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PHOTOGRAPHIC OBSERVATIONS OF THE NEWLY DISCOVERED X-RAY EMITTING DWARF NOVA 1E 0643.0 - 1648

The hard X-ray source 1E 0643.0 - 1648 has been discovered with the Einstein Observatory and identified with a bright uncatalogued variable star 9'south of Sirius (Chlebowski et al. 1981).

I observed the star on about 130 plates of the Sonneberg field iota CMa. In maximum brightness the star is also visible on good sky patrol plates.

From its optical behaviour the star seems to be a normal dwarf nova. The outbursts recur approximately every 15 days, which is consistent with the visual observations by the AAVSO (Chlebowski et al. 1981).

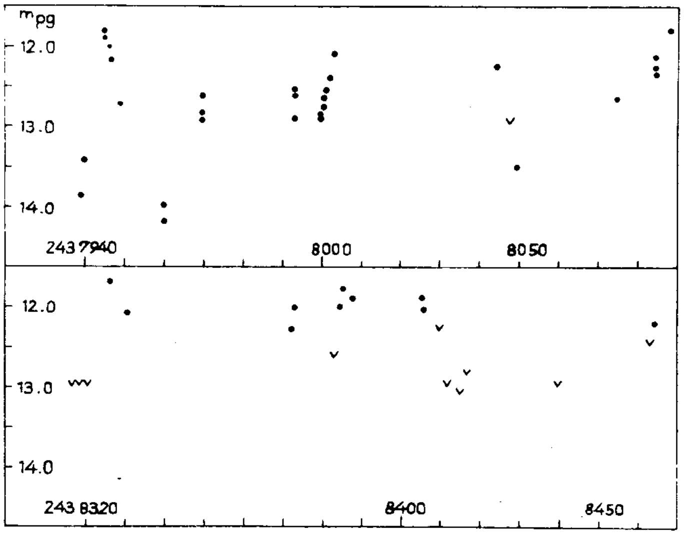

Figure 1

Two intervals well covered by observations are shown in the figure.

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Reference:

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SEVEN COLOUR PHOTOELECTRIC PHOTOMETRY OF THE RED VARIABLE GLIESE 83.3

Recently Olâh (1980) announced that the red star Gliese 83.3 (HD 12208=V 598 Cas) changes its light with a period of 2.825 days and an amplitude of about $0\overset{m}{.}12$ in V and B. Determined previously, the spectral type of the star was K5V and therefore its classification as BY Dra type variable seemed naturally. However, later Bopp (1980) challenged the spectral classification. He found a spectral type M3-4III for the star and suggested further photoelectric observations because here one is confronted by a unique case when M-type giant changes light with unusually short period.

We had opportunity to observe the star photoelectrically in the Vilnius seven-colour photometric system UPXYZVS (see description of the system by Straižys and Sviderskiene (1972)). Our observations have been carried out on 12 nights during September, 1980 on the 48 cm reflector at Mt. Maidanak (Uzbekhian SSR). The variable was measured relative to the nearby G8III comparison star HD 11865, already used by Olâh. Corrections due to difference in air mass and spectral type between the comparison star and the variable are negligible. Determined magnitudes of Gliese 83.3 are presented in the following table, where the corresponding effective wavelength in microns is also indicated for each passband:

J.D.	U	P	X	Y	Z	V	S
2444000+	0.34	0.37	0.40	0.47	0.52	0.54	0.66
485.35	-	-	10.64	8.80	7.99	7.47	6.18
487.35	-	-	10.66	8.81	8.00	7.48	6.20
488.28	-	-	10.65	8.82	8.01	7.49	6.20
489.33	13.11	12.08	10.75	8.85	8.03	7.51	6.21
490.34	13.15	12.12	10.74	8.83	8.03	7.49	6.22
493.33	13.15	12.12	10.71	8.83	8.02	7.50	6.21
494.39	13.20	12.14	10.74	8.89	8.01	7.50	6.20
495.30	13.22	12.16	10.73	8.82	8.02	7.50	6.20
497.39	13.20	12.12	10.74	8.84	8.03	7.49	6.20
499.36	13.24	12.16	10.76	8.85	8.04	7.51	6.22
500.40	13.27	12.19	10.79	8.86	8.06	7.54	6.24
502.37	13.23	12.18	10.76	8.85	8.05	7.52	6.22

Evaluated from repeated measures, errors are $0\overset{m}{.}02$ for the colour U and no greater than $0\overset{m}{.}01$ for the other colours. Its should be noted that magnitude V in the Vilnius system is practically equivalent to such one in Johnson's UBV system. The range in light variability, we have found, is from $0\overset{m}{.}06$ in the red colours to $0\overset{m}{.}13$ in the ultraviolet. Our measures contain no clear evidence for some several-day periodicity, rather the patterns of light curves bear more resemblance to small amplitude irregular variability, so common among early M-type giants.

In the Vilnius system one has possibility from reddening invariant combinations of colour indices to determine the spectral type and the absolute magnitude of stars. From our observations we have found for Gliese 83.3 spectral type M3.5 and $M_V = -1\overset{m}{.}1$ (in Schmidt-Kaler's calibration of absolute magnitudes). Though being close to the galactic plane ($b=0\overset{\circ}{.}16$) the star has small reddening $A_y=0\overset{m}{.}15$. So in agreement with Bopp's conclusion the variable indeed is a giant, not a dwarf and as having distance 480 pc the star should be cancelled from Gliese's catalog of nearby stars.

We want to conclude with notice that to get ultraviolet colours free from contamination one must observe the variable through small diaphragm, for the variable has a faint ($V\sim12^{m}$) blue companion, situated at north, 19" apart.

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ON THE LOCATION OF NOVA CORONAE AUSTRINAE 1981

In a recent communication Caldwell (1981) proposed, on the basis of U, B, V, R, I photometry of the outburst, that the distance to this nova ought to be of the order of 8 kpc., putting the object on the near side of the galactic bulge. This note points out that this outburst could well have happened on the far side of the bulge with respect to the Sun.

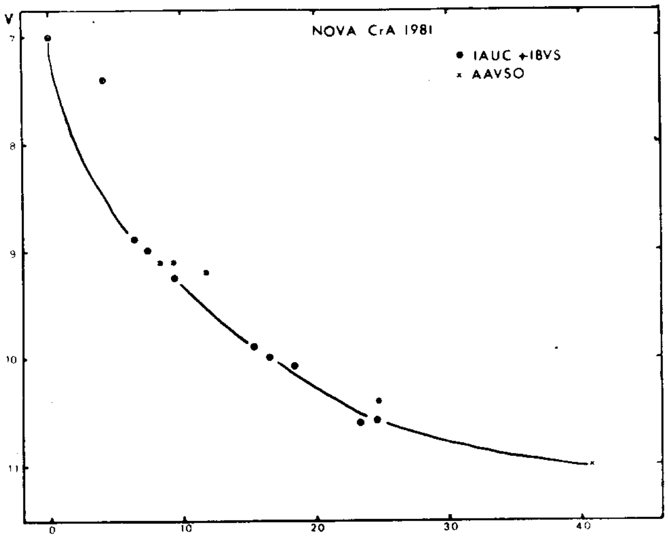
Two additional pieces of evidence should be considered when trying to understand the location of the present outburst. Firstly, stars from Klare and Neckel (1977) within 5° from the nova position, have $A_V \cong 0.3$ while being at an average distance to 500 pc. Secondly, at the accurate position given by Gilmore (1981) there is no image brighter that $m_r \cong 19$ on the red extension of the Palomar Sky Survey.

Brosch (1981) has shown, from spectrophotometry of the Balmer lines in Nova CrA 1981 one week after its discovery, that the extinction towards the object is $A_V \simeq 1.7$ mag. The line of sight towards the nova leaves the extinction layer of dust in the galactic plane rather quickly, the nova being at $b \cong -14^{\circ}.4$. With this angle a distance of 500 pc. paces out just about one scale height of extinction (Allen, 1973). Therefore most of the extinction towards the nova (1.4 mag. at V) should be produced by material in its "immediate" vicinity. Should the nova be located on the <u>near</u> side of the bulge, the way to produce this effect is by having dust grains near the pre-nova system. This would however have become evident in the measurements carried out by Vrba and Rydgren (1981), as an infra-red signature of the outburst. The second obvious possibility is that the nova was located beyond the galactic bulge, and then material in the bulge would be responsible for the additional extinction.

A simple exercise is characterizing the outburst points towards a remarkable similarity to Nova Cygni 1975 (which has been remarked also by

Busko et al., 1981), and to CP Pup. The points in common are, among others the velocity of ejection ($2.2.\ 10^{3}$ km.s^{-1}, from the width of the Balmer lines), the smooth and fast decline (see Figure 1 and compare with Duerbeck, 1981) and the lower limit of outburst range ($m_{prenova} - m_{max} \gtrsim 12$). The absolute magnitude for both these objects at maximum was brighter than -10. A bright maximum magnitude is obtained also when comparing with data in Duerbeck (1981). The light curve of the present outburst is clearly of his type A, implying that the nova belongs to his group I. The objects in this group have an absolute magnitude at maximum of $M_V = -9.4 \pm 1.0$, implying a distance of 9 ± 5 kpc.

Adopting an absolute magnitude of -10. at maximum for Nova CrA 1981 produces the following distance estimate:



Time after discovery (days)

Figure 1

$$D = \mathrm{dex}\left[\frac{m - M}{5} - \frac{A_V}{5} + 1\right] = 12\ \mathrm{kpc} \quad .$$

This puts the object in the galactic bulge, on the far side from the Sun, and makes it simpler to obtain the required amount of extinction, in this case from bulge material.

Thus a location behind the galactic bulge is not inconceivable and at least as easy to explain as the nova being in front of the bulge. The final settlement of this question shall however rest until a nebular parallax to the nova will be measured.

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NOUVELLE RECHERCHE DE PÉRIODES D'ÉTOILES Ap OBSERVÉES À L'ESO-VI

Une mission de 24 jours à l'ESO en décembre 1980 nous a permis d'étudier les variations photométriques de quelques étoiles Ap supplémentaires. Les mesures (une bonne trentaine par étoile sauf un peu moins pour les deux dernières) et les réductions ont été faites comme lors des missions précédentes (cf. IBVS 1824 et les précédents qui y sont cités, ainsi que l'article d'Astron. & Astrophys. Suppl. qui y est indiqué en référence). La recherche des périodes, par la méthode développée par l'un de nous, donne les résultats suivants. (Pour la première étoile, la grandeur réelle de la variation est 1,36 fois le résultat brut indiqué, car la lumière d'un compagnon, qui n'est qu'à 1", tombait en même temps dans le diaphragme du photomètre).

Étoile	type spectral	période (j)	grandeur approx. de la variation (mag.)			
			y	b	v	u
HD 27463=28G.Ret	A0pEuCr	2,833±0,010	0,015	0,024	0,011	0,034
HD 32966=BD-14°1045	B9pSi	3,095±0,015	0,105	0,131	0,150	0,174
HD 34631=GC6482	B9pSi	2,200±0,005	0,072	0,062	0,038	0,079
HD 41089=GC7626	B9pSrEuCr	1,376±0,004	0,032	0,037	0,038	0,052
HD54118=27G.Car	A0pSi	3,275±0,015	0,026	0,044	0,040	0,045
HD 56350=GC9613	A0pEuCrSr	1,904±0,005	0,023	0,041	0,038	0,060
HD 61966=HR2971	B9pSi	voir texte ci-dessous				
HD 66624=246G.Pup	B9pSi	2,007±0,009	v. texte ci-dessous			

La variation de l'avant-dernière étoile, HR 2971, est extrêmement grande, mais sa période, 0,9977j±0,0008j, étant pratiquement égale à 1 jour sidéral, toutes les mesures tombent dans un intervalle de phase très limité, moins de P/4. La partie observée de la variation est à peu près rectiligne; aucun extremum n'apparaît dans cet intervalle ou ne s'annonce dans son voisinage. Etant donné que cette partie ne couvre qu'un quart de la période indiquée ci-dessus, la véritable période de cette étoile peut en réalité être égale à 1/2 ou même, moins probablement, 1/3 de cette valeur. De toute façon, ni le maximum ni le minimum n'étant atteint par les observations faites, les écarts extrêmes obtenus pour y, b, v et u ne donnent que des limites inférieures aux grandeurs des variations dans les différentes couleurs : on peut seulement dire qu'elles sont >0,126, >0,183, >0,286, >0,567 et >0,178 mag. respectivement pour y, b, v, u et c_1. Ceci est tellement grand, surtout en u, qu'on peut douter que l'explication généralement avancée pour les variations de luminosité des étoiles Ap suffise dans ce cas-ci. Nous espérons faire d'autres mesures de cette étoile en janvier 1982.

Un effet analogue se présente pour la dernière étoile, 246G.Pup : sa période est tellement proche de 2j que toutes les mesures tombent dans deux intervalles étroits de la phase : celles des nuits paires dans l'un et celles des nuits impaires dans l'autre. Ceci est semblable à ce qui s'est produit pour α Dor (fig.5 de Astron. & Astrophys. Suppl. 44, 23) lors d'une autre mission : pour cette étoile dont la période est très proche de 3j, toutes nos mesures tombaient dans trois intervalles assez étroits de la phase. La variation complète de 246G.Pup n'est donc pas déterminée à partir des seules mesures de décembre 1980; comme pour l'étoile précédente, on peut seulement donner une limite inférieure à la grandeur de cette variation : >0,022, >0,029, >0,031 et >0,045 mag. respectivement pour y, b, v et u. Nous espérons aussi observer à nouveau cette étoile en janvier 1982.

La variation de HD 32966, bien que beaucoup plus petite que celle de HR 2971, est grande pour une étoile Ap. Parmi les Ap dont les variations de luminosité en uvby sont connues, cette étoile est une de celles qui varient le plus.

Les formes des courbes de variations obtenues sont, comme d'habitude, très diverses : des courbes presque harmoniques pour 28G.Ret et HD 32966 (avec une variation en opposition de phase pour v dans le cas de la première étoile), un maximum secondaire, surtout en u, pour HD 34631, un important minimum secondaire pour HD 56350, profond surtout en u aussi, enfin des courbes assez dissymétriques pour HD 41089 et surtout 27G.Car, avec pour ces deux étoiles, un très bref petit minimum à une phase déterminée comme nous avons déjà constaté notamment pour 25 Sex, GC 17353 et HD 83625.

L'une des étoiles de comparaison utilisée, HD 33331 = GC 6282, de type A0, a été trouvée variable avec P = 1,144j ± 0,004j. C'est peut-être une étoile Ap. Le catalogue HD remarque à son sujet "line 4026.3 is fairly well marked".

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NOTE ON THE PERIOD OF THE W UMa STAR AH Vir

AH Vir belongs to Binnendijk's subclass "W" of the W UMa stars. It is well known to have a variable lightcurve and a variable period (Bakos, 1977). The most recent period of Bakos is

$$t_{\text{Min I}} = 2442155\overset{d}{.}6164 + 0\overset{d}{.}40753126\cdot E \ .$$

The latest published photoelectric observations are given by Hoffmann (1981) made in March 1977. He determined four minima items which showed that the last period of Bakos was still valid.

On April 14./15., 1980, we made 80 V and 77 B photoelectric measurements with the 75 cm telescope of the Wilhelm Foerster Observatory Berlin and an 1P21 photomultiplier with usual Schott filter combinations for the UBV system. With the Pogson method we determined one primary minimum :

V	2444	$344\overset{d}{.}4535$	$\pm\ 0\overset{d}{.}0009$	(hel.)
B		344.4510	$\pm$ 0.0010	

Using the mean value from the both colours and Bakos' above given elements, we derive an O-C value of $O-C = -\ 0\overset{d}{.}0146$ (E=5371). This large O-C value indicates that the orbital period of AH Vir has changed again between 1977 and 1980.

The only other source of published minima times since Hoffmann's observations are the BBSAG-Bulletins No.31-53, where one photoelec-

tric and 22 visual minima determinations are given. From the minima items given by Bakos, Hoffmann, in the BBSAG-Bulletins and in this notice, one can estimate that the period change took place around May 1979. As a first approximation of the new period value, based strongly on the lower accurate visual minima determinations, we estimate $P=0^{d}.40751314$. Notice that the trend of increasing periods found by Bakos has stopped and the period decreased.
Our observations cover about 40% of the lightcurve and show no hints of lightcurve activities during Max.II and the primary minimum. $\Delta m = m_{MinI} - m_{MaxII}$ is found to be:

$$\Delta m\ (V) = 0.58 \pm 0.02$$

$$\Delta m\ (B) = 0.64 \pm 0.02\ .$$

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UBVR PHOTOMETRY OF UV Psc

As part of an on-going program of UBVR photometry of RS CVn binaries, we have observed the short-period system UV Psc (+6°189) several times in 1979 and 1980. The observations were made with the University of New Mexico's 61-cm Capilla Peak Observatory telescope. A photon-counting system using a cooled EMR 641A phototube was employed along with KPNO filters; the R filter was not available until fall 1980. The star +6°185 (SAO 108761) was used as the comparison star.

The results of these observations are shown in Figure 1-4. The statistical error of any single point is on the order of ±0.02 magnitude. The phases were calculated using HJD = 2443463.3493 + 0.861046 E (Oliver, 1974; IBVS 1415).

Very few observations of UV Psc have been published to date. Popper (1969) noted that UV Psc had H and K emission from both components. He classified the system as being G2. Oliver (1974) observed UV Psc photometrically and found that the light curve of UV Psc did not have any large asymmetries. Also, Oliver presented a light curve made by Carr in 1968. Oliver stated that his light curve was very similar to that of Carr's, with the exception of a depression in Carr's curve around 0.75 phase. The similarities between the light curves of Oliver and Carr indicated that UV Psc had a rather consistent light curve.

Our light curves appear quite different from those of Oliver and Carr. First, they do <u>not</u> show any evidence for an asymmetrical distortion wave in the light curve of UV Psc. Second, our observations <u>do</u> show that UV PSc is a very active system that undergoes radical changes in its light curve. At 0.0 phase, there is evidence for a large change in the depth of the primary minimum between the observations made on 12/16/1979 and those made on 10/8/1980. The difference in depth is greater at longer wavelengths. Also, there is a very large depression of the light curve just after the primary minimum at 0.1 phase on 12/16/1979. This depression is deeper at longer wavelengths. On 11/2/1980, the light

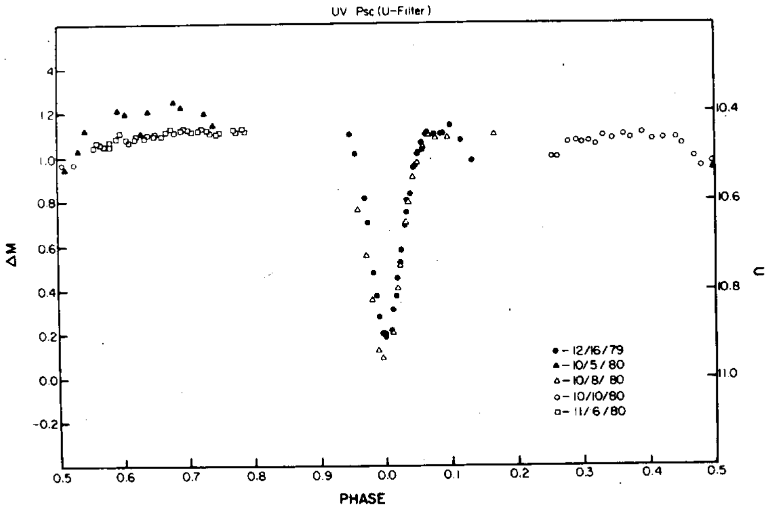

Figure 1

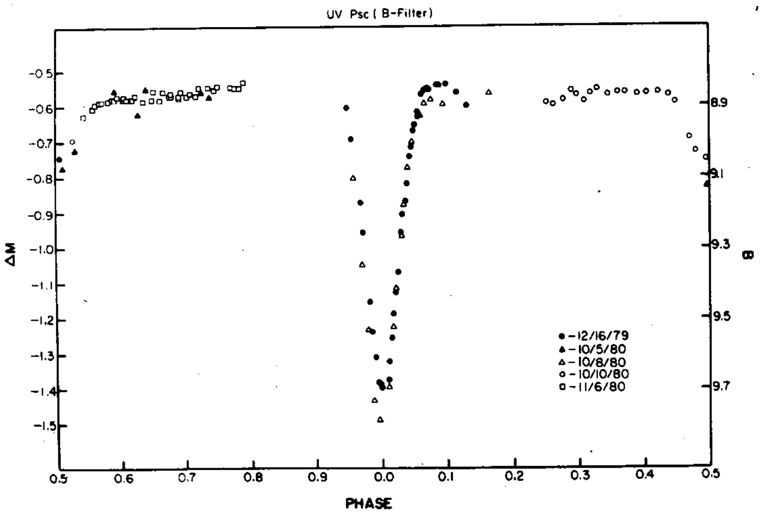

Figure 2

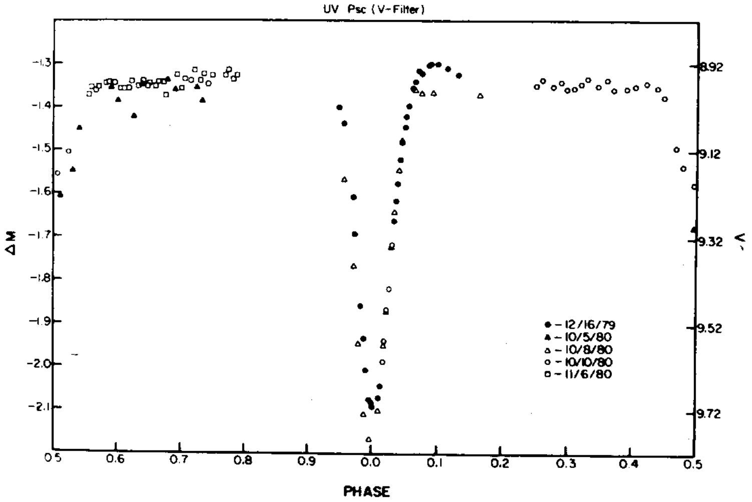

Figure 3

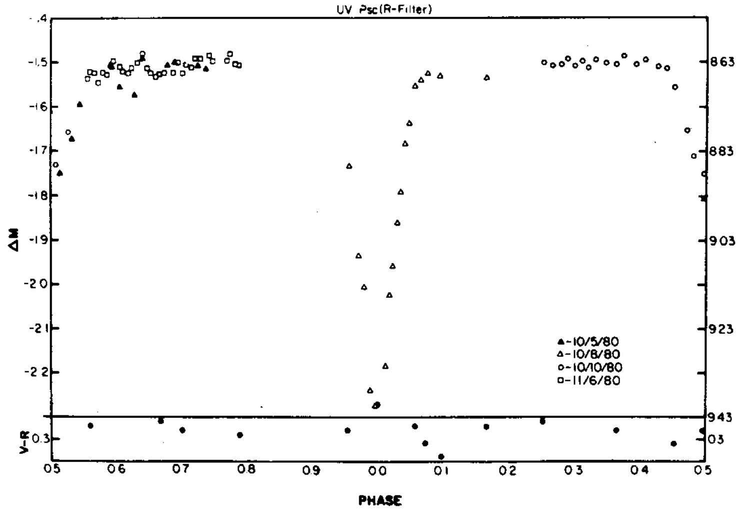

Figure 4

curve was depressed, only in the U, after the secondary minimum. Like the primary minimum, the secondary minimum increases in depth with longer wavelength.

We plan to continue our observations of UV Psc to fill the gaps in our light curves and to look for more unusual short-term features in them.

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V 68 IN THE GLOBULAR CLUSTER M 3 (NGC 5272) IS A DOUBLE MODE RR LYRAE TYPE STAR

We failed to confirm Szeidl's (1965) 10.9 day Blazhko effect period of V 68 in M 3 by our 437 observations based on Moscow collection of plates. These observations show sometimes the full variation of amplitude of the star from night to night. We have tested these observations on double mode pulsation using the theoretical suggestion by Christy (1966) that the beat period in this case is equal to four first overtone periods. This test gave positive result and only small correction was made to obtain the precise beat period $\Pi = 1^{d}\!.395426$. Final value of the fundamental period P_F was obtained from the formula:

$$\frac{1}{P_F} = \frac{1}{P_H} - \frac{1}{\Pi}$$

where $P_H = 0^{d}\!.3559732$ - the first overtone period derived by Szeidl (1965).

We represent our observations in Figure 1 like it was made by Stobie (1970) and Efremov and Kholopov (1975) for double mode cepheids VX Pup and V 367 Sct. The upper light curve in Figure 1 is constructed with elements by Szeidl the initial J.D. moment of which is corrected:

Max. J.D. hel. = 2425000.189 + $0^{d}\!.3559732 \cdot E$

The deviations from mean light curve excluding several points are well represented by the following elements:

Max. J.D. hel. = 2435602.441 + $0^{d}\!.4778805 \cdot E$

The middle light curve in Figure 1 is the "pure" curve for fundamental mode oscillation. The less dispersed "pure" first overtone light curve can be obtained by subtracting the mean deviation light curve from original observations. The lower light curve in Figure 1 represents our observations with elements by

Szeidl excluding fundamental mean periodic variation. Scattering of light curves shows that the oscillations are not additive in the observed light curve but suppress one another and have lower amplitudes in anti-phase.

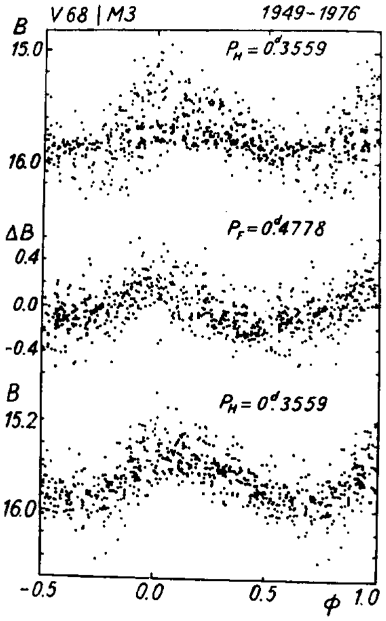

Figure 1

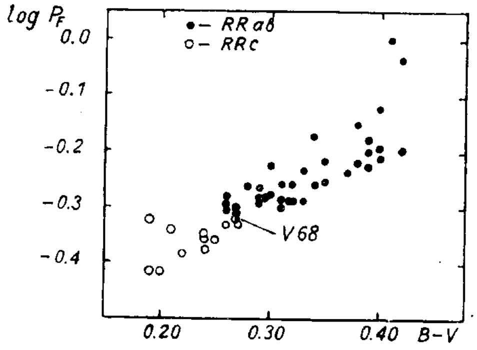

Figure 2

Amplitudes of oscillations are $0\overset{m}{.}42$ B in the fundamental and $0\overset{m}{.}45$ B in the first overtone.

To determine the location of the star in the instability strip we have used P,V observations by Roberts and Sandage (1955) and their relation with B,V magnitudes by Sandage (1959). The following colour indices were obtained: $P - V = 0.08$ and $B - V = 0.27$. This puts the star just on the boundary between fundamental and first overtone regions. The regions in M 3 occupied by variable stars oscillating in different modes do not overlap (Figure 2). The first overtone periods of RRc stars were transformed in Figure 2 to fundamental ones using the formula $P_F = 1.340\,P_H$ to remove the gap between first overtone and fundamental pulsators in the diagram.

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HD 200356: A POSSIBLE NEW δ SCUTI STAR

Since one third of the stars that lie within the limits of the instability strip are pulsators, (Breger, 1979) whenever an observation of a known variable star is made, a systematic search for detection of new variable stars is carried out (Peniche et al. 1980, Peniche and Peña 1981). In this case, together with the observation of the δ Scuti star HR 8006, the star HD 200356 (BD-1°4098) was tested for variability since its spectral type indicated that it might have features of a δ Scuti pulsator; Table I presents a summary of the characteristics of the observed stars.

Table I

Star	m_V	Spectrum	α(1950)	δ(1950)
V=HR8006	6.6	F0	$20^h52^m33^s$	$-1^\circ33'54''$
HD 200356	7.3	F2	$21^h\ 0^m32^s$	$-1^\circ30'24''$
C_1=BD-1°4074	8.0	F5	$20^h52^m21^s$	$-0^\circ53'39''$
C_2=BD-1°4073	8.0	F5	$20^h52^m19.1^s$	$-1^\circ34'\ 0''$

The photometric observations were made with the 85 cm telescope at the San Pedro Mártir Observatory, Mexico, a refrigerated 1P21 photomultiplier and Johnson's V filter were utilized. The sequence C_1, V, C_2 was followed uninterruptedly each night, with observations of HD 200356 every two cycles. A single observation consisted of at least five ten second integrations of each star and two of the sky.

HD 200356 was observed during the nights of September 28th, 29th, 30th and October 1st, 1980. Figure 1 shows the result of subtracting the mean of the magnitude of the comparison stars (interpolated at the time of the observation of the variable)

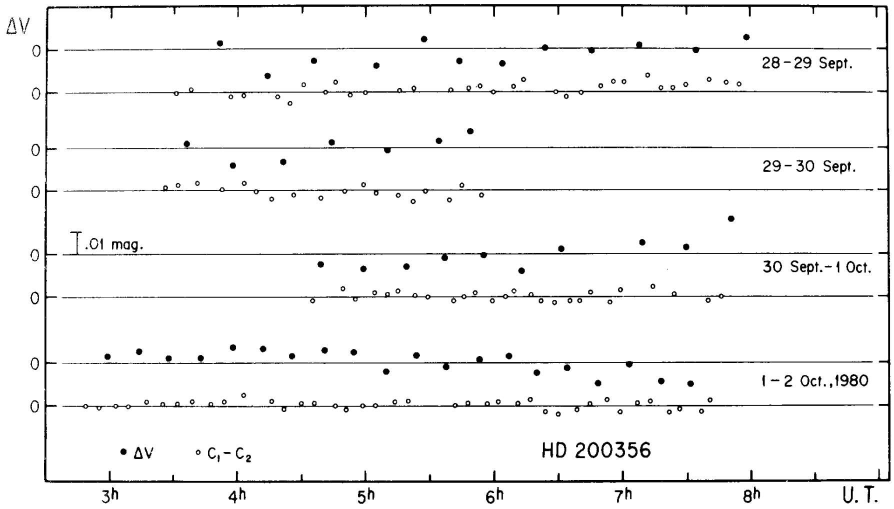
ΔV
0
0
28-29 Sept.
0
0
29-30 Sept.
.01 mag.
0
0
30 Sept.-1 Oct.
0
0
1-2 Oct.,1980
• ΔV
∘ C₁-C₂
HD 200356
3h
4h
5h
6h
7h
8h
U.T.

Figure 1

from the magnitude of HD 200356, along with the sequence of the difference in magnitudes of the comparison stars for each night. The probable error in a single observation, estimated from the comparison stars is ±0.003 mag., time is reported in universal time and its precision is of 1 minute.

It is clearly visible from the figure that, although the amplitude of the variation of HD 200356 is rather small (0.01 mag.) it is not a constant star. On each night the calculated standard deviation of the difference in magnitudes of the comparison stars is about one half that of the magnitude of the variable star, moreover, since the magnitude of the comparison stars (8.0) is fainter than the magnitude of HD 200356 (7.3) the variations seen in the light curves are real and not due to the atmospheric conditions.

At this moment nothing can be said about the period of this star, but it is on the order of hours. Hence, due to the characteristics shown (spectral type of F2, low amplitude of variation and a short period on the order of hours) we might conlude that this star is probably a δ Scuti pulsator; of course more detailed observations are needed in order to determine its periodic behaviour.

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V 1334 Cyg

The Cepheid HR 8157 =V 1334 Cyg, discovered by Millis (1969), was observed photoelectrically on the nights October 10, 13 and 20, 1980 with the UBV photometer described by Piccioni (1972) mounted on the 60 cm telescope of the Bologna Observatory.

Tau Cygni and Sigma Cygni were used as comparison stars, data about these stars are reported in Table I. Tau Cygni is variable but its range ($0\overset{m}{.}02$) is much smaller than V 1334 Cygni's ($0\overset{m}{.}20$) (Pande 1960, Pant et al. 1968, Millis 1968, Bartolini and Dapergolas 1980).

Table I

Star	Sp	V	B-V	U-B	Source
Sigma Cyg	B9 Iab	4.23	.13	-.39	Iriarte et al. (1965)
Tau Cyg	F0 IV	3.71	.41	.02	This paper

The mean UBV magnitudes of V 1334 Cygni are reported in Table II.

Table II

J.D.-2444000	N	Phase	V	B-V	U-B
523.38	11	.859	5.810	.476	.175
.46	6	.882	5.804	.476	.166
526.33	8	.744	5.873	.496	.165
.36	11	.753	5.865	.489	.173
.43	12	.774	5.856	.489	.175
534.30	16	.135	5.822	.489	.178
.38	13	.159	5.830	.490	.177
.44	10	.177	5.834	.491	.176

Standard error of the mean is about $0\overset{m}{.}005$, but in addition systematic calibration errors of $0\overset{m}{.}03$ could arise from the transformation into the UBV system.

By comparing the present observations with Millis' observations, we determined the time of maximum of light: JD 2444523.85 ±

$0\overset{d}{.}08$. Taking into account all the times of maximum (Table III) we conclude that the period is constant. The residuals have been

Table III

J.D.Obs.Max.	E	O - C	Source
2440124.533	0	.00	Millis (1969)
2441760.90	491	-.05	Szabados (1977)
2443700.63	1073	-.01	Percy et al. (1979)
2444523.85	1320	.00	this paper

computed with the formula:

$$\text{Hel. J.D. Max.} = 2440124.533 + 3\overset{d}{.}332816 \cdot E$$

in excellent agreement with the values published by Henden (1979).

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THE DELTA SCUTI STAR BETA LEONIS

The star Beta Leonis, included in Frolov's (1970) list of probable Delta Scuti stars, was observed photoelectrically in the nights February 7,8 and 24, 1980 with the photometer described by Piccioni (1972) mounted on the 60 cm telescope of the Bologna Observatory.

HR 4535 and HR 4531 were used as comparison stars, but the latter is probably a slowly variable star, because in all the colours the mean differences in magnitudes HR 4531-HR 4535 and HR 4531-Beta Leo are both variable with an amplitude of $0^{m}.03$, while the mean differences Beta Leo-HR 4535 are practically constant.

Blue and yellow instrumental differences of magnitudes, presented in the figures, show on February 8, 1980 fast light variations with an amplitude of about $0^{m}.025$ in a time scale of the order of $0^{d}.05$.

The spectral type A3V and Mv=2.0 given by Eggen (1963) put this star in the H-R diagram at the left border of the Delta Scuti instability strip (Breger 1979, Fig.2.).

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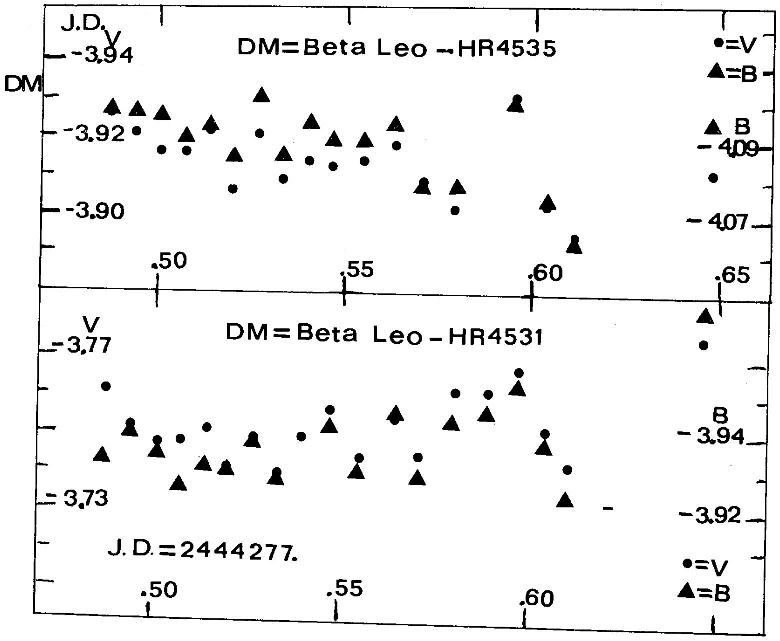
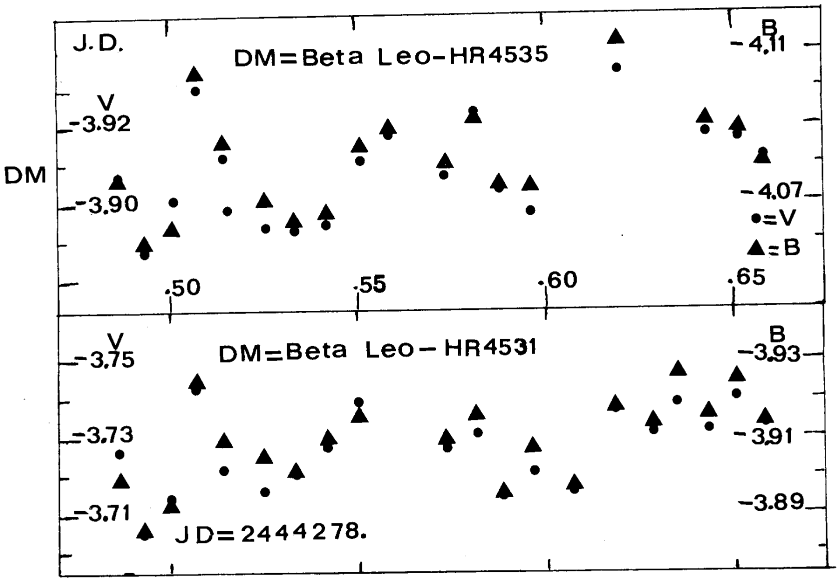

J.D.
DM
DM=Beta Leo – HR4535
V
-3.94
-3.92
-3.90
•=V
▲=B
B
-4.09
-4.07
.50
.55
.60
.65
DM=Beta Leo - HR4531
V
-3.77
3.73
B
-3.94
-3.92
J. D.=2444277.
.50
.55
.60
•=V
▲=B

Figure 1

Figure 2



J.D.
DM=Beta Leo-HR4535
V
-3.92
DM
-3.90
.50
.55
.60
.65
B
-4.11
-4.07
●=V
▲=B
V
-3.75
DM=Beta Leo-HR4531
-3.73
-3.71
JD=2444278.
B
-3.93
-3.91
-3.89

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PHOTOELECTRIC OBSERVATION OF δ CAPRICORNI

δ Cap has been known as a single-lined spectroscopic binary of metallic-line features. The eclipsing nature of this system was first announced by Eggen (1956) from his V_E observation, which indicated a depth of $0\overset{m}{.}16$ in visual region for the primary minimum. Wood and Lampert (1963) also observed the primary eclipse photoelectrically. However, the secondary minimum has never been published so far.

BV observations were made on thirteen nights in 1977-80 with the 8-inch refractor at the Education Centre of Kanagawa Prefecture, Japan. The photelectric photometer was furnished with a 1P21 photomultiplier tube and two colour filters, Schott BG12+GG13 for B and Schott GG41 for V. γ Cap was used as the comparison star throughout the course of the observations. This comparison star is the same as previously used by Eggen and Wood and Lampert.

The present observations cover the primary minimum and touch the mid-secondary minimum. All the results of observations expressed in $m_V - m_C$ are given in Table I, where the phases are calculated with

$$\text{Prim. Min.} = \text{JD } 2435656.911 + 1.022768 \text{ E},$$

which has been taken from the General Catalogue of Variable Stars (1969). The observations are also plotted in Figure 1.

The depths of both minima are deduced as shown in Table II. The observed epoch of the mid-eclipse is JD(Hel) 2443832.924, which gives + $0\overset{d}{.}006$ (E=7994) for O-C residual from the above ephemeris. The light variation in B outside eclipses can be expressed by $\ell = 0.9811 - 0.0190 \cos 2\theta$. From the coefficient 0.0190 for the Cos 2θ term, the ellipticity of the components can be deduced to be Z = 0.037 according to the procedure of Russell and Merrill (1952).

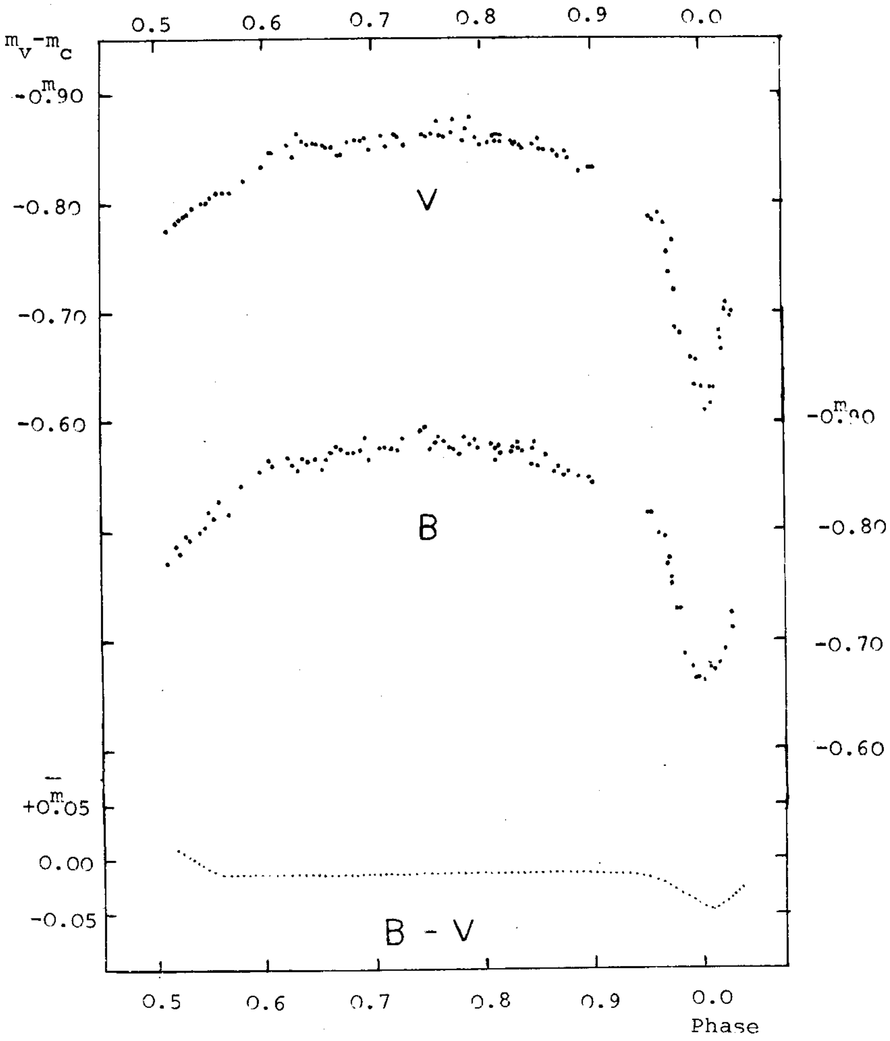

Figure 1

Table I

BV Photoelectric Observations of δ Capricorni

Date	Hel. JD 2440000+	ΔV	ΔB	Phase
1977				
Sep.20	3407.0590	-0.853	-0.865	0.6207
	.0636	-0.843	-0.860	0.6252
	.0684	-0.838	-0.855	0.6299
	.0725	-0.856	-0.867	0.6339
	.0769	-0.854	-0.865	0.6382
	.0814	-0.855	-0.866	0.6426
	.0861	-0.854	-0.867	0.6472
Nov.27	3474.9494	-0.785	-0.815	0.9494
	.9012	-0.783	-0.815	0.9527
	.9082	-0.790	-0.797	0.9595
	.9116	-0.780	-0.795	0.9629
	.9155	-0.756	-0.770	0.9667
	.9196	-0.736	-0.748	0.9707
Dec.01	3478.8796	-0.854	-0.876	0.8425
	.8827	-0.854	-0.879	0.8456
	.8857	-0.859	-0.860	0.8485
	.8883	-0.850	-0.860	0.8510
	.8910	-0.848	-0.868	0.8537
	.9001	-0.847	-0.854	0.8626
	.9033	-0.842	-0.860	0.8657
	.9192	-0.847	-0.850	0.8724
02	3479.8848	-0.854	-0.877	0.8253
	.8886	-0.854	-0.880	0.8291
	.8918	-0.852	-0.875	0.8322
	.8993	-0.851	-0.873	0.8395
	.9026	-0.854	-0.862	0.8427
03	3480.8938	-0.855	-0.876	0.8119
	.8979	-0.856	-0.867	0.8159
	.9058	-0.857	-0.872	0.8236
1978				
Oct.23	3804.9484	-0.852	-0.855	0.6527
	.9522	-0.850	-0.863	0.6564
	.9562	-0.851	-0.871	0.6603
	.9617	-0.843	-0.876	0.6657
	.9670	-0.845	-0.875	0.6708
	.9722	-0.856	-0.871	0.6759
	.9778	-0.856	-0.872	0.6814
	.9872	-0.857	-0.874	0.6856
	.9868	-0.859	-0.885	0.6902
	.9917	-0.850	-0.866	0.6950
Nov.20	3832.8859	-0.736	-0.775	0.9682
	.8911	-0.721	-0.757	0.9733
	.8971	-0.681	-0.729	0.9792
	.9057	-0.660	-0.687	0.9876
	.9102	-0.657	-0.665	0.9920
	.9166	-0.632	-0.664	0.9982
	.9236	-0.630	-0.674	0.0052
Dec.01	3843.8678	-0.862	-0.876	0.7057
	.8719	-0.851	-0.877	0.7097
	.8793	-0.861	-0.874	0.7169
	.8828	-0.860	-0.873	0.7203
	.8891	-0.853	-0.882	0.7265

Table I (cont.)

Date	Hel. JD 244000+	ΔV	ΔB	Phase
1979				
Oct.14	4160.9633	-0.862	-0.892	0.7423
	.9665	-0.861	-0.895	0.7454
	.9727	-0.863	-0.876	0.7514
	.9771	-0.876	-0.882	0.7557
	.9807	-0.862	-0.885	0.7593
	.9850	-0.861	-0.881	0.7635
	.9891	-0.864	-0.876	0.7682
	.9929	-0.876	-0.874	0.7712
	4161.0005	-0.857	-0.870	0.7786
	.0046	-0.869	-0.886	0.7826
	.0085	-0.878	-0.880	0.7864
	.0125	-0.858	-0.868	0.7904
	.0170	-0.853	-0.874	0.7949
	.0248	-0.856	-0.872	0.8024
	.0289	-0.862	-0.878	0.8063
	.0325	-0.862	-0.862	0.8099
	.0362	-0.861	-0.878	0.8135
21	4167.8871	-0.776	-0.768	0.5119
	.8951	-0.784	-0.786	0.5197
	.8993	-0.787	-0.779	0.5239
	.9035	-0.800	-0.794	0.5280
	.9076	-0.796	-0.792	0.5320
	.9166	-0.799	-0.798	0.5408
	.9209	-0.800	-0.802	0.5450
	.9248	-0.806	-0.817	0.5488
	.9307	-0.809	-0.812	0.5546
	.9340	-0.810	-0.828	0.5578
	.9434	-0.811	-0.815	0.5670
	.9477	-0.815	-0.825	0.5711
	.9552	-0.821	-0.842	0.5785
	.9716	-0.833	-0.853	0.5945
	.9799	-0.847	-0.864	0.6027
	.9831	-0.846	-0.859	0.6058
Nov.13	4190.8888	-0.610	-0.662	0.0016
	.8929	-0.617	-0.678	0.0056
	.8968	-0.632	-0.673	0.0094
	.9017	-0.674	-0.679	0.0142
	.9057	-0.701	-0.692	0.0181
	.9103	-0.696	-0.724	0.0252
1980				
Sep.29	4512.0103	-0.684	-0.728	0.9746
	.0298	-0.638	-0.663	0.9937
	.0578	-0.665	-0.689	0.0209
	.0633	-0.699	-0.711	0.0264
Oct.04	4517.0235	-0.840	-0.854	0.8761
	.0343	-0.830	-0.858	0.8867
	.0433	-0.833	-0.848	0.8955
	.0477	-0.833	-0.844	0.8998

Table II

Depths of the Minima in BV

	ΔB	ΔV
Primary minimum	0.217	0.147
Secondary minimum	0.114	0.090

I would like to express my hearty thanks to Prof. M. Kitamura of Tokyo Astronomical Observatory for his suggestion of this programme and kind guidance. Thanks are also due to Mr. H.Ogata at Fujisawa Education Office for his encouragement.

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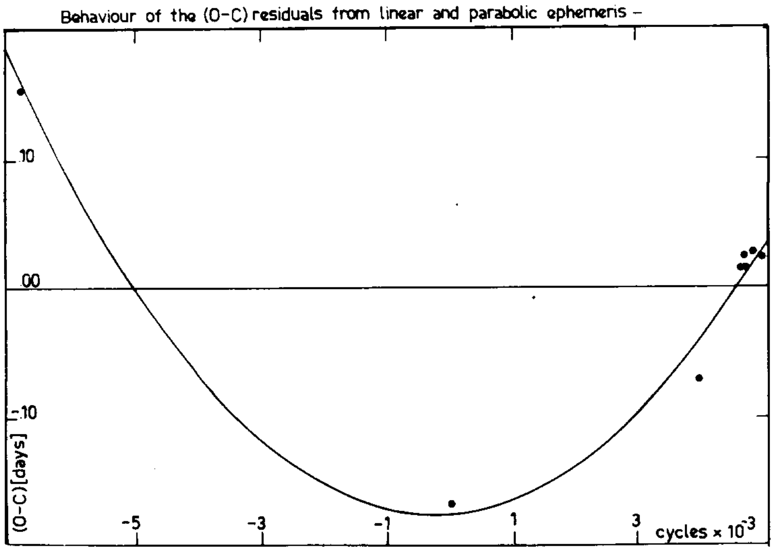
LIGHT ELEMENTS OF W Gru

The variability of W Gru =HV3370= 54.1913= HD 214791= SAO 231251= CoD-44°15009= CPD-44°10254 was discovered by Thome (1900), in the past century when he was observing for the Cordoba Durchmusterung. The first ephemeris for this system was prepared by Miss Leavitt from 6 plates taken in 1902 in the zone defined by Harvard Map 45, she derived a period of $1^{d}.47603$, an Algol-like variability, a maximum magnitude of 9.5 and an amplitude of $0^{m}.5$ (Pickering, 1913). Later W Gru was listed as a dwarf (short period) late type object with no photometric orbit in a work on statistics of eclipsing binaries (McLaughlin, 1927). Further, from 318 Harvard photographic estimates C.Payne Gaposchkin determined a period of $1^{d}.4842609$, the amplitude for Min I of $0^{m}.53$ and a weak secondary minimum of amplitude $0^{m}.06$. In 1953 S. Gaposchkin published a mean photographic light curve and absolute dimensions for this system. Recently Imbert (1974) obtained new absolute elements based on 20 double-lined spectrograms (20 Å/mm) and on the photographic light curve given by Gaposchkin, he was forced to double the period in order to conciliate it with the epochs of maximum radial velocity differences, a fact supported by his visual spectral classification of FG IV for both components.

The present observations involve five times of minimum light in the U,B and V bands made in 1978, 1979 and 1980 at the Bosque Alegre Station of Cordoba Observatory in Argentina and at Cerro Tololo Interamerican Observatory in Chile. The "history" of this system comprises now 11500 cycles.

Individual minima are listed in Table I. The standard errors are given in brackets, they were determined from the light curves on each pass-band. A least squares linear ephemeris using the mean values of the minima in the UBV bands gives:

$$\text{Min I=JD (hel)}\quad 2443781^{d}.5029 + 2^{d}.968521\ E$$
$$\pm.0021 \qquad \pm.000013 \qquad\qquad (1)$$



Behaviour of the (O-C) residuals from linear and parabolic ephemeris –

Figure 1

The minimum epochs obtained by Pickering, Gaposchkin and that found from Imbert's spectroscopic data together with the present minima give the following least squares linear ephemeris:

$$\text{Min I= JD (hel)}\ 2430132^{d}.327 + 2^{d}.9684994\ E$$
$$\pm.024 \qquad \pm.0000054 \qquad\qquad (2)$$

The epochs with their standard errors, the cycles E with their weights and the residuals (o-c) for the ephemeris (2) are listed in Table II. The primed quantities stand for the elements of ephemeris (1).

The trend of the (o-c) residuals from (2) allows to improve (2) with a quadratic term in E. The resulting least squares parabolic ephemeris is:

$$\text{Min I= JD (hel)}\ 2430132^{d}.149 + 2^{d}.9685036\ E + 7^{d}.84\times 10^{-9}\ E^{2}$$
$$\pm.012 \qquad \pm.0000016 \qquad\qquad \pm 0.46\times 10^{-9}$$
$$(3)$$

Table I

Times of Minima

JD (hel) 2440000+

Min	V	B	U
I	3778.53261(17)	3778.53091(26)	3778.52625(105)
I	3781.49871(26)	3781.49921(19)	3781.49701(48)
II	3818.61250(48)	3818.61436(17)	3818.61529(99)
II	4177.80418(19)	4177.80459(43)	4177.80302(28)
I	4517.69474(38)	4517.69469(72)	4517.69353(147)

Table II

Mean Times of Minima

JD (hel) 2400000+	E (w)	E' (w')	(O-C)	(O-C)'
10001.60	-6781.5(1)		0.1514	
30132.156	0.0(2)		-0.1709	
41569.88(55)	3853.0(2)		-0.0749	
43778.5299(33)	4597.0(3)	-1.0(1)	0.0144	-0.0045
43781.4983(12)	4598.0(3)	0.0(1)	0.0113	-0.0046
43818.6141(14)	4610.5(3)	12.5(1)	0.0209	0.0047
44177.80393(81)	4731.5(5)	133.5(3)	0.0223	0.0034
44517.69432(68)	4846.0(5)	248.0(3)	0.0195	-0.0019

Table III

Times of Minima for parabolic ephemeris

JD (hel) 2400000+	E (w)	(O-C)
10001.60	-6781.5(1)	-0.0022
30132.156	0.0(2)	0.0074
41569.88(55)	3853.0(2)	-0.0293
43781.503(02)	4598.0(5)	0.0092

The elements of (3) are presented in Table III, labeled as Table II. As can be seen in Figure 1, where the (o-c) residuals and the parabolic ephemeris are plotted versus cycles, relative to the linear ephemeris, the (o-c) residuals are smaller than in Table II. The period for this system is therefore increasing at a constant rate of 0.083 sec/y.

The light curve of W Gru is not complete for the moment mainly because of the commensurability of the period with the day. The present fractionary observations show the branches of Min I and Min II equal in shape and depth while in the regions out of eclipse the light appears to be constant. Observations are planned in the next season to cover the whole light curve.

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5 Ceti = HR 14 : A NEW AND PUZZLING VARIABLE STAR

We report photoelectric photometry which shows 5 Ceti to be a variable star with an amplitude a bit over $0\overset{m}{.}2$ in V and a period apparently very close to the orbital period of $96\overset{d}{.}41$ determined spectroscopically by Christie (1933). According to the 1964 edition of the Yale Bright Star Catalogue the spectral type is gK2.

Altogether this star was observed on 28 nights in 1979 (between JD 2444138.8 and 2444222.6) and 46 nights in 1980 (between JD 2444445.9 and 2444563.7) using 29 Piscium as the comparison star. The telescope was a 20-inch Cassegrain reflector at the Lines Observatory near Mayer, Arizona equipped with an unrefrigerated 1P21 photomultiplier operated at -900 V.

Nightly means are plotted in the figure, where Δv_0 is differential magnitude in the sense variable minus comparison, corrected for differential atmospheric extinction but not yet transformed to V of the UBV system. Phase in this figure is computed with the ephemeris

$$\mathrm{JD(hel.)} = 2444176.5 + 96\overset{d}{.}41\ n\ ,$$

where the period is the orbital period of Christie (1933) and the initial epoch is a time of primary minimum derived from this photometry. If we consider all of the relevant uncertainties, it appears primary minima are occurring at times of conjunction (with the gK2 star behind).

The fact that 5 Ceti is a spectroscopic binary, the shape of the light curve, and the occurence of minimum light at times of conjunction all suggest that 5 Ceti is an eclipsing binary. The puzzle is that a binary with such a long period can produce a light curve with a W UMa shape. Presumably one (or both) of the two stars is large enough to fill or nearly fill its Roche lobe; this would be so if one (or both) of the stars is as large as $\sim 50\ R_\odot$. Perhaps we should not be so surprised, since the one star seen in the spectrum has been classified a giant. Because that gK2 star is behind at primary minimum, we can say that the other star is cooler (spectroscopically later) than K2.

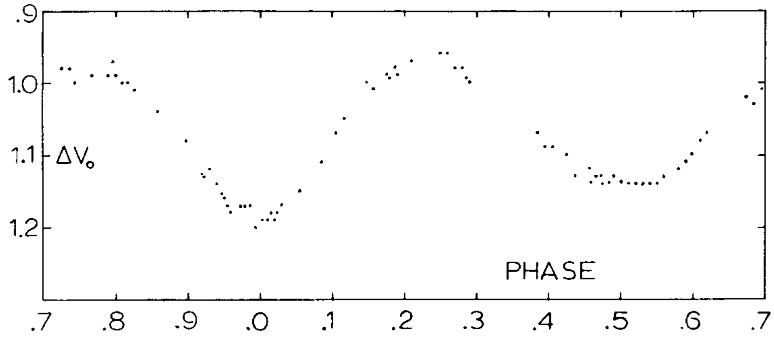

Figure 1

For 29 Piscium the 1964 Yale Bright Star Catalogue gives $V = 5\overset{m}{.}10$. From this we see that 5 Ceti varies between $V = 6\overset{m}{.}1$ and $6\overset{m}{.}3$. Spectroscopists should look for the fainter star in the spectrum, and photometrists should get the complete light curve in other bandpasses, such as B and U and perhaps R. In future photometry a better comparison star might be 4 Ceti. Though much bluer than 5 Ceti (29 Piscium was also), it is much closer in the sky and more nearly the same brightness.

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PERIOD VARIABILITY AND NEW EPHEMERIS OF RU LEPORIS

The eclipsing variable star RU Lep (CoD $-24^{\circ}3651$, CPD -24° 1206, discovery No. 637.1935) was pointed out by Hoffmeister (1935) as a variable star with Algol-type light curve. The first ephemeris based on visual estimates of brightness was published by Kaho (1938). The epoch of his ephemeris is further considered as zero epoch. Kaho gave the ranges of the eclipse D = 7.7, d = 2.4 h. Later he (Kaho 1950) published revised ephemeris based on photographic observations.

One of the authors (ZK) included RU Lep in the list of potentially interesting systems and on 7/8 Jan. 1978 the star was measred photoelectrically with the photometer P7 (Burnet, Rufener 1979) attached to the 40cm Swiss reflector at ESO La Silla, Chile. All measurements were made in the Geneva seven-colour photometric system. The eclipse was not sufficiently covered by observations as it occurred earlier than expected according to the ephemeris. In addition the descending branch of the minimum was influenced by a slight instability in atmospheric transparency and thus the accuracy of the time of minimum is lower than would be under normal conditions. Photometric quality of the night did not satisfy criteria for the normal photometry in the Geneva system but the observations were made differentially and thus the accuracy is reasonable. Standard stars were observed both at the beginning and at the end of the night. The star HD 41490 (CoD $-25^{\circ}2811$) served as comparison star. The measurements were done in the sequence CVCVC.....CVC, C for comparison, V for variable. Both comparison and variable stars were observed again on 15/16 Jan. 1978, a night of normal photometry when RU Lep was outside the minimum phase (0.81). In this way the measurements were tied-in to the Geneva standard photometric system. For details of reduction methods see Rufener (1964), for the properties of the Geneva photometric system see Golay (1980). The new ephemeris based on measurements in filter V of the Geneva system, which is in fact the same as V in the UBV system (Rufener, Maeder 1973), is given in Table I, together with Kaho's two ephemerides. The period of the new ephemeris is calculated from the epoch 3352 (this paper) and from Kaho's epoch 1064 thus representing the mean period between 1947 and 1978. If we use the epoch 0 and 3352 we obtain for the period the value 4.459608. Using this value for P the minimum at epoch 1064 should have occurred at 33313.086 or 24 minutes earlier.

Table I

E	T min		P		Ref.
0	28568.063	+	4.45907 E	1937	Kaho v
1064	33313.103	+	4.45963 E	1947	Kaho p
3352	43516.670	+	4.459601E	1978	Kviz pe

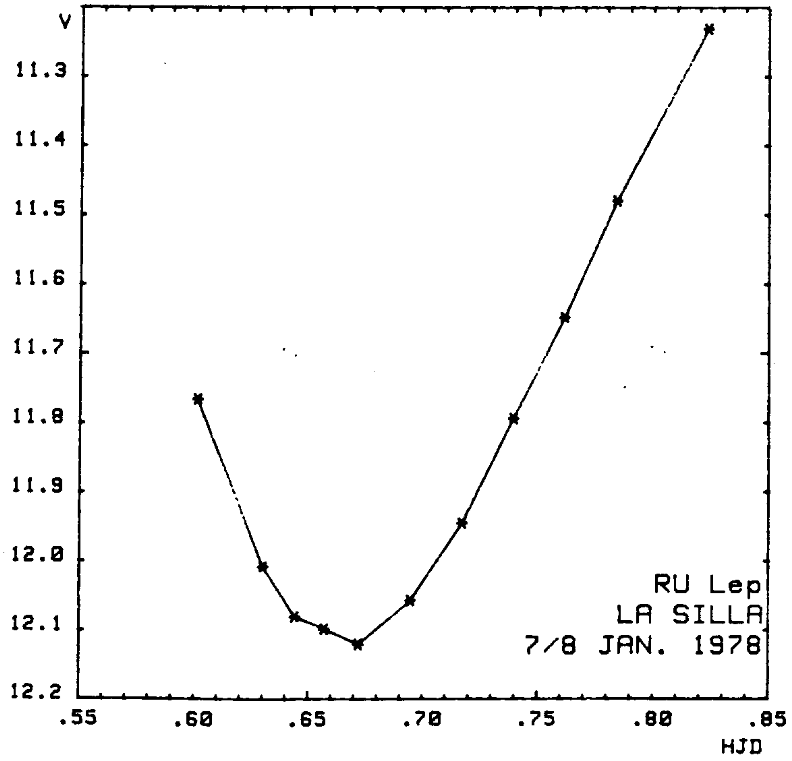

Figure 1

We may assume that the period was increasing after 1937 and is now decreasing. Even if we take the error of the time of minimum as 0.004 day the cyclic behaviour of the length of the period remains. Further photoelectric timing of the minimum and a careful search for secondary minimum is thus very desirable.

Individual V magnitudes vs. heliocentric Julian day are graphically represented in Fig. 1. This graph shows clearly the discrepancy with Kaho's conclusion about the flat bottom of the minimum. Kaho's original observations were not available to the authors and thus it is difficult to assess the reason for this discrepancy. It may be the low accuracy of the earlier visual and photographic estimates or the real change of the shape of the light curve.

The measured magnitudes with heliocentric Julian days are given in Table II. Table III gives the time of minimum for individual filters of the Geneva system calculated according to the Kwee and Van Woerden (1956) version of the Hertzsprung method. The mean errors are given in the last row under the respective digit.

Table II

	HJD	U	B1	B	B2	V	V1	G
1	43516.6014	12.457	12.041	11.145	12.618	11.766	12.505	12.840
2	43516.6302	12.753	12.429	11.431	12.915	12.009	12.809	13.130
3	43516.6442	12.775	12.467	11.495	12.963	12.081	12.805	13.311
4	43516.6571	12.934	12.511	11.591	12.983	12.099	12.896	13.181
5	43516.6720	12.941	12.508	11.576	13.003	12.121	12.838	13.181
6	43516.6948	12.906	12.471	11.522	12.910	12.057	12.787	13.158
7	43516.7172	12.736	12.252	11.335	12.734	11.945	12.647	13.026
8	43516.7394	12.501	12.037	11.131	12.578	11.793	12.522	12.876
9	43516.7615	12.400	11.847	10.957	12.408	11.647	12.355	12.742
10	43516.7841	12.245	11.639	10.746	12.211	11.479	12.204	12.587
11	43516.8234	12.006	11.329	10.449	11.948	11.231	11.943	12.382

Table III

U	B1	B	B2	V	V1	G
.674	.667	.669	.665	.670	.669	668
2	1	1	2	1	3	4

The change of colour indices and multicolour indices (d,Δ,g,X,Y,Z) during the eclipse is quite remarkable. According to the preliminary results and on the assumption that the eclipse is not far from the totality the components should be close to AV and FIII. As the minimum is not total, the interpretation of colour changes based on one minimum only is not possible and a full light curve is necessary for the solution of the system.

We wish to acknowledge the assistance of Dr. M. Burnet during the observations. One of us (Z.K.) thanks the director of Geneva Observatory for supporting the stay at La Silla.

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TWO NEW VARIABLE STARS IN THE BRIGHT STAR CATALOGUE

HR 3655 (HD 79193,21 Hya)

In the course of determining Strömgren indices for bright southern O-GO stars, Grønbech and Olsen (1976) found differing values for 21 Hya on two nights. Since this star ($V = 6^{m}_{\cdot}3$) was reported to be a double-lined spectroscopic binary with a period of 7.75 days by Chauville (1975), a search for eclipses was undertaken in late 1976 with the Danish 50 cm telescope at ESO, La Silla, Chile.

Observations on 16 nights gave parts of three eclipses, indicating a period of 7.750 days. The primary minimum is $0^{m}_{\cdot}47$ deep in y with a duration of not more than 8 hours. Secondary minimum lasts at least 5 hours, is at least $0^{m}_{\cdot}24$ deep in y and is displaced to phase 0.54, indicating an eccentric orbit.

Cowley (1968) classifies 21 Hya as A3m, and the metallicity is confirmed by the large m_1-index $m_1 = 0.238$. The secondary spectrum is very faint, but must be later, since b-y in primary minimum is 0.025 redder than outside eclipse.

Based on the observations reported here, 21 Hya has recently been named KM Hya. A full lightcurve is presently being obtained.

HR 119 (HD 2724)

This star ($V = 6^{m}_{\cdot}2$) was chosen as one of the comparison stars for the eclipsing binary AG Phe. Later reductions have shown HR 119 to be variable, with the observations spreading over $0^{m}_{\cdot}04$ in y.

A period-analysis of 346 observations gives a possible period of $0^{\mathrm{d}}_{\cdot}174$. There are indications that the amplitude is variable, but no reliable over-tones were found. HR 119 is most likely a Delta Scuti star.

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THE PERIOD OF THE SYMBIOTIC STAR AG PEGASI

AG Pegasi (WN6 + M3 III) is a well-known symbiotic star. From spectroscopical observations various authors derived periods ranging from 790 to 840 days (Merrill 1959, Boyarchuk 1967, Cowley and Stencel 1973, Hutchings et al. 1975).

The star shows also periodic brightness variations with an amplitude of about 0.35 mag. in V (Belyakina 1968). The variations are probably caused by binary motion of a hot spot on the M-star (Hutchings et al. 1975). According to those authors "the light curve may ultimately give us the best value of the period, since the velocity data are plagued with numerous difficulties already described".

Between 1973 and 1979 I observed AG Peg photoelectrically in U, B, V with the 60 cm-reflector II of Sonneberg Observatory. Photoelectric observations were published by Belyakina 1968, Mendoza 1972, Fernie 1972, Burchi 1980. Furthermore I observed the star on about 1000 Sonneberg sky patrol plates from 1928......1981. On all those observations AG Peg shows periodic brightness variations best fitted with the following elements:

$$\text{Min.} = \text{J.D. } 242\ 8250 + 827^{d}.\ E.$$

There is a steady decline in mean brightness. From photoelectric observations in 1963....1979 I derived a mean value in V of 0.015 mag. per year.

Further details are given in a forthcoming paper in Mitt. veränderl. Sterne.

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NOTE ON PUBLISHED TIMES OF MAXIMA OF DY PEGASI

Last year, Mahdy and Szeidl (1980) published a paper, "Period Changes of Dwarf Cepheids, I: CY Aquarii, EH Librae, DY Pegasi", in which our timings of maxima of DY Peg (Quigley and Africano; 1979) were used. In Table I of our paper, we had listed the 19 times of maxima we had measured at McDonald Observatory. In Table II we had listed maxima observed by earlier workers. Many of the earlier papers do not give times of maxima but instead tabulate observed points of the light curves. To determine the times of maxima from such tabulated data, we had used a quadratic fitting procedure. The majority of the maxima listed in our Table II were obtained by using this fitting procedure.

Mahdy and Szeidl concluded that our quadratic fitting procedure introduced a systematic lag of 0.0005d. (We won't argue the point here in this brief note.) Unfortunately, they applied this 0.0005d correction to our 19 McDonald Observatory timings. Since the McDonald data was in the form of high speed photometry light curves (integration times of 2-5 sec), it was a simple matter to determine the times of maxima directly from the computer generated plots, and our quadratic fitting procedure was <u>not</u> used. Thus, the "correction" applied by Mahdy and Szeidl to the McDonald DY Peg maxima is definitely wrong. In any future work incorporating this McDonald DY Peg data, the original, uncorrected values listed in Table I of our paper should be used.

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FLARE STARS IN ORION

We have continued the survey for flare stars in the region of the Orion nebula. On the plates taken with the 40 inch Schmidt telescope of Byurakan Astrophysical Observatory we discovered nine flare events of the stars around the Orion nebula.

The effective coverage of these observations was about 32 hours in the U-band and the method of observations was the common one of multiple and equal exposures of 5 minutes.

Table I gives the data for the nine flare stars found. The Haro and the Parenago numbers are also given, the coordinates and magnitudes are approximate.

Table I

Designation			RA	D	m_u	ΔU	Date
No	No Haro	No Parenago	(1900.0)	(1900.0)	(minimum)		
1			$5^h30^m.2$	$-4^\circ30'$	$17^m.7$	$2^m.5$	17.10.1980
2			5 32.8	-5 16	17.4	5.4	22.10.1980
3			5 29.7	-5 38	>18.	>3.7	22.10.1980
4		P2618	5 33.0	-6 28	15.0	1.0	22.10.1980
5	31	P1463=V749Ori	5 29.5	-5 00	17.4	4.2	04.11.1980
6		P847=HPOri	5 27.2	-5 07	17.4	4.5	04.11.1980
7		P1471	5 29.5	-5 37	17.8	2.5	04.11.1980
8			5 28.1	-4 14	15.8	1.2	01.12.1980
9	231	P2368=AZOri	5 31.3	-5 16	15.5	1.4	07.12.1980

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FLARE STARS IN THE PLEIADES REGION

A re-examination of all the multiple exposure photographic material obtained during the years 1976 through 1980 at Konkoly Observatory on the Pleiades region has been carried out. All these observations were made with the 60 cm Schmidt telescope of Konkoly Observatory on Kodak 103aO emulsion using Schott UG-2 filter.

Four new flare stars have been discovered and nine already known flare stars showed flare repetitions. For some reason all these flares escaped detection on this observational material (IBVS No. 1455,1456,1626,1696,1780).

Some data of the discovered new flare stars are presented in Table I: the first column gives the number of flare, column two the Hertzsprung number, columns three and four give the approximate coordinates for 1900.0, column five the approximate minimum brightness in U-band, column six the observed amplitude of the flare-ups in U-band and column seven the date of the flare-ups.

Table I

N	HII	RA	P	Mu(min)	ΔU	Date
		(1900.0)				
1	1516	$3^h41^m.7$	$23^\circ59'.6$	$16^m.7$	$1^m.2$	11.12.77
2		3 37.0	23 08.2	16.6	1.6	03.03.78
3					1.2	08.11.78
4		3 41.5	24 34.0	> 20.0	>3.2	27.10.79

Table II

N	HII	RA (1900.0)	D(neppP)	m_u(min)	ΔU	Date
19.	1531	$3^h41^m.7$	$23^\circ40'.0$	$15.^m7$	$1^m.2$	04.11.78
55.	2411	3 43.7	24 01.0	16.9	0.9	29.12.75
55.					1.2	24.11.78
70.	212	3 38.0	24 06.6	17.2	1.2	03.11.78
82.		3 41.5	24 13.3	18.4	2.5	04.11.78
103.		3 36.9	23 08.0	17.7	2.1	12.12.77
103.					0.8	12.12.77
103.					1.5	04.03.78
105.		3 41.7	23 23.2	18.2	1.7	27.10.79
107.	2208	3 43.3	24 16.0	18.1	1.7	02.01.76
109.	2927	3 45.1	24 25.0	16.5	2.0	07.11.77
334.	1280	3 41.1	23 51.0	17.4	1.6	29.08.79

The flare data for the already known flare stars are given in Table II. The Byurakan designation was used and the Hertzsprung numbers are also given.

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AUGUST 1981 FAINTENING OF V 348 Sgr

The irregular variable V 348 Sgr has recently fainted by several magnitudes (from $V \simeq 12$ to $V \simeq 18$) in a very short time (from Aug. 18 to 22, 1981 essentially). Photometric data in the uvby system have been collected by the undersigned during this period with the 1m telescope of the European Southern Observatory at La Silla, Chile.

These observations are presently being reduced and a detailed report will be published later.

This note aims mainly to invite other possible observers of this dramatic drop of brightness to join for a common work. Obviously data with a finer temporal resolution and wider spectral coverage will lead to a better understanding of this phenomenon difficult to catch in this puzzling object.

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VARIABILITY IN THE WOLF-RAYET STAR HD 164270

The WC9 star HD 164270 (= WR 103*; $\alpha_{1950} = 17^h58^m26.4^s$, $\delta_{1950} = -32^\circ 42'55''$) was found to decrease its brightness by almost $1^m.2$ from June 4 to June 21 1980 (Lundström and Stenholm, 1981). Our observations were interrupted June 23, when the star had become $\approx 0^m.2$ brighter than its minimum value. During this period only very minor colour changes appeared. In April 1981 the star had returned to its normal brightness, $v = 9.01$, (Smith, 1968).

There is no obvious explanation for the behaviour of HD 164270 in June 1980, although an occultation by an object with low luminosity and large radius seems to be the most promising alternative. The interpretation is however seriously hampered by the limited observational material available to us.

We are therefore very interested in all observations of this star that might have been made in 1980, especially during the time period May to August 1980. Spectrographic observations are extremely important and even low dispersion objective-prism spectra might be very valuable.

---

*The designation WR refers to the Wolf-Rayet star catalogue by van der Hucht *et al.* (1981).

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Lundström, I., Stenholm, B.: 1981, preprint

Smith, L.F.: 1968, Monthly Notices Roy. Astron. Soc. 140, 409

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PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR EV Lac IN 1980

Photoelectric monitoring of the flare star EV Lac has been carried out in September and October 1980 using the 60 cm Cassegrain reflector of the National Astronomical Observatory of the Bulgarian Academy of Sciences.

Observations have been made with a one channel photoelectric photometer (Tomov, 1977) using an EMI 9789QB photomultiplier and a photoncounting system. The observations have been made in the "b" colour with an integration time of 1 sec.

The transformation of our instrumental ubv system to the international UBV system is given by the following equations:

$$\Delta V = \Delta v - 0.12\Delta(b-v),$$
$$\Delta(B-V) = 1.14\Delta(b-v),$$
$$\Delta(U-B) = 1.08\Delta(u-b),$$

The monitoring intervals in UT as well as the total monitoring time for each night are given in Table I. Any interruption of more than one minute has been noted. In the fourth column of Table I the standard deviation of random noise fluctuation $\sigma(\mathrm{mag})=2.5\log(I_o+\sigma)/I_o$ for different times (UT) of the corresponding monitoring intervals is given.

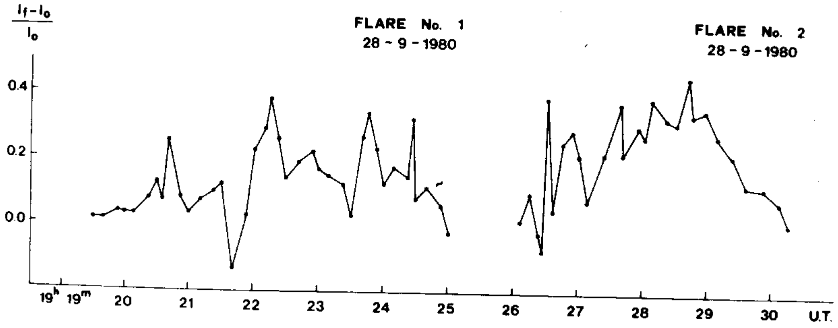
During the 15.4 hours of monitoring time 5 flares were observed, the characteristics of wich are given in Table II. For each flare the following characteristics (Andrews et al., 1969) are given: a) the date and universal time of flare maximum, b) the duration before and after maximum (t_b and t_a, respectively) as well as the total duration of the flare, c) the value of the ratio $(I_f-I_o)/I_o$ corresponding to flare maximum, where I_o is the intensity deflection less sky background of the quiet star and I_f is the total intensity deflection less sky background of the star plus flare, d) the integrated intensity of the flare over its total duration, including pre-flares, if present, $p = \int (I_f - I_o)/I_o \, dt$, e) the increase of the apparent magnitude of the star at flare maximum $\Delta m(b) = 2.5 \log(I_f/I_o)$, where b is the blue magnitude of the star in the instrumental system, f) the standard deviation of random noise fluctuation $\sigma(\mathrm{mag}) = 2.5 \log (I_o+\sigma)/I_o$ during the quiet-state phase immediately preceding the beginning of the flare and g) the air mass at flare maximum. The light curves of the observed flares in the b colour are shown in Figs 1-5.

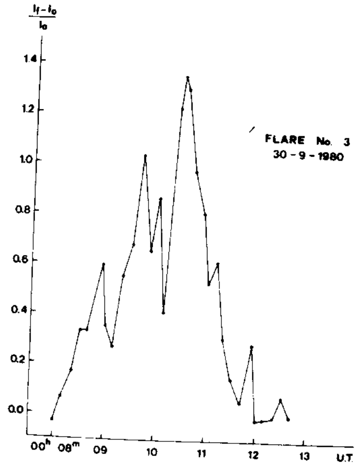
Table I

Monitoring intervals in 1980

Date 1980	Monitoring intervals (U.T.)	Total Monitoring Time	σ(U.T.)
Sept.			
21	$19^{h}02^{m}-19^{h}31^{m}$, $19^{h}33^{m}-20^{h}00^{m}$, $20^{h}16^{m}-20^{h}46^{m}$,		$0.03(19^{h}04^{m})$, $0.04(19^{h}35^{m})$,
	20 48 -21 17 ,21 36 -21 55, 21 59 -22 40 ,		0.04(20 19),0.04(20 50),
	22 48 -23 38.	$3^{h}45^{m}$	0.04(21 38),0.04(22 11),
			0.03(22 50),0.03(23 21),
22-23	18 44 -19 37 ,20 02 -20 35, 20 37 -21 21,		0.04(18 45),0.06(19 20),
	21 27 -21 51 ,21 53 -22 36, 22 42 -23 29,		0.05(20 03),0.04(20 31),
	23 30 -00 13 ,00 15 -00 19.	4 51	0.06(21 04),0.03(21 36),
			0.03(22 19),0.05(22 50),
			0.06(23 31),0.04(00 11),
28	19 12 -19 36.	24	0.04(19 14).
29-30	20 40 -20 53 ,20 54 -21 40, 21 46 -22 03,		0.02(20 41),0.03(21 13),
	22 06 -00 12 ,00 15 -00 20.	3 27	0.03(21 47),0.03(22 16),
			0.03(22 37),0.03(23 07),
			0.04(23 37).
30	20 57 -21 47 ,21 52 -22 33, 22 44 -23 05,		0.03(20 58),0.03(21 28),
	23 06 -24 00.	2 46	0.02(21 53),0.02(22 24),
			0.02(23 07),0.02(23 32),
Oct.			
1	00 00 -00 11.	11	0.02(00 01).

Total = $15^{h}24^{m} = 15^{h}.40$


$\frac{I_f - I_0}{I_0}$
FLARE No. 1
28 - 9 - 1980
FLARE No. 2
28 - 9 - 1980
0.4
0.2
0.0
19h 19m
20
21
22
23
24
25
26
27
28
29
30
U.T.


$\frac{I_f - I_0}{I_0}$
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
FLARE No. 3
30 - 9 - 1980
00h 08m
09
10
11
12
13
U.T.

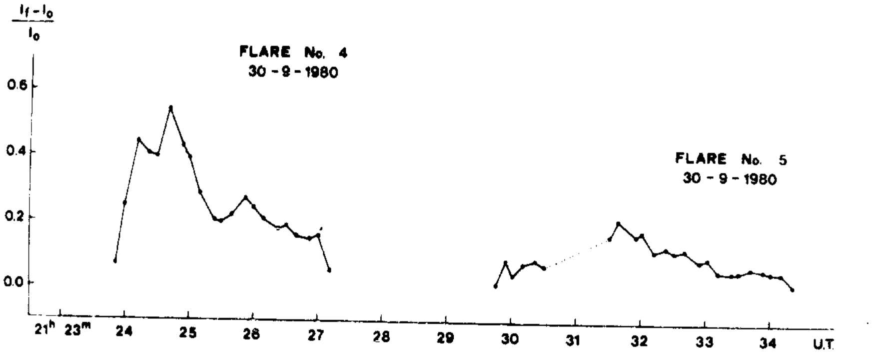

$\frac{I_f - I_0}{I_0}$
FLARE No. 4
30 - 9 - 1980
FLARE No. 5
30 - 9 - 1980
0.6
0.4
0.2
0.0
21h 23m
24
25
26
27
28
29
30
31
32
33
34
U.T.

Table II

Characteristics of the Flares Observed

Flare No.	Date 1980 Sept.	U.T. max	t_b min	t_a min	Duration min	$(I_f-I_o)/I_o$ max	P min	Δm mag	σ mag	Air mass
1	28	$19^h22^m.33$	2.50	2.67	5.17	0.382	0.850	0.351	0.04	1.044
2	28	19 28.67	2.55	1.60	4.15	0.452	0.962	0.405	0.04	1.038
3	30	00 10.43	2.40	2.10	4.50	1.346	2.326	0.926	0.06	1.286
4	30	21 24.70	1.00	2.35	3.35	0.543	0.906	0.471	0.03	1.020
5	30	21 31.65	1.90	2.67	4.57	0.206	0.387	0.203	0.03	1.024

Acknowledgements

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Tomov, A.: 1977, Dissertation, Bulgarian Academy of Sciences, Sofia

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AN ULTRAVIOLET PHOTOELECTRIC LIGHTCURVE OF THE ECLIPSING BINARY BB Peg

The W UMa type eclipsing binary BB Peg (Spectral Type F8) has a period of 8^h41^m. Photoelectric lightcurves in three colors (U, B and V) were performed by Cerruti Sola and Scaltriti during Summer 1978, mainly at Catania Astrophysical Observatory; the details concerning the employed equipment and the observational routine can be found elsewhere (Cerruti Sola and Scaltriti 1980). In that paper a study of the period and approximate geometric elements were derived, using the B and V lightcurves only. A refined analysis was made subsequently by Cerruti Sola et al. (1981) applying the Wilson-Devinney computer code; an unusual high degree of overcontact was obtained.

In this note we present the ultraviolet lightcurve of BB Peg. Due to the faintness of the star, the ratio signal to noise was very small, even with the largest gain in photoelectric equipment; moreover, the scatter in a single deflection was higher than usual. The resulting lightcurve was rather noisy; this is the reason why we have not used it in our previous papers. However, it seems advisable to us to publish our observing results in U filter for a direct comparison with B and V runs.

The scatter in a single Δm measurement may be estimated about ±0.02 mag; therefore we have formed normal points with steps of 0.02 in phase (except few cases). The average number of single Δm's forming a normal point is about 6 for phases relative to primary minimum and to first maximum, whereas poorer coverage of secondary minimum and of maximum around phase 0.75 reduces that number to half its value.

The U lightcurve we have obtained is shown in Figure 1 (where the Δm_U's (var-comp) are plotted against phases calculated with the ephemeris given by Cerruti Sola and Scalitriti (1980)). The maxima have practically the same level, whereas the second maximum is less luminous (by few hundredths of magnitude) than the first one in B and V lightcurves; the level difference between the minima appears to be about 0.1 mag, larger than that found in B and V filters. Also the total luminosity range grows from V (~ 0.68 mag) to U (~ 0.75 mag).

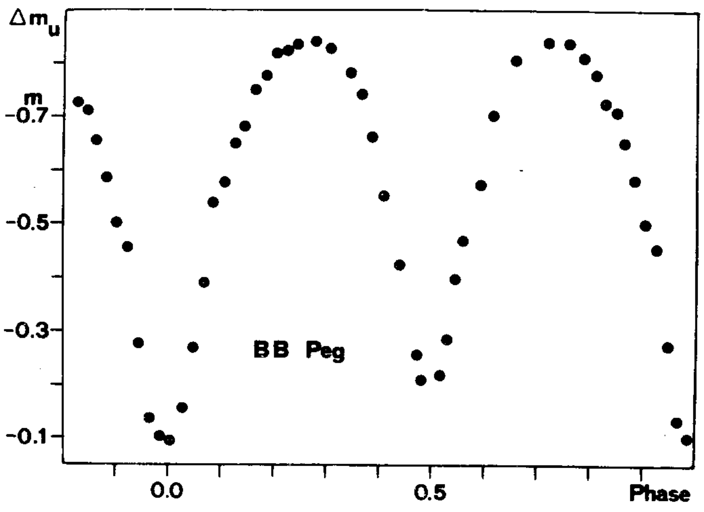

Figure 1- Ultraviolet lightcurve of BB Peg (normal points are plotted).

From the U runs it was possible to derive epochs of primary and secondary minima, bisecting chords at different light levels in a free-hand drawing through the observed single Δm's; we have obtained: Min_{I}(Hel.) = 2443750.594 and Min_{II}(Hel.) = 2443754.389, in very good agreement with the times found from B and V runs. The estimated errors of those minima amount to $\pm 0\overset{d}{.}002$ for both.

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Cerruti Sola, M., and Scaltriti, F.: 1980 Astron. Astroph. Suppl. 40,85.

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THE SPECTRUM OF THE SUSPECTED VARIABLE HD 33331

Recently, Manfroid and Renson (1981) announced the variability of HD 33331 with a period of $1\overset{d}{.}14$ and suggested that the star might be an Ap star. No details of the amplitude or form of light variation were given.

The star has been observed by Olsen (1975) in the uvbyβ system and spectroscopically by us (ESO 1.5m coudé, La Silla, Chile, at 20Å/mm)in a radial velocity programme. The three plates, taken in September and November 1974, show a range of 5 km/s in radial velocity, consistent with the scatter expected for a constant velocity. The spectrum is rather sharp -lined, with vsini around 50 km/s, and the spectral type is close to B8. No significant spectral variations or peculiar spectral features are seen, and the spectrum is entirely consistent with that expected from the uvby indices. We cannot estimate the luminosity class with certainty from these plates, but the β value by Olsen (1975) places the star in the lower half of the main sequence band. We note that Houk (1978) classified the star B5III, which is certainly earlier than indicated by our plates.

We cannot exclude the possibility that HD 33331 might be a mild He-weak or similar type of peculiar star, but there are no visible spectral peculiarities at our dispersion. The possibility of the star being an ellipsoidal variable seems ruled out by the slow rotation and apparently constant radial velocity. If the light variations of the star are confirmed, spectroscopic observations at higher resolution will be needed to clarify their origin.

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Manfroid, J., Renson, P.: 1981, IBVS No. 2004
Olsen, E.H.: 1975, Astron.Astrophys.Suppl.Ser. 29, 313.

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A LIGHT CURVE OF THE ECLIPSING BINARY LU LACERTAE

The variability of LU Lac was detected by Miller (Miller and Wachmann, 1973), who found, that the object is an eclipsing binary of W UMa type with a period just below $0^d_.3$. Photoelectric observations of LU Lac were obtained in five nights between May and August, 1981. The star was measured with the double beam photometer at the 1.06m telescope of Hoher List Observatory. The light curve was completed only in B, but some observations were also made in V to determine at least the colour difference between the variable and the comparison star. The latter, BD+50°3680, is a redder object than LU Lac (ΔB-V $\sim$ $0^m_.7$). So significant second order extinction corrections had to be applied.

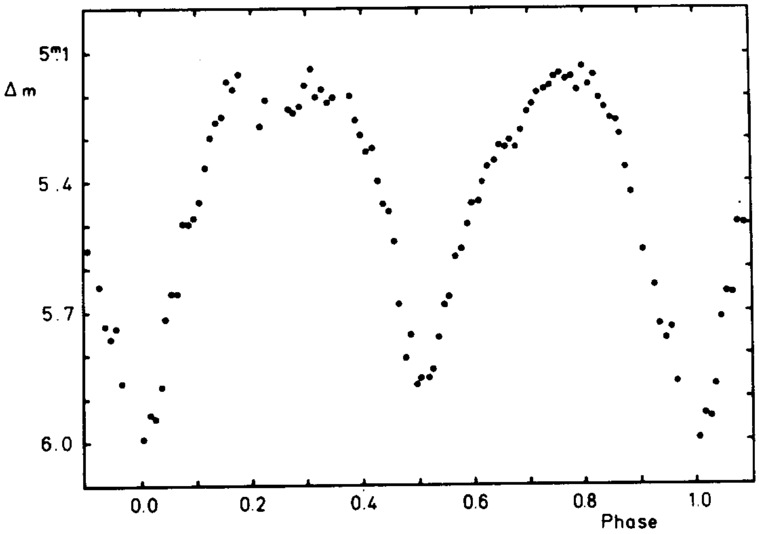

Fig. 1: B light curve of LU Lacertae

Times of minimum light were found at

JD hel.	2444726.5380	O-C	$+0\overset{\mathrm{d}}{.}0042$	Ep.	37526.5
	2444815.4282		$+0\overset{\mathrm{d}}{.}0010$		37824.0
	2444843.3680		$+0\overset{\mathrm{d}}{.}0029$		37917.5

The O-C's were calculated according to the light elements given by Miller and Wachmann (1973)

JD hel. Min. I = 2433513.5649 + 0.29880135 E

The deviation of the observations from these elements are still small. Figure 1 shows the B light curve of LU Lac relative to the comparison star (normal observations). Larger scatter around phase 0.25 results from observations at greater atmospheric extinction, when the star became quite faint for a 1m telescope (m_{pg} 14.6...15.5). The primary minimum is distinctly wider than the secondary minimum. So LU Lac seems to be of W type with an occultation at the primary minimum, which is normal for contact binaries of its period. A rectification of the light curve was tried with only a limited success. The eclipses are at least close to completeness. The ratio of the radii has a lower limit $k \geq 0.85$ which indicates a mass ratio $q \geq 0.75$. As usual for short period W UMa stars the constancy of the light curve should be checked at a later time.

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Reference:

Miller, W. J., Wachmann, A. A., 1973, Ric. Astron. 8, No. 12

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PHOTOELECTRIC MINIMA OF U PEGASI

The short period eclipsing binary U Peg was photoelectrically observed during five nights on 1980 (17-21 September). The observations were made using the 48-inch Cassegrain reflector at Kryonerion Astronomical Station and the two-beam, multi-mode, nebular-stellar photometer 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.

From our observations three primary and two secondary minima times have been derived and are given in the following Table, the successive coloumns of which give : the heliocentric Julian date, the residuals (O-C)$_I$, (O-C)$_{II}$ and the type of minimum.

Table

Hel. J.D.	(O-C)$_I$	(O-C)$_{II}$	Min
2444500.+	days	days	Type
0.4922	-0.0280	-0.0152	I
1.4295	-0.0276	-0.0147	II
2.5554	-0.0261	-0.0132	II
3.4923	-0.0260	-0.0133	I
4.6165	-0.0263	-0.0134	I

The residuals $(O-C)_I$ and $(O-C)_{II}$ have been evaluated according to

$$\text{Pr. Min} = \text{Hel. J.D. } 2436511.66878+0\overset{d}{.}37478192E$$

(Kukarkin et al. 1969 or Rudnicki 1981)

and

$$\text{Pr. Min} = \text{Hel. J.D. } 2436511.66856+0\overset{d}{.}37478133E$$

(Kukarkin et al. 1976)

respectively.

The times of minima have been calculated using the Kwee and Van Woerden method (1956) and are the mean values of B and V observations.

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Rudnicki, Konrad: 1981, Rocznik Astronomy Observatorium Krakowskiego, Krakow.

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THE MAXIMUM TIMES AND THE LIGHT ELEMENTS OF 28 ANDROMEDAE

In the course of the intermediate and narrow band photometry of some Delta Scuti type variables, 28 And was observed at Ege University Observatory with the 48 cm Cassegrain reflector, equipped with an unrefrigerated EMI 9781 A photomultiplier. The star was observed on four nights, from December 28, 1979 to February 10, 1980 and nine times of maxima were obtained.

The times of maxima are given in the following table.

Table
The maximum times of 28 And

JD Hel.	O-C(I)	O-C(II)	E	Filter
2444 236.2530	$0^{d}.0015$	$-0^{d}.0029$	0	u
.2520	0.0005	-0.0039	0	v
.2515	0.0000	-0.0044	0	b
.2545	0.0030	-0.0014	0	y
250.2595	0.0010	+0.0007	203	u
.2655	0.0070	+0.0067	203	v
.2630	0.0045	+0.0042	203	b
.2660	0.0075	+0.0042	203	y
280.2590	-0.0145	-0.0060	638	b

For the determination of preliminary elements JD Hel.2444 236.2515 was taken as a reference time and a period of $0^{d}.069$ given by Breger (1969) was adopted. The O-C(I) residuals were computed with the above given elements. The least squares solution has been applied to these O-C(I) values and cycle numbers (E), and new light elements were derived as follows:

$$\text{Max.} = \text{JD Hel.}2444\ 236.2559 + 0\overset{d}{.}0689797 \cdot E$$
$$\pm 22 \qquad\qquad \pm 91$$

Also the O-C(II) residuals were computed according to the new light elements.

The light curves and the results of the intermediate and narrow band photometry of this star will be published elsewhere.

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Reference:

Breger,M.: 1969, Astron.J. 74, 166.

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THE MAXIMUM TIMES AND NEW LIGHT ELEMENTS OF 44 TAURI

The Delta Scuti type variable 44 Tau has been observed at Ege University Observatory from December 21, 1979 to November 16, 1980. The observations were carried out with the 48 cm Cassegrain reflector equipped with an unrefrigerated EMI 9781 A photomultiplier. The intermediate band filters were used at the observations.

The maximum times obtained during the observations are given in the following table.

Table

The maximum times of 44 Tau

JD Hel.	O-C(I)	O-C(II)	E	Filter
2444 235.4116	$-0^{\mathrm{d}}.0083$	$+0^{\mathrm{d}}.0043$	-103	u
.4117	-0.0082	+0.0044	-103	v
.4124	-0.0075	+0.0051	-103	b
.4160	-0.0039	+0.0087	-103	y
236.4161	-0.0181	-0.0067	- 96	u
.4150	-0.0192	-0.0078	- 96	v
.4170	-0.0172	-0.0058	- 96	b
.4181	-0.0161	-0.0047	- 96	y
250.3450	+0.0004	-0.0042	0	u
.3440	-0.0006	-0.0052	0	v
.3454	+0.0008	-0.0038	0	b
.3438	-0.0008	-0.0054	0	y
252.3845	+0.0113	+0.0044	14	u
.3860	+0.0128	+0.0059	14	v
.3900	+0.0168	+0.0099	14	b
.3845	+0.0113	+0.0044	14	y
269.3504	+0.0239	-0.0026	131	b
.3520	+0.0255	-0.0010	131	y

For the determination of preliminary elements JD Hel.2444 250.3446 was taken as a reference time and a period of $0\overset{d}{.}1449$ given by Wizinowich and Percy (1979) was adopted.

The O-C(I) residuals were computed with these elements. The least squares solution has been applied and the new light elements were derived as follows:

$$\mathrm{Max.}= \mathrm{JD\ Hel.}2444\ \underset{\pm 15}{250.3492} + \underset{\pm 19}{0\overset{d}{.}145067}.E$$

The O-C(II) residuals were computed using these new light elements.

The light curves and the variations of their amplitudes will soon be published elsewhere.

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Bornova, Izmir-Turkey

Reference:

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TU Men, THE FIRST SU UMa STAR BEYOND THE GAP*

In December 1980, TU Men was detected to be a member of the SU UMa subgroup of dwarf novae (Stolz, Schoembs, 1981). Now, spectra of TU Men revealed an orbital period beyond the wellknown gap between 2 and 3 hours as has been suspected from the superhump period $P_s \simeq 3^h$.
Spectroscopy of TU Men has been performed in 4 nights during the superoutburst in Dec. 1980 with the IDS at the 1.5m telescope at ESO.

Table I Journal of observations

Date	covered time interval (JD-2444500)	Dispersion (Å/mm)	number of spectra (20min Int.-time)
1980-11-30/1	74.5661-74.7190	39	8
1980-12-01/2	75.5264-75.8230	114	16
1980-12-02/3	76.5330-76.6836	114	9
1980-12-03/4	77.5264-77.6709	114	9

All spectra show the typical very broad Balmer absorption lines of dwarf novae during outburst. For determination of the orbital period the spectra have been smoothed and the radial velocity for each clearly detectable Balmer absorption line has been measured. A sinus curve has been fitted to the mean velocities of each spectrum. The minimum of rms-error is obtained for the period

$$P_o = 2.823 \text{ hours}$$
$$\pm 17$$

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*Based on observations collected at the European Southern Observatory, La Silla, Chile.

The ephemerides for the upper conjunction are

$$\mathrm{HJD\ (up.conj.)} = 2\ 444\ \underset{\pm 7}{574\overset{d}{.}561} + \underset{\pm 7}{\overset{d}{.}1176} \cdot E$$

Figure 1 shows the resulting phase diagram.
Including TU Men and WZ Sge orbital and superhump periods are known for 7 objects until now. Figure 2 shows the relation of $(P_s - P_o)/P_o$ versus P_s for these stars.
The values fit quite well to a parabola; the order of the fit is not very significant however.

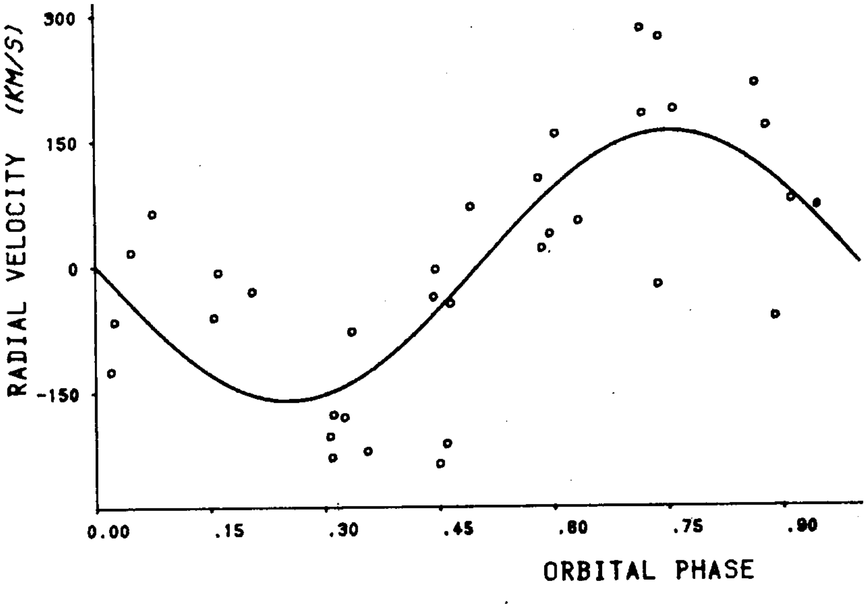

Fig. 1. Radial velocity curve of TU Men obtained during the superoutburst in December 1980.

Using this relation orbital periods for SU UMa objects with P_s known only can be calculated. Table II shows the results.

Table II

Star	P_s(d)	Lit.	computed P_o(d)
EK TRA	.06492	(1)	.0636
AY LYR	.07552	(2)	.0730
CU VEL	.07990	(3)	.0769
YZ CNC	.09204	(2)	.0876

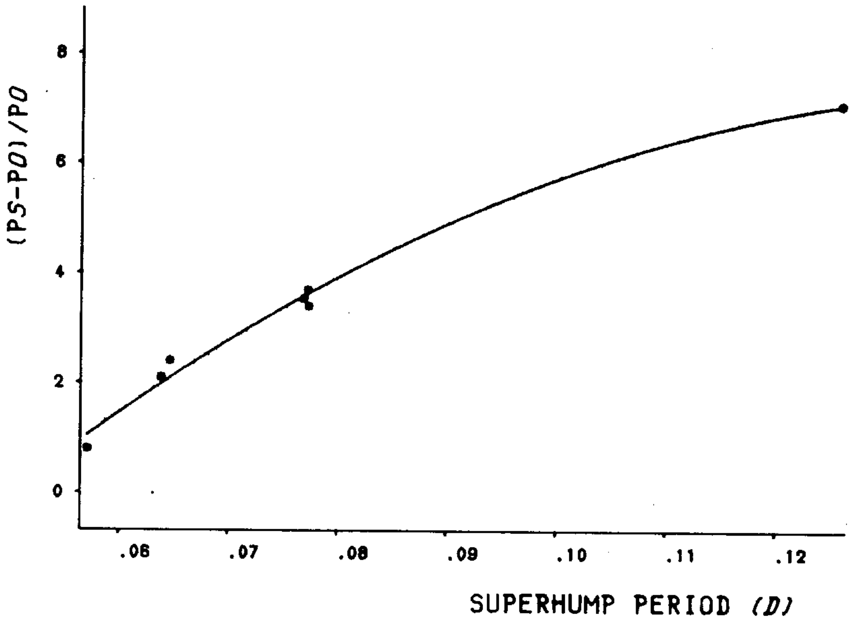

Fig. 2. $(P_s-P_o)/P_o$ versus P_o for seven objects with known orbital and superhump period.
The values for P_o and P_s have been taken from the following references:

WZ Sge - Patterson et al., 1981
V 436 Cen - Vogt, 1981; Semeniuk, 1980
OY Car - Vogt, 1981; Vogt et al., 1981
VW Hyi, WX Hyi, ZCha - Vogt, 1980

References

(1) Vogt and Semeniuk, 1980
(2) Patterson, 1979
(3) Vogt, 1981

The orbital period of TU Men and the calculated orbital period of YZ Cnc diminish the period gap of cataclysmic variables to 40 minutes.

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STANDSTILL OF γ CrB

In the course of the photoelectric monitoring of low-amplitude δ Scuti stars we observed γ CrB on four nights at Konkoly Observatory. Throughout the observations the equipment was the same as described by Kovács (1981) for the 100cm telescope and by Szabados (1977) for the 50cm telescope. Measurements were taken only in V, using δ CrB as a comparison star in the cycle δ CrB,γ CrB, sky with each observation consisting of three (for the sky only one) consecutive 20s (at the 50cm telescope 10s) integrations.

Differential magnitudes (in the instrumental system and not corrected for differential extinction) are shown in Fig. 1.

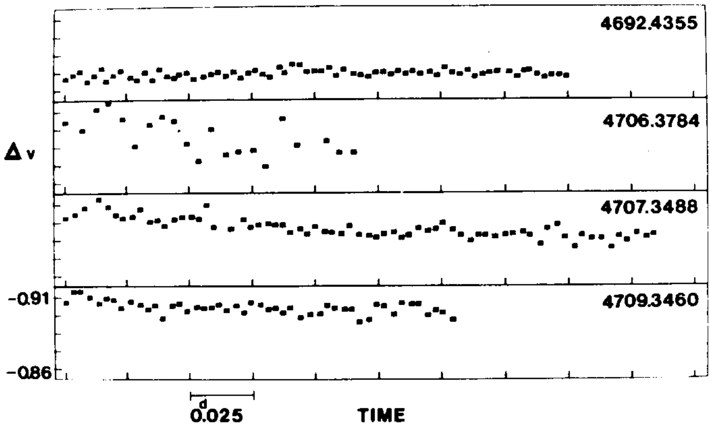

Fig. 1. Light curves of γ CrB. The numbers on the right of each graph are the heliocentric Julian Dates of the first observation of each night minus 2440000. The instrumental differential v magnitude scale is the same for each graph as indicated and refer to the comparison star δ CrB in the sense m(var)-m(comp). The data on JD. 2444692 were obtained by the 100cm telescope, the others by the 50cm telescope.

Except for the linear trends and some suspected variations at JD. 2444706, the light curves are constants within the error of the measurements (i.e. 0.005-0.002 mag). The reason for the appearance of the linear trends in the data obtained by the 50cm telescope is not known, but it may partly be accounted for the colour dependent extinction not having been taken into consideration. The systematic difference between the average light level of the data of the two telescopes may be due to the slight difference between the two optical systems. This argument is supported by the observations made simultaneously by the two telescopes on 6/7th May, 1981 (UT), showing an average difference of ≃0.04 mag between the two light curves (because of the very poor photoelectric quality of this night we have not published these data).

Our data seem to support the results of Tippets and Wilcken (1970) who found no observable variation of this star in contradiction to the observations of Percy (1970), showing light variation of 0.02-0.05 mag on a time scale of ≃0.03 days. Probably this contradiction and the very early spectral type of this star (A0 IV, according to the Catalogue of Bright Stars (Hoffleit, 1964)) led Breger not to include γ CrB in the latest list of δ Scuti stars (Breger, 1979).

Though the light curves do not indicate any permanent variation, it is still useful to calculate the frequency spectrum of the data. By use of the technique of Fourier analysis of unequally spaced data (Deeming, 1975), the power spectrum for all our data was calculated and plotted (Fig. 2). Before calculating the frequency spectrum, low frequency filtering (i.e. straight line fitting) was applied for each night of observation. Though close to the noise level, there are three well separated peaks in the spectrum. Their frequencies and amplitudes (i.e. half of their total variations) are: 5.06 c/d (0.0017 mag), 14.62 c/d (0.0018 mag), 23.59 c/d (0.0014 mag). Leaving out the data obtained on JD. 2444706, the spectrum changed somewhat but not radically (i.e. the features mentioned above were still observable within ≃1 c/d of the frequencies determined previously).

For comparison, two of the light curves (labelled "B Filter E.S.T. 1-7-69" and "B Filter 22-7-69" respectively) of Percy

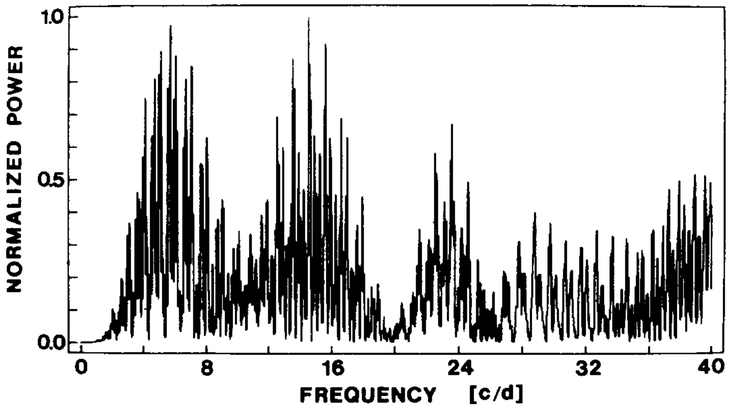

Fig. 2. Power spectrum of γ CrB calculated by all the light curves plotted in Fig. 1.

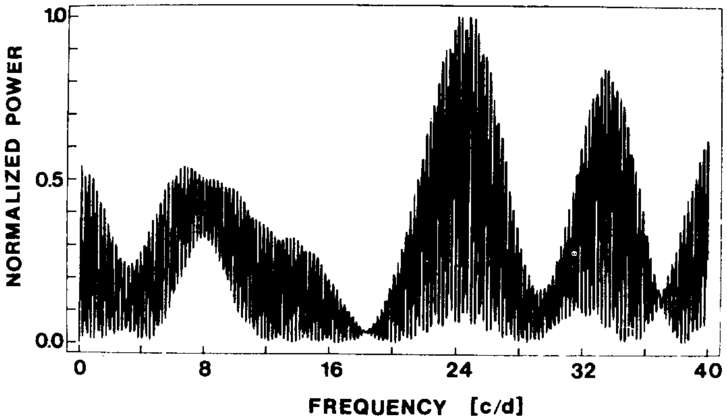

Fig. 3. Power spectrum of γ CrB calculated by using the data of Percy (1970) (for details, see text).

(1970) were sampled at their observed points and analysed. The power spectrum of these data is shown in Fig. 3. Because low frequency filtering was not applied to these data, a considerable amount of power can be observed at the low frequency region. In spite of the complexity and unresolved nature of the spectrum in Fig. 3, some similar features between the two power spectra are suspected.

At present we know nothing about the nature of γ CrB. The results of frequency analysis may indicate some sign of regularity. Nevertheless, the very small amplitudes of the light variation in our observations can hardly be explained by a very strong beat phenomenon. Whatever the reason for the light variation of γ CrB, its nature seems to be quite different from that of the normal δ Scuti stars.

We are grateful to Dr. B. Szeidl for his valuable remarks relating to the frequency analysis.

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DETECTION OF PERIODIC LIGHT VARIATIONS OF THE OLD NOVA BD Pav*

BD Pav was discovered by Boyd (1939) when it had risen during 4 days from invisibility ($m_p > 16^{m}.4$) to a maximum brightness of $12^{m}.4$ on Sept. 7, 1934. In the following 6 days the star declined to $12^{m}.85$ and finally became fainter than $15^{m}.5$, 20 days after maximum. Boyd classified BD Pav as a nova.

During two observing periods at the European Southern Observatory at La Silla, extended high speed photometry and spectroscopy of BD Pav have been performed, the observational details are given in Table I.

Table I

Date	HJD - 2444000 Start	 End	Telescope	Filter	Int.time
1980-06-13/14	404.87	404.88	1.5m ESO	Spectrum	15m
1980-06-21/22	412.643	412.820	1m ESO	R(RG 665)	3s
1980-06-21/22	412.643	412.820	1.5m Danish	white	2.9s
1981-07-01/02	787.535	787.866	1m ESO	B,R	4s
1981-07-02/03	788.560	788.910	1m ESO	white	2s
1981-07-06/07	792.583	792.909	1m ESO	V,I	1s*
1981-07-07/08	793.585	793.917	1m ESO	U,V	2s

*Simultaneously spectroscopic observations at the 1.5m ESO telescope. Exposure time: 15-20 min.

A strictly periodic light-variation with an amplitude up to $0^{m}.5$ could be detected. The mean light curve is characterized

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*Based on observations collected at the European Southern Observatory.

by two humps of different shape and amplitude. A period analysis was applied to the data spanning a time interval of about 1 year. The only two humps observed in 1980 were somewhat distorted due to changing atmospheric transparency. If the identification of the higher hump in the 1980 lightcurve is taken to be correct the error of the photometric period is $5 \cdot 10^{-7}$. The time for the deeper light minimum after the brighter hump is given by the following ephemeris:

$$\mathrm{HJD(lower\ minimum\ )} = 2444412.67\underset{\pm 1}{6} + .179301\underset{\pm 5}{5} \cdot E$$

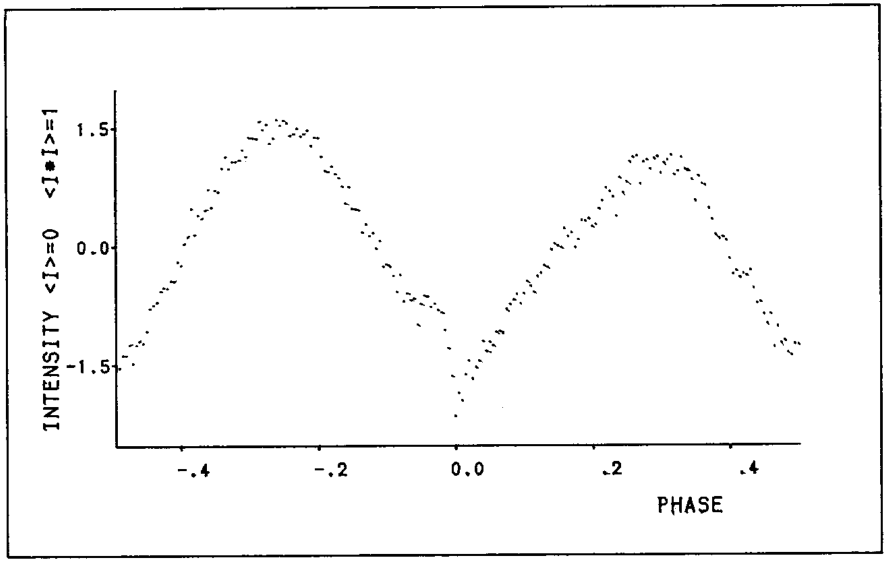

Figure 1: Variation of intensity of BD Pav according to the given ephemeris.

A phase diagram combining all data (for the nights with two color photometry we took the bluer range) is shown in Fig. 1. Before averaging into 200 bins the data of each night were normalized to obtain an average intensity of zero and equal hump amplitude.

There is a small humplike feature preceding the deeper minimum. The minimum itself frequently is very steep. Flickering, a characteristic property of cataclysmic variables, is found with timescales of minutes in the individual light curves. The spectrum is characterized by broad Balmer emission lines with complex structures, superimposed on broad shallow absorptions. Strong V/R variations with the photometric phase are shown. The intensity of the double peaked emission lines of H and HeII decreased strongly between June 1980 and July 1981.

A detailed analysis of the photometry and spectroscopy of BD Pav will be published elsewhere.

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VARIATIONS PHOTOMÉTRIQUES ET PÉRIODE DE HR 2971

(Note rectificative à l'I.B.V.S. No.2004)

Dans l'"Information Bulletin on Variable Stars" No.2004, nous annoncions que lors d'une mission d'observations à l'ESO en décembre 1980, HR 2971 avait montré des variations extrêmement grandes pour une étoile Ap. Toutefois cette variation apparente avec une période justement égale à 1 jour sidéral a seulement été provoquée par un accident dans le programme de réduction des mesures.

Celles-ci ont été reprises et réduites correctement. D'après les résultats ainsi obtenus, la variation est au contraire très faible; parmi les étoiles citées dans l'IBVS 2004, HR 2971 est même celle qui a la plus faible variation. L'analyse de ces résultats par la méthode habituelle montre que la période est 1,04j, donc quand même très proche d'1j.

L'avant-dernière ligne du tableau de la note citée doit être modifiée comme suit et tout le paragraphe relatif à cette étoile, immédiatement après le tableau, doit être supprimé.

Étoile	type spectral	période (j)	grandeur approx. de la variation (mag.) y	b	v	u
HD 61966=HR 2971	B9pSi	1,040±0,003	0,004	0,008	0,010	0,030

L'erreur sur la période P peut paraître un peu grande compte tenu du rapport entre l'intervalle total des observations, soit un peu plus de 24j, et la valeur de P. Ceci est dû à ce que les phases auxquelles l'étoile peut être observée restent proches les unes des autres d'une nuit à la suivante à cause de la très petite différence entre P et 1j; il n'y a finalement presque pas eu d'observations à la fois assez espacées dans le temps et très voisines en phase. L'ensemble des phases est néanmoins assez bien couvert.

La variation en u, qui est la plus grande, comme c'est le plus souvent le cas, présente un maximum aigu et un retard de phase de 0,1 à 0,2 P par rapport à celles des autres couleurs, surtout de v. Les variations en y, b et v sont non seulement plus faibles, mais aussi plus sinusoïdales. Comme dans le tableau de l'IBVS 2004, le dernier chiffre est évidemment très incertain pour les grandeurs des variations indiquées ci-dessus. Aux courbes moyennes qu'on peut tracer à travers les points représentant les mesures, se superposent d'appréciables fluctuations dues aux erreurs de mesures et peut-être à des fluctuations propres à l'étoile.

En ce qui concerne les indices, b-y varie extrêmement peu, m_1 ne varie pratiquement pas, tandis que c_1 présente une variation assez semblable à celle de u en forme et en grandeur.

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THE PRINCIPAL FREQUENCY OF THE RAPIDLY OSCILLATING Ap STAR α Cir

We have obtained 47 hours of high speed photometric observations of the rapidly oscillating Ap star α Cir (Kurtz and Cropper 1981) with the 0.5-m, 0.75-m and 1.0-m telescopes of the South African Astronomical Observatory. A frequency analysis of these observations indicates that most of the light variability in α Cir can be described by a single frequency $f = 8.79130 \pm 0.00012$ hour^{-1} ($P = 6.82493 \pm 0.00009$ minutes) with a semi-amplitude of 1.9 m mag. Figure 1 shows the fit of that frequency to the light curve obtained on the night of 1981 June 08/09.

It is also clear that the amplitude of the principal frequency in α Cir is variable, but we have insufficient data to derive the secondary frequencies. In terms of the oblique pulsator model (Kurtz 1981) it should be possible to derive the rotation period of α Cir and place constraints on i, the inclination of the rotation axis to the line of sight, and β the inclination of the magnetic axis to the rotation axis, once the secondary frequencies and their amplitudes are known.

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HR5463 JD2444764 B

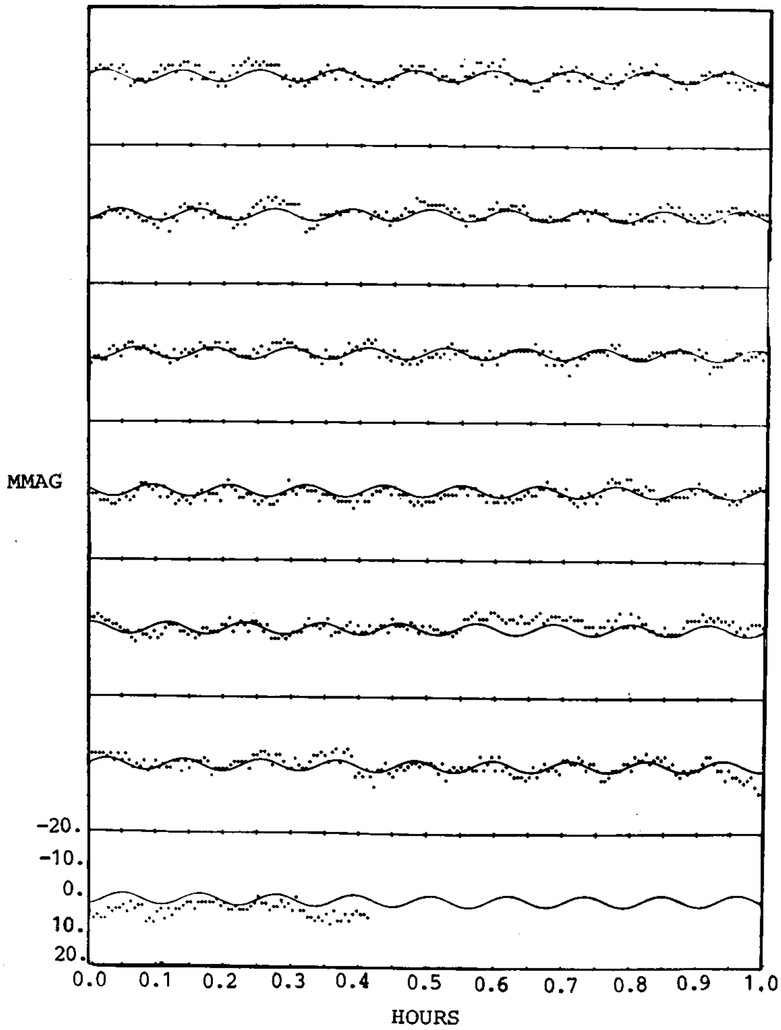

Figure 1: The fit of the principal frequency to the light curve for the night of 1981 June 08/09. The light curve should be read like lines of print with the right edge of each panel connecting directly to the left edge of the panel beneath. Each panel is 1 hour long and 0.04 mag high. The data points represent 20-s integrations. In comparing the solid line fit to the data points, one should compare only the amplitude and phase. Small vertical shifts of sections of the light curve (as in the bottom panel) are due to sky transparency variations and should be ignored.

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BD-8°4232, A NEW DELTA SCUTI STAR?

In the course of a programme of photometry of hot hydrogen-deficient stars (or helium stars) using the 1m telescope of the South African Astronomical Observatory, BD-8°4232 and BD-9°4385 (= HD148021) were used as comparisons for the helium star BD-9°4395. Figure 1 shows V-magnitudes (colour-corrected from observations through a Strömgren "y" filter) for the two comparison stars during a short run made on 1981 Jun 28/29. BD-8°4232

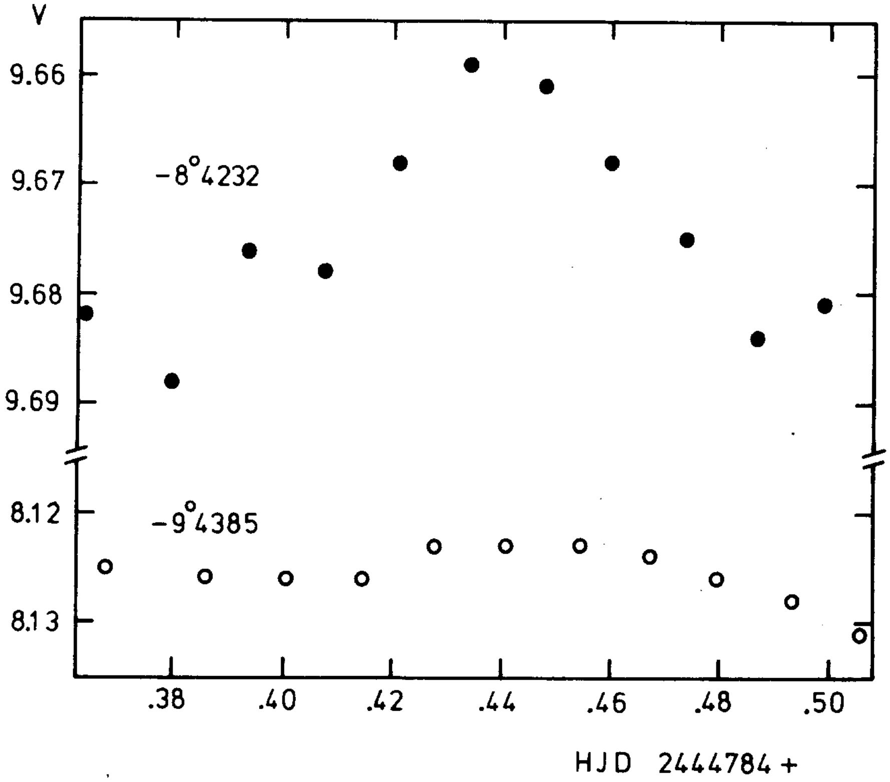

Figure 1

appears to vary with an amplitude of $0^{\mathrm{m}}.03$ and a period probably $\sim 0^{\mathrm{d}}.1$. The slight dip in the magnitude of BD-9°4385 after H.J.D. 244 4784.48 is caused by a transparency deterioration rather than intrinsic stellar variability.

Table I Strömgren colours for BD-8°4232

HJD	V	(b-y)	M_1	C_1
244 4782.374	9.681	0.352	0.143	0.952
4784.350	9.682	0.354	0.147	0.934
4822.237	9.695	0.359	0.138	0.954
.256	9.681	0.364	0.131	0.947
.370	9.677	0.375	0.121	0.940
4823.245	9.674	0.355	0.131	0.965
.306	9.676	0.358	0.140	0.939
.340	9.670	0.363	0.143	0.906

Strömgren photometry of BD-8°4232 is given in Table I. The (b-y) and C_1 indices indicate a reddening $E(b-y) = 0.275$ and a spectral type around A7 (cf. Crawford 1979; Table 2). The Smithsonian Star Catalogue gives a spectral type of A5.

The short time scale of variation and the spectral type of BD-8°4232 suggest that it is a Delta Scuti type variable (cf. Baglin et.al. 1973).

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PHOTOELECTRIC MINIMA AND LIGHT CURVES OF THE ECLIPSING BINARY VZ LIBRAE

The variability of the short period eclipsing system VZ Librae ($\alpha=15^h30^m.8$, $\delta=-15^\circ37'$, 1980) was discovered by Tsesevich (1954). He classified this variable as a WUMa-type eclipsing binary and obtained, on the basis of his photographic measurements, the following ephemeris:

$$\text{Min I} = \text{Hel. J.D. } 2429645^d.010 + 0^d.3584501 \cdot E \qquad (1)$$

Although VZ Librae has been known to be a variable star for about 25 years, little attention has been paid to it, and no photoelectric light curve of this system has yet been published.

From April 1980 to July 1981, VZ Librae was observed photoelectrically in the UBV system at the Cerro Tololo Inter-American Observatory (CTIO, Chile) and Bosque Alegre Station (BAS) of the National University of Córdoba (Argentina). The measurements were made using the CTIO 61-cm telescope, equipped with a pulse counting photometer, and with the BAS 150-cm telescope provided with a conventional design photometer. RCA 1P21 photomultipliers refrigerated with dry ice were used in both Observatories. The measurements were made differentially with respect to the comparison star HD 138187, whose spectral type is A5. All the observations have been corrected for first and second-order differential extinction.

The comparison star is located ~ 20 minutes of arc southwest from VZ Librae and, consequently, the corrections applied for differential extinction were small. The mean errors of a single differential observation in V, (B-V), and (U-B) at CTIO are 0.008, 0.005, and 0.012, respectively, while at BAS these values are 0.015, 0.014 and 0.028.

Standard stars were observed at CTIO so that all observations could be converted to the standard UBV system. No variation in the light of the comparison star was detected. This star was found to have the following values:

$$\begin{aligned} V &= 7.689 \\ (B-V) &= 0.322 \\ (U-B) &= 0.076 \end{aligned}$$

VZ Librae was found to have the following magnitude and colors at maximum light:

$$\begin{aligned} V &= 10.130 \\ (B-V) &= 0.612 \\ (U-B) &= 0.046 \end{aligned}$$

The location of the variable at maximum light in the Color-Color diagram is consistent with an unreddened main sequence star with spectral type F9.

From 982 observations obtained in 1980-1981 for each passband of the UBV system, we derived 20 times of minimum light. The bisection-of-chords method was used to determine nine times of primary minimum and eleven of the secondary one. A linear least squares solution using our photoelectric data yields the following improved ephemeris:

$$\text{Min I} = \text{Hel. J.D. } \underset{\pm 0.00014}{2444788^{d}.59010} + \underset{\pm 0.00000024}{0^{d}.35826334} \,.\, E \qquad (2)$$

The photoelectric minima together with the epoch numbers and residuals (O-C), calculated from the ephemeris given in equation (2), are listed in Table I. As shown in the table, the differences (in heliocentric julian days) between the observed minima and those calculated from ephemeris (2), yield very small randomly distributed (O-C) residuals, all being smaller than $0^{d}.001$.

Table I

Times of minimum light of VZ Librae

Min	Pass-band	Hel J.D. 2444000 +	E	(O-C)
II	U	366.7362	- 1177.5	0.0012
II	B	366.7359	- 1177.5	-0.0011
II	V	366.7339	- 1177.5	-0.0011
II	B	408.6514	- 1060.5	-0.0004
II	V	408.6509	- 1060.5	-0.0009
II	U	698.8464	- 250.5	0.0013
II	B	698.8453	- 250.5	0.0002
II	V	698.8448	- 250.5	-0.0003
I	U	787.5147	- 3.0	-0.0006
I	B	787.5154	- 3.0	0.0001
I	V	787.5154	- 3.0	0.0000
I	U	788.5901	0.0	0.0000
I	B	788.5899	0.0	-0.0002
I	V	788.5901	0.0	0.0000
I	U	789.6645	3.0	-0.0004
I	B	789.6654	3.0	0.0005
I	V	789.6654	3.0	0.0005
II	U	790.5598	5.5	-0.0007
II	B	790.5603	5.5	-0.0002
II	V	790.5608	5.5	0.0002

The new period included in ephemeris (2) appears to be about sixteen seconds shorter than given in equation (1). This change, however, is large enough as to produce a shift in the light curve of about half a period in only one year.

Orbital phases have been computed from the revised ephemeris (2) and light and color curves have been drawn. The differential light curves in the V-magnitude and (B-V) color are shown in Figure 1. The differences ΔV and Δ(B-V) are in the sense: variable minus comparison star. There is no doubt that we are dealing with a close (contact) system. The depths of primary and secondary minima are about 0.5 mag and 0.4 mag, respectively. In particular, the secondary minimum appears to be slightly flattened (total eclipse) which will make more easy a future analysis of the star. In addition, the light curve at the maxima clearly shows the variations due to the deformation and to the reflection effect of the components.

B and U light curves show similar characteristics to those presented in Figure 1. Both (B-V) and (U-B) colors are nearly constant all over the period.

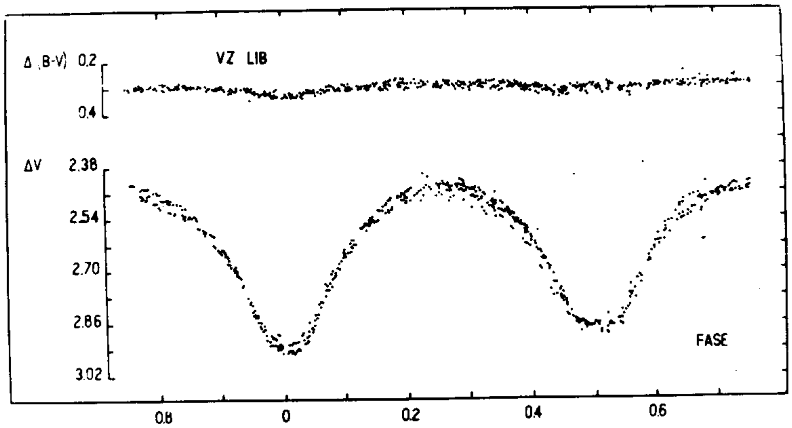

Fig. 1. V and (B-V) light curves of the eclipsing binary VZ Librae

It is interesting to note, however, that the UBV observations reveal noticeable intrinsic variations of this contact system. We have detected significant night-to-night brightness changes, particularly in the U-band, which could be indicative of abrupt changes in the structure of the system.

A detailed analysis of the light curves using the method developed by Wilson and Devinney (1971) will be published later.

We wish to express our thanks to the Director of CTIO for the time,allocation and facilities at CTIO. The assistance of J. Laborde, J.R. Puerta, and Moyano during the observations is also gratefully acknowledged.

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1 PER : A NEW ECLIPSING BINARY WITH A LONG PERIOD AND AN ELLIPTICAL ORBIT

The bright star 1 Persei (HD 11241, BS 533, $m_V = 5.52$, Sp B1.5V) was used as a standard star in the Geneva photometric system. 192 reliable measurements have been made in that system during the last twenty years. All but a few gather around V = 5.519 with a reasonable r.m.s. deviation of 0.012. In 1975 already, three discrepant measures lead one of us (F. Rufener) to suspect this star of being an eclipsing binary. Since 1975 the star was monitored visually by a group of French amateur astronomers directed by A. Figer (the GEOS), who were able to observe both minima and managed to derive a correct period and to prove the excentricity of the orbit. In the meantime, Kurtz (1977) published partial photometric results, showing part of a descending branch in the primary minimum, and part of the ascending branch of the secondary minimum; this proved definitely the binary nature of 1 Per but was not sufficient in itself to give the period. Many attempts were made to observe this star in the Geneva system from Gornergrat, but bad weather prevented us to obtain more than an ascending branch in the primary minimum, and the ascending wing of the secondary.

The results from both Kurtz and Geneva group are displayed in Fig. 1-3. Kurtz's measures (made in the y filter of the uvby system) were adjusted to ours by adding $0^m.031$. Points were plotted according to the ephemeris

$$\text{H.J.D. (short min.)} = \underset{\pm .003}{2443562.853} + \underset{\pm .0005}{25.9359}\ E$$

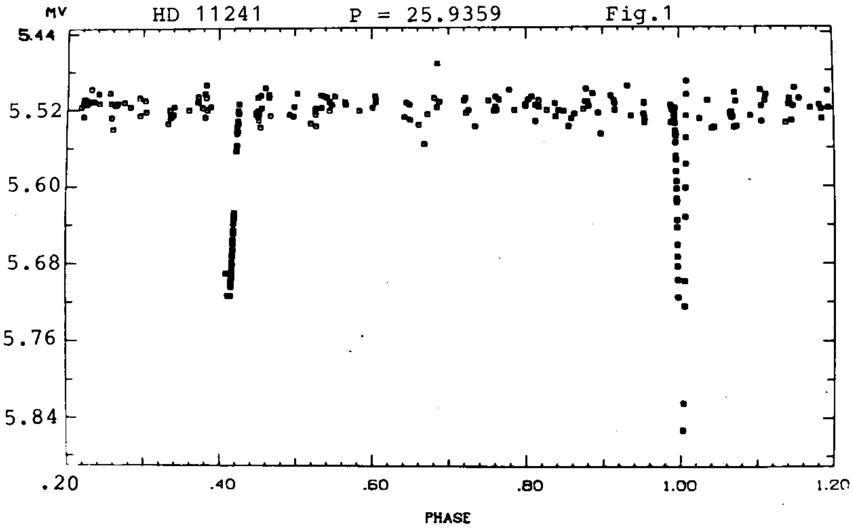

Fig. 1 : Lightcurve of 1 Per plotted according to the ephemeris HJD (short min) = 2443562.853 + 25.9359 E. Open squares: Geneva observations. Full squares: Kurtz's data corrected by 0^m.031.

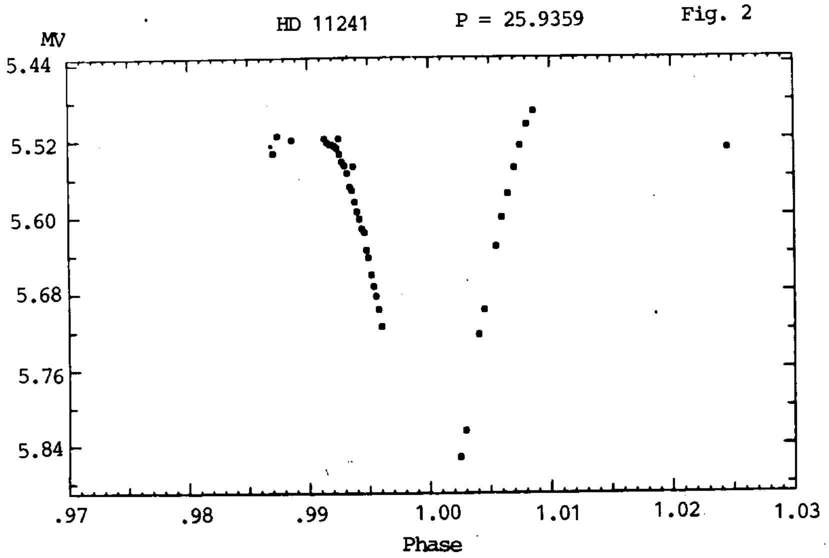

Fig. 2 Primary minimum. Same symbols as in Figure 1.

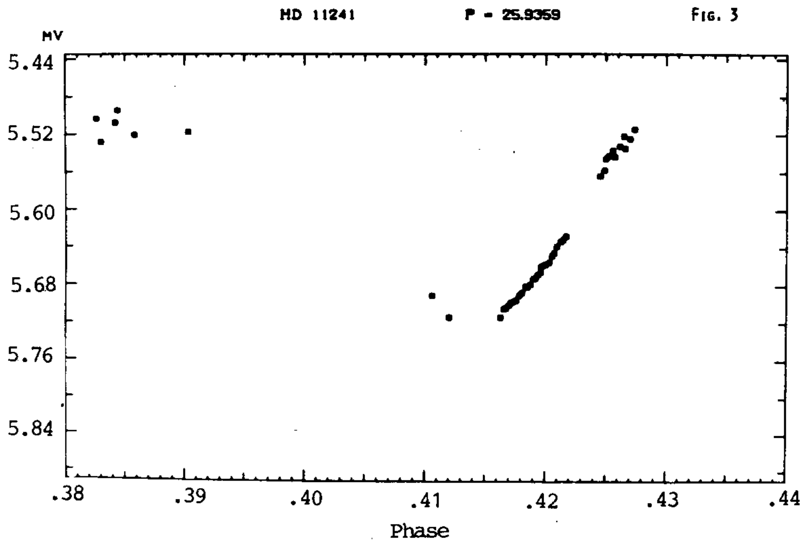

Fig.3 Secondary minimum.Same symbols as in Fig.1.

The secondary minimum is at phase $\phi = 0.4141 \pm .0004$, which lead to an approximate value of the projected excentricity: $e \cos\omega = .135$. The durations of the eclipses are respectively $D_I = 10.6$ hours and $D_{II} = 16.5$ hours (if we admit the secondary minimum to be symmetrical), but these values are rather lower boundaries to the real durations defined by the (external) tangential contact. No obvious colour changes have been noticed during eclipses, apart from a possible effect in [U-B] during the ascending branch of the primary minimum, which was observed differentially with HD 11215 in the night of 21-22 January, 1981. If this effect is real (only a rough reduction has been made, and the night was not of top quality), then it amounts only to $0\overset{m}{.}01$ or $0\overset{m}{.}015$, and indicates that the occulting star is very slightly hotter than its companion. Nothing can be said about possible colour changes in the secondary minimum, since it was not measured with sufficient accuracy (only three measures of absolute Geneva photometry fall in the bottom of it; Kurtz's measures have been made in y only).

The depth of the minimum may be estimated to about $0\overset{m}{.}40$ for the primary and $0\overset{m}{.}21$ for the secondary. It was found that this light curve is consistent with the following model:

Two identical B2V stars with $M = 10\ M_\odot$ and $R = 4.3\ R_\odot$, revolving on an excentric orbit with $e = .30$, $\omega = 116\overset{\circ}{.}7$ or $296\overset{\circ}{.}7$ (depending on which star is taken as the primary), $i = 87\overset{\circ}{.}9$ and $a = 100\ R_\odot$. The durations of the eclipses obtained with such a model are respectively 12.2 and 18.8 hours, which may be slightly too long (but it is realistic; see the remark above). A model involving two slightly different stars would be more realistic of course, but the orbital parameters and the radii would not be drastically changed. Anyway, the absence of colour effect greater than $0\overset{m}{.}015$ forces the companion to be not cooler than about B2V; a B6V companion wold not change the colours, but would be too faint to produce the amplitudes observed. An interesting result is the rather low value of the radii involved: although the model is very rough, it seems difficult to admit radii greater than $4.5\ R_o$ and masses lower than $9\ M_o$ (given the spectral type). So 1 Per would be very near the ZAMS (see e.g. "Basic Astronomical Data", K.Aa. Strand, Ed., Chicago, 1963, p. 290).

It is interesting to consider the radial velocities. They are certainly ill-defined because of the non-recognized binary nature, and because of the rather wide lines. The binarity was however suspected by Batten (1967), who classified this star as B3+B2V, but finally rejected it from his catalogue of spectroscopic binaries; it was classified as B2V by Blaauw and Van Albada (1963) and as B1.5V by Lesh (1968). At least three authors published radial velocities of this star: Cannon (1920) gives eight values in 1914 and 1916, Blaauw and Van Albada (1963) give sixteen observations made in 1956, and Beardsley (1969) fifty-nine values based on old plates taken at Allegheny between 1912 and 1915. A period search was made using the discrete Fourier transform method proposed by Deeming (1975), on the data from Beardsley (1969) and Cannon (1920). A peak arises at P = 25.789 days, very near our photometric period (Fig. 4), which is most encouraging. However, the corresponding radial velocity curve is far from conclusive (Fig. 5) because of its high noise and low amplitude. The above-mentioned model would lead to a peak-to-peak amplitude of about 200 km/s, more than two times what we have! But if there is a blend of two nearly identical lines, such a result is expected. Radial velocities from Blaauw and Van Albada (1963) are also very noisy and are roughly consistent with the others; the 15.6 d period these authors tentatively proposed is surely wrong. According to the above-mentioned model, the stars are at

Fig. 4

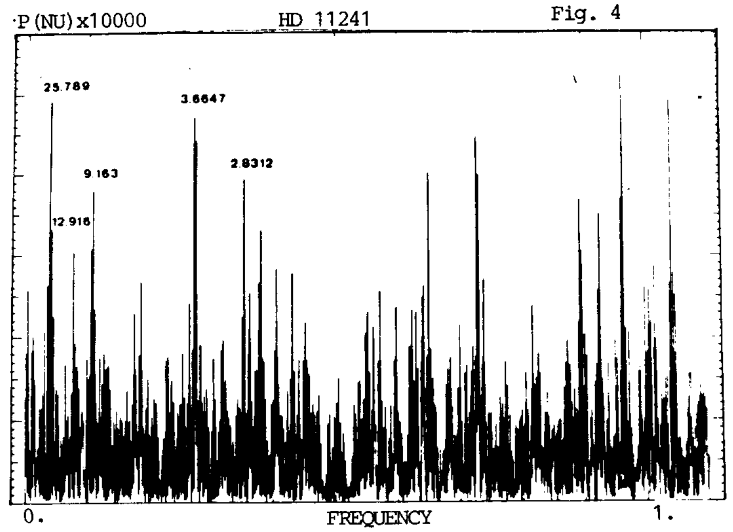

Fig. 5

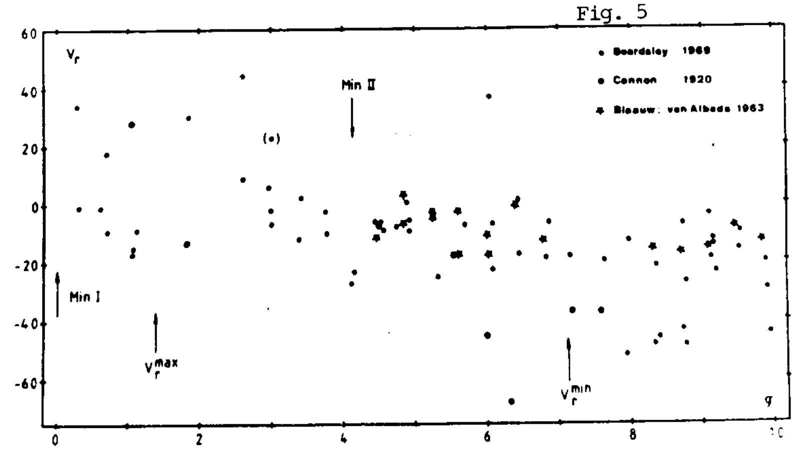

Fig. 4 : Periodogram of radial velocities published by Cannon (1920) and Beardsley (1969). Figures indicate the periods in days.

Fig. 5 : Published radial velocities as a function of the photometric phase.

periastron at phase .039; the maximum radial velocity is +116.7 km/s + V_0 and takes place at phase .138, while the minimum value ($-89.0 + V_0$) occurs at phase .714. All these values concern the star which is the occulting one at the primary minimum; it is also probably the bluer and the brighter, if both stars are not quite identical.

The rotational velocity has been measured by Sletteback and Howard (1955) who found 210 km/s. As no other measurement has been made, it is not possible to know whether the enlargement of the lines is due to axial rotation or to orbital movement of two identical companions. The latter hypothesis is quite acceptable: the rotational velocity of π And, which is a well known SBII, was once estimated at 250 km/s regardless the duplicity, the real value being less than 50 km/s (Slettebak, 1949 and Slettebak and Howard, 1955).

We think this object is interesting, because high-mass, well separated eclipsing binaries are not very numerous. Here there is no significant deformation or reflection effect, nor mass exchange, etc. Photometrists should complete the light curve and may also try to detect a colour change in the minima. Spectroscopists should also observe this star at high dispersion and try to deconvolve the lines in order to get the individual radial velocities of each component.

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R PHOTOMETRY OF RW Com

The 0.24 day W Ursae Majoris system RW Com has been the subject of intensive UBV photoelectric monitoring (Milone et al. (1980)) as well as JHKL photometry (Milone and Clark (1981)). Due to the sizeable wavelength gap between V and J it was decided to obtain a light curve in R.

The system was studied by T.J. Davidge and J.D. Himer during 3 nights in June 1980 with the 0.40 meter reflector at the Rothney Astrophysical Observatory. The detector used was a dry ice cooled FW 118 photomultiplier, run at - 1900 volts. The comparison star used was that designated as "b" in Tsesevich's (1953) study of the system. Each variable star observation was bracketed by a comparison star observation. Sky measurements were made directly after each star measurement.

The light curve is shown in Figure 1. Phases were calculated using the ephemeris given by Milone et al. (1980). Of particular importance in the light curve shown here is the size of the "O'Connell Effect" (O'Connell (1951), Milone (1969)). The O'Connell Effect is defined to be the difference in magnitudes between the two maxima. It is positive if the maximum following primary minimum is brighter than that following secondary minimum. For this system it would appear that the size of the O'Connell Effect increases with wavelength. In the published UBV light curves spanning 8 years, the O'Connell Effects in U, B, and V remain fairly constant at about -0.09, -0.09, and -0.06 magnitudes respectively (Davidge (1981)). In JHKL light curves the O'Connell Effect appears not to be less than -0.02 magnitudes and not to exceed 0.00 magnitudes (Milone and Clark (1981)). Therefore it might be expected that the O'Connell Effect in R should lie somewhere between the values quoted for V and the infrared. Although there is considerable scatter in the maximum following primary minimum in Figure 1, it can be seen that the O'Connell

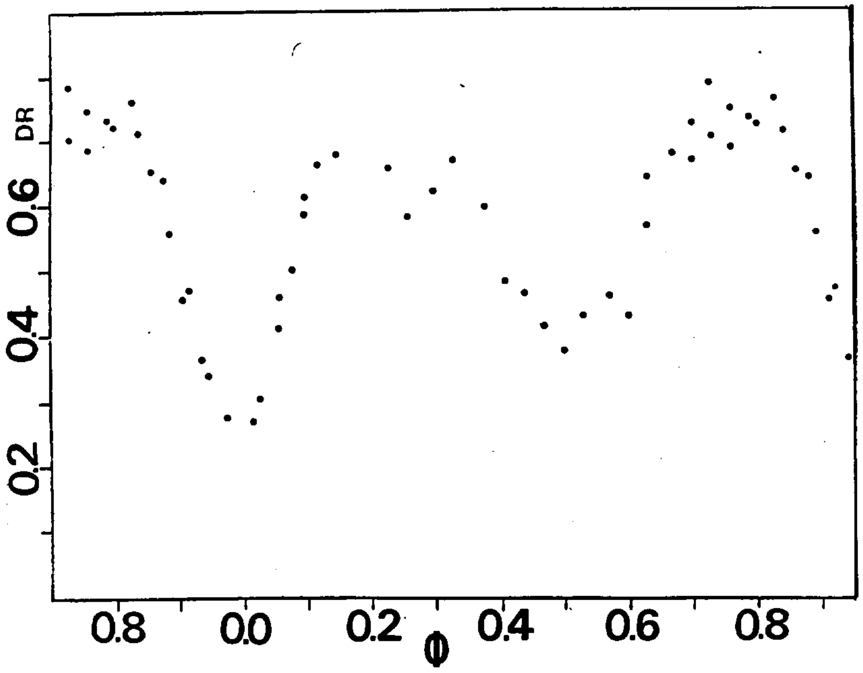

Figure 1: R light curve of RW Com.

Effect appears to be comparable to, or even less than, -0.06 magnitudes. This is not what would be expected from the above arguments.

Clearly, more intensive photoelectric monitoring of this system is necessary in R and I to confirm this finding and to uncover the complete wavelength dependence of the O'Connell Effect in this sytem.

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SYNCHRONOUS UBV FLARE OBSERVATIONS ON UV CETI

The flare observations on UV Ceti have been done at the high altitude Maidanak station of Tashkent Astronomical Institute. In the period from 20th to 29th of September 60 flares were detected on UV Ceti. Some of them were observed simultaneously in three colours. The effective time of these observations was about 42 hours. In fact these observations present the continuation of the ones done in 1978.(1,2).

The UBV colours were observed with the 60 cm, 60 cm and 48 cm telescopes, respectively. The measurements have been made by photon counting method. The duration of each measurement was 2.0 second, and the time interval between two measurements was 0.4 second. The precision of synchronization of observations was 0.001 second.

The data of observed flares are presented in Table I. The columns of Table I represent respectively: the number of flare up, data (September 1979), the time of maximum in UT, the rise time (t_1) and the decay time (t_2) in seconds, amplitudes ΔU, ΔB, ΔV, and the colours $(U-B)_f$ and $(B-V)_f$ of the flare. The data presented in the Table I show that the average frequency of flares of this observations is about 1.5 flare·hour^{-1}, and that the $(U-B)_f$ and $(B-V)_f$ colours of the flares, and especially the the $(U-B)_f$ colours, are very blue.

For illustration the light curves of two flares are presented in Figures 1 and 2.

Table I

N	Date	The time of maximum (UT)	t_1 (sec)	t_2 (sec)	ΔU	ΔB	ΔV	$(U-B)_f$	$(B-V)_f$
1	20	$21^h01^m15^s$	$9^s.2$	$345^s.0$	$3^m.49$	$2^m.20$	$0^m.94$	-	$0^m.16$
2	23	19 00 32	13.8	105.2	1.51	0.37	0.24	−0.78	1.31
3		19 23 53	13.8	793.0	4.03	1.94	0.88	−0.87	0.35
4a		20 05 32	6.9	16.1	2.17	0.18	-	-	-
4b		20 05 58	9.2	9.2	2.11	0.20	-	-	-

Table I (cont.)

N	Date	The time of maximum (UT)	t_1 (sec)	t_2 (sec)	ΔU	ΔB	ΔV	$(U-B)_f$	$(B-V)_f$
4c		20 07 15	6.9	16.1	2.86	0.57	-	-1.79	-
4d		20 08 53	2.3	9.2	2.33	0.37	-	-1.77	-
4e		20 09 49	27.6	27.6	1.73	0.48	0.22	-0.72	0.80
5		20 13 32	6.9	149.5	2.44	0.72	0.36	-1.00	0.92
6		20 19 05	9.2	32.2	1.63	0.23	0.29	-1.52	-
7		20 32 48	16.1	43.9	2.72	-	-	-	-
8		20 37 00	4.6	36.8	2.00	-	-	-	-
9		20 41 30	16.1	66.7	1.79	0.26	0.16	-1.59	1.28
10		21 08 28	4.6	20.8	1.69	0.21	0.13	-1.74	1.33
11		21 57 45	6.9	182.3	2.36	0.55	0.29	-1.29	1.03
12		22 09 30	13.8	69.2	2.57	0.58	0.24	-1.40	0.72
13	24	19 11 40	2.3	11.5	2.27	-	-	-	-
14		19 15 47	2.3	11.5	1.49	-	-	-	-
15a		20 48 37	2.3	9.2	1.97	-	-	-	-
15b		20 49 32	2.3	9.2	2.60	-	-	-	-
16	25	18 35 57	13.8	663.0	4.12	1.15	-	-2.02	-
17		18 51 12	18.4	39.3	1.84	-	-	-	-
17		18 52 49	6.9	23.1	2.34	-	-	-	-
18		19 25 37	13.8	20.8	1.53	0.16	0.06	-	-
19		19 51 14	2.3	43.8	-	0.32	0.18	-	1.15
20		21 03 21	6.9	55.2	2.02	0.28	0.15	-1.79	1.13
21		21 58 58	4.6	9.2	2.62	-	-	-	-
22		22 08 53	6.9	207.7	3.06	0.77	0.24	-1.57	0.31
23		22 20 18	2.3	11.5	2.66	-	0.27	-	-
24		23 04 37	23.0	159.3	1.60	0.22	0.16	-	-
25		23 36 39	6.9	60.0	0.97	0.36	0.19	-	1.04
26	26	20 11 15	9.2	80.8	1.97	0.32	0.22	-1.56	1.38
27		21 13 00	4.6	64.6	3.27	0.93	0.33	-1.49	0.58
28		22 55 21	13.8	29.9	1.41	0.20	0.13	-1.42	1.38
29	27	18 45 10	16.1	225.1	1.30	0.79	-	-	-
30		19 05 46	11.5	59.8	1.48	0.25	0.07	-1.23	0.43
31a		19 26 46	9.2	83.1	4.35	1.86	0.72	-1.29	0.14
31b		19 28 42	39.1	463.1	2.46	0.50	0.18	-1.50	0.58
32		20 48 42	2.3	23.0	2.43	0.51	0.17	-1.47	0.48
33		21 22 56	2.3	16.1	1.98	0.20	0.22	-	-
34		22 00 55	13.8	23.0	1.16	0.20	0.16	-1.06	1.61
35		22 22 00	9.2	36.6	1.40	0.20	-	-1.40	-
36		23 30 32	2.3	13.8	1.85	0.23	-	-1.79	-
37		23 33 16	6.9	18.4	1.63	0.32	-	-	-
38	28	18 10 00	?	400.0	-	0.45	-	-	-
39		18 23 15	2.3	73.2	-	0.35	-	-	-
40		18 59 56	6.9	36.8	2.54	0.66	0.23	-1.23	0.62
41		19 06 42	2.3	13.8	1.79	-	0.22	-	-
42		19 15 56	18.4	25.3	2.03	0.52	0.18	-1.00	0.53
43		20 13 30	6.9	43.8	2.88	0.83	0.28	-1.22	0.35
44		21 28 32	6.9	60.0	1.70	0.16	0.13	-	1.63
45a		21 47 33	4.6	4.6	2.32	-	-	-	-
45b		21 47 40	2.3	19.5	3.05	-	-	-	-
46		21 56 32	6.9	60.0	2.06	0.23	-	-	-
47		21 59 42	4.6	90.4	3.33	0.96	0.37	-1.51	0.50
48		22 02 39	6.9	191.6	4.81	1.96	0.83	-1.64	0.24
49a		22 27 05	16.1	30.0	1.89	0.44	0.39	-1.00	1.70
49b		22 29 10	108.1	800.0	2.23	0.58	0.54	-1.10	1.70
50		23 34 35	16.1	126.9	-	-	0.60	-	-
51	29	20 05 00	6.9	25.3	-	0.26	-	-	-

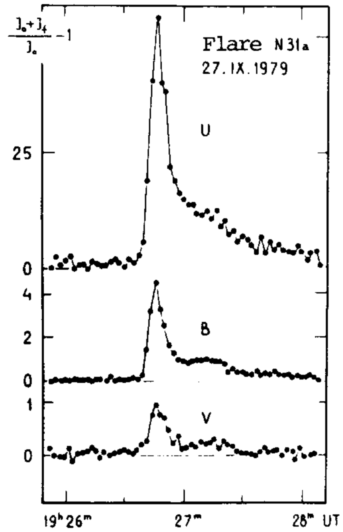

Figure 1

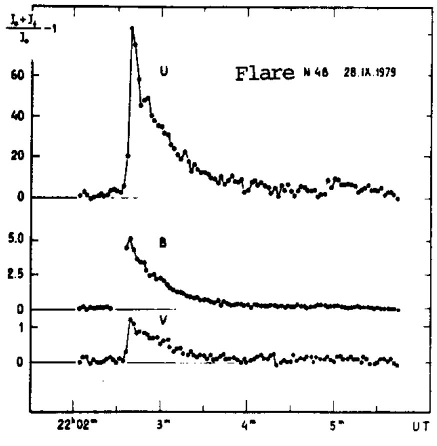

Figure 2

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THE IDENTIFICATION OF OI 090.4 AND CSV 1180

The proximity of the BL Lacertae object OI 090.4 to the suspected variable 1180 (=Ross 200 = Prager 512) has been noted earlier by one of us (Baumert 1978). In fact, Baumert suggested that the coordinates given by Ross (1927) may be in error and that Ross actually observed a brightening of OI 090.4 in 1915 and 1927.

The arguments for this hypothesis were 1) the difference of only $+1^{s}.9$ in right ascension and $+0'.64$ in declination between CSV 1180 and OI 090.4; 2) the comment by Sandig (1947) that he found no object at Ross' position that varied by more than 0.15 mag; 3) the closest star to the position cited by Ross was at best nearly 3 mag fainter than those quoted by Ross; and 4) OI 090.4 was brighter than normal in 1915 and 1927.

Ross' original plates have been searched in order to confirm or deny the hypothesis. A careful inspection of the plates reveals that the only object in the region that varies significantly is OI 090.4, thus confirming the identity of CSV 1180 and OI 090.4.

The magnitudes cited by Ross are also in error. Cudworth, using the photometric sequence of Baumert (1978), determined $m_{pg} \approx 14.2$ for 1915 March 12 and 15.5 for 1927 Jan. 5. The error for each estimate is ± 0.2 mag. These magnitudes are consistent with those obtained by Baumert (1980) who determined a magnitude of 14.7 for 1915 Feb. 19, 15.3 for 1927 Jan. 7, 15.4 for 1927 March 1, and 15.6 for 1927 March 8.

In closing, it is noted that the labels A and B are reversed in Figure 1 of Baumert (1978). They are labelled correctly in Baumert (1980).

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TWO COLOUR PHOTOELECTRIC LIGHT CURVES OF WW Dra

The RS CVn type eclipsing binary WW Dra (BD +60° 1691 A), the brighter component of the visual binary ADS 10052, was observed photoelectrically at the Ege University Observatory from June 30 to December 20, 1980. The observations were made with the 48 cm Cassegrain telescope equipped with an unrefrigerated EMI 9781 A photomultiplier.

BD +61° 1595 and BD +60° 1682 were used as comparison and check stars, respectively. The B and V filter which are approximately in the standard UBV system, were used and a total of 288 observations in each colour were obtained on 37 nights. All the differential observations in the sense comparison minus variable were corrected for atmospheric extinction and the times of individual observations were reduced to the Sun's centre.

During the observations only one primary minimum time was obtained as given below.

Observed Min I time: Hel.J.D. 24 44 446.3406

Using the photoelectric times of primary minimum given by Kizilirmak and Pohl (1974), Mardirossian et al. (1980) and given above, the following new light elements were computed with the method of least squares:

$$\text{Min.I} = \text{Hel.J.D. } 24\ 41\ 918.4994 + 4\overset{d}{.}6297444 \cdot E$$
$$\pm 32 \qquad\qquad \pm 71$$

The phases of the observations were computed from light elements already given above. The differential magnitudes were plotted against phases and are shown in Figure 1 and 2.

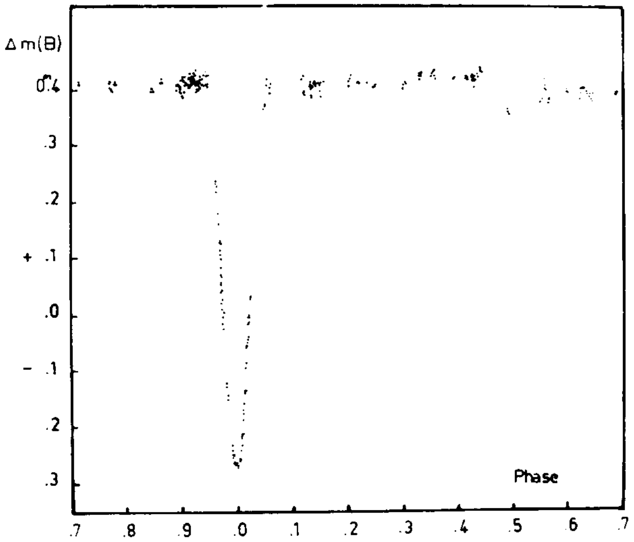

Figure 1 B light curve of WW Dra

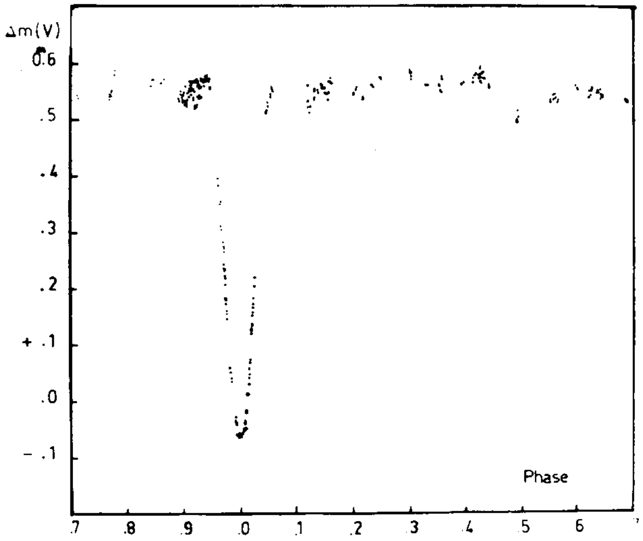

Figure 2 V light curve of WW Dra

The analysis of the light curves are in progress and the observations of the system will be continued in the coming observing season.

The authors would like to express their gratitude to the Scientific and Technical Research Council of Turkey for supporting this research.

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SPECTROSCOPIC OBSERVATIONS OF SYMBIOTIC STARS IN JULY AND SEPTEMBER 1981

The visible spectra of the following symbiotic stars were recorded on July and September 1981 with the 80 cm Telescope at the Observatoire de Haute Provence. The spectrograph was equipped with an R.C.A. tube and the spectrum was recorded on IIaO plates. The spectral range is from λ3600 Å to λ5300 Å and the reciprocal dispersion is 92.8 Å/mm at Hγ.

We report here the most conspicuous features in the following tables.

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Elements	(O III)			(Ne III)	He II	Fe II	(Fe II)	Fe III	(FeV)	(Fe VII)	N III	H. I	He I	C III	
I.P.	54.9 ev			63.4	54.4	16.2	16.2	30.7	75	103	47.5	13.6	24.4	47.9	
Stars	λ4363	λ4959	λ5007	λ3868	λ4686					λ3760	λ4640				
CI Cyg	x	x	s	s	s					w	w	x			1
Z And	w				s					w	w	x	x		2
BF Cyg	x	x	s	s	w					w		x	x	w	3
AX Per	x	x	s	s	s					w	w	x	x	w	4
AG Peg	w	w	x		s						x	x	x		5
AG Dra					s					w		x			6
YY Her	s	w	w					x		w		x			7
V 1016 Cyg	s	s	s	s	s	x	x	x	x	s	x	x	x	x	8
EG And	x	x	x							x					9
TX CVn												x			10
T CrB	x	x	x									x			11
CH Cyg						x						x	x		12
HBV 475	x	x	s	x	s			x		x	x	x	x	w	13

x:Present
s:Strong
w:Weak

Elements	TiO α system			
Stars	4761	4804	4954	5167
CI Cyg				
Z And	x		x	x
BF Cyg				x
AX Per	x		x	x
AG Peg			x	x
AG Dra				
YY Her				
V 1016 Cyg				
EG And	x	x	x	x
TX CVn	s	s	s	s
T CrB	x	x	s	s
CH Cyg			x	x
HBV 475				

x : Present
s : Strong

1. The circumstellar nebula is certainly strong. $H\gamma$ and (OIII) 4363 Å have the same intensity. In September 1981, the blue red region is similar to that of Z And.
2. The cool giant type dominates and high excitation lines are very weak.
3. In July 1981, in the blue red region the spectrum is very similar to CI Cygni.
4. The TiO bands are stronger than in the spectrum of BF Cygni. Absorption line Ca I at λ4227 Å appeared in September 1981.
5. The absorption bands of TiO (4954 and 5167) are little developed. He II λ4686 Å is much stronger than H_β.
6. Strong continuum is visible at $\lambda<3600$ Å and $\lambda> 4600$ Å.
7. The high excitation lines from optical range are in agreement with U V observations.
8. This star is characterized by high excitation lines due to a very hot source of radiation.
9. Absorption line CaI at λ4227 Å is present in September 1981. An overlying continuum is visible at $\lambda>4400$ Å.
10. The TiO absorption bands are stronger than in the spectrum of TCrB.

    The continuum in the blue red region is very strong.
11. The bands of TiO and some atomic lines λ4326 Å, λ4404 Å of FeI are strongly developed in absorption.
12. Absence of high excitation lines. The M spectrum dominates in the blue red region.
13. The (OIII) line λ5007 is much stronger than λ4363 Å. The nebular component in the system is much developed.

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66th NAME – LIST OF VARIABLE STARS

The present 66th Name–list of variable stars has been compiled in accordance with the rules established in the 56th list. It contains all necessary identifications for 203 new variables designated in 1981.

The whole number of the designated variable stars is now 28457.

In the square brackets the reference number is given for the work where (not always firstly) the information on discovery of the variable had been published. This reference number accompanies designation or number of the star given for it in the cited work. Name of the discoverer is mentioned only in the cases when it does not coincide with the name of the author of the cited work.

Reference numbers 0001–5216 correspond to the numbers from literature list published in the first volume of the 3rd edition of General Catalogue of Variable Stars (pages A42–A121). The only exception is the number 2590 which is given below. This is due to the fact that this number was changed already during the continuing work on compilation of the fourth edition of GCVS.

The numbers 5217–5824 correspond to the supplementary list published in the First supplement to the Catalogue (pages 279–289). The numbers 5825–6828 correspond to the supplementary list published in the Second supplement to the Catalogue (pages 361–380). The numbers 6829–7723 correspond to the supplementary list published in the Third supplement to the Catalogue (pages 342–357).

The numbers 7734–7894 had been published in the 62nd Name–list (IBVS № 1248, 1976), the numbers 7895–7979 – in the 63rd Name–list (IBVS № 1414, 1978), the numbers 8029, 8054, 8070, 8116, 8144, and 8197–8284 – in the 64th Name–list (IBVS № 1581, 1979), the numbers 7996 and 8305–8587 – in the 65th Name–list (IBVS № 1921, 1981). At last the numbers 2590, 8043, 8637, 8661, 8663, and 8730–8805 are given in the present edition.

The serial numbers of flare variables in the Pleiades cluster are preceded here by the symbol Plf. NSV is the ordeal number of the star in the "New Catalogue of suspected Variable Stars" ready for print now.

This Name–list is the last before the fourth edition of the GCVS. All the stars which will be designated later are supposed to be included in the Supplements to the fourth edition.

We are grateful to *T.D.Nishtcheva* for preparation of the Name–list for the print.

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Sternberg State Astronomical Institute of the Moscow State University

MZ Aps = BV 1118 [5502] = 11 [8661] = = NSV 8202.
V1358 Aql = СПЗ 1623 [5507] = NSV 11996.
V1359 Aql = BD−3°4773 (8.8) = HD 190155 (G5) [8637] = SAO 144033.
V821 Ara = 3U 1658−48 [8730] = GX 399−4 [8731].
V822 Ara = 15 [8661].
V353 Aur = CRL 618 [8735].
V354 Aur = S 10835 [8732].
V355 Aur = S 10836 [8732].
V356 Aur = BD+28°856 (8.2) = HD 37819 (F8) [8733] = SAO 077431.
V357 Aur = S 10837 [8732].
V358 Aur = CCS 414 [8734] = СПЗ 2423.
V359 Aur = S 10839 [8732].
V360 Aur = S 10840 [8732].
ξ Boo [8736] = 37 Boo = HR 5544 = = BD+19°2870 (5.0) = HD 131156 (G5) = SAO 101250 = ADS 9413AB = = СПЗ 2491.
BM Cam = 12 Cam [8737] = HR 1623 = BD +58°805 (6.5) = HD 32357 (K0) = = SAO 025003.
BN Cam = HR1643 [8488, *Winzer*] = BD +73°274 (5.5) = HD 32650 (A0p) = = SAO 005455.
DW Cnc = 2 ($7^{h}56^{m}.1$ + 16°25′, 1950.0) [8738] = СПЗ 2424.
BI CVn = BD+37°2356 (9.2) = BV 97 [0819, *Kippenhahn*] = КЗП 6984 = = NSV 6077.
HL CMa = 1 E 0643.0 −1648 [8739].
V383 Car = CoD−58°1592 (8.1) = CPD −58°807 (7.8) = HD 52788 (F2) [8740] = SAO 234839.
V384 Car = Var in the field of RW Car [8741].
V385 Car = CoD−64°520 (8.5) = CPD −64°1629 (8.3) [4696] = HD 96548 (Oc) [8532] = SAO 251264 = = КЗП 102659 = NSV 5089.
V633 Cas = S 10136 [3903] = NSV 00072.
V634 Cas = Case 23 [8743] = DO 23794 (M2) = = СПЗ 2420.
V635 Cas = 4U 0115+634 [8744].
V636 Cas = BD+62°264 (7.2) = HD 9250 (K0) [8745] = SAO 011813.
V637 Cas = Case 31 [8746] = DO 26429 (M5) = = IRC+60106 = СПЗ 2421.
V638 Cas = HR 8770 = BD +54°2900 (6.5) = = HD 217833 (B9) [8747] = = SAO 035092.
V823 Cen = CoD−53°4879 (6.8) = CPD −53°5397 (7.1) = HD 112381 (A0p) [2590] = SAO 240405.
V824 Cen = HR 4965 = CoD−51°7329 (6.5) = = CPD−51°5844 (6.1) = HD 114365 (A0p) [2590] = SAO 240627.
V825 Cen = V2 (ω Cen) [8238].
V826 Cen = V129 (ω Cen) [8742, *van Gent, Hertzsprung*].
V827 Cen = HR 5158 = CoD−50°7998 (7.0) = = CPD−50°6287 (7.0) = HD 119419 (A0p) [2590] = SAO 241120.
V828 Cen = HR 5269 = CoD−40°8373 (6.5) = = CPD−40°6417 (6.8) = HD = 122532 (A0p) [2590] = SAO 224641.
V353 Cep = 1 [8748].
V354 Cep = Case 75 [8746] = СПЗ 2486.
V355 Cep = Case 78 [8746] = СПЗ 2487.
V356 Cep = Case 81 [8746] = СПЗ 2488.
CX Cha = S 6313 [4001] = КЗП 6799 = = NSV 4966.
CY Cha = S 6315 [4001] = КЗП 6802 = = NSV 4983.
CZ Cha = S 6318 [4001] = КЗП 6807 = = NSV 5017.
DD Cha = S 6350 [4001] = КЗП 6823 = = NSV 5114.
DE Cha = S 6374 [4001] = КЗП 6863 = = NSV 5328.
DF Cha = S 6391 [4001] = КЗП 6889 = = NSV 5463.
DG Cha = S 6412 [4001] = КЗП 6942 = = NSV 5842.
DH Cha = S 6450 [4001] = КЗП 7019 = = NSV 6205.
BS Cir = CoD−66°1571 (6.7) = CPD −66°2519 (7.3) = HD 125630 (A2p) [2590] = SAO 252725.
V692 CrA = HR 6804 = CoD−41°12534 (5.9) = CPD−41°8620 (6.0) = = HD 166596 (B3) [8415] = = SAO 228815.
V693 CrA = Nova CrA 1981 [8750, *Honda*].

UU CrB = BD+32°2577 (8.1) = HD 137050 (F8) [8751] = SAO 064671.
BX Cru = 102 [8752].
V1740 Cyg = 2 ($19^{h}20^{m}50^{s}+28^{\circ}04'.9$, 1900.0) [8753] = СПЗ 2429.
V1741 Cyg = 4 Cyg [8488, *Winzer*] = HR 7395 = BD+36°3557 (5.0) = HD 183056 (A0p) = SAO 068301.
V1742 Cyg = $19^{h}22^{m}49^{s}+27^{\circ}40'35''$, 1900 [8754] = СПЗ 2450.
V1743 Cyg = HR 7442 [8755] = BD+48°2914 (6.5) = HD 184786 (Mb) = IRC +50300 = SAO 048589.
V1744 Cyg = BD+30°3658 (7.8) = HD 185224 (B9) [8747] = SAO 068578.
V1745 Cyg = BD+29°3672 (7.5) = HD 185332 (A2) [8756] = SAO 087474.
V1746 Cyg = 25 Cyg = HR 7647 = BD+36°3806 (5.8) = HD 189687 (B3) [8663] = = SAO 069231.
V1747 Cyg = $20^{h}08^{m}25^{s}+43^{\circ}35'47''$. 1950.0 [8757] = СПЗ 2451.
V1748 Cyg = 1 [8758] in the nebula IC 1318a.
V1749 Cyg = BD+35°4077 [8743] = СПЗ 2355.
V1750 Cyg = B2 [8759].
V1751 Cyg = 2 [8758] in the nebula IC 1318c.
V1752 Cyg = R1 [8759].
V1753 Cyg = R2 [8759].
V1754 Cyg = B3 [8759].
V1755 Cyg = R3 [8759].
V1756 Cyg = R4 [8759].
V1757 Cyg = R5 [8759].
V1758 Cyg = 2 [8748].
V1759 Cyg = СПЗ 2315 [8760, *Чугаров*].
V1760 Cyg = Nova? 1980 [8761].
V1761 Cyg = S 10841 [8762].
DM Dra = 4 ($15^{h}33^{m}.0+59^{\circ}57'$, 1950.0) [8738] = СПЗ 2426.
DN Dra = G 226–29 [8763].
OT Gem = HR 2817 = BD+15°1564 (7.0) = = HD 58050 (B3) = SAO 096866 = = 305.1934 [0196] = P 3025 = = КЗП 1033 = NSV 3574.
V773 Her = HR 6176 [8488, *Winzer*] = BD +15°3029 (6.5) = HD 149822 (A0p) = = SAO 102271.
V774 Her = BD+22°3406 (9.1) [8764] = HD 171314 (K2) = SAO 086187.
V775 Her = BD+23°3500 (8.3) = HD 175742 (K0) [8765] = SAO 086592.
LL Hya = BV 1722 [8368].
V361 Lac = S 10842 [8762].
V362 Lac = BD+38°4801 (8.5) = HD 213918 (A0) [8766] = ADS 16064 A = SAO 072473.
V363 Lac = BD+48°3827 (9.4) = DO 41905 (R) = S 10844 [8762].
V364 Lac = BD+37°4713 (8.2) = HD 216429 (A0) = SAO 072799 [8767].
DK Leo = Vyss 124 [8768] = AC+22°214–129.
VW Lyn = GD 99 [8400].
V477 Lyr = Central star of the planetary nebula Abell 46 [8749, 8769] = NSV 10973.
V478 Lyr = BD+30°3425 (7.8) = HD 178450 (G5) [8770] = SAO 067836.
XZ Men = CoD–80°166 (7.9) = CPD –80°132 (7.5) = HD 31908 (A3) [8447] = SAO 256135.
AX Mic = CoD–39°14192 (7.3) = CPD –39°8920 (7.4) = HD 202560 (Map) [8771] = SAO 212866.
V646 Mon = BD–0°1572 (8.7) = HD 53116 (A0) [8385] = SAO 134128.
V647 Mon = BD–0°1618 (9.3) [8772] = = HDE 293396 (B2).
GK Mus = S 6358 [4001] = КЗП 6839 = = NSV 5205.
GL Mus = S 6368 [4001] = КЗП 6853 = = NSV 5281.
GM Mus = S 6395 [4001] = КЗП 6901 = = NSV 5507.
GN Mus = S 6410 [4001] = КЗП 6936 = = NSV 5781.
GO Mus = S 6411 [4001] = КЗП 6940 = = NSV 5831.
GP Mus = 92 [8752].
QY Nor = CoD–53°6384 (6.8) = CPD –53°7015 (6.7) = HD 143658 (A0) [8415] = SAO 243296.
QZ Nor = CoD–54°6576 (9.2) = CPD –54°7159 (8.8) = HD 144972 (K0) = SAO 243412 = BV 537 [4381] = NSV 7493.

CE Oct =CoD–79°791(7.8)= –79°1052 (7.5)=HD 188520(A2) [8773]= =SAO 257764.

V2119 Oph =F2 near NGC 6284 [8774].

V2120 Oph =V6 in NGC 6284 [8774].

V2121 Oph=V10 in NGC 6284 [8775].

V2122 Oph=F4 near NGC 6284 [8774].

V2123 Oph=V11 in NGC 6284 [8775].

V2124 Oph=F1 near NGC 6284 [8774].

V2125 Oph=52 Oph [8415]=HR 6545=BD –21°4659 (6.5)=CPD–21°6421 (6.6)=HD 159376 (A0)=SAO 185526.

V2126 Oph=HR 6709 [8415]=BD+0°3832 (7.1)=HD 164258(A2p)=SAO 123004.

V2127 Oph=СПЗ 2449 ($18^{h}01^{m}.0$ +09°17′, 1950.0) [8776].

V1057 Ori =BD+13°852(8.2)=HD 34454 (Mb)=DO 1049 (M5)=IRC +10082=GC 6483=37[8777]= =NSV 1912.

V1058 Ori =70 [8778]=СПЗ 2456.

V1059 Ori =73 [8778]=СПЗ 2458.

V1060 Ori =84 [8778]=СПЗ 2468.

V1061 Ori =78 [8778]=СПЗ 2463.

V1062 Ori =67 [8778]=СПЗ 2454.

V1063 Ori =R1 [8779].

V1064 Ori =77 [8778]=СПЗ 2462.

V1065 Ori =68 [8778]=СПЗ 2455.

V1066 Ori =65 [8778]=СПЗ 2452.

V1067 Ori =76 [8778]=СПЗ 2461.

V1068 Ori =81 [8778]=СПЗ 2465.

V1069 Ori =3 [2849]=R3 [8779]=П 1292= =Brun 150=КЗП 6204=NSV 2162.

V1070 Ori =82 [8778]=СПЗ 2466.

V1071 Ori =Parenago 1644 [8780].

V1072 Ori =39 [8428]=П 2025=СПЗ 2492.

V1073 Ori =298 [8043]=П 2058=Brun 734.

V1074 Ori =79 [8778]=СПЗ 2464.

V1075 Ori =R5 [8779]=П 2372.

V1076 Ori =208 [2849]=64 [8778]=КЗП 6321=NSV 2417.

V1077 Ori =Brun 987 [2850]=69 [8778]= =КЗП 100632=NSV 2422.

V1078 Ori =75 [8778]=СПЗ 2460.

V1079 Ori =R6 [8779].

V1080 Ori =83 [8778]=СПЗ 2467.

V1081 Ori =66 [8778]=СПЗ 2453.

V1082 Ori =74 [8778]=СПЗ 2459.

V1083 Ori =71 [8778]=СПЗ 2457.

V1084 Ori =R8 [8779].

V471 Per =M 1–2, 133–8°1 [8781].

ξ Per [5160]=46 Per=HR 1228= =BD +35°775 (4.2)=HD 24912 (Oe5)=SAO 056856=Zi 264= =КЗП 100364=NSV 1427.

ψ Per [8783]=37 Per=HR 1087= =BD +47°857 (5.3)=HD 22192 (B5p) [7855]=SAO 038980= =NSV 1200.

SZ Pic =CoD–43°2114 (7.7)=CPD –43°710 (8.3)=HD 39917 (G0) [8784]=SAO 217600.

AO Psc =E[8782]=H 2252–035= =3A 2254–033.

QS Pup =HR 3058=CoD–46°3460 (6.5)= =CPD–46°1796 (6.4)=HD 63949 (B2) [8787]=SAO 219034.

QT Pup =CoD–38°3714 (10)=C2 near NGC 2477 [8788]=carbon star in NGC 2477 [7892].

QU Pup =HR 3078=CoD–42°3610 (6.6)= =CPD–42°1726 (6.6)=HD 64365 (B5) [8787]=SAO 219076.

QV Pup =CoD–29°5141 (10)=W 014–06 [7892].

VW Pyx =0855–28 [8789]=Central star of the planetary nebula K1–2 [8790]=NSV 4326.

V4065 Sgr =$18^{h}16^{m}.5$ –24°45′ [8791, *Honda*] =Nova Sgr 1980.

V4066 Sgr =Var 155 [6278]=NSV 11003.

V4067 Sgr =V32 (M22) [8792, *Watt*].

V4068 Sgr =V17 (M22) [8785, *Swope*].

V4069 Sgr =V33 (M22) [8792, *Watt*].

V927 Sco =3 Sco=HR 5912 [8054]= =CoD–24°12365 (6.7)=CPD –24°5590 (6.5)=HD 142301 (B8)=SAO 183914.

MO Ser =V1 (NGC 6535) [5114].

MP Ser =V2 (NGC 6535) [8793].

SS Sex =25 Sex=HR 4082=BD–3°2911 (6.3)=HD 90044 (B9) [2590]= =SAO 137533.

V782 Tau =Plf 528 [8794]=СПЗ 2477.

V783 Tau = Plf 536 [8794] = СПЗ 2483.
V784 Tau = Plf 524 [8794] = СПЗ 2476.
V785 Tau = T 61b [8795] = Plf 486.
V786 Tau = T 62b [8795] = Plf 487.
V787 Tau = T 63b [8795] = Plf 526 [8794] = = Plf 488.
V788 Tau = Plf 531 [8794] = СПЗ 2479.
V789 Tau = T 70b [8795] = Plf 491.
V790 Tau = T 71b [8795] = Plf 492.
V791 Tau = Plf 535 [8794] = СПЗ 2482.
V792 Tau = 1 [8796] = Plf 521.
V793 Tau = T 64b [8795] = Plf 489.
V794 Tau = T 65b [8795] = Plf 490.
V795 Tau = 2 [8796] = Plf 522.
V796 Tau = T 72b [8795] = Plf 493.
V797 Tau = Plf 538 [8794] = СПЗ 2484.
V798 Tau = Plf 539 [8794] = СПЗ 2485.
V799 Tau = Plf 534 [8794] = СПЗ 2481.
V800 Tau = 3 [8796] = Plf 523.
V801 Tau = R 10 [8797]. In Pleiades region.
V802 Tau = R11 [8797]. In Pleiades region.
V803 Tau = Plf 533 [8794] = СПЗ 2480.
V804 Tau = Plf 530 [8794] = СПЗ 2478.
V805 Tau = A 351 [8798]. Member of the Hyades cluster.
V806 Tau = 23 in the Taurus dark cloud complex [8799].
V807 Tau = СПЗ 2448 [8800].
V808 Tau = BD+24°692 (9.2) [8801] = HD 283882 (K5) = SAO 076773.
V809 Tau = 137 Tau [8786, *Winzer*] = = HR 2033 = BD+14°1060 (6.0) = = HD 39317 (B9) [8418] = SAO 094945.
PX Tel = V 15 (NGC 6584) [8802].
PY Tel = S 7657 [4195] = BV 1444 [6031] = КЗП 7814 = NSV 10672.
PZ Tel = CoD−50°12190 (8.0) = CPD −50°10862 (8.0) = HD 174429 (G5) [8803] = SAO 245781.
LL TrA = CoD−62°1021 (8.0) = CPD −62°5193 (6.9) = HD 144231 (B9) [8415] = SAO 253437.
LM TrA = 485.1933 [4488] = HV 8862 = = P 1076 = 1 [8661] = КЗП 2624 = = NSV 7605.
LN TrA = 3 [8661].
LO TrA = 6 [8661].
LP TrA = HR 6204 = CoD−66°1991 (5.6) = = CPD−66°3009 (5.7) = HD 150549 (A0p) [8415] = SAO 253688.
LQ TrA = 8 [8661].
DS UMa = GR 300 [8804].
DT UMa = GR 301 [8804].
DU UMa = GR 305 [8804].
IS Vel = HR 3213 [8787] = CoD−47°3653 (5.9) = CPD−47°1920 (6.3) = = HD 68324 (B3) = SAO 219513 = = SAO 219515.
IT Vel = CoD−46°4025 (7.5) = CPD −46°2383 (7.8) = HD 70084 (B5) [8805] = SAO 219751.
IU Vel = HR 3593 [6311] = CoD−42°4875 (6.6) = CPD−42°3235 (6.2) = = HD 77320 (B3) [6313] = SAO 220738 = NSV 4349.
IV Vel = HR 3941 [8420] = CoD−52°3465 (6.7) = CPD−52°2980 (7.3) = = HD 86466 (B3) = SAO 237526.
IW Vel = HR 4274 [8403] = CoD−50°5534 (6.4) = CPD−50°3802 (7.2) = = HD 94985 (A3) = SAO 238622.
PV Vul = 1 ($19^{h}27^{m}40^{s}$ +25°45′.0, 1900.0) [8753] = СПЗ 2428.

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PHOTOELECTRIC LIGHT CURVES OF CK BOOTIS (HD 128141)

The system, which was discovered to be a binary of WUMa type by Bond (1975), has been observed in two colours with the 30 cm Maksutov telescope of the Ankara University Observatory. Bond's comparison star, HD 128128, was adopted. HD 128186 and BD $+09^{\circ}2919$ were used as check stars.

Two light curves obtained in 1977 and 1978 are presented in Figs. 1 and 2, respectively. The phases were calculated from the formula (Aslan, 1978):

$$\mathrm{HJD}\ 2442897.3759 + 0^{d}.3551501\ E$$

The light curve displays typical W UMa type features with a scatter of individual observations that is more than expected from observational errors alone; the mean rms error of a single differential measure is about $0^{m}.015$ in both colours. The most important property of the light variation is the interchanging depths of the eclipses. Such behaviour has been observed in AC Boo, AM Leo and TZ Boo. Hoffmann (1978,1980) has recently discussed his observations of TZ Boo in some detail.

The minimum at phase 0.0, which will be called arbitrarily the primary minimum, is seen to be the fainter one in Fig.1, but in the observations of Bond, it was the brighter. In 1978 observations in Fig.2, the sense has reversed again.

The primary minimum was fainter than the secondary in 1977 (Fig.1) by $0^{m}.02$ in v and $0^{m}.03$ in b. In 1978 (Fig.2) the minima were almost equally deep, the secondary being slightly deeper by about $0^{m}.015$ in b, but not more than $0^{m}.01$ in v.

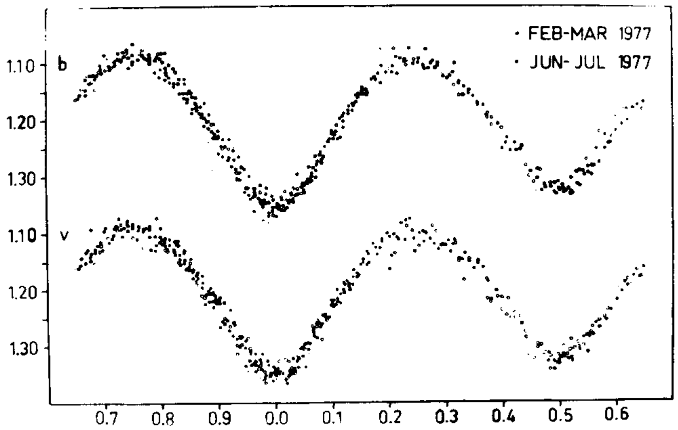

Figure 1

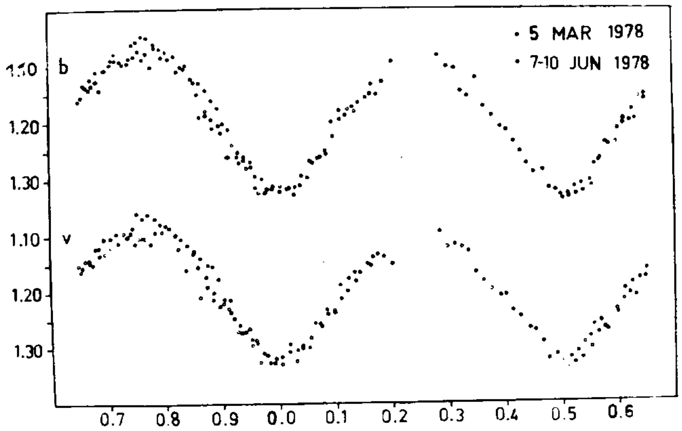

Figure 2

Comparing the 1977 and 1978 light curves, it is seen that there was hardly any change in the brightness of the secondary minimum but the primary minimum became brighter in 1978 by about $0^m.03$ in v and $0^m.04$ in b, with a large scatter from night to night. This presumably indicates that the source of the changes is the eclipsing component during the primary minimum.

Another feature of the light curve is that the maximum preceding the primary minimum is brighter than the maximum following the primary minimum, the phasing being the same as in Bond's light curve, save the interchange of the depths of the eclipses. Maxima attained in 1977 and in 1978 light curves were almost the same with the exception of 5th March 1978, on which the system was decidedly brighter near the phase 0.75, with no difference in the level of the minimum.

Any change in b-v colour index over the period is less than $0^m.01$. The observations, together with those in 1981 will be given elsewhere.

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THE ECLIPSING BINARY HD 124195

The runaway star HD 124195 was observed in 1975 with the Dutch satellite ANS in the ultraviolet. The star has V = 6.11, B - V = +0.05, MK type: B5V. It has a variable radial velocity. The pointing direction of ANS was: Ra(1950) = 14h 10m 15s, D(1950) = -54d 23.5m. ANS has a field of view of 2.5 x 2.5 arc minutes.

In two consecutive half years 13 observations were obtained (see Table I). Observations 6 and 7 are about 0.5 magnitudes fainter than the remaining 11 observations. On the basis of the groundbased colours and spectral type, and unreddened colours in the visual of Fitzgerald (1970), and in the ultraviolet of Wesselius et al. (1980) I have predicted the ultraviolet magnitudes of HD 124195. The result is shown in the last line of Table I. It is apparent that the 11 bright observations agree quite well with this expectation.

While encountering this object in an earlier stage of the ANS data reduction I thought it was due to an —as yet unknown— observational problem. After many studies based on ANS material, and an extensive comparison with other ultraviolet data (Gilra et al., 1982) I had become reasonably convinced that the observed depression was real, i.e. we are observing an eclipse of HD 124195.

Indeed I found that the star is listed as a variable in Kukarkin's catalogue under the name: V716 Cen. Schoeffel and Koehler (1965) published a lightcurve showing a primary minimum of about 0.6 magnitudes and a secondary one of 0.3 magnitudes. The next year Popper described 6 spectrograms of this star: he found only single lines. Hube (1970) published three radial velocities of HD 124195: +92, +95, +10 km/s, on average "+65.9 var".

Table I

ANS Observations on HD 124195

No.	Date	m1550N	m1550W	m1800	m2200	m2500	m3300
1	1975.10873	4.743	4.729	4.921	5.665	5.530	5.624
2	1975.11043	4.754	4.729	4.896	5.660	5.532	5.631
3	1975.11044	4.746	4.728	4.898	5.655	5.530	5.632
4	1975.11268		4.722	4.894	5.643	5.529	5.606
5	1975.11269		4.728	4.895	5.640	5.526	5.604
6	1975.11378	5.296		5.439	6.179	6.048	6.129
7	1975.11378	5.295		5.430	6.178	6.056	6.123
8	1975.61623		4.715	4.889	5.640	5.524	5.625
9	1975.61623	4.735		4.887	5.638	5.528	5.625
10	1975.61881		4.718	4.895	5.640	5.520	5.624
11	1975.61882	4.733		4.893	5.646	5.531	5.624
12	1975.61900		4.752	4.930	5.671	5.560	5.654
13	1975.61900	4.756		4.923	5.679	5.555	5.660
14	prediction		4.76	4.92	5.61	5.46	5.61
15	average	4.745		4.902	5.652	5.533	5.628
16	rms error	.009		.015	.014	.013	.017
17	eclipse	0.551		0.533	0.527	0.519	0.498

On the basis of Hube's result, and apparently unaware of the previous studies establishing the star as an eclipsing binary, Bekenstein and Bowers (1974) included it in a list of potential runaway stars on the basis of the high peculiar velocity derived from Hube's +65.9. This large peculiar velocity is due to the binary nature, and consequently the star is not a runaway star.

Each of the observations consists typically of 10 samples on the star, preceded and/or followed by 6 samples dark current of the photomultipliers;each sample lasts 8 seconds. The data reduction on an observation results in five net fluxes, one for each photometric channel (they are registered simultaneously). The internal error in each of these net fluxes is smaller than 0.5%. During the observations in the eclipse phase (lasting 208 seconds) the flux did not vary too.

HD 124195 has a period of Min = JD 2438524.410 + 1.49008 days. The ANS observation has been done 2638.044 periods later, i.e. 1.6 hours after minimum. Judging from Schoeffel and Koehler's lightcurve I predict a depression in the visible of 0.47 mag and an increase in intensity in 208 seconds of 0.004 mag. Row 15 and 16 of Table I present the average of the 11 ANS observations apparently done outside of both eclipse phases, and row 17 presents the difference between this average and the eclipse observations. We see that there is a small color effect: the depression is 0.55 mag at 1550 A to 0.50 mag at 3300 A. The predicted depression at V of 0.47 mag seems perfectly in agreement with the UV depressions, and the ANS observations are apparently on the rising part of the primary minimum.

It might be possible to derive some properties of the secondary, but I will leave that to more experienced binary star specialists. It might be worthwhile to obtain more observations on this star in order to establish its properties.

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PERIODIC LIGHT VARIATIONS OF V 603 Aql*

During July and August 1981 a total of 1510 UBV-measurements of the old nova V 603 Aql has been obtained (partly simultaneously with polarimetric observations) using the ESO 50cm telescope equipped with the single-channel standard photometer. An integration time of 30s per filter has been applied as a compromise between precision and time resolution. The resulting error for a single measurement was then about $0\overset{m}{.}01$. Most of the 13 observing runs cover a time interval of about six hours.

A repeating hump structure is clearly visible in all 11 runs which span at least the orbital period of $0\overset{d}{.}13854$ as derived spectroscopically by Kraft (1964). A periodogram analysis yielded a photometric period of $0\overset{d}{.}144854$ which is about 4.6% longer than the spectroscopic one. Fig. 1 shows a phase diagram of all V-measurements representing the averaged V-light curve. The U- and B- light curves also reveal the same general behaviour: The hump lasts about half the period and its amplitude is around $0\overset{m}{.}15$. The large scatter results from the fact, that minimum light and especially the amplitude and shape of the hump is changing from cycle to cycle (Fig.2). B-V remains nearly constant whereas U-B is slightly bluer in the rising part of the hump.

In most cases the hump is divided into several peaks. The elements

$$\text{HJD } 244\ 4816.\underset{\pm 3}{387} + 0.144\ \underset{\pm 8}{854}E$$

refer to the mean position of that peak, which is always present and which is usually, but not always, the brightest.

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*Based on observations collected at the European Southern Observatory.

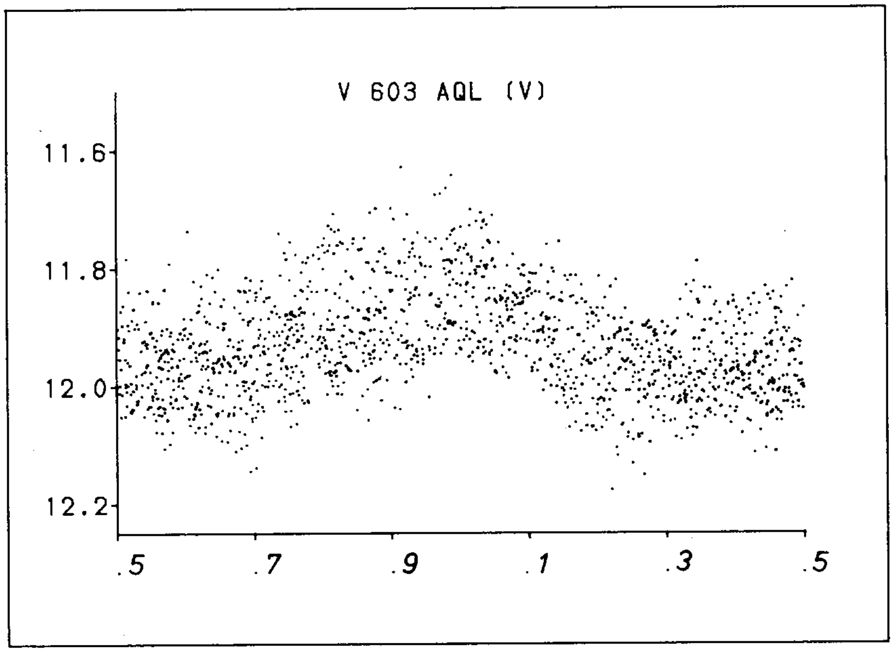

Fig. 1 All V-magnitudes folded with the $0^{d}.144\ 854$ period.

Fig. 2 shows examples where an additional peak is present before or after the reference peak. Sometimes a pronounced secondary hump appears near phase 0.5 with an amplitude up to half that of the primary hump.

Until now only two papers have been published reporting on longer observation runs of V 603 Aql. Rahe et al. (1980) detected eclipselike features with approx. Kraft's period in an eight hour run. Slovak (1981) failed to find any periodic features in his five runs, of which only two cover the orbital period. It might be that such features only can be identified when the mean light level of the system is low (Rahe et al.: V ~ 11.8, Haefner: V ~ 11.9), otherwise (Slovak: V ~ 11.4) they might be masked by a strong flickering activity. On the other hand the two broad maxima in the light curve of Rahe et al. do not fit the ephemeris given above.

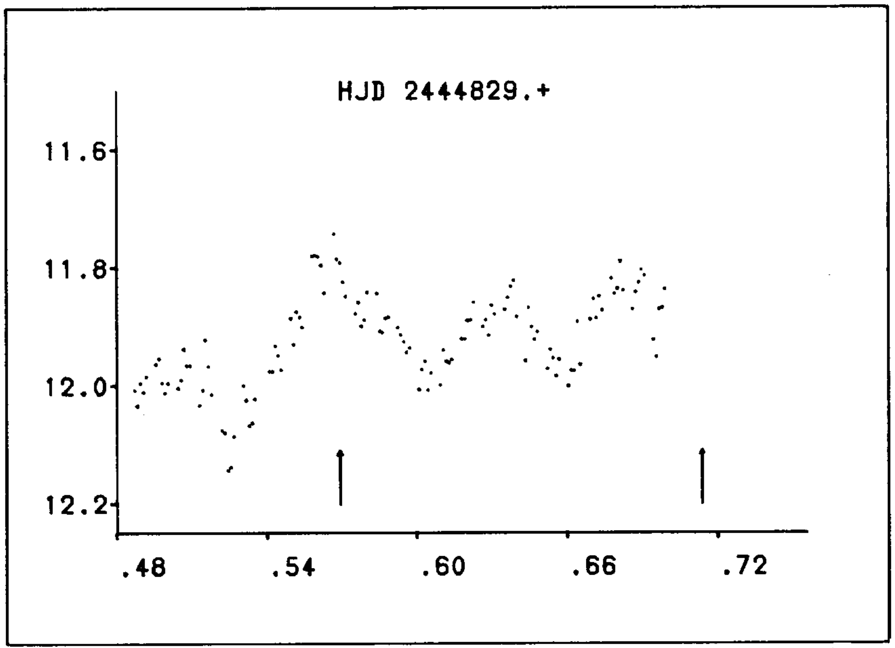

Figure 2/a

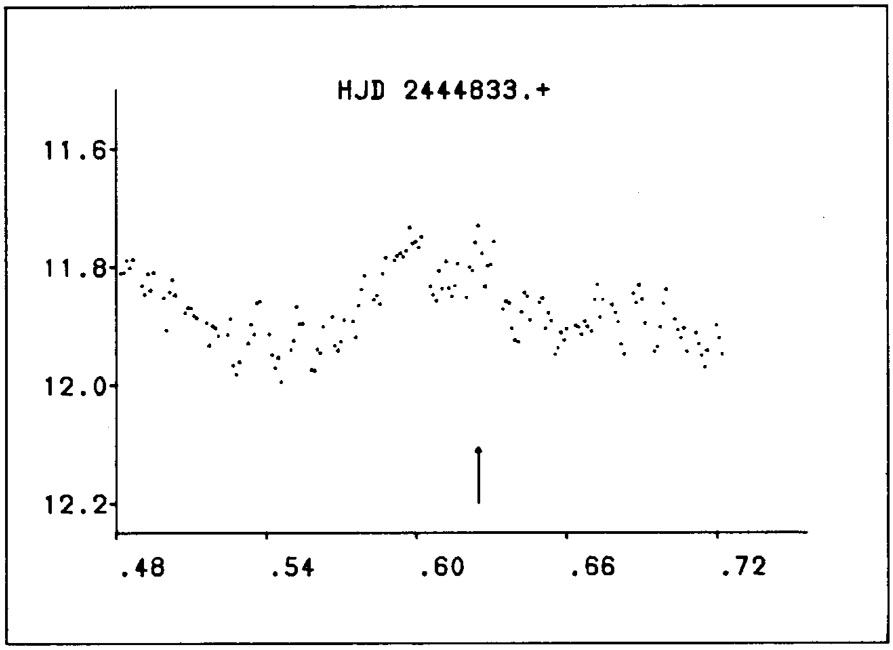

Figure 2/b

<u>Fig. 2</u> V-magnitudes as a function of Heliocentric Julian Date. The times of maxima are indicated by arrows.

If new spectroscopic observations prove the period found by Kraft (which has been checked to be correct by Slovak (1981) and the author), then the first of the two models proposed by Cook (1981) to explain light variations in a low inclination system is very promising. In that model a small orbital eccentricity modulates the mass transfer and leads, because of apsidal motion, to a variable brightness with a period which is slightly longer than the spectroscopic one. Detailed results of this photometry and the polarimetry will be published elsewhere.

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PERIOD CHANGES OF AC And

The method of the envelopes was successfully used for the investigation of the multiperiodic variable star AC And (Guman, 1982). Since 1926 a dozen of observation sequences are available which make possible to find the period variations of this unique star. The results are collected in Table I. For each series of observations, from the envelopes we obtained virtual maximum moments ($\bar{O}$) for a mean Julian Date, $\overline{\text{J.D.}}$, for each of the three periods. From these $\bar{O}$ dates the following linear elements have been calculated by the method of least squares for the three periods:

$$\text{J.D. } 2424708.058 + 0^{d}.71121566 \times E_{0.7}$$

$$\text{J.D. } 2424708.143 + 0^{d}.52512765 \times E_{0.5}$$

$$\text{J.D. } 2424708.110 + 0^{d}.42105993 \times E_{0.4}$$

The $\bar{O}$-C residuals from these linear elements are presented in the columns headed ($\bar{O}$-C). According to the deviations from the linear elements the periods vary. Namely, the $0^{d}.711$ period has been first increasing, and after J.D. 2433400 decreasing, the other two periods have been continuously increasing (supposing continuous variation). These variations are fitted in with the following cubic and parabolic elements, respectively:

TABLE I.

	$0^{d}.711$ Period				$0^{d}.525$ Period				$0^{d}.421$ Period					
J.D.	$\bar{O}$	E	$(\bar{O}-C)$	$[\bar{O}-C]$	$\bar{O}$	E	$(\bar{O}-C)$	$[\bar{O}-C]$	$\bar{O}$	E	$(\bar{O}-C)$	$[\bar{O}-C]$	Typ	Reference
2424833	$^{d}.296$	176	$+^{d}.064$	$+^{d}.008$	$^{d}.189$	238	$+^{d}.066$	$+^{d}.010$	$^{d}.206$	297	$+^{d}.042$	$+^{d}.009$	pg.	Guthnick,Prager (1927)
2425596	.376	1249	+.010	-.011	.166	1691	+.032	-.003	.557	2110	+.011	-.009	vis.	Lause (1937)
2426693	.749	2792	-.023	-.008	.155	3780	+.030	+.020	.402	4715	-.005	-.011	vis.	Lause (1932)
2426955	.475	3160	-.024	-.003	.159	4274	-.005	-.009	.330	5337	+.024	+.021	vis.	Florja (1937)
2426968	.279	3178	-.022	-.001	.285	4304	-.007	-.011	.381	5368	+.022	+.019	vis.	Lause (1933)
2428392	.122	5180	-.033	+.009	.403	7016	-.036	-.013	.362	8750	-.022	-.009	pg.	Lurje (1950)
2428485	.286	5311	-.038	+.005	.366	7193	-.020	+.004	.398	8971	-.040	-.027	vis.	Lause (1937)
2433183	.589	11957	-.024	-.020	.640	16140	-.063	-.005	.588	20129	-.037	-.003	pg.	Guman (1982)
2435383	.446	15010	+.041	+.010	.414	20329	-.049	-.001	.197	25353	-.045	-.017	pe.	Guman (1982)
2436811	.524	17032	+.041	-.007	.235	23067	-.027	+.005	.139	28768	-.023	-.003	pe.	Notni (1963)
2437000	.055	17283	+.057	+.008	.318	23408	-.013	+.017	.133	29193	+.021	+.039	pe.	Fitch,Szeidl (1976) *
2442702	.465	25301	-.060	-.001	.791	34267	+.099	-.007	.157	42735	+.051	-.009	pe.	Jakate (1978)
Mean error			$\pm^{d}.044$	$\pm^{d}.010$			$\pm^{d}.050$	$\pm^{d}.012$			$\pm^{d}.035$	$\pm^{d}.020$		

*The $\bar{O}$ dates calculated from the five noncoupled elements.

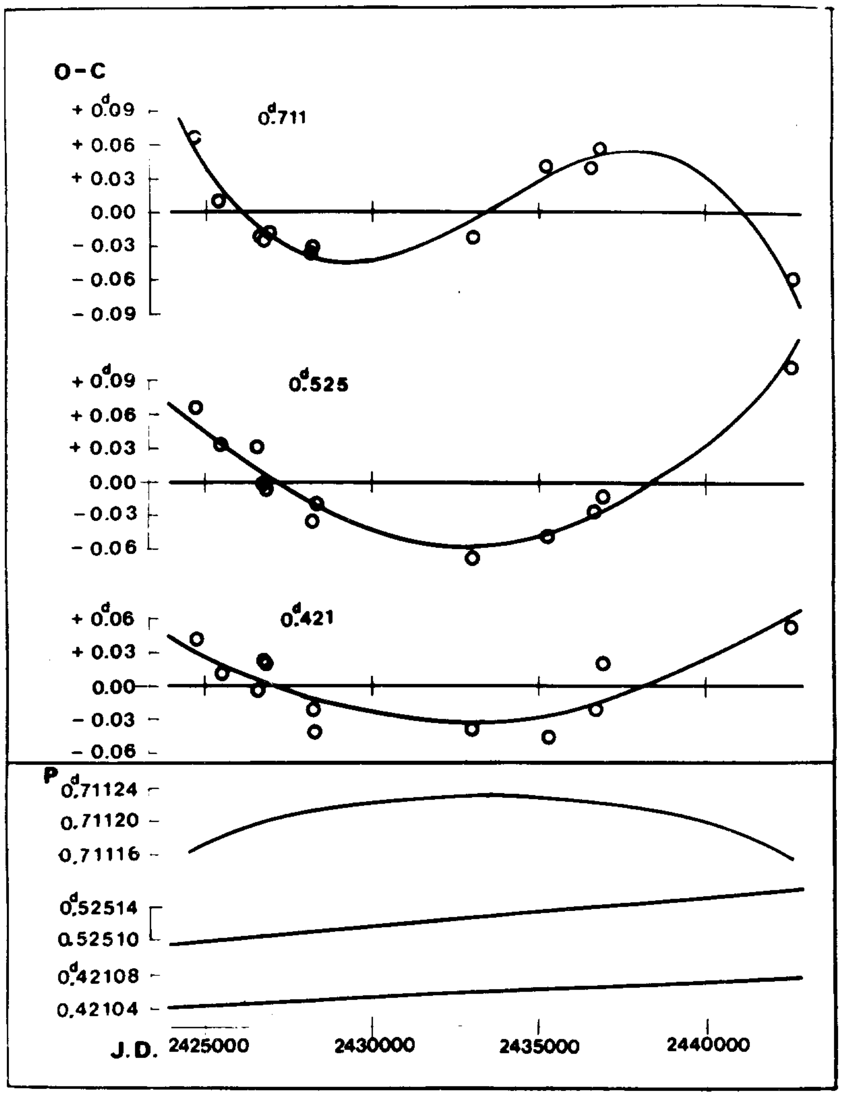
O-C
+ 0.09
0.711
+ 0.06
+ 0.03
0.00
- 0.03
- 0.06
- 0.09
+ 0.09
0.525
+ 0.06
+ 0.03
0.00
- 0.03
- 0.06
+ 0.06
0.421
+ 0.03
0.00
- 0.03
- 0.06
P
0.71124
0.71120
0.71116
0.52514
0.52510
0.42108
0.42104
J.D.
2425000
2430000
2435000
2440000

Figure 1

$$[+1^{d}\!.191\times10^{-5}(E_{0.7}-12266) + 1^{d}\!.020\times10^{-10}(E_{0.7}-12266)^{2} - 0^{d}\!.046\times10^{-13}(E_{0.7}-12266)^{3}]$$

$$[-0^{d}\!.058 + 4^{d}\!.760\times10^{-10}(E_{0.5}-15705)^{2}]$$

$$[-0^{d}\!.034 + 1^{d}\!.769\times10^{-10}(E_{0.4}-19720)^{2}]$$

The $\bar{O}$-C residuals computed with the formulae extended with the above presented elements of higher order are listed in the columns headed [$\bar{O}$-C].

These results are also represented in Figure 1. In the upper part we have plotted the $\bar{O}$-C residuals from the linear elements and the cubic and parabolic fittings, respectively. The changes of the periods, derived from the higher fittings, are plotted in the lower part of the figure.

The variations of the periods, particularly the variation of the $0^{d}\!.711$ period, are very exciting. If this last variation has not been secular, but periodic, the period can be estimated as roughly 44 years. Therefore the photoelectric observation of this star is very desirable.

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NEW OBSERVATIONS OF THE DELTA SCUTI VARIABLES SIGMA OCTANTIS AND B OCTANTIS.

SIGMA OCTANTIS

The A7n star σ Octantis (= HR 7228 = HD 177482) was first recognized as a δ Scuti variable by McInally and Austin (1978). Our observations of this star were made on the 17th and 19th July, 1981 using a photoelectric photometer attached to the 41 cm telescope of the Monash observatory. The standard star chosen, o Octantis (= DM -89 1 = SAO 258218), proved to be constant over the two nights observations, while σ Octantis varied with a single period of 0.097 day and a visual light range, ΔV = 0.025 magnitudes (c.f. results of McInally and Austin: period = 0.100 day, ΔV = 0.03 magnitudes).

Figure 1 shows the data collected and the reconstructed light curve from Fourier analysis of these data. Our results indicate that σ Octantis is probably a δ Scuti star undergoing radial pulsation in the fundamental mode only.

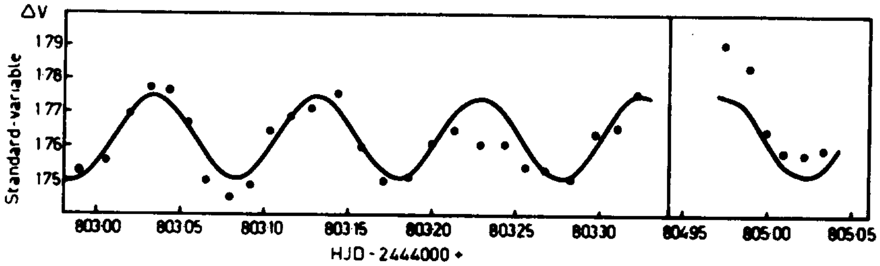

Figure 1

B OCTANTIS

B Octantis (= HR 8294 = HD 206553) was first reported as a δ Scuti variable by McInally and Austin (1978). On the basis of two nights observations they reported a period of 0.064 day, a visual light range of 0.010 magnitudes, and noted that the star exhibited a highly variable amplitude.

Using the 41 cm telescope at the Monash Observatory, B Octantis was observed on the 17th and 19th July, 1981 (see Figure 2). Fourier analysis of the data obtained revealed a period of 0.063 day and a visual light range of 0.010 magnitudes; this is in excellent agreement with the results of McInally and Austin. In addition another period of 0.143 day with a visual light range of 0.014 magnitudes was located. The standard star chosen was o Octantis (= DM -89 1 = SAO 258218); both standard and variable lie within 1½° of the south celestial pole, hence the air mass through which they are observed remains virtually constant. o Octantis gave a constant signal throughout both nights.

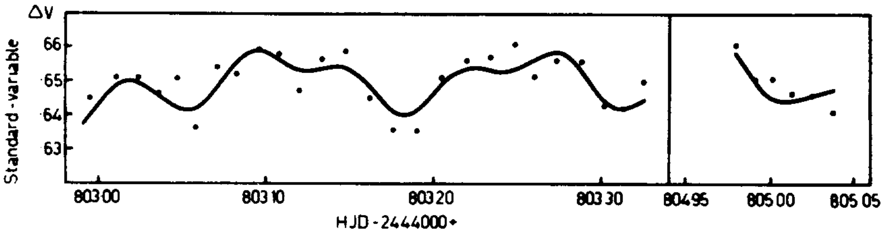

Figure 2

B Octantis was again observed on the 9th, 14th and 20th September, using the same equipment. However we altered the observing technique by measuring B Octantis continuously, interspersed at about half-hour invervals with single (2 minutes) observations of the standard. Fourier analysis of these data again revealed the same periods. Figure 3 gives the data obtained and the reconstructed light curves from Fourier analysis of these data.

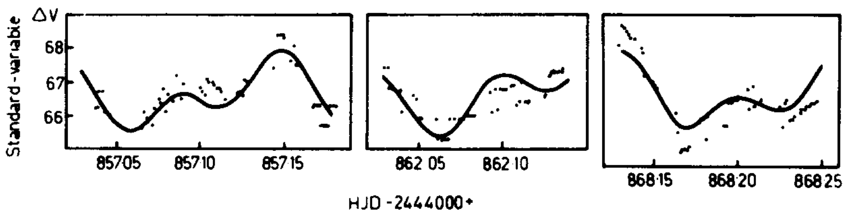

Figure 3

These two periods give a period ratio of 0.44 which cannot be attributed to any commonly observed modes of radial pulsation. Breger (1979) gives the observed period ratios for radial pulsation in δ Scuti stars as $P_1/P_0 = 0.76$, $P_2/P_0 = 0.60$, $P_2/P_1 = 0.81$, and $P_3/P_2 = 0.845$. Breger (1979) also points out that non-radial modes of pulsation have only been well established for a few δ Scuti stars. Because the light variations of B Octantis are small, further observations may not reveal more structure in the light curve. We plan to measure colour indices of this star in an effort to locate its exact position within the δ Scuti instability strip.

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THE ACTUAL PHOTOMETRIC BEHAVIOUR OF CH CYGNI

With this notice, we want to call the attention of all kinds of observers for the unusual member of the group of symbiotic variable stars, CH Cyg. Observers who are interested to learn about the history of the star, are referred to the papers of Luud (1979) and Anderson et al. (1980).

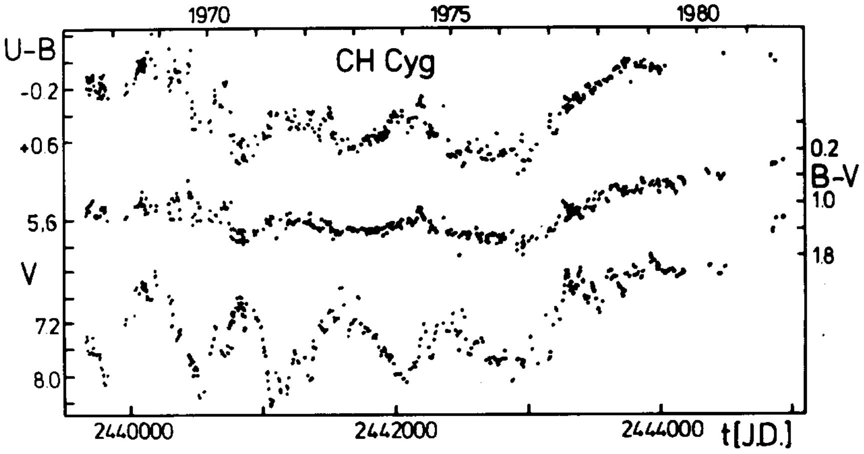

Figure 1

Luud's (1979) light and colour curves updated by the observations of this paper (Table II). One clearly sees the SRa light changes in the first part of the figure and the outburst light curve since May 1977.

In May 1977 the star begun a new outburst. In Figure 1 we show the excellent light and colour curves of Luud (1979), up-dated by our own photoelectric UBV measurements made with the 75 cm telescope of the Wilhelm Foerster Observatory Berlin and the 36 cm Cassegrain telescope of the Observatorium Hoher List. Both telescopes are equipped with uncooled 1P21 photomultipliers behind the usual Schott filter combinations for the UBV system and with usual DC amplifier techniques.
Our comparison star data are given in Table I.

Table I
Comparison star data for CH Cyg

Star	V	B-V	U-B	Sp.	Reference
A = BD+49°2994	6.50	-0.07		B8V	M.N.R.A.S. 185.591[&]
	6.54	-0.08	-0.37	B9	Observatory 88.111
	6.52	-0.08	-0.23	B9	Tokyo Astron.Bull. II, No.258
		-0.08	-0.37	B9	ApJ 137.530
	6.28	-0.08	-0.37	B8V	PASP 86.233
	6.46	-0.09	-0.37		this paper
C = BD+49°3012	7.27	+0.46	-0.16	F5	" "
E = BD+49°3034	5.53	+1.16	+1.19	KO	" "

[&] There are given also V-R and R-I values.

Star A was also used by several other observers and there is no real consensus about the V magnitude and the U-B colour. Therefore we made an own determination of these values as listed in the Table I. In addition we checked all magnitude differences A-C in our measurements for possible variability of A, but we found no sufficient evidence to judge for variability.
In Table II we present V and B-V observations made in 25 nights between 1977 and 1981 and four U measurements made with the 36 cm Cassegrain telescope. They are plotted in the figure together with Luud's values.
From Figure 1 one can make the following primary conclusions:

i) CH Cyg is still in outburst, more than 1600 days after its beginning.

ii) Actually, CH Cyg is brighter than observed so far

iii) B-V has decreased continuously since the beginning of the outburst up to now which means that the blue continuum source has brightened since more than 1600 days continuously and can actually be well observed.

iv) Actually, CH Cyg lies in an unusual area in the two colour diagram (compare the two colour diagram of Cester (1969), for instance).

Table II : New UBV measurements of CH Cyg

Jul. Date	V	B-V	U-B	n	Observatory
24 43287$^{\mathrm{d}}$.55	6.57	+1.31		1	Berlin
289.44	6.43	+1.32		3	"
319.45	6.67	+1.29		2	"
328.42	6.60	+1.19		2	"
996.54	6.31	+0.78		1	"
44044.46	6.53	+0.70		1	"
045.47	6.60	+0.76		1	"
048.51	6.60	+0.78		1	"
053.40	6.53	+0.74		1	"
057.41	6.51	+0.76		1	"
097.36	6.46	+0.86		1	"
105.39	6.54	+0.92		2	"
132.44	6.71	+0.71		1	"
146.47	6.66	+0.72		2	"
168.27	6.54	+0.80		1	"
173.29	6.59	+0.77		2	"
370.48	6.36	+0.56		1	"
373.41	6.36	+0.60		2	"
445.41	6.54	+0.61		1	"
456.48	6.53	+0.70		1	"
24 44489.45	6.35	+0.60	-0.68	2	Hoher List
851.38	5.78	+0.48	-0.66	4	" "
854.40	5.85	+0.48	-0.67	2	" "
871.39	5.64	+0.44	-0.60	2	" "
928.29	5.60	+0.36		1	Berlin

As there exist two different models for CH Cyg in the literature - a spotted single star model and a binary model with mass accretion - and as it is even not yet clear if CH Cyg belongs to the symbiotic stars or belongs to an other stage of stellar evolution, observers are asked to have a close eye on CH Cyg during the actual interesting stage of its light curve.

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PHOTOELECTRIC MINIMA OBSERVATIONS OF THE ECLIPSING BINARY ST CARINAE

The eclipsing character of the tenth photographic magnitude star ST Carinae (HD 89234, CD-59°2985, CPD-59°2007, HV 1270, A0 + F6) was discovered photographically by Pickering (1906) from Harvard patrol plates. The system was later observed photographically by Leavitt (1908) who described it as an Algol-like eclipsing binary and found a period of $0\overset{d}{.}901652$. Shapley (1915) obtained a preliminary orbital solution based on photographic data. Further photographic observations carried out by Hertzsprung (1925) confirmed the existence of a secondary minimum of about $0\overset{m}{.}06$ in depth predicted by Shapley (1912). Hertzsprung obtained the following ephemeris:

$$\text{JD Hel Min I} = 2423901\overset{d}{.}675 + 0\overset{d}{.}9016498\ E \qquad (1)$$

More recently Gaposchkin (1953) obtained new photographic minima from which he found the following revised ephemeris:

$$\text{JD Hel Min I} = 2428915\overset{d}{.}756 + 0\overset{d}{.}9016495\ E \qquad (2)$$

So far, no photoelectric light curve of ST Car has been obtained. During the period from February 1980 to March 1981, we made 650 UBV photoelectric observations at the Bosque Alegre Station (BAS) of the National University of Córdoba (Argentina).

The measurements were carried out with the BAS 154-cm telescope provided with a conventional design photometer. These data were supplemented with 100 photoelectric observations in each color, obtained during April-May 1980 with the 61-cm Lowell telescope at the Cerro Tololo Inter-American Observatory (CTIO, Chile). RCA 1P21 photomultipliers refrigerated with dry ice were used in both observatories. All the observations of ST Car were made differentially in relation to HD 89234, whose spectral type is AO. Mean atmospheric extinction coefficients were used to correct for first and second-order differential extinction. No variation in the light of the comparison star was detected.

Using the bisection-of-chords method we derived a total of 17 new times of minimum light. A linear least squares solution, including the above photoelectric minima and three older photographic ones, leads to the following improved ephemeris:

$$\text{JD Hel Min I} = \underset{\pm .0004}{2444317\overset{d}{.}7292} + \underset{\pm .00000004}{0\overset{d}{.}90164965}\,E \qquad (3)$$

Table I

Times of minimum light of ST Carinae

JD Hel. 2440000 +	E	(O-C)	Reference
-25739.666	-33336.0	-0.002	A
-16098.325	-22643.0	-0.001	B
-11084.244	-17082.0	0.006	C
4282.5654	-39.0	0.0006	D
4282.5653	-39.0	0.0005	D
4282.5636	-39.0	-0.0012	D
4317.7288	0.0	-0.0004	D
4317.7290	0.0	-0.0002	D
4317.7290	0.0	-0.0002	D
4365.5156	53.0	-0.0010	D
4365.5155	53.0	-0.0011	D
4365.5155	53.0	-0.0011	D
4647.7330	366.0	0.0001	D
4647.7333	366.0	0.0004	D
4647.7328	366.0	-0.0001	D
4675.6850	397.0	0.0009	D
4675.6844	397.0	0.0003	D
4675.6846	397.0	0.0005	D
4698.6733	422.5	-0.0028	D
4698.6785	422.5	0.0023	D

References to Table I

A: Leavitt (1908)
B: Hertzsprung (1925)
C: Gaposchkin (1953)
D: This study

It is clearly seen that the period of ST Car does not seem to have varied over the past seventy years. Table I gives in succession the available times of minima, epoch numbers, residuals (O-C) computed from equation (3), and sources of reference.

Orbital phases have been calculated from the revised ephemeris given in equation (3) and light and color curves have been obtained. The differential light curves in the V-magnitude and (B-V) color are shown in Figure 1. The differences ΔV and $\Delta(B-V)$ are in the sense variable minus comparison star. The light curve in the V-magnitude reveals partial eclipses; the depths of primary and secondary minima are about 1.2 and 0.3, respectively. In addition, the variation in the maxima due to ellipticity and reflection effects is also evident.

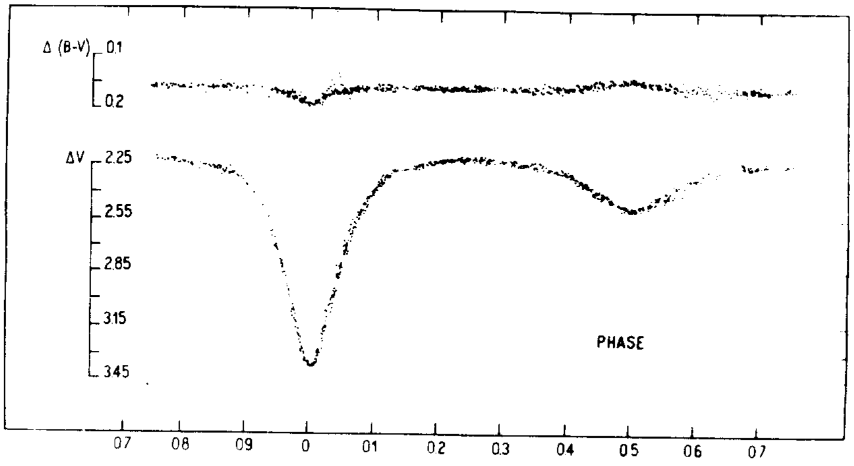

Figure 1: V and (B-V) light curves of the eclipsing binary ST Carinae

A detailed analysis of ST Carinae by means of the classical Russell-Merrill procedure will be published elsewhere.

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**Member of the Carrera del Investigador Científico del Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET) de Argentina.

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THE LIGHT CURVE AND ELEMENTS FOR EM CEPHEI

The variable star EM Cephei was observed at Bucharest Observatory with the 50-cm telescope in 1979 and 1980. The photometer was equipped with an unrefrigerated EMI-6256B photomultiplier and the standard UBV filters. The star BD +62°1994 has been used as comparison star. About 478 individual observations in each colour have been obtained and with them 45 normal points have been derived. The mean light curve in B colour is represented in Figure 1, together with the r.m.s. error of each normal point. The phase has been computed with the elements:

$$\text{Phase} = (\text{J.D.hel.} - 2440134.7374)/0\overset{d}{.}8061876$$

Filter B

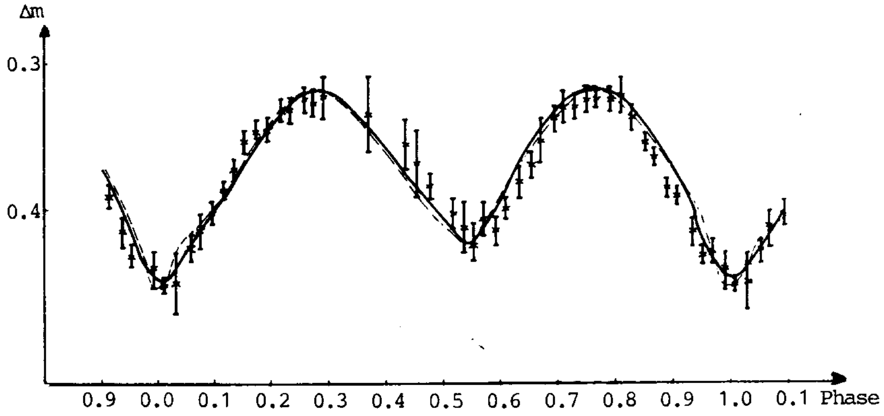

Figure 1

given in SAC No. 52 (1980), the whole light curve has been shifted by adding 0.015 to the phase. The large r.m.s. errors are due to the scatter in the light curve, mentioned also by other authors (see Breinhorst and Karimie 1980). An important jump was present sometimes at phases 0.25 - 0.35.

Assuming that EM Cephei is a binary system, we tried to determine its elements. The approximate solution resulted from a Horak-type model. Afterwards the improved solution has been obtained with the WINK-model by Wood (1972). Several variants of solutions have been tried: the imprecision of the light curve does not allow the simultaneous variation of all elements. Therefore, first the radii r, inclination i, temperature of the cooler star T_c and the ellipticity of the orbit (e and ω) have been allowed to vary, the other elements being kept constant. For example, the temperature of the hotter star T_h and the limb darkening coefficients u_h, u_c, have been chosen according to the spectral class B1 IV of the star EM Cephei, for the other constants as, for example, the mass ratio q, the reflectivity coefficients w etc., several assumptions have been made.

Table I

	Model 1	Model 2		Model 1	Model 2
	Variable parameters			Auxiliary parameters	
r_h	0.5266	0.3908	a_h	0.5843	0.4219
r_c	0.1183	0.1099	b_h	0.5266	0.3869
i	$59\overset{\circ}{.}743$	$67\overset{\circ}{.}181$	c_h	0.4689	0.3636
T_c(eq)	13994°K	12092°K	a_c	0.1188	0.1101
e	0.087	0.087	b_c	0.1182	0.1098
ω	$10\overset{\circ}{.}361$	$10\overset{\circ}{.}361$	c_c	0.1180	0.1097
	Fixed parameters		L_h(norm)	0.9826	0.9839
T_h(eq)	23800°K	23800°K	L_c(norm)	0.0174	0.0161
u_h	0.31	0.31	L_h(ap)	0.7869	0.4332
u_c	0.60	0.60	L_c(ap)	0.0139	0.0071
w_h	0	0	r.m.s.error		
w_c	2.0	1.0		0.00899	0.01009
q	0.5	1.0			

Then the obtained value for the ellipticity was fixed, and a new solution has been obtained by changing the mass ratio q and the reflectivity coefficient w_c. In Table I two selected solutions, with the smallest r.m.s. error are given. The theoretical light curves obtained with these elements are also represented in Fig.1 (Model 1 - full line, Model 2 - dotted line). One can see that both theoretical models are situated in the error limit of observations.

The complete solutions including the filters V and U will be given elsewhere.

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SPECTROSCOPY OF V1425 CYGNI AND AH CEPHEI

The star HD 202000 was discovered to be variable by the Bamberg Observatory and was given the provisional designation BV 346. Its HD spectral type is B8, and the visual magnitude of the system is 7.7 at maximum light. Photoelectric light curves of this eclipsing binary were obtained by Tate (IBVS Nr. 438), who also determined its period to be 1.252387 days. Subsequently the star was named V1425 Cygni.

On October 7 through 11, 1981, this investigator obtained seven spectrograms of V1425 Cygni using the 1.0 meter coude feed telescope of the Kitt Peak National Observatory. The emulsion used was IIaO, and the dispersion was 16.9 Å/mm. It was hoped that the system would prove to be a double-lined spectroscopic binary, since the two minima are approximately of the same depth. The Balmer lines, however, are extremely broad and are hopelessly blended at all orbital phases, and the weaker lines are all washed out by rotation. Interstellar H and K lines were present, and for the K line a mean velocity of -20 ± 2 km/s was obtained. The diffuse interstellar absorption feature at 4430 was not observed.

The eclipsing binary AH Cephei was also observed on four nights between October 7 and 11, 1981. The spectral type of this star is B1, and the lines are diffuse and strongly broadened by rotation. The interstellar H and K lines of CaII are very strong and show a radial velocity of -31 ± 1 km/s. This value can be compared with the gamma-velocity for this system of -20.6 km/s obtained by Harper et al. (J. R. A. S. Canada, vol. 29, 413, 1935). The measurements used in determining the orbit which was reported in that paper showed a high degree of scatter, and it was hoped by this investigator that the orbit could be improved, but all of the spectral lines of AH Cephei proved to be extremely broad and shallow.

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LIGHT ELEMENTS OF GG Vel

The variability of GG Vel = BV 1201 = HD 79459 = SAO 220955 = = CoD-42°5065 = CPD-42°3467 was discovered by Strohmeier and Patterson (1967) on Sky Patrol plates taken from Mt.John Observatory. They published a list of times of minimum light, gave the first light elements, an Algol-like variability, a weak secondary minimum and an amplitude of 0.45 mag. These elements were also listed by Strohmeier and Knigge (1969).

This variable was named by Kukarkin et al. (1972) and mentioned in a report of the Rosemary Hill Observatory as part of a VRI photoelectric photometry observing program (see Bull.Am.Astr. Soc. Vol.10, pg 107, 1978).

In this note I present six photoelectric times of minimum light for each pass-band in the UBV system and the derived light elements.

Observations were made between 1979 and 1980 from CTIO* in Chile, and from Bosque Alegre (Córdoba) and El Leoncito (San Juan) Observatories, both in Argentina, with apertures of 40,152, and 76 cm, respectively. Individual minima are listed in Table I with the standard deviation given in parenthesis. They were determined from the light curve on each pass-band. The color average of these minima are listed in Table II (standard deviations in parenthesis) together with the photographic minima given by Strohmeier and Patterson (1967).

Table I

Individual times of minima

HJD 2440000+

V	B	U
3899.8150(13)	3899.8180(06)	3899.8161(12)
3902.7628(06)	3902.7610(13)	3902.7623(08)
3908.6737(10)	3908.6721(17)	3908.6744(11)
3973.5714(12)	3973.5706(11)	3973.5725(07)
4302.5533(09)	4302.5513(23)	4302.5533(13)
4306.9765(08)	4306.9798(07)	4306.9778(09)

Table II

Minima of GG Vel

Meth.	HJD 2440000+	w	E	(O-C)	(O-C)'	(O-C)"
Pg	38379.542	1	-2000	-0.0154		-0.014
Pg	38382.545	1	-1998	0.0371		0.039
Pg	38385.543	1	-1996	0.0847		0.087
Pg	38441.399	1	-1958	-0.1175		-0.116
Pg	38490.272	1	-1925	0.0734		0.075
Pg	38841.292	1	-1687	-0.0080		-0.007
Pg	38844.293	1	-1685	0.0425		0.044
Pg	38869.233	1	-1668	-0.0962		-0.095
Pg	38872.227	1	-1666	-0.0526		-0.052
Pg	39118.543	1	-1499	-0.0977		-0.097
Pg	39198.313	1	-1445	0.0107		0.011
Pg	39201.311	1	-1443	0.0582		0.059
Pg	39232.237	1	-1422	0.0047		0.005
Pg	39235.230	1	-1420	0.0473		0.048
Pg	39862.101	1	- 995	-0.0485		-0.049
Pg	39907.964	1	- 964	0.0828		0.082
UBV	43899.8164(15)	1	1742	0.0007	0.0023	
UBV	43902.7620(09)	3	1744	-0.0041	-0.0026	
UBV	43908.6734(12)	2	1748	0.0064	0.0079	
UBV	43973.5715(10)	3	1792	-0.0050	-0.0041	
UBV	44302.5526(12)	2	2015	0.0029	0.0008	
UBV	44306.9780(17)	1	2018	0.0027	0.0005	

A least squares solution for the 16 photographic minima give the following linear light elements:

$$\text{Min I} = \text{HJD } 2438379\overset{d}{.}556 + 1\overset{d}{.}475218 \text{ E}' \qquad \pm 0.026 \quad \pm 0.000047 \text{ m.e.} \qquad (1)$$

while for the present 6 photoelectric minima the light elements are:

$$\text{Min I} = \text{HJD } 2443973\overset{d}{.}5756 + 1\overset{d}{.}475230 \text{ E}'' \qquad \pm 0.0014 \quad \pm 0.000012 \text{ m.e.} \qquad (2)$$

These results show the period to be constant within the errors. Finally, a least squares linear fit was performed with all the minima giving the following elements:

$$\text{Min I} = \text{HJD } 2441329\overset{d}{.}98944 + 1\overset{d}{.}4752160 \text{ E} \qquad \pm 0.0096 \quad \pm 0.0000056 \text{ m.e.}$$

which comprise about 4000 cycles of the "history" of this system.

The cycles E and the residuals (O-C) from the latter ephemeris are listed in columns 4 and 5 of Table II, while (O-C)' and (O-C)" from (1) and (2) are in columns 6 and 7.

The light curve is not completely observed yet. The present observations show partial eclipses, a primary minimum of amplitude 0.5 mag and no evidence of a secondary eclipse.

GG Vel has a visual companion ($\Delta\alpha=0$, $\Delta\delta=6"$) of magnitude V=11.2. The effect of the light of this star on the combined light of the components at maxima is about 0.01 mag. Therefore, one component of the system would be a faint star with a luminosity beyond the accuracy of photoelectric magnitudes, only detected due to a pronounced reflection effect as seen in the observations.

On the other hand, if the period were twice that considered above, then the system would be composed by two similar stars in temperature and luminosity. This is also supported by the observations because the colors are almost constant during the whole period and the amplitudes of all measured minima are of the same order. Then also the orbit would be circular, as shown by the behaviour of the residuals (O-C) of odd cycles.

A spectrographic study of GG Vel could decide between the two possibilities. Observations of this system are planned in the next season.

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SAO 072799, A NEW BRIGHT ECLIPSING BINARY

The variability of SAO 072799 (BD +37°4713) was detected photographically by one of us. The star was suspected to be an eclipsing binary. This could be confirmed photoelectrically by the other. Despite the fact of a still incomplete light curve we present our results now, to make possible that other observers join the observation of this interesting star.

Photoelectric observations were made by a digital photometer equipped with an EMI 9781B tube in B, using the filters Schott BG 12+GG 13 (2mm), with a 25 cm Schmidt-Cassegrain telescope. SAO 072816 (FO,$m_V=7\overset{m}{.}6$) served as comparison star, the constancy of which was checked with SAO 072806 (MO,$m_V=7\overset{m}{.}1$). The latter was found to be variable during the course of the observations ($A\sim 0\overset{m}{.}1$).

The observed minima of SAO 072799 are given in Tab.I. It was possible to find retrospectively some more on the photographic films. The times of these minima are also included. The

Table I
The minima with asterisks were extrapolated from parts of the decrease or increase

Epoch	Min. JD2444...	O-C	p or B
-15.5*	143.4913	+0.163	p
0*	257.2789	-0.0037	p
35.5	518.4573	+0.1863	p
51	632.2236	+0.0090	p
83	867.4795	-0.0013	B
84.5*	878.6625	+0.1541	B
88.5*	908.0849	+0.1684	B
89	911.5875	-0.0040	B
89.5	915.4233	+0.1559	B

star shows primary and secondary minima of almost equal depth. From the times of the primary minima the following elements were calculated:

$$\text{Min.} = \text{JD } 2444\ 257.2826 + 7\overset{d}{.}351785$$
$$\pm 43 \qquad \pm 65$$

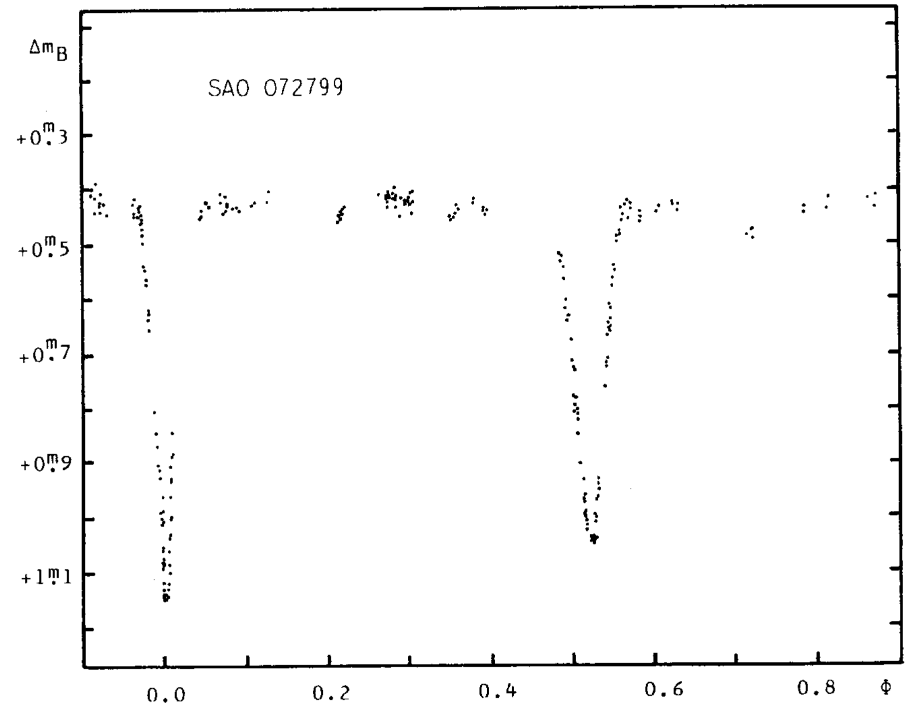

Figure 1

The O-C against these elements are also given in Tab.I, in the case of the secondary minima the O-C against the phase 0.50 is calculated. With these elements the lightcurve in Fig.1 was obtained from the observations in B. The secondary minimum lies clearly excentric at the phase 0.52. Also the shape is different from that of the primary. The latter shows a "D" of 10.0, and a "d" of 0.6 hours, the values for the secondary are: "D" 13.6, "d" = 1.6 hours. The amplitudes in B are $A_1 = 0\overset{m}{.}74$, $A_2 = 0\overset{m}{.}64$. Whereas the primary minimum is symmetric, the secondary shows a steeper increase immediately after the constant phase. Also the maximum light seems to be distorted. Especially around the phase 0.2 after both minima a small decrease in brightness (~$0^{m}.08$) is obvious. This has been found also repeated in the photographic light curve and was originally described as secondary minimum in IBVS 1885. All other peculiarities described here were also found by the photographic observations. After completion of the light curve all data will be published in "BAV-Rundbrief".

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Reference:

Frank, P., 1980 IBVS No. 1885

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ADDITIONAL AND NEWLY-NAMED VARIABLES IN TWO OBJECTIVE-PRISM M-EMISSION-STAR LISTS

The extensive lists of discoveries of M-type stars showing hydrogen emission lines published some time ago by Stock and Wroblewski (1972) and Bidelman and MacConnell (1973) contain, as anticipated, many variable stars. In subsequent years a considerable number of additional objects in these lists have been discovered to be variable or given definitive names. Tables I and II list the Stock-Wroblewski and Bidelman-MacConnell objects that are, to the writer's knowledge, either recently discovered to be variable, recently named, or whose variable nature was not mentioned in the original lists.

Three of the objects classed as Me deserve special mention: S-W IId-8 and IId-17 are AS 283 and 295 respectively (Merrill and Burwell 1950). The former is considered a Be star by Herbig (1969) and Sanduleak (1976), while the latter exhibits He II λ4686 and H emission according to Bidelman and MacConnell (1973) and Sanduleak and Stephenson (1973). Further, the B-M object at $\alpha = 9^h\ 35^m.8$, $\delta = -40°37'$ (1900) is undoubtedly the proper-motion star CoD - 40°5404 = CPD - 40°3789 = LHS 2166 = Gl 358 and is thus an Me dwarf rather than a Mira variable.

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TABLE I

ADDITIONAL AND NEWLY-NAMED VARIABLES IN STOCK AND WROBLEWSKI

Designation	Variable	Designation	Variable	Designation	Variable
Id- 2	V389 Ara	Id-72	MW Aps	IId- 68	V640 CrA
- 3	CN Ara	-74	CV Aps	- 73	V669 CrA
- 7	EX TrA	-75	EO Aps	- 74	V646 CrA
- 8	CP TrA	-77	V362 Car	- 75	V543 CrA
-10	V615 Ara	-79	CH Mus	- 77	V426 CrA
Id-13	V771 Ara	Id-82	FW Aps	IId- 78	V443 CrA
-15	CSV 4212	-84	YY Cha	- 79	CSV 4406
-16	ER TrA	-86	CSV 2246	- 80	CSV 4439
-20	NX Pav	-89	T Aps	- 84	V388 CrA
-23	V755 Ara	-90	WY Aps	- 85	V688 CrA
Id-25	HN TrA	Id-91	CL Cha	IId- 90	V423 CrA
-27	V631 Ara	-92	CSV 2118	- 91	V544 CrA
-28	V471 Ara	-93	GG Aps	- 93	V627 CrA
-30	FY TrA	-94	AC Aps	- 94	V671 CrA
-36	IS TrA	-95	CSV 7178	- 95	V685 CrA
Id-38	DS Mus	Id-96	BE Aps	IId- 99	CSV 3788
-40	TZ Aps	-97	CG Aps	-100	CSV 3802
-43	CSV 1318	IId- 4	OU Sgr	-101	OW Tel
-45	V351 Car	- 6	V2407 Sgr	-103	BH Ara:
-46	CSV 1678	-19	V3679 Sgr	-104	BN Ara
Id-47	BV 832	IId-34	V3873 Sgr	IId-105	V641 Ara
-49	CSV 1739	-35	V3434 Sgr	-106	TT Ara
-53	CE Aps	-40	V2833 Sgr	-107	CSV 3753
-54	DS Aps	-41	V3190 Sgr	-108	GV Tel
-55	CSV 1662	-44	V3551 Sgr	-109	NY Tel
Id-56	CSV 1706	IId-50	V3018 Sgr	IId-111	V Ara
-57	V352 Car	-52	V1165 Sgr	-112	CSV 3656
-58	CSV 1733	-54	V3366 Sgr	-113	CSV 4139
-59	CSV 1893	-55	V3746 Sgr	-115	BN Tel
-63	PR Car	-56	V2334 Sgr	-117	BV 1633
Id-64	V339 Car	IId-57	V2335 Sgr	IId-123	BE Tel
-65	CP Mus	-58	*	-124	BM Tel
-67	VZ Aps	-59	V1979 Sgr	-125	CSV 2916
-69	PQ Car	-62	GZ CrA	-127	PQ Ara
-71	CR Mus	-67	V434 CrA	-129	PQ Tel

*V2337 or V3933 Sgr

TABLE I (cont.)

Desig- nation	Variable	Desig- nation	Variable	Desig- nation	Variable
IId-131	CSV 2952	IIId-56	CSV 1513	IVd-111	CSV 1580
-133	V798 Ara	IVd- 3	V1353 Oph	-112	GQ Vel
-134	V561 Ara	- 4	CSV 2514	-113	GN Vel
-135	CSV 3462	-10	GM Sco	-115	CSV 2245
-143	V639 Ara	-15	V2100 Oph	-116	CSV 2266
IId-145	BG Tel	IVd-16	GM Oph:	IVd-118	CSV 1708
-146	V768 Ara	-19	V873 Sco	-120	CSV 1720
-149	SX Ara	-20	V860 Sco	-124	CSV 2296
-150	AY Tel	-21	CO Oph	-125	HH Lup
-151	V650 Ara	-22	CSV 2529	-127	CSV 1526
IId-156	CSV 3254	IVd-23	V857 Sco	IVd-131	CSV 1933
-162	V371 Ara	-25	V882 Sco	-139	CSV 1728
-163	CSV 2843	-37	U Lup	-141	V507 Cen
-164	V776 Ara	-38	V875 Sco	-146	CSV 2007
-170	DX Ara	-45	CSV 2286	-148	CSV 1585
IId-171	DZ Ara	IVd-47	CZ Sco	IVd-149	CSV 1714
IIId-14	V CMa	-50	AA Ant	-151	CSV 1992
-20	SY Col	-55	BF Hya	-152	BV 737:
-29	KW Car	-57	KR Sco	-155	CSV 2262
-31	V342 Car	-58	BH Hya	-157	CSV 1745
IIId-36	CSV 1445	IVd-65	AC Ant	IVd-158	CSV 1976
-38	IY Car	-71	V880 Sco	-166	CSV 1911
-39	KX Car	-80	V800 Cen	-169	CSV 1823
-44	UV Vol	-86	CSV 2308	-170	CSV 1726
-45	V346 Car	-89	CSV 2507	V - 65	U Scl
IIId-46	CSV 1560	IVd-90	AD Ant	IIId-34	CSV 1283
-47	CSV 1614	-93	CSV 2070		
-48	UU Vol	-98	RS Ant		
-50	V335 Car	-102	BV 1378		
-51	CSV 6650	-107	CSV 2243:		

TABLE II

ADDITIONAL AND NEWLY-NAMED VARIABLES IN BIDELMAN AND MacCONNELL

α(1900)	Variable	α(1900)	Variable
5 21.2	SV Lep	15 58.7	IS TrA
5 40.8	SX Pic	15 59.6	V864 Sco
6 24.4	SY Col	16 5.0	V872 Sco
6 38.6	V340 Car	16 6.5	V874 Sco
7 32.8	PP Pup	16 9.1	V894 Sco
7 56.9	NR Pup	16 18.9	IU TrA
8 13.1	NN Pup	16 22.2	PP Nor
8 17.7	UV Vol	16 34.6	V880 Sco
8 26.8	V342 Car	16 40.6	V629 Ara
8 30.1	V336 Car	16 40.9	V630 Ara
8 39.2	UU Pyx	16 50.3	GH Aps
8 41.4	UV Pyx	16 53.8	V614 Ara
9 24.8	ZZ Ant	17 3.7	V1482 Oph
9 33.2	ST Hya	17 9.7	V505 Oph
10 1.5	AA Ant	17 23.5	V638 Ara
10 10.8	GQ Vel	17 31.9	V619 Ara
10 17.1	AC Ant	17 33.0	V639 Ara
10 19.2	GR Vel	17 42.4	V640 Ara
10 25.7	AD Ant	18 24.6	V3841 Sgr
10 41.7	V335 Car	18 27.9	V670 CrA
11 4.0	V352 Car	18 31.7	NX Pav
11 29.4	CK Cha	18 36.7	NY Pav
11 32.4	BV 1208	18 38.6	NX Tel
12 18.5	EK Mus	18 58.6	NY Tel
13 44.0	V773 Cen	19 15.5	NZ Tel
14 13.0	IP Hya	19 27.0	V3881 Sgr
14 46.9	V799 Cen	19 30.5	V3882 Sgr
14 56.6	V776 Cen	19 33.4	V3883 Sgr
15 19.0	IP TrA	19 35.5	V3884 Sgr
15 22.1	GP Lup	19 50.3	NO Pav
15 33.3	HK TrA	19 51.7	V3887 Sgr
15 42.7	HL TrA	21 2.6	AV Ind
15 43.8	IR TrA	21 39.2	AH Cap
15 50.6	GR Lup	22 57.9	BR Tuc

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ON THE SUSPECTED VARIABLE CSV 96

Attention was called to CSV 96=P 27 by Ross (1926), who noted that this star (his No. 136) seen on a plate taken on November 13, 1925 but was invisible on one taken on September 20, 1906. Since this object is fairly close to the proper-motion star G 1-26 = LTT 10289 it was of interest to check Ross's original plates to see if the two objects were identical. This has been done: the suspected variable is not G 1-26. Further, from inspection of the image and in view of Sandig's (1950) negative observations it appears likely that the object was an asteroid. Ross himself was well aware of this possibility.

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PHOTOELECTRIC OBSERVATIONS OF CI Cyg

From July 11 to October 20, 1980 (JD 2444432 - 2444541) a series of photoelectric observations of the symbiotic star CI Cyg was accomplished on the 50 cm telescope of the Byurakan Astrophysical Observatory. The observations were made close to the standard u,b,v bands and in the r and Hα bands, characterized by the following data:

	r	Hα
Halfwidth	270 Å	12 Å
λ_{max}	6563 Å	6563 Å
Transmission coefficient at λ_{max}	42 %	60 %

HD 226117 = BD +35°3828 and HD 226172 = BD +35°3834 served as comparison stars.

Due to bad weather conditions a part of the final phase of the eclipse was missed. In Figure 1 the results of our observations are presented. Each point in this figure presents the mean value of 2-4 comparisons with both comparison stars. The corresponding values of 3σ (the bars on the right hand side in Fig.1) are presented as well.

On the light curves one can discern four phases.

During the first interval (JD 2444432-455) the brightness of CI Cyg increased continuously in all the observed bands. On the Hα curve a relatively short lived brightness decrease was well noticeable. The Δ(u-b), Δ(b-v) and Δ(v-r) colour values decreased i.e. the star became bluer.

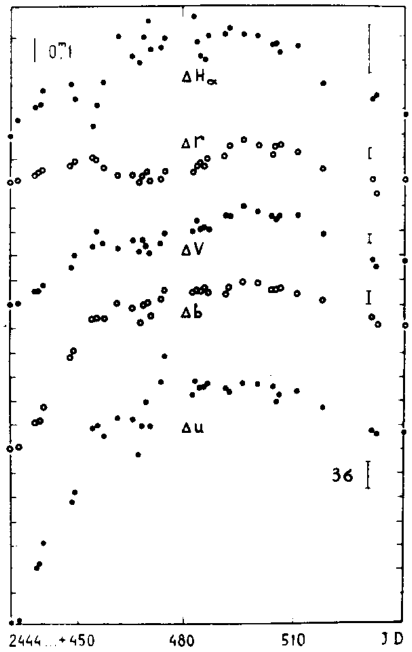

Figure 1

During the second interval (JD 2444455-473) the brightness increase continued in general at a smaller rate and with some irregularities in all the bands except in r. The brightness in r decreased by 0.1 magnitude. The colours of the star continued to decrease but at a smaller rate, as well.

During the third interval (JD 2444473-497) the brightness in Hα remained constant on its maximum level. In the bands, r,v,b and u the brightness increased by small amounts, the greatest increase being in the b band - 0.15 magnitudes. In the u band a short lived brightness increase of the order of 3σ ($\Delta m=0.17$ mag.) was noticed. During this interval the colours of the star remained on a constant minimum level.

During the fourth interval (JD 2444497-542) a systematic brightness decrease in all the bands was observed the amplitudes being Δu = 0.20, Δb = 0.17, Δv = 0.21, Δr = 0.20 and $\Delta H\alpha$=0.30 magnitudes. It should be noticed that, except maybe in the Hα band, the amplitude of brightness decrease in all the bands was the same. At the end of this interval the brightness levels of the star in the bands Hα and r are almost equal to those observed in these bands at the beginning of our observations, i.e. to those corresponding to a phase close to minimum. In this interval the colours Δ(v-r) and Δ(u-b) increased a little, indicating a slight reddening of the star. The colour Δ(b-v) increased as well at the beginning of this interval, but went back to its normal value at the end.

The above presented data allow to conclude:

1. During the minimum the hot component was eclipsed.
2. The fact that the amplitude of brightness decrease after the maximum is almost the same in all the bands allows to admit that the decrease is due to a neutrally absorbing agent.
3. The short lived brightness changes in Hα and u can be due to an interaction between the hot component of CI Cyg and the surrounding nebula.

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BVR PHOTOELECTRIC OBSERVATIONS OF ER Vul
JUNE, JULY, 1981

ER Vul (= HD 200931, BD + 27°3952) was discovered to be a spectroscopic binary system in 1946 (Northcott and Bakos, 1956). The system was suspected to eclipse by Bakos, who was able to confirm the light variation by photoelectric observations, discussed later by Northcott and Bakos (1967). Abrami and Cester (1963) observed the star and produced two light curves in yellow and blue filters. Al-Naimiy (1978) observed the system in B and V filters. All the previous light curves show irregular light variations outside the minima.

CaII H and K emission lines were noted in the spectrum of the system by Bond (1970), lending weight to the suggestion about this by Northcott and Bakos (1967). The system has been classified by Hall (1976) with the RS CVn "short period group" on the basis of these peculiar properties. Budding et al. (1982) reported a high resolution IUE spectrogram for ER Vul which shows a remarkable doubling of the MgII h and k emission lines, which could be interpreted as an indication of intense chromospheric activity over both stars.

The present observations were carried out on five nights during the period 26th June - 11th July, 1981 with very good sky conditions (the mean transperency is ~ 90% in blue). A total of 530 reduced points in each of B, V and R filters (characteristics given by Jassur, 1979) were obtained using the three beam (unrefrigerated EMI 9558B tubes) photometer, described by Sadik (1978), attached to the 74 inch telescope at Kottamia observatory (Egypt). The comparison and check stars were HD 200270 and HD 200468, respectively. The observations have been given phases using the photometric elements Min I = 2435693.5112 + 0.698095 E (Rudnicki, 1981). These elements seem to give more consistent results than other available ones (e.g. Abrami and Cester, 1963; Al-Naimiy, 1978; and Wood et al., 1980), even though a small shift in the time of primary minimum is still suggested.

Three sets of standard stars, combined with the extinction coefficients obtained from the comparison star observations on the same nights, were used to calculate the scale factors and zero constants, which have been used for the determination of the standard differential magnitudes of the variable star (Hardie, 1962). The standard ΔB, ΔV and ΔR magnitudes of the system are presented graphically with the corresponding phases in Figure 1. The differential standard colour indices of the system with the corresponding phases are presented in Figure 2.

The shape of the bottom of the primary minimum as compared with that of the secondary in all the three light curves indicate a possible occultation, though with variable surface brightness of the secondary component. Since there is no significant variation in the colour of the system with phase, the difference in the light levels outside eclipse can be attributed to the existence of a cool spot on one hemosphere of either component (e.g. see Eaton and Hall, 1979).

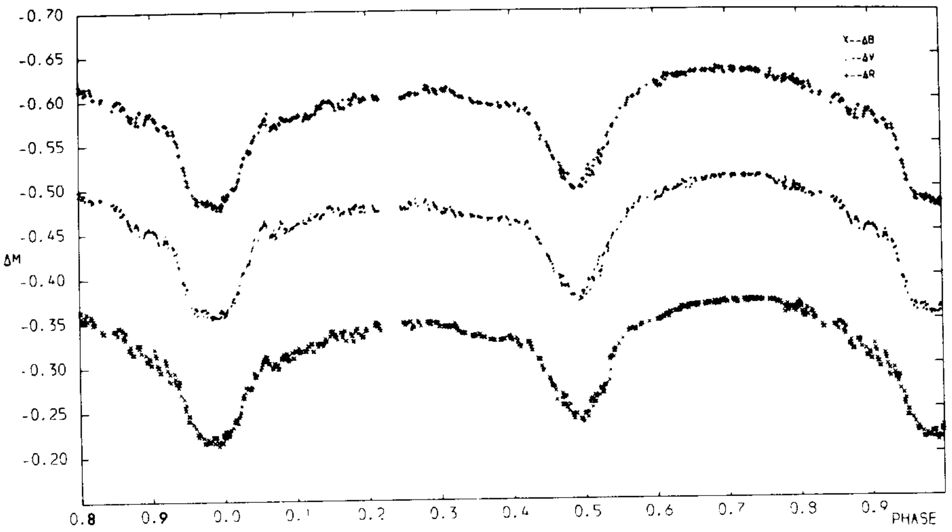

FIG. 1 . STANDARD ΔM LIGHT CURVES OF ER VUL.

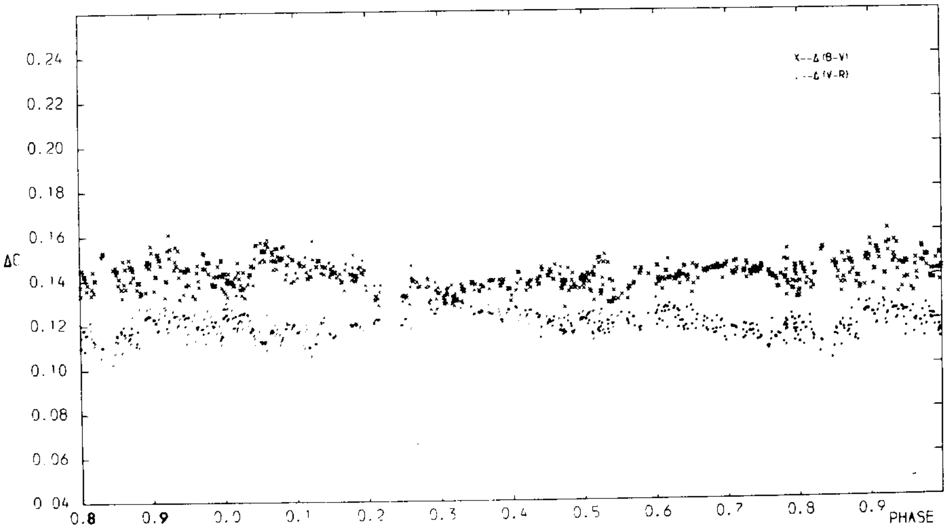

FIG. 2 STANDARD ΔC COLOUR CURVES OF ER VUL.

Comparing the present B and V light curves with those of Al-Naimiy (1978) on the one hand, and those of Northcott et al. (1967)* and Abrami et al. (1963)** on the other, it is possible that a "distortion wave" has migrated with decreasing phase. This would be in a relatively short time scale compared with the other candidates of the short period RS CVn binaries.

Finally, the comparable depths of the minima in the present observations and the comparable shapes of the double Mg II h and k emission features, indicate a very close similarity between the two components of the system which puts the well separated values of G0 V for the primary star and G5 V for the secondary obtained from the spectroscopic solution of Northcott and Bakos (1956) somewhat in doubt.

It is early at this stage of reduction to decide whether the system ER Vul displays an orbital eccentricity of the scale considered by both Abrami et al. (1963) and Northcott et al. (1967) in their solutions. We hope to deal with this matter in a forthcoming more detailed treatment of the present observations.

* Observations were taken in 1956-1957
**Observations were taken in 1956.

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HD 12180: A NEW QUADRUPLE STAR SYSTEM

The star HD 12180 has long been known as a visual binary (ADS 1581). In 1971 the brighter component (SAO 167451) was recognized as being variable by Bloomer (IBVS Nos. 586, 587). This star was given the provisional designation BV 1481 and is now known as AA Ceti. In 1972 Bloomer (IBVS No. 745) determined its correct period to be $0^{\mathrm{d}}.5361735$. More recent work by Grõnbach (IBVS No. 890) has confirmed this period. This system is of the W Ursae Majoris type, and its eclipses appear to be complete. At maximum light the visual magnitude of AA Ceti is 7.3, and its spectral type is F2.

The companion of this system is SAO 167450, whose magnitude is 7.7. It is situated $8''.5$ from AA Ceti, and most photometric data for the latter have included this star in the diaphragm.

Recently spectra were obtained of both of these stars by this investigator using the 1.0 meter coudé feed telescope of Kitt Peak National Observatory. SAO 167450 proves to be a double-lined spectroscopic binary. The lines are very sharp, and the spectral type is F5. Two systems of lines are observed, those displaced to the violet being somewhat the more intense of the two sets. The radial velocities obtained from a single plate are as follows:

Hel. JD	velocity
2444887.838	-12 ± 2 km/s , +68 ± 1 km/s

The dispersion used was 16.9 Å/mm. Two spectrograms were also taken of AA Ceti on the same night. These show broad, diffuse lines, strongly affected by rotational broadening. The mean radial velocity for the two spectrograms, both of which were taken near primary minimum, is +41 ± 11 km/s, a value which is in agreement with the center-of-mass velocity which can be estimated from the data given for SAO 167450.

No evidence has been presented that indicates SAO 167450 is an eclipsing binary. Observations should be made to determine whether or not this is the case, however, since SAO 167450 is a double-lined system which will probably be found to have a well-defined radial velocity curve. If the inclination of the orbit of this system can be determined, precise masses should be obtainable for both components.

The author wishes to thank Daryl Willmarth of the KPNO staff for his assistance. He also wishes to acknowledge the support which he received from a Small Research Grant from the American Astronomical Society.

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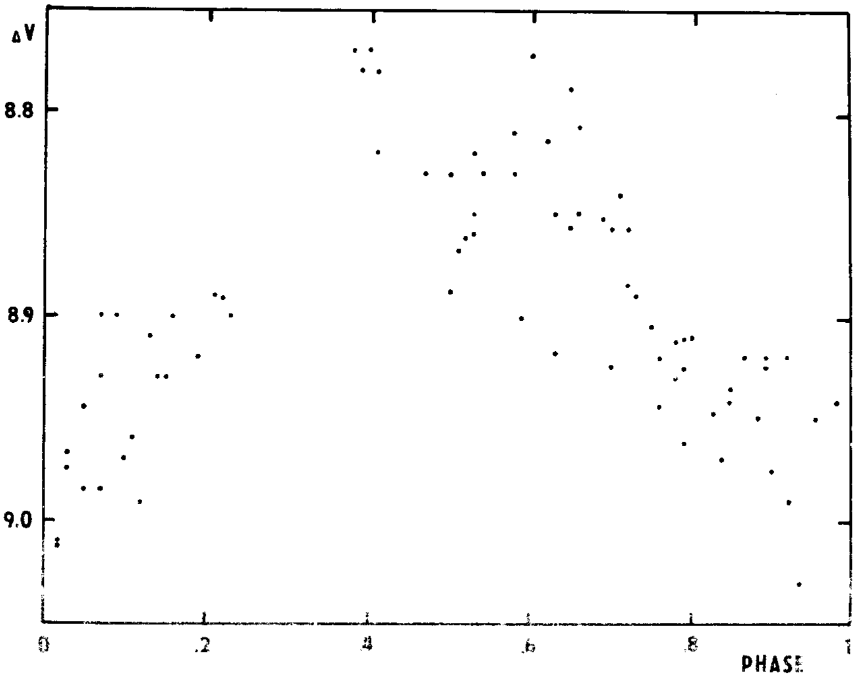
PU VULPECULAE (OBJECT HONDA - KUWANO 1979) - 78.1 DAYS PERIOD

Two outbursts of PU Vul were observed in 1979 and 1981. Photometric history of the object is being published by Chochol and Grygar (1982) and Belyakina et al. (1982). Duration of the flat maximum of brightness was 340 days during the first outburst. The average V magnitude of PU Vul was 8.9^m at that time.



Figure

Table I

Data for PU Vul and comparison stars

Star	Catalogue number	R.A.$_{1950}$	DEC.$_{1950}$	V	B-V	U-B	Spectrum
Comparison 1	HD 194 011	$20^{h}20^{m}22\overset{s}{.}3$	$21^{\circ}\,38'\,43''\!.7$	8.31	1.26	1.14	K 0
Comparison 2	HD 193 859	$20^{h}19^{m}38\overset{s}{.}1$	$21^{\circ}\,14'\,33''\!.0$	8.22	-0.04	-0.46	A 0
Check 1	HD 193 706	$20^{h}18^{m}48\overset{s}{.}8$	$21^{\circ}\,21'\,29''\!.2$	7.84	1.64	1.98	K 5
Check 2	BD 21° 4165	$20^{h}18^{m}37\overset{s}{.}9$	$21^{\circ}\,23'\,42''\!.6$	9.23	0.57	-0.01	
PU Vul		$20^{h}19^{m}01\overset{s}{.}1$	$21^{\circ}\,24'\,43''\!.1$	8.9 *	0.55 *	0.40 *	

---

* average values during the maximum brightness in 1979

Table II

U,B,V, observations of PU Vul

HJD 2440000+	Phase	V	n	B	n	U	n	Observatory
4008.55	0.834	8.947	5	9.463	5	9.818	5	SP
4009.53	0.847	8.969	5	9.461	5	9.825	10	SP
4010.41	0.858	8.935	5	9.490	5			SP
4014.52	0.911	8.975	12	9.48	17	9.855	17	B
4016.48	0.936	8.99	24	9.485	15	9.87	4	B
4023.53	0.026	9.012	5	9.526	5	9.954	5	SP
4023.55	0.026	9.01	10	9.52	6	9.94	3	B
4024.51	0.038	8.975	16	9.49	19	9.89	8	B
4025.50	0.051	8.985	28	9.51	22	9.87	17	B
4027.56	0.077	8.985	13	9.50	10	9.905	11	B
4029.49	0.102	8.970	5	9.505	5	9.956	5	SP
4088.46	0.857	8.942	1	9.472	1			SP
4116.37	0.214	8.890	15	9.460	15	9.957	15	SP
4117.39	0.227	8.891	19	9.462	19	9.953	19	SP
4146.32	0.598	8.901	5	9.539	5	10.040	6	SP
4149.36	0.637	8.918	29	9.540	29	10.072	30	SP
4154.28	0.700	8.925	3	9.55	4	10.10	4	B
4156.32	0.726	8.885	5	9.55	2	10.07	3	B
4157.31	0.738	8.89	3	9.55	5	10.075	4	B
4158.31	0.751	8.905	3	9.60	3	10.10	3	B
4159.29	0.764	8.944	22	9.627	22	10.20	22	SP
4161.32	0.790	8.925	9	9.64	4	10.18	5	B
4161.38	0.790	8.962	10	9.648	10	10.274	10	SP
4162.34	0.803	8.91	4	9.62	3	10.13	3	B
4169.34	0.892	8.95	5	9.62	6	10.13	6	B
4170.38	0.906	8.925	2	9.62	3	10.14	2	B
4173.38	0.944	9.03	2	9.66	3	10.12	2	B
4185.31	0.097	8.90	8	9.59	5	10.14	3	B
4210.24	0.416	8.78	4					B

We observed PU Vul photoelectrically with 0.6 m telescopes of Skalnaté Pleso (SP) and Brno (B) observatories in the year 1979. The data for comparison stars and PU Vul are in Table I. Magnitudes and colours were determined by us. Our U,B,V, observations of PU Vul are in Table II. Every value represents the average from observations made in one night. A letter n designates number of individual observations included.

In view of the fact that variations in brightness with amplitude 0.26^m in V were found, we tried to find the period of variations. We have included photometric observations during the flat maximum in the year 1979 made by Mahra et al. (1979), Margrave (1979), Mims (1979), Whitney (1979), Zissell (1979), Bruch (1980) and Belyakina et al. (1982) into our analysis. Observations made by Nakagiri and Yamashita (1980) were not included, because of large scatter. The computing code for period search Hec 18 (Harmanec, 1981) and code of Zverko (1981), which are based on Morbey's method (Morbey, 1978), were used to find the period. The best period is 78.12 days. The ephemeris is as follows:

$$JD\ (Min) = 2443943.39 + 78\overset{d}{.}12\ xE. \qquad (1)$$

Phase in Table II is computed according to this ephemeris. As it is possible to see on the phase diagram of PU Vul (Fig. 1), the primary and secondary minima are well seen on the light curve. Chochol and Grygar (1982) propose binary model "down scaled" symbiotic to explain photometric and spectroscopic behaviour of PU Vul.

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OPTICAL OBSERVATIONS OF THE PRIMARY MINIMUM OF THE SOLAR-TYPE BINARY AI Phe WITH THE IUE SATELLITE

In an extension of a program to study the ultraviolet center-to-limb variation in the sun, we have used the International Ultraviolet Explorer Satellite (IUE) to observe the flux during the eclipse of the G2 component of the $24^{d}.6$ totally eclipsing system AI Phoenicis.

Previous uvby studies of this system reported by B. Reipurth (IBVS No. 1419, 1978) established that the primary eclipse was total. M. Imbert's (Astron. and Astrophys. Suppl. 36, 453, 1979) spectroscopic study indicated that the apparently cooler component was of spectral type G5, slightly more massive, and slightly more luminous than the hotter star.

We anticipated that, although the cooler star might be slightly evolved, the components would not be strongly interacting and that the conditions of a lengthy eclipse (13^{h}) and relatively bright system magnitude ($8.5 \leq V \leq 9.2$) would permit a sufficient number of IUE exposures to determine the UV limb-darkening.

On UT August 20-21, ten LWR spectra were obtained in two successive eight-hour shifts at Goddard SFC and at Vilspa, covering totality and the rising branch. Features are discernible to at least 2600Å on the least well exposed frame. Fine Error Sensor (FES) flux readings were taken before and after each exposure to tie in the light curve variation. An algorithm of

A. Holm and G. Rice (private communication, 1981) was used to convert FES flux to V magnitude:

$$V = -2.5 \log \left[\frac{C}{1 - 1.6d\ \mathrm{ex}(-4) C^{0.781}} \right] + 16.58 - 0.24\ (B-V).$$

The results appear in Figure 1, with the time of IUE exposures indicated by shaded bars. The phase is computed using Reipurth's ephemeris, with which our data appear to be in reasonable agreement.

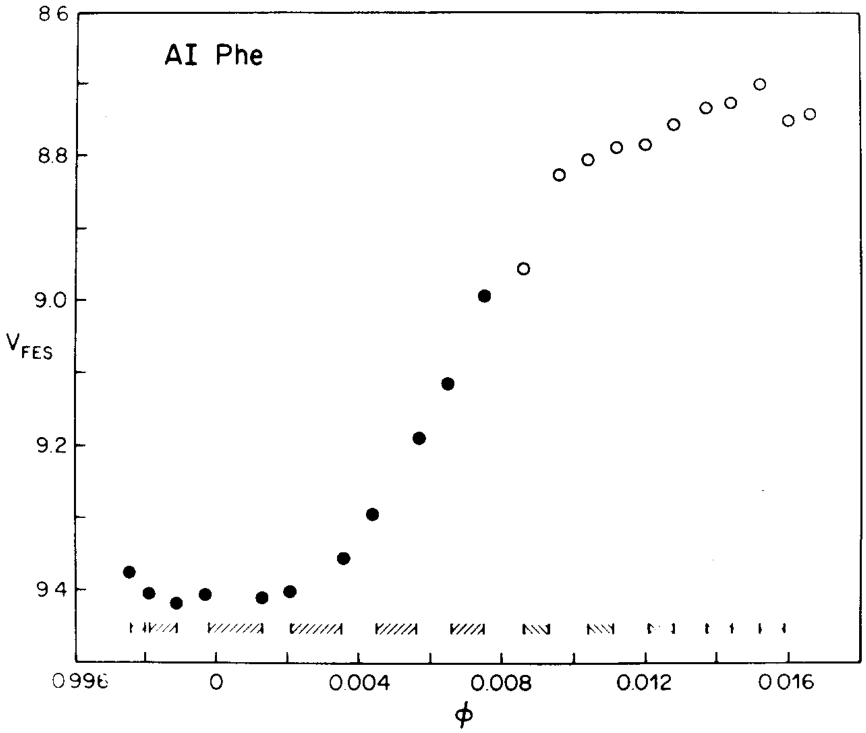

Figure 1

One of us (BJH) obtained ground-based UBVRI observations and spectra at CTIO and another of us (I. Shelton, resident observer of the David Dunlap Observatory, University of Toronto Station at Las Campanas) obtained UBVRI observations at Las Campanas. The value of B-V used in the above equation came from a preliminary reduction of these ground-based data. The reduced light curves will be modeled in five colors, and the resulting improved elements used in the determination of the center-to-limb variation in the eclipsed component. The V data from the different sources show rough agreement in amplitude and shape except at the high shoulder. These results suggest that the duration of totality is at least 105 minutes and perhaps as long as 140 minutes, therefore longer than the 80 minutes of totality in Reipurth's report. The fully reduced photometric data and the spectra will be discussed elsewhere.

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A SUPERNOVA IN MCG +07-29-043

On a 75 min. exposure objective-prism plate taken with the Burrell Schmidt telescope at our Kitt Peak observing station on March 11, 1981, a supernova has been found in the 14th mag. spiral galaxy MCG +07-29-043 (1950: $\alpha = 14^h\ 01^m.2$, $\delta = +38° 46'$). The supernova, estimated to have been at $B \sim 15$ mag. at the time, is situated in the outer region of the galaxy approximately 12 arc seconds west and 8 arc seconds south of the nucleus. No image is visible at this position on the POSS charts. The unwidened spectrum, as recorded at a dispersion of 1360 Å mm^{-1} at H_γ on baked IIIa-J emulsion, shows apparently broad emission features centered at λ4650, 4280, 3960, and 3660 and equally broad absorption troughs centered at λ4470, 4130, and 3810. The λ4650 feature contains the strongest emission. The apparent absence of H_β in emission suggests that this was a Type I supernova.

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FLARE STARS IN ORION

Continuing the photographic observations in the Orion aggregate by means of the 70/100/210-cm Meniscus-type telescope of the Abastumani Observatory, using the multiple exposure method, 16 new flare stars (Table I) and 11 repeated flares of known flare stars (Table II) had been revealed.

As in the publication (1), Table I and II give the data of these flares where the "Ab" numeration of the Orion's flare stars is continued.

Table I

No	α1900			δ1900		m_{pg}	Δm_{pg}	Date
85	5^h	26^m	53^s	-7°	$22'.1$	$17^m.7$	$1^m.8$	09.01.1981
86		31	14	-5	24.8	17.4	3.1	09.01
87		29	12	-5	15.8	15.5	1.0	09.01
88		30	28	-5	14.7	15.3	2.2	26.01
89		31	07	-5	11.4	15.5	1.0	29.01
90		29	14	-6	08.8	17.8	1.1	05.02
91		33	34	-7	36.6	17.9	3.5	06.02
92		32	47	-6	56.4	>21.0	>4.5	23.02
93		33	38	-3	33.7	19.5	3.4	23.02
94		37	47	-4	51.9	19.8	3.7	23.02
95		26	54	-7	40.7	19.4	4.4	24.02
96		28	41	-6	30.0	>21.0	>4.6	24.02
97		39	05	-6	00.8	16.3	1.3	24.02
98		28	38	-7	46.4	17.6	2.0	25.02
99		21	43	-5	49.6	17.0	1.8	25.02
100		22	18	-5	27.9	16.5	1.6	04.03

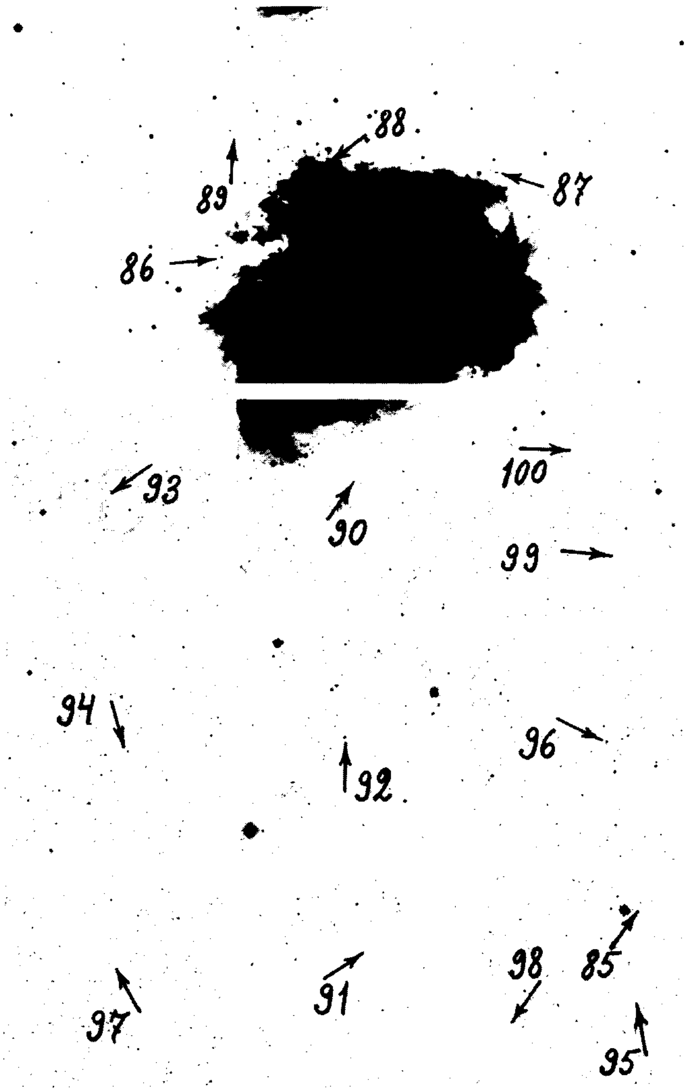

Figure 1

Table II

No	$\alpha 1900$	$\delta 1900$	m_{pg}	Δm_{pg}	Date	Ident.
1	5^h 30^m 35^s	-6° $13'.5$	$17^m.3$	$1^m.4$	08.01.1981	T 57
2	29 10	-4 11.3	17.1	0.8	08.01	A 9
3	29 37	-5 04.6	17.0	2.3	09.01	T 32
4	34 46	-3 28.4	15.6	1.3	09.01	Ab 80
5	28 54	-6 04.7	16.2	1.1	22.01	T 139
6	29 20	-5 59.7	17.7	2.6	29.01	T 207
7	34 46	-3 28.4	15.6	1.5	29.01	Ab 80
8	26 57	-5 46.5	17.1	1.5	05.02	Ab 77
9	28 47	-4 59.9	18.3	2.0	06.02	Ab 46
10	31 13	-6 29.2	16.0	1.0	24.02	T 83
11	28 51	-5 40.6	20.0	2.9	03.03	T 21

Outburst of the star No. 87 had unusual character:its brightness increased for less than 6 minutes and stayed at the maximum for approximately 1^h 50^m.

Finding charts are given.

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Reference:

Natsvlishvili, R.Sh., 1981, IBVS No. 1926

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MT CASSIOPEIAE, ANOTHER CONTACT BINARY WITH COMPLETE ECLIPSES

MT Cas was discovered by Götz and Wenzel (1956) as a W UMa type eclipsing binary. They did not publish a light curve, but the amplitudes were given as $0^m.4$ and $0^m.3$ for the primary and secondary minimum, respectively.

This 13th magnitude star was observed at Hoher List Observatory with the double beam photometer at the 1.06m telescope in B between October and December, 1981 (JD 2444901, 2444914, 2444941, 2444955). Comparison star was a 12th magnitude star 5' north of MT Cas. This star is $0^m.8$ redder than the variable. Unfortunately it was not possible to fill the gaps in the light curve at phases $0^p.05$ and $0^p.40$, and only the observations between $0^p.43$ and $0^p.93$ could be obtained during very good weather conditions. With exception of the first night, also some additional V observations were made.

Minimum times were determined:

JD hel.	2444901.5705	Epoch	50249.5	O-C	$+0^d.0442$
	2444941.5925		50377.0		+0.0469
	2444955.2420		50420.5		+0.0428

Epochs and O-C's were calculated according to the light elements given by Götz and Wenzel (1956). Although the minima are now displaced by $0^p.14$ from their predicted instants, this can still be explained by the uncertainty of the period determination from the minimum observations by Götz and Wenzel (1956).

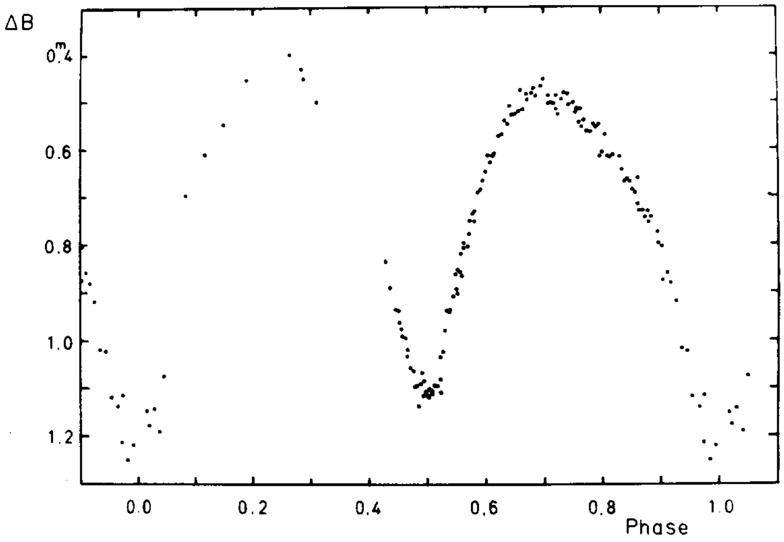

Figure 1: B observations of MT Cas

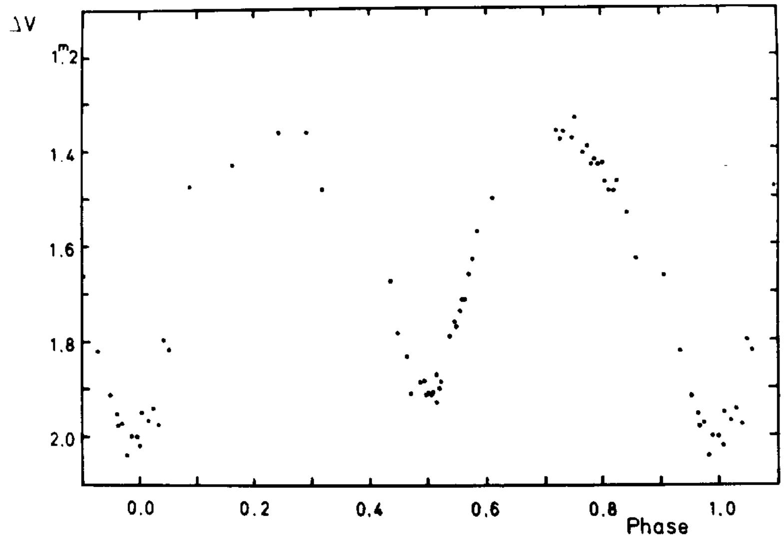

Figure 2: V observations of MT Cas

The B light curve is shown in Fig. 1. It can be seen that the amplitude of MT Cas is much larger than previously assumed. It amounts roughly $0^{m}_{.}7$. The minima have flat intervals of $0^{p}_{.}04$. It is concluded that this eclipsing binary has complete eclipses. However, between the second and third contacts of both eclipses the light curve is slightly ascending. This "intrinsic" variability affects also the symmetry of the incomplete eclipse parts and complicates the determination of minimum times, therefore, as well as attempts for a solution of the system parameters.
The maximum at phase $0^{p}_{.}25$, though poorly covered with observations, seems to be a little brighter than the other one. Considerable displacements of the maxima from the mid-points between the minima towards the secondary minimum are visible. The wider primary minimum suggests that MT Cas is of W type. This is not unusual if the period and the amplitude (moderately great mass ratio) is taken into account.
Fig. 2 shows the V observations. The main features of this light curve are the same as in B in principle, but the amplitude is smaller. Since V observations are lacking for the first observing night, the B and V light curves may only be comparable with restriction, however.

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Reference:
Götz, W., Wenzel, W., 1956, Veröff. Sternw. Sonneberg 2, 279

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LINEAR POLARIZATION OF THE LATE-TYPE VARIABLE STARS μ Cep AND MIRA IN YEAR 1981

Linear polarization observations of the late-type variable stars μ Cep (M2 Ia, SRc) and Mira (o Cet: M5e-M9e) were carried out in the late summer and autumn of the year 1981. The polarization of both these stars at earlier epochs has already been extensively chronicled by many observers. Data from the past, present and future epochs should ultimately form one of the bases for generating definitive models of the atmospheres in these and similar stars. A more immediate motivation was to compare the results being reported here with those obtained about one year earlier.

All observations were carried out at the Cassegrain focus of the 61 cm telescope at Columbia University's Harriman Observatory. The same wide-band (B) filter, polarimeter, ancillary equipment and observing procedures were used as in previous surveys of this type made by the author [vide Hayes (1981b) and references contained therein for further details regarding instrumentation and observing procedures.] The results of this survey appear in Table I, with the amount (P) and direction (θ) of polarization being expressed in percentages and in the equatorial coordinate system, respectively. Each observation of the amount of μ Cep's and Mira's polarization had a Poisson photon-count standard deviation of 0.025% and 0.020%, respectively. The polarization position angle standard deviation is given by 28°.7 (σ_p/P). The same photon-count errors applied for the 1980 measurements of these stars reported by Hayes (1981a) and Hayes and Russo (1981).

I. Discussion of the μ Cep Observations.

Comparison of the 1981 observations of μ Cep being presented here with the 1980 observations of Arsenijevic et al. (1980) and Hayes (1981a) reveals a drastic change in polarization. For the autumn 1980 data Hayes (1981a) reported a historic polarization maximum of $\overline{P}$ = 4.15±0.05% (here and henceforth the cited errors are the standard deviations of the data). The current observations ($\overline{P}$ = 2.09±0.20%) indicate that a remarkable decrease in polarization has occurred in the course of about one year. But the polarization position angles have not changed markedly in the interim - going from a value of $\bar{\theta} = 41.3 \pm 0.8^\circ$ in 1980 to $\bar{\theta} = 38.4 \pm 1.9^\circ$ in 1981. (The eight measurements carried out in 1981 spanned an interval of about three months, while the seven measurements made in 1980 spanned about two months.) It should be noted that large-scale polarization changes are not unknown in this star [vide the earlier results summarized by Coyne and Kruszewski (1968)]. Perusal of Table I suggests that μ Cep may now be entering into an interval of polarization quiescence.

Table I

Journal of Polarization Amount and Position Angle

Star	Date (UT)	P (%)	θ (deg.)
μ Cep	1981 Aug. 25.16	2.47	36.7
	1981 Sep. 21.09	2.24	37.9
	1981 Sep. 26.06	2.14	38.2
	1981 Sep. 29.16	2.13	35.4
	1981 Oct. 18.02	2.01	38.7
	1981 Oct. 25.15	1.99	37.9
	1981 Nov. 03.02	1.91	40.6
	1981 Dec. 01.01	1.85	41.4
o Cet	1981 Sep. 09.39	1.19	42.7
	1981 Sep. 10.26	1.17	43.6
	1981 Sep. 11.36	1.20	46.1
	1981 Sep. 21.27	1.19	44.9
	1981 Sep. 25.31	1.24	46.4
	1981 Sep. 29.35	1.28	45.2
	1981 Oct. 05.28	1.34	46.3
	1981 Oct. 09.29	1.39	45.6

Consideration was given to the possibility that these polarization changes are the manifestation of a mass loss event as it traversed the extended (circumstellar) envelope. If one assigns μ Cep a radius of 1030 solar radii (Sanner 1976), it would take some 1.8 years for matter traveling at a representative velocity of 13 km $\sec^{-1}$ (Deutsch 1960) to traverse even one stellar radius [which is only a very small portion of this star's extended envelope]. As apparent from Table I, appreciable polarization changes can occur over an interval of less than a week. Thus the comparatively rapid polarization changes being reported here are inconsistent with such a mass loss event. The observed time-scales of variability suggest that the polarization is ultimately seated in the lower atmosphere - either being directly produced in the photosphere itself, or indirectly through photospheric processes which control temporal variations in the anisotropic illumination of circumstellar polarization-producing material. The first scenario (i.e., photospheric production) is very attractive despite some potential pitfalls. The primary problem with such an explanation lies in the fact that μ Cep's polarization arises from grains (Coyne and McLean, 1979), and current prevailing wisdom indicates that these particles would not survive in the lower atmosphere of such a star. But the existence of grains in such an environment may not be as vexing as once thought, since Schmid-Burgk and Scholz (1981) have recently advanced tentative theoretical arguments to account for their survival at such atmospheric depths. Complementary observational evidence may also be at hand since Hagen (1978) has suggested that the presence of grains near the stellar surface may be responsible for μ Cep's lack of chromospheric emission.

II. Discussion of the Mira Measurements.

The eight polarization measurements of Mira being reported here were carried out over a one month interval which commenced about three weeks after the 1981 light maximum. (Janet A. Mattei of the A.A.V.S.O. kindly provided a provisional estimate of the date of maximum.) Hayes and Russo (1981) have reported on four polarization measurements of this star which commenced about six weeks after the 1980 light maximum and extended over a one week interval. The amount of polarization in 1981 ($\overline{P} = 1.25\pm0.08\%$) was appreciably greater than in 1980 ($\overline{P} = 0.84\pm0.02\%$). The polarization position angles were $\overline{\theta} = 45.1\pm1.3°$ in 1981 and $\overline{\theta} = 39.7\pm0.7°$ in 1980. Shawl (1975) has reviewed arguments which suggest that nonradial pulsations are ultimately responsible for this star's polarization variations.

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BV PHOTOMETRY OF SUPERNOVA IN NGC 1316

BV photometry of the supernova (Maza, 1980) in Fornax A (NGC 1316), the first of two supernovae discovered in that galaxy, is reported. Observations were obtained with the CTIO 0.6 m telescope (S-20 phototube) and 0.9 m telescope (GaAs phototube). Extinction and transformation coefficients for each night were determined by observing equatorial standards (Landolt, 1973). Typically, at least 15 standards were observed, and several were observed at a variety of air masses. The standard deviation of a single measurement is typically $0\overset{m}{.}015$ in B-V and $0\overset{m}{.}03$ in V.

Date	UT	V	B-V	Telescope
12/24/80	2^h20^m	12.80	0.57	0.6 m
12/25/80	2 00	12.84	0.61	0.6
12/26/80	1 54	12.96	0.68	0.6
12/30/80	2 27	13.17	0.94	0.9
12/31/80	4 40	13.24	1.00	0.9
1/01/81	1 21	13.30	1.03	0.9
1/02/81	2 48	13.35	1.10	0.9
1/03/81	2 32	13.41	1.11	0.9

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VARIABLE STARS IN THE GENERAL CATALOGUE OF TRIGONOMETRIC PARALLAXES

In preparation for W. van Altena's forthcoming revision of the General Catalogue of Trigonometric Parallaxes, I have checked the earlier version and its supplement (Jenkins 1952, 1963) for variable stars. The 1958 edition of the GCVS and its 1960 supplement has 194 stars in common with the parallax catalogues. However, only two thirds of these (134 stars) are noted as variable in the parallax catalogues. Subsequently, of course, large numbers of new variables have been discovered. Now at least 458 of the nearly 6400 parallax stars are named variables (Kukarkin 1969-77, Kholopov 1977-81). A great many others are given in the catalogues of suspected variables (Kukarkin 1951, 1965) but they are not included in this survey.

The distribution of the parallaxes of the named variables is shown in the Figure. These represent nearly all types of variability, from supernovae down to stars of nearly negligible variability. 55 are eclipsing variables, 9 are of dubious variability, classified as "cst", and the types of variability are still lacking for 83. Only 27 of the variables have parallaxes over ″.100. Of these 18 are of the UV Ceti type and 3 are BY Dra stars (a group that may be related to the UV Cet). One (RT Lac) is an eclipsing binary, while the remaining 5 are of undetermined type. There are 10 additional UV Cet stars, all with parallaxes over ″.045. The lower part of the Figure shows the distribution of the parallaxes of the UV Cet and BY Dra stars. In 1958 the GCVS listed 11 stars as UV Cet type, of which 8 are included in the parallax catalogues, but only one being noted as variable, with no type assigned. These parallax stars had been chosen for parallax determination on the basis of their proper motions, not because of their peculiar variability.

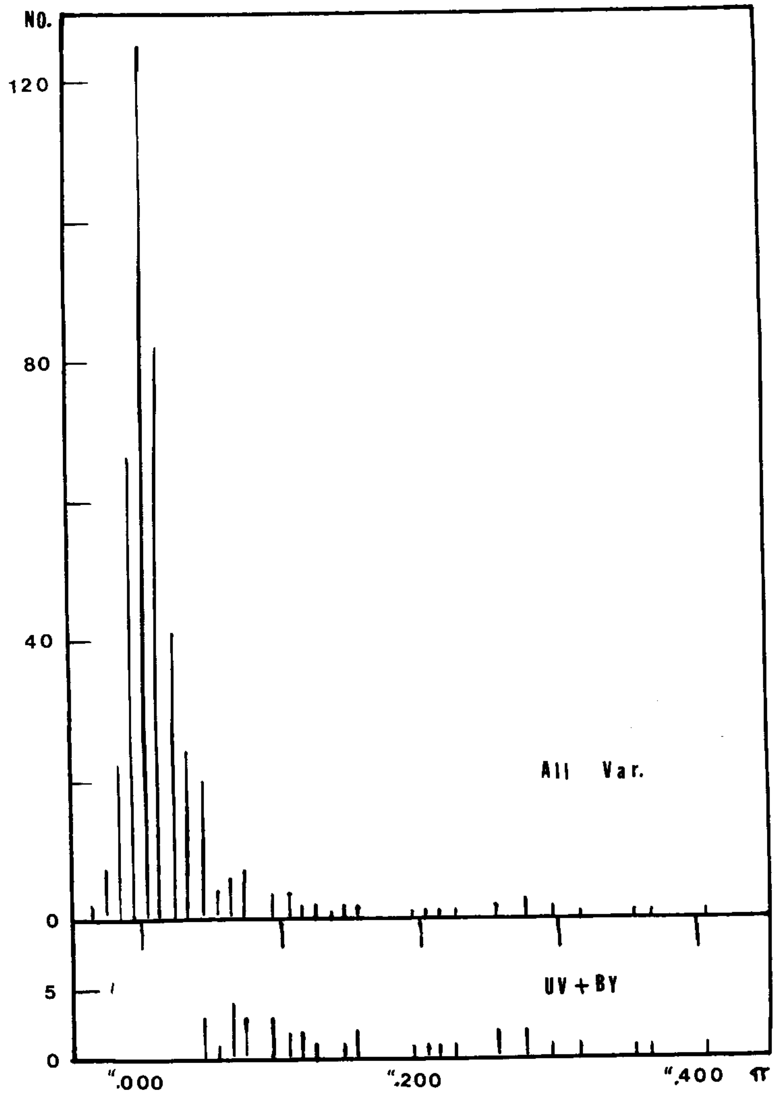

Figure 1

The available apparent magnitudes of the UV Ceti stars as given in the GCVS are on heterogeneous system, ranging from v, p, V, B through U. Older visual magnitudes in the parallax catalogue are often grossly in error, especially for the fainter stars (see, for example, Hoffleit 1970 for a comparison of photographic estimates, indicating differences with a probable error of over a whole magnitude. Provisional estimates of visual magnitude of faint stars are often no better). A crude reduction of the parallaxes to absolute magnitude, using the published visual magnitudes of the UV Ceti stars, gives an unweighted mean $M_V = 11.7 \pm .4$, the individual values ranging from 8.5 to 16.5.

Parallaxes less than $0\farcs030$ are rarely significant. Among the 72 stars with parallaxes larger than $0\farcs030$, in addition to the UV Ceti stars, there are 13 eclipsing variables and 9 Delta Scuti stars. Other types are represented by less than five stars each. In all, the parallax catalogues contain 33 known Delta Scuti stars. The 9 with parallaxes exceeding $0\farcs030$ indicate a mean absolute magnitude, $M_V = 2.1 \pm .1$, the values ranging from 0.4 to 4.2. For no other types is there a sufficient number of significant parallaxes to warrant an estimate of the mean absolute magnitude.

The new catalogue of trigonometric parallaxes will contain not only revisions of the currently known parallaxes, and in many cases up-dated photometric data, but a few thousand additional stars, undoubtedly including many more variable stars. As it will be some time before this compilation is completed, the list of variables among the stars in the 1952 catalogue and its 1963 supplement will be furnished to interested users upon request.

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FLARE STARS IN THE PLEIADES

In September 1980 the photographic monitoring observations in the Pleiades region were continued according to the joint programme of investigation on the flare and nonstable stars in the stellar aggregates between the National Astronomical Observatory of the Bulgarian Academy of Sciences and Byurakan Astrophysical Observatory of the Armenian Academy of Sciences. 10 plates with total time of effective observations 9^h40^m were obtained with the 40"/52" Schmidt telescope at Byurakan Astrophysical Observatory.

Table I

Number	HII	RA(1900.0)	D(1900.0)	m_{Umin}	Δm_U	Date (UT)
1		$3^h33^m.5$	$24^o39'$	$15^m.6$	$1^m.5$	11.09.1980
39		37.1	24 30	18.3	3.8	13.09.1980
91		43.8	21 52	16.6	2.1	9.09.1980
101		33.2	24 25	18.8	4.0	10.09.1980
118		37.3	24 20	18.5	2.9	10.09.1980
270	1532	41.7	23 26	16.2	0.8	11.09.1980
473		41.6	22 04	17.0	0.6	9.09.1980
Anon.		33.8	23 35	20.0	4.8	10.09.1980

In Table I some informations about the observed flares are summarized and the successive columns give the following data:

1. Number of the flare star in the Pleiades according to the General Numeration
2. Hertzsprung number

3.-4. Coordinates for 1900.0

5.-6. Photographic magnitude at minimum and amplitude of the observed flare in U-light

7. Date of the flare event (U.T.).

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THE PERIOD OF DN UMa (HR 4560): A BRIGHT ECLIPSING BINARY

In a previous communication (Giménez and Quesada, 1979) we presented photometric evidences of the variability of the brighter component of the visual binary 65 UMa (HR 4560, ADS 8347, HD 103483, SAO 43945, BD +47°1913) which is itself a multiple system of close members. One of them, appears to be an eclipsing binary.

During last year, new photoelectric observations have been carried out at the high altitude observatory of Sierra Nevada (Granada, Spain) with the same instrumental equipment. All measurements were accomplished in the Johnson's B filter except for one night when the three UBV filters were used during a primary minimum. The new data have confirmed the variability previously reported as well as the position of the eclipses allowing us to determine several times of minimum. In total, we have obtained more than seven hundred individual photoelectric estimations of magnitude referred to the comparison star HR 4561.

The times of minimum light were calculated by means of the traditional method of Kwee and Van Woerden (1956) only for those eclipses well covered along the ascending and descending branches. Two times of minimum for which the observed phases did not covered suitably well both branches, were obtained by means of a graphical procedure and consequently a lower weight was given. All observed minima are included in Table I along with the type of eclipse, the epoch and the residuals based on the adopted linear ephemeris.

Table I

No.	Hel.J.D.	Ecl.	Epoch	O-C
1	244 3936.4851	P	0.0	0.0037
2	3937.352	S	0.5	0.005
3	4249.683	P	181.0	-0.004
4	4275.6355	P	196.0	-0.0078
5	4334.4700	P	230.0	-0.0075
6	4557.7034	P	359.0	0.0020
7	4629.5218	S	400.5	0.0081

A systematic search for the period was accomplished using the method outlined by Lafler and Kinman (1965) and we were able to obtain a value close to 1.73 days. Calculating the epochs for each time of minimum, the following linear ephemeris was determined by least-squares,

$$\text{Min I} = \text{H.J.D. } 244\ 3936.\underset{26}{4814} + 1^{d}.\underset{11}{730418}\ E$$

which permits the prediction of future light minima. The secondary eclipse lies almost exactly on phase 0.5 and, therefore, the orbit can be assumed to be circular. Moreover, our observations cover the whole light curve and we were able to estimate the depth of the eclipses ($0^{m}.08$) which appear to be practically identical. The duration of these shallow partial eclipses is close to 5 hours and out of eclipse the *maximum light remains apparently constant although the scatter* of the measurements did not allow a definitive conclusion.

It should be finally noticed that Abt (1970) in his catalogue of radial velocities indicated the existence of a double lined spectrum for the brighter component of the visual binary 65 UMa (ADS 84347 A). Nevertheless, the presence of several close visual companions in the vicinity of the eclipsing binary, makes rather difficult to obtain radial velocity determinations free of light contamination.

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PERIODIC ERUPTIONS IN T CrB?

The recurrent nova T Coronae Borealis has been observed to erupt four times, to our knowledge, with novae or flarelike events with peak amplitude of one magnitude or greater. These eruptions are summarized in the table below. We have calculated the orbital phase of each event based on a period of 227.6 days measured for the system by spectroscopic methods (Kraft 1958).

Event	Epoch (JD)	Orbital Phase (cycles)
Nova T CrB 1866	2402734	(0.00)
Nova T CrB 1946	2431861	127.97
Flarelike event 1963 (Ianna 1964)	2438030	155.08
Event of 1975 (Radick 1981)	2442543	174.91

The relative phases of all three events subsequent to Nova T CrB 1866 are within 0.10 cycle of phase 0.00. The probability of such a coincidence being fortuitous is less than one per cent. T CrB does exhibit smaller outbursts throughout its orbit, but we consider only those of large amplitude here. Both the 1963 and 1975 events were observed in the ultraviolet.

Because of the suggested periodicity in these data, we recommend that T CrB be monitored in the ultraviolet by photometrists for three weeks either side of orbital phase zero. This will next occur about April 7, 1982.

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OBSERVATIONS OF THE 1981 ECLIPSE OF RZ Oph

The long period Algol-type binary RZ Oph was photoelectrically observed in summer 1981 at the University Observatory in Brno. During 9 observing nights spread in the time period between 1 June and 4 September 33 and 27 individual observations were performed in the V and B colours, respectively. The observations cover relatively large portions of the light curve out of the eclipse, the disk eclipse before the 1st and after the 4th contacts, and the whole phase of the totality.

We did not succeed in observing the descending and ascending branches of the eclipse, this is why the whole light curve of the eclipse as well as its time minimum cannot be presented here. The observed depths of the minimum - 0.73 mag in the V colour and 1.57 mag in the B one - are in very good accordance with the measurements performed by Baldwin (1978) and Baldinelli and Ghedini (1977).

The presented observations are attached to the three comparison stars

BD +7°3828	V = 10.18 ±2	B = 11.52 ±3
BD +6°3928	V = 9.94 ±2	B = 11.14 ±3
BD +6°3918	V = 9.16 ±1	B = 10.51 ±1

The photometric data for these stars were derived from the measurements of 8 standard stars in the neighbourhood of the variable.

The observations of RZ Oph grouped in the normal points representing each observing night follow.

J.D.	V	B
244 4756.55	9.65:	10.88
788.39	9.67	10.83
812.40	9.72	10.89
819.38	10.39	12.32
821.38	10.37	12.44
822.36	10.42	12.45
823.35	10.40	12.45
838.36	9.72	10.89
847.32	9.73	10.89
852.30	9.69	10.86

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PHOTOELECTRIC UBV OBSERVATIONS OF PU Vul IN 1981

This star was found to be variable independently by Honda (1979) and Kuwano (1979) and described as a nova-like object. The object started to brighten near the end of 1977 with a gradient of about $0\overset{m}{.}01$ day^{-1}, reached a plateau after increasing its brightness by approximately 5^m in early 1979, and remained almost constant until the end of that year. Then it faded rapidly at a rate of up to $0\overset{m}{.}025$ day^{-1}, reaching about 14^m in autumn 1980 (Honda et al., 1979, Nakagiri and Yamashita, 1980, Mattei, 1981). Immediately thereafter the object started to brighten again (Verdenet, 1981, Purgathofer and Schnell, 1981) but much faster than in 1978, up to $0\overset{m}{.}025$ day^{-1}, reaching a new plateau in October 1981, somewhat higher than the previous one in 1979. Since then PU Vul seems to be about "constant" again.

The present observations were obtained with the new 24 inch RC reflector of the Figl-Observatory, Vienna, Austria, using a single channel photometer attached to the broken Cassegrain focus. This photometer is equipped with EMI 9844 multiplier tube, standard UBV filters (Corning), d.c.amplifier and potentiometer recorder. The observations cover the period from May 8 to December 28, 1981. We used BD +21°4165 = SAO 88548 (star A) as main comparison star (Mahra et al., 1979), since it is very close to the variable (less than 6 arc min) and of sufficiently similar colour. In 16 nights we also observed BD +20°4533 = SAO 88573 (star B). Within the observing period the difference in V between star A and B was constant to within $0\overset{m}{.}014$ s.d. The measured mean difference between these two stars together with a single intercomparison to BS 7678 and BS 7724 suggests a zero point error for star A of + $0\overset{m}{.}09$.

Table I

UT 1981		JD 2444000	V		B - V		U - B	
05	8,07	732,57	$9^{m},89$	± 0,02	$0^{m},79$	± 0,01	$0^{m},51$	± 0,01
	10,04	734,54	9,78	1	0,81	1	0,47	1
	19,00	743,50	9,62	1	0,82	1	0,55	1
	21,03	745,53	9,61	1	0,82	1	0,53	2
06	3,00	758,50	9,39	1	0,84	1	0,54	1
	12,00	767,50	9,16	1	0,83	1	0,55	1
	27,93	783,43	8,98	1	0,80	1	0,54	1
07	1,92	787,42	8,95	1	0,80	1	0,57	1
	4,97	790,47	8,91	1	0,80			
	6,03	791,53	8,88					
	23,93	809,43	8,71	1	0,77	1	0,58	1
	30,92	816,42	8,67	2	0,71	3	0,58	3
	31,89	817,39	8,66	1	0,72	1		
08	5,89	822,39	8,68	1	0,71	1	0,55	1
	6,89	823,39	8,66	1	0,72	1	0,55	1
	7,99	824,49	8,64	1	0,70	1	0,54	1
	8,90	825,40	8,63	1	0,71	1	0,54	1
	13,88	830,38	8,63	1	0,70	1	0,55	2
	18,90	835,40	8,60	1	0,70	1	0,55	1
	22,84	839,34	8,61	2				
	30,87	847,37	8,63	1	0,73	2	0,56	2
09	4,83	852,33	8,62	1	0,72	1	0,56	2
	5,84	853,34	8,61	1	0,71	1	0,54	1
	6,84	854,34	8,61	1	0,72	1	0,54	1
	7,82	855,32	8,60	0	0,72	1	0,53	1
	8,81	856,31	8,60	0	0,71	1	0,53	1
	21,83	869,33	8,57	1	0,71	1	0,51	2
	22,80	870,30	8,57	1	0,70	1	0,51	1
	26,84	874,34	8,51	3	0,70	3	0,49	2
10	4,83	882,33	8,52	3				
	5,83	883,33	8,50	2	0,69	4	0,49	4
	6,84	884,34	8,53	2	0,69	3		
	9,75	887,25	8,53	0	0,70	1	0,53	1
	18,72	896,22	8,59	0				
	20,82	898,32	8,59	1	0,74	1	0,55	1
	25,80	903,30	8,61	1	0,74	1	0,55	1

Table I cont.

UT 1981	JD 2444000	V		B - V		U - B	
11 4,72	913,22	8,60	1	0,70	1	0,50	1
17,88	926,38	8,60	1				
22,74	931,24	8,61	4				
23,81	932,31	8,59	1	0,68	1	0,47	2
12 21,77	960,27	$8\overset{m}{,}59$	± 0,01				
27,69	966,19	8,63	7	0,72	± 0,09		
28,72	967,22	8,61	1	0,66	1	0,48	± 0,02

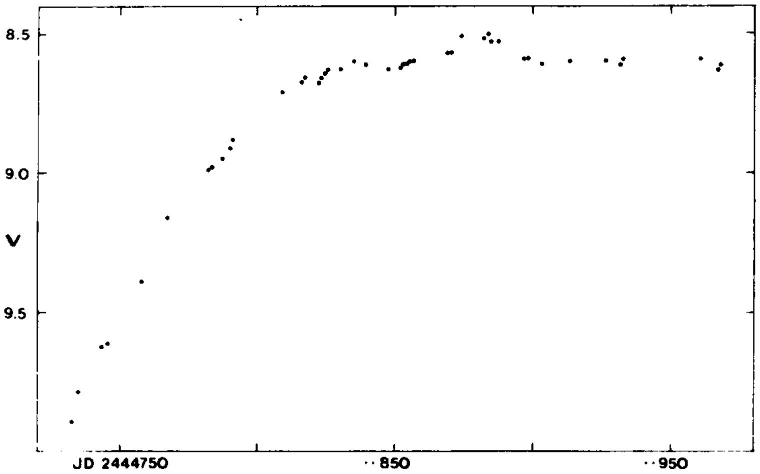

Figure 1

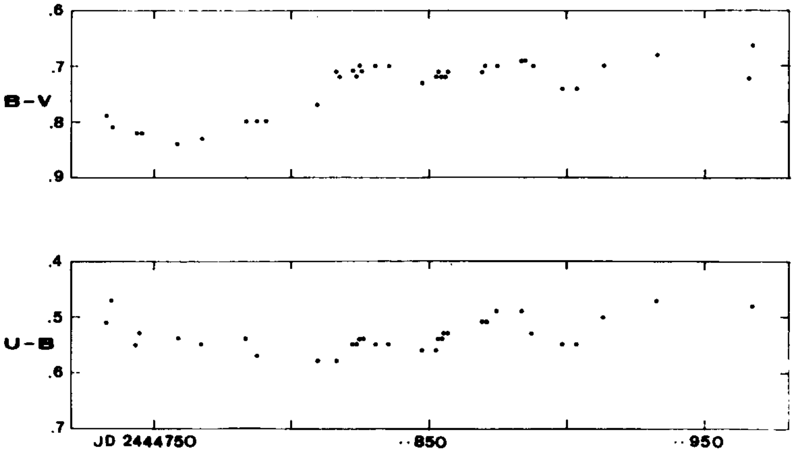

Figure 2,3

All our UBV data given in Table I are therefore relative to the corrected UBV magnitudes for this star: V = $9^{m}.30$, B - V = + 0.52, U - B = + 0.03. All errors quoted in the table are standard deviations. In a number of nights of poor quality only V or B and V measurements could be obtained.

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PERIOD AND LIGHT CURVE OF UW GRUIS FROM PHOTOELECTRIC OBSERVATIONS (*)

The variability of UW Gru ≡ S7704 ($\alpha_{1950.0}$: $22^h16^m57^s$; $\delta_{1950.0}$: $-54^\circ48'.5$) was discovered from photographic plates by Hoffmeister (1963) who classified it as an RR Lyrae-type star with $12 < m_{pg} < 13$.
As far as we are aware no other observations existed until now. In the present Bulletin we give the complete photoelectric V light curve and the period and ephemeris of the variable as they result from three-year observations, extending over more than 2200 cycles.

First UBV observations were obtained on few nights in June and July 1978, and July and August 1979. Unfortunately, it was not possible to phase these observations together because of their scarcity due to bad meteorological conditions and the commensurability of the period with the day. However, these data appeared much valuable when connected with those collected in June and July 1981 on six good photometric quality consecutive nights. All of these observations were made at the European Southern Observatory, La Silla, in Chile, using the 100 cm photometric telescope equipped with the standard UBV photometer (refrigerated EMI 6256 photomultiplier, pulse counting system, standard UBV filter set).
Additional photoelectric observations in V light were performed in September and October 1981 at La Silla with the 70 cm Swiss telescope.

(*) based on observations collected at the European Southern Observatory.

First- and second- order extinction coefficients and color-equation constants necessary to reduce the measures to the UBV system were obtained each night through observations of twelve E-region standard stars. Two comparison stars (stars A and B in Fig. 1) were frequently observed in order to check and further improve the quality of the photometry. The magnitudes adopted were finally V = 14.24 and V = 13.66 for A and B stars, respectively. So, the probable error on one observation of the variable (near V = 13.2) is ± 0.015 mag with the 100 cm telescope ; it is about ± 0.025 mag with the 70 cm telescope from differential observations using star B as comparison star.

The extreme U, B, and V magnitudes reached by UW Gru were

$$U_{max.} = 12.84 , U_{min.} = 13.98$$
$$B_{max.} = 12.75 , B_{min.} = 14.00$$
$$V_{max.} = 12.60 , V_{min.} = 13.62$$

corresponding to the phases 0 (A5 type) and 0.87 (F5 type), respectively.

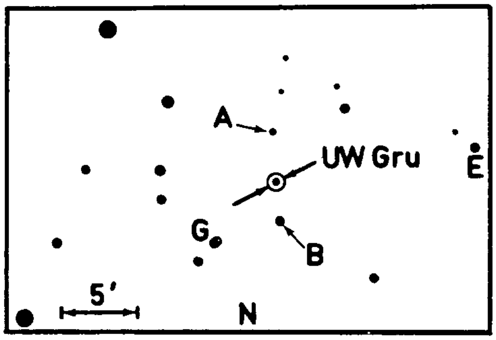

Fig. 1- Finding chart for UW Gru and the comparison stars A and B. The integrated magnitude of the anonymous object G (galaxy ?) is $V_{60''} = 14.5$.

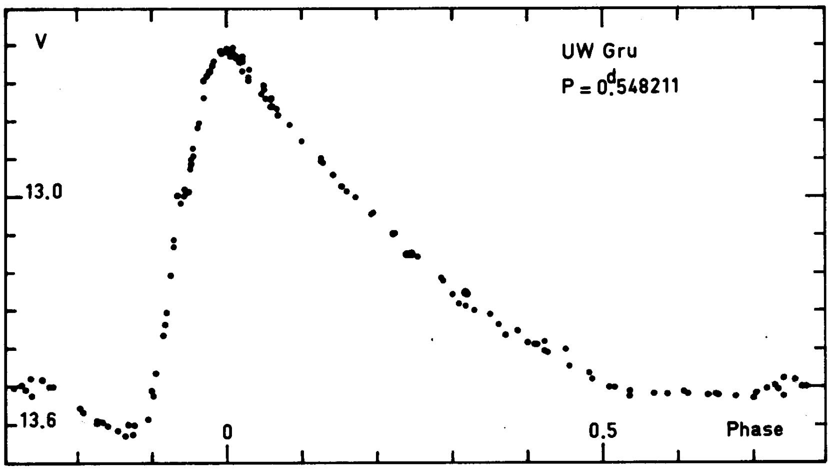

Fig. 2- V light curve for UW Gru from three-year observations phased together with P = 0.548211.

The period P = 0.548211 yields a good representation of the observations and the light curve shown in Fig. 2. Both the light amplitude and period appear to have remained constant over the past three years. No variations are detectable as the light curve repeats almost exactly from cycle to cycle to better than ± 0.02 V magnitude and ± 0.005 phase. The somewhat higher dispersion shown in Fig. 2 results from data obtained on few nights of lower photometric quality. The derived mean intensity expressed in magnitudes is V = 13.22.

The heliocentric epochs of the V maxima are given by the following elements :

$$HJD_{max.} = 2\ 443\ 689.640 + 0\overset{d}{.}548211\ E.$$

According to Sturch (1966) the color excess of an RR Lyrae star can be derived from observational UBV data during the phase interval 0.5 — 0.8. The method yields $E(B-V) \simeq 0.10$ for UW Gru. Adopting $A_V = 3.2\ E(B-V)$ and an absolute magnitude $\langle M_V \rangle = +0.5$, one finds a distance modulus of 12.4 mag. corresponding to a distance of 3000 pc from the sun.

Thus, UW Gru appears to be a quite normal Bailey ab-type RR Lyrae star located in the halo, about 2.3 kpc below the galactic plane.

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HD 8152 - A NEW W URSAE MAJORIS TYPE ECLIPSING BINARY

While making observations of the X-ray star HD 8357 for detecting any RS CVn type light variations in the optical region, it was found that the star HD 8152 used as a check star, showed light variations. Subsequently HD 8152 was observed photoelectrically on thirteen nights during 1980-81. The observations were made with the 48-inch telescope of the Japal-Rangapur Observatory, through the standard U,B and V filters. An unrefrigerated EMI 6256 B photomultiplier was used, the output of which was fed to a GR 1230A D.C. amplifier and a Honeywell-Brown strip chart recorder. Stars HD 8523 and HD 8171 were used as comparison and check stars respectively. All the observations were reduced to outside the atmosphere by applying nightly extinction coefficients for each filter determined from the observations of the comparison star. The differences Δm (variable - comparison) were then transformed to the Johnson and Morgan's standard UBV system using the transformation relations obtained from the observations of the UBV standard stars.

The observed magnitude differences Δm (check - comparison) on different nights show for a single observation a standard deviation of $\pm\ 0^{m}_{\cdot}02$ in V, $\pm\ 0^{m}_{\cdot}01$ in B, and $\pm\ 0^{m}_{\cdot}02$ in U. This indicates that the comparison and check stars remained constant during the period of our observation within the above limits.

The observations of all the 13 nights were analysed by the method of Marraco and Muzzio (1980) for a period determination. From this analysis the Ephemeris of the variable is found to be HJD of Primary Minimum = 2444562.4691 + $0^{d}_{\cdot}47564$ E.

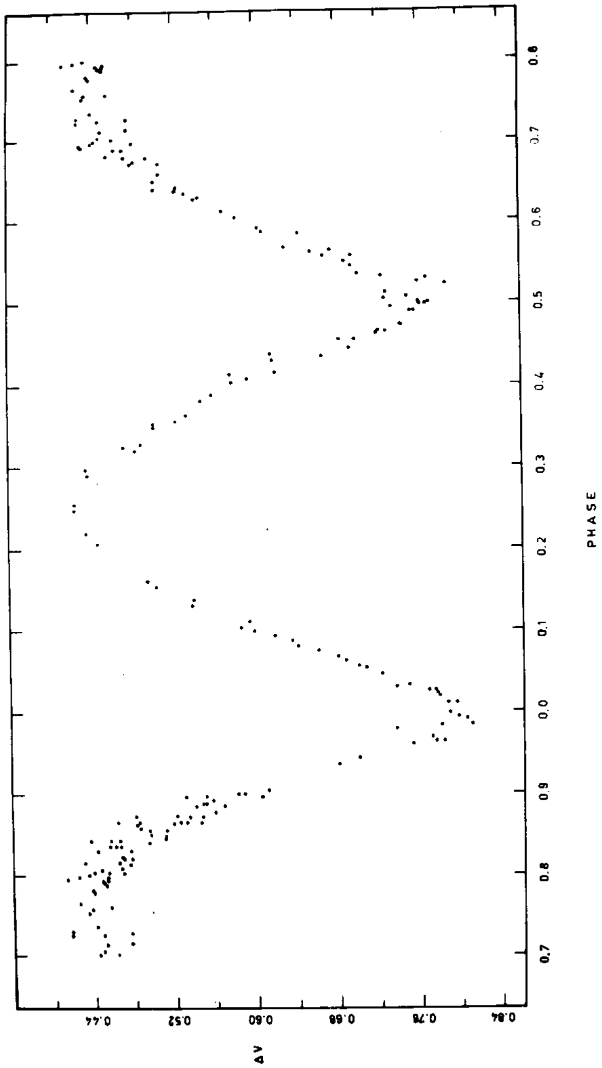

Fig. 1: HD 8152 - OBSERVED LIGHT CURVE IN YELLOW

Figure 1

The light curve in yellow, computed with this Ephemeris is shown in Figure 1. This shows the nearly equal depths of primary and secondary minima and the continuous light variation outside the eclipses, characteristic of the W Ursae Majoris type eclipsing binaries. The magnitudes and depths in the various colours are found as:

	V	B	U
Magnitude at Maximum	$8^{m}.60$	$9^{m}.10$	$9^{m}.10$
Depth of Primary Minimum	$0^{m}.364$	$0^{m}.376$	$0^{m}.392$
Depth of Secondary Minimum	$0^{m}.330$	$0^{m}.360$	$0^{m}.359$

From the (B-V) colour of + $0^{m}.5$ and (U-B) colour of + $0^{m}.0$ at maximum light, the combined spectral type of the system is found to be F8V (Allen 1976). This is within the range of spectral types of other known W Ursae Majoris stars.

Photometric and spectroscopic observations of the new variable are in progress to obtain the elements.

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PHOTOELECTRIC LIGHT CURVE OF 44 BOOTIS

A complete light curve of the W UMa-type eclipsing binary 44 Boo was obtained on the night of 8-9 May, 1982. The observations were made on the No. 3 40 cm telescope at Kitt Peak National Observatory. A dry-ice cooled 1P21 photomultiplier and pulse - counting system were used to make the observations in the V band of the UBV system. Observations were made relative to the comparison star 47 Boo.

Observations of the close pair 27/28 LMi provided data for transformation to the standard UBV system. Analysis of the comparison star magnitude versus air mass provided a measure of extinction. Observational times were calibrated with respect to radio station WWV to within 0.1 seconds. All integrations were of 10 seconds duration, and the observations were made in the following order: 6 of the comparison star; 3 of the comparison star background; 60 of the variable star; and 3 of the variable star background; etc. A neutral density filter was used to limit the maximum counts to approximately 200,000 for the 10-second integrations.

The data were reduced at the Fairborn Observatory using the BASIC program described by Genet (1980). This included correction for differential extinction, transformation to the standard system and heliocentric correction of the observational times. Approximately 1500 10-second observations of the variable star were made in about seven hours. These data were grouped and mean counts for each seven observations were used in the analysis.

The phase was calculated using the ephemeris of van't Veer (1972).

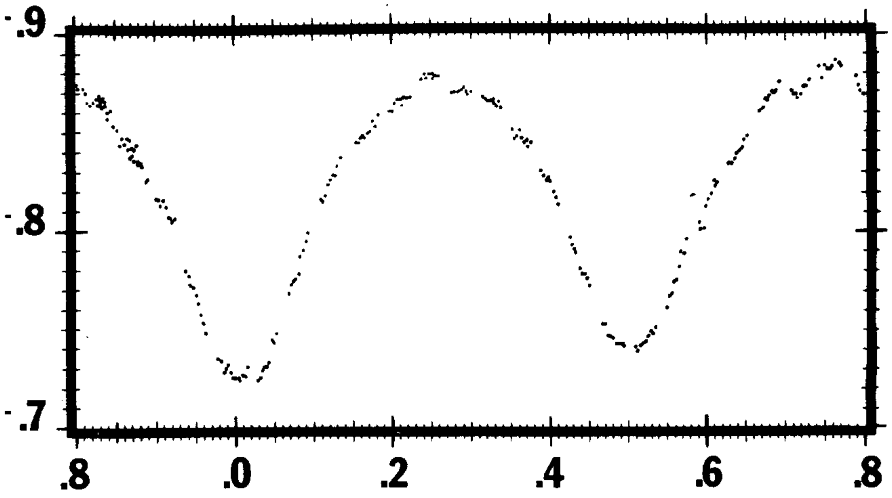

Figure 1

Pr. Min. = Hel. J.D. 2439370.4222 + 0.2678160 E

The resultant light curve is shown in the figure. The data are available as IAU 27 File No. 89. The persistance of certain irregularities in the light curve are being examined with respect to observations made on nights prior to and subsequent to the night's observations reported herein.

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V 1068 CYGNI - A LONG-PERIOD RS CVn STAR?

On the long-period eclipsing binary V 1068 Cygni (= BD +41°4100) there was published a report in this Bulletin by D. Hoffleit (1). More recent investigations of this star were made by R. Diethelm (2) and by B. Fuhrmann (3).

First photoelectric UBV observations of the object were obtained by the author with the Sonneberg 60 cm telescope II and the Piszkéstető (Hungary) 50 cm telescope in the years 1979 to 1981 (see Table I). The comparison star BD +41°4108 was linked to BD +42°4081 with magnitudes from (4). The magnitudes found for BD +41°4108 are: V = $9^{m}.49$, B-V = $+1^{m}.07$, U-B = $+0^{m}.76$. Figure 1 shows the mean light curves (outside eclipse) for the separate years computed with the elements given by B. Fuhrmann (3). There is an indication of a migrating

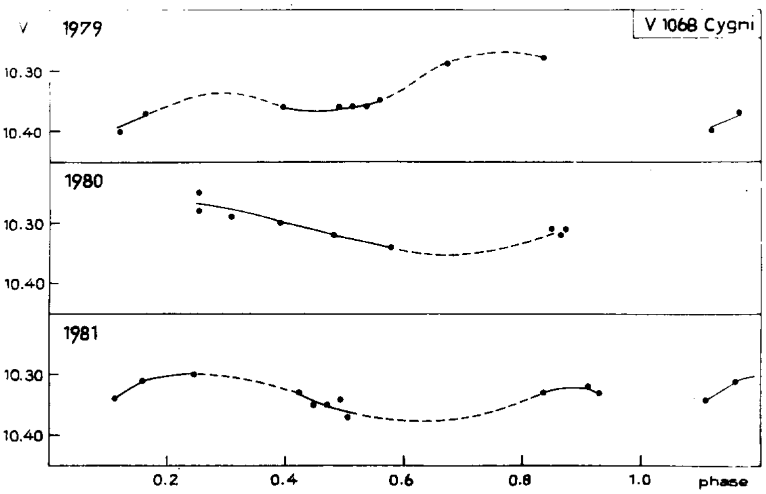

Figure 1

wavelike distortion as it occurs in RS CVn type stars. With respect to the period of 42.7 days the system would then be a member of the long-period RS CVn group.

Table I

year	J.D.hel. 2444000+	V	B-V	U-B	phase	
1979	136.397	10.29	+1.14	-	.6729	
	143.352	10.28	+1.19	-	.8358	
	155.380	10.40	+1.12	+0.80:	.1176	x
	157.328	10.37	+1.14	+0.78:	.1633	x
	167.328	10.36	+1.14	+0.75	.3976	x
	171.274	10.36	+1.14	+0.76:	.4900	x
	172.275	10.36	+1.12	+0.78	.5135	x
	173.301	10.36	+1.12	+0.68	.5375	x
	174.253	10.35	+1.08	+0.80:	.5598	x
1980	374.526	10.25	+1.21	+0.89	.2521	
	485.379	10.31	+1.15	+0.68	.8493	
	486.376	10.31	+1.18	+0.65	.8727	
	490.326	10.57	+1.44	+1.03:	.9652	
	491.397	10.55	+1.49	+1.03	.9903	
	508.460	10.30:	+1.16:	+0.66:	.3901	x
	512.302	10.32	+1.15	+0.77	.4801	x
	516.504	10.34	+1.15	+0.69	.5786	x
	545.280	10.28	+1.17	-	.2528	
	571.344	10.32	+1.17	+0.74	.8634	
	575.313	10.46	+1.36	+0.96	.9564	
	577.308	10.58	+1.43	+1.00	.0032	
	590.297	10.29	+1.17	+0.69	.3075	
1981	769.473	10.37	+1.16	+0.66	.5055	
	783.545	10.33	+1.16	+0.71	.8352	
	787.545	10.33	+1.14	+0.64	.9289	
	829.422	10.32	+1.17	+0.69	.9101	
	851.340	10.33	+1.13	+0.74	.4236	
	852.329	10.35	+1.13	+0.71	.4468	
	853.335	10.35	+1.15	+0.72	.4703	
	854.305	10.34	+1.16	+0.69	.4931	
	886.393	10.30	+1.17	+0.71	.2449	
	923.229	10.34	+1.16	+0.76	.1079	
	925.342	10.31	+1.19	+0.72	.1574	

: uncertain values
x observed at Piszkéstető

Moreover P. Notni kindly took image tube spectra at the Tautenburg 2 m telescope with a dispersion of 140 Å/mm on 1980 April 15 (24.5 days past minimum) and 1980 December 3 (in minimum phase). The first spectrum is composite and indicates a spectral class B5 to A5 + G8 II-III in accordance with (1). The second spectrum also seems to be composite, but the Balmer lines of the hotter component are clearly weeker. Unfortunately the spectra do not reach the CaII lines H and K, so it is impossible to decide on the presence of emission in those lines, which would be an important criterion of RS CVn stars and related objects. Further spectroscopic investigation is desirable. Emission in other lines could not be found.

If we assume that the hotter component of the system has physical properties of a normal main sequence star and that the colour excess ratio E_{U-B}/E_{B-V} for hotter component attains the normal value of 0.7, then the observed minimum depths in the three colours, $\Delta V = 0^{m}_{.}30$, $\Delta B = 0^{m}_{.}58$, $\Delta U = 0^{m}_{.}93$, are well to reproduce by a B9.5 V component ($M_V = 0^{m}_{.}7$) and a G8 II-III component ($M_V = -0^{m}_{.}3$). In this case the hotter component is eclipsed in the centre of the minimum phase about 85%. From the colour excess $E_{B-V} = 0^{m}_{.}62$ follows $A_V = 3.E_{B-V} = 1^{m}_{.}9$. The maximum apparent brightness of the hotter component alone is, after the computed model, $V_{max} = 11^{m}_{.}65$. This amounts to a distance to the system of 650 pc.

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PHOTOELECTRIC PHOTOMETRY OF θ^1 ORIONIS A = V1016 Ori

With the Dyer Observatory 24-inch Seyfert reflector in the winter of 1979-80 (between JD 2444191.7 and 2444320.6) we obtained differential magnitudes of the eclipsing binary θ^1 Ori A with respect to the comparison star θ^2 Ori B: 21 in V, 15 in B, and 10 in U. These observations have been sent to the I.A.U. Commission 27 archive for unpublished observations of variable stars (Breger 1979), where they are available as file no. 88. Further details are given by Sowell (1981).

The comparison star was the same one used by Hall and Garrison (1969) and Arnold and Hall (1976) in their photometry of BM Ori, the other eclipsing binary in the Trapezium. The diaphragm, 11 arcseconds in diameter, included the light of θ^1 Ori E, the faint companion star about 4 arcseconds away. The sky offset for the variable was taken always at a point in the Orion Nebula 18 arcseconds due south of the variable.

Only on the first night were observations taken anywhere inside primary eclipse; they covered part of the rising branch around fourth contact. Comparing those observations with the V light curve of primary eclipse shown in figure 3.3/1 of Lohsen (1978), we determined

$$\text{JD(hel.)} = 2444191.552 \pm 0\overset{d}{.}005$$

for a time of mid primary eclipse.

Our remaining observations plotted with the ephemeris

$$\text{JD(hel.)} = 2443144.600 + 65\overset{d}{.}43233\ E$$

of Baldwin and Mattei (1977) showed no trace of secondary eclipse. According to the elements $e = 0.662 \pm 0.041$ and $\omega = 188\overset{\circ}{.}2 \pm 5\overset{\circ}{.}6$ given by Lohsen (1978) in his solution of his radial velocity curve, secondary eclipse (conjunction with the primary star behind) should occur at orbital phase $0\overset{P}{.}114$, surprisingly close to primary eclipse and not at all midway between successive primary eclipses. Unfortunately there was a gap in our observations between $0\overset{P}{.}05$ and $0\overset{P}{.}29$, so we can say nothing about the existence of or depth of any secondary eclipse. It has yet to be detected photometrically but should be looked for in the right place.

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PRELIMINARY PHOTOMETRIC ORBITAL ELEMENTS OF 1 PERSEI

The light variation of the bright eclipsing binary 1 Persei (HD 11241, m_V=5.52) has been studied photoelectrically by Kurtz in 1977 and by North and Rufener in 1980 in V-light.

We solved the combined light curve of this binary system by means of a least square procedure applied to unrectified observations.

In the table we list our photometric orbital elements.

Min I = Transit
Min II = Occultation
$u_g = u_s = 0.40$ (assumed)
$k = .87 \pm .07$
$r_g = .0381 \pm .0003$
$r_s = .0331 \pm .0002$
$i = 88^\circ.3 \pm 0^\circ.9$
$e = .309 \pm .008$
$\omega = 115^\circ.9 \pm 0^\circ.7$
$L_g = .73 \pm .03$
$L_s = .27 \pm .03$

1 Persei is confirmed to be a detached system free of complications. A detailed analysis of this system will be published elsewere.

Acknowledgements. Thanks are due to Dr. P. North and Dr. F. Rufener for making their observations available to me.

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PHOTOMETRIC OBSERVATIONS OF V603 AQUILAE

Recent photometric observations of the old nova V603 Aql (1918) revealed periodic light variations which can be interpreted as eclipses of the accretion disk around the white dwarf component. The discovery was made by using the Fine Error Sensor (FES) instrument aboard the IUE satellite, during a longer run of UV-observations (Rahe et al. 1980, Drechsel et al. 1981). Further observations reported by Slovak (1980) were confirming the occurrence of eclipses. The period has been found to be close to Kraft's spectroscopic period ($0^{d}.13854=3^{h}19^{m}.5$); Rahe et al. proposed $0^{d}.1377=3^{h}18^{m}.3$ for the improved orbital period.

Cook, in a recent paper (1981), while accepting the occurrence of <u>periodic</u> "dips" in the light curve, argued against the assumption of an eclipse of the accretion disk and proposed two alternative models. New observations of V603 Aql are in obvious demand.

At the suggestion of Dr. Jürgen Rahe, two sets of photoelectric observations of V603 Aql have been obtained in an attempt to determine the eclipsing period more accurately: at Kitt Peak National Observatory* in September 1980 (no. 3 16 in. tel., 4 nights) and at Cerro Tololo Interamerican Observatory* in March 1981 (no. 1 16 in. tel., 5 nights). In both observing seasons the orbital period was completely covered; in particular, on Sep. 30, 1980, a 183 minute run represented 92 percent of the period. A conventional UBV photometer was used; during the first two runs in 1980 only V was measured, in all other nights B and V.

A conventional single channel photometer is, of course, not the ideal instrument for the photometry of a cataclysmic binary. There is, however, nothing wrong with its use for the study of a feature in the light curve which can last 30-40 minutes and reach an amplitude of 0.35 magn. Both variable and comparison stars were measured in 50 sec. counts; the observations of the variable totalled 210 (at Kitt Peak) and 140 (at

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*Operated by Associated Universities Inc., under contract with the National Science Foundation.

Cerro Tololo). Comparison star was BD+0°4023, as in the IUE photometry; it is much brighter and redder (K2) than the variable but its closeness made at least the corrections for differential extinction almost negligibly small even for large zenith distances. The short term constancy of the comparison star was clearly indicated by the exemplary, straight Bouguer lines of the extinction diagrams, see Fig. 1. (Most observations have been taken at considerable zenith distances.)

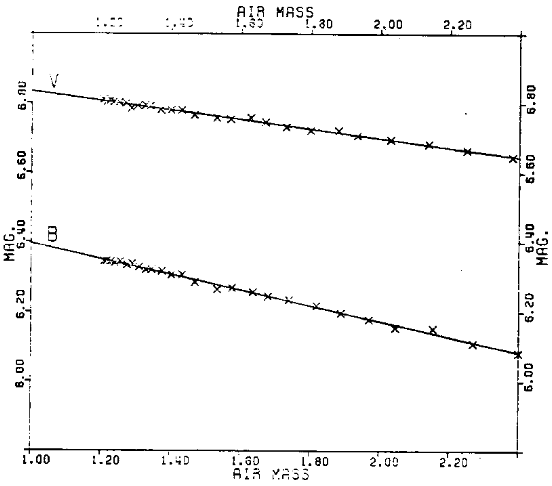

Fig. 1. Observations of BD+0°4023, Sep. 30, 1980. (Zero point of the magnitude scale arbitrary.)

The present list of the minimum epochs reads as follows:

JD 2444	401.399	IUA observers
	415.9235	Slovak
	416.8178	Slovak
	499.625:	this paper, Kitt Peak (Herczeg, Cobble)
	503.692	
	504.74:	
	513.72:	
2444	681.866	this paper, Cerro Tololo (Herczeg)

Given the minimum epochs, the derivation of a period (assumed to be constant) is a simple, almost trivial procedure which does not necessitate any details told. In this case, however, we have the added difficulty of a very strongly distorted light curve and frequent irregular variations up to 0.3 magn. (Panek 1979, see also the alarming Fig. 2c in Bruch 1980).*

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*We estimate that in our measurements any scatter of the variable's brightness above ±0.02 magn. is certainly due to intrinsic variations and not of instrumental origin.

As it appears, the time interval of the IUE observations has been marked by an almost exceptionally quiet photometric behaviour of the system and thus the occurrence of eclipses (dips) is beyond doubt. Yet the observations of Slovak's already present a problem. These two minima are incompatible with any period close to Kraft's: they are separated by 6.46x0.1385 days, or, 6.49x0.1377 days. Since in these systems secondary minima are hardly expected, we have to conclude that one of these eclipses was probably spurious, merely a strong fluctuation of the brightness. Combining each of the epochs with the IUE minimum, we can derive three possible values of the period: $0^{d}.1377$, $0^{d}.1383$, $0^{d}.1389$. Kraft's spectroscopic observations are more than 47,000 epochs away and cannot help us to decide about the fourth digit of the period. Neither present us the new observations, regrettably, with completely unambiguous information.

We assume that the minimum observed on JD2444681 at Cerro Tololo, shown in Fig. 2, was "real". The minima obtained at Kitt Peak, however, present a less obvious case.

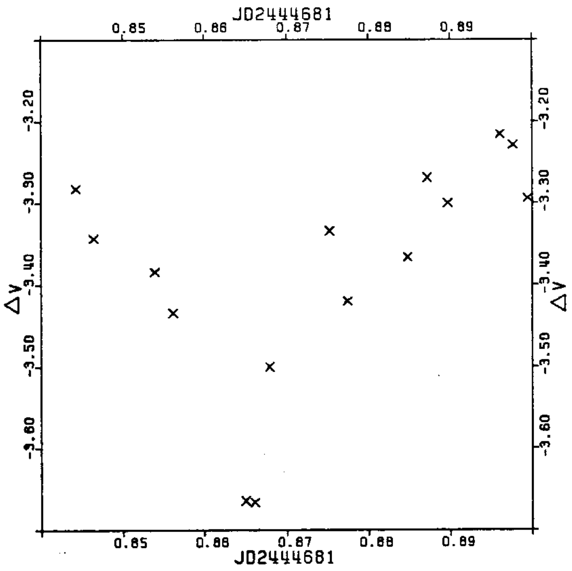

Fig. 2. V observations, March 17/18, 1981.

1. Let us further assume that the sharp, narrow dip observed on JD2444503 at Kitt Peak, shown in Fig. 3, was an eclipse. If this is so then the three epochs of minimum in the table marked by colons (:) do not correspond to real eclipses (the phases are not compatible with the minimum on

JD2444503). Compared with the first minimum epoch, obtained by IUE observers, these two epochs (Kitt Peak and Cerro Tololo) determine the period to about $1\mathrm{x}10^{-5}$ day. The period assumed to be constant, we get five values near $0\overset{d}{.}1380$, compatible with the three epochs: 0.13748, 0.13769, 0.13823, 0.13844 and 0.13898 days. Comparison with Slovak's possible minimum epochs would make $0\overset{d}{.}1377$ the most probable value. One has to add, however, that using this value, Cerro Tololo observations on March 14/15, 1981, should have started at phase 0.04, those on March 16/17 ended at phase 0.99. There is no minimum discernible in the records of March 14/15 while a possible decline is visible at the end of the March 16/17 series, finished already in the astronomical twilight.

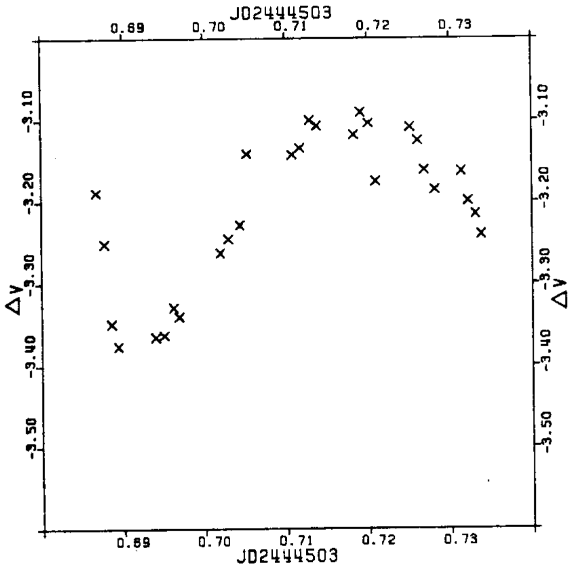

Fig. 3. V observations, Sept. 20, 1980.

2. If we assume, on the other hand, that the dip on JD2444503 was a mere fluctuation, the minimum epoch spurious, then the three less accurate Kitt Peak minima (extrapolations from a rising or descending branch) suggest a period between $0\overset{d}{.}1381$ and $0\overset{d}{.}1383$, see the composite "eclipse" from two series in Fig. 4. Accepting the normal epoch JD2444513.720 for a moment, comparison with the well established epochs indicate $0\overset{d}{.}13816$ as the best value for the period, with the further possibilities of $0\overset{d}{.}13822$ and $0\overset{d}{.}13828$.

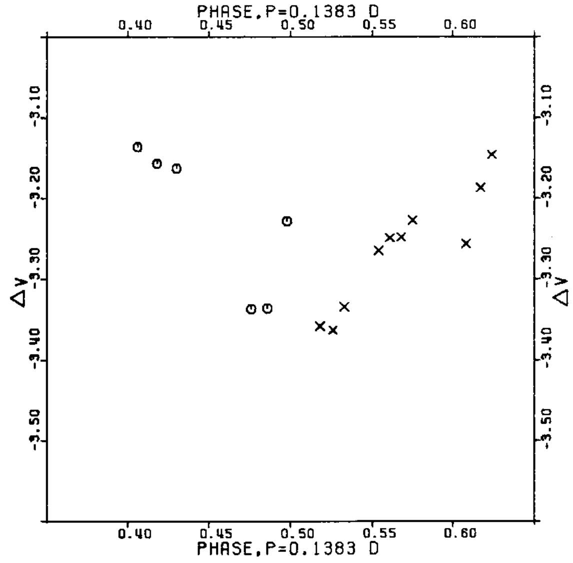

Fig. 4. Composite "minimum", Sep. 16 and Sep. 21, 1980. P = $0^{\mathrm{d}}.1383$

We have discussed the meager results of this attempt to derive the eclipsing period of V603 Aql in far more detail than usual in the present literature. Our aim was to emphasize here the very considerable observational difficulties stemming from the strong photometric disturbances the system exhibits.

Acknowledgements:
The author is indebted to Kitt Peak and Cerro Tololo observatories for the use of their facilities. He is also thankful to Ms. Linda Barker who took over most of the reductions, Mr. Kevin Cobble who observed the long run on Sep. 30, 1980, and to Ms. Jaquine Littell for the preparation of the manuscript.

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ADDENDUM

January 28, 1982

Two recent papers contain significant information about the system V603 Aql.

M. H. Slovak (Ap J 248, 1059, 1981) discussed his photometry in more detail and suggested that the eclipses discovered earlier using the IUE satellite may correspond to transient features in the accretion disk. R. Haefner carried out the hitherto most extensive photometry of the variable (IBVS 2045). His measurements suggest a periodic hump rather than an eclipse in the light curve, but the period he found, 0.14485 days, differs significantly from the spectroscopic value.

Photometric complications indicated in these papers may explain the difficulties we encountered in finding the orbital period of V603 Aql.

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CREATION OF A SUPERNOVA DATABASE

We have begun a collection, from the literature, of all spectroscopic and photometric data on supernovae and are converting them to digital form in order to make them available as a database on an interactive computer system (Starlink in the UK). Our primary aim is to store the published data in a readily accessible form. Astronomers will then be able to interrogate the database and use simple commands to extract and examine precisely those data of interest. In addition we intend to provide means of "standardising" the data (eg. reducing photometry to a common system) and for displaying them graphically in a uniform format so that meaningful combinations and comparisons may be made. We also plan to store complete bibliographical references to the sources of the data and ancilliary information on the parent galaxies.

We would be pleased to receive preprints and reprints of reduced data for inclusion in the database and to hear advice and enquiries from potential users. Please write to:

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HD 13831 A NEW BETA CEPHEI STAR

In the course of a photometric survey of the Hill's variables in the h & χ Persei galactic cluster the star HD 13831 (=BD + 56° 469, V= $8^{m}.26$), which Hill (1967) found photometrically constant and used as a photometric standard, was chosen as comparison star.

However when we carried out the photometric reduction of the data with this star as comparison constant star a periodic variation appeared.

Observations were made with the 1.2 m telescope at Calar Alto in Almería (Spain) and a cooled standard photon-counting photometer with the Strömgren uvby system was used.

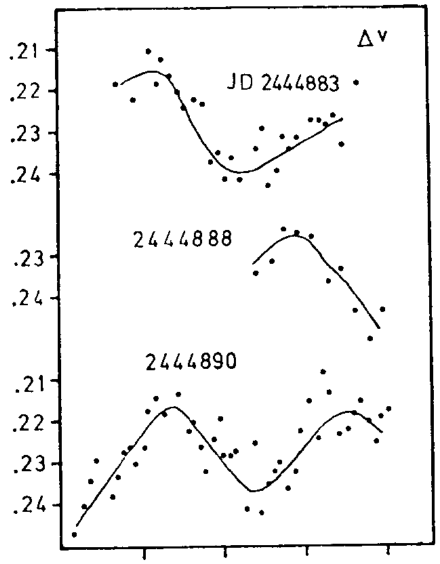

Figure 1

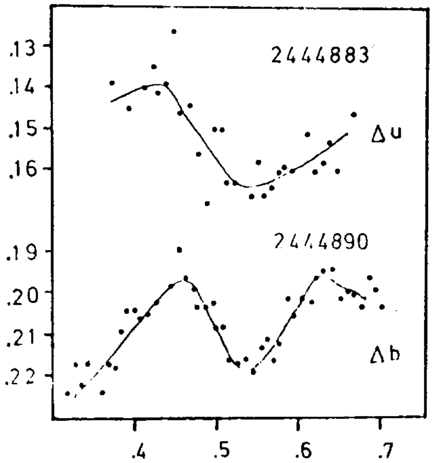

Figure 2

New reductions were made with the star HD 13621(=BD + 54°494, V=8^{m}.10, B 0.5 IV) in order to find reliable photometric measurement of the variable. In the figures the magnitude differences between both stars during the three observation nights are represented.

Due to the scarcity of the data we can only say that apparently there is no colour variation along the cycle of about 4.6 hours and that the range of variation is over 0^{m}.03 peak to peak in the three bands measured (u, v and b).

With these properties and its spectral type, BO IV, we think that HD 13831 is a β Cephei star. Nevertheless its great vsini (340 km s^{-1} is the adopted value by Hill) makes it different from the "classical" β Cephei stars whose projected rotational velocities are in average very much smaller.

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Reference:

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CX AURIGAE: A K-DWARF VARIABLE

Recently one of us (W.P.B.) noted that the small-range variable CX Aurigae = HV 7667 (Shapley and Boyd 1937) agreed quite closely in position with a star assigned a spectral type of dK8 by Vyssotsky (1956). Inspection of the original Harvard plates (by E.P.B.) and a red-sensitive Warner and Swasey Observatory objective-prism plate, which incidentally confirms the dwarf nature of the star, has shown that the objects are in fact identical. Further study, both spectroscopic and photometric, might prove of interest.

E.P.B. wishes to thank Harvard College Observatory for its hospitality.

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o And: A NEW ACTIVE EPISODE?

After the shell episode of July 1975 (I.A.U. Circ.No. 2802) we have performed continuous photoelectric observations of the shell star o And, beginning in the October of the same year (Bossi et al., 1976, Guerrero and Mantegazza, 1978, Bossi et al., 1980).

In Table I abc we report the results of new photoelectric observations taken in 1980 and 1981. The Δm_B values (the comparison star is 2 And) are also represented in Figure 1 compared with all those obtained since 1978. In the same figure the bars indicate, in magnitude, the range covered during the period of the observations, no bar refers to the nights in which the observations were of short duration.

In addition to the lasting short period light variations, we immediately remark a considerable light decrease after the maximum reached in 1979, moreover the behaviour of the light curve suggests a future similar trend.

Such a behaviour which can indicate an activity (Bossi et al., 1980), induced us to get some blue and red grating spectra of this star (with a dispersion of 35 and 18 Å/mm). Figure 2, in which the transparency of the photographic emulsion is plotted, shows the H_α profile obtained from a red spectrum of November 28, 1981, in which a strong absorption core is flanked by two weak emission components. Moreover, in the blue spectra we observed a remarkable shell absorption superimposed on the other hydrogen photospheric lines.

Table I a

Photoelectric V observations

Hel. J.D. 2400000+	ΔV	σ	Hel. J.D. 2400000+	ΔV	σ
44473.424	1.503	.005	44540.267	1.444	.002
44484.341	1.529	.008	.301	1.464	.003
44490.465	1.519	.002	.330	1.467	.002
.499	1.524	.002	44541.220	1.497	.002
.524	1.528	.001	.264	1.498	.004
.550	1.521	.001	.321	1.511	.005
44506.306	1.519	.004	.365	1.501	.003
.316	1.517	.003	.404	1.502	.008
.333	1.522	.002	44862.329	1.420	.004
.366	1.526	.004	.393	1.456	.003
.396	1.515	.003	44865.342	1.496	.002
.424	1.514	.002	44891.341	1.440	.003
.452	1.519	.002	44892.253	1.446	.004
44540.222	1.441	.001	44915.237	1.468	.003

Table I b

Photoelectric B observations

Hel. J.D. 2400000+	ΔB	σ	Hel. J.D. 2400000+	ΔB	σ
44473.421	1.678	.007	44540.311	1.630	.002
44484.356	1.702	.003	.339	1.646	.003
44490.456	1.692	.002	44541.233	1.678	.003
.490	1.694	.002	.272	1.673	.002
.517	1.700	.001	.335	1.689	.005
.541	1.696	.003	372	1.687	.005
44506.343	1.692	.004	.417	1.671	.004
.376	1.696	.003	44862.347	1.614	.006
.416	1.689	.004	44865.373	1.650	.002
.443	1.686	.002	44891.357	1.601	.002
44540.234	1.618	.004	44915.258	1.639	.003
.277	1.621	.007			

Table I c

Photoelectric U Observations

Hel. J.D. 2400000+	ΔU	σ	Hel. J.D. 2400000+	ΔU	σ
44490.441	2.315	.016	44540.289	2.190	.002
.478	2.280	.005	.320	2.222	.003
.508	2.301	.005	44541.244	2.260	.003
.531	2.279	.004	.286	2.238	.005
.558	2.271	.010	.378	2.249	.004
44506.356	2.288	.004	.329	2.241	.007
.386	2.268	.002	44862.370	2.202	.002
.406	2.267	.003	44865.395	2.252	.011
.433	2.260	.003	44891.399	2.173	.001
.464	2.268	.005	44915.270	2.214	.003
44540.245	2.184	.002			

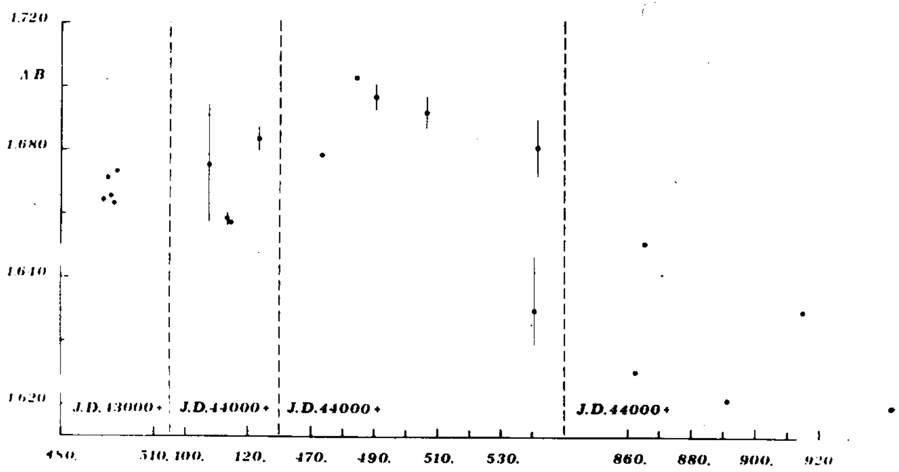

Figure 1

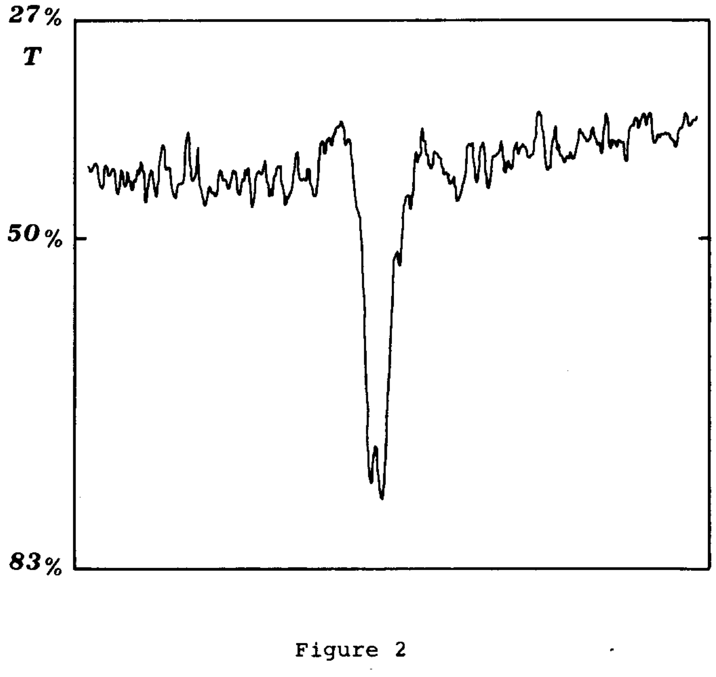

Figure 2

This incipient shell episode is very interesting, since it could contradict a supposed 26-29 years periodicity of the phenomenon (Fracassini et al., 1977, Harmanec and Koubsky, 1981).

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TWO (O-C) RESIDUALS OF W URSAE MAJORIS SYSTEM

The well known short period ($0^{d}.333\ 63808$) eclipsing variable, W Ursae Majoris (BD+56^{o}1400) was observed with a photoelectric photometer attached to the 48 cm Cassegrain telescope at the Ege University Observatory, Izmir. The observations were carried out on January 16-17, 1982 on two nights of excellent sky conditions, which are rare for this time of the year. The first night complete light curve and the second night the primary minimum were obtained. On both nights the (BD+56^{o}1399,$8^{m}.5$) star was monitored as a comparison star with EMI 9781 A as a detector.

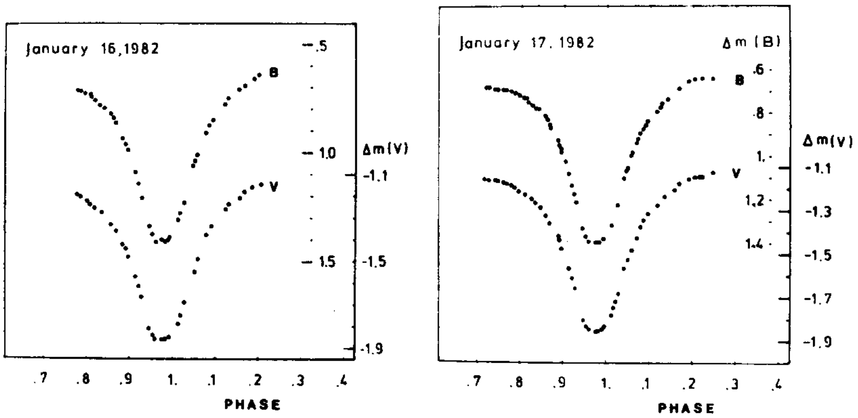

Fig.1: Two primary minima of W UMa obtained on 16-17 Jan.,1982

The star is well known for the variation of its orbital period and there are observational evidences for the oscillatory variations within the (O-C) residuals. Also there are some other indications of the second oscillatory variations superimposed on the (O-C) residuals.

We shall present a discussion somewhere else on these oscillatory variations of the (O-C) residuals.

Our (O-C) values are,

$(O-C)_1 = -0\overset{d}{.}005 = -7\overset{m}{.}27$ (January 16,1982) - $(O-C)_{II} = 0.0053 = 7\overset{m}{.}63$

$(O-C)_2 = -0\overset{d}{.}0045 = -6\overset{m}{.}48$ (January 17,1982) -

for which,

Hel Min I= JD 243 7986.9742+$0\overset{d}{.}33363808$.E

was adopted. On the other hand our accurate observed time of primary minimum are:

JD_1 = 244 4986.3624 ; JD_{II} = 244 4986.5290

JD_2 = 244 4987.3639

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ON THE RADIAL PULSATIONS OF THE DELTA SCUTI STARS SIGMA OCTANTIS AND B OCTANTIS

The southern Delta Scuti variables σ Octantis (=HR 7228= HD 177482) and B Octantis (= HR 8294= HD 206553) were discovered by McInally and Austin (1978). Recently these stars have been again observed by Coates et al. (1981), who plan in the future to measure the colour indices of B Octantis in order to locate its position within the instability strip.

In the present note, on the basis of our results (Tsvetkov, 1981 a,b) we estimate the expected locations of these two variables within the instability strip and discuss the possible pulsation modes of B Octantis.

1. σ Octantis. Coates et al. (1981) determined a single oscillation period P ≐ 0.097 day with a visual light amplitude ΔV = 0.025 mag. They indicate that σ Octantis pulsates probably in the fundamental mode only. In such a case, from our semiempirical period - luminosity relation for this mode one may estimate its absolute magnitude: $M_{bol} \simeq M_V = (1.60 \pm 0.23)$ mag. σ Octantis is not likely situated near the observed blue edge of the instability strip, where the Delta Scuti stars pulsate in overtones. At the above evaluated luminosity, its effective temperature within the observed instability strip (Breger, 1979) is expected to be in the range $3.83 \leq \log T_e \leq 3.90$.

2. B Octantis. In this case the problem is more complicated. Coates et al. (1981) found two oscillations: one with a period P = 0.063 day and an amplitude ΔV = 0.010 mag, and an other with P = 0.143 day and ΔV = 0.014 mag. The authors note that the observed period ratio of 0.44 cannot be obtained from oscillations in the four lowest modes. It is known that the radial pulsations of Delta Scuti stars lead to the following mean period

ratios: $\langle P_1/P_o \rangle \simeq 0.76$, $\langle P_2/P_o \rangle \simeq 0.62$, $\langle P_3/P_o \rangle \simeq 0.52$.

We suggest that the observed period ratio for B Octantis may be explained, if one accepts that this star pulsates in both fundamental mode and fourth (or perhaps fifth) overtone. Indeed, if the mean value of the pulsation "constant" for the fourth overtone is $\bar{Q}_4 \simeq 0.015$ day, then with $\bar{Q}_o \simeq 0.033$ day one derives a mean period ratio $\langle P_4/P_o \rangle \simeq \bar{Q}_4/\bar{Q}_o \simeq 0.45$ in a good agreement with the observed period ratio ratio for B Octantis. Assuming that the observed period of 0.143 day may be attributed to the fundamental mode, one may estimate the absolute magnitude of this star: $M_{bol} \simeq M_v = (1.12 \pm 0.23)$ mag. At such a luminosity, pulsations in the fundamental mode within the observed instability strip are possible for $3.82 \leq \log T_e \leq 3.90$.

In conclusion we notice that there is an evidence for oscillation in a high mode for other variables too (Tsvetkov, 1981 b): V 1004 Ori (= HR 2100 = HD 40372) and BN Cnc (= HD 73763). For these two stars, in particular, one obtains an "observed" pulsation "constant" of 0.015 day, which indicates a mode higher than the third overtone ($\bar{Q}_3 \simeq 0.017$ days). Hence the observations give evidences that some Delta Scuti variables may perform radial oscillations in the fourth (or even fifth) overtone.

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PHOTOMETRIC OBSERVATIONS OF 1 PERSEI

Radial velocity variations in 1 Per (HR 533, HD 11241, $m_V = 5.52$, Sp.T. B 1.5 V) have been suspected for 70 years. Estimates of the time scale of the variations have ranged from 15.6 days (Blaauw and van Albada, 1963) to "very short" (Beardsley, 1969). Light variations were first announced by Kurtz (1977). Kurtz suspected that 1 Per was an eclipsing binary, but he commented that the highest peak in the power spectrum of his observations was at a frequency of 3.01 cycles.day^{-1}, or a period of 0.33 day. Because of the proximity of 1 Per to the β Cep instability strip, and because of my interest in the β Cep and related stars (Percy, 1980), I obtained photometric observations of 1 Per in 1980 and 1981.

Subsequently, North et al. (1981) showed that 1 Per was an eclipsing binary with a period of 25.9359 days, and an eccentric orbit. Because the variations in 1 Per are now explained, and because I have found absolutely no evidence for intrinsic variations in 1 Per, I do not plan to observe this star further, and I am publishing my 1980 and 1981 observations at this time.

The observations were made at the Kitt Peak National Observatory (Tucson, Arizona, U.S.A.) in November 1980 and 1981, using the #4 0.4 m telescope, a pulse-counting photometer, and a Strömgren b filter. The comparison star was HR 540, which was found by Kurtz (1977) to be constant. The observations are listed in Table I and shown in Figure 1. The phase has been calculated from the ephemeris of North et al (1981), namely:

$$\text{HJD (short minimum)} = 2443562.853 + 25.9359\ E$$

The following conclusions can be drawn from these observations.

1. There is no intrinsic variability outside of eclipse ($\Delta b < 0^{m}.01$).
2. The light curve appears to be flat ($\Delta b < 0^{m}.01$) from phase 0.25 to 0.40 and from 0.45 to 0.60.

Table I

Photometric Observations (Δb) of 1 Per--HR 540

HJD 2444000+	ϕ	Δb	HJD 2444000+	ϕ	Δb
555.6764	0.280	-1.061	562.6653	0.549	-1.062
555.7243	0.282	-1.067	562.7708	0.553	-1.062
555.7944	0.284	-1.071	562.8729	0.557	-1.064
555.8917	0.288	-1.060	562.9313	0.560	-1.058
556.8590	0.325	-1.064	563.6736	0.588	-1.064
556.9354	0.328	-1.062	563.7375	0.591	-1.062
557.7813	0.361	-1.066	563.8472	0.595	-1.063
557.8861	0.365	-1.063	918.7280	0.278	-1.067
558.8271	0.401	-1.035	919.7083	0.316	-1.066
560.6632	0.472	-1.062	920.8326	0.359	-1.067
560.7431	0.475	-1.062	921.6840	0.392	-1.069
560.8576	0.480	-1.064	924.6889	0.508	-1.059
560.9604	0.484	-1.055	925.6715	0.546	-1.062

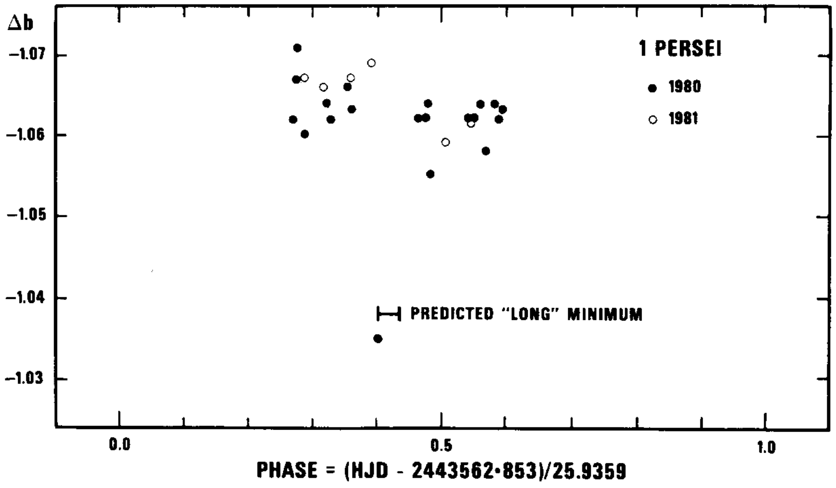

Figure 1: Photometric observations (Δb) of 1 Per relative to HR 540.

3. There is no significant change in brightness between 1980 and 1980 ($\Delta b < 0\overset{\mathrm{m}}{.}01$).
4. Secondary minimum has begun by phase 0.401, and probably began at about phase 0.399. This information, when combined with Figure 3 of North *et al* (1981), suggests that the secondary minimum is symmetrical.

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PHOTOELECTRIC TIMES OF MINIMA OF ECLIPSING BINARIES

The following times of minimum light have been determined from V-filter observation made during the 1981 observing season with the 40-cm f/18 Cassegrain reflector operated by the Department of Physics and Astronomy at the University of Montana. The observing procedure has been described previously (Margrave et al. 1978).

As has been done previously, a least-squares parabolic fit to the observations was used to find each time in Table I, in which are listed the Heliocentric Julian Date (minus 2,440,000) for each minimum, its epoch number E, the O-C value, and N, the number of observations (each being the average of three 10-second integrations) used in the determination.

As a check, the chord-bisection method was also used on the above eclipses, and the average difference between the results from the parabolic fit and the chord bisection methods was $0^{d}.0004$, which gives $\pm 0^{d}.0002$ as a reasonable estimate of the uncertainty in the final results. The ephemerides used to calculate the above O-C values are given in Table II.

The residuals for RZ Cas continue to become more negative, extending a trend exhibited during the previous observing season (Margrave, 1981). The trend suggests that a period decrease of about 0.1 seconds occurred between October 1979 and August 1980.

Table I. Heliocentric Times of Primary Minimum

Star	Hel.JD-2,440,000	E	O-C	N
KO Aql	4785.8991	1012	$+0^{d}.0030$	48
44 i Boo	4813.7845	20325	+0.0021	29
RZ Cas	4813.8884	12498	-0.0026	32
	4855.7220	12533	-0.0026	27
TV Cas	4859.8426	1801	+0.0019	40
	4879.7816	1812	+0.0024	55
TW Cas	4827.8954	1974	-0.0035	45
DO Cas	4859.8888	15969	-0.0014	37
XX Cep	4839.8022	1412	+0.0078	40
	4860.8373	1421	+0.0071	23
SW Lac	4854.8834	22706	-0.1414	40
	4856.8064	22712	-0.1427	27
	4860.8188*	22724	-0.1394	25
	4914.8574	22893	-0.1435	27
AT Peg	4826.7553	3856	+0.0055	47

*Secondary minimum

Table II. Ephemerides for Program Stars

Star	Epoch (24...)	Period	Source
KO Aql	41,887.4724	$2^{d}.864055$	IBVS 1869
44 i Boo	39,370.4222	0.2678160	SAC 53
RZ Cas	29,875.6902	1.1952473	Herczeg and Friboes-Conde
TV Cas	41,595.3582	1.8125944	IBVS 1869
TW Cas	42,008.3873	1.4283240	IBVS 1869
DO Cas	33,926.4573	0.6846661	SAC 53
XX Cep	41,539.4971	2.337321	SAC 53
SW Lac	37,572.5723	0.32072811	Bookmyer (1965)
AT Peg	40,407.4370	1.14610886 $-5.5772\text{x}10^{-9}E$	IBVS 1930

The recent residuals for TV Cas exhibit a continuing positive trend, a result which has also been noted by deLandtsheer (1981), who has suggested that the period of TV Cas may have increased slightly relative to that given by Margrave (1980).

In the case of SW Lac the residuals have continued to grow more negative but at a diminishing rate. This result would seem to support the suggestion by Faulkner and Bookmyer (1978) that the period of this system has increased. It is also possible that a continuous period decrease lasting ten years or so has been replaced by a phase of continuous period increase, but further observations are required to substantiate this hypothesis.

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USA

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THE DELTA SCUTI VARIABLE HR 1287

The variability of HR 1287 (44 Tauri) was noted by Henriksson (1977), who listed it as a Delta Scuti variable with amplitude $0^{\mathrm{m}}.104$ and period $0^{\mathrm{d}}.1266$ on the basis of six nights of observations over a six-month period. HR 1287 was observed at the Blue Mountain Observatory on September 24-25, 1979 with the 40-cm Cassegrain reflector and a Johnson single-channel photoelectric photometer equipped with an EMI 6256B photomultiplier. A Corning 3384 filter was used to define the V band. The photomultiplier signal was fed through a DC amplifier to a voltage-to-frequency converter, whose output was integrated by an electronic counter for ten seconds.

The stars HR 1269 and SAO 76480 were used as the comparison and check stars, respectively. The smoothed magnitude differences between HR 1287 and HR 1269 are plotted in Figure 1 as a function of Heliocentric Julian Date. A five-point running average was used to smooth the original data, which consisted of averages of three ten-second integrations spaced about two minutes apart. An additional straight average of pairs of successive points was applied to arrive at the points plotted in Figure 1. The scatter in the magnitude difference between the comparison and check stars was $\pm 0^{\mathrm{m}}.007$.

It appears from Figure 1 that the amplitude and period of HR 1287 were $0^{\mathrm{m}}.083$ and $0^{\mathrm{d}}.1724$, respectively, on September 24-25, 1979. The maximum brightness occurred at HJD 2,444,141.8975, and the minimum brightness occurred at HJD 2,444,141.9837. The period given above was determined by doubling the time difference between maximum and minimum brightness. Thus it assumes that the brightness variation is perfectly

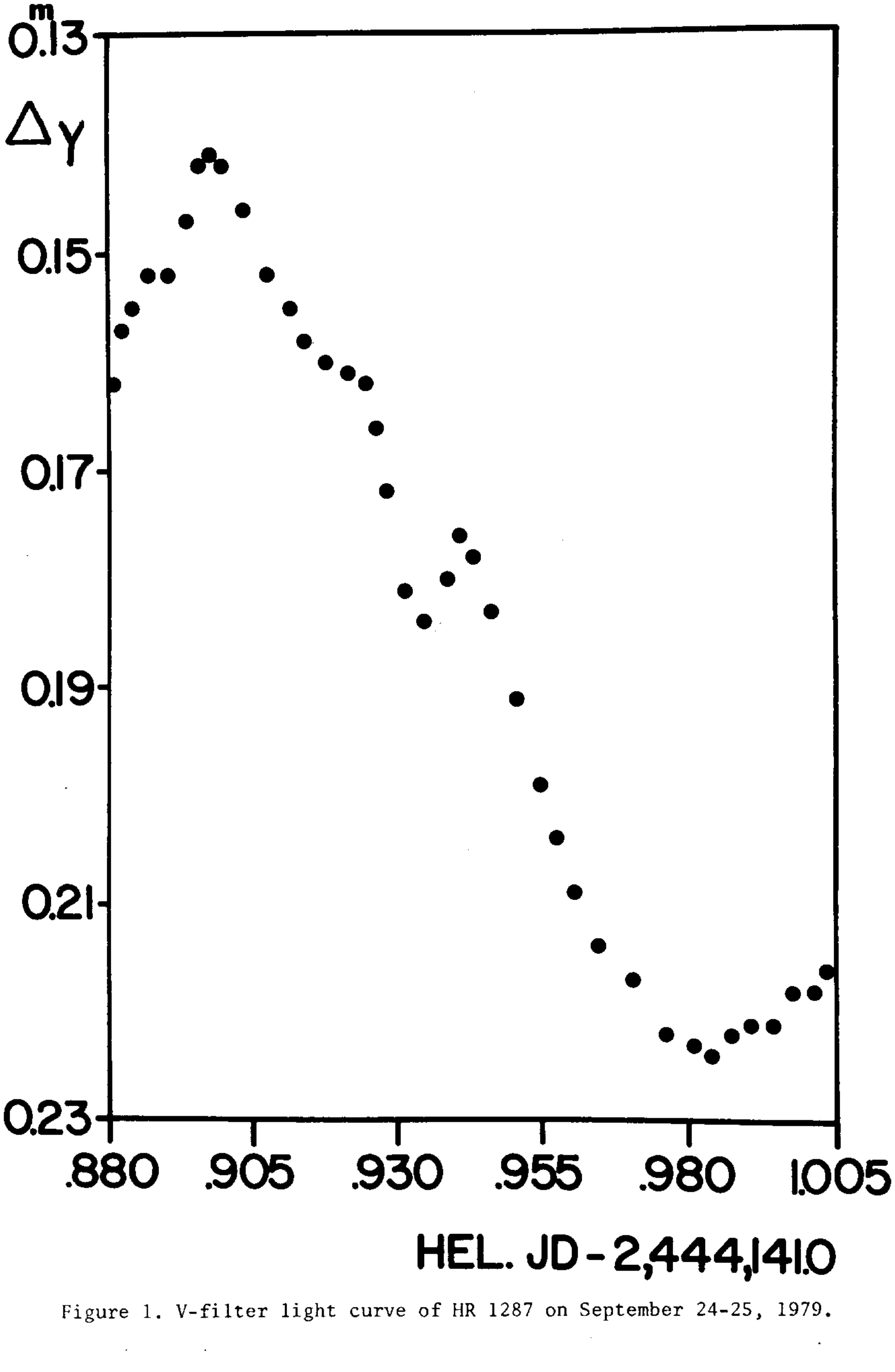

Figure 1. V-filter light curve of HR 1287 on September 24-25, 1979.

sinusoidal, which, of course, is not very likely. Even so the large difference between the value for the period given by Henriksson and that found above suggests either multiperiodic behavior for HR 1287 or a very rapid rise from minimum to maximum brightness (about $0\overset{d}{.}04$ to permit the observations presented here to be consistent with Henriksson's period of $0\overset{d}{.}1266$). The fragmentary portions of the rising brightness section of the light curve given in Figure 1 do not seem to indicate such a rapid brightness rise. Thus it appears more likely that HR 1287 is multiply periodic. A much less likely prospect is that it has only a single fundamental period which underwent rapid change between the time of Henriksson's observations and those presented here. However, the elapsed time of 3-4 years would seem to rule out this possibility. Further monitoring of HR 1287 will be carried out in order to clarify its behavior.

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PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR DO Cep IN 1975

Continuous photoelectric monitoring of the flare star DO Cep has been carried out at the Stephanion Observatory during the year 1975, using the 30-inch Cassegrain reflector of the Department of Geodetic Astronomy, University of Thessaloniki. Observations have been made with a Johnson dual channel photoelectric photometer in the B colour of the international UBV system. The telescope, the photometer, and the observational procedure have been described elsewhere (Mavridis et al., 1982). Here we mention only that the transformation of our instrumental ubv system to the international UBV system is given by the following equations:
for the time interval from 25-6-1975 to 30-7-1975

$$V = v_o + 0.119(b-v)_o + 2.163,$$

$$(B-V) = 0.819 + 1.047(b-v)_o,$$

$$(U-B) = -1.509 + 1.006(u-b)_o,$$

and for the time interval from 31-7-1975 to 30-9-1975

$$V = v_o + 0.046(b-v)_o + 2.440,$$

$$(B-V) = 0.782 + 1.062(b-v)_o,$$

$$(U-B) = -1.612 + 1.063(u-b)_o.$$

The monitoring intervals in UT as well as the total monitoring time for each night are given in Table I. Any interruption of more than one minute has been noted. In the fourth column of Table I the standard deviation of random noise fluctuation $\sigma(\text{mag})=2.5 \log(I_o+\sigma)/I_o$ for different times (UT) of the corresponding monitoring intervals is given.

During the 59.13 hours of the monitoring time no flare was observed.

Table I

Monitoring intervals in 1975

Date	Monitoring intervals (UT)	Total Monitoring time	σ(U.T.)
1975 July			
20-21	21^h00^m-21^h13^m,21^h17^m-21^h54^m,		0.11(21^h09^m),0.09(21^h29^m),
	21 57 -22 25 ,22 42 -23 11 ,		0.09(22 09),0.11(23 01),
	23 15 -23 41 ,23 47 -00 10 ,		0.08(23 35),0.06(00 03),
	00 23 -00 54 ,00 59 -01 23 ,		0.05(00 37),0.03(01 11),
	01 27 -01 40 ,01 44 -01 55.	03^h55^m	0.02(01 47).
25-26	21 48 -22 13 ,22 18 -22 54 ,		0.08(22 02),0.07(22 35),
	22 59 -23 27 ,23 50 -00 06 ,		0.07(23 13),0.07(23 54),
	00 22 -00 49 ,00 54 -01 23 ,		0.08(00 39),0.09(01 09),
	01 47 -02 07.	03 01	0.09(01 51).
26-27	20 48 -21 16 ,21 21 -21 36 ,		0.07(20 57),0.11(21 22),
	21 51 -22 19 ,22 38 -23 05 ,		0.12(21 54),0.15(22 42),
	23 08 -23 37 ,23 41 -00 04 ,		0.17(23 11),0.13(23 44),
	00 24 -00 50 ,00 55 -01 27 ,		0.11(00 32),0.11(01 02),
	01 31 -01 52.	03 49	0.11(01 38).
28-29	21 09 -21 35 ,21 40 -22 08 ,		0.09(21 20),0.09(21 57),
	22 13 -22 46 ,23 16 -23 36 ,		0.12(22 39),0.11(23 25),
	23 55 -00 12 ,00 17 -00 44		0.08(00 03),0.09(00 25),
	01 10 -01 40 ,01 45 -02 01.	03 17	0.07(01 30),0.08(01 54).
29-30	23 09 -23 37 ,23 46 -00 04 ,		0.11(23 20),0.11(23 57),
	00 07 -00 13 ,00 18 -00 45 ,		0.10(00 27),0.09(01 28),
	01 08 -01 35 ,01 40 -02 05.	02 11	0.10(01 51).
31	23 47 -00 00.	00 13	0.07(23 49).
August			
1	00 00 -00 11 ,00 26 -00 40 ,		0.10(00 37),0.11(01 10),
	00 44 -01 13 ,01 35 -02 04.	01 23	0.09(02 00).
1-2	21 15 -21 36 ,22 08 -22 21 ,		0.05(21 35),0.04(22 09),
	22 27 -22 36 ,22 58 -23 27 ,		0.08(23 25),0.06(23 58),
	23 31 -00 01 ,01 21 -01 59.	02 20	0.05(01 23).
2-3	19 29 -19 56 ,20 12 -20 31 ,		0.05(19 40),0.05(20 26),
	20 36 -21 01 ,21 30 -21 54 ,		0.04(20 44),0.03(21 42),
	22 02 -22 29 ,22 34 -23 06 ,		0.03(22 12),0.04(22 44),
	23 30 -23 58 ,00 02 -00 31 ,		0.05(23 51),0.03(00 13),
	00 36 -01 01 ,01 26 -01 55.	04 25	0.03(00 49),0.04(01 46).
5-6	23 53 -00 19 ,00 22 -00 50 ,		0.04(00 02),0.04(00 35),
	00 55 -01 35 ,01 38 -02 03.	01 59	0.04(01 03),0.05(01 40).
7-8	21 07 -21 36 ,21 40 -22 07 ,		0.03(21 13),0.04(21 42),
	22 11 -22 37 ,22 52 -23 20 ,		0.04(22 14),0.03(23 04),
	00 16 -00 31 ,00 38 -01 02 ,		0.04(00 28),0.04(00 48),
	01 13 -01 20.	02 36	0.03(01 18).
8-9	20 36 -20 59 ,21 31 -21 56 ,		0.08(20 39),0.04(21 34),
	21 59 -22 29 ,22 43 -23 11 ,		0.03(22 05),0.03(22 49),
	23 14 -23 50 ,00 31 -00 56,		0.04(23 17),0.04(00 43),
	01 04 -01 47.	03 30	0.03(01 18).

Table I (Continued)

August			
17	19^h39^m-20^h08^m,20^h13^m-20^h43^m,		0.07(19^h44^m),0.07(20^h17^m),
	20 46 -21 16 ,21 47 -22 14 ,		0.09(20 57),0.05(21 56),
	22 17 -22 45.	02^h24^m	0.06(22 22).
23	20 25 -20 56.	00 31	0.17(20 33).
24-25	19 15 -19 48 ,19 52 -20 26 ,		0.11(19 42),0.12(19 57),
	20 29 -20 58 ,21 11 -21 38 ,		0.11(20 35),0.11(21 15),
	21 43 -22 23 ,23 08 -23 37 ,		0.11(21 48),0.14(23 11),
	23 49 -00 20 ,00 29 -00 58 ,		0.13(23 52),0.16(00 52),
	01 05 -01 56.	05 03	0.13(01 09).
25-26	19 57 -20 25 ,20 28 -20 58 ,		0.08(20 05),0.07(20 31),
	21 02 -21 30 ,21 44 -22 13 ,		0.08(21 19),0.08(21 49),
	22 17 -22 49 ,23 34 -00 19 ,		0.07(22 20),0.08(23 38),
	00 22 -01 04 ,01 08 -01 46.	04 32	0.11(00 28),0.10(01 12).
26-27	20 01 -20 31 ,20 37 -21 02 ,		0.07(20 03),0.06(20 45),
	21 06 -21 36 ,21 53 -22 40 ,		0.06(21 11),0.05(21 59),
	22 44 -22 47 ,22 52 -23 02 ,		0.05(22 54),0.07(23 52),
	23 48 -00 27 ,00 30 -00 58.	03 32	0.08(00 34).
September			
3-4	19 26 -20 01 ,20 05 -20 59 ,		0.05(19 31),0.04(20 10),
	21 02 -21 38 ,22 57 -23 22 ,		0.04(21 08),0.04(23 03),
	23 39 -00 40 ,00 17 -00 37 ,		0.05(23 40),0.04(00 23),
	00 42 -01 00.	04 09	0.05(00 47).
13-14	22 45 -23 07 ,23 11 -23 19 ,		0.03(23 03),0.03(23 45),
	23 27 -23 33 ,23 43 -00 13 ,		0.03(00 29),0.03(01 08).
	00 27 -00 55 ,00 58 -01 04 ,		
	01 06 -01 11 ,01 13 -01 23 ,		
	01 26 -01 30.,	01 59	
15-16	20 19 -20 50 ,20 54 -21 28 ,		0.05(20 39),0.05(21 11),
	22 16 -22 32 ,22 34 -22 46 ,		0.05(22 30),0.03(23 03),
	22 49 -22 56 ,22 59 -23 16 ,		0.03(23 34),0.03(01 21).
	23 20 -23 44 ,00 43 -01 02 ,		
	01 05 -01 11 ,01 18 -01 31.	02 59	
24	22 41 -23 08 ,23 12 -23 38 ,		0.07(22 55),0.11(23 25),
	23 44 -00 11.	01 20	0.15(23 55).

TOTAL $59^h08^m = 59^h.13$

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1981 UBVR PHOTOMETRY OF UV Psc

As part of an on-going program of UBVR photometry of RS CVn binaries, we have observed the short-period system UV Psc (BD +6°189) in October and November of 1981. The observations were made with the University of New Mexico's 61-cm Capilla Peak Observatory telescope. A photon-counting system using a cooled (-20°C) EMR 641A phototube was employed. The star BD +6°185 (SAO 108761) was used as the comparison star.

The results of these observations are shown in Figure 1-4. Magnitudes are given in the instrumental UBVR system. The data has been folded so that both primary and secondary minima are clearly visible and the presence of any distortion wave more easily detected. The statistical error of any single point is on the order of ±0.01 magnitude. The phases were calculated using HJD=2443463.3493 + 0.861046 E (Oliver, 1974; IBVS #1415). Table I gives a phase log of the observations.

Few observations of UV Psc have been published to date. Oliver (1974) observed UV Psc photometrically and found that the light curve of UV Psc did not have any large asymmetries. Also, Oliver presented a light curve made by Carr in 1968. The similarities between the light curves of Oliver and Carr indicated that UV Psc had a rather consistent light curve. Previous observations we made in 1979 and 1980 (Zeilik et al., 1981; IBVS #2006) did not show any evidence for an asymmetrical distortion wave, but did indicate that the system undergoes radical changes in its light curve.

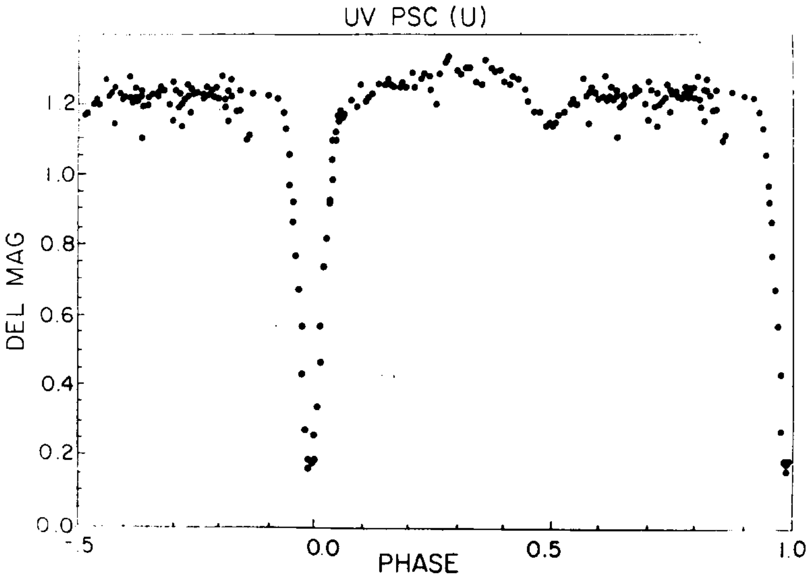

Figure 1

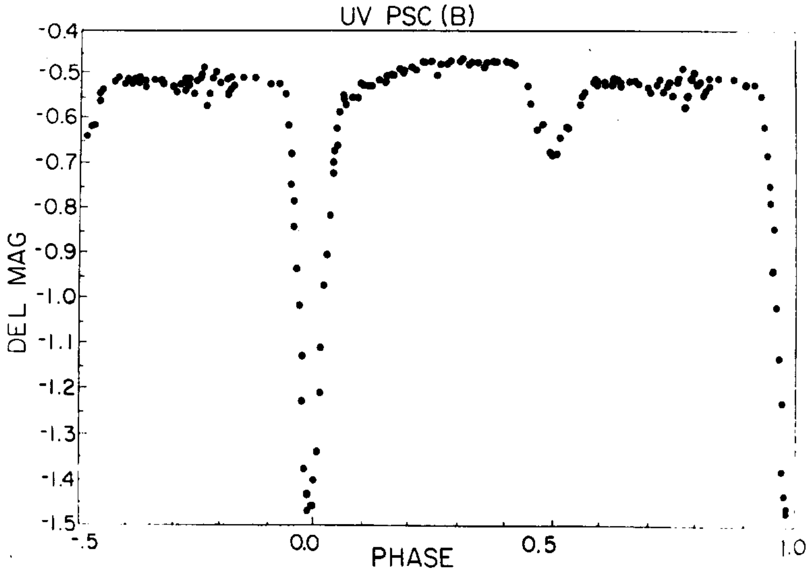

Figure 2

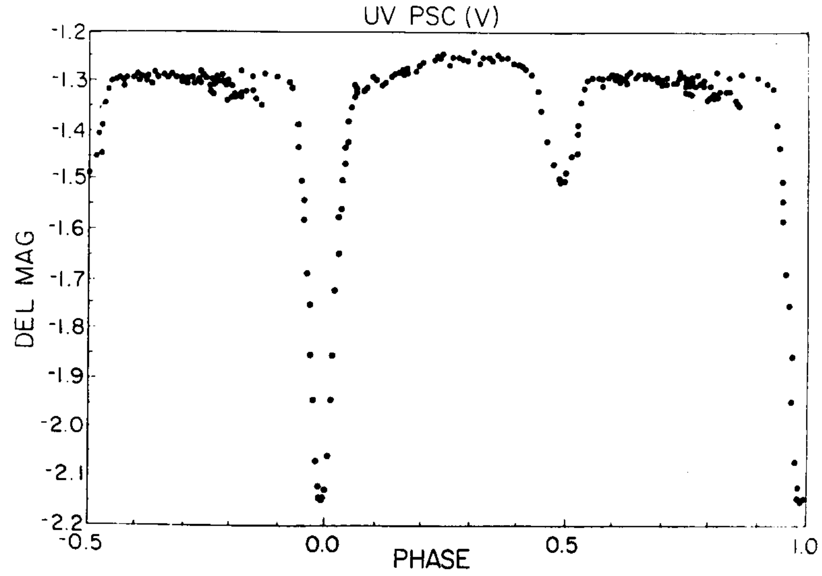

Figure 3

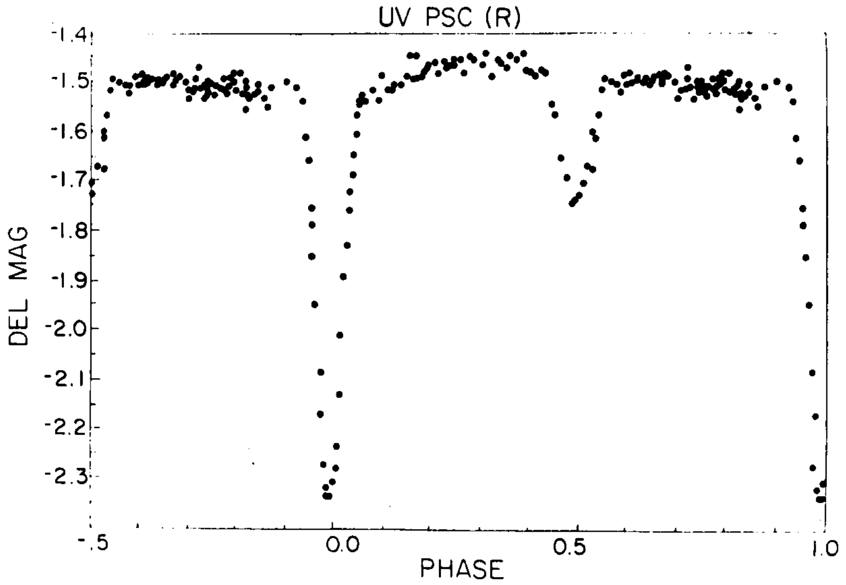

Figure 4

Our present light curves are much improved over those obtained in 1979 and 1980. The span of observations was on a much shorter time scale and phase coverage more complete. These observations do indicate the presence of an asymmetrical distortion wave with a maximum amplitude near 0.3 phase. A large asymmetry in the secondary eclipse is also evident. The system still appears to be quite active as noted by a large depression going into the primary minimum on 11/13/81, especially evident at U and V. Depths of the secondary minima relative to the primary remain consistent with those of the 1980 observations with the secondary depth increasing at longer wavelengths relative to the primary.

TABLE I - 1981 Phase Log of UV Psc

Date (UT)	Phase
10/18	0.62→0.72
10/20	0.83→0.06
10/24	0.58→0.64
10/26	0.73→0.83
11/3	0.04→0.25
11/5	0.25→0.58
11/13	0.74→0.87

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1981 UBVR PHOTOMETRY OF RT And

As part of our long-term program of UBVR photometry of RS CVn binaries, we have observed the short-period (0.63 day) system RT And (=BD +52°3383a), which has a very peculiar light curve known since 1949 (Gordon, 1948). The observations spanned the time from September to November 1981 and were made with the University of New Mexico's 61-cm Capilla Peak Observatory telescope. A single-channel, photon-counting system with a cooled (-20°C) EMR 641A phototube was used; the filters were from Kitt Peak. The star BD +52°3383 (SAO 35204) was the comparison for all observations, which are reported in the instrumental UBVR system.

Figures 1-4 summarize the results. The data have been folded so that both primary and secondary eclipses are clearly visible. The statistical error in any point is ±0.01 magnitude or better. Phases were calculated using HJD=2441508.5550 +0.62892990E (Mancuso et al., 1978). Table I provides a log of the observations.

RT And has been well observed since 1949 (see the summary of light curves in Milano et al., 1981). It exhibits complex, variable behavior, such as sudden changes in period (Williamon, 1974), a pronounced asymmetry in secondary eclipses (Dean, 1974), and a variable level of intensity outside of eclipses. Our data reinforce the long-term nature of this erratic behavior. Specifically, we can compare our V-light curve (Figure 3) to those from 1949 to 1978 (Milano et al., 1981). We note: (1) a large asymmetry in the secondary eclipse, (2) statistically significant fluctuations during ingress to secondary minimum, (3) continued symmetry in the primary eclipse, and (4) changes in outside-eclipse intensities by as much as 0.1 magnitude over a period of only two months. These latter variations are so large that a combined light curve has noticeable jumps in it (see Figure 3 near phase 0.3 and 0.6).

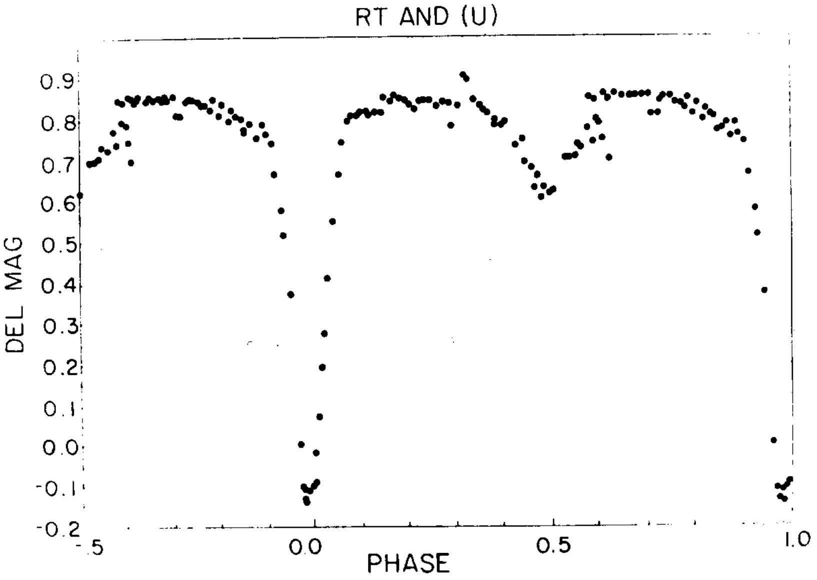

Figure 1

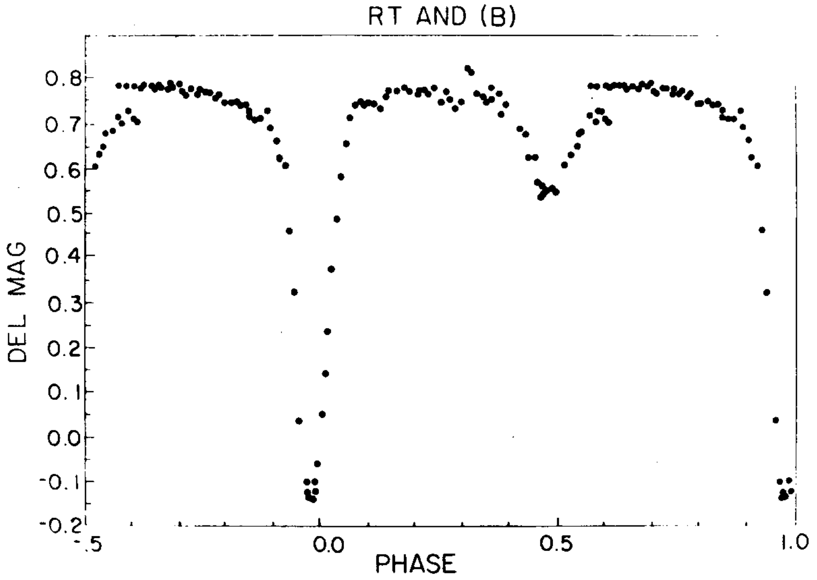

Figure 2

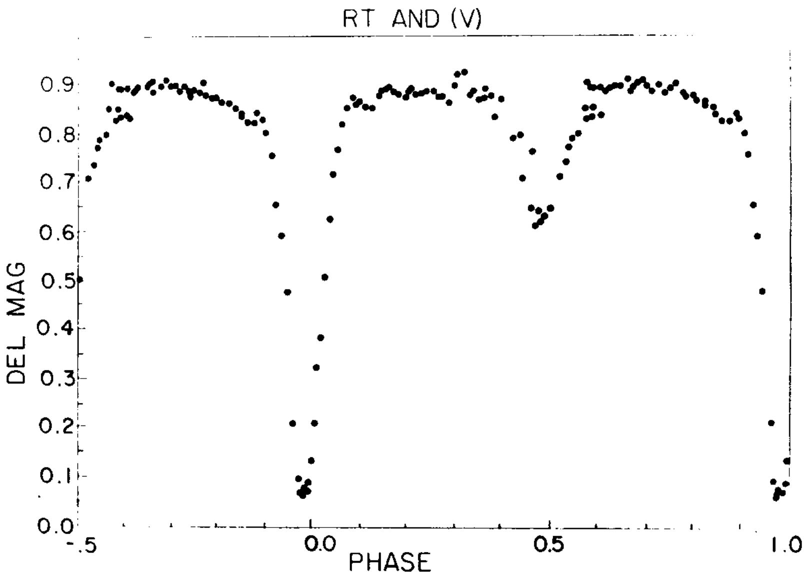

Figure 3

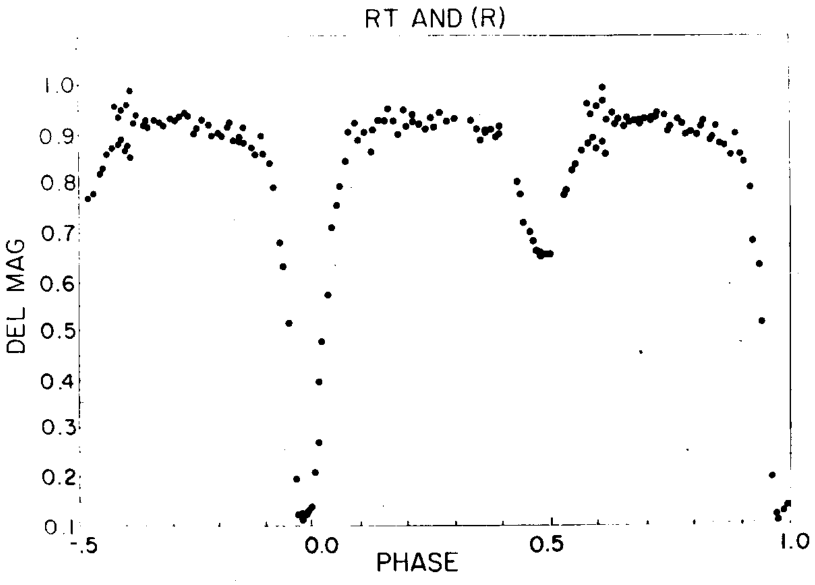

Figure 4

Table I - Phase Log of RT And

Date (UT)	Phase
9/20	0.19→0.36
9/27	0.47→0.62
10/17	0.85→0.50
10/26	0.37→0.50
11/16	0.58→0.86

As noted by Milano et al. (1981), the distortion wave has a small amplitude and a period of about 22 years. The wave was most apparent in 1974, with a peak at about phase 0.24. The phase of maximum amplitude of the wave has been decreasing; a linear fit to the rate indicates a peak at about phase 0.0 in 1981, which unfortunately coincides with the primary eclipse. Hence, it is not readily visible in our light curve.

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PS4452-1347* - A NEW RR Lyr VARIABLE STAR OF BAILEY TYPE C

In a search programme for field population II A and F stars with visual magnitudes between 13^m and 16^m in high galactic latitudes, extending a pilot project reported on by Crawford et al. (1979), simultaneous photoelectric photometry in the Strömgren uvby photometric system (Strömgren, 1966) has now been carried out for 275 candidate stars in two observing periods in 1980 and 1981 with the Danish 1.5-m telescope at ESO, La Silla (Andersen, 1982). One of these stars, PS4452-1347, was, based on three observations in October 1980, suspected for variability and observed systematically on six consecutive nights in August 1981 along with other programme and standard stars. The reduction of these observations shows that the star is an RR Lyr variable with a nearly sinusoidal lightcurve indicating a Bailey type c; the period is 0.381 d and the mean visual magnitude is 13.53 . The star is not included in the General Catalogue of Variable Stars (Kukarkin et al., 1969) nor in the subsequent name-lists of variable stars (Kukarkin et al., 1970-1977; Kholopov et al., 1978-1981).

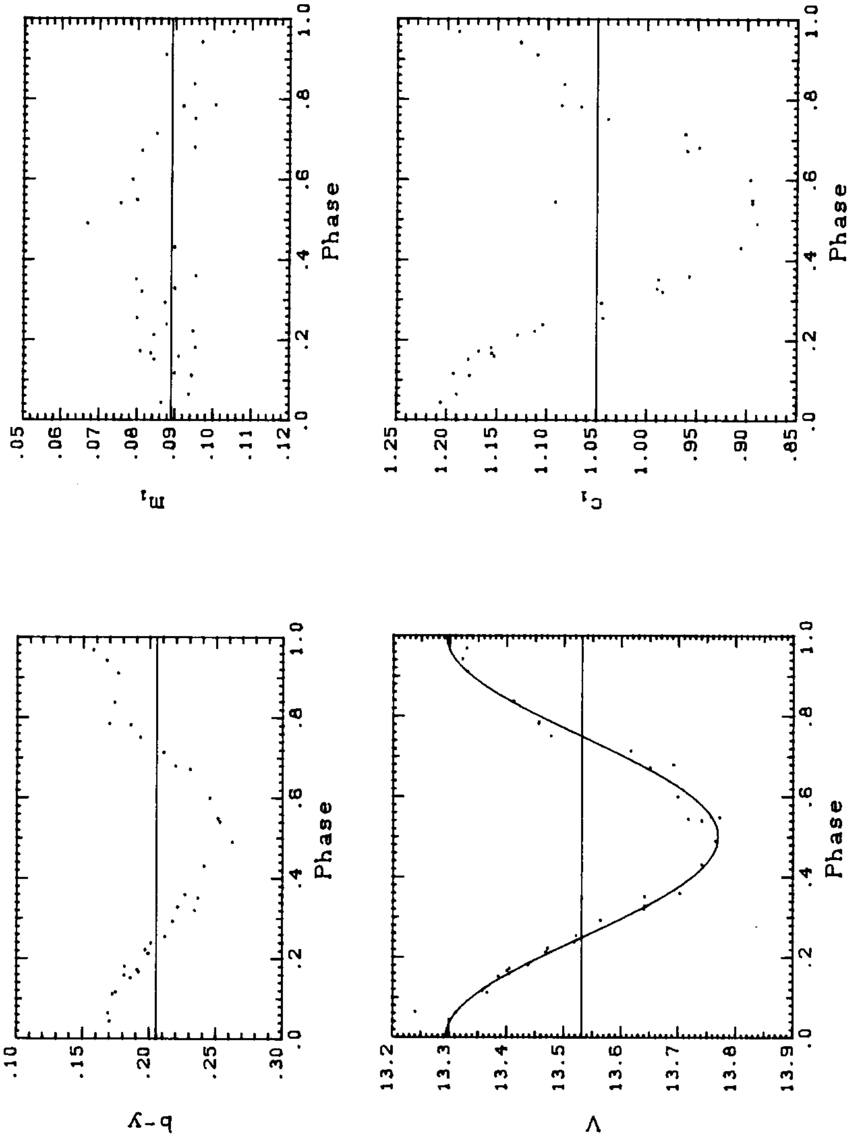
The star PS4452-1347 ($\alpha_{1950} = 0^h\ 24^m\ 30^s.13$, $\delta_{1950} = +0^\circ\ 23'\ 54''.9$, epoch 1960.64) was observed 34 times during the six nights, each observation consisting of 3 to 4 60-second integrations. Table I gives the 34 observations reduced to visual magnitudes on the Johnson system and indices on the standard system of Crawford and Barnes (1970). Typical mean

---

* Star no. 1347 measured on Palomar Schmidt plate no. 4452 .

Table I

Helioc. JD -2440000	V	b-y	m1	c1	Phase
4839.7790	13.403	.181	.091	1.152	.158
4839.8157	13.521	.212	.080	1.043	.255
4839.9255	13.717:	.307:	.030:	1.092:	.543
4840.7090	13.699	.246	.079	.897	.599
4840.7667	13.477	.193	.095	1.039	.750
4840.8861	13.240	.169	.094	1.190	.064
4841.6664	13.367	.172	.094	1.177	.111
4841.7577	13.641	.237	.080	.988	.351
4841.8105	13.765	.262	.067	.890	.489
4841.8297	13.741	.253	.076	.895	.540
4841.8795	13.650	.230	.081	.960	.670
4842.6577	13.616	.211	.085	.962	.713
4842.6838	13.455	.185	.092	1.066	.781
4842.7450	13.322	.168	.097	1.127	.942
4842.7836	13.299	.170	.086	1.206	.043
4842.8306	13.401	.192	.084	1.155	.166
4842.8517	13.472	.197	.095	1.112	.222
4842.8786	13.564	.218	.087	1.045	.292
4843.6542	13.642	.221	.090	.989	.327
4843.6933	13.741	.241	.090	.906	.430
4843.7381	13.772	.251	.080	.895	.548
4843.7881	13.691	.219	.095	.948	.679
4843.8284	13.456	.170	.100	1.085	.785
4843.8485	13.411	.173	.095	1.083	.837
4843.8762	13.331	.176	.087	1.110	.910
4843.8982	13.328	.157	.105	1.189	.968
4844.7170	13.358	.175	.090	1.193	.116
4844.7304	13.386	.186	.084	1.178	.152
4844.7382	13.405	.191	.081	1.168	.172
4844.7415	13.438	.182	.095	1.155	.181
4844.7535	13.469	.199	.084	1.129	.212
4844.7634	13.518	.201	.088	1.104	.238
4844.7946	13.640	.234	.081	.984	.320
4844.8094	13.703	.227	.095	.957	.359
Mean	13.531	.205	.089	1.050	β = 2.706
Amplitude	.476	.100	.024	.286	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c1
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1.10
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1.00
.95
.90
.85
b-y
.10
.15
.20
.25
.30
V
13.2
13.3
13.4
13.5
13.6
13.7
13.8
13.9
Phase
.0
.2
.4
.6
.8
1.0

Figure 1

errors of one observation in V, b-y, m_1 and c_1 are 0.008, 0.006, 0.009 and 0.010, respectively. It was found that the instrumental magnitudes u, v, b, y, could each be accurately fitted with a pure sine curve with no significant difference in period, and in this way a period

$$P = 0\overset{d}{.}38108 \pm 0\overset{d}{.}00020 \text{ (m.e.)}$$

has been determined. The epoch of maximum is given by the expression

$$\text{Max} = 2\ 444\ 839.7186 + 0.38108\ E \quad .$$

In Figure 1 we give the observed V-light curve along with the observed (b-y)-, m_1-, and c_1-colour curves. Also shown is the sine curve best fitting the V observations. In Table I we have also given the mean magnitude and colours and the respective full amplitudes as determined from the optimum sine curves. The mean value of a few Hβ-observations is also given. The observations indicate a mean spectral type around F0.

Assuming a mean absolute visual magnitude of $+0\overset{m}{.}5$, the star is located at a distance of 4.0 kpc , i.e., 3.6 kpc from the galactic plane.

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SPECTROSCOPIC OBSERVATIONS OF V 471 TAURI
(BD+16°516)

This RS CVn type eclipsing variable was spectroscopically observed at the Astrophysical Observatory of Asiago. Continuous observations cover the period from November 1980 to February 1981. Observations were achieved with the telescopes with 122 and 182 cm diameters. The first instrument is equipped with medium dispersion prism spectrograph (40 Å.mm^{-1} at 4340 Å) and the second one with high dispersion Reosce Echellé spectrograph (16 Å mm^{-1} at 6563 Å). 70 medium and 7 high dispersion spectra were secured with the 122 cm and 182 cm telescopes. Some of the medium dispersion spectra were obtained in a single trail mode (Walker and Chincarini, 1968). 35 spectra were utilized in the computer construction of the radial velocity curve (see Fig.1.) and the spectroscopic orbital elements were calculated.

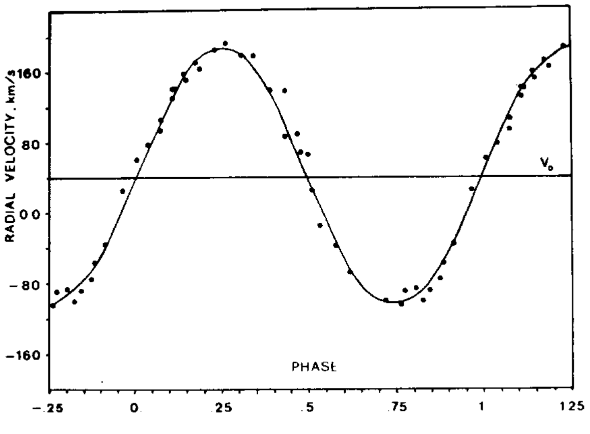

Fig.1. Computer constructed radial velocity curve of V 471 Tauri

The orbital elements and their probable errors can be summarized as:

Elements	Probable Errors
V_o = 40.1 km s^{-1}	2.06 km s^{-1}
P = 0.52118286 day	(assumed constant)
Passage from periastron = 244 4970 . 716	0.027 day
ω = 101°	18°.9
e = 0.0548	0.0275
a.Sini = 1.07 x 10^{6} km	2.05 x 10^{4} km
K = 150 km s^{-1}	2.86 km s^{-1}

Note: Complete references for this star were not repeated instead they can be found in Hamzaoğlu, 1981.

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S ERIDANI - A DELTA SCUTI VARIABLE

S Eridani (= 64 Eridani = HR 1611 = HD 32045) was noted by Millis (1967) as a variable of unknown type. Leung (1970) included this star in his list of known δ Scuti variables but this classification has been questioned by Valtier (1972) who remarked that there was no evidence of periodicity in Millis' limited data. S Eridani is included in the 1974 supplement to the GCVS as a possible δ Scuti type star with a visual light range of 0.02 magnitudes and a spectral type F0 IV; no period is given. Eggen (1979) includes this star in his list of Ultra Short Period Cepheids while Breger (1979) omits it from his δ Scuti list.

We felt that fresh observations of S Eridani may help establish what type of variable it is and assign a period to it. Using the 40cm reflector at Siding Spring Observatory we observed S Eridani on the 30th November 1981. Two nearby standard stars, HR 1661 (= HD 32996) an A0 type star, and HR 1665 (= HD 33093) an F8 star, were chosen. All three stars were measured in the V band of the standard UBVRI system through a large range of air mass so that the differential measurements of magnitude could be corrected accurately for atmospheric extinction.

Figure 1 illustrates the light curve of S Eridani for the observing run and the constancy of the standard stars during this time.

Crawford et al. (1970) made uvbyβ measurements of S Eridani and derived the following indices: $b-y = 0.171$; $m_1 = 0.169$; $c_1 = 1.002$ and $\beta = 2.754$. Trigonometric parallax has been measured for this star and reddening can be considered negligible. Using the measured c_1 and b-y indices, the absolute magnitude, M_V, was calculated to be 0.8. Measured parallax (0.015") for S Eridani places the star at about 67 parsecs. Though errors in trigonometric parallax measurement at this distance are large, it is worth noting that from the known parallax, M_V is calculated to be 0.7.

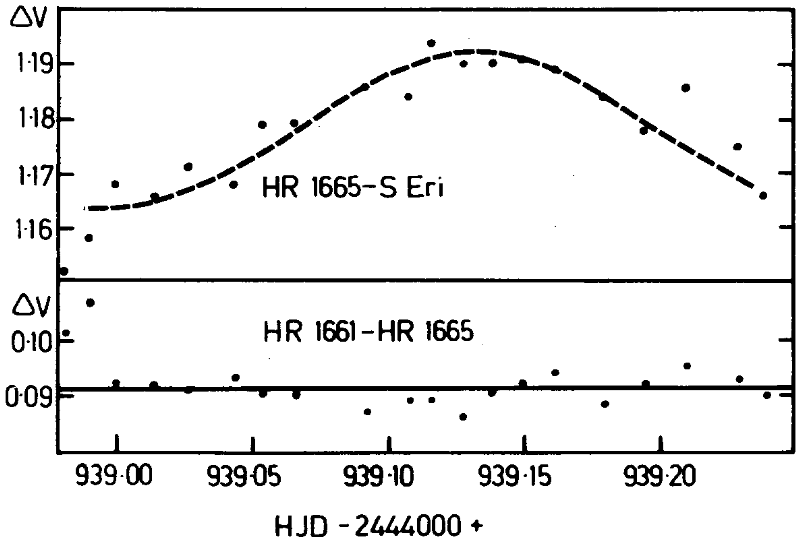

Figure 1

From our data (see figure 1) S Eridani appears to have a longer period than most small amplitude δ Scuti stars. Estimation of a period from a single night's data can be hazardous, but using Fourier techniques we suggest that this star has a fundamental period of 0.273 days and a visual light range of 0.025 magnitudes.

If we use the following formula derived for δ Scuti stars and Dwarf Cepheids, (Fernie, 1964) :

$$M_V = -1.5 - 2.50 \log P + 3.50 (B-V)$$

and substitute into it our estimation of the period and the known B-V index of 0.27, (Cousins and Stoy, 1962), we calculate $M_V = 0.8$ in agreement with values stated earlier.

The calculated metallicity ($\Delta m_1 = 0.026$) suggests that S Eridani is slightly metal-deficient, in accord with the majority of δ Scuti stars. From the available date we conclude that S Eridani is probably a small amplitude, longer period δ Scuti star. Derived absolute magnitude and measured b-y (or B-V) colour index place this star at the high luminosity end of the δ Scuti instability region.

We would like to thank Mt. Stromlo and Siding Spring Observatories for allocating us time on the 40 cm. telescope. This work was funded by a Monash University special research grant.

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PHOTOELECTRIC MINIMA TIMES OF DO CASSIOPEIAE AND BX ANDROMEDAE

Photoelectric observations of the eclipsing variables DO Cas and BX And were carried out during August 1980 and September 1981, respectively. The observations were carried out using a two-beam, nebular-stellar photometer attached to the 48 inch Cassegrain reflector at the Kryonerion Station of the National Observatory of Athens.

Reduction of the observations was made in the usual way and the filters used are in close accordance to the standard ones. The times of minima have been calculated by Kwee and Van Woerden's method (1956) and are the mean values from B and V observations.

For DO Cas the following ephemeris formulae were used:

Min I (Hel JD) = 2433926.45729 $+0\overset{d}{.}68466595$.E (I)
(GCVS, 1976, SAK, 1978)

and

Min I (Hel JD) = 2433926.4573 $+0\overset{d}{.}6846661$.E (II)
(Cester et al. 1977)

while for BX And the:

Min I (Hel JD) = 2436528.7777 $+0\overset{d}{.}61011534$.E (I)
(GCVS, 1969, SAK, 1982)

and

Min I (Hel JD) = 2443809.8873 $+0\overset{d}{.}61011508$.E (II)
(Castelaz, 1979).

From our observations three times (one secondary and two primaries) were reduced for DO Cas and one primary for BX And, they are represented in the following Table the successive columns of which give: the Hel. J.D., the $(O-C)_I$ and $(O-C)_{II}$ according to the two ephemeris formulae for each star, and the type of minimum.

Table I

	Hel J.D. 2444000.+	$(O-C)_I$ days	$(O-C)_{II}$ days	Min Type
DO Cas	475.4466	-0.0013	-0.0036	II
	476.4732	-0.0017	-0.0040	I
	478.5239	-0.0050	-0.0073	I
BX And	868.4446	+0.0038	+0.0011	I

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NEW MINIMUM OF X-RAY SOURCE KR AURIGAE

The variable KR Aur was discovered by Popova (1960). Photometric investigations (Popova 1965 a,b, 1975) showed that it was of unique type. This was confirmed by electrophotometric observations of Doroshenko and Terebizh (1978) and photometric study of Liller (1980). Recently KR Aur was recognized to be an X-ray source (Mufson, Wisniewski, McMillan, 1980).

Electrophotometric, spectroscopic and X-ray observations of KR Aur were obtained only during the period of maximum brightness. The last minimum occurred eight years ago.

The observations of KR Aur on the 2-meter telescope of Bulgarian National Astronomical Observatory in the night 28/29 December 1981 showed that a new minimum of KR Aur has occurred. The visual magnitude of the object was estimated to be $16\overset{m}{.}8$ - $17\overset{m}{.}0$. One may expect that the duration of minimum brightness will be some months, or, may be, a year.

The observations, both spectroscopic and photometric, in minimum are urgently needed for understanding the nature of KR Aur.

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HIGH SPEED PHOTOMETRY OF HO139-68

We have obtained high speed photometric observations of the optical counterpart of the AM Her star HO139-68 (*IAUC 3649, 3658*). 10-sec integrations in "white light" were made with the UCT photometer and an RCA 8644 (S20-response) on the 0.75m reflector at the Sutherland site of the South African Astronomical Observatory.

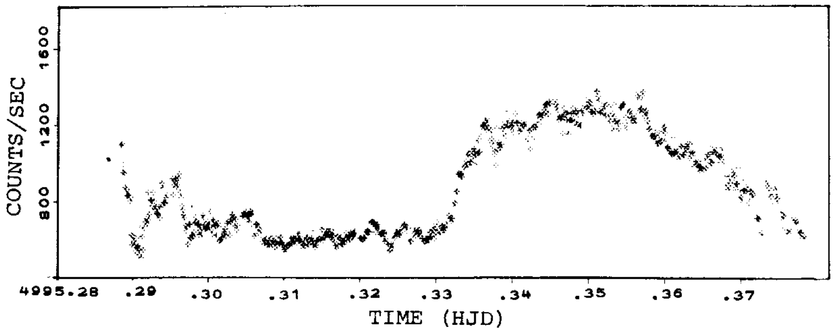

Figure 1 Light curve of HO139-68 on January 24, 1982. For heliocentric Julian Day add 2440 000.

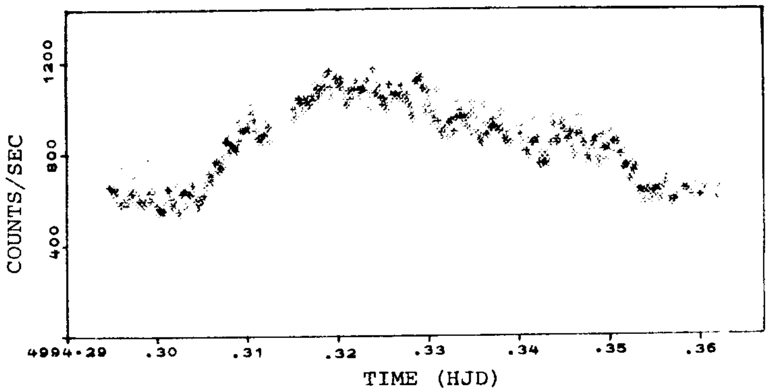

Figure 2 Light curve of H0139-68 on January 25, 1982.

The light curves, corrected for atmospheric extinction, are shown in Figures 1 and 2. The abrupt rise in light, following a period of relative quiescence, is similar to that seen in VV Pup (Warner and Nather, *M.N.R.A.S. 156*, 305, 1972), which supports the AM Her classification. Flickering on a timescale of minutes is present throughout the orbital cycle. Power spectra show no significant coherent rapid oscillations.

The observations are not sufficiently extensive to determine the orbital period unambiguously. Combining the light curves of Figures 1 and 2, orbital periods of 105.5 mins or 113.6 mins (±0.5 mins) are possible. From a brief observation made in poor observing conditions on 23 January, the latter period is favoured.

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THE OPTICAL VARIABILITY OF PU VULPECULAE (KUWANO'S OBJECT) IN 1979 - 1981

The variable star PU Vul has been discovered in 1979 by Y. Kuwano (1) and M. Honda (2). The star made a gradual flaring up of five magnitudes for 1977-1979 (3). Photoelectric UBV photometry has been carried out in Crimea during 1979-1981. The observations were made with the use of the 64 cm telescope of the Crimean Astrophysical Observatory and the 60 cm reflector of the Crimean station of Sternberg Astronomical Institute. These observations were partly published in (4). Figure 1 shows the composite light curve in V and the colour curves in B-V and U-B, where the Crimean measurements and the photoelectric observations of other authors (5-12) are presented by dots and crosses, correspondingly .

As seen from Figure 1, during 1979 the brightness of PU Vul changed around $\bar{V} \approx 8\overset{m}{.}9$, the half amplitude was $\Delta V \approx \pm\ 0\overset{m}{.}15$. Dr. D. Chochol from Skalnate Pleso Observatory (Czechoslovakia) determined (private communication) the following elements from the photometry in 1979: Min. J.D. 244 $4173\overset{d}{.}38 + 76\overset{d}{.}4$. The variations of colour index B-V corresponding to periodic V light change are obvious, but for U-B such conclusion is impossible. Besides, in 1979 both colour indices slowly increased from $\sim +0\overset{m}{.}40$ to $\sim +0\overset{m}{.}70$ in B-V and from $\sim +0\overset{m}{.}20$ to $\sim +0\overset{m}{.}50$ in U-B.

The rapid decrease of brightness of PU Vul started in February, 1980. During the phase of full decline between J.D. 244 4290 - ...4480 the amplitude ΔV was estimated as equal to $\sim +4\overset{m}{.}8$ with the rate $\Delta V/\Delta t \approx +0\overset{m}{.}025$ per day (this decline rate was obtained in (11) on the initial part of fading). Meanwhile noticeable colour indices variations also occurred. Before the end of the declining phase in V they achieved the maximum values B-V ≈ +1^m.0 and U-B ≈ +0^m.80 in time interval J.D. 244 4340-...4360 and then both B-V and U-B decreased.

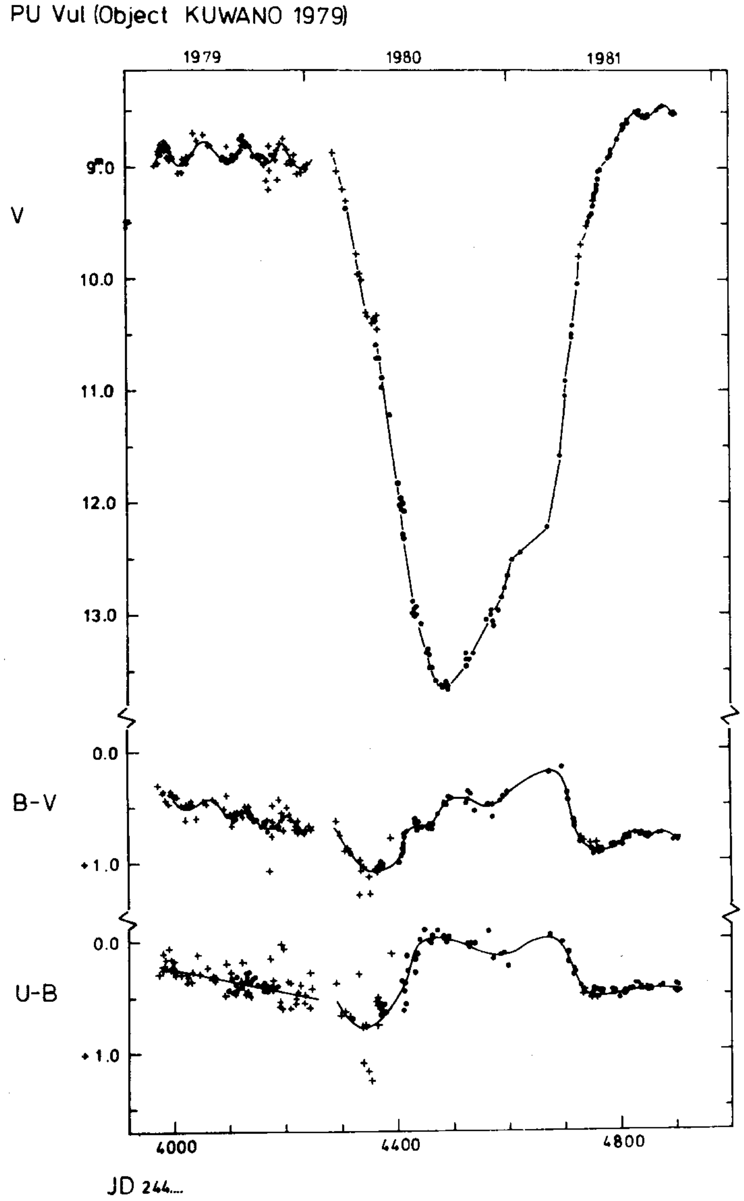

Figure 1

From our observations PU Vul had a light minimum ($V \approx 13^m.65$) in the time interval J.D. 244 4480 -...4490. In this time, B-V and U-B decreased to ~ $+0^m.45$ and ~ $0^m.0$, respectively. The next brightening of PU Vul had two stages. At first, in the time interval J.D. 244 4490 -...4670 it was characterized by the brightening at a rate $\Delta V/\Delta t \approx -0^m.008$ per day on average. By the end of this stage colour index B-V decreased downward ~ $+0^m.20$. The variations of U-B occurred symmetrically in this time interval (see Figure 1).

Further, in the time interval J.D. 244 4670 -...4830 the brightening of PU Vul was characterized by noticeably greater rate, $\Delta V/\Delta t \approx -0^m.023$ per day. This value is similar to that of the light decrease to the minimum. With the beginning of this stage the colour indices increase rapidly as $B-V \approx +0^m.92$ and $U-B \approx +0^m.50$ around J.D. 244 4760. After this moment U-B slightly changed on average, but B-V decreased to ~ $+0^m.76$ at J.D. 244 4830. By this time the systematic light increase of PU Vul had been finished and its brightness equalled on average $\bar{V} \approx 8^m.5$. Thus the star was brighter than during its maximum of 1979. The time span of light decrease of PU Vul was about 500 days. Note also that our observations from J.D. 244 4830 permit us to suspect the existence of periodic light variations of the star with shorter period and smaller amplitude than in 1979.

The results of the detailed analysis of the photometric observations of PU Vul carried out in 1979-1981 will be published elsewhere.

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PHOTOELECTRIC OBSERVATIONS OF THE ECLIPSING BINARY IM AURIGAE

The variability of IM Aurigae (BD + 46°985 = HD 33853) was discovered by Strohmeier (1959). The variable star, designated BV 267, was recognized photographically as an eclipsing binary with a period of $0^d.684315$ and β Lyrae type light curve (Strohmeier et al. 1963). Spectroscopic and photoelectric observations led to a period of $1^d.24730$ while the light curve appeared to be of Algol type (Margoni et al. 1966). Kondo (1966) confirmed these results independently with his photoelectric observations, and solved the orbital parameters using the method of Russell-Merrill. Mammano et al. (1966) investigated this single line eclipsing binary spectroscopically and calculated the orbital elements. They also deduced the absolute properties of the system by combining their spectroscopic elements with the photometric ones given by Kondo (1966). Dworak (1974) obtained one photoelectric minimum and calculated the light elements as,

$$\text{Min I JD Hel} = 24\ 40\ 515.5465 + 1^d.247296 \cdot E,$$

collecting the times of minima obtained photoelectrically by Kondo (1966) and Margoni et al. (1966).

The system was observed photoelectrically at the Ege University Observatory on 11 nights from October 1980 to November 1981. The observations were made in yellow and blue colours with the 48 cm Cassegrain telescope equipped with an unrefrigerated EMI 9781 A photomultiplier tube and Johnson's standard B,V filters. A total of 354 and 343 individual points were obtained in B and V colours, respectively. BD + 47°1126 was used as comparison and BD +46°0979 as check star. All the differential observations (comparison minus variable) were corrected for the differential extinction. During the observations two primary and three secondary minima were obtained. These are given in Table I.

Table I

Times of Minima of IM Aur

Hel Min JD	Min	Filter	O-C
24 44 517.4706	II	B,V	-0.0009
567.3674	II	"	+0.0043
569.236	I	"	+0.002
893.5270	I	"	-0.0027
931.5674	II	"	-0.0046

The new light elements are recalculated collecting all the photoelectric minima published up to date. These elements are as follows:

$$\text{Hel Min JD} = 24\ 38\ \underset{\pm 11}{327.7922} + \underset{\pm 3}{1^{d}.2472906}.E.$$

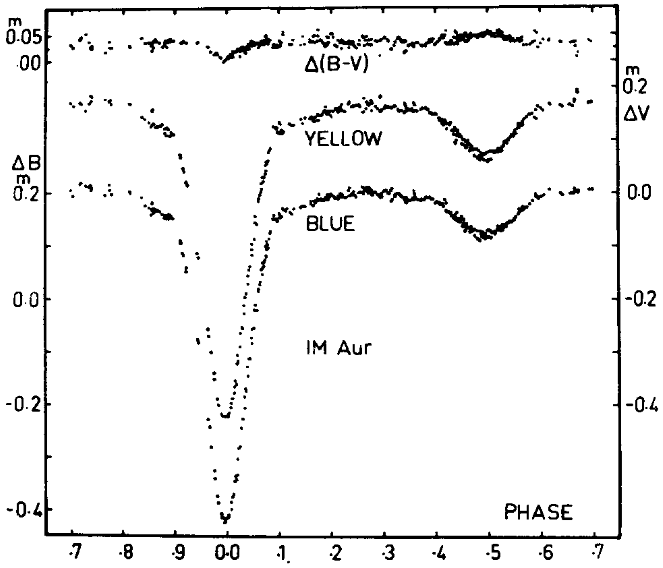

Figure 1

The light and colour curves are presented in Figure 1 where the magnitude differences have been plotted against the phases. The phases in Figure 1 and O-C values in Table I were calculated with the above new light elements. From Figure 1 it can be seen that the system is reddening at the primary minimum and the depth of secondary minimum is changing.

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PHOTOELECTRIC PHOTOMETRY OF NN CEPHEI

NN Cephei (BD + 61°2384 = HD 217796) is catalogued as RR? in the Second Supplement to the Third Edition of the General Catalogue of Variable Stars (1974). The eclipsing character of the system was firstly announced by Figer and Rolland (1977). They observed the system visually and gave the light elements as follows:

$$\text{Min I} = \text{JD Hel } 24\ 42\ 959.\underset{\pm 7}{57} + \underset{\pm 2}{2^{d}.058}.E,$$

and suggested that the shape of the mean light curve is of β Lyrae type.

The first photoelectric minima, light elements and light curves were published by Güdür and Gülmen (1980). The new light elements were found as,

$$\text{Hel Min JD} = 24\ 44\ 507.40\underset{\pm 4}{33} + 2^{d}.0583\underset{\pm 5}{05}.E$$

However, the light curve was not complete. For this reason we continued to observe the system with the same telescope and equipment at the Ege University Observatory. The comparison and check stars are taken to be the same stars (BD + 61°2388, BD + 61°2385) with the previous observations. The system is observed totally on 30 nights from July 1979 to October 1981, and 1177 and 1058 individual points were obtained in B and V colours, respectively. The extinction coefficients in separate colours for each night were calculated from the observations of comparison star using the conventional method, then all the differential observations (variable minus comparison) were corrected for the differential extinction.

The light and colour curves of the system are presented in Figure 1. The new photoelectric minima obtained in 1981 are given in Table I.

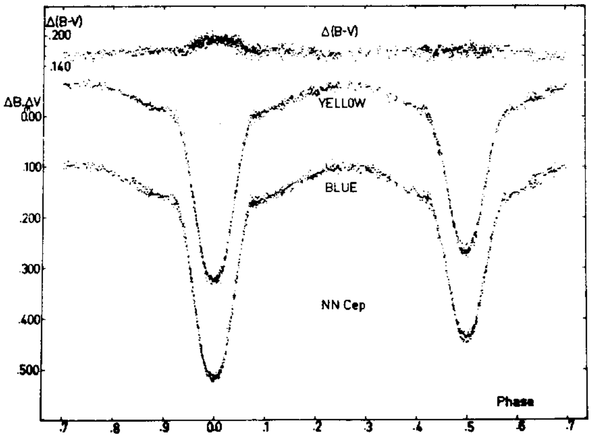

Figure 1

Table I

Times of minima of NN Cep

Hel Min JD	Min	Filter	O-C
24 44 824.3814	I	B,V	-0.0009
827.467	II	"	-0.003
859.3742	I	"	+0.0007
893.336	II	"	+0.001

The phases in Figure 1 and the O-C values in Table I were calculated by using the light elements given by Güdür and Gülmen (1980). The accuracy of these light elements are confirmed by the small O-C values in Table I. The light curves show a sinusoidal shape if we do not consider the eclipses. This is a very good example of the proximity effects. It is also seen that the light curves are of Algol type. There are no other complications in the light curves. The solutions are in progress.

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PHOTOELECTRIC MINIMA AND LIGHT CURVES OF V 478 CYGNI

V 478 Cygni (BD + $37^{\circ}3890$ = HD 193611) was discovered to be a binary by J.A. Pearce from a spectrogram obtained on September 29, 1947 (McDonald, 1948). McDonald (1948) investigated the system spectroscopically and determined the orbital elements from the radial velocity curve, and he also suggested that the system may be an eclipsing binary with the following light elements:

$$\text{Min I JD Hel} = 24\ 32\ 458.777 + 2^{\mathrm{d}}.8815.\mathrm{E}.$$
$$\pm 878$$

From the spectroscopic and photometric elements Gaposchkin (1949) found that the system consists of two spherical, or very nearly spherical components which are identical in their physical characteristics and gave the light elements as,

$$\text{Min: JD } 24\ 18\ 552.648 + 2^{\mathrm{d}}.880921.\mathrm{E}.$$

Popper and Dumont (1977) observed the system photoelectrically at Palomar and Kitt Peak Observatories and obtained its light curves. A neighbouring star to V 478 Cyg was apparently included in the Palomar observations because of the larger diaphragm used there than for the Kitt Peak observations. Thus the light curves were systematically different from each other. Koch et al. (1979) announced the system as a photometrically neglected eclipsing binary.

The system was observed photoelectrically at the Ege University Observatory on 31 nights in the period of the observational season in 1981. The observations were made in yellow and blue colours with the 48 cm Cassegrain telescope equipped with an unrefrigerated EMI 9781 A photomultiplier tube and Johnson's standard B,V filters. A total of 1093 and 1084 individual points were obtained in B and V colours, respectively. BD + $37^{\circ}3873$ was used as comparison and BD + $37^{\circ}3874$ as check star. No evidence for the variability of the comparison star was found. All the observations were corrected for atmospheric extinction using the extinction coefficients determined from observations of the comparison star for each night. During all the observations the smallest diaphragm was used to eliminate the light of the neighbouring star to V 478 Cygni. Seven primary and three secondary minima were obtained in the observational season and are given in Table I.

Table I

Times of minima of V 478 Cygni

Hel Min JD	Min	Filter	O-C
24 44 777.4777	I	B,V	-0.0002
800.5236	I	"	-0.0006
813.5094	II	"	+0.0216
816.3893	II	"	+0.0207
826.4533	I	"	+0.0019
829.3318	I	"	-0.0004
849.4970	I	"	-0.0009
852.3781	I	"	-0.0005
862.481	II	V	+0.020
878.3065	I	B,V	+0.0008

New light elements are determined using the above photoelectric primary minima by the method of weighted least squares as,

$$\text{Hel Min I JD} = 24\ 44\ 777.477\underset{\pm 6}{9} + 2^{\mathrm{d}}.88079\underset{\pm 29}{5}.E.$$

The light and colour curves are presented in Figure 1 where the magnitude differences between the comparison and variable stars have been plotted against the phases. The phases in Figure 1 and the O-C values in Table I were calculated with the above new light elements. The light curves show that the system is an Algol type eclipsing binary.

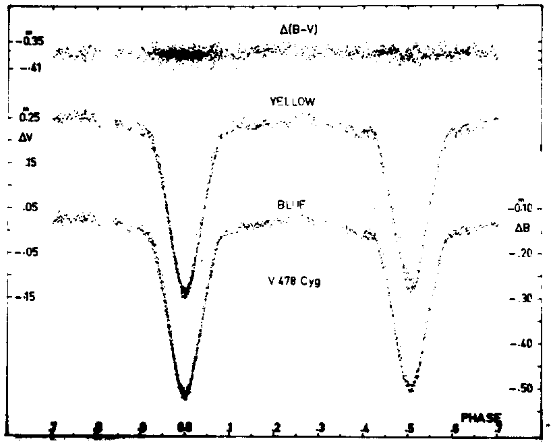

Figure 1

The phase of mid-secondary does not coincide with 0.5 phase. The phase shift of the secondary minima is about 0.0072 φ. Since there is no shift in the mid-primary, it clearly shows that the relative orbit is not circular but eccentric. The system varies about $0^m.395$ and $0^m.385$ at the primary, $0^m.380$ and $0^m.365$ at the secondary minimum in blue and yellow light, respectively. There is no variability in the colour curve. The shape of light curve confirms the results of Gaposchkin (1949). The solutions are in progress.

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