astrophys. J., 216, 508.
Walter, F.M., Gibson, D.M., and Basri, G.S., 1983, Astrophys. J., 267, 665.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2882

Konkoly Observatory
Budapest
18 March 1986

HU ISSN 0374 - 0676

SEVEN NEW VARIABLE STARS IN THE FIELD OF 2 LACERTAE

By comparing plates with the blink-microscope the following new variables have been discovered:

Designation	Approx.position 1855.0 / 1950.0		Type	Approx.magn.	
S 10902 Cyg	$21^h50^m.0$ 21 53.9	$+42^\circ21'.3$ +42 48.1	eclipsing star?	13^m	$- 13.5^m$
S 10903 Lac	22 07.6 22 11.5	+44 14.3 +44 42.3	Algol type	15	>16
S 10904 Lac	22 14.8 22 18.6	+48 39.6 +49 08.0	slowly variable	14	15
S 10905 Lac	22 24.7 22 28.7	+46 34.5 +47 03.5	Algol type	15	16
S 10906 Lac	22 29.8 22 33.9	+41 45.1 +42 14.4	slowly variable	12.5	13.5
S 10907 Lac	22 36.0 22 40.0	+48 20.1 +48 49.7	irregular	14	14.5
S 10908 Lac	22 37.8 22 42.0	+43 00.0 +43 29.7	slowly variable	15.5	16.5

Charts and further details of the variability will be published in Mitt.Veränderl.Sterne.

H. GESSNER

Sternwarte Sonneberg
Zentralinstitut für Astrophysik
der Akademie der Wissenschaften
der DDR

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2883

Konkoly Observatory
Budapest
18 March 1986
HU ISSN 0374 - 0676

CORRECT PERIOD OF THE MIRA STAR BV CYGNI

By evaluating 465 Sonneberg Sky Patrol plates taken by H. Huth I found that the period given in the literature (see GCVS Moscow, 1985) was not correct. The following improved elements have been derived:

$$\text{Max.} = 244\ 5559 + 254\overset{d}{.}3 \cdot E$$

Table I shows the degree of fitting by these elements of the observed maxima.

Table I

Max.	E	O-C	Remarks
243 8179	- 29	- 5^d	1,2
8708	- 27	+ 15	1,2
9205	- 25	+ 3	1,2
9440	- 24	- 16	1,2
244 0480	- 20	+ 7	2
0740	- 19	+ 13	2
1240	- 17	+ 4	2
2513	- 12	+ 6	1,2
2742	- 11	- 20	1,2
3008	- 10	- 8	2
3790	- 7	+ 11	1,2
5558	0	- 1	2
6330	3	+ 8	3

Remarks: 1 single bright observation
2 observation on ORWO RP1 + filter GG 14
3 observation on ORWO ZU 21

Visual estimations of the AFOEV of 1983 and 1984 are not in contradiction to our results.

E. SPLITTGERBER

DDR-4020 Halle
Otto-Winzer-Strasse 41/30

ERRATUM

In Table I of the IBVS No.2870, "Variation of the CP2 star BD+24° 3675", the amplitude in u-filter is erroneously given: instead of 0.152 one should read 0.304 .

H. SCHNEIDER

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2884

Konkoly Observatory
Budapest
24 March 1986

HU ISSN 0374 - 0676

THE VARIABILITY OF BD+60° 562

Bartolini et al. (1982) have noted variability of an undetermined nature for the star BD+60° 562, noting a range in V magnitude of 9.95 to 10.05 and in (B-V) of +.39 to +.45 over a time spread of 230 days. In an effort to determine the type of variability of this star, differential BV photometry was carried out on 43 nights from October, 1984 to Ja~uary, 1986 with the 0.6-m. telescope and automated photon-counting photometer with its uncooled EMI 9924A photomultiplier tube of the Corralitos Observatory. The comparison stars were those of Bartolini et al.: BD+60°493 (V=8.44; B-V=+.79) and BD+60°497 (V=8.80; B-V=+.57). Extinction and transformations to BV magnitudes were found by observations of standard stars.

No obvious variability either of short or long term was found for BD+60°562. The differential V and (B-V) magnitudes of BD+60° 562 were compared to both comparison stars separately. The residuals from the mean for each difference were found and compared for evidence of variability of either BD+60° 562 or its two comparison stars. Table I shows the results, where VAR denotes BD+60° 562, COMP1 BD+60° 493, and COMP2 BD+60°497. The mean value of ΔV for (COMP1-COMP2) was found to be -.36 (average residual 0.02) and that of Δ(B-V) as +.22 (.02), both in good agreement with the adopted magnitudes for the comparison stars. The mean V magnitude for BD+60° 562 was 10.03 and its (B-V) +.32.

Table I Average residuals about the mean

	V Magnitude		(B-V) Magnitude	
	(COMP1-VAR)	(COMP2-VAR)	(COMP1-VAR)	(COMP2-VAR)
Mean	-1.58	-1.23	0.48	0.25
Av. Res.	.02	.02	.02	.02

The average residuals from the mean for the comparison stars with each other and the variable with each comparison being identical, there seems no compelling reason to assume that variability of BD+60°562 is indicated by the data taken. However, the average residuals from the mean were larger than expected and would mask small variations. Nonetheless, a change in V magnitude of 0.10 such as that observed by Bartolini et al. should have been obvious. Buscombe (1977) compiles spectral types of B9 V and A0 V for BD+60°562. It is tempting to suggest that perhaps an emission episode was in progress during the observations of Bartolini and colleagues, since their observations resemble the sort of longterm photometric variations undergone by some Be stars when active.

Special thanks are rendered to B. Goodrich for automation of the photometric system.

E.M. HALBEDEL

Corralitos Observatory
P.O. Box 16314
Las Cruces, NM 88004
U.S.A.

References:

Bartolini, C., Custodi, P., Dell'atti, F., Guarnieri, A. & Piccioni, A. 1982 , Inf. Bull. Var. Stars, No. 2139.

Buscombe, W. 1977 , MK SPECTRAL CLASSIFICATIONS: THIRD GENERAL CATALOGUE (Evanston, IL).

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2885

Konkoly Observatory
Budapest
24 March 1986

HU ISSN 0374 - 0676

CURRENT MICROVARIABILITY FOR THE Be STAR ϕ PERSEI

The binary Be star system ϕ Persei has been known to exhibit spectrum and photometric peculiarities. Models of the system have recently been published by Kitchin (1982) and Poeckert (1979) with the latter invoking a possible neutron star or helium core from a previously more massive star for the secondary object. Photometrically, the star has been observed to vary irregularly in V magnitude from 4.03 - 4.11 in a manner connected with shell ejection from the primary's equator. The Second Supplement to the General Catalogue of Variable Stars also gives an approximate period for the variation of 19.5 days, a period seemingly unrelated to the orbital period of nearly 127 days. Other investigators (e.g., Dapergolas et al. 1981) have found general irregularity unrelated to this suggested period.

ϕ Persei was observed on 35 nights from September, 1984 to November, 1985 with the 0.6-m telescope and automated photon-counting photometer (with its uncooled EMI 9924A photomultiplier tube) of the Corralitos Observatory in an effort to examine the suspected 19.5 day variability. Differential BV photometry was done utilizing two comparison stars, 2 Persei and HR 538. Unfortunately, one of these stars (2 Persei) may be variable over the long term as evidenced by published magnitudes in the literature ranging from V = 5.79 (Nicolet, 1978 and Bright Star Catalogue) to 5.70 (Rufener, 1976 and 1981). The most recent values of V = 5.70 and B-V = -0.07 were adopted for 2 Persei. Rufener (1981) gives V = 6.26 for HR 538 and a derived value of B-V = +0.04 was found. The mean ΔV and Δ(B-V) between the two comparison stars was observed to be 0.560 (in V) and 0.109 (in B-V) magnitudes, in good agreement with the magnitude values chosen. Average residuals about these means were 0.008 and 0.007 magnitudes respectively. Extinction and transformations to BV magnitudes were found by observations of standard stars.

When the differential magnitude of ϕ Persei from each of the comparison stars was examined, no large-scale variations were found. Residuals from the mean were calculated and compared to those of the comparison stars with the following results:

V magnitude

	2 Per - ϕ Per	HR 538 - ϕ Per	2 Per - HR 538
Mean	1.702	2.283	-0.560
Av. residual	.015	.018	.008

B-V magnitude

	2 Per - ϕ Per	HR 538 - ϕ Per	2 Per - HR 538
Mean	-0.016	0.093	-0.109
Av. Residual	.007	.009	.007

The sizes of the average residuals from the means in V magnitude for each of the comparison stars minus ϕ Persei are approximately twice that for the difference between the comparison stars, leading to the conclusion that variability of only a very low order occurred during the time period ϕ Persei was under observation, with no concurrent color changes. No correlation of this microvariability with orbital phase was found. A mean value of $\dot{V} = 3.988$ and $B-V = -0.054$ for ϕ Persei for 1984-5 was found.

Special thanks are rendered to B. Goodrich for automation of the photometric system.

E.M. HALBEDEL

Corralitos Observatory
P.O. Box 16314
Las Cruces, NM 88004
U.S.A.

References:

Dapergolas, A., DiCola, G., Guarnieri, A., and Madama, G., 1981, Inf. Bull. Var. Stars, No. 1920.
Kitchin, C.R., 1982, Mon. Not. Roy. Astr. Soc., 198, 457.
Nicolet, B., 1978, Astron. Astrophys. Suppl. Ser., 34, 1.
Poeckert, R., 1979, Astrophys. J., 233, L73.
Rufener, F., 1976, Astron. Astrophys. Suppl. Ser., 26, 275.
Rufener, F., 1981, Astron. Astrophys. Suppl. Ser., 45, 207.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2886

Konkoly Observatory
Budapest
9 April 1986
HU ISSN 0374 - 0676

AH CEPHEI: A NEW PHOTOMETRIC TRIPLE STAR

The period of the bright early-type eclipsing binary AH Cep was discussed several years ago by Mayer and Tremko (1983) and thought to vary irregularly. However, the recent times of minima obtained with our Department's 65 cm telescope in Ondřejov strongly suggest another explanation. All published minima, i.e. those from papers by Mayer (1980) and Mayer and Tremko, as well as the new minima are given in Table I. In the column $O-C_1$ the comparison with the ephemeris found by Guarnieri et al. (1975) is presented:

$$\text{Min. I} = \text{J.D.hel. } 2434989.404 + 1^{d}.774759\ E \qquad (1)$$

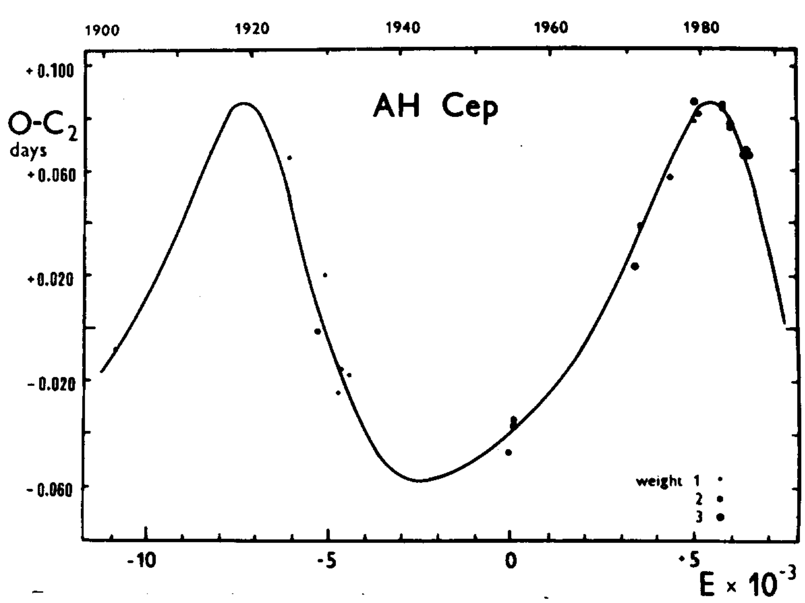


Figure 1

Table I

Minima of AH Cep

J.D.hel. +2400000	E	$O-C_1$	$O-C_2$	$O-C_3$	W	Source
15500.11:	-10981.5	+.222	-.0090	+.0024	1	1
24076.621	- 6149	+.210	+.0647	+.0151	1	2
25388.089	- 5410	+.131	-.0012	-.0129	2	3
25835.345	- 5158	+.148	+.0200	+.0189	1	1
26440.487	- 4817	+.097	-.0248	-.0135	1	1
26564.728	- 4747	+.105	-.0157	-.0021	1	1
26985.34	- 4510	+.099	-.0174	+.0034	1	1
34714.309	- 155	-.007	-.0467	-.0047	2	4
34981.420	- 4.5	+.002	-.0343	+.0058	2	5
34989.404	0	.000	-.0366	+.0035	3	5
40873.619	3315.5	+.0015	+.0236	-.0077	3	6
41196.637	3497.5	+.014	+.0388	+.0023	2	7
42647.507	4315	+.018	+.0577	-.0027	2	7
43779.813	4953	+.028	+.0787	+.0014	1	8
43815.3153	4973	+.0348	+.0862	+.0085	3	7
44010.532	5083	+.028	+.0814	+.0014	2	9
45200.499	5753.5	+.020	+.0844	-.0010	2	9
45223.570	5766.5	+.019	+.0837	-.0016	2	9
45562.5380	5957.5	+.0073	+.0761	-.0060	3	9
45579.398	5967	+.008	+.0761	-.0058	2	9
46343.4150	6397.5	-.0097	+.0670	+.0019	3	10
46358.5006	6406	-.0090	+.0672	+.0026	3	10
46359.3887	6406.5	-.0088	+.0680	+.0034	3	10

Sources: 1 - Zverev (1933), 2 - Moore (1936), 3 - Huffer and Eggen (1947), 4 - Nekrasova (1960), 5 - Guarnieri et al. (1975), 6 - Battistini et al. (1974), 7 - Mayer (1980), 8 - Hartigan and Binzel (1982), 9 - Mayer and Tremko (1983), 10 - this paper.

Values in the column $O-C_2$ are obtained using the ephemeris

$$\text{Min. I} = \text{J.D.hel. } 2434989.4406 + 1\overset{d}{.}7747413\ E \qquad (2)$$
$$\pm\ 20 \qquad \pm\ 18$$

These values are also plotted in Fig. 1. The curve drawn in this figure corresponds to a third-body light time effect, with the third-body orbit of the following parameters:

$P = (12830 \pm 170) \cdot P_o$, i.e. 62.3 ± 0.8 years

T_o (time of periastron) = J.D. 2445890 ± 360

$e = 0.534 \pm 0.023$

$\omega = 125^o \pm 8^o$

The semiamplitude of the light time effect is $0\overset{d}{.}0694 \pm 0\overset{d}{.}0024$. These values were obtained together with the ephemeris (2) by the least squares method. Weights applied in the solution are given in the column W. They are assigned according to the estimated accuracy σ of the times of minima: $W = 1$ for $\sigma \geq 0\overset{d}{.}01$, $W = 2$ for $0\overset{d}{.}01 > \sigma > 0\overset{d}{.}001$, and $W = 3$ for $\sigma \leq 0\overset{d}{.}001$. The corresponding O-C values may be found in the column $O-C_3$. Mean errors are given.

We realize that in several systems the explanation of period changes by a third body proved to be untenable when newer data were secured. In this case one must also see that the early times of minima are rather inaccurate. Therefore the significance of the favourable fact that the data now cover 1.4 of the long period is impaired. However, the present explanation is supported by the quite reasonable value of the mass function $f(m_3) = 0.45$, from which the minimum mass of the third body follows as 8 $M_\odot$ (under assumption $m_1+m_2 = 25\ M_\odot$, as can be estimated from data collected by Batten et al. (1978)). If the new explanation is correct, then the period of AH Cep should be nearly constant in the next 6-7 years, having the value of about $1\overset{d}{.}77468$.

In the column $O-C_3$ one can see that the remaining differences - namely those of weight 3 - are larger than the observing errors. This could perhaps be again explained by a periodic behaviour; a period of 668 days, with amplitude $0\overset{d}{.}0060$ suits the data quite well. The corresponding fourth body would have a minimum mass of 7 $M_\odot$. The number of good measurements is, however, rather low, so the presence of this body should yet be proven.

PAVEL MAYER and MAREK WOLF

Department of Astronomy and Astrophysics
Charles University
Švédská 8, 150 00 Praha 5, Czechoslovakia

References:

Batten, A.H., Fletcher, J.M., and Mann, P.J., 1978, Publ. Dominion Astrophys. Obs. Victoria, 15, 121.
Battistini, P., Bonifazi, A., and Guarnieri, A., 1974, Inf. Bull. Var. Stars, No. 817.
Guarnieri, A., Bonifazi, A., Battistini, P., 1975, Astron. Astrophys. Suppl. Ser., 20, 199.
Hartigan, P., and Binzel, R.P., 1982, Journal AAVSO, 11, 21.
Huffer, C.M., and Eggen, O.J., 1947, Astrophys. J., 106, 313.
Mayer, P., 1980, Bull. Astr. Inst. Czechoslovakia, 31, 292.
Mayer, P., and Tremko, J., 1983, Inf. Bull. Var. Stars, No.2407.
Moore, J.H., 1936, Lick Obs. Bull., 16, 483.
Nekrasova, S.V., 1960, Perem Zvezdy, 13, 157.
Zverev, M, 1933, Perem Zvezdy, 4, 177.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2887

Konkoly Observatory
Budapest
10 April 1986
HU ISSN 0374 - 0676

OBSERVATIONS OF W SERPENTIS STARS

Observations have commenced at the Stephen F. Austin State University Observatory in Nacogdoches, TX USA on the strongly interactive W Serpentis binary star systems. The observing program has been described in Wilson, et al. (1984). We employ the newly completed 1.04 m automated telescope (Markworth and Rafert, 1984), equipped with a Starlight-1 pulse counting photometer. This photometer is equipped with an EMI 9798A (S-20) photomultiplier and filters that together closely match the B, V, and R of the standard UBVRI system. Also used in these observations is the 46 cm. telescope at the same site, equipped with an identical photometer.

Because of the long orbital periods of W Ser stars each observation listed below consists of (typically) four differential measures of the variable in each of the three colors extending over 15 - 25 minutes. Although phase coverage on individual stars is, as yet, limited, preliminary analysis has begun. Observations of the W Ser stars are continuing.

Star	Date Observed (1985)
KX And	July 29/30, August 25/26
BM Cas	July 25/26, 29/30, 30/31 August 1/2, 3/4, 6/7, 10/11, 13/14
SX Cas	August 25/26
U Cep	August 13
KU Cyg	August 1/2, 6/7, 9/10
V367 Cyg	July 28/29, 29/30, 30/31 August 1/2, 3/4, 6/7, 9/10, 10/11, 25/26
V1507 Cyg	June 7/8, 13/14 July 28/29, 29/30 August 1/2, 6/7, 9/10, 25/26

RZ Oph	June 7/8, 13/14 July 23/24, 25/26 August 3/4, 6/7, 9/10, 21/22
AG Peg	August 9/10, 25/26
V453 Sco	July 9/10, 12/13, 15/16, 25/26, 31/01 August 1/2, 3/4, 8/9, 10/11
W Ser	June 7/8 July 12/13, 13/14, 23/24, 24/25, 25/26 August 3/4, 6/7, 8/9, 9/10, 10/11,21/22, 26/27
V356 Sgr	July 12/13, 13/14, 14/15, 23/24 24/25, 25/26 August 1/2, 3/4, 6/7, 8/9, 9/10, 10/11, 17/18, 21/22
HD 207739	July 29/30 August 28/29

This work is supported by the U.S. National Science Foundation under Grant Number AST 840-1479

N.L. MARKWORTH
R.L. GANN
Stephen F. Austin State University
Dept. of Physics and Astronomy
Nacogdoches, TX 75962

J.B. RAFERT
E. SMITH
Florida Institute of Technology
Dept. of Physics and Space Sciences
Melbourne, FL 32901

R.E. WILSON
University of Florida
Dept. of Astronomy
Gainesville, FL 32611

References:

Markworth, N.L. and Rafert, J.B., 1984, "A 41- inch Telescope for East Texas", Microcomputers in Astronomy II, ed. R.M. and K.A. Genet.

Wilson, R.E., Rafert, J.B., and Markworth, N.L., 1985, "The W Serpentis Stars", Comm. I.A.P.P.P. #16,1

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2888

Konkoly Observatory
Budapest
11 April 1986
HU ISSN 0374 - 0676

WHERE IS AK CANIS MINORIS?

The eclipsing binary AK CMi was photographically observed by Notni (1955) and was found to have a light curve with relatively undistorted maxima and a period of 0.56 days. The primary minimum was approximately 1.0 magnitude deep, and the secondary minimum was about 0.2 magnitudes in depth. No finder chart was given, but the star was indicated to be BD+4°1778. The same position is given by the General Catalog of Variable Stars (Kholopov 1985). Spectra taken with the 1.8m telescope of the Dominion Astrophysical Observatory showed BD+4° 1778 to be of spectral type near K2 and the nearby star we called "C", was about spectral type K4.

We observed the star BD+4° 1778 with the 0.50m reflector of the Climenhaga Observatory of the University of Victoria on 1986 February 5/6, 6/7, 11/12, and 12/13. A refrigerated EMI 9658R photomultiplier tube and filters matching the Cousins VRI system were used. The sky was observed nearly simultaneously with each star. The observations of BD+4° 1778 were bracketed by observations of the comparison star "C", which is about 1 arc minute south, and whose constant brightness was checked by 21 observations of BD+4° 1777 = SAO 115777. The mean check star minus comparison star magnitude was -1.84±.04 in V, -1.93±.03 in R and -2.01±.04 in I.

The errors are standard deviations about the mean and are consistent with those expected. Mean extinction and transformation coefficients were used to correct all observations to the standard Cousins VRI system.

The star BD+4° 1778 was observed NOT to vary more than about 0.02 magnitudes in V during the time of our observations. The 98 observations cover all phases with no gaps larger than a few minutes. The mean difference of BD+4° 1778 minus "C" was -0.42±.04 in V, -.42±.05 in R and -.40±.06 in I. These errors are also standard deviations around the mean and are consistent with those of the check star.

To answer "Where is AK CMi?" Photographs of five minute duration of this area were taken with our 0.25m Schmidt telescope on 1986 March 01.

The exposures were centred at $05^h27^m36^s$ and $07^h32^m36^s$UT. The phases of AK CMi at these times calculated using the ephemeris of Flin et al. (1979) were 0.82 and 0.96. Inspection of the two plates revealed a variable star of the amplitude expected for AK CMi at the position of k3π1102 (Strohmeier et al. 1957.) This star is listed in the New Catalog of Suspected Variable Stars (Kholopov, 1982) as number 102559. We are certain that this star IS AK CMi.

Astrometric positions for the stars involved were measured from the first plate and are given in Table I. The solution used Turner's Method of plate constants as modified by Tatum (1982).
The use of nine SAO reference stars yielded an estimated precision of 0.2 arc seconds.

Table I

		RA (1950.0)	DEC
A	AK CMi	$07^h37^m37^s50$	$+04^\circ04'08''.5$
B	BD+4° 1778	$07^h37^m37^s.93$	$+04^\circ00'21''.0$
C	comp "C"	$07^h37^m37^s.26$	$+03^\circ59'25''.5$

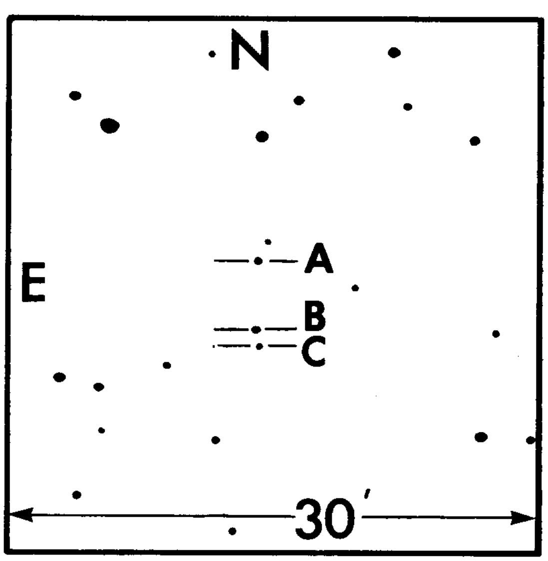


Figure 1

To facilitate further study of this system a finder chart identifying these stars is given in Figure 1.

R.M. ROBB*
T.B. LOWE
J.D. MOFFATT
D.D. BALAM

Climenhaga Observatory
Department of Physics
University of Victoria
Victoria, B.C., Canada

* Visiting Observer at the Dominion Astrophysical Observatory

References:

Flin, P., Frasinska, Z., and Sztajno, M., 1979, Rocznik Astronomiczny Observatorjum Krakowskiego. International Supplement No. 51, 96.

Kholopov, P., New Catalog of Suspected Variable Stars, 1982
Kholopov, P., General Catalog of Variable Stars, 1985
Notni, P., 1955, Mitteilungen über Veränderliche Sterne
Strohmeier, W., Kippenhahn, R. and Geyer, E., 1957, Kleine Veröff. der Remeis-Sternwarte Bamberg No. 18
Tatum, J.B., 1982, J.R.A.S.C., Vol. 76, No. 2, 97

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2889

Konkoly Observatory
Budapest
16 April 1986
HU ISSN 0374 - 0676

PHOTOELECTRIC OBSERVATIONS OF BY Dra IN 1984-85

Photoelectric monitoring of BY Dra was carried out in 7 nights during 1984-85 using the 60 cm telescope of the National Astronomical Observatory, Rozhen, Bulgaria and the 1 m and the 50 cm telescopes of the Piszkéstető mountain station of the Konkoly Observatory, Hungary. The observations in Rozhen were obtained in U light using 1 to 10 sec integration times. Alternating UBV measurements at Piszkéstető were made with 20 sec integrations in each colour. The total monitoring time was $7^h51^m10^s$. The time intervals covered are given in Table I. The comparison star used was BD + $51^{\circ}2408$ = HD 172268 (K5).

Table I

Colour	Time intervals
U	2445919.3606-.3705, .3834-.4007, .4037-.4066, .4107-.4299, .4342-.4438, .4465-.4489
U	2445923.4084-.4112, .4134-.4209, .4229-.4325, .4342-.4418, .4435-.4548, .4648-.4736, .4757-.4874
U	2445925.4617-.4693, .4711-.4803, .4820.-4891
UBV	2445932.3666-.3700, .3752-.3786, .3841-.3875, .4070-.4131, .4182-.4243, .4298-.4358, .4409-.4470, .4521-.4556, .4673-.4733, .4791-.4852, .4905-.4965, .5045-.5075
UBV	2446211.4440-.4505, .4566-.4631, .4694-.4758, .4830-.4894
U	2446214.4348-.4369, .4379-.4408, .4422-.4447, .4467-.4490, .4499-.4522, .4530-.4559, .4566-.4588, .4596-.4624, .4632-.4661, .4668-.4688, .4696-.4726, .4739-.4763, .4771-.4794, .4801-.4826, .4835-.4859, .4880-.4900, .4908-.4932, .4938-.4963, .4973-.4993, .5001-.5006
UBV	2446271.4287-.4359, .4438-.4482, .4491-.4532, .4604-.4692, .4767-.4854, .4929-.5015, .5088-.5129

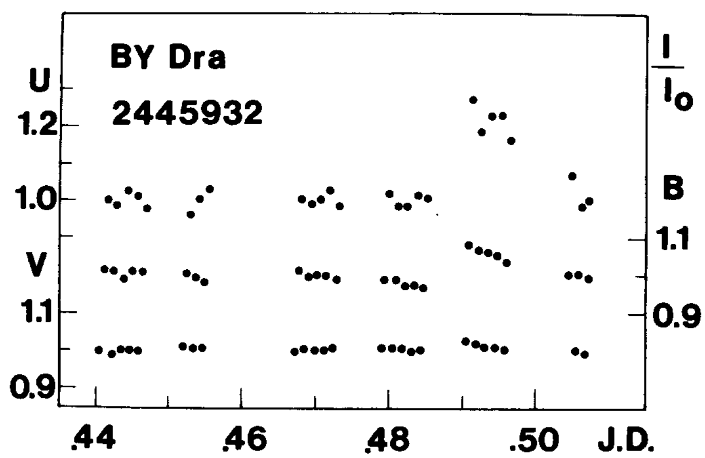


Figure 1: Flare of BY Dra

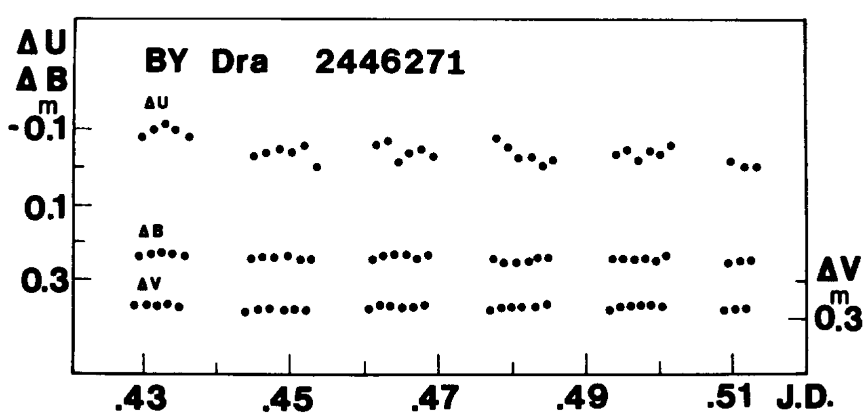


Figure 2: UBV observations of BY Dra

One flare event was recorded in 19/20 August, 1984 at Konkoly Observatory in UBV light. The intensity curves of the flare are drawn in Figure 1 together with the preceding one hour quiescent light. The flare showed the following characteristics:

Time of maximum: 2445932.4905

$\frac{I}{I_o}$ (max.): 1.28 (U), 1.09 (B), 1.035 (V)

Max. amplitudes in magn.: $0\overset{m}{.}26$ (ΔU), $0\overset{m}{.}12$ (ΔB), $0\overset{m}{.}04$ (ΔV)

Standard deviations of the observations: $0\overset{m}{.}032$ (U), $0\overset{m}{.}012$ (B), $0\overset{m}{.}007$ (V)

Since no observation was made after the flare declined the duration of the flare event ≈36 min. is probably underestimated.

On an other night, 24/25 July, 1985 = 2446271, when 32 U,B and V measurements were taken, the observations had the following standard deviations; 0.031 (U), 0.006 (B), 0.005 (V). Similarly to those observations taken at 19/20 August, 1984, the scatter in the ultraviolet light is extremely high. At the mountain station of the Konkoly Observatory when the sky is reasonably good, in the case of a similar bright star (but without chromospheric activity) the typical scatter in the ultraviolet light is under 0.02 magn.

Therefore we concluded that we observed some intrinsic variation (see Figure 2). Butler et al. (1986) observed UV Cet in LE X-ray (EXOSAT) and in Hγ and found almost continuous microflaring in both wavelenghts, on time-scales from tens of seconds to several minutes. Our observations of BY Dra show similar features in the ultraviolet light which, similarly to those events observed in UV Cet by Butler et al.(1986), is very probably a manifestation of the continuous chromospheric activity, namely microflaring.

Acknowledgement: One of us (K.O.) thanks to J. Márton for making some of the observations.

KATALIN OLÁH

Konkoly Observatory
1525 Budapest, P.O. Box 67
Hungary

MARGARITA IVANOVA and L. ILIEV

National Astronomical Observatory
4700 Smoljan, P.O. Box 136
Bulgaria

Reference:

Butler, C.J., Rodono, M., Foing, B.H., Haisch, B.H., 1986, Armagh Observatory Preprint Series No. 24, submitted tó Nature

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2890

Konkoly Observatory
Budapest
30 April 1986
HU ISSN 0374-0676

NONVARIABILITY OF SVS 1740

SVS 1740 is listed as NSV 3633 in the New Catalogue of Suspected Variable Stars (NCSVS; Moscow; 1982). Lange noted its variability while observing TV Lyn, an RR Lyr star situated about 12' south of SVS 1740. Lange and Mandel (1971) gave the finding chart, evaluated the period, which is nearly half the period of TV Lyn, and classified SVS 1740 as a W UMa variable. They obtained independently complete light curves and derived the following ephemeris on the basis of 38 instants of minimum:

$$\text{Min I} = \text{hel. JD } 2441059.347 + 0\overset{d}{.}121369 \cdot E$$

According to the NCSVS the depths of minima are nearly half a magnitude. During the ensuing years five visual epochs of minimum have been published in MVS 7, 149, 1976 and MVS 8, 25, 1977 with good O-C computed by means of the above ephemeris.

According to Eggen (1967) there exists a sharp six-hour cut-off in the period distribution of W UMa systems. More recent data set the limit at $0\overset{d}{.}221$ with CC Com, but some doubt has been raised about the reality of the cut-off, which could be an effect of observational selection (Mochnacki, 1983).

It seemed therefore useful to obtain more precise light curves for a system which looked to be situated beyond the actual cut-off. B and V observations were performed by means of a two beam photoelectric photometer applied to the one meter reflector of the Merate Observatory (Broglia and Conconi; 1985). SVS 1740 was measured simultaneously with BD +48°1548 during runs as long as about half the supposed period. No variations greater than a few millimagnitudes appear in the $\Delta m = m_{BD} - m_{SVS}$ and the colour of SVS 1740 is much bluer than expected from the colour-period relation for W UMa systems (Eggen, 1967). In particular we have the following results:

Interval	Δ V	ΔB	
JD 2446121.341 -- .394	$-0^m.102$	$-0^m.132$	
	± 1	1	m.e.
6144.325 -- .385	-0.101	-0.138	
	2	1	

After these observations were performed,Dr. M. Frolov (private communication) made known to us that the discovery of Lange and Mandel has inspired three precedent photoelectric investigations on the variability of SVS 1740. Mandel (1972) and Kovalenko's (1973) found constant light. Moreover sixty unpublished measurements obtained by G. Zhukov gave also constancy: V= 10.98, B-V= +0.50, U-B= +0.01.

What can be the reasons of so discordant results between visual and photoelectric measures, is not clear, because a misidentification or a choice of TV Lyn as comparison star seem to be unlikely. In any case SVS 1740 can be ruled out from the list of Suspected Variables.

P. BROGLIA

P. CONCONI

Merate Observatory
I - 22055 Merate,
Italy

References:

Broglia P., Conconi P.; 1985: Astron. Astrophys, 149, 15
Eggen O.J.; 1967: Mem. R. astr. Soc. 70., 111,
Kovalenko V.M., Kovalenko O.N.; 1973 : Astron. Circ. No. 768
Lange G., Mandel O.; 1971: Astron. Circ. No. 637
Mandel O.; 1972: Astron. Circ. No. 747.
Mochnacki S.W.; 1983: Interacting Binaries, ed. P.P. Eggleton and J.E. Pringle, p. 51.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2891

Konkoly Observatory
Budapest
7 May 1986
HU ISSN 0374-0676

PHOTOMETRIC VARIABILITY OF 27 CYGNI

27 Cygni (HR 7689, HD 191026, KO IV, V = 5.36^m) is used as a "red standard" in a long-term UBV photometric campaign on Be stars (Harmanec, Horn and Koubský 1982). The star also appears on a list of forty suspected variable stars (Fekel and Hall 1985). Several groups of astronomers were therefore observing the star in 1985, and in this paper, we present our combined data.

These observations were made with several telescopes. Basic information about the observers, instruments and observational technique used is summarized in Table I. All the observations were reduced to differential magnitudes on the standard UBV system.

The analysis of the observations was further complicated by the fact that not all observers used the same comparison stars. Some used 22 Cyg (HR 7613, HD 188892), the local comparison star in the Be star campaign; others used 21 Cyg (HR 7615, HD 188947), which was suggested by Fekel and Hall. The constancy of 22 Cyg has been checked by repeated use of the check star 36 Cyg, but the constancy of 21 Cyg has not yet been checked. Neither of these two is a suitable comparison for 27 Cyg in fact. 22 Cyg is a blue star and its long-term constancy has yet to be verified. 21 Cyg is a suspected variable (CSV 101914 = NSV 12586) and a multiple system of at least 5 stars. Considering the high incidence of variables among the brighter stars in Cygnus, any future observations should be carried out with at least two different check stars until the present situation is clarified. 15 Cyg and 39 or 42 Cyg appear at the moment as the best available candidates for a comparison and a check star, respectively.

The values of (V, B-V) given by Nicolet (1978) for 22 Cyg and 21 Cyg are (4.94, -0.08) and (3.89, +1.02). Harmanec, Horn and Koubský, in the Bright Be Star Observing Programme, Release 5, prefer (4.95, -0.09) for

Table I

Observers	Observatory Telescope	Photometer, Tube	Filters	Comparison	Check
Harmanec, Horn Koubský, Kříž, Božić	Hvar 0.65-m Cassegrain	DC EMI	UBV	22 Cyg	36 Cyg
Hoff and Kelsey	Hillside 0.4-m reflector	Starlight 1 PC	BV	21 Cyg	-
Landis	Landis 0.2-m Newtonian	DC IP21	V	21 Cyg	-
Percy and Richer	Univ. of Toronto 0.4-m Cassegrain	DC EMI	BV	22 Cyg	36 Cyg
Reisenweber	Rolling Ridge 0.2-m Celestron compound	Optec SSP-3 solid state	V	22 Cyg 21 Cyg	-
Wasson	Sunset Hills 0.2-m reflector	PC	V	21 Cyg	-

22 Cyg, and we have adopted those values. Because of potential problems in combining observations from many and varied sources, we adopted the following procedures: the (V, B-V) observations obtained at Hvar Observatory were adopted as standard, and all other observations were fitted to them. This required a small adjustment of $+0.010^m$ to the (B-V) values of Percy and Richer, an adjustment of -0.03^m to the V values of Hoff and Kelsey, and an adjustment of $+0.042^m$ to the V values of Reisenweber using 22 Cyg as the comparison. The light curve obtained using the values so obtained is shown in Figure 1, together with the corresponding data for the check star.

The variability amounts to about 0.05^m in V. A similar range of variation can also be found in the previous published all-sky photometry of 27 Cyg (c.f. Blanco et al. 1970). The variability is apparent in all of the long sets of data, though it is less apparent in the combined data

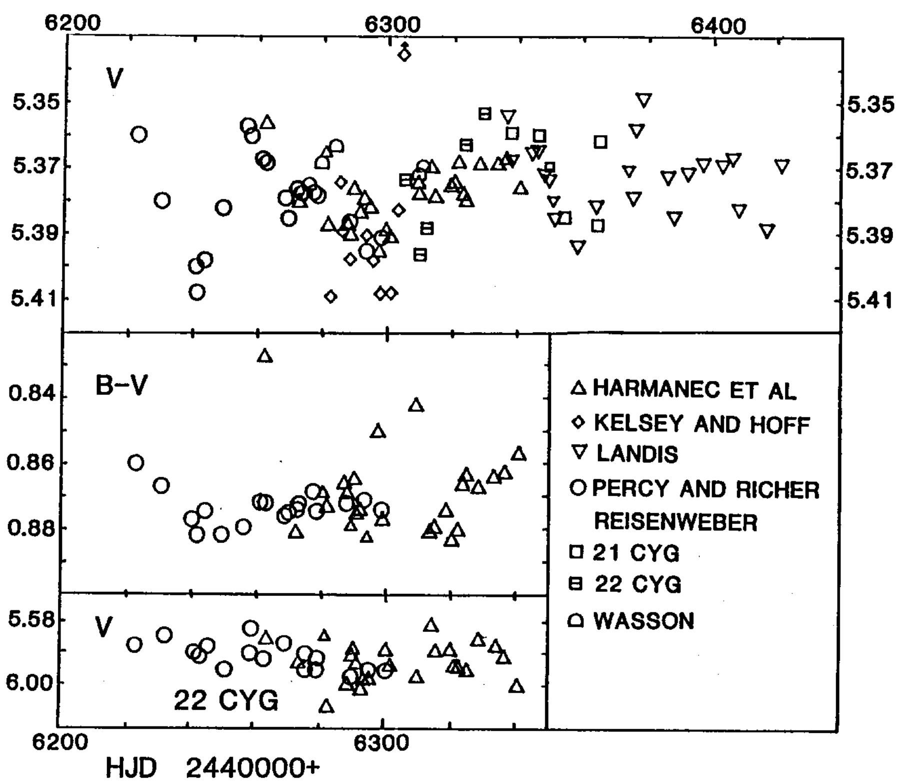


Figure 1: The light and colour curves of 27 Cyg (upper and middle panel) and the light curve of the comparison star 22 Cyg (lower panel). Slightly smaller symbols represent points of slightly lower accuracy.

because of the extra scatter contained therein. The behaviour does not appear to be strictly periodic, although no period analysis has been attempted at this stage. Variations seem to have a characteristic time scale of about 50-60 days. The cause may be pulsation, or more likely the rotation of a spotted star. However, more rapid variations may also be suspected in some data sets, and should be checked by future observations. A part of these rapid fluctuations is probably connected with the relatively low signal-to-noise ratio of the data (as evidenced by the plot for the check star), but the variability of the comparison star 21 Cyg also cannot be excluded at present. Radial velocity observations of the star are sparse, but there are no reports of velocity variations. Further photometric and spectroscopic observations of this bright variable star are certainly warranted.

The observations have been deposited in File 187 in the Archive of Unpublished Photoelectric Observations, maintained by IAU Commission 27 (Breger 1982).

Acknowledgement: This work was supported in part by the Natural Sciences and Engineering Research Council of Canada.

*J.R. PERCY and M.G. RICHER

Department of Astronomy
University of Toronto
Toronto, Ontario
Canada M5S 1A1

H. BOŽIĆ

Hvar Observatory
Faculty of Geodesy
University of Zagreb
41000 Zagreb
Yugoslavia

P. HARMANEC, J. HORN, P. KOUBSKÝ and S. KŘÍŽ

Astronomical Institute
Czechoslovak Academy of Sciences
251 65 Ondřejov
Czechoslovakia

L.A. KELSEY and D.B. HOFF

Hillside Observatory
University of Northern Iowa
Cedar Falls IA 50613
USA

H.J. LANDIS

Landis Observatory
50 Price Road West
Locust Grove GA 30248
USA

R.C. REISENWEBER

Rolling Ridge Observatory
3621 Ridge Parkway
Erie PA 16510
USA

R. WASSON

Sunset Hills Observatory
15870 Del Prado Drive
Hacienda Heights CA 91745
USA

*to whom any correspondence about this paper should be addressed

References:

Blanco, V.M., Demers, S., Douglas, G.G. and FitzGerald, M.P. 1970 Publ. U.S. Naval Obs. 21 (2nd series)

Breger, M. 1982 IAU Inf. Bull. Var. Stars #2246

Fekel, F.C., Hall, D.S. 1985 IAPPP Comm. #20, 37

Harmanec, P., Horn, J., Koubský, P. 1982 IAU Symp. 98: Be Stars, ed. M. Jaschek and H.-G. Groth (Dordrecht: D. Reidel), 269

Nicolet, B. 1978 Catalogue of Homogeneous Data in UBV Photoelectric Photometry (Strasbourg: Strasbourg Observatory)

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2892

Konkoly Observatory
Budapest
8 May 1986

HU ISSN 0374-0676

HαN AND HαW OBSERVATIONS OF THE ECLIPSING BINARY SYSTEM VV ORIONIS (HR1868)

H-alpha narrow and H-alpha wide observations of the eclipsing binary system VV Orionis were carried out in two sets, during 23 nights from 7 March through 21 April 1983 and in 13 nights from 10 December, 1983 through 10 February, 1984. The observations were obtained using 51 cm Cassegrain reflector equipped with an unrefrigerated RCA 4509 photomultiplier at Biruni Observatory of Shiraz University. Each reading lasted about 50 seconds and the usual pattern SCVVVCS was used in this investigation.

The stars HR1861 (B3V) and HR1873 (B3V) were used as comparison and check stars respectively. There was not considerable change during the observations.

VV Ori (B1V and B4V, m_v=5.3) is an important system among the very few early-type eclipsing binaries for which reliable limb-darkening coefficients can be empirically determined at least for one of its components (Chambliss, 1983).

The observations were made using Strömgren filters HαN (half-width = 38 Å, λmax=6569 Å, Max.transmission=57%) and HαW (half-width =238 Å, λmax = 6583 Å, Max. transmission = 47%).

Figure 1 shows the light curves belonging to the first set of observations. The second set of observations obtained during excellent sky conditions is shown in Figure 2. The composed light curves of the two sets of observations are also represented in Figure 3.

A total of five times of minimum light are obtained according to the ephemeris given by Duerbeck(1975): JD (Hel) Min I = 2442041.6813 + $1^{d}.48537788$E. These values are given in Table I.

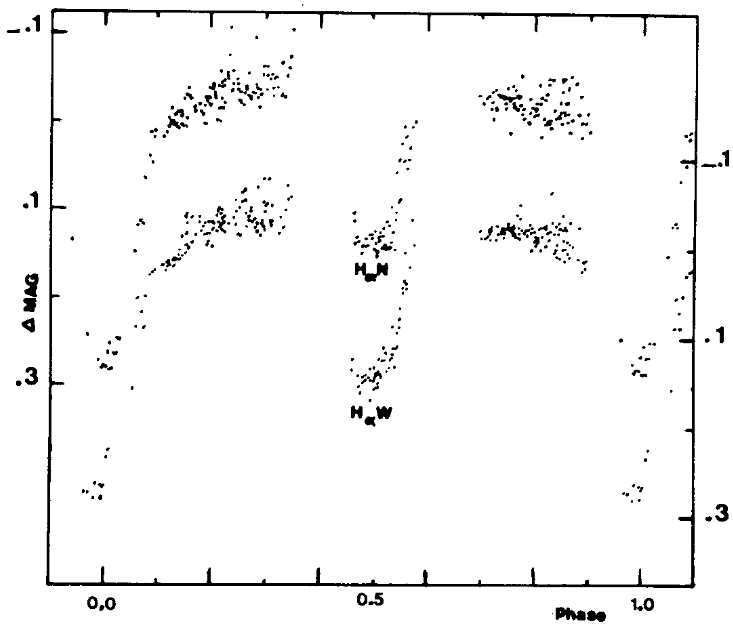


Figure 1 ; Light curves of VV Ori (first set of observations)

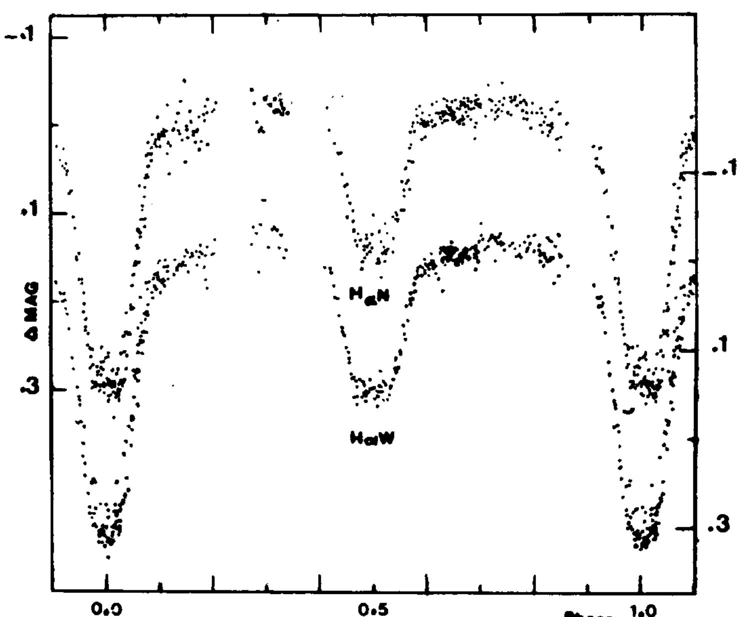


Figure 2 ; Light curves of VV Ori (second set of observations)

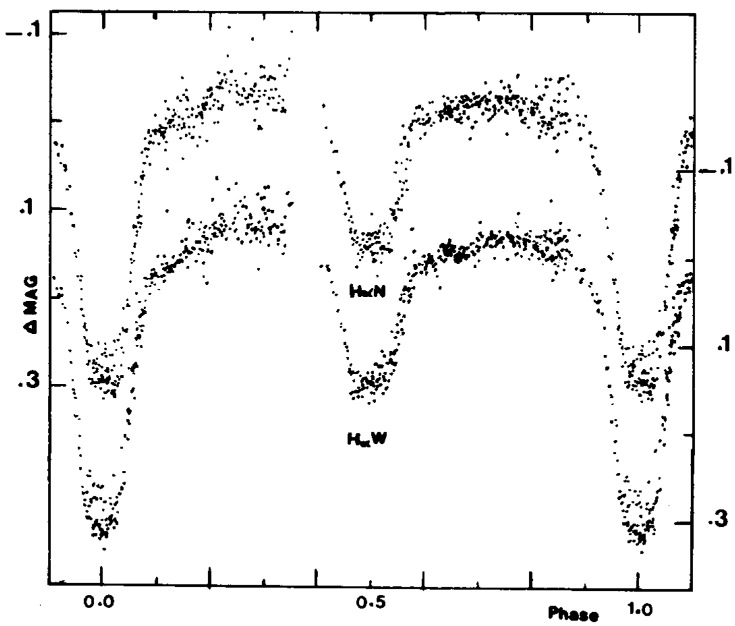


Figure 3 : Composed light curves of VV Ori.

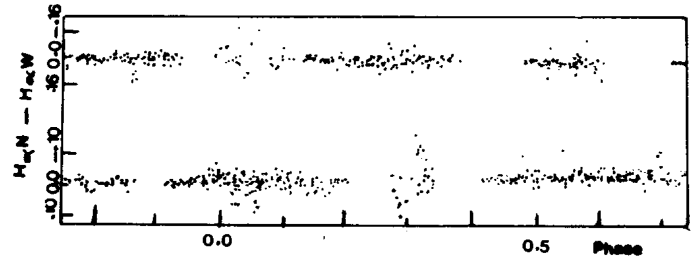


Figure 4 : Color index curves. The upper one belongs to the first set and the lower one belongs to the second set of observations. Scales are slightly different.

Table I. Times of minimum light for VV Ori.

JD 2445000+	E	$(O-C)_1$	$(O-C)_2$
679.3725	2449	+0.0008	0.00083
699.4234	2462.5	-0.0009	-0.00085
717.2494	2474.5	+0.0005	0.00063
737.3006	2488	-0.0009	-0.00075
740.2718	2490	-0.0004	-0.00031

The first set of residuals, $(O-C)_1$, are those obtained using tracing paper method and the second one, $(O-C)_2$, are obtained by means of least squares method. The two methods resulted in very similar residuals and a new minimum time and period is obtained for Duerbeck's epoch.

$$\text{JD(Hel) Min I} = 2442041.6846 + 1^{d}.48537652\ E$$
$$\pm 4 \quad \pm 22 \text{ p.e.}$$

The period is very precisely determined to within 0.02 second. There is no evidence for any change of period and all available data indicate that the period of VV Ori has remained constant for at least the past 70 years (Chambliss and Leung, 1982).

Color indices are given in Figure 4. The average value of HαN-HαW is about -0.01 and it decreases to about -0.02 at primary minimum for the second set of observations.

The analysis of the light curves of VV Ori in collaboration with Dr.Carlson R.Chambliss (Kutztown University, Kutztown, USA) is in preparation.

Acknowledgments

I would like to express my sincere gratitude to Dr.Carlson R.Chambliss, from Kutztown University, for providing me with the minimum times. I also offer my thanks to Professor Y.Sobouti and Dr. H.W.Duerbeck for their help.

BEHROUZ M. DAVAN

Biruni Observatory
Dept. of Physics
Shiraz University
Shiraz- I.R. IRAN

References:

Chambliss, C.R.:1983,Astrophysics and Space Science 89, 15.
Chambliss,C.R.,Leung,K.C.:1982,Astrophysical Journal Supplement Series, 49, 531.
Duerbeck,H.W.:1975,Astron.Astrophys, Suppl.Ser., 22,19
Duerbeck,H.W.:1975, Acta Astronomica 25, No.4

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2893

Konkoly Observatory
Budapest
8 May 1986

HU ISSN 0374-0676

PHOTOELECTRIC OBSERVATIONS OF γ Cas, X Per AND BU TAU

The three variable stars have been observed in the U, B, V - bands with a 250/3250 Cassegrain telescope and a 1P21 PMT. These observations are the continuation of those published in IBVS No.2723.

γ Cas

Comparison star: Alpha Cas (HD 3712),
(V=2.23, B-V = + 1.17)

Check star: Eta Cas (HD 4614),
(V=3.44, B-V= +0.57)

Hel.J.D. 2440000+	V	Hel.J.D. 2440000+	V
6304.396	2.08	6368.316	2.21
6306.488	2.19	6378.379	2.16
6310.388	2.21	6414.275	2.33
6327.403	2.19	6416.279	2.16
6338.367	2.26	6422.270	2.21
6339.367	2.24	6463.188	2.21
6346.350	2.24	6508.263	2.20
6347.392	2.27	6530.263	2.17
6360.370	2.21	6537.270	2.21
6361.329	2.20	6546.279	2.11

X Per

Comparison star: HD 24167
(V=6.25, B-V =+0.20, U-B=+0.14)

Hel. J.D. 2440000+	V	B-V	U-B
6374.238	6.75	+0.17	
6382.305	6.83	+0.08	-0.68
6453.256	6.81	+0.09	

Hel. J.D. 2440000+	V	B-V	U-B
6466.265	6.74	+0.13	-0.64
6468.276	6.75	+0.26:	
6469.275	6.76	+0.07	-0.60
6506.304	6.79		
6507.292	6.76	+0.06	
6508.266	6.73	+0.11	
6515.292	6.79	0.00:	
6522.300	6.77		

BU Tau

Comparison star: 16 Tau (HD 23280),

(V=5.46, B-V= -0.04, U-B= -0.31)

Check star: 19 Tau (HD 23338)

(V=5.65, B-V= -0.07, U-B= -0.36)

Hel. J.D. 2440000+	V	B-V
6374.283	5.11	-0.05
6382.298	5.09	0.00
6466.273	5.13	-0.06
6468.282	5.07	-0.09
6515.271	5.12	-0.04

D. BÖHME
4851 Nessa No.11
German Democratic Republic

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2894

Konkoly Observatory
Budapest
14 May 1986
HU ISSN 0374-0676

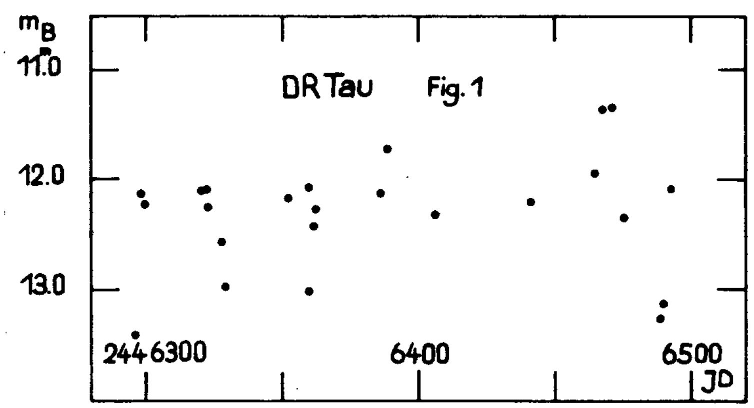
PHOTOMETRIC BEHAVIOR OF DR TAURI IN THE SEASON 1985/86

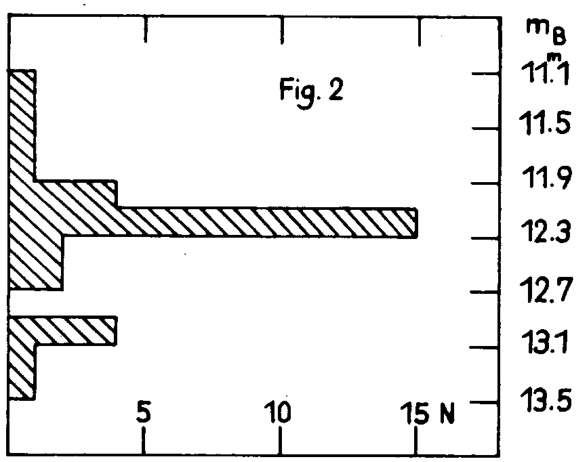
In linking to the previous sequence of comparison stars given by Götz (1982) the star was measured on 33 blue-sensitive plates (ORWO-ZU21 +GG13+BG12) from 24 nights obtained with the 50/70/172cm Schmidt camera of Sonneberg Observatory covering the time interval between 18 August 1985 and 1 March 1986. The measurements, which are listed in Table I and the light curve, which is given in Figure 1 are used to complete and to supplement our knowledge of the brightness variations (Götz, 1980, 1982, 1983, 1984, 1985) of this star.

Table I

J.D. 244....	m_B	J.D. 244....	m_B
6296.587	$13^m.42$	6360.569	$12^m.48$
6298.592	12.12	6360.582	12.30
6299.583	12.22	6361.593	12.25
6320.519	12.08	6385.485	12.10
6321.603	12.05	6385.502	12.13
6321.615	12.12	6387.504	11.69
6322.551	12.3 :	6405.369	12.28
6322.568	12.1 :	6440.381	12.14
6327.547	12.6 :	6440.397	12.20
6327.566	12.59	6463.322	11.90
6328.514	12.97	6466.304	11.32
6351.516	12.17	6469.273	11.30
6351.529	12.10	6474.268	12.30
6358.552	11.98	6488.266	13.24
6358.570	12.15	6489.276	13.08
6359.494	12.98	6491.281	12.04
6359.518	13.00		

When comparing the given light curve with those obtained in former years, we find the star in an active phase. This behaviour is expressed by a total amplitude of $\Delta m_B = 2^m.1$ and by short-time light depressions and brightness increases starting from a normal light at $m_B \approx 12^m.2$. The brightness distribution (Figure 2) of the individual measurements confirms this statement.





W. GÖTZ

Akademie der Wissenschaften
der DDR, Zentralinstitut für
Astrophysik, Sternwarte Sonneberg
DDR

References:

Götz, W., 1980, I.B.V.S., No. 1747
Götz, W., 1982, I.B.V.S., No. 2172
Götz, W., 1983, I.B.V.S., No. 2345
Götz, W., 1984, I.B.V.S., No. 2513
Götz, W., 1985, I.B.V.S., No. 2731

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 2895

Konkoly Observatory
Budapest
14 May 1986
HU ISSN 0374-0676

BEHAVIOUR OF THE X-RAY BINARY V 1727 CYGNI = 4U 2129+47 IN 1985

In monitoring the behaviour of V 1727 Cyg the star was inspected on 60 blue-sensitive plates (ORWO-ZU21+GG13+BG12) from 35 nights obtained with the Schmidt camera 50/70/172 cm of Sonneberg Observatory covering the time interval between 22 March 1985 and 31 December 1985. The individual estimates, which are summarized in Table I, are linked to the sequence of comparison stars given by Wenzel (1983). On most of the plates the star is below the limiting magnitude. The object is visible only on 19 plates. There, its brightness varies between m_B = 18$^m_.$0 and m_B = 18$^m_.$4. The behaviour given here characterizes the low or inactive state of the star which probably started near 7 September 1983 (Wenzel, 1983).

The observations listed in Table I are shown in Figure 1. They are reduced to one common epoch by means of the elements:

$$\text{Min(hel.)} = 244\ 4403.743 + 0^d_.2182579 \cdot E$$

given by McClintock et al. (1982). The arrows indicate "fainter than" observations.

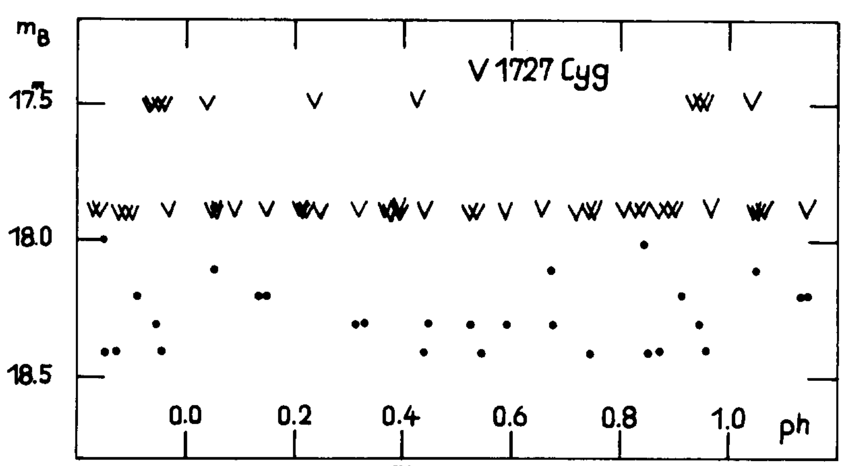


Figure 1

Table I

J.D. hel.	m_B	Rem.	J.D. hel.	m_B	Rem.
244....			244....		
6147.591	$18^{m}.0$:		6296.469	> 17.9	iv
6147.610	> 17.5	iv	6296.488	> 17.9	iv
6173.569	> 17.9	iv	6298.490	> 17.9	iv
6173.587	> 17.5	iv	6298.509	> 17.9	iv
6175.550	> 17.5	iv	6299.477	> 17.9	iv
6175.569	> 17.5	iv	6299.497	> 17.9	iv
6177.558	> 17.9	iv	6320.477	> 17.9	iv
6177.575	> 17.9	iv	6320.496	> 17.9	iv
6200.496	> 17.9	iv	6321.486	> 17.9	iv
6200.515	18.3		6321.505	18.1	
6210.502	> 17.9	iv	6327.441	18.4	
6260.475	18.1		6327.459	18.4	
6260.495	18.2		6328.438	18.4	
6260.514	> 17.5	iv	6328.458	> 17.9	iv
6261.517	> 17.9	iv	6351.376	> 17.9	iv
6261.536	18.2		6355.383	> 17.9	iv
6264.521	18.3		6358.324	> 17.9	iv
6264.540	18.3		6360.371	18.4	
6270.548	> 17.9	iv	6373.271	18.4	
6271.520	> 17.9	iv	6373.291	18.3	
6271.538	> 17.9	iv	6374.273	18.3	
6272.516	> 17.9	iv	6374.295	18.4	
6272.536	18.3		6385.293	> 17.5	iv
6272.554	> 17.9	iv	6386.294	> 17.9	iv
6288.411	> 17.9	iv	6387.318	> 17.9	iv
6288.430	18.2		6404.233	> 17.9	iv
6291.434	> 17.9	iv	6404.253	> 17.9	iv
6292.423	> 17.5	iv	6405.250	> 17.9	iv
6292.443	18.3		6431.225	> 17.9	iv
6293.505	> 17.9	iv	6431.238	> 17.9	iv

iv = invisible

W. GÖTZ
Akademie der Wissenschaften
der DDR, Zentralinstitut für
Astrophysik, Sternwarte Sonneberg
DDR

References:

Wenzel, W., 1983, I.B.V.S., No. 2452
McClintock et al., 1982, Astrophys. J. 258,245

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2896

Konkoly Observatory
Budapest
14 May 1986
HU ISSN 0374-0676

THE LIGHT CURVE OF KR AURIGAE IN THE SEASON 1985/86

In completing the long-time light curve of KR Aurigae the star was measured on 27 blue-sensitive plates (ORWO-ZU21+GG13+BG12) from 19 nights obtained with the Schmidt camera 50/70/172 cm of Sonneberg Observatory, covering the time interval between 12 September 1985 and 1 March 1986, using the comparison star sequence given by Popova (1965). The observations are given in Table I.

Table I

J.D.	m_B	J.D.	m_B
244....		244....	
6321.631	$13^m.15$	6387.573	$15^m.10$
6322.605	13.4 :	6405.390	14.40
6327.607	13.1 :	6440.435	14.70
6327.622	13.25	6463.340	13.30
6358.590	14.90	6466.324	13.30
6358.606	14.70	6466.344	13.40
6359.540	15.0 :	6469.315	13.57
6359.565	15.10	6469.335	13.66
6360.602	14.70	6474.312	13.65
6360.626	14.80	6474.338	13.70
6361.619	15.20	6488.285	14.10
6364.669	14.80	6489.296	14.15
6385.528	15.35	6491.305	14.30
6385.548	15.35		

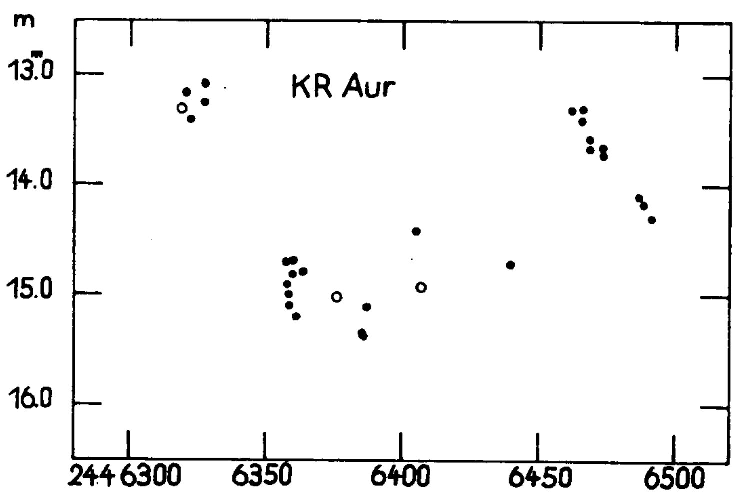


Figure 1

It can be seen from Figure 1 that KR Aurigae was in a minimum phase in the time interval between J.D. 244 6358 and J.D. 244 6440. The decrease from the maximum brightness ($m_B \approx 13^{m}.2$) to the faint light ($m_B \approx 15^{m}.0$) as well as the increase from that state to the maximum brightness ($m_B \approx 13^{m}.3$) could not be observed, unfortunately. But there is no doubt that the decrease to the faint light took place within less than 31^d.

Slow temporal light fluctuations are superimposed on the mean light curve. At the end of the series a continuous decrease in the brightness from $m_B = 13^{m}.3$ to $m_B = 14^{m}.3$ is indicated.

Concerning the minimum phase our own observations in B are in agreement with visual estimations given by Ducoty (1985), which are marked by circles in Figure 1.

W. GÖTZ

Akademie der Wissenschaften
de DDR, Zentralinstitut für
Astrophysik, Sternwarte Sonneberg
DDR

References:

Popova, M., 1965, Peremennye Zvezdy, 15,534
Ducoty, R., 1985, IAU-Circ. No. 4150

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 2897

Konkoly Observatory
Budapest
26 May 1986

HU ISSN 0374-0676

RECENT MASS LOSS EPISODE OF THE Be STAR o And

Variability in the spectra of Be stars on time scales ranging from days to decades is well known in the astronomical community (Doazan 1982, and references therein). o And (1 And, HR 8762, HD 217675-6, BD + 41°4664) is one such interesting object which is having a long history of spectrum variations. It has changed from a normal B-type star to a shell star and back again a number of times and also shows more rapid variations. Analyzing all observations available in the literature on this star, Harmanec(1984) finds evidence for the short - term variations reported by many observers being truly periodic with period $1^{d}.571$. Also the shell spectrum phases of this star repeat after integer multiples of 3100 d. This short term activity of presumably photospheric origin and the long - term variability of the envelope is clearly visible in this star. Baade (1981) has suggested that this star is a nonradial pulsator. Recent observations suggest that perturbations in the nonradial pulsation spectrum may be involved in the episodic mass loss from early-type stars (Smith and Ebbets,1981; Vogt and Penrod, 1983; Baade and Ferlet, 1984; Smith and Penrod. 1984).

In order to find a correlation between photospheric pulsations and mass loss, we started narrow band Hα photometric observations of o And during September 1985. The observations were made using an Hα filter of bandpass 5 Å , centered at 6563 Å with an automated photon-counting system in the cassegrain focus of the 102 cm telescope at Vainu Bappu Observatory. Photon counting interval was 1 sec. o And was observed on 5 nights in September 1985. Along with o And, different standard stars and sky background were also scanned to find out the steadiness of the sky. Except the night of 13 Sep. 1985, in all other nights there were no drastic change in Hα flux. The results of 13 Sep. night are shown in Figure 1. From Figure 1 it is clear that average Hα flux level (Hα flux continuum level) slowly increased during the development of mass loss episode and during this episode Hα flux strength

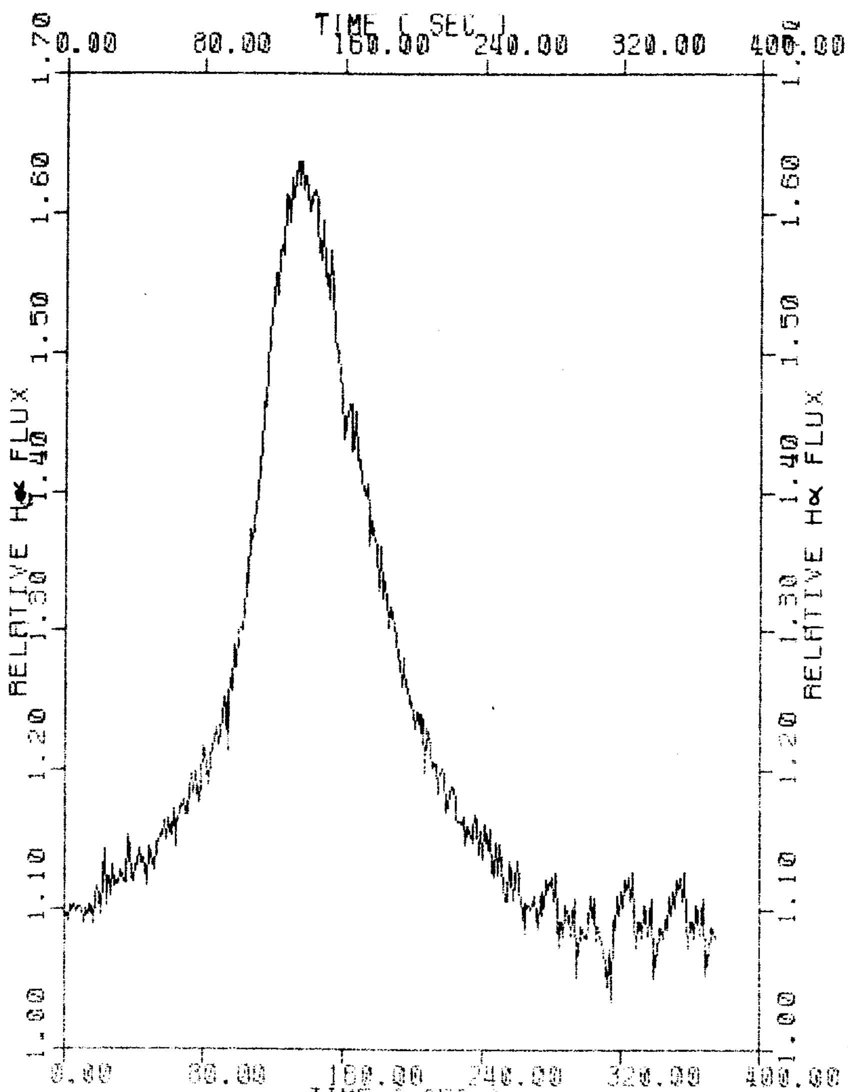


Fig. 1. Hα flux variations in o And during mass loss episode on the night of 13.7326 September 1985 (JD= 2446322.2344). Relative Hα flux in the sense ratio of Hα counts during the episode and that two hours before the episode. Two hours before the episode Hα average count over 5 Å band pass was 17500 which we have defined as Hα continuum (relative Hα flux = 1).

enhanced by a factor of 1.64 over a duration of 300 sec. Afterwards this flux decreased slowly and came back to the normal level.
There are two explanations for mass loss mechanisms of Be stars. According to Hayes and Guinan (1984), mass loss is due to some type of marginal stellar instability (Rayleigh type rotational instability) arising from the star's angular momentum gradient and it can be inferred from rapid increase of continuum polarization accompanying the strengthening of Hα flux.

Other explanation is that if the resonance occurs between different l-modes (one unstable mode already pulsating with large amplitude and another mode which produces large surface amplitudes) when some overall equipartition of energy between different modes is achieved, the result is likely to be a rapid damping of the pulsation energy by shock waves in the stellar envelopes and these shock waves drive the episodic mass loss (Vogt and Penrod, 1983 and references therein). Smith and Ebbets (1981) proposed that the simultaneous excitation of many modes can also produce surface shock waves through heating effects. Propagation of shock waves through the stellar envelope will temporarily increase the local temperature of the medium and as a result the average Hα flux (we have described as Hα continuum level) will increase which is clearly visible in Fig. 1. Also the ejected mass (due to the episode) driven by shock waves will temporarily increase the optical depth of the envelope and Hα strength will enhance (Fig. 1.). From the present observation it is seen that the onset of this episode in o And was accompanied by rapid variability in Hα flux on a time scale as short as 5 minutes. This short duration variability was indicative of the presence of a high-order nonradial mode. To find the positive correlation between photospheric pulsations and mass loss for Be stars, it is very urgent to have different types of observations on Hα. With present observations it may be remarked that nonradial pulsations were prominent in o And during the development of this mass loss episode.

From the enhancement of Hα strength one can measure about volume emission ($V N_{ion} N_e$), envelope mass and the energy required to lift the material from the photosphere into the envelope. Detailed results will be published elsewhere.

K.K. GHOSH, K. JAYKUMAR, M. J.ROSARIO and M.APPAKUTTY
Indian Institute of Astrophysics, Vainu Bappu Observatory,
Alangayam, North Arcot, Tamil Nadu 635701, INDIA

References:

Baade, D. : 1981. in Proc. Workshop Puls. B.Stars, eds. G.E.V.O.N., C. Sterken, Obs. Nice, p. 267
Baade, D. and Ferlet, R. : 1984, Astron. Astrophys., 140, 72.
Doazan, V. : 1982 in B Stars With and Without Emission, ed. A.Underhill and V. Doazan (NASA SP - 456), p. 316
Harmanec,P. : 1984, IAU Inf. Bull. Var. Stars No. 2506
Hayes, D. P. and Guinan, E. F. : 1984, Astrophys, J., 279, 721
Smith, M. A. and Ebbets, D. : 1981, Astrophys J., 247, 158
Smith, M. A. and Penrod, G. D, : 1984 in Proc. 3rd Trieste Workshop, ed.R. Stalio, Trieste.
Vogt, S. S. and Penrod, D. : 1983, Astrophys. J, 275, 661.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 2898

Konkoly Observatory
Budapest
29 May 1986
HU ISSN 0374-0676

CD $-30^{\circ}5135$

Further photographic UBV photometry has been obtained for this peculiar, variable emission-line F supergiant from plates taken with the Uppsala Southern Station Schmidt telescope at Siding Spring Observatory, Australia. The results are, with estimated probable errors ± 0.1 mag.:

Date	V	B	U	Observer
20 Jan. 1985	9.5	10.2	10.9	B. Pettersson
21 Jan. 1985	9.6	10.3	10.8	"
14 Feb. 1985	9.2	10.1	10.6	"
10 Mar. 1986	9.3-9.7	10.3	11.0:	P. Magnusson

From 14 Feb. 1985 there are two sets of plates taken two hours apart; the small differences are possibly not significant, as they are only slightly larger than the estimated errors. On 10 March 1986 four sets of plates were taken in direct succession (30-45 min between plates of the same colour). The star was then fainter in V at the beginning and end of the observations, and brighter in between, whereas there seems to have been a small increase in the brightness in U at the end; B remained constant to within the presumed errors. This supports the suggestion of rapid variations put forward by Welin (1981).

GUNNAR WELIN
GREGER WESTLING
Astronomical Observatory
Uppsala, Sweden

Reference:

Welin, G. 1981, Inf. Bull. Var. Stars No. 1940

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 2899

Konkoly Observatory
Budapest
30 May 1986

HU ISSN 0374 - 0676

A SECONDARY PHOTOMETRIC PERIOD OF TT ARIETIS

The resemblance of TT Ari to intermediate polars, particularly to TV Col, prompted us to search for a secondary photometric period analogous to the 32 minutes X-ray and optical period of TV Col (Schrijver et al., 1984; Bonnet-Bidaut, Motch, and Mouchet, 1985). For this purpose we have collected 22 photometric runs of TT Ari obtained by various observers in various observatories, including 7 already published (Smak and Stępień, 1969). The observations were made during six seasons spanning the time interval from 1966 till 1985. The length of runs varied from one to more than 6 hours, most were at least 3 hours long.

These data were subject to the power spectrum analysis. In most runs the 3 hour period (Smak and Stępień, 1975) appeared with a high amplitude. However, we found in our power spectra another persistent feature corresponding to a secondary photometric period of about 20 minutes. This conclusion is based on the following facts:

i) A peak at the consistent position appeared on all nights, albeit its amplitude varied from night to night.

ii) In 13 of 22 nights the corresponding peak was the strongest feature in the relevant frequency band.

iii) We have used two techniques, the Fourier analysis and the maximum entropy method, which gave mutually consistent results.

iv) Same conclusions could be drawn from ours and Smak and Stepien´s data separately.

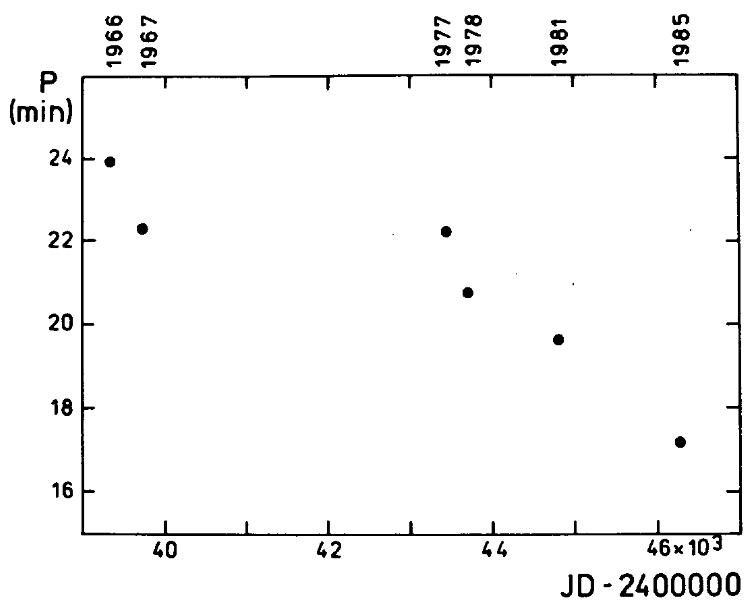


Figure 1

Although on different nights of a season the peak appeared at the same frequency, the period varied smoothly from season to season. In the time interval 1966 - 1985 the secondary photometric period decreased from the value of 24 minutes to the value of 17 minutes. The season mean values of the period versus time are plotted in Fig. 1.

We cannot say yet whether this periodicity is coherent or not. Williams (1966) and Smak and Stępień (1969) searched for periodic oscillations in data taken during a single night and could only conclude that quasiperiodic and transient fluctuations with the periods 14 - 20 minutes are present in their data. Our conclusion about persistence of this phenomenon is founded on more nights and two independent methods.

The fast rate of period decrease restrains us from identifying it with the rotation period of the compact star as it was done for the 32 minutes period of TV Col. We have analysed additionally the X-ray observations of TT Ari by Jensen et al.(1982) obtained on two consecutive days. In the power spectra for each day there were peaks at frequencies around 1 mHz although inconsistent with each other and with our optical data. Full details of our analysis will be given elsewhere.

We would like to thank Prof. J. Smak and Prof. K. Stępień for providing us with their observations and to Prof. A. Kruszewski for helpful discussions and encouragement.

I. SEMENIUK, A. SCHWARZENBERG-CZERNY,
Warsaw University
Observatory
Warsaw, Poland

H. DUERBECK, M. HOFFMANN,
Astronomical Institute
University of Münster
Münster, F.R.G.

J. TREMKO
Astronomical Institute
Slovak Academy of Science
Tatranská Lomnica
Czechoslovakia

References:

Bonnet-Bidaut, J. M., Motch, C., and Mouchet, M., 1985, Astron. Astrophys., 143, 313.

Schrijver, J., Brinkman, A. C., van der Woerd, J., Watson, M. G., King, A. R., van Paradijs, J., and van der Klis, M., 1984, 18th ESLAB Symp. ed. A. Peacock, Reidel, in press.

Smak, J. and Stępień, K., 1969, Nonperiodic Phenomena in Variable Stars, ed. L. Detre (Budapest: Academic Press), p. 335.

Smak, J. and Stępień, K., 1975, Acta Astron., 25, 379.

Williams, J. O., 1966, P.A.S.P. 78, 279.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 2900

Konkoly Observatory
Budapest
3 June 1986
HU ISSN 0374 - 0676

HIGH DISPERSION SPECTROSCOPY ON TY Vir*

We present the detailed analysis of HD 103036 = TY Vir. We find that effective temperature, gravity and metallicity show that TY Vir is similar to red giants in halo type globular clusters and that variations of the atmospheric parameters are related to photometry.

TY Vir is among the brightest known examples of semiregular variable stars of the halo population. It belongs to the Kapteyn moving group (Eggen, 1978) from the kinematical parameters U = + 54 km/s, V = - 273 km/s, W = + 96 km/s and V_r= 233 km/s. Few stars like TY Vir are known. It has been analyzed by Leep and Wallerstein (1981) with Θ_{eff}= 1.17 and log g = 0.6. They have found it is very metal deficient : $[Fe/H]_{\odot}$ = - 1.9. Luck and Bond (1985) have found it is less metal deficient : $[Fe/H]_{\odot}$= - 1.45 with Θ_{eff}= 1.19 and log g = 0.7. Such a difference between iron abundance determinations is related with the effective temperature determination, i.e. the choice of the T_{eff} calibration. However, the use of a T_{eff} versus (R-I) and/or (V-K) calibration is not easy to derive effective temperature, since from minimum to maximum light, R-I ranges between 0.75 to 0.67 correspond to T_{eff} = 4000 to 4200 K.

Although TY Vir is classified in the GCVS (Kukarkin et al., 1976) as SRd with a magnitude 8.00 to 8.32 and a corresponding period of ~ 50 days, the only extensive photometric observations published are those which Beyer (1937) obtained between 1924 and 1936, which indicates a highly irregular light variation, sometimes with a period of about 100 days but without a definite recurrent pattern. However, the U, B, V data suggest a cyclic variation of small amlitude with a characteristic time between maxima of the order of 20 or 30 days (Preston and Wallerstein, 1963). Eggen (1961) observed this star and concluded that the variation was erratic. However, a plot of Eggen's data is consistent with a 30 day cycle. Note that radial velocity measurements of TY Vir show no definite evidence of variability (Preston and Wallerstein, 1963).

*based on observations made at Observatoire de Haute Provence, France.

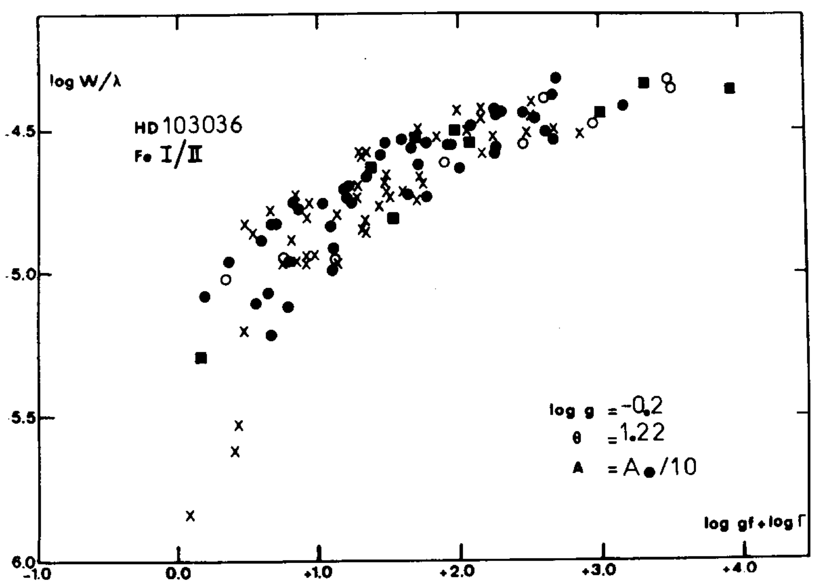


Figure 1

We have analysed in detail TY Vir in order to check its chemical composition, age and evolution.

The detailed analyses are based upon three high dispersion spectrograms taken with the Coudé spectrograph of the 1.52m telescope at Observatoire de Haute-Provence with a dispersion of 12.4 Å/mm and a mean resolution of 0.3 Å. They have been taken on baked IIaO Kodak plates. The reduction of the spectrograms has been made using the method of equivalent width measurements, the principles of which are given in Proust and Foy (1986). The atmospheric parameters have been partly deduced from the curve of growth analysis. For this purpose, we have used FeI and FeII curves of growth, since they are the best defined. We have computed model atmospheres from $T(\tau)$ relations homologous to those computed by Gustafsson et al. (1975) and Bell et al. (1976) for the most appropriate values of the effective temperature T_{eff}, gravity g and metal abundance A relative to the sun.

The effective temperature was obtained from the R-I(0.71) and V-K(3.10) colour indices, with the colour index versus T_{eff} calibrations of Johnson (1966) applied differentially with respect to the two well known giants, HD 113226 (ϵVir) and HD 122563. The gravity g has been determined as a function of T_{eff} from the ionization equilibrium criterion applied to iron.

From the deatiled analysis with respect to the sun, we deduce the following atmospheric parameters : θ_{eff}= 1.22, log g = - 0.2 $[Fe/H]_{\odot}$= - 0.95 ξ= 2.8 km/s^{-1}, ξ is the microturbulent velocity. Fig. 1 shows the iron curve of growth obtained for TY Vir.

The difference between our [Fe/H] determination and that of Luck and Bond (1985) can be accounted in the following way : we have reanalysed their equivalent width measurements using our model atmosphere and the atmospheric parameters they have derived : θ_{eff} = 1.19, log g = 0.7 and $[Fe/H]_{\odot}$= - 1.45. We have obtained $[Fe/H]_{\odot}$ = - 1.35, value which closely matches their determination. The 0.1 dex difference could be due to the differences in the differences in the input physics (abundance of electron donors), and to the scatter of the linear part of the curve of growth. Correcting this abundance for our lower θ_{eff} leads to $[Fe/H]_{\odot}$= - 1.43 (from the FeI curve of growth). But we have to restore the ionization equilibrium : this requires to adopt log g = 0.4. As a result, the iron abundance becomes [Fe/H] = - 1.37 with θ_{eff} = 1.22 and log g = 0.4. Gravity is always difficult to determine accurately. For hotter effective temperetures, large uncertainties in the gravity have little consequences on the abundance determination ; this is no more the case for stars as cool as TY Vir. We have also to keep in mind that TY Vir is an irregular variable, so that the photometric data used in the analysis should be acquired simultaneously with the spectrograms, Waiting for a more complete analysis, we will assume for the following discussion the compromise [Fe/H] = - 1.2.

We cannot explain the large discrepancy with the determination of Leep and Wallerstein (1981) in the same way ; their gravity determination is consistent with that of Luck and Bond (1985). The same discussion as above leads to decrease [Fe/H] by 0.04 dex ; this is much too small to get a value consistent with that of Luck an Bond, and a fortiori with ours.

TY Vir is classified by Eggen (1978) as member of the Kapteyn moving group from its kinematical parameters.It has been classified as a globular cluster like giant by Preston and Wallerstein (1963) from its location on the giant branch of M3, and also by Eggen (1978) using the U-B, B-V diagram of ω Cen.

The membership of TY Vir to the Kapteyn moving group would lead to an age of $10\text{-}12 \cdot 10^9$ years corresponding to the late halo population.

If we adopt an average absolute magnitude $M_v = -1.2$ (Eggen, 1978), our value of T_{eff} from the above analysis and evolutionary tracks (Vandenberg, 1983) give the same age of $10 - 12 \cdot 10^9$ years. Note that the Kapteyn's star (HD 33793) has been analyzed in detail by Mould (1976) with $\Theta_{eff} = 1.43$, log g = 4.87 and $[Fe/H]_{\Theta} = -0.5 \pm 0.3$. This metallicity is close to our determination for TY Vir. Another star of the group, HD 44007 has been also analyzed in detail by Proust (1984) with a deficiency $[Fe/H]_{\Theta} = -0.65$. From the point of view of the chemical composition, this group is real. Carrying on further these arguments would lead to the idea that stars like TY Vir could be escaped from globular clusters (Peebles, 1966). However a large increase of detailed analyses of stars like TY Vir as a function of phase will be a powerful tool : i) in the understanding of the variability processes and ii) for our understanding of the galactic structure and evolution.

DOMINIQUE PROUST
Observatoire de Meudon
92195-MEUDON FRANCE

References:

Bell, R.A., Eriksson, K., Gustafsson, B., Nordlund, A. : 1976, Astron. Astrophys, Suppl. Ser., 23, 37
Beyer, M.: 1937, Astron. Nach., 263, 54.
Eggen, O.J.: 1961, Roy, Obs. Bull., No. 29.
Eggen, O.J.: 1978, Astrophys, J., 221, 881.
Gustafsson, B., Bell, R.A., Eriksson, K., Nordlund, A.: 1975, Astron. Astrophys., 42, 407.
Johnson, H.L.1966, Ann, Rev. Astron. Astrophys., 4, 193.
Kukarkin, B.V., Kholopov, P.N., Fedorovich, V.P., Frolov, M.S., Kukarkina, N.P., Kurochkin, N.E., Medvedeva, G.L., Perova, N.B., Pskovsky, Yu, P.: 1976, Third Supplement to the third edition of the General Catalogue of Variable Stars, Moscow.
Leep, E.M., Wallerstein, G. : 1981, Mon. Not, Roy. Astron. Soc., 196, 543
Luck, R.E., Bond, H.E. : 1985, Astrophys. J., 292, 559.
Mould, J.R. : 1976, Astrophys, J., 210, 402.
Preston, G., Wallerstein, G. : 1963, Astrophys. J., 138, 820
Proust, D., Foy, R. : 1986, Astron, Astrophys., in press.
Proust, D. : 1984, Thesis, Observatoire de Meudon.
Peebles, P.J.E. : 1966, Astrophys. J., 146, 543.
Vandenberg, D. : 1983, Astrophys. J. Suppl. Ser., 51, 29.