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Konkoly Observatory
Budapest
1979 May 10

ON THE VARIABILITY OF HD 66194 AND OF HD 101158

We report on the photometric variability of two stars observed in January 1977 at La Silla, Chile using the Bochum University 61 cm telescope. Observing and reduction procedures follow those outlined by Stift (1978).

A member of the open cluster NGC 2516, HD 66194 has been classified $B2IVpne_{1+}$ by Hiltner et al. (1969). Being one of the less spectacular emission line B-type stars it has been little observed so far. Photoelectric photometry, mainly carried out by Feinstein (1968) and Dachs (1970), indicates a total amplitude of $\Delta V \sim 0\overset{m}{.}10$ and marginal colour variations on an unknown time scale. Photoelectric $H\alpha$ scans have been reported by Dachs et al. (1977); they suggest variability within a few days. On January 16, 18, 19, 20, and 21 photoelectric observations of HD 66194 were obtained relative to HD 66341, a B8III star. A gradual fading by $\sim 0\overset{m}{.}03$ in *UBV* between January 16 - 19 was followed by an interval of constant brightness from January 19 - 21. The photometric behaviour of HD 66194 thus appears quite similar to that of most Be stars with well-known photometric variations : variability occurs on the time scale of a few days, overall amplitudes rarely exceed $0\overset{m}{.}1$.

Classified F0V in the *Michigan Spectral Catalogue*, HD 101158 is a southern star of photographic magnitude $7\overset{m}{.}6$ for which no photoelectric measurements are available. It was used as a secondary comparison star for differential photometry of Przybylski's star, HD 101065, from January 3 to

January 11. Throughout this observing run HD 101158 displayed low-amplitude short-term variations. Starting at J.D. 2443149.794 it brightened by $0\overset{m}{.}04$ - $0\overset{m}{.}05$ in *UBV* in an interval of ∿1 hour. Air mass differences and/or amplifier settings cannot account for such variations; the constancy of the control star HD 100367, an A0V star, was checked against several other stars. Thus there is a very strong case for short-term low-amplitude variability of HD 101158.

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References :

Dachs, J.: 1970, Astron. Astrophys. 5, 312

Dachs, J., Maitzen, H.-M., Moffat, A.F.J., Sherwood, W.A. and Stift, M.: 1977, Astron. Astrophys. 56, 417

Feinstein, A.: 1968, Z. Astrophys. 68, 29

Hiltner, W.A., Garrison, R.F. and Schild, R.E.: 1969, Astrophys. J. 157, 313

Stift, M.J.: 1978, Astron. Astrophys. Suppl. 32, 343

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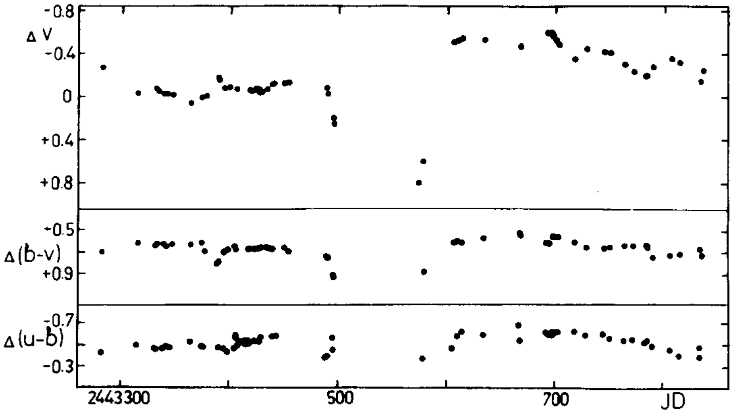
1979 May 11

OBSERVATIONS OF CI Cyg IN 1977-78

Photoelectric observations of the symbiotic eclipsing binary star CI Cyg have been continued in 1977-78. (Belyakina,1976,1979).

The results of these observations in instrumental photometric system are plotted in Fig.1. From Fig.1 one can see that the brightness of CI Cyg has decreased as compared with 1975 (Belyakina, 1976). Besides the variable star did not have any great outburst in this period. A deep minimum in the period JD 2443490-600 corresponds to the regular eclipse of the hot component by the cold one (Belyakina, 1979). Unfortunately CI Cyg could not be observed in this period and the detailed light-curve was not obtained. The small smooth fluctuations are also seen over all the curves of Fig.1. Their amplitudes are close to $0^m.1$-$0^m.2$ and their durations are about 10-50 days.



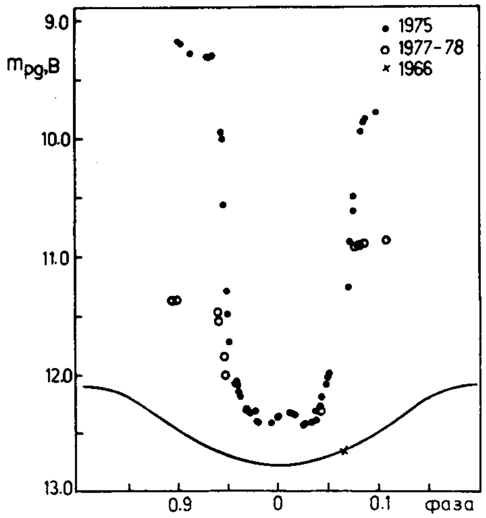


Fig.2 shows a correlation between the light-curve (in system B) of the eclipses of 1975 and 1977-78 (dots and open circles accordingly) and combined photographic one of CI Cyg before an outburst in 1971 (line). A cross placed near the last curve corresponds to the B magnitude of CI Cyg in 1966 (Belyakina, 1967). One can see that the duration of the minimum in 1975 was close to that of 1977-78 but they had different depths. Besides in 1975 the variable star was brighter before eclipse than after it. The reverse situation was observed in the minimum of 1977-78.

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References:

Belyakina, T.S. 1967, Izv. Krimsk. Astrophys. Obs. 38, 171

Belyakina, T.S. 1976, I.B.V.S. No. 1169

Belyakina, T.S. 1979, Izv. Krimsk. Astrophys. Obs. 59

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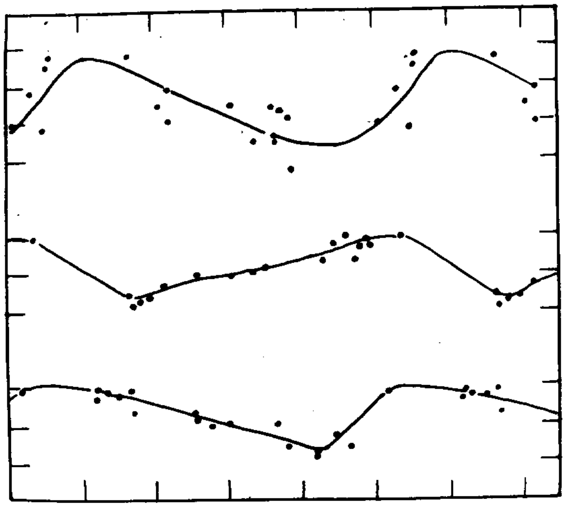
VX PUPPIS - A PUZZLE

About a dozen cepheids with periods between 1.5 and 6.3 days are known to have beat periods such that the ratio of secondary to primary period is close to 0.7 (e.g., Faulkner 1977). In most of the cases for which both light curves have been published, the secondary appears normal, in the sense that ascending light is steeper than descending. Stobie's (1970) curves for the secondary period of VX Puppis, to the contrary, show a markedly steeper descent. The periods given are $P_1=3^{d}.01172$ and $P_2=2^{d}.1370$, the latter having been found by first assuming a ratio close to 0.7. The curve, however, looks spurious, and on the basis of the same 17 sparse published observations used by Stobie (Mitchell 1964) I was able to obtain another period, $P_3= 1^{d}.8706$ for which the light curve is normal. The two periods are related by

$$1/P_3 = 1/\mathrm{Sid.Day} - 1/P_2 \ .$$

The visual light curves are shown in the Figure, where the upper plot shows the original observations represented by P_1. The second and third strips show how well the deviations of the observations from the smooth curve are represented by P_2 and P_3, respectively. An additional 12 later photoelectric observations by Takase (1969) roughly substantiate these periods.

From an observational standpoint one would intuitively favor P_3 over P_2; however, the ratio of P_3/P_1 is only 0.621 whereas theory (Stobie 1969) favors 0.7. That the primary period might be spurious as well is not likely. C.H. Payne-Gaposchkin (1952) published a period of $3^{d}.01209072$ based on 624 Harvard plates spanning about half a century. She made no mention of a secondary or beat period. Since the amplitudes Stobie found for the primary and secondary are comparable, the Harvard material should reveal beat phenomena. The GCVS does indicate that Russian astronomers have found an indication of a 10^{d} beat period. This is not obviously



Light curves for VX Pup. Upper, Observations represented by $P_1=3\overset{d}{.}01172$. Middle, Residuals from the smooth curve above fitted to $P_2=2\overset{d}{.}1349$. Lower, Residuals represented by $P_3=1\overset{d}{.}8706$. Markers at intervals of 0.2 period and 0.2 mag.

consistent with the periods given here. If the beat period were 15^d we would have very closely, $3P_1 = 7P_2 = 8P_3 = 15.0$, with no clear choice between P_2 and P_3.

Obviously this interesting star merits further investigation in order to resolve a possible conflict between observation and theory.

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References:
Faulkner, D.J. 1977, Ap.J. 216, 49
Mitchell, R.I.,Iriarte, B.I., Steinmetz, D. and Johnson,H.L. 1964, Tonantzintla-Tacubaya Bull. 3, 153
Payne-Gaposchkin, C.H. 1952, Ann.Harvard Coll.Obs.115, No.18
Stobie, R.S.,1969, M.N.R.A.S. 144, 511
Stobie,R.S., 1970, Observatory, 90, 20
Takase, B., 1969, Tokyo Ast.Bull. No. 191

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STARSPOTS ON THE RED DWARF GLIESE 490 A

Gliese 490 A is the brigther component (V=10.6) of the visual double BD +36°2322 (RA=$12^h55^m19^s$; Dec=+35°29ʹ.8; epoch 1950.0). The secondary (V=13.2) is 17 arcsec from the primary and has exceptionally strong emission lines according to Dyer (1954). Joy and Abt (1974) classified the stars as dM1.5e and dM3.5e, respectively, the e indicating hydrogen Balmer lines in emission.

Gliese 490 A was observed by Bopp and Espenak (1977) in their survey of M-dwarfs, looking for periodical low amplitude brightness variations due to starspots in the photospheres of these stars. They did not detect any variations in Gliese 490 A larger than about 0.01 mag.

We have observed Gliese 490 A with the 91 cm telescope and a pulse counting photometer at McDonald Observatory. The detector was a RCA C31034 photomultiplier cooled with dry ice to -78°C. The following filter combinations were used to approximate the UBVR-system:

U : 2 mm UG 2 + 2 mm BG 18
B : 4 mm BG 12+ 2 mm BG 18 + 1 mm GG 4
V : 3 mm GG 495+2 mm BG 18
R : 2 mm OG 550+1 mm RG 6

All measurements were done through a 16 arcsec circular diaphragm, and we were particularly concerned with centering Gliese 490 A to avoid any contribution from the fainter secondary star. Ten seconds integrations were done in each filter, and the data were reduced differentially with respect to the comparison stars SAO 63287 and SAO 63286. Extinction stars were measured several times each night.

We also measured the stars through two narrow band filters

Table 1

Differential magnitudes and colours in instrument system

Date (UT) April 1979	Gliese 490 A - SAO 63287 ΔV	Δ(U-B)	Δ(B-V)	Δ(V-R)	SAO 63287 - SAO 63286 ΔV	Δ(U-B)	Δ(B-V)	Δ(V-R)
3.44	2.86	0.58	0.43	0.42	0.12	0.01	0.01	0.01
4.23	2.84	0.54	0.43	0.41	0.14	0.02	0.02	0.01
4.45	2.82	0.55	0.44	0.39	0.14	0.01	0.01	0.01
5.23	2.83	0.58	0.43	0.41				
5.43	2.85	0.53	0.42	0.41				
6.20	2.90	0.56	0.42	0.42				
6.46	2.88	0.54	0.43	0.42				
9.33	2.88				0.12			

Table 2

H-alfa and H-beta indices for Gliese 490 A and comparison stars

Date (UT)	H-alfa index			H-beta index		
April 1979	490A	SAO 63287	SAO 63286	490A	SAO 63287	SAO 63286
3.44	0.757	0.748	0.758	2.551	2.674	2.674
4.23	0.751	0.750	0.752	2.601	2.663	2.676
4.45	0.748	0.749	0.744	2.561	2.673	2.680
5.23	0.737	0.748		2.604	2.674	
5.43	0.745	0.742		2.636	2.671	
6.20	0.747	0.745		2.608	2.682	
6.46	0.720	0.746		2.632	2.689	
Average	0.744	0.747	0.751	2.599	2.675	2.677
±s.d.	.012	.003	.007	.032	.008	.003

centered at H-beta (FWHM=30 A and 150 A, respectively) and through two filters centered at H-alfa (FWHM=55 A and 115 A, respectively). The H-beta and H-alfa indices defined as

$$\text{index} = -2.5 \log \frac{\text{Flux through narrow filter}}{\text{Flux through wide filter}}$$

are essentially extinction free.

Table 1 presents the broad band differential magnitudes and colours in the instrumental system. The accuracy is 0.01-0.02 mag (somewhat larger in U-B). We find that Gliese 490 A varies with a total amplitude of 0.08 mag in the V-band, but we are not able to detect significant changes in the colour indices.

Figure 1 indicates a period of about 3.1 days.

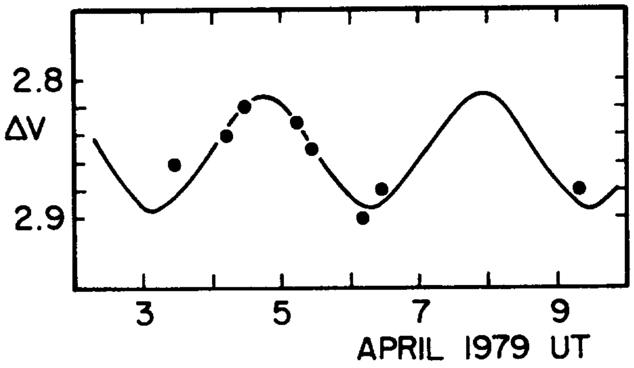

Table 2 presents the H-alfa and H-beta indices. They are found to be basically constant when we take into consideration the higher countrates from the comparison stars.

Gliese 490 A seems to be another example of a spotted red dwarf observed during periods when it had photometric spots and when it did not.

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References:
Bopp, B.W., Espenak, F., 1977, Astron.J. 82, 916
Dyer, E.R., 1954, Astron.J. 59, 218
Gliese, W., 1969,Astron.Rechen-Inst.Heidelberg Veröff.Nr.22
Joy, A.H., Abt,H.A., 1974, Astrophys. J. suppl. 28, 1

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TWO STARS NAMED KY AQUILAE

Dr.W.P. Bidelman recently called to my attention a confusion in the identification of KY Aql. At Harvard in 1932 I had discovered a star provisionally called HV 5429, 14.3 - 15.5pg. This is the star first assigned the designation KY Aql, and the corresponding data were included in the GCVS through the 1958 editions. Then Gessner (1958) discovered another variable close to this one and mistakenly assumed it to be KY Aql, even though she, herself, pointed out that her results did not substantiate mine. Bidelman noted that the position of an infrared source, which does appear to be the star that Gessner discovered, is about 1ʹ.3 north and 2 sec west of the position I gave. Figure 1 shows the relative positions of the two variable stars.

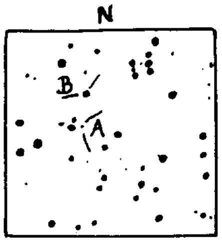

Figure 1. Finder chart, about 10ʹx 10ʹ, for the two stars called KY Aquilae. A = HV 5429; B = variable discussed by Gessner.

In my original publication I had indicated that HV 5429 might be a short period variable; indeed a period of 0.5023 day seemed promising although not quite acceptable. This result, however, must be considered as spurious. Some 50 plates of the MC series (16-inch Metcalf telescope) and only six MF (10-inch Metcalf) and 5 B (8-inch Bache) were available, all within the interval 1926-31. The basis for the assumption of the short period was that a maximum on an MC plate fell between two minima on the MF. Later I established that the color transmission of the MF is different from that of most of the other Harvard lenses: there is a sharp cut-off to the red of Hβ for the MF. Thus, if either the variable or one of its comparison stars is red, then there may well be systematic errors between the estimates made from the different plate series. Figure 2 shows the bulk of the observations on the MC plates alone. This suggests a probably irregular variable.

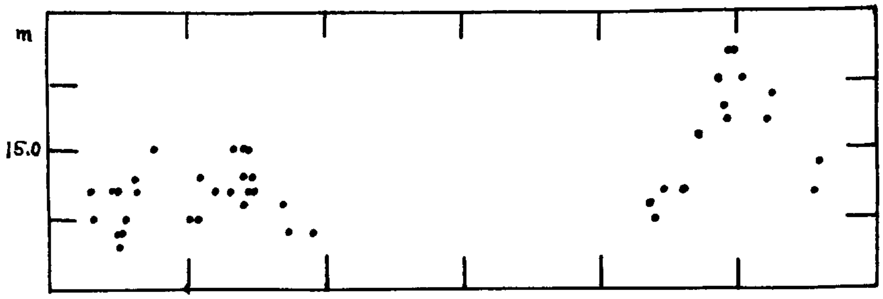

Figure 2. Observations of HV 5429 from JD 26100 to 26700; markers at intervals of 100 days. Ordinates, photographic magnitudes at intervals of 0.5 mag.

According to Bidelman this star does not have a late-type spectral class.

The question now is, which of the two variable stars is to retain the designation, KY Aquilae ?

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References:

Bidelman, W.P. 1978, Private communication

Gessner, H. 1958, Mitt der Veränderlichen Sterne, Sonneberg, Nr.366

Hoffleit, D. 1932, Bull. Harvard Coll. Observatory, No. 887, p. 9

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IMPROVED PERIODS FOR VARIABLES IN NGC 5897

In 1939 a series of plates of the globular cluster NGC 5897 was taken by H. Sawyer Hogg with the 90-cm telescope of the Steward Observatory. Additional plates were taken from 1946 to 1969 with the 185-cm reflector of the David Dunlap Observatory. Beginning in 1970 plates were taken by A. Wehlau with the 122-cm telescope of the University of Western Ontario.Because of the low altitude in the northern hemisphere at which we were forced to observe this cluster,blending of the image occurs on many of the plates and this,combined with the low amplitudes of the light curves for most of the variables, made it hard to determine the periods.

Since 1972 several series of plates have been taken with the 60-cm telescope of the University of Toronto located at the Las Campanas Observatory of the Hale Observatories. This has led to improved values for the periods of the 6 RR Lyrae variables listed in the 3rd Catalogue of Variable Stars in Globular Clusters (Sawyer Hogg, 1973). One of these, variable 7, which was discovered by Sandage and Katem (1968) was incorrectly identified as star 119 on their chart. It is actually star 161. In addition, variability is confirmed for their star 63 which they called possibly variable. A period has also been derived for this star,variable 8. Variable 5 is a red variable still under investigation.

No variation can be seen on our plates for the UV-bright star No.2 discovered by Zinn, Newell and Gibson (1972). Variability of this star was reported by Samus (1976) who suggested two possible periods.

Table 1 lists the periods we have obtained as well as the values of V and B-V given by Sandage and Katem. There appears to be no doubt that variables 1 and 6 have unusually long periods. These two stars both lie at the red edge of the variable star gap and the other five RR Lyrae stars lie near the blue edge.The only star which falls between these two groups of variables on the horizontal branch is star 120 of Sandage and Katem. Photoelectric observations of this variable would be valuable.

Table 1

RR Lyrae Stars in NGC 5897

Var.	Per.	Sandage No.	V	B-V
1	0.79730	351	16.14	0.50
2	0.45392	299	16.20	0.28
3	0.41993	206	16.20	0.25
4	0.33559	-	-	-
6	0.85623	118	16.39	0.55
7	0.35049	161	16.27	0.24
8	0.34180	63	16.35	0.26

The periods for variables 1, 4, 6 and 7 given here differ from those determined earlier from the northern hemisphere plates (Wehlau, Sawyer Hogg, and Potts, 1972). For variables 2 and 3 the periods are only slightly different from those given earlier. The correct variable 7 and the new variable 8 have not been measured on the older plates and the older measures of variable 4 are not considered reliable since the image for variable 4 is blended with that of another star.

Although there are not many variables in NGC 5897, the lack of variables with periods from 0.46 day to 0.79 day is quite unusual and the variables in this cluster deserve further study. The authors plan to obtain more plates of this cluster during the summer of 1979 and to publish their results in more detail including blue and visual light curves for the variables.

We wish to thank Dr. Sandage for the use of his plates and to gratefully acknowledge the financial support of the National Research Council of Canada.

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References:

Samus, N.N. 1976, Astron.Circ. No. 899
Sandage, A. and Katem, B. 1968, Astrophys. J. 153, 569
Sawyer Hogg, H.B. 1973, Pub.David Dunlap Obs. 3, No.6, 58
Wehlau, A., Sawyer Hogg, H., and Potts, N. 1972, J.R. Astron. Soc. Can. 66, 72
Zinn, R., Newell, E., and Gibson, J. 1972, Astron.Astrophys.18,390

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PHOTOELECTRIC MINIMA AND NEW LIGHT ELEMENTS OF W UMa

The variability of the short period eclipsing variable W Ursae Majoris (BD +56°1400, HD 83950) was discovered by Müller and Kempf (1903) at the beginning of this century. Previous observational data were well summarized up to now by several authors. They have given different light elements for different intervals of cycles. Kwee (1956) suggested that W UMa was a triple system.

The observations in B and V were made at the Ege University observatory. The light curve obtained from these observations has been published by Evren et al. (1979). The photoelectric minima obtained recently are given in the following table.

Times of minima

JD Hel.	$(O-C)_I$	$(O-C)_{II}$	Minimum type
2443 563.3995	-.0016	.0006	primary
564.4005	-.0015	.0006	"
928.3998	-.0013	-.0001	"
928.5658	-.0021	-.0009	secondary
929.4009	-.0011	.0001	primary
929.5668	-.0021	-.0008	secondary
930.4019	-.0011	.0002	primary

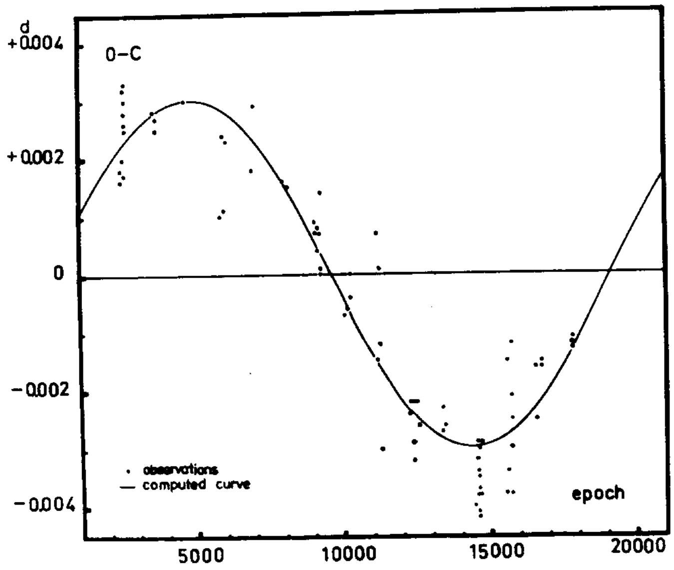
The photoelectric Min I observations from 1965 to 1979 March were collected and the $(O-C)_I$ values were calculated from the following light elements (Equ.1).

$$\text{Min I} = \text{JD Hel. } 2437986.9742 + 0\overset{d}{.}33363808 \cdot E \qquad (1)$$

The $(O-C)_I$ variation is shown in the Figure. The new light elements computed and the observations from 1965 to 1979 March are represented with the following equation, on the assumption that the $(O-C)_I$ variation shows a sinusoidal curve;

$$\text{Min I} = \text{JD Hel. } \underset{\pm 5}{2437986.97426} + 0\overset{d}{.}\underset{\pm 6}{33363808} \cdot E +$$

$$0\overset{d}{.}\underset{\pm 4}{00302} \cdot \sin(E \cdot 2\pi / \underset{\pm 1}{19200.9}) \qquad (2)$$



The $(O-C)_{II}$ values in the table are differences between observations and calculations with the new light elements (Equ.2).

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References:
Evren, S., Tunca, Z. and Tümer, O., 1979, I.B.V.S. No. 1577
Kwee, K.K., 1956, B.A.N. 12, 330
Müller, G. and Kempf, P., 1903, Ap.J. 17, 201

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Budapest
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PREDISCOVERY LIGHTCURVE OF NOVALIKE OBJECT KUWANO IN VULPECULA

Sonneberg Sky Patrol plates, taken by H. Huth, show that the rise to maximum of this object, which was discovered by Kuwano at $20^{h}19\overset{m}{.}0$ $+21^{\circ}25'$ (1950) (IAUC 3344), was well underway in the spring of 1978 already. The following estimates could be made on the exposures mentioned :

Date 1978 UT	J.D. 244...	m_{pg}	m_{pv}	
March 8.13	3575.63	$>14\overset{m}{.}0$	$>13\overset{m}{.}0$	
April 7.08	3605.58	13.5	>12.5	
July 27.91	3717.41	-	>11.0	poor plate
July 30.97	3720.47	11.4	11.2	
Aug. 6.90	3727.40	-	>10.0	poor plate
Aug. 28.89	3749.39	11.1	10.6	
Oct. 7.86	3789.36	10.2	9.9	
Nov. 1.77	3814.27	-	10.2	
Dec. 4.72	3847.22	-	9.55	

(> means: invisible fainter than)

Comparison stars	B	V	Reference
HDE 351704	$9\overset{m}{.}4$	$9\overset{m}{.}3$	Die Sterne <u>43</u>,21
HDE 351584	10.0	9.8	"
USNO 17569	11.2	10.8	Hoag Catalogue

The Tri-X brightness of 10^{m} on 1978 Aug. 21.52 UT of Honda (IAUC 3348) fits to our series.

By comparing the two overlapping fields 276 and 1608 of the POSS at the given position a variable object can easily be identified which with high probability is the pre-outburst phase of the star.

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COMMENTS ON THE VARIABILITY OF HD 219018, COMPARISON STAR TO SZ Psc

HD 219018 has long been used as a very convenient comparison star to the important RS CVn binary SZ Psc. It was claimed in Jakate et al. (1976) that the non-variability of HD 219018 had been established through observations by Bakos in 1957 and again by myself in 1974, although no details were given. The recent announcement by Jakate (1979) that this star is in fact variable on a scale of about 0.1 mag has therefore proved very disconcerting, and,of course, casts doubt on earlier conclusions regarding SZ Psc itself. I have, therefore, re-examined the photometry of HD 219018 that I obtained at the Las Campanas Observatory, Chile, in September 1974, in case Bakos' earlier conclusion had somehow subconsciously affected my own conclusion that the star is not variable.

The observations consisted of BVRI photometry made sporadically on seven consecutive nights, during which I was searching for an eclipse of SZ Psc. This was found on September 17/18, and on that night there are observations extending over six hours or more.

Table 1

NIGHT-TO-NIGHT PHOTOMETRY OF HD 219018

Date	V (Absolute)	ΔV (219018-220825)
1974 Sep. 14/15	7.70	2.776
15/16	7.70	-
16/17	7.69	2.779
17/18	7.71	2.781
18/19	7.70	2.774
19/20	7.69	2.783
20/21	7.68	2.777

The sporadic night-to-night observations are listed in Table 1 with results shown in two ways. Absolute results were obtained by treating HD 219018 merely as another program star reduced with respect to the general set of standards, and differential results were obtained by comparing HD 219018 to HD 220825 only, the latter being a nearby bright standard.Neither column offers any evidence for variability on a scale of 0.1 mag.

Such observations, however, do not entirely rule out the possibility that HD 219018 is variable with a period close to 1^{d}. Table 2, therefore, lists a selection of observations spanning about six hours made during the time SZ Psc was undergoing eclipse. (Space precludes showing all the observations, but their use would not change any conclusions.) Again it is clear that there is no variability exceeding 0.01 mag during the six hours.

Table 2

ABSOLUTE PHOTOMETRY OF SEP. 17/18, 1974

U.T.	V	U.T.	V	U.T.	V
23^{h}:51	7.70	03:08	7.70	04:44	7.71
00:06	7.72	03:35	7.71	05:14	7.70
00:22	7.70	04:09	7.71	05:46	7.70

If we now set aside these results and consider those of Jakate (1979), the following comments may be made. Jakate's conclusions are not the result of random photometric errors, because the differential magnitudes in his Table 1 show a very smooth sinusoidal variation. If nightly means are taken, I find they can be fitted to within 0.01 mag by the expression

$$\Delta V = 0.438 + 0.038 \sin \left[\frac{360\,(JD-JO_{o})}{9.0}\right]$$

where JD_{o}= 2443812.1.

A period of $9^{d}.0$ is suggested.

The colours of HD 219018 (given in Jakate et al.,1976) show with little uncertainty that it is a G1 V star. (At this spectral type the U-B vs B-V diagram distinguishes dwarfs from other luminosity classes quite accurately). It is therefore very unlikely that it is a pulsating variable of any period. Could it be a binary ? (It is known to be a close visual binary - AD8 16591 - of period 29.5 years (Baize 1955), but this seems irrelevant here.) Jakate's own nightly observations seem to rule out any W UMa variability, as of course do those in Table 2. Could it be an ellipsoidal binary ? If the primary is G1 V, then $(m_1+m_2)>1.0 m_{\odot}$, and with an orbital period now of 18^{d}, the semimajor axis of the relative orbit is >29 $R_{\odot}$. It seems most improbable that a G dwarf could be significantly distorted by the presence of a similar star 30 stellar radii away. Thus a binary interpretation looks unpromising.

Hence, not only do the 1974 observations disagree with Jakate's findings, but his own observations are difficult to account for by any reasonable model.

There are only two explanations that occur to me: (a) It is Jakate's check star, HD 219150, that is in fact variable, despite the apparent contradiction in his Table 2; or (b) HD 219018 or its optical companion has a rotational period of $9\overset{d}{.}0$ and developed severe starspots between 1974 and 1978 that modulated the brightness at the later epoch. It is intended to obtain further observations this coming season to investigate these alternatives. Meanwhile, it does not seem likely that any earlier conclusions regarding SZ Psc were vitiated by variability in HD 219018.

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References:

Baize, P. 1955, J. des Observateurs, 38, 57

Jakate, S.M. 1979, I.B.V.S. No. 1578

Jakate, S.M., Bakos, G.A., Fernie, J.D., and Heard, J.F. 1976, A.J., 81, 250

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PHOTOELECTRIC OBSERVATIONS OF THE 1946 OUTBURST OF THE RECURRENT NOVA T CORONAE BOREALIS

The outburst of T CrB on 9 February 1946 occurred just as a study of the characteristics of photomultipliers, wide-band filters, amplifiers, and recording devices was getting under way at the Lick Observatory. Now, these many years later, with the benefit of experience and photometric catalogs, it is possible to reduce some photoelectric observations made at that time to the UBV system.

The observations consist of tracings of the brightness of T CrB and comparison stars on an Esterline-Angus recorder made with the Lick 12-inch (30cm) refractor. Magnitude differences between T CrB and Delta CrB were measured through no filter at all or a neutral glass filter to equalize the size of the deflections. Colors were measured through two Corning filters: 5mm BPu for the blue and 2.01mm Noviol A for the yellow. Three multipliers were used: RCA 931A on 10 February, 1P21b on 12, 13, and 14 February, and 1P21a on the rest of the nights. The effective wavelength of the unfiltered observations is about 4300 Å; hence, in Table I the brightness of T CrB is expressed as B. It is based on the difference in magnitude, corrected for the difference in color between the two stars, and V = $+4^{m}.64$ and B-V = $+0^{m}.80$ for Delta CrB.

TABLE I

Observations of the 1946 Outburst of T CrB

Date (UT)	JD (Hel) 2430000+	B	average deviation	B-V	average deviation	no. of obser.
10 Feb.	1861.961	$3^{\mathrm{m}}.68$	± $0^{\mathrm{m}}.10$			4
	1862.021	3.66	± 0.05			11
	.063			$+0^{\mathrm{m}}.1$		1
12 Feb.	1863.925			+0.27		1
	.951	4.85	± 0.01			4
	.984	4.87				3
13 Feb.	1864.942	5.29				3
	.985			+0.07	± $0^{\mathrm{m}}.01$	5
	1865.003	5.35				3
14 Feb.	1865.949	5.71				3
	.979			+0.13	± 0.05	5
	1866.013	5.70				3
23 Feb.	1874.964	9.11				3
	.965			+0.4		2
24 Feb.	1875.907	9.44				2
	.909			+0.52		2
26 Feb.	1877.906	9.35				3
	.909			+0.50		2
1 Mar.	1880.904			+0.50		2
	.905	9.66	± 0.01			4
5 Mar.	1884.889	10.10				3
	.891			+0.55		2
8 Mar.	1887.903	10.17				3
	.903			+0.63		2

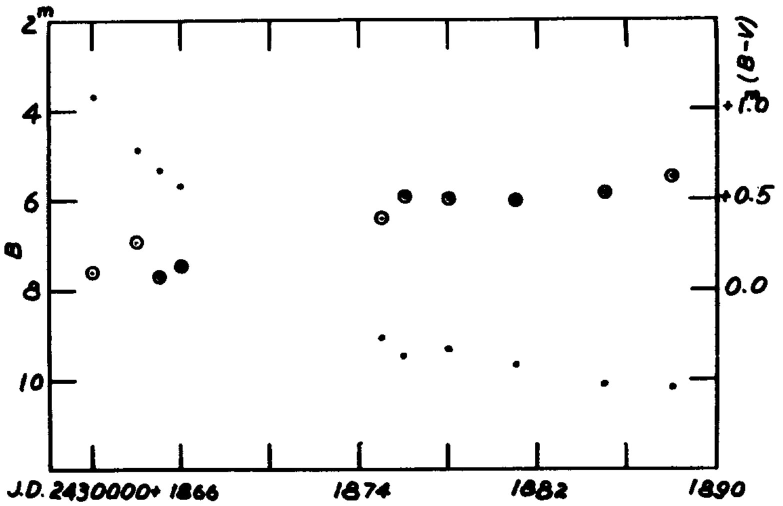

Figure 1. Magnitude (dots) and color (circled dots) of T CrB
after the 1946 outburst.

The transformation from the photoelectric b-y system to B-V is linear in the range of color variation observed in T CrB. Delta CrB was the primary comparison star among the eight observed. The observations were made by G.E. Kron assisted by H.L. Johnson. The data of Table I are plotted in Fig. 1 where smaller dots indicate greater uncertainty.

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DISCOVERY OF A PERIOD IN THE SYMBIOTIC STAR AG DRACONIS

AG Dra is a well-known symbiotic star. Its photographic light-curve resembles that of the nova-like stars (Robinson, 1969; Splittgerber, 1974). Since 1955 this star has been in a quiet phase and has shown only small variations about the minimum light.

Since February 1974 I have observed AG Dra photoelectrically in U, B, V with the 60cm-reflektor II of Sonneberg Observatory. During this time the star has been slowly variable with small amplitude in V and B, but with large amplitude in U (see Fig.1). The same behaviour was observed by Beljakina (1969) in 1965 .... 1967.Beljakina (l.c.) concluded from her observations that the variations were irregular, which, however, is not the case. The U variations are clearly periodic with the following elements:

$$U_{max} = \text{J.D. } 243\,8900 + 554^{d} \cdot E.$$

There are good reasons for assuming that all symbiotic stars are binaries containing an evolved red giant and a hot main sequence or white dwarf companion (Bath,1977; Allen, 1978). But so far only three stars of this class could definitively been shown to be binaries (by T CrB; AR Pav; AG Peg; see Allen 1978). I think that the observations of AG Dra given in this paper could well be explained by binary motion of a hot source. But before a reliable model can be constructed, there are more photoelectric and spectroscopic observations necessary.

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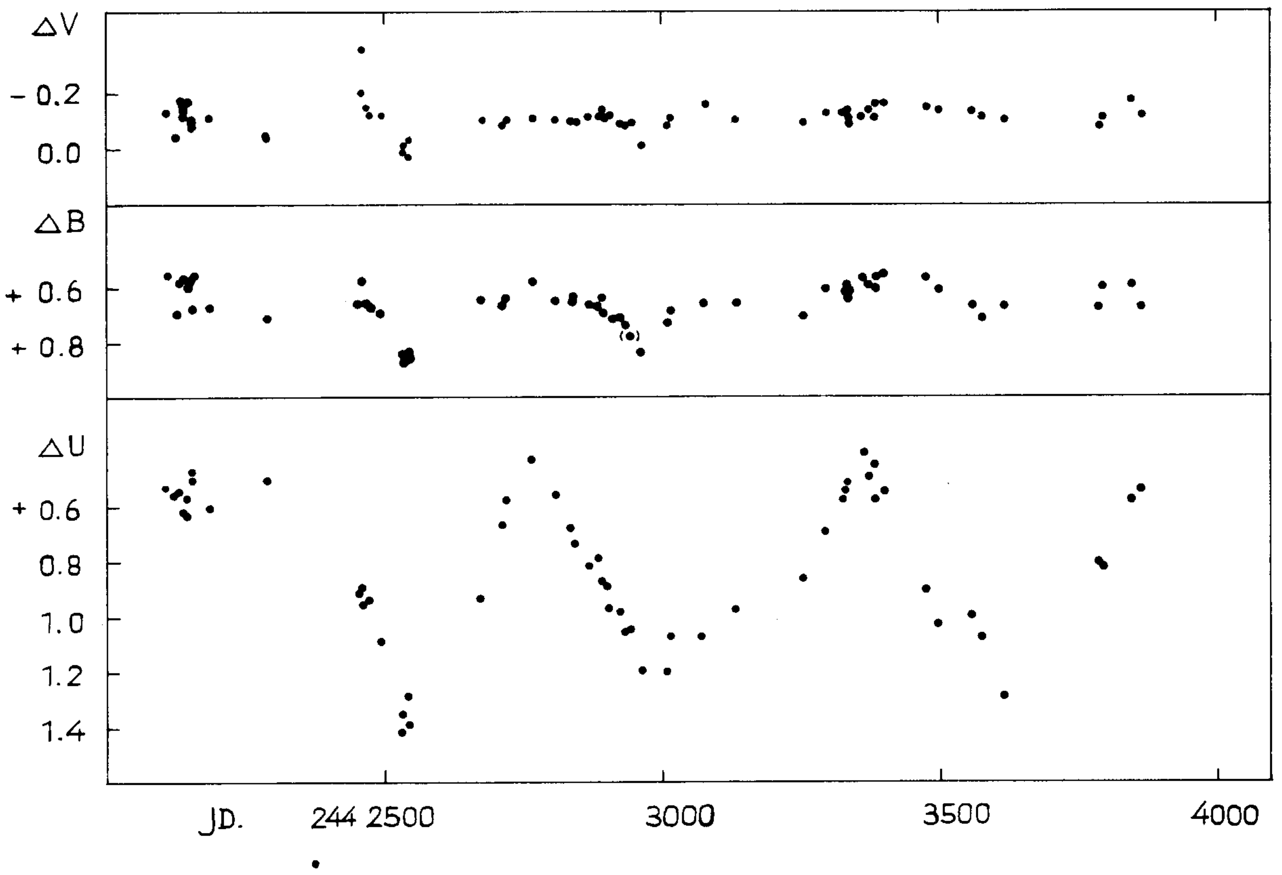
References:
Allen, D.A. 1978, Anglo-Australian Obs. No. 12
Bath, G.T. 1977, MN 178, 203
Beljakina, T.S. 1969, Iswest.Krim Obs. 40, 39
Robinson, L. 1969, VS 16, 507
Splittgerber, E.,1974, Mitt. veränderl.Sterne 6, 193



ΔV
− 0.2
0.0
ΔB
+ 0.6
+ 0.8
ΔU
+ 0.6
0.8
1.0
1.2
1.4
JD.
244 2500
3000
3500
4000

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SPIKE FLARES OF UV Ceti

During 2-9 December 1975 the flare star UV Ceti [R.A. = $01^h36^m24^s$, declination = $-18^\circ13'$ (1950), visual magnitude 12,9 at minimum, spectral type dM5,5e] was monitored at Boyden Observatory with the 41 cm Nishimura reflector. A Johnson B filter and an uncooled EMI 6256 A photomultiplier tube were used in the observations. The two flares of $\frac{I_{0+f}-I_0}{I_0}$ equal to 14,20 and 3,09 were visually confirmed on the night of 2/3 December in the 15cm finder.

Of the 38 other flares recorded during this period 36 were spike flares, either single flares or in the form of a spike complex. Their $\frac{I_{0+f}-I_0}{I_0}$ values were between 1,00 and 2,17 with durations generally between 3 and 12 seconds.

The data is presented in the table, following the proposals to flare star observers (1). Examples of light curves representing a selection of the flares are shown in Figures 1-16.

On past occasions we have reported similar spike flares from UV Ceti (references 2-5), using the terminology suggested by Moffett (6).

Our data reduction has been greatly facilitated by the kindness of Prof. F.D.I. Hodgson, Director of the Institute of Groundwater Studies at the Universtiy, in making available his institutes' Hewlett Packard Model 9825 microcomputer and digitizer.

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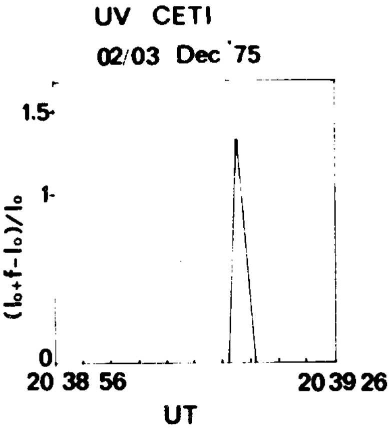
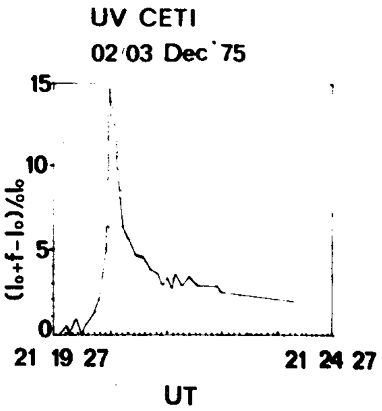
DATE 1975	MONITORING TIME U.T.	FLARE MAXIMUM U.T.	$\frac{I_{o+f}-I_o}{I_o}$	$2.5 \log[\frac{I_{o+f}-I_o}{I_o}]$	σ(mag) $= -2.5 \log \frac{\lvert\sigma\rvert}{I_o}$	$m_{lim}-m_o$ $= \sigma(mag)-1.19$
2 December	$18^h05^m29^s$ - $18^h27^m06^s$	* $19^h37^m17^s$	1,14	0,15	2,10	0,91
	18 31 24 - 18 53 12	* 19 56 13	1,18	0,18	1,90	0,71
	18 57 12 - 19 05 06	* 20 00 42	1,22	0,21	1,90	0,71
	19 07 54 - 22 00 00	* 20 01 12	1,14	0,14	1,90	0,71
		* 20 39 16	1,29	0,27	2,13	0,95
		x 21 20 30	14,20	2,88	2,04	0,85
		x 21 45 07	3,09	1,23	1,98	0,79
3 December	18 01 18 - 18 45 28	* 18 29 25	1,13	0,13	1,98	0,79
	18 49 32 - 19 01 00	** 19 25 52	1,23	0,23	2,03	0,84
	19 04 12 - 22 00 15	19 28 55	1,37	0,34	2,03	0,84
		* 19 50 05	1,57	0,49	1,87	0,68
		* 20 39 42	1,39	0,36	2,03	0,84
		* 20 44 43	1,63	0,53	2,03	0,84
		* 20 49 43	1,42	0,38	2,03	0,84
		** 20 56 18	1,49	0,43	2,03	0,84
		** 21 16 45	1,07	0,07	2,03	0,84
		* 21 31 58	1,48	0,43	1,93	0,74
		* 21 35 44	1,55	0,48	1,93	0,74
		** 21 38 41	1,03	0,03	1,93	0,74
		* 21 42 02	1,29	0,28	1,93	0,74

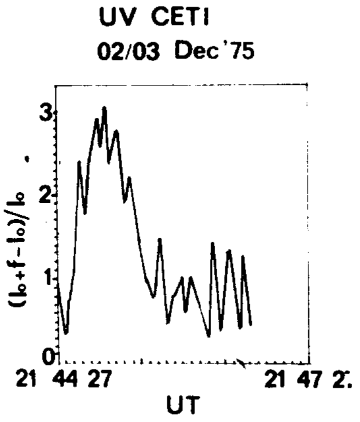
x Visually Confirmed
* Spike
** Spike Complex

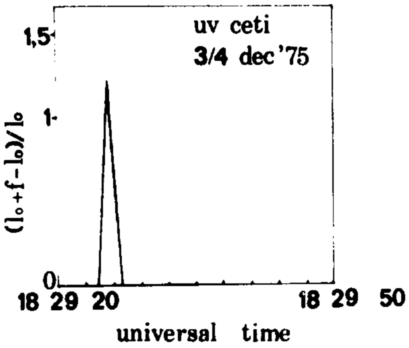
DATE 1975	MONITORING TIME U.T.	FLARE MAXIMUM U.T.	$\frac{I_{o+f}-I_o}{I_o}$	$2.5 \log[\frac{I_{o+f}-I_o}{I_o}]$	$\sigma(mag) = -2.5 \log \frac{\lvert\sigma\rvert}{I_o}$	$m_{lim}-m_o = \sigma(mag)-1.19$
7 December	$18^h17^m15^s$ - $18^h45^m04^s$ 18 49 02 - 18 36 01 18 39 06 - 22 01 14	* $18^h56^m03^s$	1,38	0,35	1,78	0,59
		** 19 58 52	1,38	0,35	1,78	0,59
		20 17 58	1,56	0,48	1,81	0,62
		** 20 22 26	1,26	0,25	1,81	0,62
		* 20 33 45	1,42	0,38	1,81	0,62
		* 21 02 46	1,28	0,27	1,68	0,49
		* 21 06 32	1,84	0,66	1,68	0,49
		* 21 12 46	2,17	0,84	1,68	0,49
		** 21 22 45	2,04	0,78	1,68	0,49
		** 21 22 55	1,79	0,63	1,68	0,49
		* 21 23 38	1,53	0,46	1,68	0,49
		* 21 24 18	1,28	0,27	1,68	0,49
		* 21 45 30	1,82	0,65	1,68	0,49
		* 21 49 20	1,45	0,40	1,68	0,49
8 December	18 24 26 - 18 34 18 18 38 00 - 18 41 18 18 45 06 - 22 00 18	* 20 55 16	1,13	0,13	2,00	0,81
		* 21 01 08	1,18	0,18	1,81	0,62
		* 21 02 38	1,00	0,00	1,81	0,62
		* 21 39 12	1,44	0,40	1,81	0,62
		* 21 48 09	1,50	0,44	1,81	0,62
		* 21 53 27	1,39	0,36	1,81	0,62
9 December	18 04 14 - 18 36 14 18 42 00 - 19 07 36 19 12 18 - 23 00 10	NO FLARES RECORDED				

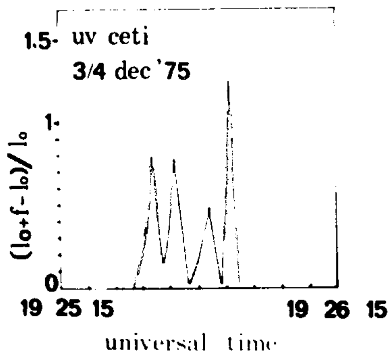
x Visually Confirmed
* Spike
** Spike Complex


UV CETI
02/03 Dec '75
1.5
1
0
(I0+f-I0)/I0
20 38 56
20 39 26
UT


UV CETI
02/03 Dec '75
15
10
5
0
(I0+f-I0)/I0
21 19 27
21 24 27
UT


UV CETI
02/03 Dec '75
3
2
1
0
(I0+f-I0)/I0
21 44 27
21 47 2
UT


uv ceti
3/4 dec '75
1,5
1
0
(I0+f-I0)/I0
18 29 20
18 29 50
universal time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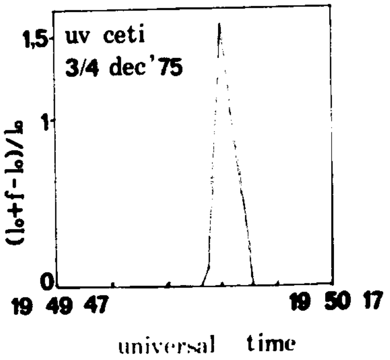
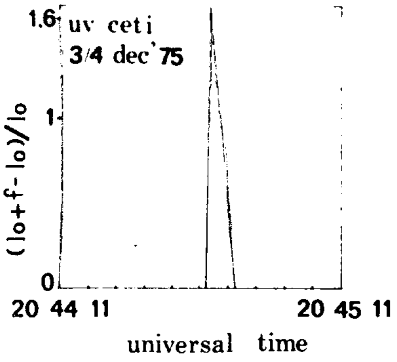
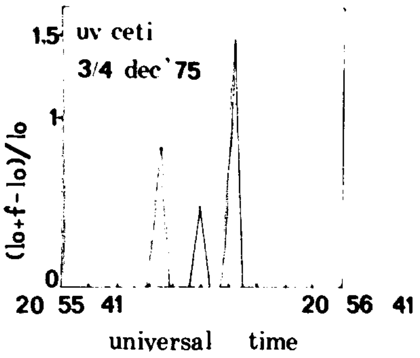
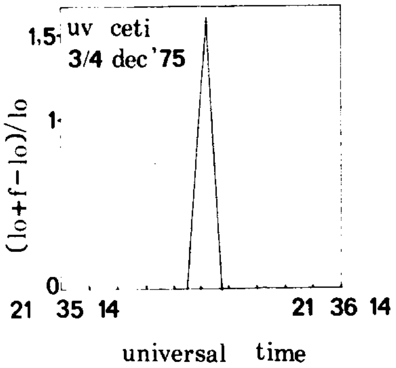
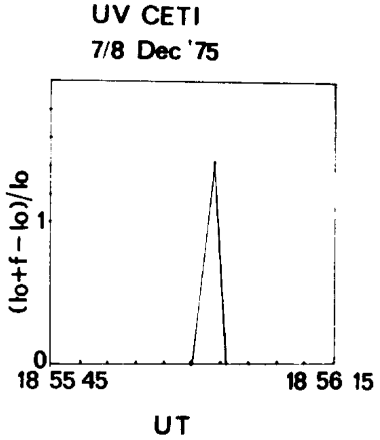
3/4 dec '75
1.5
1
0
(I0+f-I0)/I0
19 25 15
19 26 15
universal time

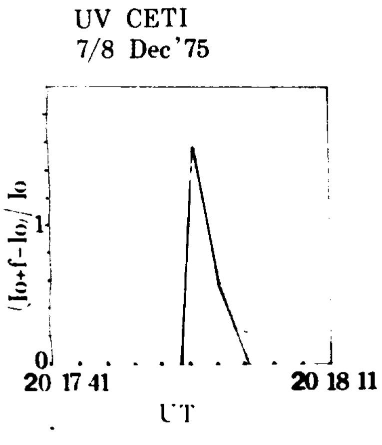

uv ceti
3/4 dec '75
1,5
1
0
(I0+f-I0)/I0
19 49 47
19 50 17
universal time

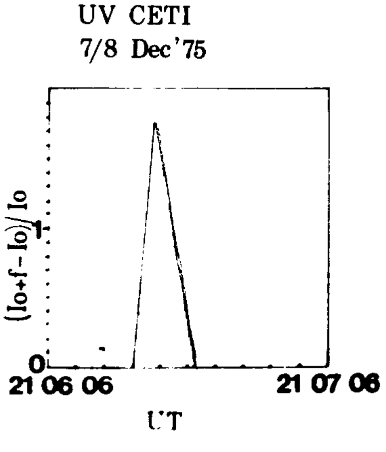

uv ceti
3/4 dec'75
1.6
1
0
(Io+f-Io)/Io
20 44 11
20 45 11
universal time


uv ceti
3/4 dec'75
1.5
1
0
(Io+f-Io)/Io
20 55 41
20 56 41
universal time

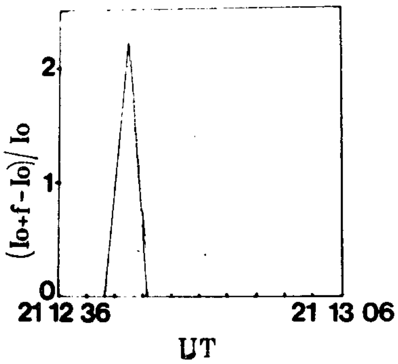

uv ceti
3/4 dec'75
1.5
1
0
(Io+f-Io)/Io
21 35 14
21 36 14
universal time


UV CETI
7/8 Dec'75
1
0
(Io+f-Io)/Io
18 55 45
18 56 15
UT

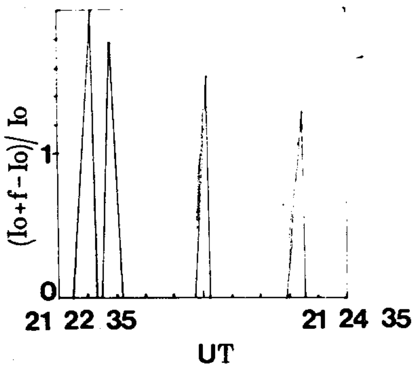

UV CETI
7/8 Dec'75
1
0
(Io+f-Io)/Io
20 17 41
20 18 11
UT


UV CETI
7/8 Dec'75
1
0
(Io+f-Io)/Io
21 06 06
21 07 06
UT

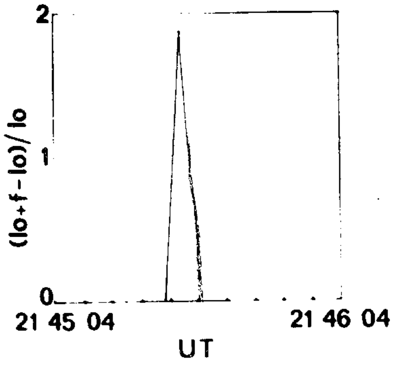
UV CETI
7/8 Dec'75



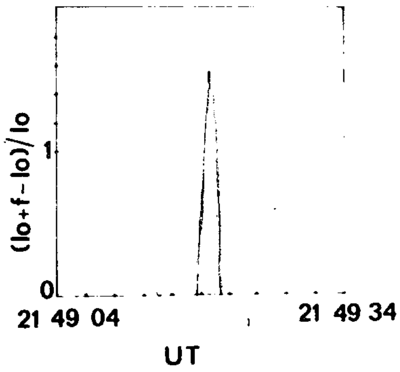
UV CETI
7/8 Dec'75



UV CETI
7/8 Dec'75



UV CETI
7/8 Dec'75



References:

1) Andrews, A.D., Chugainov, P.F., Gershberg, R.E. and Oskanian, V.S., 1969, I.B.V.S. No. 326
2) Jarrett, A.H. and Gibson, J.B., 1975, I.B.V.S. No. 979
3) Jarrett, A.H. and Gibson, J.B., 1975, I.B.V.S. No.1017
4) Jarrett, A.H. and Gibson, J.B., 1976, I.B.V.S. No.1105
5) Jarrett, A.H. and J. van Rooyen, 1979,I.B.V.S. No.1585
6) Moffett, T.J., 1974, Sky and Telescope, <u>48</u>, 94

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1613

Konkoly Observatory
Budapest
1979 May 28

REVISED PHOTOMETRIC ELEMENTS OF AY CAM

The eclipsing binary AY Camelopardalis was discovered by Strohmeier and Knigge (1961), and was observed during the years 1966-1968 by Tempesti (1969), who found out that the period of the variable is $2^{d}.7349658$, i.e. twice the one found earlier.

Tempesti also obtained a solution for the photometric and geometric elements using the procedure of Russell and Merrill (1952), assuming primary minimum is due to an annular eclipse, but found some departure of the model from the true system.

Using the normal points given by Tempesti (1969), reduced to 100 points in order to save computing time, we have calculated a set of photometric and geometric elements for AY Cam with the method by Wood (1971, 1973-1978). The solution, shown in the table, confirms the annular type of the eclipse occurring at primary minimum.

Table*)

adjusted parameters	fixed parameters	
$i = 88^{\circ}.0 \pm 0.2$	$\log g_1 = \log g_2 = 4.3$	
$r_1 = 0.221 \pm 0.001$	$w_1 = w_2 = 0.5$	
$\kappa = r_2/r_1 = 0.747 \pm 0.002$	$n_1 = n_2 = 5.0$	
$\beta_1 = 0.080 \pm 0.023$	auxiliary parameters	
$\beta_2 = 0.080 \pm 0.054$	$a_1 = 0.225$	$a_2 = 0.167$
$x_1 = 0.6 \pm 0.2$	$b_1 = 0.222$	$b_2 = 0.166$
$x_2 = 0.6 \pm 0.2$	$c_1 = 0.220$	$c_2 = 0.165$
$T_{1,eq} = 6890\ ^{\circ}K \pm 10$	$T_{1,pol} = 6910\ ^{\circ}K$	
$T_{2,eq} = 7000\ ^{\circ}K \pm 10$	$T_{2,pol} = 7020\ ^{\circ}K$	
$q = m_2/m_1 = 0.83 \pm 0.10$	$L_1 = 0.626$	
	$L_2 = 0.374$	

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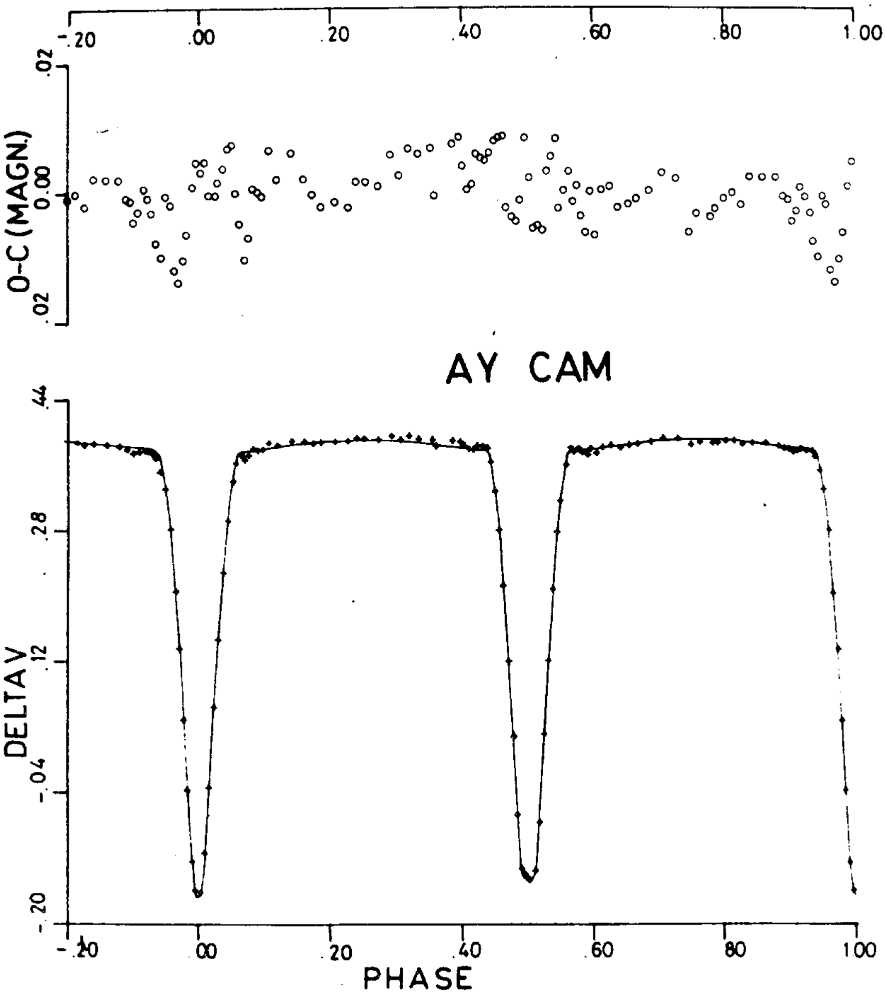
*) for the explanation of the symbols used, see Wood (1971); also Mancuso et al. (1978).


-.20
.00
.20
.40
.60
.80
1.00
.02
0.00
.02
O-C (MAGN.)
AY CAM
.44
.28
.12
-.04
-.20
DELTA V
-.20
.00
.20
.40
.60
.80
1.00
PHASE

The value of the mass ratio, although poorely determined, gives for the quantities y_{11}, y_{12} of the Roche lobes the values 0.391 and 0.357, respectively (Plavec and Kratochvil, 1964). A comparison with the semi-axis of the components reveals that AY Cam is a normal detached system, made of two main sequence stars, which are well inside their respective critical lobes. The values of the temperature correspond to two F0-F2 stars, as indicated by the B-V curve of Tempesti (1969). In the figure we give the computed lightcurve, plotted among the observed normal points, and the detail of the O-C (in magnitude units) obtained. In contrast with the most complete model we adopted, the non-random distribution of the O-C's displays the existence of some effect which has not yet been identified.

An accurate multicolour photometry, as well as spectrographic observations, are needed in order to get a better comprehension of the physical conditions of this system.

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References

Mancuso S., Milano L. and Russo G.: 1978, Astron. Astrophys. 63, 193
Plavec M. and Kratochvil P.: 1964, Bull. Astron. Inst. Czecosl. 15, 165
Russel H.N. and Merrill J.E.: 1952, Contr. Princeton n° 26
Strohmeier W. and Knigge R.: 1961, Bambery Mitt.Veränd. Sterne 5, n. 10
Tempesti P.: 1969, Mem. Soc. Astron. It. 40, 345
Wood D.B.: 1971, Astron. J. 76, 701
Wood D.B.: 1973-1978, Wink Status Report no. 1-9 (circulars).

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INFORMATION BULLETIN ON VARIABLE STARS
Number 1614

Konkoly Observatory
Budapest
1979 May 30

IU AURIGAE: THE ORBITAL INCLINATION CONTINUES TO INCREASE

The eclipsing binary IU Aurigae is remarkable in that it has well-defined eclipses which have increased steadily in depth over the last few decades. This behavior has been interpreted as a manifestation of the increasing orbital inclination that results from precession of the plane of the eclipsing binary in a triple system (Mayer 1971, Eaton 1978). I have observed this star in yellow light during Winter 1978-79 to monitor the rate of increase of the eclipse depths. I find that the depths of both eclipses have continued to increase at a rate consistent with that found by Mayer (1971, 1976). Interpreted through my previous light curve solution (Eaton 1978), the increased eclipse depths indicate that the orbital inclination is continuing to increase by about 0.5 degree/year.

The Figure shows yellow observations for the epoch 1979.0 obtained at the Black Moshannon Observatory of Pennsylvania State University. Small dots represent individual measurements obtained during eclipses while the larger dots correspond to the averages of several (typically four) observations at phases out of eclipse. The solid curve is a smoothed representation of my previous yellow observations (Epoch 1974.9). Phases for the 1979 data have been computed with the latest non-linear elements of Mayer (1976). These elements are beginning to reach the limits of their uncertainties; a series of well-determined times of minimum next season would make it possible to increase their accuracy significantly. Although I was unable to observe a complete eclipse, we can estimate a time of minimum for this year by comparing two observations at phase 0.063 obtained on JD2443848 with those around phase 0.933 obtained on JD2443853. It is $JD_{\odot}2443853.844 \pm 0.004$.

This star should continue to undergo light curve changes for the next decade. The present inclination being about 85°, the eclipses will increase in depth to totality over the next eight years. Eclipses should be total for a period of a little more than four years after that. In other words, my solution predicts a

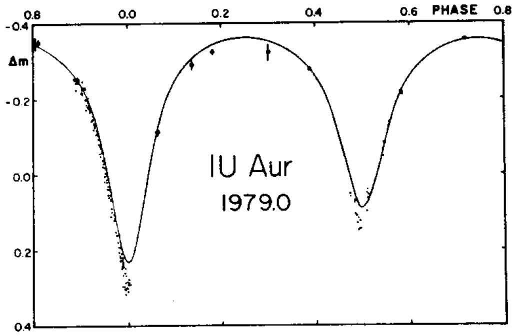

Figure. Recent yellow observations of IU Aur obtained to monitor the light curve changes. The magnitude differences are with respect to HD35619 and are within 0.001 mag of V magnitude differences.

central eclipse at about 1989. However, the present solutions are uncertain in that aliasing between inclination and third light makes it difficult to determine the inclination at any particular epoch to better than about two degrees. So observations should be obtained every couple of yeras from now on to monitor the light curve changes. A complete light curve for this binary near $i = 90^{\circ}$ will be especially useful in obtaining a more definitive solution to the light variation. This is desirable in order to study the triple-system interaction, to determine the limb-darkening coefficients of a B0 star, and to define better the degree of gravity darkening of this star.

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References:
Eaton, J. A. 1978, Acta Astr., 28, 63.
Mayer, P. 1971, Bull. Astr. Inst. Czechoslovakia, 22, 168.
Mayer, P. 1976, Bull. Astr. Inst. Czechoslovakia, 27, 308.

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INFORMATION BULLETIN ON VARIABLE STARS
Number 1615

Konkoly Observatory
Budapest
1979 May 31

HD 200925, A NEW SHORT PERIOD VARIABLE STAR

The discovery of a new variable star sometimes follows an unpredictable pattern. In our case, a search of variable stars with metallic lines (Am) of short period led us to the discovery of a new variable that had previously been considered as standard.

This star, HD 200925 (BD+50°3259), of spectral type F 5 III as reported by Moore and Paddock (1950) has an m_V=8.0 and (B-V)= 0.4. It was originally taken as standard along with HD 200926 (BD+49°3455) in the search for the variability of the Am star HD 200739 (BD+50°3256). Both, the Kukarkin catalogue of variable stars and the Mount Wilson catalogue of radial valocities do not report any variability in any of the previously mentioned stars.

All the reported photoelectric observations were carried out on the 33 inch telescope at the Observatorio of San Pedro Mártir, Baja California, México, during the nights from the 25th to the 28th of September, 1978. A 1P21 photomultiplier and the V filter of the original Johnson's photometer were employed. It was not necessary to change the amplification during the night.

The method followed was suggested by Warman and has already been reported (Warman et al., 1974). It consisted of the following: the sequence, C1, V C2, C1, V was followed uninterruptedly all night, with an average spanned time between successive observations of the same star of 4 minutes. Each observation consisted of 3 integrations of 10 sec of the star followed by one 10 sec integration of the sky, that was subtracted from the average of the star integrations. The instrumental magnitude was obtained by means of the well known relation m=-2.5 log I.

Table 1 shows the result of subtracting the mean of the magnitudes of the standard stars from the magnitude of the variable star. The accuracy on each observation is better than .003 mag. The time is reported in Heliocentric Julian Dates, and its precision is ,001 day. These values are plotted and shown on Figure 1. The shortest night, September 27th, was interrupted by clouds.

The analysis of the data showed that the behaviour of C1 and C2 during the four nights were constant with an accuracy of ±.003 mag. On the other hand, from Figure 1 it is easy to infer that the variation of HD 200925 is periodically repeated on the nights of the 25th and 28th of September. The period deduced from these two nights is close to 0.238 days. The mean amplitude is of 0.35 mag.

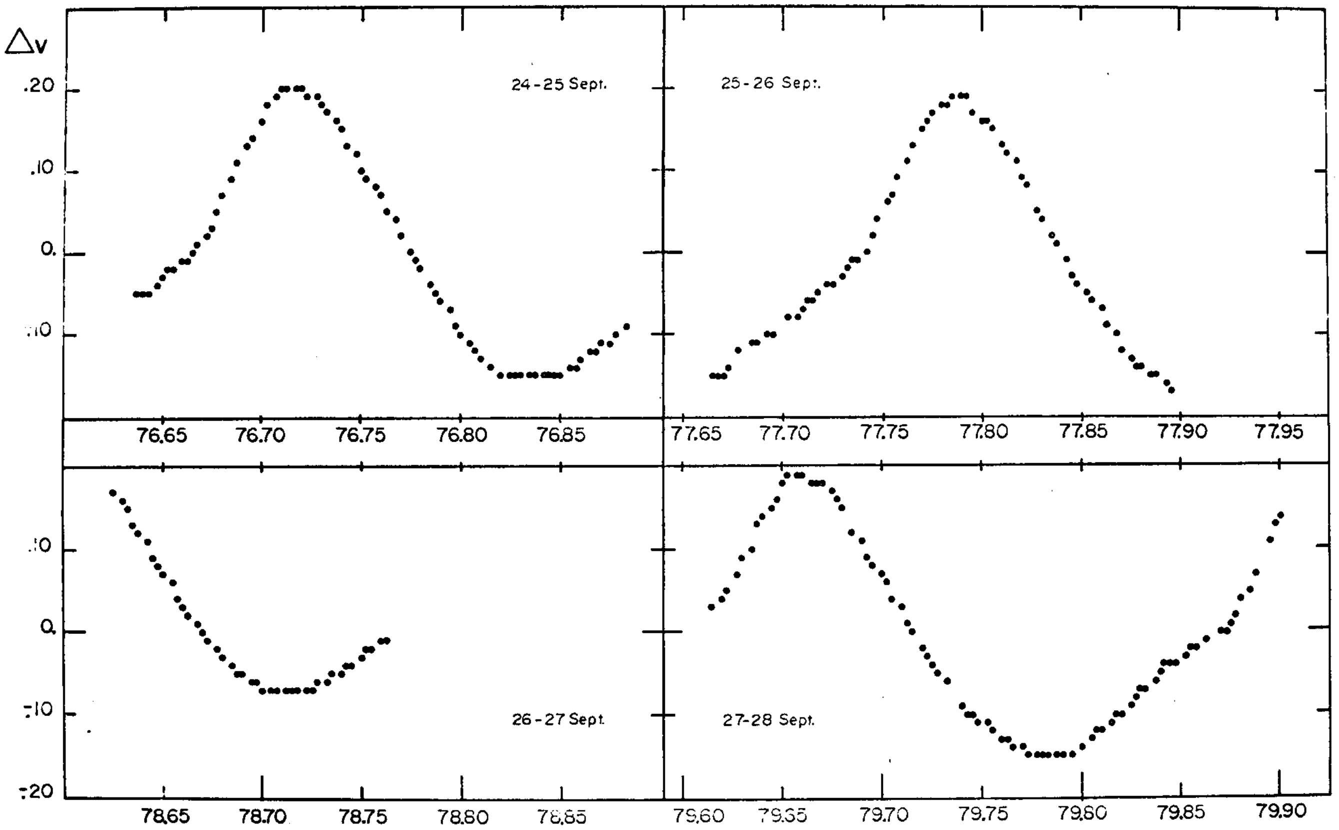
Unfortunately the data available for the light curve of the night of the 26th do not allow us to determine a period or an amplitude, but nevertheless, its behaviour matches with the nights of the 25th and 28th so we might conclude that the period and amplitude on this night have the same values as those on the two other nights. With respect to the night of the 27th, the curve of light shows a change in magnitude of lesser amplitude that cannot be precisely determined due to interruption by clouds. Nevertheless, the period seems to be the same.

On considering the nature of the variability of this star, one might infer that, if it were an eclipsing star, the lesser variation in the amplitude of the night of the 27th could be interpreted as a secondary minimum commonly presented by the W Ursae Majoris type stars. If, on the other hand, this were a pulsating star, its spectral type, (F5 III), its period (0.24), the amplitude of its variation and the shape of the curve lead us to catalogue it as a δ Scuti type star (as suggested by Payne-Gaposchkin, 1979).

Unfortunatly ubvyβ photometric data do not exist for this star. However, given the spectral type we can infer (Mihalas, 1968) both the Mv and the B-V for its luminosity class (III); values of 1.0 and 0.4, respectively, were obtained. Interpolating in the B-V vs. b-y calibration (Crawford, 1966) a value of 0.23 for b-y was derived. These inferred values of Mv and b-y fix the position of this star within the limits of the instability strip, and when combined with the estimated period, their relationship

TABLE I. PHOTOMETRY OF HD 200925 IN THE V FILTER

HEL JD	D MAG	HEL JD	D MAG	HEL JD	D MAG	HEL JD	D MAG	HEL JD	D MAG
2443700.0 +									
		76.8144	-0.137	77.7825	0.184	78.6908	-0.052	79.7215	-0.026
		76.8207	-0.147	77.7860	0.189	78.6943	-0.057	79.7257	-0.041
76.6367	-0.052	76.8242	-0.147	77.7894	0.189	78.6978	-0.062	79.7285	-0.051
76.6408	-0.047	76.8276	-0.147	77.7929	0.189	78.7012	-0.067	79.7320	-0.061
76.6436	-0.047	76.8311	-0.152	77.7957	0.174	78.7047	-0.072	79.7083	39.000
76.6471	-0.042	76.8346	-0.152	77.7999	0.164	78.7082	-0.072	79.7389	-0.086
76.6499	-0.032	76.8374	-0.152	77.8026	0.159	78.7117	-0.072	79.7424	-0.096
76.6526	-0.022	76.8415	-0.147	77.8061	0.149	78.7151	-0.072	79.7451	-0.101
76.6561	-0.017	76.8450	-0.147	77.8096	0.134	78.7186	-0.072	79.7486	-0.106
76.6596	-0.012	76.8485	-0.147	77.8131	0.119	78.7221	-0.072	79.7528	-0.111
76.6624	-0.007	76.8512	-0.147	77.8165	0.109	78.7256	-0.067	79.7556	-0.116
76.6658	-0.002	76.8547	-0.142	77.8200	0.094	78.7283	-0.062	79.7590	-0.126
76.6686	0.008	76.8582	-0.137	77.8235	0.079	78.7325	-0.057	79.7625	-0.131
76.6721	0.023	76.8610	-0.132	77.8269	0.054	78.7360	-0.052	79.7660	0.136
76.6742	0.033	76.8644	-0.122	77.8304	0.039	78.7394	-0.047	79.7695	-0.141
76.6769	0.048	76.8679	-0.117	77.8346	0.024	78.7422	-0.042	79.7729	0.146
76.6804	0.068	76.8707	-0.112	77.8381	0.009	78.7457	-0.037	79.7764	-0.151
76.6846	0.088	76.8749	-0.107	77.8415	-0.011	78.7492	-0.027	79.7799	-0.146
76.6887	0.113	76.8783	-0.097	77.8443	-0.026	78.7526	-0.022	79.7833	-0.146
76.6922	0.128	76.8818	-0.087	77.8478	-0.036	78.7554	-0.017	79.7868	-0.146
76.6950	0.143			77.8519	-0.051	78.7589	-0.012	79.7903	-0.146
76.6992	0.163			77.8554	-0.061	78.7624	-0.007	79.7938	-0.146
76.7026	0.178	77.6644	-0.151	77.8596	-0.071			79.7972	-0.141
76.7068	0.188	77.6679	-0.146	77.8631	-0.086			79.8007	-0.136
76.7103	0.198	77.6707	-0.146	77.8672	-0.101	79.6160	0.029	79.8042	-0.131
76.7137	0.203	77.6735	-0.141	77.8707	-0.116	79.6201	0.044	79.8070	-0.121
76.7172	0.203	77.6783	-0.116	77.8742	-0.131	79.6236	0.054	79.8104	-0.116
76.7200	0.198	77.6853	-0.111	77.8776	-0.136	79.6271	0.074	79.8139	-0.111
76.7235	0.193	77.6887	-0.106	77.8811	-0.136	79.6306	0.094	79.8174	-0.101
76.7269	0.188	77.6915	-0.101	77.8846	-0.146	79.6340	0.104	79.8208	-0.101
76.7297	0.183	77.6957	-0.096	77.8881	-0.151	79.6375	0.129	79.8243	-0.091
76.7332	0.173	77.7033	0.081	77.8915	-0.161	79.6403	0.144	79.8271	-0.081
76.7367	0.163	77.7068	-0.076	77.8950	-0.171	79.6438	0.154	79.8306	-0.071
76.7401	0.148	77.7096	0.066			79.6465	0.164	79.8333	-0.066
76.7436	0.133	77.7124	-0.061			79.6500	0.179	79.8368	-0.061
76.7471	0.123	77.7158	-0.056	78.6262	0.173	79.6535	0.189	79.8396	-0.051
76.7506	0.103	77.7186	-0.046	78.6290	0.158	79.6576	0.194	79.8424	-0.041
76.7533	0.093	77.7228	0.041	78.6318	0.148	79.6604	0.189	79.8458	-0.036
76.7568	0.078	77.7256	-0.036	78.6353	0.133	79.6639	0.184	79.8486	-0.036
76.7603	0.068	77.7290	0.026	78.6387	0.118	79.6667	0.184	79.8521	-0.031
76.7631	0.048	77.7325	0.021	78.6415	0.108	79.6708	0.172	79.8556	-0.021
76.7665	0.038	77.7353	0.011	78.6450	0.093	79.6743	0.174	79.8583	-0.016
76.7707	0.018	77.7387	-0.006	78.6485	0.083	79.6771	0.164	79.8618	-0.011
76.7742	0.003	77.7415	0.004	78.6512	0.068	79.6799	0.154	79.8333	45.000
76.7776	-0.012	77.7450	0.024	78.6540	0.058	79.6861	0.124	79.8688	-0.001
76.7804	-0.022	77.7485	0.039	78.6575	0.038	79.6896	0.109	79.8715	0.004
76.7839	-0.037	77.7519	0.059	78.6603	0.033	79.6931	0.094	79.8743	0.014
76.7881	-0.052	77.7554	0.074	78.6631	0.023	79.6958	0.084	79.8778	0.024
76.7908	-0.062	77.7582	0.094	78.6665	0.008	79.6993	0.069	79.8806	0.039
76.7943	-0.072	77.7624	0.114	78.6700	0.003	79.7021	0.059	79.8840	0.054
76.7978	-0.087	77.7658	0.129	78.6735	-0.007	79.7056	0.044	79.8875	0.074
76.8012	-0.097	77.7693	0.149	78.6769	-0.022	79.7090	0.029	79.8938	0.109
76.8047	-0.107	77.7721	0.159	78.6804	-0.027	79.7125	0.014	79.8972	0.129
76.8075	-0.122	77.7756	0.174	78.6846	-0.037	79.7153	-0.001	79.9000	0.144
76.8110	0.127	77.7790	0.179	78.6874	-0.047	79.7188	-0.016		


△v
.20
.10
0.
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-.20
24-25 Sept.
25-26 Sept.
26-27 Sept.
27-28 Sept.
76.65
76.70
76.75
76.80
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78.80
78.85
79.60
79.65
79.70
79.75
79.80
79.85
79.90

is consistant with the PLCR as in Breger (1978). Perhaps the only conclusion that can be made at this time is (if this is a pulsating star) the agreement between the long observed period and the luminosity class (III).

At any rate, it would be desirable to obtain more data,both photometric and spectroscopic, in order to decide between the eclipsing or pulsating nature of this star.

The authors would like to thank Dr. Josef Warman for his assistance and guidance during the several stages of this work. Fruitful discussions with Drs. C. Payne-Gaposchkin and S. Gaposchkin are also acknowledged.

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References:

Breger, M. 1978, preprint
Crawford, D.L. 1966, IAU Symposium 24, 170
Mihalas, D., 1968, Galactic Astronomy
Moore, J.H. and Paddock, G.F., 1950, Astrophysical Journal,112,48
Payne-Gaposchkin, C., 1979, private communication
Warman, J., Malacara, Z. and Breger, M., 1974, Revista Mexicana de Astronomia y Astrofisica, 1, 143

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FLARE STARS IN THE COMA CLUSTER REGION

In accordance with the program of flare star investigation in stellar agregates accomplished at Byurakan Observatory, we have continued the observations of the Coma cluster region initiated by G. Haro (1).

Our plates centered at RA=$12^{h}18^{m}.5$, D=+26°24′ (1950.0) were obtained from April 1969 to March 1975. They present several series of multiple exposure patrol plates, which have been taken both Schmidt telescopes (21"/21" and 40"/52") of Byurakan Observatory.

The total effective observational time was about 153^{h}. Some of the plates (about 10^{h} of effective patrol time) have been put in our disposal by I. Jankovics from Konkoly Observatory.

Usually we used Orwo ZU2 or Kodak 103 aO photographic emulsions with ultraviolet filter Schott UG 1 on the 40"/52" telescope.

Data for new flare stars and new flare events on previously known flare stars are presented in chronological order in the Table.

Table 1

N	RA	D	m	Δm	UT		
T3	$12^{h}24^{m}.5$	+27°18′	16.7pg	3.7	19.03.71	5x10	76
B1*	17.0	25 30	(21 pg	>4.8	22.03.71	2x10	
B2	15.7	27 06	18.1pg	3.3	28.04.71	18x10	
B3	16.8	27 30	16.6pg	1.2	15.04.72	3x10	
B4	22.7	23 53	19.6pg	4.9	30.05.72	5x10	
T3	24.5	27 18	16.7pg	2.0	31.05.72	5x10.	76
T1	22.0	26 01	16.7 U	1.6	27.03.74	3x10	69
B5	29.4	25 26	16.6 U	1.3	27.03.74	3x10	
B6*	23.9	26 10	(21 pg	>5.5	14.06.74	2x 5	
B7	22.2	27 04	18.5 U	3.9	12.02.75	3x10	70
B7	22.2	27 04	18.5 U	2.6	16.02.75	2x10	70

* There is a very week star on the red copy of the POSS chart.

It contains the following data; serial number of flare stars discovered at Byurakan (B) or Tonantzintla (T) Observatories, position for 1950.0, approximate photographic or ultraviolet magnitude at minimum light, amplitude of flare event in the corresponding light, the date of observation and duration of each flare. The serial number of the star according to Sanduleak's (2) list is added in the last column. Taking into account the results of the papers (1), (3) and (4) the total number of known flare stars in the Coma cluster region is 14 and the number of flare-ups is 21. The total effective coverage is 337^h45^m. Our data support G. Haro's conclusion (1) about the relatively low flare activity in the direction of the Coma cluster.

But it is necessary to remark that the observed number of flare stars, if they all are members of this cluster, already contradicts to the conclusion that the main sequence of the cluster is very poor and even terminates at about $V=11^m$ (5).

It is already known that not all flare stars are members of the Coma cluster. For instance, the T3 star is, according to its proper motion, doubtless a foreground star. The same can be said about FP Com (6). According to V. Ambartsumian's formula (7) the total number of flare stars in this region should be greater than 40.

On the other side, if we suppose that most of them are general field stars, then the number of flare stars in this particular direction is greater than in any other direction of the Galaxy.

In this connection it is interesting to note the coincidance of three flare stars with the stars from Sanduleak's list, of which 34 stars are situated in our region. It is known that this list was compiled by Sanduleak for detailed investigation of very red dwarfs near NGP, where their real excess - according to (2) - seems to be shown.

I wish to thank akad.V.A. Ambartsumian for helpful discussion.

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References:

1. Haro, G., Flare Stars, Stars and Stellar Systems,vol.VII,141,1968
2. Sanduleak, N., A.J., 81, 350, 1976
3. Sedjakina, A.N., VS, 18, 218, 1971
4. Luyten, W.J., Erickson, R.R., PASP, 77, 472, 1965
5. Argue, A.N., Kenworthy, C.M., M.N. 146, 479, 1969
6. Argue, A.N., Kenworthy, C.M. Observatory, 88, 109, 1968
7. Ambartsumian, V.A., Stars, Nebulae, Galaxies, 283, Yerevan,1969

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ON THE DECREASING PERIOD AND ASYMMETRIC LIGHT CURVE OF RT SCULPTORIS

RT Scl is a southern EB-type eclipsing binary whose light curve has been studied fairly regularly since the turn of the century. An asymmetry is present in all light curves, which manifests itself in the different heights of the maxima and the shape of the secondary minimum. It is therefore interesting to study the stability of the period in order to decide on the presence and strength of mass flow between the components. A new study of the period is also important because recent visual minimum determinations suggest very large period changes.

We present here a new UBV light curve, obtained with the ESO 50 cm telescope in 1977, and new photographic minima, derived from plates of the Bamberg sky patrol for the years 1964 to 1972.

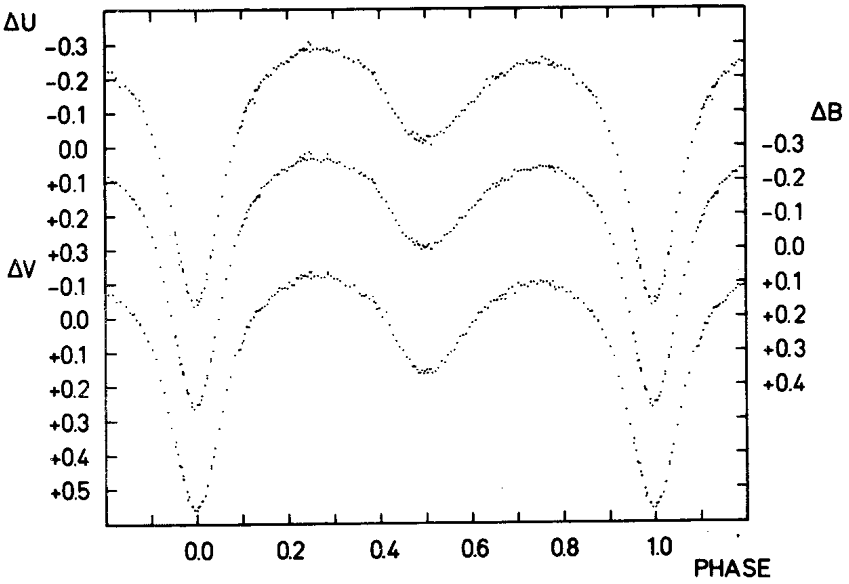

Fig. 1. U B V light curves of RT Scl, relative to CoD -26°193 (CPD -26°49)

The new light curves, as compared with the photoelectric light curves of Cilliê and Lindsay (1958), and Clausen and Grønbech (1977), show no obvious change in the asymmetric disturbance (Fig. 1). A detailed analysis will be published later.

All available minimum times are collected in Table 1. A new linear ephemeris, derived from the existing photoelectric observations, yields

$$\text{J.D.hel. (primary minimum)} = \underset{\pm 0.0007}{2\,443\,450.6370} + \underset{\pm .00000007}{0.51156208} \cdot E$$

Table 1. Minimum times of RT Scl

J.D.hel. (2 400 000+)	E	$(O-C)_1$	$(O-C)_2$	type	source
11 736.1140	-61995	-0.2319	-0.0019	pg	Pickering/Whiteside (1908)
23 761.5806	-38488	-0.0551	+0.0073	pg	Dugan (1928)
24 116.6056	-37794	-0.0542	+0.0048	pg	"
24 147.2980	-37734	-0.0555	+0.0032	pg	Schilt (1925)
34 222.5660	-18038	-0.0026	-0.0047	pe	Cilliê and Lindsay (1958)
34 991.4463	-16536	-0.0002	-0.0040	pe	"
35 014.4661	-16491	-0.0006	-0.0045	pe	"
35 030.3257	-16460	+0.0005	-0.0034	pe	"
35 031.3501	-16458	+0.0018	-0.0021	pe	"
38 621.5180	- 9440	+0.0270	+0.0204	pg	Bamberg
38 641.4470	- 9401	+0.0051	-0.0015	pg	"
38 701.3030	- 9284	+0.0084	+0.0018	pg	"
38 721.2650	- 9245	+0.0194	+0.0129	pg	"
38 722.2650	- 9243	-0.0037	-0.0103	pg	"
40 469.7610	- 5827	-0.0038	-0.0083	pg	"
40 509.6570	- 5749	-0.0096	-0.0141	pg	"
40 555.2860	- 5660	+0.0904		vis	Diethelm and Locher (1970)
40 572.0620	- 5627	-0.0152	-0.0195	pg	Bamberg
41 580.4620	- 3656	+0.0960		vis	Locher (1972)
41 623.3901	- 3572	+0.0529		vis	"
41 624.4160	- 3570	+0.0556		vis	"
41 987.5718	- 2860	+0.0024	+0.0013	pe	Clausen and Grønbech (1976)
41 989.6177	- 2856	+0.0020	+0.0010	pe	"
42 415.2470	- 2024	+0.0117		vis	Locher (1975)
42 417.3020	- 2020	+0.0204		vis	"
43 143.2150	- 601	+0.0268		vis	Locher (1977)
43 450.6352	0	-0.0018	+0.0020	pe	this paper

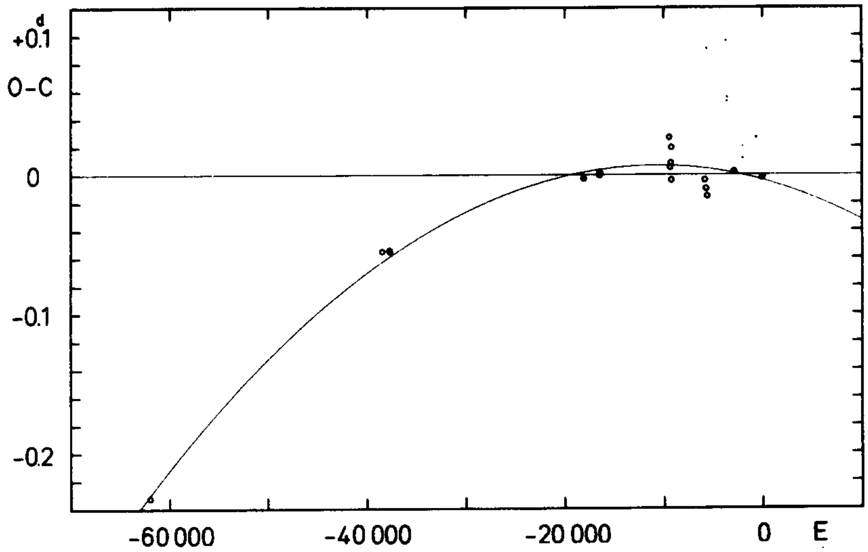

Fig. 2. O - C diagram of RT Scl. The quadratic ephemeris is also indicated. Open circles represent photographic, filled circles photoelectric, and dots visual minima.

The O - C diagram is shown in Fig. 2. It is noted that the visual minima deviate strongly, especially the early ones, while nearly simultaneous photographic minima confirm the period variation obtained from the photoelectric data. Thus it must be stated that at least the early visual minimum times must be grossly in error. The O - C diagram thus does not show dramatic irregularities of the period, but merely a continuous decrease of the length of the period.

A thorough period study, taking into account also the early observations, was published by Cilliê and Lindsay (1958). They proposed the introduction of a quadratic term into the ephemeris to represent the minimum times between 1891 and 1954.

The photoelectric minimum times obtained between 1952 and 1977 are also not well represented by a linear ephemeris. Thus we have introduced a new quadratic term. Surprisingly it differs only by about 10% from the one derived from the early minima. We propose therefore that a general quadratic term really exists which is determined from all observed minimum times of good quality (with proper weighting):

$$\text{J.D.hel. (prim. min.)} = \underset{\pm .0037}{2\,443\,450.6332} + (\underset{\pm .00000034}{0.51156012} - \underset{\pm .53}{9.04} \cdot 10^{-11}\,E)\,E$$

This ephemeris might be suited to describe future minimum times with some confidence.

It should be noted that this ephemeris cannot describe the "fine structure" of period variations, which are certainly superimposed on the general trend, but are difficult to determine because of the scarcity of data of high precision. We only want to draw attention to this star whose period, like that of SV Cen, is continuously decreasing in a roughly predictable way.

Acknowledgements. Observations were collected at the European Southern Observatory, La Silla, Chile. We thank Professor J. Rahe, Bamberg, for his invitation to use the Remeis Observatory plate collection, and for his hospitality. M.T.K. also thanks the Alexander von Humboldt - Stiftung, Bonn-Bad Godesberg, for financial support of his work.

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References:

Cillié, G.G., Lindsay, E.M., Mon. Not. R. astr. Soc. 118, 585 (1958)
Clausen, J.V., Grønbech, B., Astr. Astrophys. Suppl. Ser. 28, 389 (1977)
Diethelm, R., Locher, K., Orion 28, 22 (1970)
Dugan, R.S., Princeton Univ. Obs. Contr. 8 (1928)
Locher, K., BBSAG 5 (1972)
Locher, K., BBSAG 6 (1973)
Locher, K., BBSAG 20 (1975)
Pickering, E.C., Whiteside, I., Harvard Circ. 139 (1908)
Schilt, F., Bull. astr. Inst. Netherl. 3, 63 (1925)

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COMPARISON STAR ADJUSTMENTS FOR THE CEPHEID EU Tau

EU Tau has become well studied after Guinan (1966) showed that it was a classical, short period cepheid of type Is. UBV observations include 28 by Szabados (1977), 45 by Wachmann (1976), 139 by Sanwal and Parthasarthy (1974), and 342 by Guinan (1972). However, the mean V magnitudes of all four sets of data disagree, in some cases by $0\overset{m}{.}13$. In addition, Guinan's results should have one day added to all dates due to an error in his computer program. Because of the low amplitude of this variable, disagreements of more than $\pm\ 0\overset{m}{.}02$ are obvious when data is combined.

The source of error in the mean values stems from magnitude determinations for the three common comparison stars. However, no single comparison star was measured by all four observers. For this reason, all three comparisons were reobserved, in the course of a survey of short period cepheids (Henden 1979a), with the 41 cm cassegrain telescope of the Morgan-Monroe State Forest site of Goethe Link Observatory. Results were obtained on three nights and were computed differentially with respect to four standard stars from the Arizona-Tonantzintla catalog (Iriarte, et. al. 1965) : HR 1908, HR 1946, HR 2010, and HR 2047, which spatially bracket the variable and its comparison stars. The new and previous measures for the comparison stars are presented in Table 1. By comparison of the derived magnitudes, the adjustments for each observer have been calculated and are given in Table 2.

Table 1. Comparison Star Magnitudes

	BD +18°939			BD +18°959			BD +18°966		
Observer	V	B-V	U-B	V	B-V	U-B	V	B-V	U-B
Guinan	-	-	-	7.72	0.42	0.11	7.90	1.02	0.93
Wachmann	-	-	-	7.60	0.446	0.105	-	-	-
Sanwal	8.41	0.35	0.09	-	-	-	7.77	1.09	0.90
Szabados	-	-	-	7.53	0.44	0.17	7.79	1.10	1.04
Henden	8.41	0.339	0.144	7.58	0.460	0.130	7.76	1.084	0.942
(p.e.)	0.02	0.01	0.01	0.02	0.02	0.01	0.02	0.01	0.02

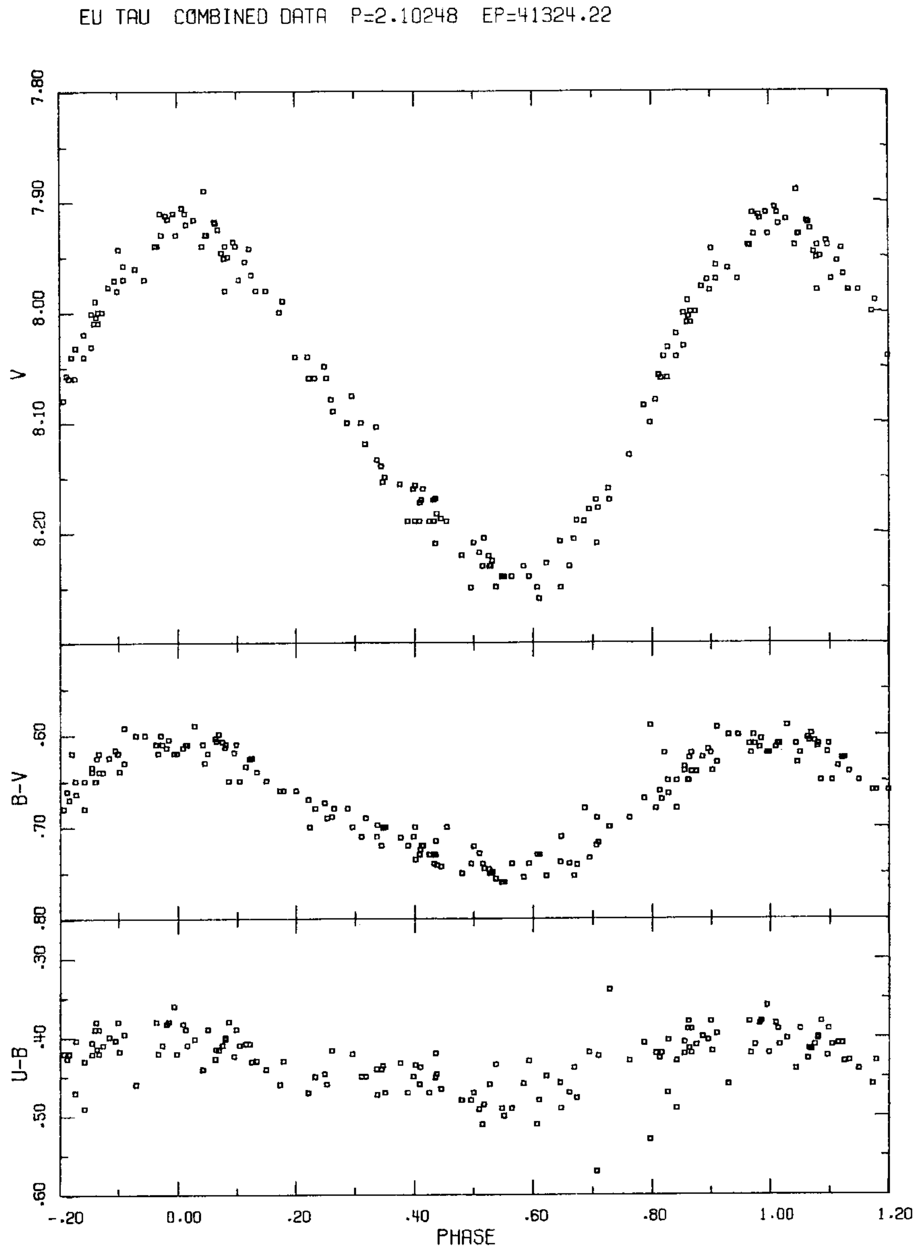

Figure 1 : EU Tau data after zero point corrections have been made.

Table 2. Corrections to Existing Data

Observer	V	B-V	U-B
Guinan	-0.14	+0.05	+0.01
Wachmann	-0.02	+0.01	+0.02
Sanwal	+0.00	-0.01	+0.05
Szabados	-0.04	-0.01	-0.07

The combined light curve after adjustments were made is shown in Figure 1. All data by Henden (1979b), Szabados and Wachmann are included, along with a random sample of 25 observations each by Sanwal and Parthasarthy and Guinan. The data is phased according to the light curve elements:

$$T_{max} = \text{J.D. } 2441324.22 + 2\overset{d}{.}10248\ E$$

The scatter has now been reduced to observational error limitations.

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References

Guinan, E. F. 1966, Inf. Bull. Var. Stars, n. 170.

__________ 1972, Publ. astr. Soc. Pacific 84, 56.

Henden, A. A. 1979a, Mon. Not. Roy. astr. Soc. (in press).

__________ 1979b, in preparation.

Iriarte, B., Johnson, H. L., Mitchell, R. I. and W. K. Wisniewski 1965, Sky Tel. 30 , 21.

Sanwal, N. B. and M. Parthasarathy 1974, Astr. Astrophys. Suppl. 13, 91.

Szabados, L. 1977, Mitt. Stern. Ungarisch. Akad. Wiss., Budapest-Szabadsaghegy, n. 70.

Wachmann, A. A. 1976, Astr. Astrophys Suppl. 23, 249.

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PHOTOELECTRIC MINIMA OF RZ CASSIOPEIAE

During the past season three times of minimum light of RZ Cas were obtained by us. The first two were observed at the Kutztown State College Observatory using the 46-cm telescope equipped with an EMI 6256 SA photomultiplier while the third was observed at Kitt Peak National Observatory using the 0.4 meter telescope no. 4 equipped with an RCA 1P21 photomultiplier. All observations were made in B and V light.

The times of minimum light are as follows:

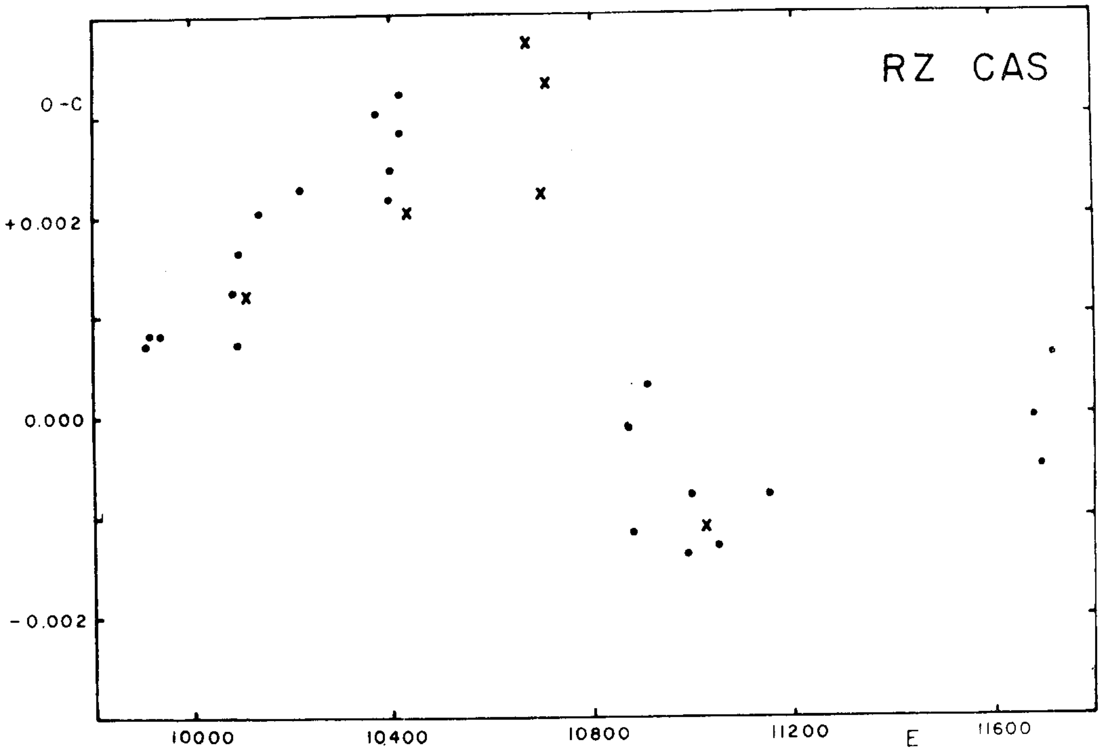
Hel. JD	E	O - C
2443832.5929	11677	$0^{d}.0000$
844.5449	11687	-0.0005
875.6224	11713	+0.0006

The epoch and O-C values have been calculated from the ephemeris given by Herczeg and Friboes-Conde (1974):

$$\text{JD Hel. Min. I} = 2429875.6902 + 1^{d}.1952473\ E.$$

As noted by Barlow and Scarfe (1978) the ephemeris given by Chambliss (1976) no longer predicts accurate times of minimum light for RZ Cas. Thus it appears that its period has recently undergone a change.

The Figure shows a plot of all photoelectric times of minimum light of RZ Cas obtained since the investigation by Chambliss and published in the IBVS. The times of minimum light given in that investigation are also included. The various observations appear to be internally consistent except for those of Margrave et al. (1975, 1978), which appear to be about $0^{d}.0045$ too early.


RZ CAS
O-C
+0.002
0.000
-0.002
10000
10400
10800
11200
11600
E

These have been shifted by this amount and are indicated by crosses rather than circles on the figure.

The residuals and epoch number values have been calculated using the ephemeris of Herczeg and Friboes-Conde. It appears that an abrupt change of period occurred at about E = 10800, i. e., at the beginning of 1976. The period of RZ Cas is now about $0\overset{s}{.}5$ shorter than it was prior to this time.

We wish to thank Dr. Colin Scarfe for the information which he provided us on this system.

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References:

Barlow, D. J., and Scarfe, C. D., 1978, IBVS no. 1379

Chambliss, C. R. 1976, Pub. Astron. Soc. Pacific 88, 22

Herczeg, T., and Friboes-Conde, H. 1974, Astron. and Astrophys. 30, 259

Margrave, T. E. et al. 1975, IBVS no. 1019

———————— 1978, IBVS no. 1478

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Budapest
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PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR YZ CMi IN 1974, 1975

Continuous photoelectric monitoring of the flare star YZ C Min has been carried out at the Stephanion Observatory ($\lambda = -22^{\circ}49'44''$ $\varphi = +37^{\circ}45'15''$) during the years 1974, 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 and photometer will be described elsewhere. Here we mention only that the transformation of our instrumental ubv system to the international UBV system is given by the following equations:

$$V = v_o - 0.018(b-v)_o + 2.297$$
$$(B-V) = 0.886 + 1.004(b-v)_o$$
$$(U-B) = -1.818 + 0.974(u-b)_o \ .$$

The monitoring intervals in UT as well as the total monitoring time for each night are given in the Tables Ia, Ib. Any interruption of more than one minute has been noted. In the fourth column of Tables Ia,Ib the standard deviation of random noice 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 18.93 hours of monitoring time 6 flares were observed the characteristics of which are given in Table II. For each flare following characteristics (Andrews et. al. 1969) are given: a) the date and universal time of flare maximum, b) the duration before and after the 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 noice fluctu-

Table Ia

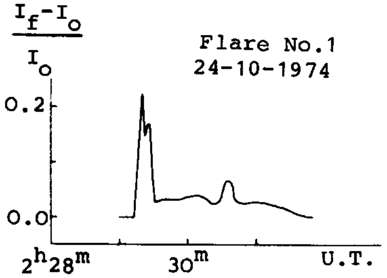
Monitoring intervals in 1974

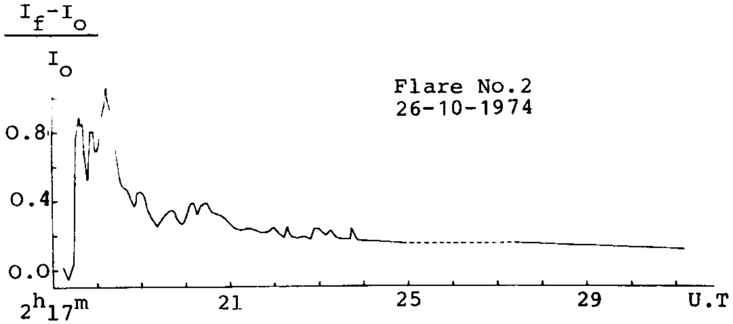
Date	Monitoring intervals (U.T.)	Total Monitoring Time	σ(U.T.)
1974			
October			
24	$01^{h}52^{m}$-$02^{h}21^{m}$,$02^{h}24^{m}$-$02^{h}53^{m}$,		0.04($01^{h}54^{m}$),0.04($02^{h}20^{m}$),
		$0^{h}58^{m}$	0.04(02 52).
26	01 29 -01 56 ,01 59 -02 25 ,02 27 -02 31 ,		0.04(01 30),0.04(02 00),
	02 34 -02 38 ,02 40 -02 50 .	$1^{h}21^{m}$	0.03(02 37).
	TOTAL	$2^{h}19^{m}$	

Table Ib

Monitoring intervals in 1975

Date	Monitoring intervals (U.T.)	Total Monitoring Time	σ(U.T.)
1975			
January			
4-5	$22^{h}24^{m}$- $22^{h}56^{m}$,$23^{h}13^{m}$-$23^{h}44^{m}$,$23^{h}48^{m}$-$00^{h}19^{m}$,		0.03($22^{h}34^{m}$),0.04($23^{h}28^{m}$),
	00 27 -00 52 ,01 06 -01 29 ,01 35 -01 43 ,		0.05(23 56),0.05(00 39),
	01 46 -02 05 ,02 08 -02 32 ,02 45 -02 57 ,		0.05(01 20),0.06(01 50),
	02 59 -03 17 ,03 20 -03 27 ,03 33 -03 49 ,		0.08(02 15),0.08(03 01),
	03 52 -04 00 ,04 11 -04 18 .	$4^{h}21^{m}$	0.10(03 35).
5-6	22 43 -23 27 ,23 30 -23 59 ,00 02 -00 26 ,		0.03(23 56),0.03(00 07),
	00 38 -01 18 ,01 10 -01 29 ,01 33 -01 39 ,		0.04(00 50),0.04(01 16),
	01 42 -01 53 ,02 08 -02 25 ,02 28 -02 48 ,		0.06(01 50),0.04(02 11),
	02 51 -03 02 ,03 05 -03 20 ,03 23 -03 32 ,		0.05(02 54),0.08(03 29).
	03 36 -03 40 ,03 44 -03 51 ,03 53 -04 01.	4 14	
6-7	22 36 -23 03 ,23 06 -23 35 ,23 39 -24 00 ,		0.03(22 53),0.02(23 20),
	00 00 -00 07 ,00 18 -00 59 ,01 01 -01 21 ,		0.03(23 50),0.03(00 37),
	01 23 -01 29 ,01 31 -01 50 ,01 51 -02 07 ,		0.03(01 05),0.03(01 54),
	02 18 -02 49 ,02 52 -03 09 ,03 12 -03 20 ,		0.04(02 27),0.05(03 01),
	03 22 -03 45 ,03 43 -03 56 ,03 58 -04 06 .	4 46	0.06(03 38).
7-8	22 37 -23 11 ,23 14 -23 44 ,23 47 -24 00 ,		0.05(22 43),0.04(23 10),
	00 00 -00 18 ,00 29 -00 38 ,00 40 -00 56 ,		0.03(23 42),0.03(00 17),
	00 58 -01 34 ,01 37 -02 08 ,02 18 -02 36 ,		0.04(00 56),0.04(01 31),
	02 37 -02 47 ,02 51 -03 00 ,03 01 -03 23 ,		0.04(02 07),0.05(02 45),
	03 26 -03 55 .	3 16	0.07(03 22),0.06(03 55).
	TOTAL	$16^{h}37^{m}$	


Flare No.1
24-10-1974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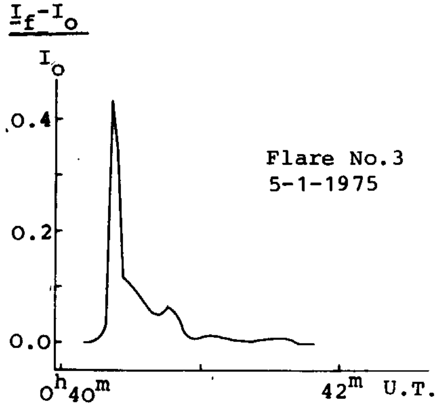
26-10-1974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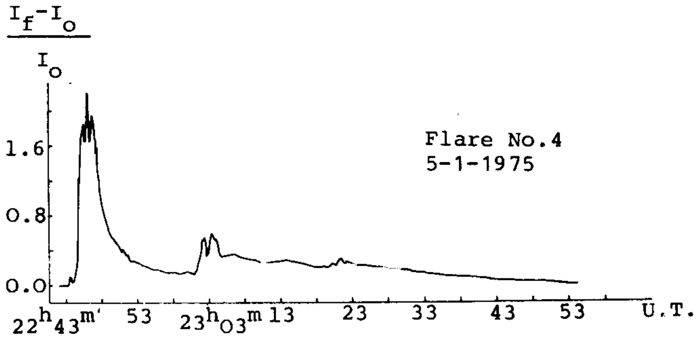
5-1-1975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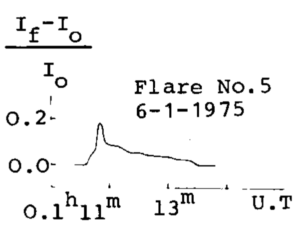
5-1-1975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6-1-1975

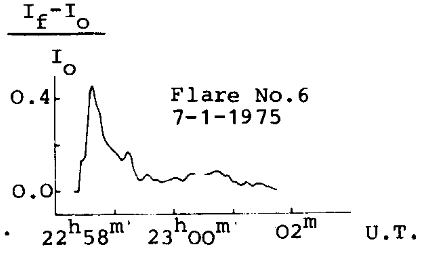
Flare No.6
7-1-1975

Table II

Characteristics of the Flares Observed

Flare No.	Date	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
	1974 October									
1	24	$02^h29^m.21$	0.12	2.24	2.36	0.22	0.11	0.22	0.04	1.33
2	26	02 18.24	0.78	12.94	13.72	1.06	2.79	0.79	0.04	1.34
	1975 January									
3	5	$00^h40^m.37$	0.12	1.32	1.44	0.43	0.07	0.39	0.05	1.29
4	5	22 46.20	3.10	67.20	70.30	2.21	18.97	1.27	0.03	1.22
5	6	01 11.80	0.20	1.80	2.00	0.18	0.10	0.18	0.04	1.38
6	7	22 58.63	0.24	3.08	3.32	0.46	0.33	0.41	0.04	1.21

ation $\sigma(mag) = 2.5 \log(I_o+\sigma)/I_o$ 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.1-6.

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Reference:
Andrews, A.D. , Chugainov, P.F., Gershberg, R.E. and Oskanian, V.S. : 1969, I.B.V.S. No. 326.

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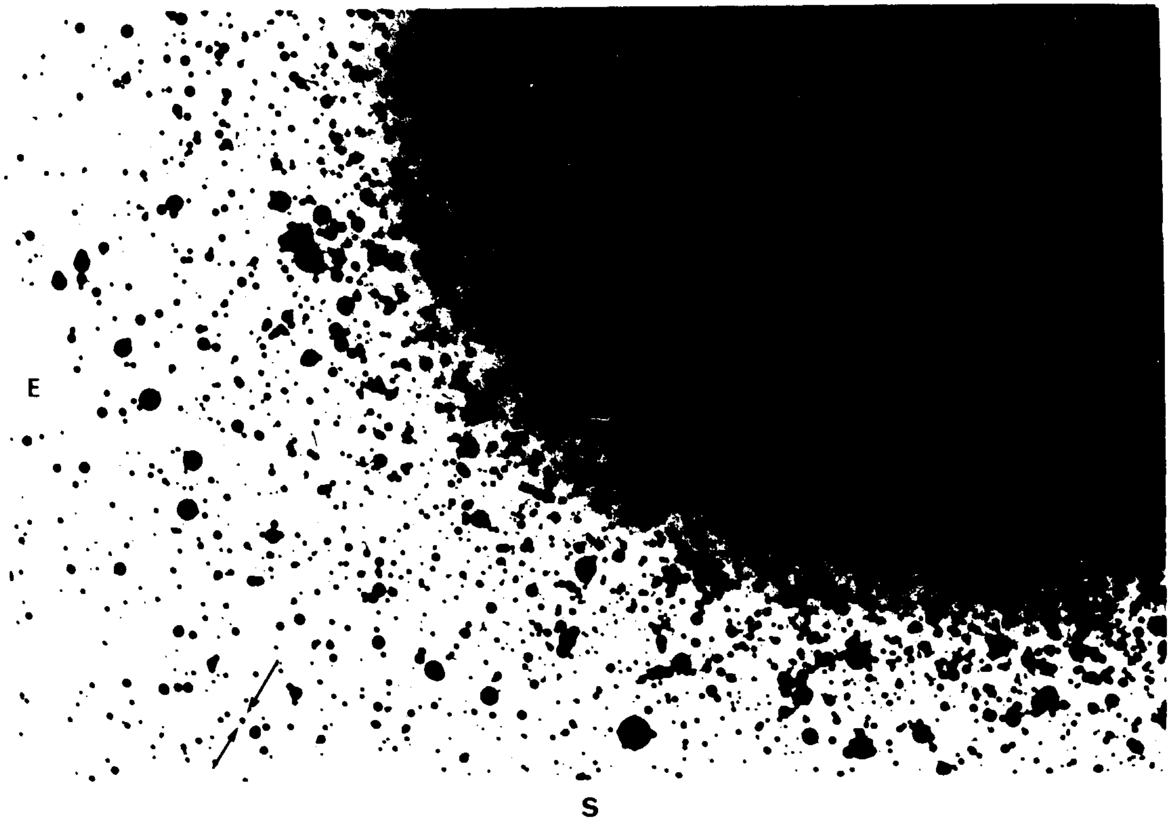
FAINT VARIABLE IN THE FIELD OF NGC 6397

There has been renewed interest recently in the incidence of close binary systems in globular clusters (see, for example, Niss et al. 1978; Liller, 1978, Alexander and Budding, 1979). Motivated by this interest, 10 plates of the relatively near (~ 2kpc) globular cluster NGC 6397 were taken last year with the 74" reflector at Sutherland. A few plates were also received from other sources. Numerous examples of suspicious objects were subsequently found, but no very convincing cases of variability of the sought type have been discovered so far. A fuller presentation of this work will be given elsewhere.

The main purpose of the present note is to call attention to one of the more prominent variables which was recently picked up in the cluster halo. Its position is indicated on the accompanying chart. Details of its magnitude variation on the 10 Sutherland plates are given below. Cannon's (1974) sequence was used in calibrating the iris photometer readings and, to the accuracy of the determination (~ $0^m,05$), it is regarded that the arrangement of filters and emulsions used corresponds to standard B and V.

With the apparent tendency to faintness it seems unlikely that the variable could be a close binary system; in any case, its magnitude would probably make it too bright to be a binary of the sought type. However, it may be interesting to trace the variable on other plates and determine any periodicity. In connection with this work we would like to remark that any long exposure plates or film copies of such plates of NGC 6397 which could be sent to the authors would be gratefully received.


E
S

J. D. 244+	Magnitude	J. D. 244+	Magnitude
3603.542	16.47 B	3608.664	15.83 B
3603.635	16.10 V	3609.550	16.50 B
3607.519	16.38 B	3609.588	16.35 B
3608.571	15.64 B	3609.641	16.52 B
3608.616	16.12 B	3609.667	16.47 B

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References :

Alexander, M. E., Budding, E.: 1979, Astron. Astrophys. 73, 227
Cannon, R. D.: 1974, Mon. Not. R. Ast. Soc., 167, 557
Liller, M. H.: 1978, I.B.V.S. No. 1527
Niss, B., Jorgensen, H. E., Lausten, S.: 1978, Astron. Astrophys. Suppl. 32, 387

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Budapest
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TT Ari

Fast (sampling time of 3 seconds) unfiltered photoelectric observations of the nova-like variable TT Ari (= BD+14^{0}341) have been carried out on three nights (22,23,24) of November 1978 with the 1-meter Cassegrain telescope of the Astronomical Observatory of Trieste, equipped with a twin-beam computer controlled photoelectric photometer bearing EMI 6256SA photomultipliers. A finding chart for TT Ari, showing also the star we have adopted as the comparison star, is given in Figure 1 (V= variable, C= comparison, a= BD+14^{0}337, b= BD+14^{0}339, d= BD+14^{0}342).

Figures 2,3 and 4 show the lightcurve of TT Ari obtained on November 22,23,24 respectively. The magnitude differences are ordered as variable minus comparison. The phases were calculated by using the value of the orbital period P= 0.137551 (in days) given by Cowley et al. (1975); the phase zero corresponds to JD 2443835.29585, JD 2443836.27660, JD 2443837.27205 for the three graphs respectively. Strong flickering (up to 0.1 magnitudes) is superimposed to the regular light variations associated to the orbital period of TT Ari.

Power spectral analysis revealed no stable periodic brightness variations. However, a short living quasi monochromatic oscillation (∿0.026 Hz frequency) lasting about 1500 seconds has been observed on November 22 (starting time JD 2443835.34419), as is shown in Figure 5a,b. The simultaneous spectrum of the comparison star does not show evidence of similar lines at the same frequency. Figure 5a,b is also representative for the power spectra of the variable and of the comparison star during the night of November 22. The range below ∿0.02 Hz shows a power excess which can be attributed to the flickering of the variable.

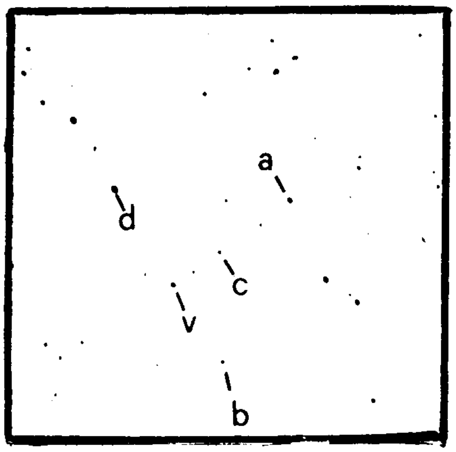

Fig. 1

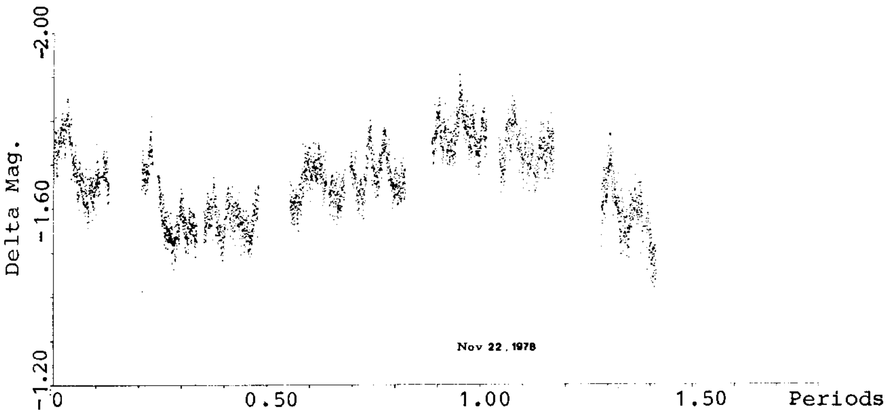

Fig. 2

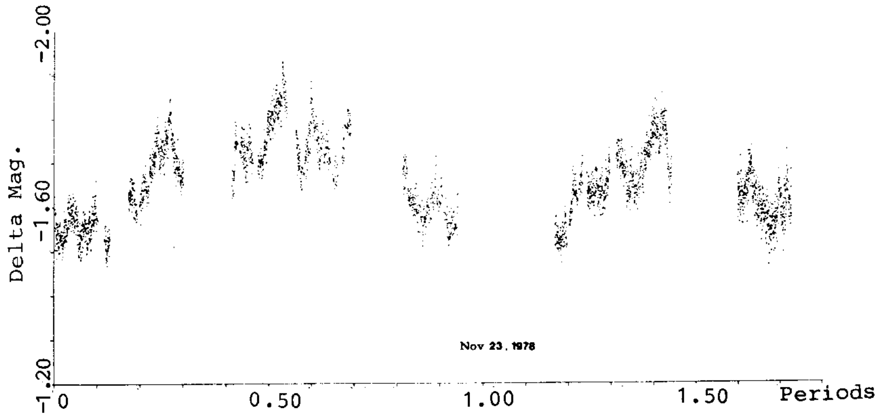

Fig. 3

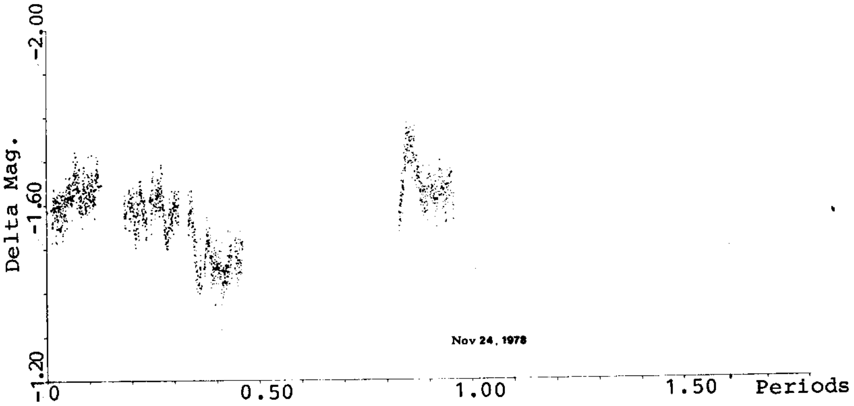
Delta Mag.
-2.00
-1.60
-1.20
0
0.50
1.00
1.50
Periods
Nov 24, 1978

Fig. 4

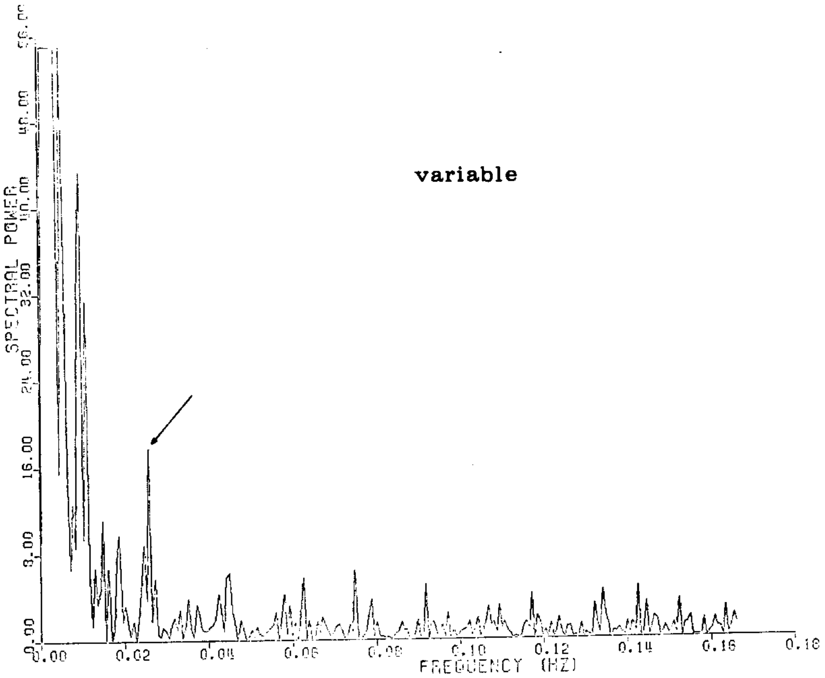
SPECTRAL POWER
56.00
48.00
40.00
32.00
24.00
16.00
8.00
0.00
variable
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
FREQUENCY (HZ)

Fig. 5a

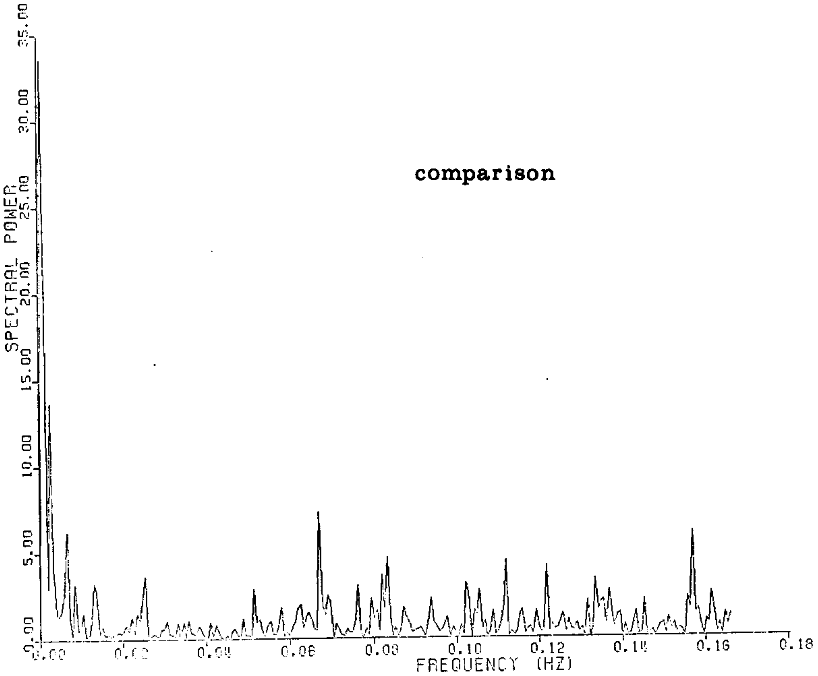

Fig. 5b

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Reference:

Cowley,A.P.,Crampton,D.,Hutchings,J.B.,Marlborough,J.M., Astrophys. J. 195,413.

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Budapest
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THE PERIOD VARIABILITY OF SX CASSIOPEIAE

Photoelectric observations of the complicated $36^{d}.57$ eclipsing binary, SX Cas were carried out at Villanova University Observatory using the 38-cm reflector. The observations were obtained during February and March 1979 at time when the star was being studied in the UV with the IUE satellite by Drs. R.H. Koch and M. Plavec. During early February, 1979 we were fortunate to obtain four consecutive clear nights during the primary eclipse. The duration of the eclipse is about 4 days. Additional data were collected on three nights outside eclipse and on one night during the following eclipse in March. The observations were made using a photoelectric photometer equipped with a thermoelectrically cooled RCA C31034 gallium - arsenide multiplier photocell and a microprocessor-controlled integrating system. Pairs of wide-and narrow-band interference filters centered near the OI λ 7774 triplet and the Hα feature were used. Only the observations obtained through the wide bandpass filters were used in this study to determine the time of minimum light. The results of the full photometric study will be published later. The characteristics of the wide-band filters are: OIw (λ max = 7790Å; HWFH = 185Å), Hαw (λ max = 6595Å; HWFH = 270Å). The wide-band filters are broad enough so that the line feature does not significantly contribute to the measure.

The present observations obtained during primary eclipse were combined using the light ephemeris of Koch (1972),

$$\text{Pri. Min.} = \text{HJD}2433963.240 + 36.56717 \cdot E \quad . \qquad (1)$$

The phase at which mid-eclipse occurred was found by comparing our observations with a mean *V* light curve of SX Cas obtained from the observations given by Koch. The $\lambda 7790$ and $\lambda 6595$ observations were each scaled to the *V* light curve and the phase at which primary minimum occurred was found using the method of Szafraniec (1948). The time of primary eclipse determined in this manner was HJD2443909.11 and has an estimated uncertainty of about ±0.04 day. The *O–C* for this timing was found to be $-0\overset{d}{.}41$ when eq. 1 is used.

Although a recent period study of SX Cas has been published by Whitney (1978), only data up to 1966 were used and no new light ephemeris was derived. The relatively large *O–C* found here indicates that the old light ephemeris for SX Cas is no longer adequate and a new period study was undertaken.

Compilations of times of minimum light for SX Cas have been published by Dugan (1933), Koch (1972), and Whitney (1978). The most recent timing included in these compilations was for 1966. In addition to these timings, two visual timings of primary minimum by Samolyk and Wedemayer are listed by Baldwin (1978). These are for the same night and have been combined yielding: HJD2442592.64. Visual and photographic timings from Table I of Dugan, and also from Whitney's Table I, and photoelectric minima given in Table II of Whitney were combined with the present photoelectric timing and the visual estimate obtained from Baldwin. Fifty six timings of minimum light were accumulated and were assigned weights based upon weighting criteria given by Dugan and Whitney. Residuals were first computed from eq. 1. These residuals were then subjected to least squares polynomial fitting. A quadratic fit was found to be inferior to a cubic one and the latter is shown among the residuals in Figure 1. The improved ephemeris is:

$$\text{Pri. Min.} = 2433963.297 + 36.56667\,E - (2.78 \times 10^{-6}) \cdot E^2 - (2.34 \times 10^{-9}) \cdot E^3 \quad (2)$$

If the small cubic term is neglected, the change in period may be found:

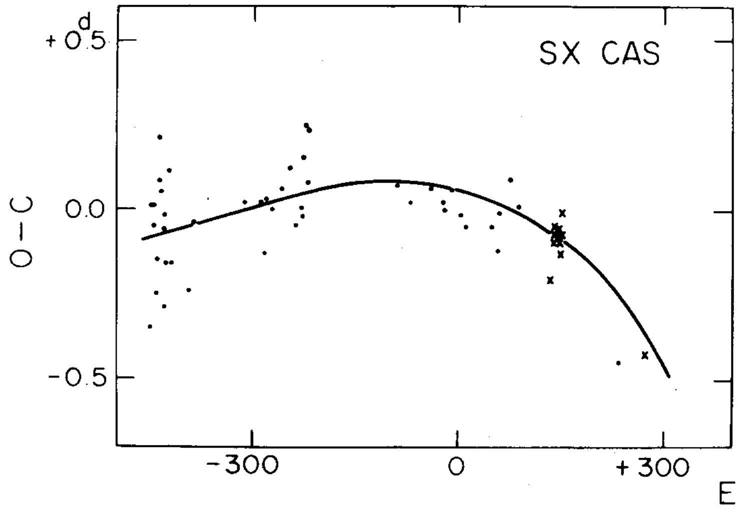

Figure 1. The (O-C) diagram from EQ. 1 for SX Cas. Small circles refer to visual or photographic measures and the crosses refer to photoelectric determinations. The curve represents EQ.2.

$\Delta P/E = -0.24$ sec/cycle

$\Delta P/P = -7.60 \times 10^{-8}$.

Alternatively it could be assumed that the period change was more abrupt and took place during the early 1960's. Two linear ephemerides were computed from the timings obtained before and following 1960,

$$\text{Pri. Min.} = 2433963.267 + 36.56727 \cdot E \qquad (3)$$

(1908-1960)

$$\text{Pri. Min.} = 2439009.525 + 36.56375 \cdot E. \qquad (4)$$

(1965-1979)

By subtracting the first period determination given in eq. 3 from that of eq. 4, we obtain,

$$\Delta P = 0\overset{d}{.}00352 = 304 \text{ sec.}$$

Equation 4 can be used to compute eclipse predictions for SX Cas in the near future.

In a recent IUE study by Plavec and Koch (1978) , SX Cas was one of several close binaries displaying strong UV emission lines indicative of hot plasmas. It is proposed by these authors that these systems, which include RX Cas, SX Cas, W Cru, V 367 Cyg, β Lyr, RW Per, and W Ser, contain hot components having optically and geometrically thick disks. These systems may be in the rapid stage of mass transfer or mass loss which could lead to the formation of an accretion disk about one of the components. The relatively large value of $\Delta P/P = -7.6 \times 10^{-8}$ found in the present study for SX Cas as well as the large values of $\Delta P/P$ found in the recent period studies of β Lyr (Herczeg 1973) and of W Ser (Koch and Guinan 1978) appear to be in accord with mass transfer rates of $\sim 10^{-5} M_{\odot}$/ year. The rate of period change found SX Cas is comparable in magnitude but opposite in sign, however, to those found for β Lyr and W Ser. For β Lyr and W Ser the period appears to be increasing while the period of the SX Cas is decreasing. This may indicate that SX Cas is at a different stage of stellar evolution than the other two systems. If the rate of period decrease for SX Cas is assumed to be steady (with conservation of mass and angular momentum), the decrease in period could indicate that mass transfer is taking place with the mass flow from the more to the less massive component (Kruszewski 1966). Under this interpretation SX Cas may be in the rapid mass transfer stage prior to mass-ratio reversal. β Lyr and W Ser as well as many other close binary systems appear to be in the mass transfer stage after mass reversal has taken place - i. e. where the flow is from the less to the more massive component. The spectrographic study of SX Cas by Struve (1944) indicates the existence of a stream of gas receding from the G-type component and flowing toward and around the hotter component. In a recent spectrographic study by Andersen (1973) the spectrum of the cooler component was detected and was found to have a radial velocity amplitude of two to three times greater than the hotter star. This would imply that the mass of the G-type component is approximately 1/2 to 1/3 the mass of the hotter star. Thus, the negative value of $\Delta P/P$ found here for SX Cas, when interpreted in terms of mass transfer from the more to the less massive star, is not in agreement with that indicated by the spectrographic studies. It is apparent that SX Cas is a very complex system and more observations are needed to clarify its evolutionary state.

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References:

Andersen, J., 1973, Publ. Astron. Soc. Pacific, 85, 191.

Baldwin, M.E., 1978, Journal of A.A.V.S.O., Vol. 7, No. 1.

Dugan, R.S., 1933, Princeton Obs. Contr. No. 13.

Herczeg, T.J., 1973, I.B.V.S., No. 820.

Koch, R.H., 1972, Astron. J., 77, 500.

Koch, R.H., and Guinan, E.F., 1978, I.B.V.S., No. 1483.

Kruszewski, A., 1966, Adv. in Astronomy and Astrophys., Vol. 4, 233.

Plavec, M. , and Koch, R.H., 1978, I.B.V.S., No. 1482.

Struve, O., 1944, Ap.J., 99, 89.

Szafraniec, R., 1948, Acta Astron., 4, Series C, 81.

Whitney, B.S., 1978, I.B.V.S., No. 1430.

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Budapest
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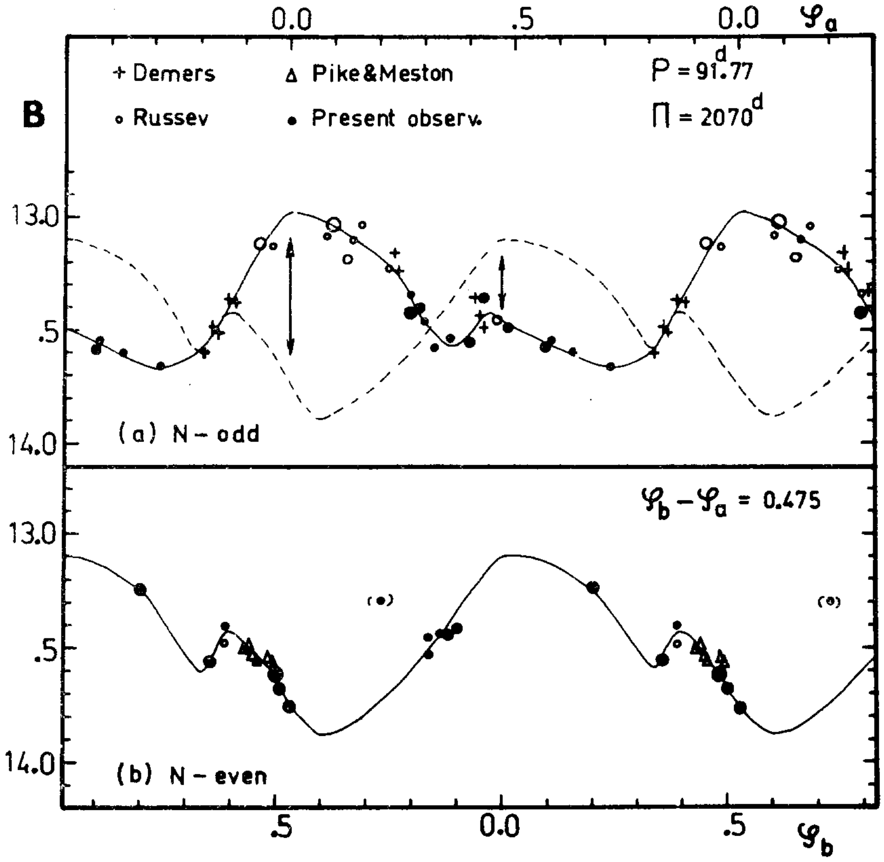
SEMI-REGULAR VARIABLE STAR VII IN M13

The variable star VII (Sawyer-Hogg, Publ.DDO, 3, No.6, 1973) is one of the brightest and reddest stars in the globular cluster M13=NGC 6205. It is undoubtedly physical member of the cluster according to radial velocity measurements (Joy, ApJ. 110, 105, 1949), proper motions (Kadla, Iz.Pulkovo Obs., 24,92, 1966) and position in the colour-magnitude diagram (Russev,Astr. Zr.,51, 122, 1974).

We have investigated the variability of the star VII on 43 blue plates of M13 taken with the 60 cm reflector of the Belogradchik Astronomical Station (Bulgaria) during four years,from 1974 to 1978 (J.D. 2442294-2443669). The photometric system was close to the B one as it was reported recently (Russev and Russeva, I.B.V.S. No. 1534, 1979). In addition to the present observational material we have used the B measurements of Demers (AJ, 76, 445, 1971), Russev (VS, 19, No.2, 181, 1973) and Pike and Meston (MN, 180, 613, 1977).

The analysis of the available observational data, covering about 16 years (J.D. 2437790-2443669), allowed us to establish, (1) that the period $P=91\overset{d}{.}77$, obtained by Russev (VS, 19, No.2,181, 1973), presents only the fundamental period of VII and (2) that the light curve is probably subjected to periodical changes, manifested by changing the roles of the main and secondary maxima with a period $\Pi=2070^d$. As it is shown in the Figure, where the size of the symbols depends on the number of the observations per night, during 1035^d the star has a light curve (Figure a), which is characterized with a secondary maximum (bump) on the descending branch at phase $\varphi\approx0.45$. During the following 1035^d the secondary maximum is transformed in a main one, and the former main maximum



decreases and becomes a bump of the descending branch of the light curve (Figure b) and so on. The data allowed us to study six such changes, the moments of which are obtained by the formula:

$$T = \text{J.D. } 2436370 + 1035^d \cdot N.$$

The odd N gives the beginning of the intervals in which "acts" the first maximum with the following elements of the light curve:

$$\text{Max} = \text{J.D. } 2438228.85 + 91\overset{d}{.}77 \cdot E \quad \text{(Figure a)}.$$

When N is even we have respectively the elements :

$$\text{Max} = \text{J.D. } 2438272.44 + 91\overset{d}{.}77 \cdot E \quad \text{(Figure b)}.$$

It seems that the change of the maxima takes place comparatively quickly, for about 1-2 fundamental periods. The next such change of the VII light curve may be expected at the beginning of 1981.

We have obtained from the light curve for VII $\bar{B}=13\overset{m}{.}45$ and amplitude of the variation $A_B=0\overset{m}{.}68$. Since $\bar{V}=11\overset{m}{.}83$ (from the observations of Demers, Pike and Meston and two our V plates) the colour index of the star is $\overline{B-V}=+1\overset{m}{.}62$.

The red semi-regular variables with periods about 90 days in globular star clusters are not a rarity. We may show at least 6 stars with periods from 90 to 93 days (V2 NGC 362, V148 NGC 5139, V17 NGC 6626, V5 NGC 6656, V6 NGC 6779, V19 NGC 7006), which are similar to VII in M13. Doubtlessly they have something in common with the RV Tau type stars of the Galaxy field, but their connection with them, at present, is not sufficiently investigated.

The details of our studies of VII together with other variables in M13 will be published elsewhere.

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PHOTOMETRIC VARIABLE STARS IN THE FIELD OF OPEN CLUSTERS

During the years 1975 to 1978 one of us (J.J.C.) was carrying out photoelectric observations of several open clusters of the southern hemisphere. Most of the selected clusters have either not been previously observed photoelectrically or the existing data are far from being complete. The results of these investigations are being prepared for publication.

The purpose of this note is to report the variability detected in nine stars located in the vicinity of the following open clusters: Collinder 135, NGC 2547, Pismis 13, NGC 3293, and NGC 5138. Two hundred and eighty stars in the above clusters were observed photoelectrically in the UBV system using the 150-cm telescope of the Bosque Alegre station of the Córdoba Observatory (Argentina) and the 41-cm, 61-cm and 91-cm telescopes of Cerro Tololo Inter-American Observatory. Mean coefficients were employed in both observatories to correct for atmospheric extinction and nightly observations of about 15 E-region primary standards (Cousins 1972) were used to transform to the UBV system. The external and internal mean errors of a single observation are about 0.01 mag in all the cases.

Among the new variables there are five whose individual measurements differ more than 0.2 mag, while the other four stars have ΔV variations in the range $0.12<V<0.20$. Five of the nine variables are found to be physical members of the clusters.

The individual photometric data for the new variables are presented in Table I, whose columns are self-explanatory. Some remarks on individual stars in the clusters are given at the end of the table.

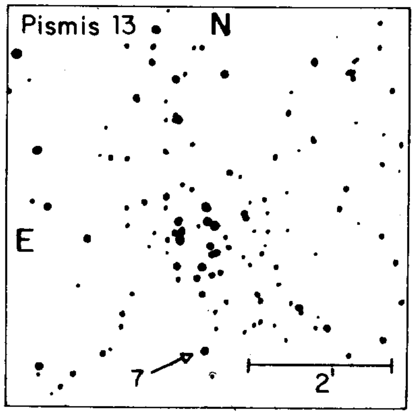
TABLE I

UBV observations of new photometric variables

Star	Membership	Sp.Type	HJD 2440000 +	V	B-V	U-B
		Collinder 135				
HD 55718	n-m	B3V	3563.6219	5.93	-0.13	-0.63
			3567.5201	5.72	-0.15	-0.63
			3574.6507	6.06	-0.19	-0.60
			3580.5223	5.96	-0.17	-0.64
HD 57034	n-m	B8	2458.6881	8.32	-0.05	-0.26
			2461.7097	8.08	-0.04	-0.27
			3563.6579	8.13	-0.04	-0.21
			3576.5309	8.12	-0.05	-0.24
		NGC 2547				
CD-49^{o}3379	n-m	K2	3167.6822	9.47	1.03	0.54
			3168.6913	9.54	1.06	0.52
			3169.7038	9.59	1.05	0.51
			3221.5488	9.49	1.05	0.61
			3222.5516	9.51	1.07	0.62
CD-48^{o}3526	m	F2	3167.7169	10.95	0.36	-
			3168.6788	10.97	0.36	-
			3169.6781	11.00	0.39	-
			3562.6163	11.06	0.38	0.00
			3576.5878	11.11	0.38	0.05
			3577.5484	11.09	0.36	0.05
CD-48^{o}3533	m	F0	3167.6524	10.63	0.30	0.06
			3169.6885	10.69	0.30	0.09
			3562.6060	10.76	0.31	0.06
			3576.6093	10.78	0.30	0.10
CD-49^{o}3384	n-m	M	3167.7287	9.59	1.65	2.08
			3168.7003	9.71	1.69	1.97
			3169.7419	9.78	1.66	1.83
			3221.5668	9.62	1.70	2.30
			3566.6330	9.67	1.77	2.09

Table I (continued)

Star	Membership	Sp.Type	HJD 2440000 +	V	B-V	U-B
			Pismis 13			
7	m	B8	3569.7382	13.74	0.57	0.13
			3570.6995	13.62	0.55	0.06
			NGC 3293			
CPD-57^{o}3502	m	M0Iab	3564.7559	7.22	2.05	2.30
			3567.7657	7.37	2.02	2.16
			3575.7305	7.41	2.05	1.98
			3581.7101	7.56	2.00	-
			NGC 5138			
63	m	K3	3563.8418	10.24	1.51	1.78
			3568.8357	10.28	1.49	1.71
			3570.8896	10.26	1.50	1.73
			3575.7715	10.30	1.52	1.72
			3578.8354	10.44	1.48	1.75



REMARKS ON INDIVIDUAL STARS

HD 55718: This is a double star ($\rho \approx 2''$) in the field of the very inconspicuous open cluster Cr 135. The UBV photometry refers to the combined light of both components. The spectral type of the A component has been taken from Kennedy and Buscombe (1974). The system lies well above the cluster main sequence in the colour-magnitude diagram. The reddening and distance obtained by Clariá and Kepler (1979), viz. E(B-V)=0.01 and d=620 pc, are both inconsistent with cluster membership.

HD 57034: Clariá and Kepler (1979) obtained $\beta=2.836$, E(B-V) = 0.02 and $V_o-M_V=7.50$ implying a foreground star.

CD-49°3379: This red star is slightly outside the main cluster region. Its position in the colour-magnitude diagram excludes it from cluster membership. Star No.14 of Fernie (1959).

CD-48°3526: The location of this star in the two colour-magnitude diagrams and in the (U-B) vs. (B-V) diagram is consistent with cluster membership. Star No.17 of Fernie (1959).

CD-48°3533: This star, No.22 of Fernie (1959), lies in the central region of the cluster. The UBV photometry is consistent with the star being an F-type cluster member.

CD-49°3384: Its location about 1.5 mag below the main-sequence turn-off suggests that it may not be a cluster member. Star No. 25 of Fernie (1959).

Pismis 13: This cluster is a compact group of faint stars in Vela; hence Ruprecht (1966) placed it as belonging to class II2p. The UBV data of star 7 are compatible with this star being a late B-type cluster member with E(B-V)= 0.66. A finding chart for the suspected variable No.7 (Clariá 1979) in Pismis 13 is shown in Figure 1.

CPD-57°3502: From the spectral classification (M0Iab) and radial velocity (-12 km/sec) given by Feast (1958), the star is very probably a cluster member.

NGC 5138: The colour-magnitude diagram of this cluster shows four red stars which could be giant cluster members. They are Lindoff's (1972) stars 22, 63, 79 and 151. DDO photometry of star 63 imply E(B-V)=0.12 and a K5 III-IV spectral type suggesting that this star is probably not a cluster member.

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References:

Claria, J.J. 1979, (to be published)

Claria, J.J. and Kepler, S.O.,1979 (in preparation)

Cousins, A.W.J., 1972, Mon.Notes Astron.Soc.Sth.Africa,31,127

Feast, M.W., 1958, Mon.Not.Roy.Astron.Soc. 118, 618

Fernie, J.D., 1959, Mon.Notes Astron.Soc.Sth.Africa 18, 57

Kennedy, P.M. and Buscombe, W., 1974, MK Spectral Classifications published since Jaschek's La Plata Catalogue, Evanston

Lindoff, U., 1972, Astron.Astrophys.Suppl. 7, 231

Ruprecht, J.,1966, Bull.Inst. Czech. 17, 33

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Konkoly Observatory
Budapest
1979 June 21

FLARE STAR OBSERVATIONS IN THE PLEIADES REGION

Four new flare stars and six outburst repetitions of the Pleiades-region flare stars were discovered.

The observations were made with the 60/90/180 cm Schmidt telescope at Konkoly Observatory in the winter period of 1975-76.

The effective coverage of these observations was 16.0 hours and the method of observations was the common one of multiple and equal exposures of 10 minutes in the U-band.

Table 1

No	RA	D	m_u	Δm_u	Date
1	$3^h35^m.7$	+23°27′	$18^m.5$	$1^m.8$	30.12.1975
2	36.1	23 02	17.2	1.7	02.01.1976
3	42.0	22 35	20.0	5.5	31.12.1975
4	42.5	22 25	19.3	4.3	29.12.1975

Table 1 gives some data for the new flare stars found and the columns give: the serial number; the approximate coordinates for 1900.0; the approximate minimum brightness in U-band; the observed amplitude of the flare-up in U-band and the date of the flare up, respectively.

The data for the registered flare repetitions of the already known flare stars are presented in Table 2.

Table 2

No	HII	RA	D	m_u	Δm_u	Date
55	2411	$3^h43^m.7$	+24°01′	16.9	2.0	29.12.1975
139		38.7	23 12	18.3	2.3	29.12.1975
202		39.3	23 03	20.1	3.7	30.12.1975
212	1029	40.5	24 27	16.7	2.0	02.01.1976
352		41.5	22 50	20.0	5.5	31.12.1975
361		33.6	23 56	19.4	4.4	28.12.1975

The Byurakan designation was used and the Hertzsprung numbers are also given.

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Budapest
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FLARE STAR OBSERVATIONS IN THE PRAESEPE REGION

Two new flare stars have been discovered during 37 hours of effective coverage (21 hours in the Pg- and 16 hours in the U-band).

The observations centered at RA=$8^h37^m05^s$, D=$19^\circ51'$ (1950) have been carried out with the Schmidt telescopes of the Byurakan Observatory (40" and 21").

The method of observations was the common one of multiple and equal exposures of 10 minutes.

Table 1

No	RA (1950)	D (1950)	m_{umin}	Δm_u	Date
1	$8^h37^m.9$	$+18^\circ33'$	>20.0	>4.0	07.03.1975
2	38.9	$+17^\circ45'$	18.5	3.5	08.03.1975

Table 1 gives the data of the observed flares. The coordinates and the magnitudes are approximate.

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Budapest
1979 June 21

FLARE STARS IN ORION

We have continued the survey for flare stars in the region of Orion nebula. On the plates taken with the 40" and 21" Schmidt telescopes of Byurakan Observatory we discovered nine flare events of the stars around the Orion nebula.

The total time of effective coverage was 14 hours in pg- and 17 hours in the U-band. In most cases the plates were taken with the multiple and equal exposure method.

Table 1

Designation No.	No. Haro	No. Parenago	RA (1950)	D (1950)	m_{min} (pg)	m_{min} (u)	Δm (pg)	Δm (u)	Data	Telescope
1			$5^h32.7$	$-5^\circ49'$	$16^m.5$		$1^m.2$		25.10.1962	40"
2	198	1215	31.2	-4 15	17.5		2.4		14.01.1964	40"
3			40.3	-5 51	16.5		1.3		12.02.1964	40"
4			32.4	-5 47	16.5		1.5		03.10.1970	40"
5			32.0	-5 03		18.0		4.5	07.03.1975	40"
6			34.3	-5 38	17.5		2.3		08.03.1975	21"
7			41.1	-4 56		>20.0		>6.5	08.03.1975	40"
8			29.2	-7 13		18.7		5.2	10.11.1977	40"
9			31.7	-5 58		17.6		2.1	07.11.1977	40"

The informations about the flare events of the stars No.1 and No.6 have already been published: L.V. Mirzoyan, Astronomicheskij Cirkular No.294, 1964; H.S. Chavushian, N.D. Melikian, Astrofizika, 13,199, 1977.

Table 1 gives the data for the nine flare stars found. The Haro and the Parenago numbers are also given, the coordinates and magnitudes are approximate.

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Budapest
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NEW FLARE STARS IN THE NGC 7000 REGION

Five new flare stars were discovered in 43 hours of effective observational time in the region of NGC 7000 centered on the star BD +41°3922, covering about 16 square degrees.

The observations were made with the 40" Schmidt telescope of Byurakan Observatory.

The method of observation was the common one of multiple and equal exposures of 10 minutes in U-band.

The informations about our flares are summarized in Table 1.

Table 1

No.	RA (1950)	D (1950)	m_u(min)	Δm_u	Data
1	$20^h46^m.2$	42°49'	$18^m.0$	$1^m.5$	20.09.1977
2	55.1	43 55	17.7	0.6	13.09.1977
	"	"	"	1.2	02.09.1978
3	54.5	43 05	>21.0	>3.7	27.08.1978
4	54.5	43 03	18.0	1.0	27.08.1978
5	57.5	41 44	18.1	1.6	09.09.1978

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COMMISSION 27 OF THE I. A. U.
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Number 1630

Konkoly Observatory
Budapest
1979 June 21

A NOTEWORTHY STAR IN SERPENS

In the course of a search for galaxies with ultraviolet continuum on plates obtained at Byurakan 40" Schmidt-camera with a low-dispersion objective prism survey, we have discovered a new variable star whose brightness in comparison to POSS was about four magnitudes brighter corresponding thus to $m_V= 1{\cdot}4^m$.

On slit spectra (D=200 Å/mm) taken with the Byurakan 2.6 m telescope on June 6, 1978 we discovered the following very strong and broad emission lines: HeII 4686, HeI 6678, 5875, 4471, 3888, H_α-H_ε. There are no forbidden or absorption lines, and it is necessary to note that all emission lines are broad. The total width of H_α line on the continuous spectrum level is about 70Å, which corresponds to an expansion velocity of more than 3000 km/sec. We obtained only one spectrum in red and one spectrum in blue regions.

Using the plates of several co-workers of Byurakan Observatory we followed the behaviour of the star from May 1965 and established that the star's brightness in the period from May 1965 to May 1979 was about $m_V=14^m$.

We do not have any data in the period from April 1950 (POSS) to May 1965, so that it is not possible to establish when and how the brightening took place.

From its flare amplitude, long time sojourn on this higher level of brightness and the presence of only wide permitted lines, we have not succeeded to adhere this star to any class of flare stars.

Identification chart in red colour reproduced from POSS and coordinates for the epoch 1950 are given below. North is at the top, east is to the left. The field is approximately 16'x 16'.

RA = $15^h35^m44^s$ Decl. = $+19^\circ01'30''$

I wish to thank academician B.E. Markarian for discussions and valuable remarks, R.E. Gershberg for advise, and V.S. Oskanian for the preview the text.

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PHOTOELECTRIC MINIMA OF FIVE ECLIPSING BINARIES IN CASSIOPEIA AND PEGASUS

During the summer and fall of 1978 photoelectric V-filter observations were made of primary minima of DO Cas, RZ Cas, TV Cas, TW Cas, and AT Peg with the 40-cm Cassegrain telescope of the University of Montana. The observing procedure was the same as described in IBVS No. 1478 (Margrave et al., 1978).

Table 1. Observed Heliocentric Times of Minima

Star	Hel. JD - 2,440,000	O-C
DO Cas	3728.8184 ± 0.0003	$-0^{\mathrm{d}}.0013$
	3795.9144 ± 0.0003	-0.0026
RZ Cas	3723.8235 ± 0.0003	-0.0019
	3729.8003 ± 0.0002	-0.0014
	3760.8740 ± 0.0004	-0.0041
	3772.8246 ± 0.0002	-0.0060
	3790.7519 ± 0.0001	-0.0074
	3796.7303 ± 0.0002	-0.0052
	3803.9019 ± 0.0003	-0.0051
TV Cas	3786.7774 ± 0.0002	-0.0178
	3795.8442 ± 0.0003	-0.0140
TW Cas	3803.7904 ± 0.0005	-0.0029
AT Peg	3728.7993 ± 0.0010	-0.0512

The times of minima in Table 1 were determined both by the chord bisection method and by the least-squares fitting of a parabolic curve. The results given by the two methods are usually the same to four decimal places. When they differ by amounts of the order of the quoted standard deviations, the least-squares quadratic fit result is given here.

The ephemerides used to calculate the O-C values are given in Table 2. The large negative residuals for TV Cas are consistent with the trend of early-occurring eclipses evident in the data of Pohl and Kizilirmak (1976) and Ebersberger, Pohl, and Kizilirmak (1978). A more accurate ephemeris for the prediction of future primary minima of TV Cas is

Table 2. Ephemerides for Stars Observed

Star	Hel. JD	Period (days)	Source
DO Cas	2,433,926.4573	0.68466595	SAC 50
RZ Cas	2,429,875.6902	1.1952473	Herczeg and Friboes-Conde
TV Cas	2,443,043.6265	1.8126066	SAC 50
TW Cas	2,442,008.3850	1.428328	SAC 50
AT Peg	2,440,438.383	1.146105	SAC 50

$$\text{Hel. JD (Min)} = 2,442,590.4728 + 1\overset{d}{.}81258632\ E.$$

This ephemeris gives residuals less than 0.0025 days for the minima of the two notes cited above and the present note but is not intended as a definitive new ephemeris for TV Cas.

The very large negative O–C value for AT Peg found here continues the trend to early-occurring eclipses noted by Margrave et al. (1978). It would appear that the period decrease of AT Peg has accelerated since 1975. The following quadratic ephemeris is suggested for prediction of future primary minima of AT Peg:

$$\text{Hel. JD (Min)} = 2,440,438.3819 + 1\overset{d}{.}14611546\ E - 9.523 \times 10^{-9}\ E^2.$$

This ephemeris is based on observations only back to 1969, for which it gives a mean residual of 0.0030 days, and is intended merely to aid observers in planning observations of AT Peg. It is obvious, however, that careful attention should be given to deriving a revised ephemeris for this star.

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References:

Ebersberger, J., Pohl, E., and Kizilirmak, A.: IBVS No. 1449, 1978.

Herczeg, T. and Friboes-Conde, H.: Astr. and Ap., 30, 259, 1974.

Margrave, T. et al.: IBVS No. 1478, 1978.

Pohl, E. and Kizilirmak, A.: IBVS No. 1163, 1976.

Rudnicki, K.: Supplemento ad Annuario Cracoviense No. 50, Krakow 1978.

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PRIMARY MINIMUM AND NEW EPHEMERIS OF TT Hya

Primary minimum of eclipsing variable TT Hya was observed photoelectrically in UBV with 41 cm reflector at Siding Spring on 13/14 Feb. 1979. Observing conditions were not very good. The observation had to be interrupted because of cloudiness also the observation was terminated because of photocell failure. The star HD 97637 (Sp. A0) served as comparison star. A pulse counting system with 1P21 photomultiplier and standard UBV filters of the Mt. Stromlo and Siding Spring Observatories were used. Observation consisted of the sequence CVCVC.... each star being observed in all three colours, and three to five 10-second integrations were made to check the fluctuations. Each integration reading of the photometer was printed and the local sidereal time was read off the digital display and recorded manually.

TT Hya - primary minimum in UBV
13/14 February, 1979, Siding Spring, 41 cm

HJD 2440000.+	ΔV		ΔB		ΔU
3917.9321	-0.093	3917.9343	0.284	3917.9348	0.274
.9424	+ .032	.9442	.494	.9449	.490
.9527	.140	.9543	.693	.9549	.704
.9614	.239	.9630	.913	.9639	.994
.9709	.354	.9726	1.161	.9733	1.361
.9801	.443	.9819	1.318	.9827	1.545
.9911	.490	.9927	1.336	.9935	1.603
3918.0165	.500	3918.0182	1.372	3918.0188	1.642
.0493	.508	.0514	1.410	.0522	1.718
.0599	.496	.0616	1.422	.0623	1.732
.0716	.497	.0732	1.404	.0741	1.738
.0818	.491	.0834	1.415	.0842	1.727
.1786	.494	.1802	1.416	.1808	1.708
.1871	.487	.1888	1.383	.1893	1.678
.1951	.490	.1966	1.379	.1971	1.664
.2029	.479	.2043	1.396	.2048	1.659
.2258	.460	.2273	1.330	.2278	1.615
.2337	.432	.2357	1.240	.2365	1.402
.2416	.362	.2431	1.139	.2436	1.225
.2503	.232	.2517	.874	.2524	.900
.2595	.135	.2612	.630	.2617	.563
.2685	.099	.2700	.447	.2706	.610

The data in the Table represents the time in heliocetric Julian Days and the observed differential magnitude in the telescope-photometer natural system (variable minus comparison). As the minimum was not well covered by observations the time of minimum was obtained by simple Kordylewski's method of folded tracing paper at large scale using averages from all 3 colours. The error was estimated also by that graphical method. The primary minimum occurred at HJD 2443918.1060 ± 0.0006 which is $1^h\ 05^m$ later than according to the ephemeris given in GCVS. The new period is slightly longer than in GCVS and the new ephemeris is

$$T_{min} = 2443918.1060 + 6.9534287\ E.$$

The observed points of the light curve are represented in Fig. 1, which is the direct output of the Plotter HP-9125B. The reduction of the observation was done with HP-97 and HP-9100 (+HP-9101A) calculators.

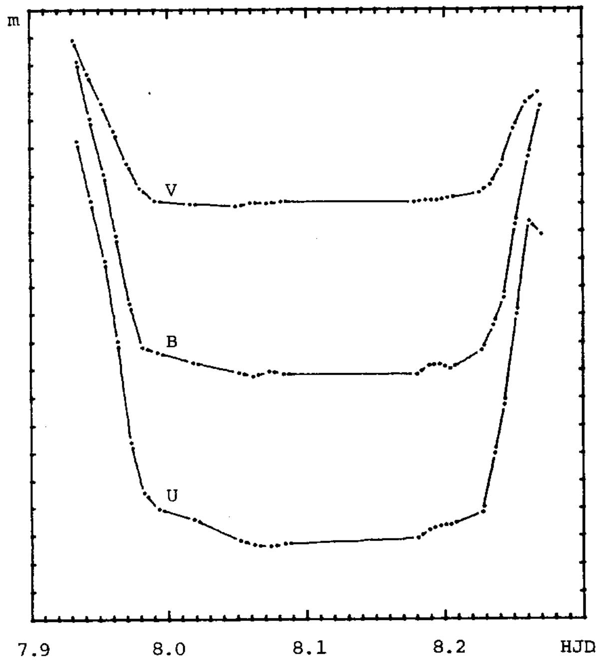

Fig. 1. Differential magnitudes TT Hya - HD 97637. Magnitude zero-point arbitrary, division marks 0.1^m.

These results are part of the project of photoelectric observation of southern eclipsing variable stars with known changes of periods or stars not observed for long time or not observed photoelectrically at all. This project is supported by the Grant No. B 76/15712 of the Australian Research Grant Commission. I wish to express my thanks to the Mt. Stromlo and Siding Spring Observatories for the time allocation and facilities at Siding Spring and to Mrs. A.E. Harris for her assistance during the observation.

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B V OBSERVATIONS OF NOVA CYGNI 1978 (V 1668 Cyg)

Between 7 Oct. 1978 and 19 Dec. 1978 photoelectric observations of the nova were made during 19 evenings even if the weather was not of high quality. The 75 cm telescope of the Wilhelm Foerster Observatory, Berlin, an uncooled 1P21 multiplier, an usual amplifier and Schott filters BG12+GG13 for the B-band and GG11 for the V-band were used.

The stars listed in Table 2 and identified in the Figure served as comparison stars. Table 1 gives the heliocentric Julian Date, the mean magnitude $\overline{V}$ and its standard deviation, the mean colour $\overline{B}$-$\overline{V}$ and its standard deviation and the number of individual measurements of the nova for each of the 19 evenings.

Except J.D. 2442828^d, all measurements were done within half an hour. Consequently, nothing could be said about quick fluctuations as found by Margrave (IAUC 3296, 1978). The observations on J.D. 2443828^d seem to indicate such short periodic fluctuations.

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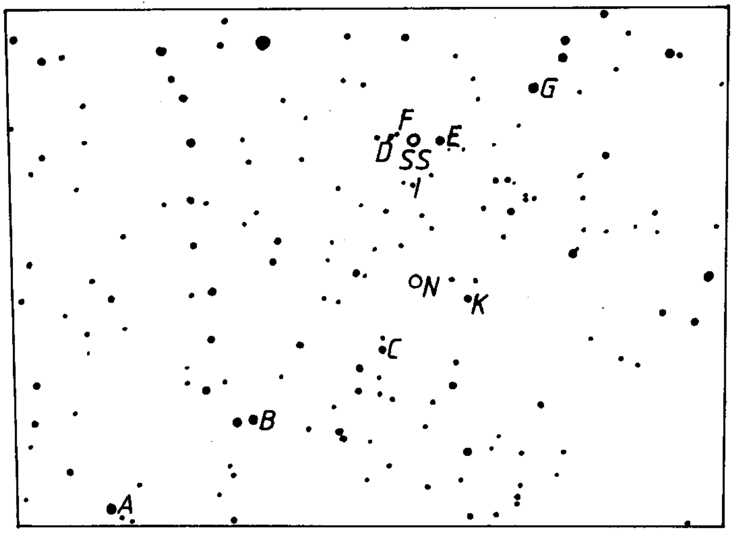

Identification chart of the Nova Cyg 1978, SS Cyg and the used comparison stars. South at the top.

Table 1
Daily means of N Cyg 1978 observations

Date (J.D.)	$\bar{V}$		$\overline{B-V}$		n
2443 $789^{d}.325$	$9^{m}.06$	$\pm0^{m}.03$	$+0^{m}.29$	$\pm0^{m}.04$	2
790.258	9.08	0.02	0.34	0.04	3
793.271	9.15	0.01	0.16	0.01	2
794.306	9.67	0.02	0.40	0.02	3
795.307	9.64	0.01	0.20	0.01	4
800.377	9.68	0.02	0.22	0.02	2
807.309	9.90	0.01	0.47	0.02	4
808.344	10.10	0.01	0.24	0.03	3
814.206	10.44	0.02	0.52	0.03	2
815.234	10.36	0.02	0.41	0.11	4
828.249	10.51	0.01	0.29	0.02	10
829.274	10.51	0.02	0.45	0.04	2
832.261	10.61	0.02	0.25	0.03	5
833.255	10.63	0.01	0.24	0.01	5
847.245	10.90	0.05	0.16	0.06	3
848.251	10.83	0.02	0.31	0.03	6
850.191	10.99	0.05	0.23	0.06	3
861.221			0.33	0.11	3
862.240	10.93	0.05	0.33	0.05	2

Table 2
Comparison stars

Star	V	B-V
A	$6^{m}.21$	$+0^{m}.18$
B	6.72	-0.06
C	9.23	+0.13
D	9.72	+0.54
E	8.47	+1.20
F	10.73	+0.47
G	7.49	+1.84
I	9.57	+0.95
K	11.18	+0.53

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Konkoly Observatory
Budapest
1979 July 2

A NOTE ON THE REVISED PHOTOMETRIC ELEMENTS OF THE R CMa SYSTEMS

In a recent paper by Cester et al. (1979), the light curves of several R CMa systems have been analyzed in order to obtain homogeneous photometric elements using Wood's computer model,WINK. As a result of this important rediscussion, it has been shown that these systems could well be considered normal semi-detached ones, with only S Vel retaining anomalous properties. Therefore, as expected since some years ago by some authors (e.g. Sahade,1963), there exists no evidence left supporting the reality of a homogeneous group of R CMa stars.

The anomalies of S Vel, moreover, are based on very doubtful spectroscopic elements (as Cester already pointed) and we have attempted a different approach to the absolute parameters of this particular system.

In our analysis, preliminary values of the unperturbed elements r_h, k and i were determined together with the limb darkening coefficients of the hotter component through a frequency-domain analysis of the primary minimum of the light curve from Sisteró (1971) following the method of Kopal. Taking the temperatures from the scale given by Johnsòn (1966) and using the computer model of D.B. Wood (1972), the photometric elements of S Vel were determined from the mean of the V and B solutions independently obtained. U filter was not included because of the known existence of ultraviolet excess and the stronger distortion of the light curve. The comparison of the secondary size with the corresponding Roche lobe allowed us to estimate the value of the mass ratio, q, by trial and error using the tables of Tsesevich (1973) in 0.14 ± 0.01.

Table I, gives the determined photometric elements for the system S Vel. Symbols and units are equal to those used by Cester et al.

Table I

i	86.55 ± 0.12
r_h	0.080 ± 0.001
a_c	0.278 ± 0.002
b_c	0.226 ± 0.002
c_c	0.207 ± 0.002
T_h(eq.)	8260 (assumed)
T_h(pol.)	8262
T_c(eq.)	4160
T_c(pol.)	4228
L_h(V)	0.722
L_h(B)	0.860

Now, for the determination of the absolute elements, instead of assuming that the radial velocity curve is an exact representation of the orbital velocities of the components, we suppose that the hotter star is actually in the main sequence.This hypothesis is quite fair if we have assumed a value of T_h in our analysis from a calibration for main-sequence stars. Moreover, it is strongly supported not only by the fact of the observed spectral type (A5V) but also by the measurements in Hβ photometry by Sisteró (1971). The value of β for the primary component is in fact of 2.898, which is in very good agreement with the expected absolute magnitude in the calibration of Crawford (1973). On the other hand, the luminosity determined by Cester for the hotter star does not coincide with the observed value of β.

Then, if we take bolometric corrections and M_b is equal to $2^{m}.1 \pm 0.1$, using the mass-luminosity relation by McCluskey and Kondo (1972), we have that m_h= 1.9 solar massses and thence m_c=0.27. The mass function deduced from these values is of 0.0041 solar masses which implies a K_1 of 19 km/sec, well within the probable errors of the observed radial velocity curve.

The combination of the above mentioned parameters with equations 4-6 in Cester's paper, results in the absolute elements collected in Table II.

Table II

	h	c
Mass	1.9	0.27
Radius	1.4	4.2
Luminosity	8.5	4.8

Conclusion

The position of S Vel in the mass-luminosity and mass-radius planes as well as in the HR diagram (see figures 1,2 and 3 of Cester's paper) is consistent with the theory of semi-detached binaries and with the revised photometric elements of the so-called group of R CMa systems. It is deduced from the present note that anomalous properties of S Vel are not strongly supported by observations and that peculiarities indicating the existence of a homogeneous R CMa group of stars can be definitely ruled out, although further spectroscopic observations are highly desirable.

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References:

Cester, B., Giuricin, G., Mardirossian, F., Mezzetti, M. and Milano, L.: 1979, Astron.Astrophys.Suppl. 36, 273

Crawford, D.L.: 1973, IAU Symp. No.54. Hauck et al. editors Reidel Publ. p.105

Johnson, H.L.: 1966, Annual Rev. Astron. Astrophys.,4, 193

McCluskey, G.E. and Kondo, Y.: 1972, Astrophys.Space Sci. 17,134

Sahade, J.: 1963, Ann. d'Astrophys. 26, 80

Sisteró, R.F.: 1971, Bull.Astron.Inst.Czechosl. 22, 188

Tsesevich, V.P.: 1973, In "Eclipsing variable stars", ed.Tsesevich. IPST Astrophys. Library. Israel. Chap.7

Wood, D.B.: "A computer program for modeling non-spherical eclipsing binary systems". GSFC. Greenbelt, Md., U.S.A.

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INFORMATION BULLETIN ON VARIABLE STARS
Number 1635

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ADDITIONAL IDENTIFICATION OF VARIABLE STARS IN A GENERAL CATALOGUE OF COOL CARBON STARS

A comparison of A General Catalogue of Cool Carbon Stars (Stephenson, 1973) with the First, Second and Third Supplement to the General Catalogue of Variable Stars (1971, 1974, 1976) results in the correlations given in Table I. Carbon and variable stars are considered identical if their positions agreed within 3′ in declination and $12^s \sec\delta$ in right ascension. The first column gives the number in Stephenson's catalogue while the second gives the variable designation. An asterisk after a CCS number refers to a remark about this star which is placed after the table.

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References:

Alksnis, A. and Alksne, Z. 1969, Astron.Tsirk., N. 538, 7
Kukarkin, B.V., Kholopov, P.N., Efremov, Yu.N.,Kukarkina, N.P., Kurochkin, N.E.,Medvedeva, G.I.,Perova,N.B.,Pskovskii,Yu,P., Fedorovich, V.P.,Frolov,M.S.1971, First Supplement to the Third Edition of the General Catalogue of Variable Stars
_________ 1974, Second Supplement to the Third Edition of the General Catalogue of Variable Stars
Kukarkin, B.V., Kholopov, P.N., Kukarkina, N.P.,Kurochkin, N.E., Medvedeva, G.I., Perova, N.B., Pskovskii, Yu.P., Fedorovich, V.P., Frolov, M.S. 1976, Third Supplement to the Third edition of the General Catalogue of Var.Stars
Stephenson, C.B. 1965, Ap.J.,142, 712
Stephenson, C.B. 1973, A General Catalogue of Cool Carbon Stars, Pub. Warner and Swasey Observatory, 1, No.4

TABLE 1

CCS	Variable Designation	
88	V481	Cas
136	TW	Hor
142	V384	Per
201	V695	Tau
233	V395	Per
260	NQ	Aur
263	NR	Aur
279	NS	Aur
303	NZ	Aur
312	OO	Aur
338	OP	Aur
339	OQ	Aur
343	OR	Aur
345	OS	Aur
346	OT	Aur
347	OU	Aur
355	OV	Aur
367	OW	Aur
503	V617	Mon
505	V619	Mon
519*	V622	Mon
527	V587	Mon
530	LV	Gem
538	V624	Mon
550	V626	Mon
623	NP	Pup
645	V614	Mon
779	NQ	Gem
1293	UW	Pyx
1404	IQ	Hya
1630	AB	Ant
1671	GR	Vel
1689	V354	Car
1824	CI	Cha
1869	V750	Cen
1874	V751	Cen
2567	FO	Ser
2574	V3816	Sgr
2617	V3857	Sgr
2851	V1303	Cyg
2862	V1422	Cyg
2866	V1423	Cyg
2904	V1387	Cyg
3041	V1426	Cyg
3045	LU	Cep
3076	V1398	Cyg
3077	V1428	Cyg
3079	V1399	Cyg
3083	V1502	Cyg
3092	V1409	Cyg
3093	V1410	Cyg
3096	IS	Cep
3097	V1415	Cyg
3098*	V1420	Cyg
3104	PQ	Lac
3113	PU	Lac
3116	IW	Lac
3138	QZ	Lac
3154	MV	Cep
3161	OO	Cep
3164	OP	Cep
3166	MW	Cep
3179	MZ	Cep
3209	V543	Cas
3210	V532	Cas

REMARKS

CCS 519 A check with Stephenson (1965) reveals that the declination listed in the CCS is in error by exactly 10°. It should read $+07^{\circ}13'33''$.

CCS 3098 Although the positions of CCS 3098 and V1420 Cyg differ by 36 sec in right ascension, a check between the CCS and Alksnis and Alksne (9169) indicates that they are indeed the same object. Stephenson did indicate in his catalogue that the position of CCS 3098 is more uncertain than the quoted precision.

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Z ANDROMEDAE: LONG TIME SCALE VARIATION OF Hα DURING QUIESCENT PHASE

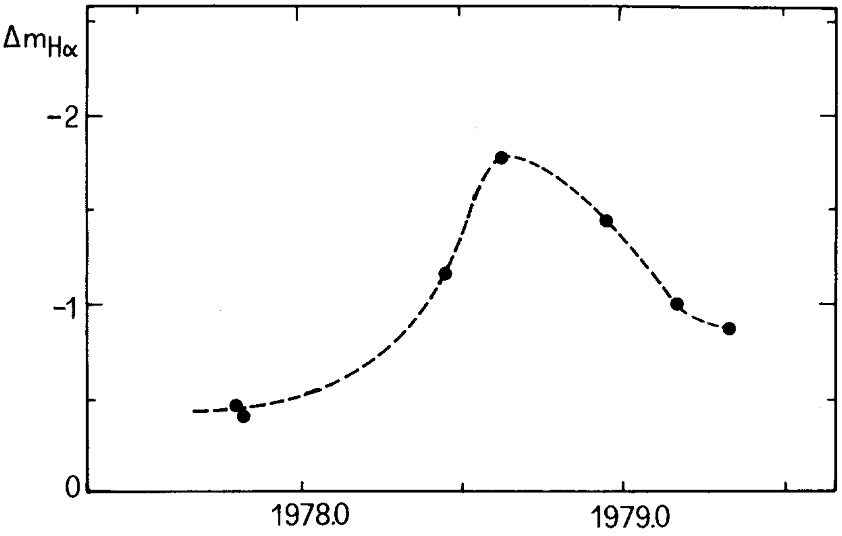
The light history of the symbiotic star Z Andromedae during the last half century is characterized by active phases with recurrent nova-like variations, followed by long periods during which the star is at minimum luminosity (Mattei 1978). The mean repetition time between the light maxima according to Mattei is 632 days, but the single time intervals largely differ from their mean. Merrill (1944) suggested a periodic variation of the radial velocity of the emission lines with a similar period, but Boyarchuk (1968) pointed out that these variations seem to be primarily due to variations in the physical conditions of emitting envelope, rather than to a real orbital motion. Strong spectral variations have been largely reported in the literature (e.g. Swings and Struve 1941, Bloch et al. 1969), but at our knowledge no systematic observations of the spectrum of Z And during its quiescent phase have been so far published.

Since 1973 Z And is in a quiescent phase, and this is a good opportunity to look deep in the system, disregarding all those phenomena that are related to the outbursts. We have monitored the spectrum of the star with the Schmidt telescope of Campo Imperatore from October 1977 to May 1979, to look for any long time scale variation, and to derive a better spectral classification of the cool spectrum. Several objective prism plates were collected on IIaO, IIIaJ, IIaF and IN Kodak emulsions. Low and high resolution ultraviolet spectra were obtained during the same period of time with the IUE satellite (Baratta et al. 1978, 1979). The visual magnitude remained constant with V=10.8±0.1 (Observations of Variable Stars Report, No.32 Groningen, and Feijth, private communication).

The objective prism plates show that the cool spectrum is the main contributor to the continuum of Z And longwards of 4100-4300 Å.

Several TiO absorption bands were identified, and their strength is in agreement with a spectral type of M 6.5. From a careful comparison with the spectra of nearby stars, we found that the continuum of Z And does not show significant variations during the whole period of our observations. In particular the near infrared continuum was constant within ±0.1. This value is much smaller than the upper limit for the luminosity variation of the cool component derived by Boyarchuk (1968). This result leads one to reject the hypothesis that the cool star is mainly responsible for the large variations of Z And.

On the other hand the Balmer emission lines markedly varied with respect to the stellar continuum. Hα increased its intensity by a factor of about 3 between October 1977 and August 1978, and decreased again in 1979 to nearly the same intensity as in 1977. The behaviour of this line is illustrated in the Figure.



Such a variation was not displayed by the emission lines of the other ions. In particular the He II 4686 line remained nearly at constant intensity during the period 1977-79.

This long time scale variation of Hα and of the other Balmer lines has some resemblance with the luminosity variations of Z And during the active phases, and the epoch of maximum Hα emission seems to be in phase with the last reported light maxima (Mattei, 1978). This, however, does not imply the same origin for the two phenomena, principally because of the large variation of the time interval between the light maxima. Radial velocity and line profile measurements of H_α over a long period of time would be of great help in the study of the nature of Z And.

We are grateful to H. Feijth for providing us with the 1978 magnitudes of Z And.

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References:

Baratta, G.B., Altamore, A.,Cassatella, A., Viotti, R. 1978, I.B.V.S. No. 1493

Baratta, G.B., Altamore, A.,Cassatella, A., Giangrande, A., Ricciardi, O., Viotti, R., 1979, IAU Circ. No.3335

Bloch, M., Jounsten, N., Swings, J.P., 1969, Bull.Soc.R.Sci.Liège, 38^{e}année, n^{o} 5-6, 245

Boyarchuk, A.A., 1968, Soviet A.J., 11, 818

Mattei, J.A., 1978, J.Roy.Astron.Soc.Can., 72, 61

Merrill, P.W., 1944, Ap.J., 99, 481

Swings, P., Struve, O. 1941, Ap.J. 93, 356

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B V OBSERVATIONS OF V 1057 CYGNI

Winnberg and Walmsberg (1979) found that this unusual FU Ori type variable star flared up again in the 1720 MHz OH line on May 30, 1979.

On six plates (Orwo ZU2) taken with the f/5 fourlens astrograph of the Observatorium Hoher List, B magnitudes were estimated. Photoelectric observations were made with the 75 cm telescope of the Wilhelm Foerster Observatory, Berlin, an uncooled 1P21 photomultiplier and Schott filters BG 12 + GG 13 for the B band and GG 11 for the V band. Comparison star data are adopted from Landolt (1975). Table I lists all magnitudes. The mean of the photographic observations is $\bar{B}=12\overset{m}{.}8 \pm 0\overset{m}{.}1$, 1978.6 the mean of the photoelectric observations is $\bar{B}=12\overset{m}{.}66 \pm 0\overset{m}{.}01$, $\bar{B}-\bar{V}=+1\overset{m}{.}79 \pm 0.01$, 1979.5. Herbig (1977) collected all available observations up to 1977 and determined an average fading rate of $1\overset{m}{.}7$/6 yrs. since the outburst in 1970. From this rate, one expects in 1978.6 a B magnitude of $12\overset{m}{.}74$ which is in good agreement with our photographic results. For 1979.5 one would expect $B=12\overset{m}{.}99$ which is $0\overset{m}{.}33$ less than the listed photoelectric B magnitude. Thus, a small optical outburst may be possible, too.

We have to thank the Observatorium Hoher List for the possibility to use the astrograph of the institute.

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References:
Herbig, G.H., 1977 - Astrophys.J. 217, 693
Landolt, A., 1975 - Publ.Astron.Soc.Pacific 87, 379
Winnberg, A., Walmsley, C., 1979 - IAUC 3364

Table I

Date (J.D. geo.)	B	B-V	Method
244 $3715\overset{d}{.}396$	$12\overset{m}{.}7 \pm 0\overset{m}{.}1$		pg
3717.439	12.9		pg
3718.431	12.8		pg
3719.406	12.9		pg
3723.499	12.9		pg
3725.474	12.8		pg
4044.476	12.65 ± 0.04	$+1\overset{m}{.}78 \pm 0\overset{m}{.}04$	pe
4045.488	12.68	+1.80	pe
4046.479	12.66	+1.68:	pe

The error in V is about $\pm 0\overset{m}{.}01$.

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ON THE PERIOD AND VELOCITY CURVE OF THE β CEPHEI STAR HR6684

In a recent paper McNamara (1978) derived a velocity curve for the β Cep star HR6684 (=HD 163472) that differs considerably from those obtained by Pike (1974, 1978) and Bolton, Percy and Shemilt (1975, hereafter BPS). McNamara does not consider the differences in velocity amplitude to be real, though he does suggest that his observations indicate some asymmetry in the velocity curve. The purpose of this note is to show that the differences found by McNamara are due to the method of analysis and the use of a slightly incorrect period.

Inspection of Figure 1 of McNamara (1978) shows that the sinusoidal velocity curve has been fit to the data assuming the descending branch crosses the γ-velocity at the time of maximum light predicted by the ephemeris of Morton and Hansen (1974),

$$\text{Max.light} = \text{JD}_{\odot}2441442.048 + 0\overset{\rm d}{.}1398903 \cdot \text{E}.$$

BPS showed that this is the correct relationship between the light and velocity curves. However, McNamara's velocities were obtained almost 58.000 cycles before the epoch of the light ephemeris, so even a small error in the period could produce a substantial phase shift between the true and computed ephemerides.

I have fitted sine curves to all three sets of radial velocity data with the γ-velocity, amplitude, and time of maximum radial velocity as free parameters. The results are given in Table I.

Table I

Element	McNamara	Pike	BPS
V_o (km s^{-1})	-16.6(4)	0.2(6)	-15.5(3)
K (km s^{-1})	7.2(8)	8.2(11)	8.8(5)
T($JD_{\odot}$2400000+)	33332.92116(3)	42225.6705(2)	42229.74375(8)
ε (km s^{-1})	2.5	3.8	1.4
O-C (d)	-0.08876	-0.008	+0.00844
n (cycles)	-57968	+5602	+5631

V_O is the γ-velocity, K the velocity semi-amplitude, T the $JD_\odot$ of maximum velocity, ε the RMS scatter about the fitted curves, O-C difference between the observed and predicted time of maximum velocity according to the ephemeris of Morton and Hansen, and n is the number of cycles elapsed between the epoch of the ephemeris and the epoch of the observations. The standard errors of the fitted quantities in the sense of the uncertainty in the last digit quoted are given in parantheses following the parameters. I have used the measures from Pike (1978) rather than the earlier measures Pike (1974). This accounts for the widely discrepant γ-velocity for this data set.

None of the velocity curves show any evidence of asymmetry, and there is excellent agreement among the velocity semi-amplitudes. If we ignore the velocity curve of Pike, which was obtained only 4 days before that of BPS and is of much lower accuracy, then the O-C's indicate that the period given by Morton and Hansen should be increased by 1.53×10^{-6} day to $0\overset{d}{.}13989183$.

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References:

Bolton, C.T., Percy, J.R., and Shemilt, R.E. 1975, Pub.A.S.P., 87, 595 (BPS)

McNamara, D.H. 1978, Pub.A.S.P., 90, 96

Morton, A.E. and Hansen, H.K. 1974, Pub.A.S.P., 86, 943

Pike, C.D. 1974, Pub.A.S.P., 86, 681

Pike, C.D. 1978, Mon.Not. R.A.S., 184, 265

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TX SCUTI - A MYSTERY SOLVED

TX Sct was discovered by Hubble (1920) who estimated that it varies from 12.5 to 14.5 pg. On the basis of only 9 plates he assumed it to be a long period variable. In the summer of 1978 at the Maria Mitchell Observatory I assigned this star to an undergraduate research participant, Wendy Whiting (1978), to identify and, if possible, determine a period. However, we were unable to find any star close to the given position which varied appreciably.

An inquiry to Dr. K. Cudworth at Yerkes Observatory led to his resolving the mystery. He succeeded in locating the plates on which Hubble had marked the variable. Cudworth measured its position and found that it disagreed with the approximate position Hubble had estimated from a BD chart. The correct position is

(1950) $18^h25^m27^s\!.5$ $-11^\circ17'\!.1$
(1900) 22 40 18.8

Whereas Hubble had given

(1900) 18 23 25 -11 15.1.

The spectral class given in the GCVS is M6:. This stems from Cameron and Nassau (1956) who were uncertain as to the identification of the variable TX Sct. Dr. Bidelman kindly supplied a marked print and references, also indicating that the IR source at $18^h24^m09^s$ $-11^\circ13'\!.8$ (1900) identified as the M7 type star BD $-11^\circ4642$ (Nassau and Blanco 1954) might be the variable. The stars Bidelman indicated, however, do not correspond with the one Cudworth found marked on Hubble's plate.

I have now examined Hubble's TX Sct (Fig.1) relative to surrounding stars on 22 available Harvard plates of the MC series (16-inch Metcalf telescope) taken between 1915 and 1974, and on 132 RB and RH plates (3-inch Ross-Fecker lenses) taken between

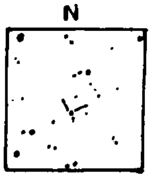

Figure 1. Finder chart for TX Sct, approximate 10′x 10′.

1935 and 1951. These observations are reasonably represented (Fig.2) by

$$\text{Max} = \text{JD } 2425830 + 24^{\text{d}}.344n.$$

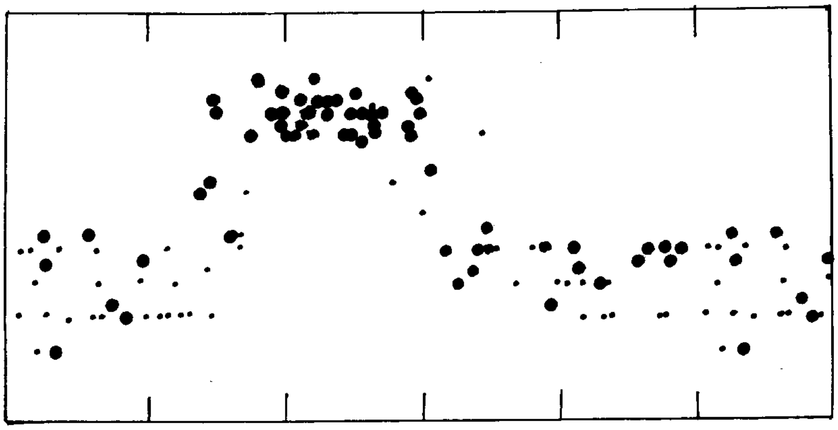

Figure 2. Observations of TX Sct (on arbitrary scale) fitted to a period of 24ᵈ344. Small dots for the less reliable observations. On some of the plates the image was partially blended with the star S prec by about 0ʹ4. Abscissa markers at intervals of 0.2 period.

Figure 2 also includes Hubble's maximum discovery plate and non-maximum observations on Barnard's Atlas plates 24 July and 1 August 1905. For its period the light curve resembles a W Virginis star. On the other hand, the variable appears red relative to its neighbors on the Palomar sky survey, and might therefore be a semi-regular variable of exceptionally short period. A spectral type is needed for definitive classification.

I am grateful to Drs. Bidelman and Cudworth for their very helpful correspondence.

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References:
Cameron, D. and Nassau, J.J. 1956, Ap.J., 124, 346
Hubble, E.P. 1920, P.A.S.P., 32, 161
Nassau, J.J. and Blanco, V.M. 1954, Ap.J., 120, 118
Whiting, W.A. 1978, Jour. A.A.V.S.O., 7, 70

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INFRARED OBSERVATIONS OF LR Sco, AN RCB STAR

LR Sco (HV 6539) is classed as an SR variable of 104.4 day period ($10^{m}.9$ - $12^{m}.3$ pg) (Shapley and Swope 1934, Kukarkin et al. 1970). However recently Stephenson (1978) has classified its spectrum as similar to that of R CrB at maximum, using objective prism plates.

Table I lists JHKL (1.2, 1.6, 2.2 and 3.5μ) photometry of LR Sco. These were obtained with the Mk II SAAO infrared photometer (similar to the one described by Glass 1973) and using an In Sb detector on the 0.75m telescope at Sutherland. The results indicate an infrared excess for LR Sco which is very similar to that of other RCB type stars. If we take $M_V \sim -4$ (cf. Feast 1979) then $A_V \sim 1.6$ on the absorption model of the galaxy used by van Herk (1965). Correcting the observations for this reddening it is found that LR Sco lies in the region of other RCB stars in the J-H/H-K and H-K/K-L diagrams (cf. Feast 1979).

LR Sco can therefore be classified as an RCB star with some certainty though typical RCB type minima have not been recorded. It would be particularly valuable to confirm the 104.4 day period derived by Shapley and Swope. RY Sgr which has a similar temperature to R CrB has a pulsation period of 39 days (cf. Alexander et al.) and both R CrB itself (Fernie et al. 1972) and UW Cen (Bateson 1972) have been reported to have pulsation periods near 40 days. 104 days would be a very long pulsation period for a star of the same temperature (and luminosity) as R CrB. Longer periods may however exist for cooler RCB stars (e.g. S Aps for which a period of 120 days has been reported (Waters 1966).

Table I

Date	J	H	K	L
1979 May 8	8.20 ± .07	7.47 ± .05	6.52 ± .04	4.77 ± .05
June 1	8.21 ± .06	7.50 ± .05	6.53 ± .04	4.70 ± .05

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1979 June 26

References:

Alexander, J.B., Andrews, P.J., Catchpole, R.M., Feast, M.W., Lloyd Evans, T., Menzies, J.W., Wisse, P.N.J., Wisse, M., 1972. Mon. Not. R. astr. Soc. 158, 305.

Bateson, F.M., 1972. Inf. Bull. Var. Stars No. 661.

Feast, M.W., 1979. I.A.U. Colloquium No. 46, Hamilton, New Zealand - in press.

Fernie, J.D., Sherwood, V. & Dupuy, D.L., 1972. Astrophys. J. 172, 383.

Glass, I.S., 1973. Mon. Not. R. astr. Soc. 164, 155.

Kukarkin, B.V., Kholopov, P.N., Efremov, Yu. N., Kukarkina, N.P., Kurochkin, N.E., Medredeva, G.I., Perova, N.B., Fedorovich, V.P., Frolov, M.S., 1969. General Catalogue of Variable Stars (Third Ed.) Moscow.

Shapley, H. & Swope, H.H., 1934. Harvard Ann. 90, No. 5.

Stephenson, C.B., 1978. Inf. Bull. Var. Stars No. 1453.

van Herk, G., 1965. Bull. Ast. Inst. Neth. 18, 71.

Waters, B.H.J., 1966. R.A.S. New Zealand Circ. 119.

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OBSERVATIONS OF V645 Cen

During April 1976 the flare star V645 Cen (R.A. $14^h26^m42^s$, declination - $62^o29'$ /1950/, 11.3 visual magnitude at minimum, spectral type dM5e) was monitored during three nights at Boyden Observatory.

An uncooled EMI 6256A photomultiplier tube and a standard Johnson B filter were used, fitted to the 41 cm Nishimura reflector. Observing conditions were excellent throughout the runs.

Seven low intensity flares were recorded, five being considered as spike flares following Moffett's terminology (1).

The diagrams are representative of the flares; they are similar in character to some of the V645 Cen flares we have observed on previous occassions.

Date	Monitoring Time (U.T.)	Time of Flare Maximum (U.T.)	$\frac{I_{o+f}-I_o}{I_o}$	Duration of Flare (seconds)	Comments
06 April	$17^h54^m00^s$	$19^h23^m36^s$	0.82	6	Small flare
1976	to				
	19 33 00				
23 April	19 20 45	21 23 37	1.06	3	Spike flare
1976	to	21 56 51	0.71	3	Spike complex
	23 20 00	22 35 28	0.56	4	Spike flare
		22 38 03	0.61	3	Spike flare
24/25 April					
1976	23 35 00	00 51 53	1.19	2	Spike flare
	to	02 26 14	0.91	>78	flare
	03 20 13				

We are greatly appreciative of the help given to us by Professor F.D.I. Hodgson, the Director of the Institute of Groundwater Studies at the university, in providing access to his department's Hewlett Packard Model 9825 microcomputer and digitizer for the reduction of our data.

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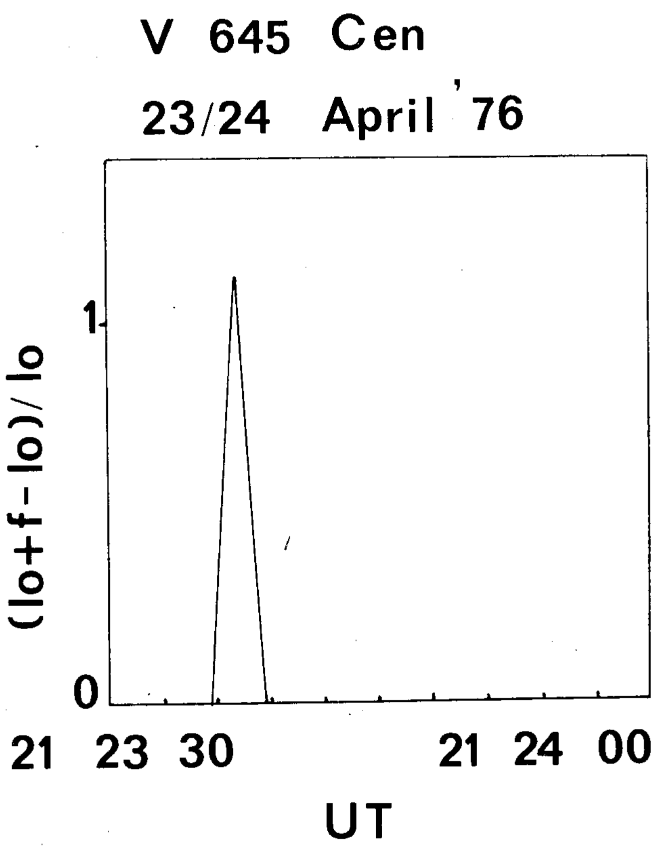
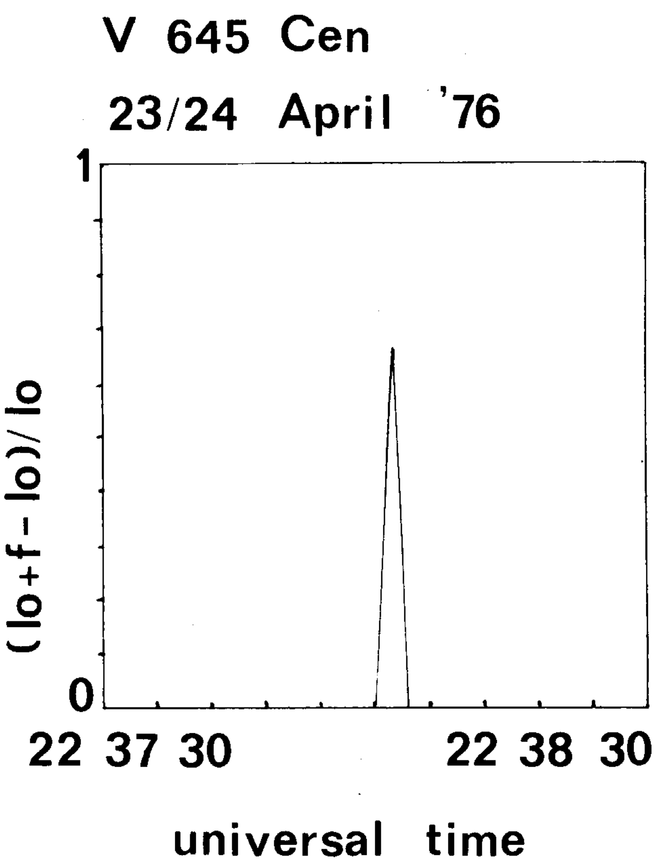
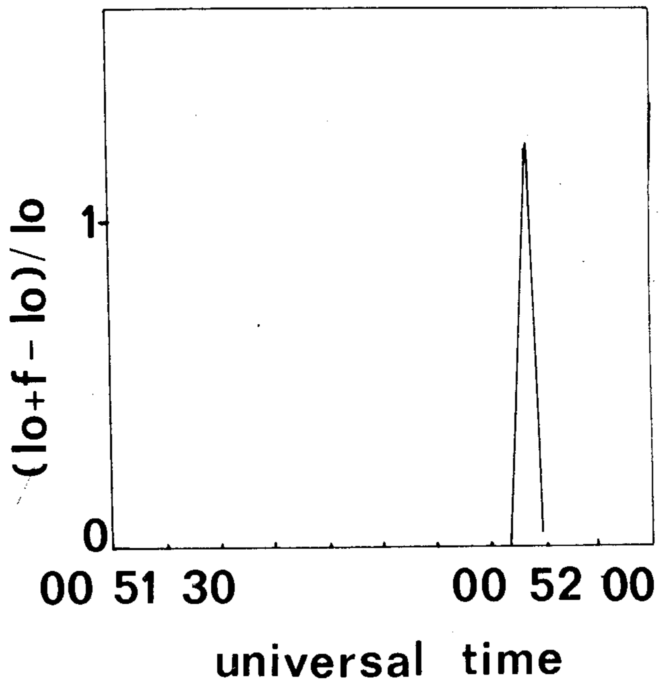
Reference:
(1) Moffett, T.J., 1974, Sky and Telescope, 48. 94


V 645 Cen
23/24 April '76
(Io+f−Io)/Io
1
0
21 23 30
21 24 00
UT


V 645 Cen
23/24 April '76
(Io+f−Io)/Io
1
0
22 37 30
22 38 30
universal time

V 645 Cen
24/25 April '76



V 645 Cen
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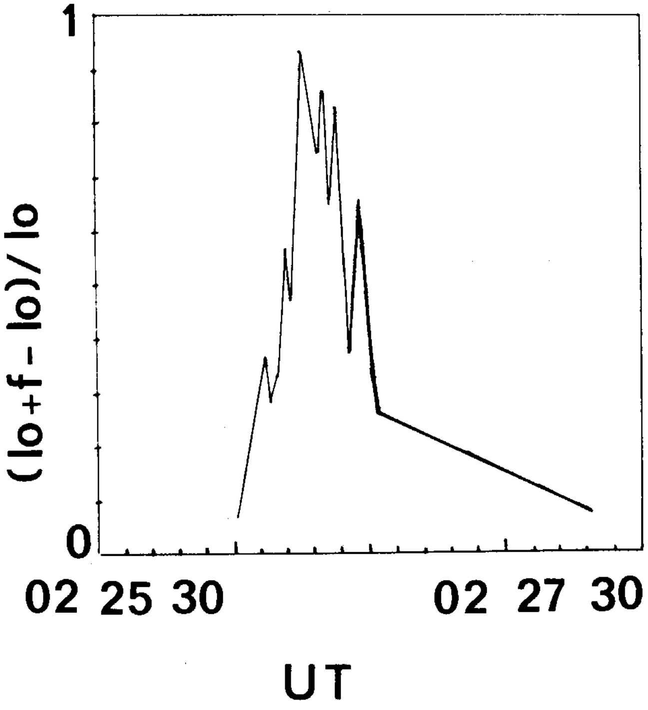

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Number 1642

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Budapest
1979 July 17

THE SECONDARY PERIOD OF RZ CEPHEI

We have analized the 20 light maxima obtained by Todoran during 1972-1973 (I.B.V.S. No.915, 1974) and 2 maxima observed in the same period by Cester and Todoran (Mem.SAIt, 47, 217).

At first we have derived the following elements valid from J.D. 2441475 to J.D. 2442006:

$$\mathrm{Max.}_{hel} = 2441475.378 + 0\overset{d}{.}30868218\cdot E \qquad (1)$$

Table I contains the 22 maxima and the O-C values derived from the ephemeris (1).

Based on an harmonic analysis we have derived the secondary period of the star: $P_b = 96.8$ $P_o = 29\overset{d}{.}88$.

In Figure 1 the values of O-C are plotted against the phase of the secondary period computed by the formula:

$$\text{Lowest Maximum} = 2441464.147 + 29\overset{d}{.}88\cdot N \qquad (2)$$

The phases of the light maxima performed with the elements (2) are given in third column of Table I.

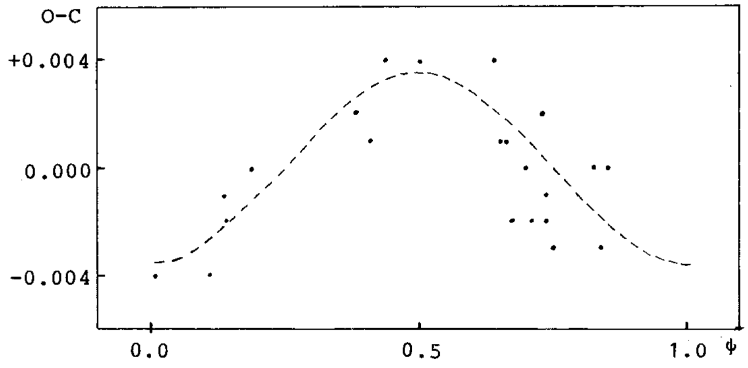

Table I

Max.hel. 2440000	O-C	ϕ
1475.380	+0^{d}.002	0.38
1519.519	0.000	0.85
1546.372	-0.003	0.75
1559.339	0.000	0.19
1605.335	0.002	0.73
1605.640	-0.002	0.74
1608.420	0.000	0.83
1897.350	0.004	0.50
1902.286	0.001	0.66
1902.592	-0.002	0.67
1903.520	0.000	0.70
1904.445	-0.001	0.74
1907.530	-0.003	0.84
1942.410	-0.004	0.01
1946.425	-0.002	0.14
1963.402	-0.002	0.71
1975.439	-0.004	0.11
1984.396	0.001	0.41
1985.325	0.004	0.44
1991.190	0.004	0.64
1991.495	0.001	0.65
2006.310	-0.001	0.14

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NEW LIGHT ELEMENTS FOR THE ECLIPSING BINARY XZ CMi

Five new photoelectric minima were obtained of the short-period eclipsing variable XZ CMi during the year 1976 at the Observatory of Sierra Nevada (Granada, Spain).

Times of minimum were evaluated taking on account the existence of a small asymmetry in the light curve (Breinhorst et al.). Observed values show considerable O-C's against the elements published in the "General Catalogue of Variable Stars" (I) or by Wilson (II), positive or negative respectively.

$$\text{min} = \text{J.D. } 2428877.100 + 0^{d}.5788090 \cdot E \qquad \text{(I)}$$

$$\text{min} = \text{J.D. } 2437375.7710 + 0^{d}.57881062 \cdot E \qquad \text{(II)}$$

New elements were derived using our observations with linear fitting by least-squares to all available minima. As a result, a slightly shorter period was calculated and new elements are given by,

$$\text{min} = \text{J.D. } 2442444.4017 + 0^{d}.57880845 \cdot E \qquad \text{(III)}$$

O-C's corresponding to the above mentioned elements (I), (II) and (III), with the observed minimum times are the following:

	Minima	O-C(I)	O-C(II)	O-C(III)
p	2442444.4014	$+0^{d}.018$	$-0^{d}.0142$	$-0^{d}.0003$
p	2442462.3443	$+0^{d}.018$	$-0^{d}.0144$	$-0^{d}.0005$
p	2442463.501	$+0^{d}.017$	$-0^{d}.015$	$-0^{d}.001$
s	2442497.362	$+0^{d}.018$	$-0^{d}.015$	$-0^{d}.001$
s	2442868.380	$+0^{d}.019$	$-0^{d}.014$	$+0^{d}.001$

(p, indicate primary minimum and s, secondary)

The plot of computed residuals from linear ephemeris for all available minima, suggests the existence of a small period change as indicated, with weaker evidences, by Wilson.

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References:

Breinhorst, R.A., Pfleiderer, J., Reinhardt, M. and Karimie, M.T.: Astron. & Astrophys. 22, 239 (1973).

Wilson, R.E.: Astron. J. 71, 32 (1966).

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NOUVELLES ETOILES VARIABLES OU SUSPECTES DE GRANDE PARALLAXE

A diverses reprises (Petit 1976, 1977) j'ai publié des listes de variables confirmées ou suspectes, situées à moins de 22 pc du Soleil ($\Pi \geq 0\overset{''}{.}045$) et qui sont contenues dans le "Catalogue of nearby stars" de Gliese (1969).

La préparation de la 3e édition de ce catalogue m'a amené, en accord avec les auteurs, le Dr. Gliese et le Dr. Jahreiss (Astron.Rechen Inst., Heidelberg) a établir une liste de toutes les étoiles variables ou suspectes de parallaxe égale ou supérieure à $0\overset{''}{.}045$. Cette liste, qui paraitre en annexe au Catalogue of Nearby stars, comprend actuellement environ 260 entrées.

Le tableau suivant présente 29 étoiles variables ou suspectes dont les parallaxes ont été déterminées récemment. Les numéros Gl notés dans les Remarques sont des numéros provisoires et donc susceptibles d'être modifies (les n^{o}s 2001 à 2159 concernent des étoiles dont les parallaxes sont encore incertaines). Les valeurs de V, B-V et Sp sont généralement extraites d'un travail récent de Gliese et Jahreiss (1979).

Parmi les 29 entrées, il y a quelques etoiles pour lesquelles on note simplement des discordances entre diverses déterminations photometriques; certaines meritent d'être réexaminées, car il s'agit de naines rouges très faibles (n^{o} 3,4,5 et 9). La majorité des autres étoiles appartiennent, ou sont susceptibles d'appartenir aux types UV Cet ou BY Dra.

M. PETIT

		1950						
n°	Design.	A.R.	Dec	V	B-V	Sp	Π	M(V)
1	G 268-30	$01^{h}06^{m}47^{s}$	$-24^{\circ}57'4$	12.38	1.53	dM2	0"055	11.1
2	+30°448	02 45 42	+30 54 6	6.93	0.72	dG9e	047	5.3
3	G 77-31	03 10 39	+04 35 2	13.78	1.83	m	116	14.10
4	G 95-30	03 19 41	+41 51 3	15.33	1.89	m	066	14.43
5	G 160-28	03 48 18	-06 13 6	12.79	1.69	m	105	12.90
6	L230-188	04 09 17	-53 42 0	13.58	1.93	dMep	095	13.5
7	+26°730	04 33 42	+27 02 0	8.42	1.12	K5Vpe	061	7.35
8	G100-28AB	05 37 21	+24 46 9	14.85	1.88	m	097	14.78
9	G 112-50	07 49 20	+00 08 1	13.30	1.68	dM	115	13.60
10	+33°1646 A	08 05 46	+32 58 1	10.13	1.38	dM0.5e	057	8.9
11	+33°1646 B	08 05 46	+32 58 1	11.4		dM3e	057	10.2
12	GR 151	08 25 15	+25 31 3	13.6		DAe	063:	12.6:
13	G 51-15	08 26 53	+26 57 2	14.81	2.06	dMe	278	17.03
14	G 40-25 A	08 28 46	+19 34 0	12.2		dM5e	115:	12.5:
15	G 40-26 B	08 28 46	+19 43 2	13.4		dM5e	115:	13.7:
16	-31°7745 A	09 51 17	-31 10 9	10.21	1.38	MOV	048	8.6
17	+48°1958 A	11 31 53	+48 01	10.12	1.26	MOVe	048	8.6
18	G 12-30	12 16 32	+11 24 0	13.79	1,83	dMe	153	14.71
19	-10°4149	15 40 22	-10 46 3	7.20	0.50	F3VI	052	5.8
20	-38°11343 A	16 53 22	-39 00 9	11.37	1.54	M3Ve	063:	10.4
21	-38°11343 B	16 53 22	-39 00 9	13.1:		M4Ve	063:	12.1
22	Anonyme	18 55 54	+06 06	10.5		dMe	080:	10.0
23	G208-44 A	19 52 16	+44 17 5	13.41	1.90	M5.5Ve	211	15.03
24	G208-45 B	19 52 17	+44 17 5	13.99	1.98	m	211	15.61
25	+75°752	20 38 03	+75 25 0	7.3	0.85	KOV	047	5.7
26	-72°2640	21 44 34	-72 19 9	9.80	1.46	dM2e	100	9.8
27	+47°4058 B	23 07 35	+47 41	7.91	1.01	KOVe	048	6.3
28	G 29-33	23 23 39	+08 37 0	10.54	1.50	sdM	079	10.0
29	Anonyme	23 29 09	-03 01 7	14.2		dM4e	059	13.0

Remarques:

1= Gl 1032. Légère discordance dans les valeurs photométriques: V= 12.25 (Pesch et Sanduleak) 12.38 (Eggen)

2= Gl 113.1. Sursaut observé par Chugainov (1976). C'est l'une des plus brillante étoiles à sursauts connue.

3= Gl 1057. Discordance dans les valeurs photometriques: V=13.00 B-V=1.80, U-B=1.10 (Eggen) V=13.78, B-V=1.83, U-B=1.15 (USNO)

4= Gl 1059. Semble varier de 1 mag. sur les plaques de l'observatoire Lowell

5= Gl 1065. Semble varier de mpg 14.0 à 14.8

6= Gl 1068 = CSV 6093. Variabilité annoncée par Hoffmeister (1962) Spectre d'émission avec des variations importantes. Type UV possible

7= Gl 171.2. Spectre avec H et CaII en émission, montrant des variations d'intensité importantes. Type UV ou BY possible

8= Gl 1083. Couple très serré (0"6 315°), la composante B étant 1 mag. plus faible que A. Sursaut observé photoélectriquement par Dahn (1976). Type UV

9= Gl 1103. Couple physique (3" 78°); le compagnon est de mag.16 Discordance dans les observations de A: V=13.26 (USNO) 13.40 (Rodgers et Eggen)

10 et 11= Gl 1108= Bz 72 (13"3 242°). Sursaut de B (=CSV 6615) observé par Dyer (1954); A présente également des variations de spectre. Les deux étoiles appartiennent probablement aux types UV ou BY

12= Gl 2068= AT Cnc. Variabilité (mpg 12.3 à 14.6) annoncée par Romano et Perissinotto (1968). Naine blanche, avec spectre d'émission Binaire à eclipses de P non connue (Bond et Tifft, 1974)

13= Gl 1111. Etudiée par Liebert (1976). Type UV, selon Gershberg (1979, comm.privée)

14 et 15= Gl 2069= CU et CV Cnc. Couple en mouvement propre commun (13" 347°), situé dans le champ de Praesepe, mais probablement non lié à cet amas. Les deux étoiles ont des sursauts du type UV (Haro et al., 1975)

16= Gl 1130. Compagnon (V=14.32, B-V=1.70) à 8". Légère discordance dans les observations. Spectre d'emission du CaII

17=ADS 8842=BZ114.Couple en mouvement lent direct (2"5 22° 1902 1"7 65° 1965); B est de mag 10.4. A= DF UMa est une binaire spectroscopique (P=1.0388j); variation de type BY (Bopp 1974, Bopp et Fekel 1977, Bopp et Espenak, 1977)

18= Gl 1156. Type UV, sursauts observés par Veeder et Hansen (1977)

19= Gl 1195 = CSV 101522. Il s'agit d'une sous-naine, de spectre F3 VI. Type inconnu

20 et 21= Gl 2123 = V 914 Sco. Couple serré (3" 200°), spectres M3Ve et M4Ve (Herbig 1977). Type BY Dra, avec P= 2.69j $\Delta B=0.15$ (Busko et al., 1977)

22= Gl 2143. Variabilité découverte par Hidajat et Akyol (1972) Type UV

23 et 24= Gl 1245= V1581 Cyg. Couple en mouvement orbital (7"9 106° 1954; 8"2 96° 1974). Une des composantes a des sursauts (Cristaldi et Rodono 1976). Le spectre de A est donné par Buscombe (1977)

25= Gl 1255= VW Cep. Binaire à éclipses, type EW; P=0.2783j; possède un compagnon (V=10.3) à 0."64 222°, lui même binaire astrométrique.

26= Gl 1264= AY Ind. Sursauts observes par Busko et al.,(1974)

27= ADS 16557 B= KZ And. Binaire spectroscopique (P= 3.0329j), variable du type BY (Bopp et Fekel 1977)

28= Gl 2155. Discordance dans les valeurs photométriques: B-V=1.41 à 1.50; U-B=1.18 à 1.24

29= Gl 1285. Type UV, sursaut observe par Bond (1976)

References:

Bond, H.E,, Tifft, W.G., 1974 Pub.Amer.Soc. Pacific 86,981
Bond, H.E., 1976 I.B.V.S. No. 1160
Bopp, B.W., 1974 Monthly Not.Roy.Astron.Soc. 166, 79
Bopp, B.W., Espenak, F., 1977, Astron.J. 82,916
Bopp, B.W., Fekel, Jr., 1977, Astron.J. 82,490
Busko, I.C., Torres, C.A.O., Quast,G.R., 1974,I.B.V.S. No. 939
Busko, I.C., Quast, G.R., Torres, C.A.O.,1977, I.B.V.S. No.1275
Buscombe, W., 1977, MK Spectral Classification, third general catalogue edited by Northwestern University, Evanston
Chugainov, P.F., 1976, Izv.Krymski Astron.Obs. 54, 89
Cristaldi, S., Rodono, M., 1976, Astron, and Astrophys. 48, 165
Dahn, C.C.,1976,U.S. Naval Obs, Pub. vol. 25
Dyer, E.R.,1954,Astrophys.J.Suppl. 1,7, 354
Gliese, W. 1969, Catalogue of Nearby Stars,Heidelberg Veröff.No.22
Gliese, W., Jahreiss, H., 1979, Nearby Stars Data Published 1969-78 Astron.and Astrophys.en préparation
Haro, G., Chavira, E., Gonzales, G., 1975, I.B.V.S.,No.1031

Herbig, G.H., 1977, I.B.V.S., No.1323
Hidajat, B., Akyol, M.U., 1972, I.B.V.S., No.623
Hoffmeister, C., 1962, Mitt.über Veränd.Sterne No.695
Liebert, J., 1976,Pub.Americ.Soc. Pacific. 88, 232
Petit, M., 1976, I.B.V.S., No.1135
Petit, M., 1977, I.B.V.S.,Nos.1242, 1267, 1362
Romano, G., Perissinotto, M. 1968, Padova Pub. No.151
Veeder, G.J., Hansen, O.J., 1977, I.B.V.S., No.1266

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POSSIBLE HETEROGENEITY OF THE δ Sct COMPLEX

The relation between the normal A, the metallic A_m and the variable stars of δ Sct type is theoretically examined by Vauclair (1976). In this work it is supposed that the normal A and the δ Sct stars come from the stable A_m phase. The time scale of the A_m phenomenon is of the order of 1.5×10^6 years and it is possible to reach it on different stages of evolution, since it may be repeated many times at the same star (Vauclair, 1976).

All this calls forth the question about the homogeneity of the δ Sct complex, in spite that the boundaries, in which their physical characteristics change, are narrow. Nevertheless, still on their setting apart as a separate group of variables by Eggen (1956), attempts are made to differenciate groups in the complex of δ Sct variables (Leung, 1970 - two groups with different masses, in different stages of evolution; Frolov, 1972 - two groups with different periods; Breger and Bregman, 1975 - two groups with different temperatures, different pulsation constants and different period-luminosity dependences; Dworak and Zieba, 1975 - two groups with different luminosities).

On the basis of the systematized photometric data made in the Strömgren system published up to the middle of 1978 for about 120 variable stars of δ Sct type we decided to examine once more the question of the existence of sub-groups among them, which would allow the classification of some problems related to the evolution of these variables.

The comparison of the effective temperatures T_{eff} and the absolute stellar magnitudes M_V for 65 stars of δ Sct type, for which there are calculated pulsation masses (Baglin et al., 1973; Breger, Bregman, 1975; McMillian et al., 1976; Kurtz, 1977), is shown in Fig.1. The analysis of the Figure using the

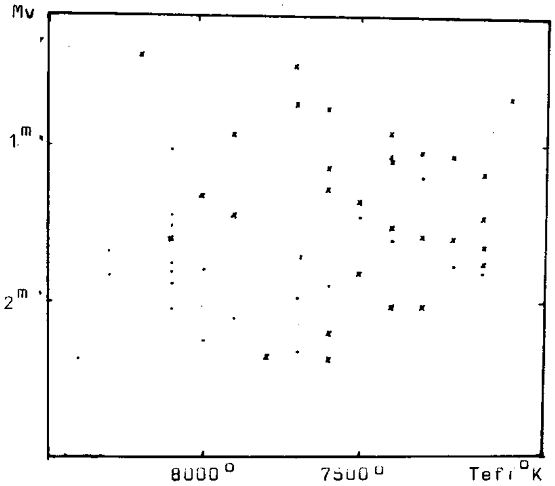

Fig. 1

data of the pulsation masses of the stars shows that the masses increase in the direction of lower temperatures and higher luminosities. Therefore the stars of the "cooler" group have masses on the average by 0.5 $M_{\odot}$ higher than the masses of the stars of the "hot" group (Breger and Bregman, 1975). Several stars which make an exception (τ Peg, δ Sct, HR 7501, 28 And, HR 8006, 26 Ari, HD 73798), have anomalies in their chemical composition, which are expressed in the increased abundance of metals from the group of iron. Besides, the errors on defining the pulsation masses reach up to 30 percent (Tsvetkov, 1977).

The comparison of the amplitudes of the light change for the two groups after Breger and Bregman (1975) shows on the average a three-times higher average amplitude for the stars with $T_{eff} \leqq 7\ 800^{\circ}$ in comparison to the stars with $T_{eff} \geqq 7\ 800^{\circ}$ (Fig.2).

The position of the δ Sct stars on the diagram log g - T_{eff} (Fig.3) depends on their chemical composition (Lub, 1977). The stars with solar abundances of elements fall near the main sequence, built for the stars of the Hyades cluster (Strömgren, 1963). The stars with metallic deficit, such as the RR Lyr type stars, are grouped far from the main sequence, in the region of the giants with low log g. In this diagram the variable stars of δ Sct type

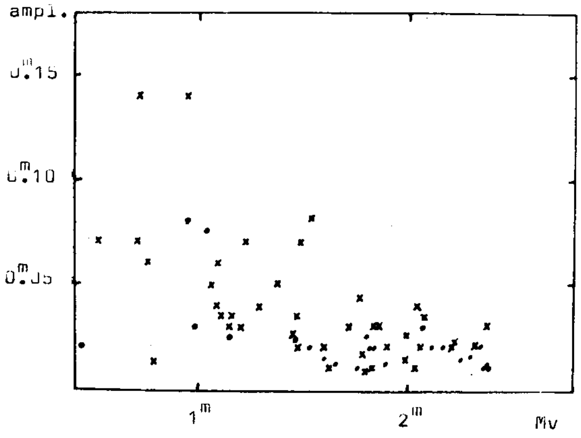

Fig.2

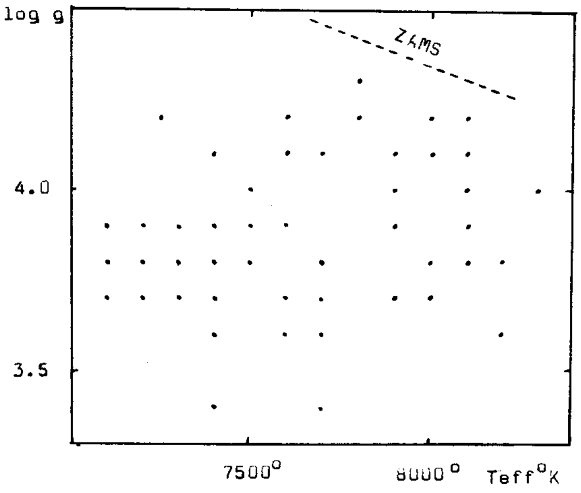

Fig. 3

are divided anew in two groups with a limit of about 7 800°, falling around the main sequence.

In conclusion we may summarize confirming Leung's inferences with richer material:

1. The group of the "cool" δ Sct stars with $T_{eff} \leq 7\,800^{\circ}$ consists of stars with masses of about 2.1 $M_{\odot}$, which pulsate mainly in the basic or first harmonic frequency. They have, on the average, longer periods and larger amplitudes of light change. They are in their stage of evolution on the way to the giant branch crossing the instability strip for the first time.

2. The group of the "hot" δ Sct stars consists of stars with masses of about 1.6 $M_{\odot}$, which pulsate mainly in the second overtone or the first one. They are on the main sequence or descend from it.

3. The existence of two groups of δ Sct stars is a proof that the phenomenon "variability" of δ Sct type may come into being at different stages of stellar evolution.

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References:

Baglin, A.,Breger,M.,Chevalier,C.,Hauck,B.,Le Contel,J.M., Sareyan,J.,Valtier,C.,1973, Astron.and Astroph.,23,221
Breger, M., Bregman, J., 1975, preprint
Chevalier, C., 1971, Astron. and Astroph., 14, 24
Dworak, T.Z., Zieba, S., 1975, I.B.V.S. No.1005
Eggen, O.J., 1956, Publ.Astron.Soc.Pacific, 68, 235
Frolov, M.S., 1972, Astron.Zirk., No.671, 3
Kurtz, D., 1977,Publ.Astron.Soc.Pacific, 89, 50
Leung, K.C., 1970, Astron. J. 75, 643
Lub, J., 1977, Dissertation, Leiden
McMillian, R.S., Breger,M.,Ferland,G.J.,Loumos,G.L., Publ.Astron.Soc. Pacific 88, 495
Strömgren, B., 1963, in "Basic Astronomical Data", ed. by K.Aa. Strand, The University of Chicago Press, Chicago and London
Tsvetkov, Ts., 1977, Dissertation, Moscow
Vauclair, G., 1976, Astron. and Astroph., 50, 435

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TWO VARIABLE STARS IN THE SOUTHERN COALSACK REGION

While obtaining photographic photometry of objects showing H-α emission found by Gómez and Mendoza (1976) in the Coalsack region, we found rather large differences among the magnitudes obtained from different plates for their star 137.

Since the star was not listed by Kukarkin et al. (1972), even though it lies very near to V Mus, we decided to check its variability measuring with the iris photometer several B and V plates obtained by J.C. Muzzio and A. Feinstein at Cerro Tololo Inter-American Observatory, (CTIO) between 1969 and 1975. On ultraviolet plates obtained at the same epochs the star is too faint to be measured, and its ultraviolet magnitude was estimated as fainter than 16.2 mag. We also used plates obtained with the "thin" prism and the Curtis-Schmidt camera at CTIO to derive an approximate spectral type K6-M5.

The chart (size about 15′x 21′) shows both V Mus and the new variable together with the stars used to calibrate the photometric data. The western one is the new variable.

The adopted magnitudes for the comparison stars are:

Star	V	B-V
1	16.17	1.57
2	15.95	1.43
3	15.59	1.08
4	13.95	2.48
5	15.46	1.26
6	15.95	0.94
7	14.60	1.65

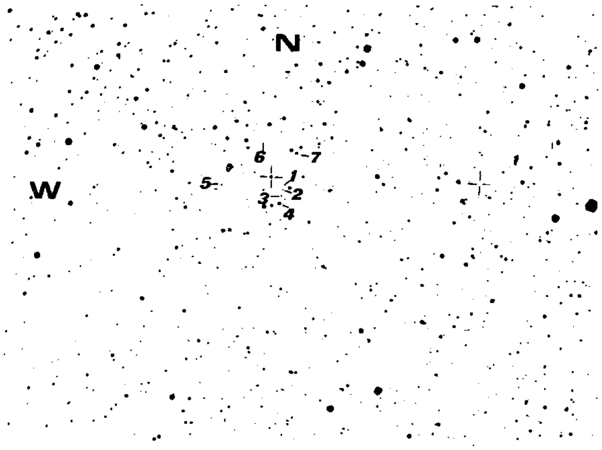
These values were derived photographically extrapolating a photoelectric sequence which reached only V=14.50 and B=15.40. They may thus be affected by systematic errors but, nevertheless, they are useful to derive the light changes of the variable stars. The observed magnitudes of the variable stars are:

V values

Heliocentric J.D.	New Var.	V Mus
2441537.4786	14.68	17.01
2442191.6168	14.66	16.54
2442507.8232	15.05	16.10
2442509.6584	15.06	16.18
2442509.6994	15.17	16.05

B values

Heliocentric J.D.	New Var.	V Mus
2440419.4155	17.30	17.23
2440694.6592	17.17	15.65
2442191.5723	16.87	18.27
2442507.8523	17.40	17.94
2442508.8076	17.23	17.92
2442509.6883	17.22	17.87



We are grateful to Drs. J.C. Muzzio and A. Feinstein for the use of their plates and, to the former, also for guiding this investigation.

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References:

Gómez, T. and Mendoza, E.E.: 1976, Rev.Mex.Astron.Astrof., 1, 4, 381

Kukarkin, B.V. et al.,: 1972, Special Supplement to the Third Edition of the General Catalogue of Variable Stars,Moscow

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PHOTOELECTRIC OBSERVATIONS OF u Her

Photoelectric observations on the eclipsing variable u Her (68 Her, BS=HR 6431, HD 156633, BD $+33^{\circ}2864$, GC 23359) were carried out, in B and V, from 1974 to 1978. The observations were made using the two-beam, multi-mode, nebular-stellar photometer (Goudis and Meaburn, 1973) of the National Observatory of Athens attached either to the 25-inch Newall refractor (1974-75), at Penteli Astronomical Station, or to the 48-inch Cassegrain reflector (1976-1978) at Kryonerion Astronomical Station (Contopoulos and Banos, 1976).

The stars ε Her (58 Her, BS 6324, HD 153808) of m_V=3.87 and B-V=-0.03 and 59 Her (BS 6332, HD 154029) of m_V=5.25 and B-V=+0.02 were used for comparison and checking, respectively. The filters used are in close accordance with the standard ones. Reduction of the observations has been made using Hardie's method (1962). The estimated uncertainties for a single observation are of the order of $\pm0\overset{m}{.}006$ in V and $\pm0\overset{m}{.}009$ in B.

The following data were found:

Hel.J.D. 2440000+	Phase	(O-C) days	m_V	(B-V)	
2225.5041	Min I	0.0105	5.277	-0.046	Penteli
2279.3438	Max		4.641	-0.001	
2280.3750	Max		4.643	-0.004	
2282.4236	Max		4.640	-0.010	
3283.3264	Max		4.661	-0.019	Kryonerion
3309.4792	Min II	0.0071	5.055	-0.017	
3310.5069	Min I	0.0093	5.280	-0.046	
4029.3889	Min II	0.0070	5.073	-0.030	

In the residuals (O-C) the C values were calculated using the ephemeris formula given by Kukarkin et al.,(1969).

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References:

Contopoulos, G. and Banos, C.: 1976, Sky and Telescope, 51, 154
Goudis, C. and Meaburn, J.: 1973, Astroph.Space Sc. 20, 149
Hardie, R.H.: 1962, Stars and Stellar Systems Vol.II, Astronomical Techniques, ed. Hiltner, W.A., The University of Chicago Press, Chicago
Kukarkin, B.V. et al.: 1969, General Cat. of Variable Stars, Moscow

COMMISSION 27 OF THE I. A. U.
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Number 1648

Konkoly Observatory
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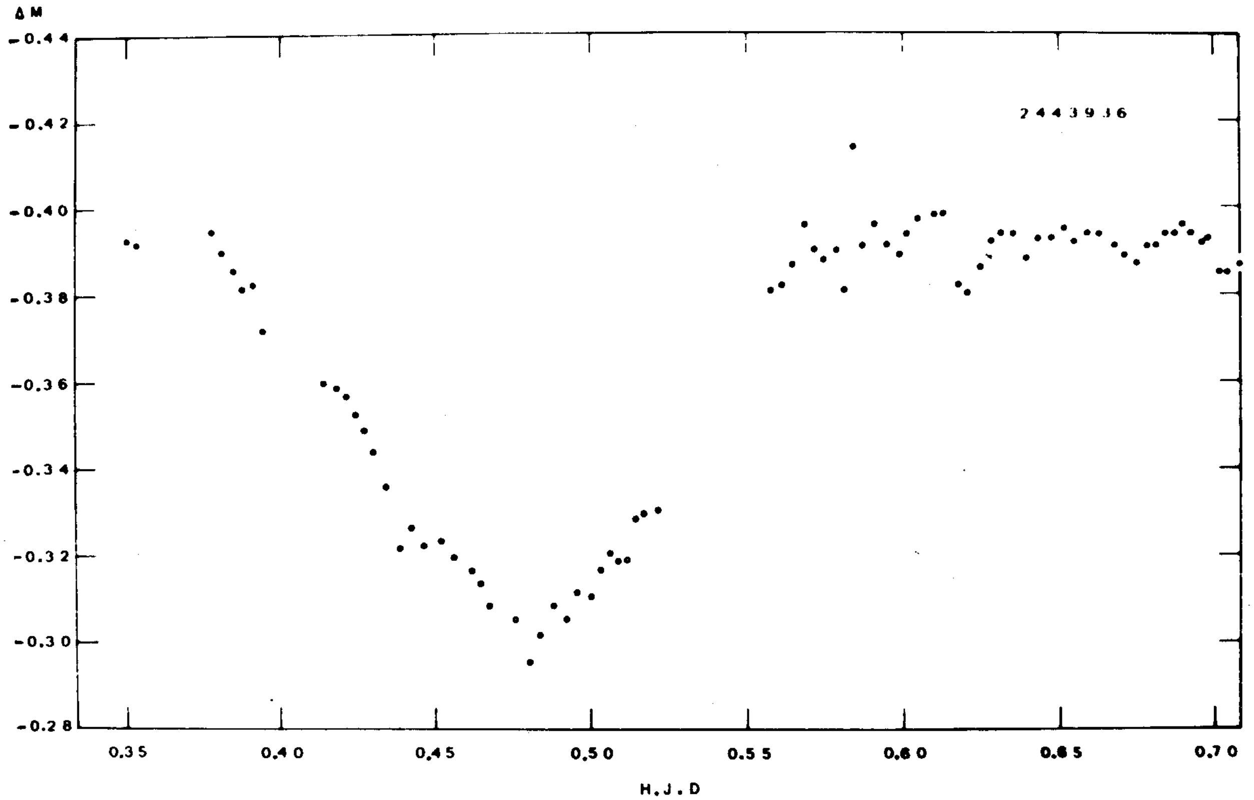
PHOTOELECTRIC PHOTOMETRY OF 65 UMa (HR 4560)

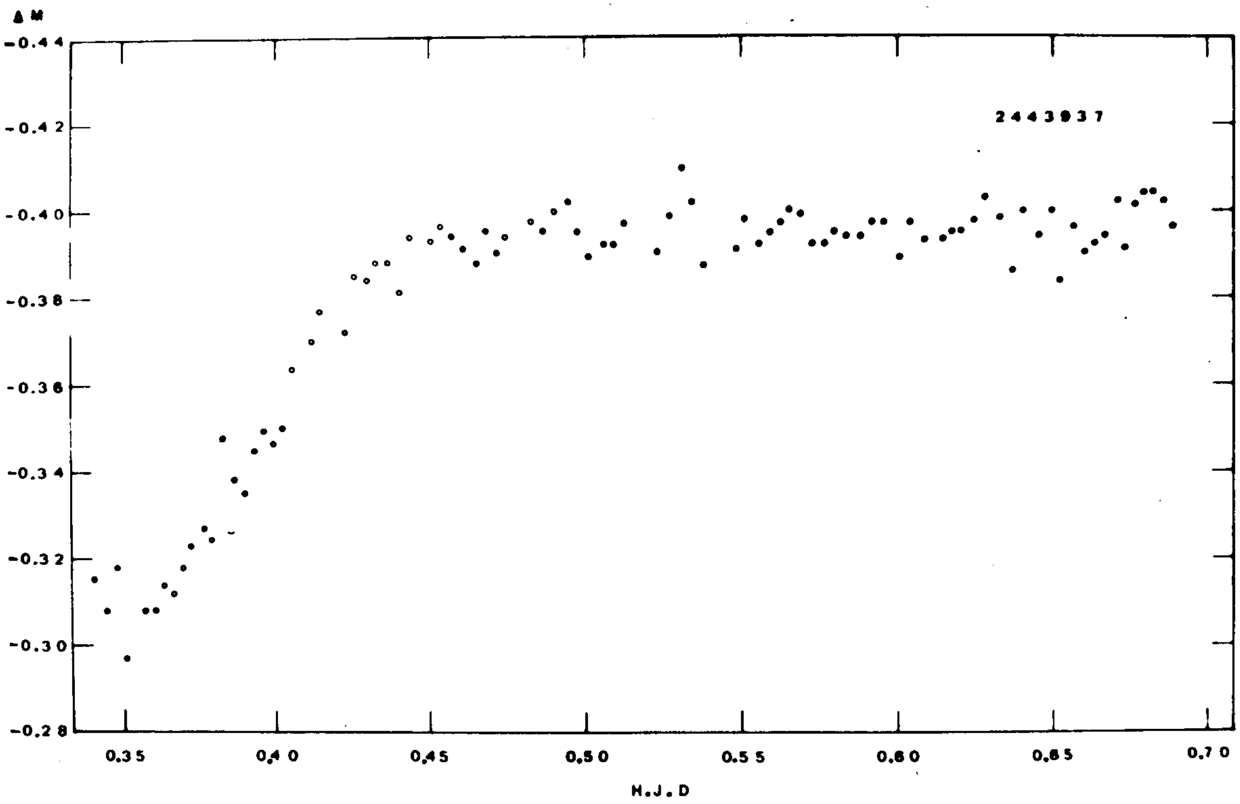
During a series of observations carried out in order to check the constancy of some possible bright comparison stars in selected areas, the brighter component of the visual double star 65 UMa (HR 4560-4561) has been found variable. This star was already pointed as probable variable in the Catalogue of Bright Stars (Hoffleit, 1964) and included in the catalogue of stars suspected in variability (Kukarkin et al., 1951) with the number 101230.

Observations of 65 UMa have been performed during two nights of March (3/4 and 4/5) of the present year at an altitude of 2609 m in the Observatory of Sierra Nevada (Granada, Spain). The observing equipment consisted of a 32 cm Cassegrain telescope, a photoelectric photometer equipped with an unrefrigerated EMI 6256 A photomultiplier and an analogical recorder. Only one filter, close to the B of the Johnson's system was used.

Magnitude differences in the sense star-comparison are given in Figures 1 and 2 for both observing nights. The comparison star was HR 4561 ($6\overset{m}{.}81$; B9), the visual companion of HR 4560 ($6\overset{m}{.}46$; AO) separated $63\overset{''}{.}2$ and already checked for constancy by Kurtz (1979). It has been also indicated that the system is a spectroscopic binary (Bečvař, 1964). Moreover, HR 4560 is a triple star itself (A=$7\overset{m}{.}2$, B=$9\overset{m}{.}0$ and C=$8\overset{m}{.}3$) with separations AB-C= $3\overset{''}{.}8$ and A-B=$0\overset{''}{.}3$. Because of the small separation between A, B and C, they were all measured as a whole and therefore it is not possible for the moment to identify the real variable.

The shape of the observed curves, seems to indicate that the variation of light is due to an eclipsing binary within the above mentioned multiple system of stars HR 4560. The depth of the


ΔM
-0.44
-0.42
-0.40
-0.38
-0.36
-0.34
-0.32
-0.30
-0.28
2443936
0.35
0.40
0.45
0.50
0.55
0.60
0.65
0.70
H.J.D


ΔM
-0.44
-0.42
-0.40
-0.38
-0.36
-0.34
-0.32
-0.30
-0.28
2443937
0.35
0.40
0.45
0.50
0.55
0.60
0.65
0.70
H.J.D

eclipses is of $0\overset{m}{.}09$ in the filter used with a duration of around four hours being of partial type. Two minima were observed corresponding to Julian Dates 2443936.48 and 2443937.35 approximately, therefore, a separation of $0\overset{d}{.}87$ between minima can be deduced.

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References:

Bečvář, A.: Atlas Coeli II. Českoslovenké Akademie Věd.Praha,1964
Hoffleit, D.: Catalogue of Bright Stars. Yale University Observatory, New Haven, Conn. 1964
Kukarkin, B.V., Parenago, P.P., Efremov, Yu.I. and Kholopov,P.N.: Catalogue of Stars Suspected in Variability, Moscow,1951
Kurtz, D.W.: Monthly Notices of the Royal Astronomical Society, <u>186</u>, 567, 1979

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FURTHER EXAMINATION OF THE EQUATIONS FOR THE TIMES OF MAXIMUM LIGHT FOR SX PHOENICIS

From data published elsewhere (Coates et al., 1979), we have constructed the equations for the times of maximum light:

$$t_{MAX}(\text{pre-1960}) = 2433923.9618 + 0.054964519 \cdot E_1 - 0.00337 \sin 2\pi (0.28503379 \cdot E_1 + 0.074) \qquad (1)$$

and

$$t_{MAX}(\text{post-1960}) = 2438636.6170 + 0.054964438 \cdot E_2 - 0.00325 \sin 2\pi (0.28503575 \cdot E_2 - 0.107) \qquad (2)$$

which yield values for the times of maximum light of SX Phe, t_{MAX} (calculated), that differ from the observations with an rms deviation of 0.0006 days in the case of equation (1) and 0.0009 days in the case of equation (2). E_1 is the number of cycles of the pre-1960 fundamental period since the epoch HJD 2433923.9618; E_2 is the number of cycles of the post-1960 fundamental period since the epoch HJD 2438636.6170, and the number of cycles between these two epochs is 85740.

We have made preliminary examinations of the residuals $[t_{MAX}(\text{observed}) - t_{MAX}(\text{calculated})]$ for all 314 observations of maximum light (Appendix 1) for systematic deviations which might provide evidence for another mode of oscillation of SX Phe. We find that for all groups of observations but two the residuals appear to be normally distributed about zero. A standard Student's t-test yields probabilities that each group of residuals is a sample from a normal distribution of residuals of mean zero, (Table 1).

It is seen that the two groups of observations made by Stock and Tapia between 1966 September 18 and 1966 November 1 appear to be exceptional.

Table 1

ANALYSIS OF RESIDUALS

Observer	No. of Maxima	Sample Mean (Units of 10^{-4} day)	Sample RMS Dev. (Units of 10^{-4} day)	Probability (from t-test)
Eggen	8	1.1	10.8	0.808
Walraven	71	-0.1	5.3	0.624
Wilson and Walker	6	4.8	7.4	0.185
Wood	5	-2.6	4.4	0.237
Stock and Tapia	7	4.0	7.3	0.192
Stock and Tapia	*41	-5.0	6.9	0.000043
Stock and Tapia	*29	9.2	5.9	4.4×10^{-9}
Stock and Tapia	21	-3.4	7.6	0.053
Stock and Tapia	23	-2.9	7.8	0.095
Stock et al.	5	12.6	7.5	0.020
Elst	46	-1.0	8.4	0.458
Haefner	5	-0.4	14.2	0.958
Dale	7	2.3	8.3	0.488
Halprin	33	0.2	9.1	0.903
Halprin	7	0.3	10.7	0.937

*Refer to Table 2

Table 2

COMPARISON OF RESIDUALS FOR STOCK AND TAPIA

No. of Maxima	Sample Mean (Units of 10^{-4} Day)		Sample RMS Dev. (Units of 10^{-4} Day)		Probability	
	Old	Adjusted	Old	Adjusted	Old	Adjusted
41	-5.0	1.7	6.9	6.5	4.3×10^{-5}	0.086
29	9.2	-0.9	5.9	6.5	4.4×10^{-9}	0.489

The residuals for these observations are plotted in Figure 1. These results may be explicable in terms of some previously unnoticed instability in the behaviour of SX Phe, perhaps the temporary excitation of a third mode of oscillation. However, we cannot exclude the possibility that these groups of data are based on an incorrect conversion between Geocentric and Heliocentric time. If we assume that all the observations have been converted to Heliocentric time using a constant factor appropriate to JD 2439410, which is the approximate mid-time for these groups, then the form of Figure 1 may be explained. Assuming that the conversion to HJD was made in this way, we have recovered adjusted residuals for these observations, and these are shown in Figure 2. Table 2 then gives the new probability values from a t-test, and it is clear that the adjusted residuals are much more likely to be a sample from a normal distribution of residuals of mean zero.

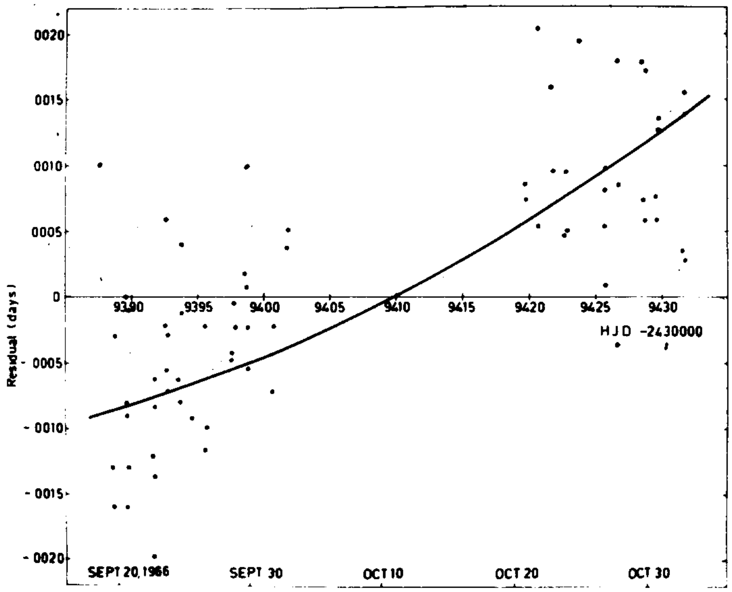

Figure 1: Plot of residuals for Stock and Tapia maxima Sept.-Nov. 1966. The curve represents the required correction to the data assuming that a constant geocentric to heliocentric time conversion factor calculated for mid-time was originally used.

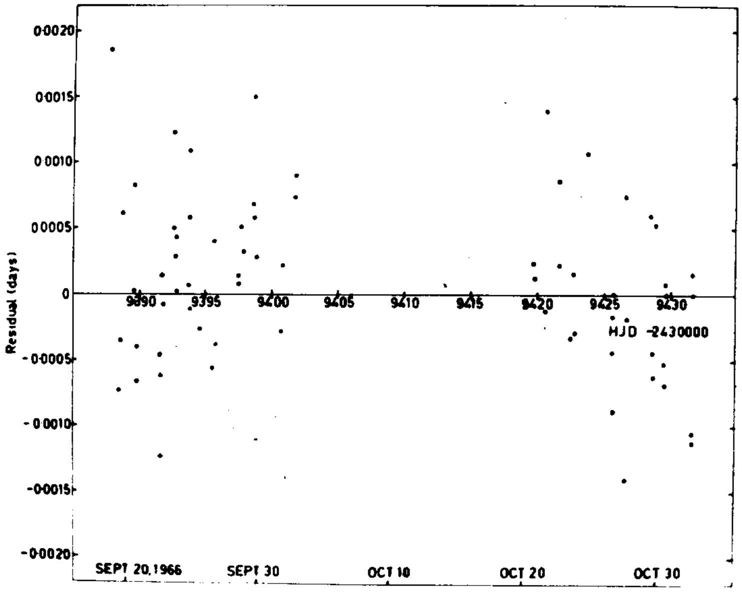

Figure 2: Plot of the adjusted residuals for Stock and Tapia using the corrections acquired from the curve in Fig.1.

Analysis of the residuals for periodicity has not as yet provided sufficient evidence to support the existence of an additional mode of oscillation of SX Phe.

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Reference:

Coates, D.W., Dale, M., Halprin, L., Robinson, J. and Thompson, K., 1979, Mon.Not.R. astr. Soc. 187, 83

Appendix. We give for reference the residuals determined from our equations for all observed times of maximum light.

Pre-1960 Residuals

Observed Time (HJD-2430000)	Residual (Days)	Observed Time (HJD-2430000)	Residual (Days)
3923.95960	-0.00070	4238.52040	-0.00030
3924.01310	-0.00100	4238.58170	0.00090
3926.92770	-0.00140	4238.63560	-0.00010
3926.98920	0.00110	4240.39220	-0.00010
3927.03920	0.00010	4240.50440	0.00040
3927.09340	0.00170	4251.43670	-0.00060
3927.15240	0.00070	4254.29570	-0.00040
3927.20720	0.00040	4254.35180	0.00000
4224.51090	0.00070	4254.41140	-0.00010
4224.56390	-0.00030	4254.46280	-0.00090
4227.42540	0.00120	4254.51530	0.00020
4227.52810	0.00030	4254.57440	0.00010
4227.58830	0.00060	4278.26200	0.00090
4227.64320	0.00030	4278.32170	0.00060
4228.41280	0.00030	4278.37280	-0.00070
4228.51830	-0.00070	4278.42550	0.00090
4228.57820	-0.00020	4278.48300	-0.00070
4228.63010	0.00030	4283.26180	-0.00020
4229.34860	0.00070	4283.32200	-0.00010
4229.39940	-0.00010	4283.42670	0.00010
4229.51130	0.00030	4283.48310	-0.00120
4229.56700	0.00000	4293.32280	-0.00050
4231.37560	0.00060	4293.38100	-0.00050
4231.43450	0.00020	4293.43210	0.00030
4231.49110	0.00010	4293.48460	-0.00100
4231.54080	-0.00010	4294.31490	-0.00020
4231.59600	-0.00040	4294.36960	0.00040
4232.36500	-0.00070	4294.41960	0.00020
4232.42550	-0.00010	4294.47730	-0.00010
4232.47790	-0.00030	4295.30450	-0.00080
4232.58790	-0.00040	4295.35560	-0.00050
4232.64480	-0.00070	4295.40920	0.00010
4235.33940	0.00040	4295.46880	-0.00030
4235.38910	0.00010	4295.52380	0.00000
4235.44330	0.00010	4966.85690	0.00150
4235.50320	0.00000	4966.91600	0.00070
4235.55680	-0.00020	4966.97050	-0.00030
4235.60790	0.00050	4967.84680	0.00020
4236.43430	-0.00060	4967.90590	-0.00030
4236.49280	-0.00050	4967.95880	0.00110
4236.54420	0.00040	6158.98190	-0.00020
4236.59700	-0.00020	6175.96790	0.00030
4236.65880	0.00150	6176.02570	-0.00060
4238.41770	0.00060	6183.99100	0.00000
4238.46770	-0.00030	6184.04470	-0.00080

Post-1960 Residuals

Observed Time (HJD-2430000)	Residual (Days)	Observed Time (HJD-2430000)	Residual (Days)
8636.66920	0.00020	9422.77700	0.00050
8636 72700	0.00080	9423.65170	0.00190
8636.78500	0.00000	9425.57390	0.00050
8636.83760	0.00140	9425.63380	0.00080
8639.64200	0.00070	9425.68890	0.00010
8639.69660	-0.00090	9425.73970	0.00090
8639.74800	0.00060	9426.56400	-0.00050
9387.65420	0.00100	9426.62570	0.00180
9388.58350	-0.00130	9426.72840	0.00080
9388.64200	-0.00160	9428.54930	0.00170
9388.80700	-0.00030	9428.60080	0.00080
9389 57660	0.00000	9428.65180	0.00050
9389.63110	-0.00080	9428.71200	0.00170
9389.68100	-0.00090	9429.53760	0.00080
9389.73720	-0.00160	9429.58750	0.00050
9389.79770	-0.00010	9429.64300	0.00110
9389.84790	-0.00130	9429.70300	0.00140
9391.60470	-0.00130	9431.56550	0.00030
9391.66000	-0.00200	9431.62670	0.00150
9391.72090	-0.00060	9431.67910	0.00040
9391.77200	-0.00140	9431.73070	0.00130
9391.82430	-0.00090	9756.67880	-0.00090
9392.59520	0.00060	9756.74090	0.00130
9392.65370	-0.00020	9756.79220	-0.00150
9392.70790	-0.00070	9756.84350	-0.00060
9392.75980	-0.00060	9758.76780	-0.00020
9392.81570	-0.00040	9758.82320	-0.00210
9393.64450	-0.00070	9759.75710	-0.00030
9393.69680	-0.00070	9759.81690	-0.00010
9393.74870	-0.00020	9761.79620	-0.00030
9393.80830	0.00040	9762.78310	-0.00030
9394.57630	-0.00100	9762.83520	0.00010
9395.56750	-0.00120	9763.72030	-0.00010
9395.62160	-0.00020	9763.77050	0.00000
9395.67160	-0.00100	9763.82540	-0.00040
9397.59600	-0.00050	9764.75820	-0.00060
9397.65400	-0.00060	9764.81600	-0.00170
9397.71260	0.00000	9766.74120	0.00020
9397.81660	-0.00040	9766.79870	-0.00010
9398.58640	0.00010	9766.84970	0.00060
9398.64720	0.00100	9768.77350	0.00020
9398.70060	0.00010	9768.82640	-0.00040
9398.75020	-0.00060	10142.64380	-0.00110
9398.80820	-0.00030	10142.75060	-0.00080
9400.73100	-0.00080	10143.58120	0.00120
9400.79050	-0.00020	10143.63170	-0.00020
9401.66440	0.00040	10143.68400	0.00020
9401.72400	0.00040	10143.74480	0.00160
9419.69910	0.00070	10143.79840	-0.00090
9419.74950	0.00080	10144.61900	0.00010
9420.57270	0.00050	10144.67400	-0.00070
9420.63420	0.00200	10144.73460	0.00030
9421.62380	0.00150	10144.78560	-0.00080
9421.72720	0.00090	10145.55520	-0.00090
9422.61070	0.00050	10145.60780	0.00040
9422.66130	0.00090	10145.66500	-0.00150

Observed Time (HJD-2430000)	Residual (Days)	Observed Time (HJD-2430000)	Residual (Days)
10145.72280	-0.00060	11945.64280	-0.00010
10145.77260	-0.00070	11945.69390	0.00080
10147.58980	-0.00010	11945.74950	-0.00080
10147.64720	-0.00010	11945.80950	0.00040
10147.69680	-0.00070	12389.53740	0.00100
10148.58160	0.00020	12389.58770	0.00130
10148.63440	-0.00040	12389.64100	-0.00120
10148.68580	0.00040	12392.55550	-0.00190
10148.74230	-0.00150	12392.61540	0.00060
10879.55000	0.00180	13047.07710	0.00050
10879.60870	0.00070	13047.12740	-0.00060
10879.66320	0.00090	13063.07180	0.00090
10879.71320	0.00060	13063.12330	-0.00040
10879.77270	0.00230	13110.99540	0.00160
11933.66140	-0.00060	13141.99740	0.00020
11933.71350	0.00070	13142.98350	-0.00060
11933.76590	0.00000	13280.18050	0.00160
11933.82520	-0.00060	13280.23590	0.00090
11934.53570	0.00040	13331.07570	0.00090
11934.65050	0.00040	13331.13320	0.00050
11934.70090	0.00070	13331.18370	0.00060
11934.81660	0.00040	13331.23700	-0.00010
11934.86690	-0.00050	13336.07390	-0.00150
11935.52470	-0.00200	13336.13590	0.00130
11935.58440	-0.00130	13336.18580	-0.00010
11935.63740	0.00030	13336.23790	-0.00040
11935.68900	-0.00040	13345.03670	-0.00060
11935.80200	-0.00260	13345.08790	0.00030
11936.62390	-0.00030	13379.05470	-0.00130
11936.68150	0.00090	13379.11720	0.00120
11936.73910	-0.00090	13379.16920	-0.00090
11936.79190	0.00030	13379.22080	0.00040
11936.84410	0.00050	13379.27800	-0.00020
11936.90200	-0.00120	13393.12670	0.00010
11937.50950	0.00010	13394.06150	0.00030
11937.56120	0.00000	13394.11710	-0.00070
11937.61330	0.00020	13394.17620	-0.00080
11937.67190	-0.00060	13394.22800	-0.00050
11937.72890	0.00030	13410.99300	-0.00080
11937.77900	0.00040	13411.04460	-0.00010
11937.83320	-0.00150	13411.10330	0.00000
11937.89430	0.00020	13411.16160	0.00080
11940.52690	-0.00040	13411.21120	0.00020
11940.69250	0.00150	13411.26370	-0.00190
11940.74830	-0.00150	13411.98080	0.00010
11943.55120	0.00010	13425.01360	0.00230
11943.60390	-0.00090	13425.06420	-0.00110
11943.66540	0.00070	13425.11620	0.00050
11943.76970	0.00060	13442.04750	-0.00030
11944.65450	-0.00040	13618.26590	-0.00080
11944.70670	0.00110	13633.21150	-0.00020
11944.75950	0.00060	13644.15100	0.00030
11944.81810	-0.00060	13644.20360	-0.00090
11944.87350	0.00030	13644.26650	0.00200
11945.52930	0.00100	13644.31740	-0.00090
11945.58790	-0.00020	13709.06890	0.00070

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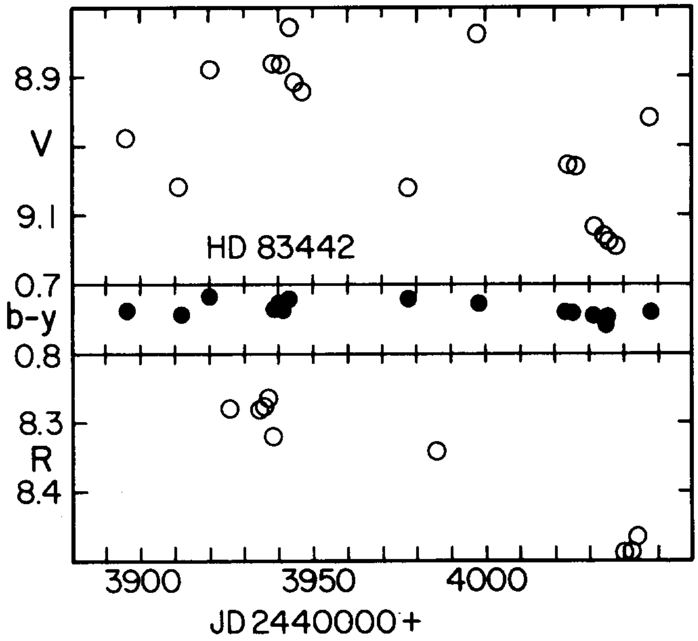
A NEW LATE TYPE VARIABLE WITH H AND K EMISSION

An obvious source of candidates for variable G and K type giants and subgiants with H and K emission is the Michigan Spectral Type Catalogue (vols. I and II) which covers the sky from -90° to -40°. The first star selected from this catalogue for photometric monitoring was HD 83442, which is classified K2 IIIp ("Ca H and K cores are quite strongly in emission"). The observations on a modified Strömgren system are listed in Table 1 and a few on the (RI) system are in Table 2. Figure 1 shows the variations in V, b-y and R. The total range in near 0.3 mag in V and appears to be quasiperiodic with P = 65 to 70 days. The minima are relatively narrow, judging by the last observations shown in the figure (June 1979). The color is reddened at minima by only one or two hundredths in both (b-y) and (R-I). Early type stars in the region indicate a reddening of only about E(b-y) = 0.02 mag at a distance modulus of 8.5 mag in this direction. If we adopt a reddening of 0.02 mag, the values of (R-I) and M_1 indicate a near solar metal abundance. The mean value of $C_1 = 0.340$ mag indicates a lower luminosity than that given by the spectral luminosity class but this possibly is reflecting some spectral abnormality (e.g., CH or BaII). Nearly identical values of the proper motion are



given in the Cape and Yale Zone catalogues; the mean values on the FK4 system with precessional corrections are $(\mu_\alpha \cdot \mu_\delta)$ = (-0".063, 0".000). The star is also BPM 34343 with a relative proper motion of 0".052 in position angle 300°. If the luminosity is near $M_V = 0$, (U, V, W) = $(+140, -14+\rho, -126)$ km/sec; the unknown radial velocity is essentially a measure of the V velocity only. These velocity vectors indicate a halo object, but if we lower the assumed luminosity to $M_V = +2$ mag, which would be more in accordance with the value of C_1, the vectors become $(+56, -6+\rho, -50)$ km/sec.

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TABLE 1

Observations of HD 83442

JD244	V	b-y	M_1	C_1	(u-b)
3886.542	$8\overset{m}{.}99$	$0\overset{m}{.}740$	$0\overset{m}{.}482$	$0\overset{m}{.}298$	$2\overset{m}{.}721$
3911.562	9.06	0.743	0.504	0.322	2.799
3920.587	8.89	0.712	0.479	0.355	2.719
3938.656	8.88	0.734	0.478	0.348	2.750
3939.760	8.88	0.723	0.492	0.369	2.751
3940.750	(8.83)	0.732	0.476	0.369	2.762
3941.750	8.91	0.728	0.485	0.358	2.764
3942.615	8.92	0.720	0.508	0.311	2.752
3977.635	9.06	0.721	0.500	0.351	2.777
3997.543	8.84	0.724	0.482	0.336	2.728
4023.545	9.03	0.740	0.487	0.337	2.769
4024.521	9.03	0.742	0.484	0.329	2.759
4032.503	9.12	0.746	0.485	0.340	2.780
4035.476	9.13	0.758	0.468	0.344	2.770
4036.493	9.13	0.752	0.483	0.350	2.798
4037.465	9.13	0.745	0.494	0.326	2.785
4048.458	8.96	0.738	0.470	0.332	2.724

TABLE 2

(RI) Observations

1979	R	R-I
21 Feb.	$8\overset{m}{.}28$	$+0\overset{m}{.}392$
2 Mar.	8.28	+0.398
3 Mar.	8.27	+0.406
4 Mar.	8.26	+0.395
5 Mar.	8.32	+0.416
21 Apr.	8.34	+0.412
15 June	8.49	+0.427
16 June	8.49	+0.423
17 June	8.47	+0.425

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Konkoly Observatory
Budapest
1979 July 31

OPTICAL SPECTRUM OF UV Cas

A spectrum of the star UV Cas between λλ 4150 and 5050 Å has been secured on September 15, 1978 at the 152 cm telescope of the Bologna Observatory on a II aD plate and a Varo image-tube, with a reciprocal dispersion of nearly 84 Å/mm. The most remarkable feature is the lack of the Balmer hydrogen lines, while metals are mostly ionized and C_2 is possibly present at λ 4714 and λ 4737.

The general pattern of the spectrum is very similar to that of RY Sgr near maximum light (Alexander et al.,1972). As the spectrum is underexposed below λ 4300 Å it was not possible to achieve a correct MK classification; however, on the basis of the available features, a spectral type between F0 Ib and F5 Ib may be suggested.

A rough measure of the radial velocity (-30±10 km/s) has also been obtained in good agreement with those reported by Abt (1973).

The nature of R CrB-type star UV Cas seems so well established from a spectroscopical point of view, despite the puzzling behaviour of its light-curve (Zavatti, 1975).

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References:

Abt, H.A., Ap.J.Suppl., 26, 365, 1973
Alexander, J.B., Andrews, P.J., Catchpole, R.M., Feast, M.W., Lloyd Evans, T., Menzies, J.W., Wisse, P.N.J., Wisse, M., MNRAS, 158, 305, 1972
Zavatti, F., I.B.V.S., No.1027, 1975

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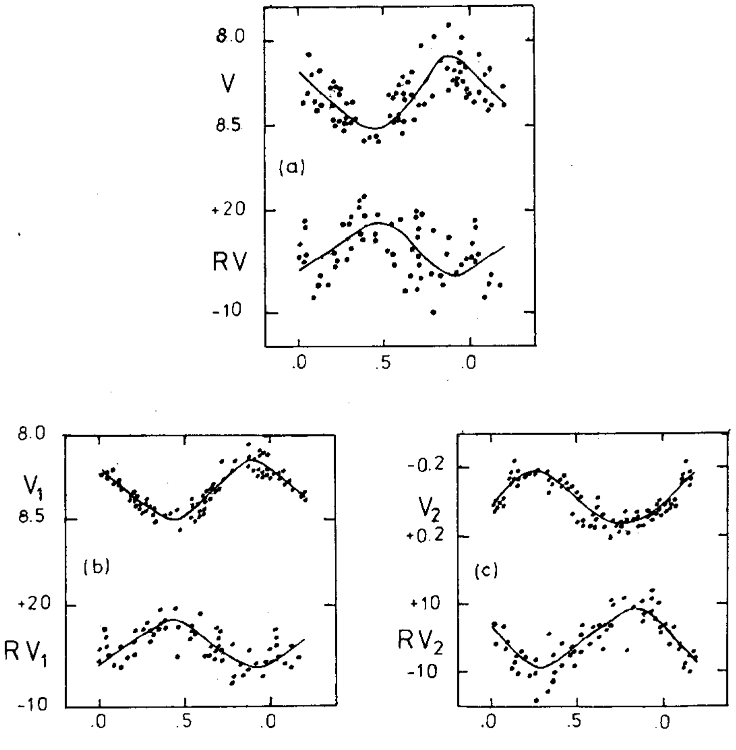
VX PUPPIS - THE PUZZLE RESOLVED?

VX Puppis is a member of the class of double-mode (or beat) cepheids which show the simultaneous excitation of 2 modes of pulsation. Recently Hoffleit (1979) pointed out that the periods of P_1 = 3.01172 days and P_2 = 2.1370 days derived by Stobie (1970) appeared anomalous in that the light curve for the P_2 oscillation showed a steeper descent than ascent in marked contrast to the analysis of other double-mode cepheids. Hoffleit proposed an identification of the secondary period with P_3 = 1.8706 days for which the light curve appeared normal. The problem with either interpretation is that only 17 observations (Mitchell et al, 1964) were available to determine the secondary period although Hoffleit also noted that 12 observations by Takase (1969) roughly substantiated the period P_3. Schaltenbrand and Tammann (1971) had noted that the observations by Takase did not appear to fit the beat period derived by Stobie. Subsequently using Fourier analysis techniques Stobie (1977) showed that many secondary periods were capable of fitting the data set and that with the available photoelectric observations no unique determination was possible.

To attempt to solve this problem, Balona and Stobie (1979) undertook a study of VX Pup as part of a larger program of observing eight double-mode cepheids in the southern sky. Contemporaneous BVRI photometry and photoelectric radial velocities were obtained. We will present here only a brief summary of the frequency analysis of the observations of VX Pup. A least squares Fourier analysis technique (Barning, 1963) was used to identify the primary and secondary frequencies and subsequently a multivariate Fourier solution of second order was fitted to the observations. The frequency range 0 to 1 cycles/day was searched for frequency components. In total 66 B,V observations and 53 radial velocity observations were frequency analysed. This presented a far more extensive and concentrated data set than available previously. Unfortunately the observations listed by Mitchell et al. and Takase could not be incorporated as it was not possible to count cycles uniquely between the different epochs of observation. Thus the results presented here are based solely on the observations of Balona and Stobie.

Frequency analysis of the B and V observations both gave identical results in identifying the primary and secondary frequencies as $f_1 = 0.33213 \pm 0.0001$ cycles/day and $f_2 = 0.46751 \pm 0.0001$ cycles/day. The search for the secondary frequency was carried out after prewhitening the observations by the sinusoid corresponding to the primary frequency. The value of f_1 is consistent with the more accurate period listed in the General Catalogue of Variable Stars (third edition) but f_2 is not consistent with either of the 2 secondary periods already mentioned. There was no ambiguity in the identification of these frequencies. This was confirmed by an analysis of the radial velocity observations (which had a different alias pattern since spectroscopic observations were obtained on some nonphotometric nights). The analysis of the radial velocity observations identified the same 2 frequencies but in the reverse order. This simply meant that the amplitude of the f_2 term was larger than the f_1 term in the radial velocity observations (see table). This feature has proved to be a property of other double-mode cepheids and clearly is a systematic effect (i.e., A_{RV}/A_V for the first overtone is always greater than A_{RV}/A_V for the fundamental). The period ratio $P_2/P_1 = 0.71042$ is in the range expected from the analysis of other double-mode cepheids.



Decomposition of

(a) V and RV observations of VX Puppis into component waves,

(b) primary frequency of 0.33213 cycles/day, and

(c) secondary frequency of 0.46751 cycles/day.

TABLE: SEMI-AMPLITUDES OF FREQUENCIES PRESENT IN VX PUP.

Mode	Frequency	A_B	A_V	A_{RV}
fundamental	0.33213	0.213	0.153	6.4
first overtone	0.46751	0.212	0.146	8.7

In order to check whether the shape of the light curve was reasonable, the light curve was decomposed into its component oscillations according to the frequencies given in the table. The results are shown in the figure and encouragingly the shapes of both the light curves and the radial velocity curves appear normal. The earlier results where the secondary period was inaccurately determined were caused by attempting to analyse an inadequate data set.

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References:

Balona, L. A. and Stobie, R. S. 1979. Mon. Not. R. astr. Soc., <u>188</u>, in press.

Barning, F. J. M. 1963. Bull. astr. Inst. Netherl., <u>17</u>, 22.

Hoffleit, D. 1979. Inf. Bull. Variable Stars, No. 1603.

Mitchell, R. I., Iriarte, B. I., Steinmetz, D. and Johnson, H. L. 1964. Ton.y Tac. Bol., <u>3</u>, 153.

Schaltenbrand, R. and Tammann, G. 1971. Astr. and Astrophys. Suppl., <u>4</u>, 265.

Stobie, R. S. 1970. Observatory, <u>90</u>, 20.

Stobie, R. S. 1976. Multiple Periodic Variable Stars, I.A.U. Coll. No. 29, Budapest, p.103.

Takase, B. 1969. Tokyo astr. Bull. Second Series No. 191, p. 2233.

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PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR EV Lac IN 1974

Continuous photoelectric monitoring of the flare star EV Lac has been carried out at the Stephanion Observatory ($\lambda=-22^{\circ}49'44''$ $\varphi=+37^{\circ}45'15''$) during the years 1974 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 and photometer will be described elsewhere. 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 2-6-1974 to 12-8-1974

$$V = v_o + 0.053\ (b-v)_o+2.380,$$
$$(B-V)= 0.858 + 1.043(b-v)_o,$$
$$(U-B)=-1.782 + 1.020(u-b)_o,$$

and for the time interval from 13-8-1974 to 31-10-1974

$$V = v_o - 0.018(b-v)_o+2.297,$$
$$(B-V)= 0.886 + 1.004(b-v)_o,$$
$$(U-B)=-1.818 + 0.974(u-b)_o.$$

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 noice 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 74.55 hours of monitoring time 23 flares were observed the characteristics of which 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

Flare Star EV Lac, I974

T a b l e I

Date I974	Monitoring intervals (U.T.)	Total Monitoring Time	σ (U.T.)
July			
I0-II	23^h34^m-23^h58^m,000I-0035, 0038-0II3,	$I^{h*}33^m$	0.02(23^h47^m),0.02(00^hI3^m), 0.02(00^h52^m).
II-I2	232I-2357, 000I-0022, 0024-0038, 0043-0I20.	I^h48^m	0.03(23^h36^m),0.02(00^hI7^m), 0.02(00^h46^m),0.02($0I^hI5^m$)
I3	0033-0I00, 0I03-0I33	0^h57^m	0.0I(00^h46^m),0.0I($0I^h23^m$),
I6-I7	233I-000I, 0004-0032, 0034-0I06,	I^h30^m	0.0I(23^h47^m),0.0I(00^hI5^m), 0.0I(00^h55^m).
I7-I8	230I-2332, 2334-0008, 00II-0039, 004I-0I09	2^h0I^m	0.0I(23^h22^m),0.0I(00^h00^m) 0.0I(00^h24^m),0.0I(00^h50^m).
I8-I9	22I6-2247, 225I-2326, 2328-2359, 00I0-0038, 004I-0I08, 0II4-0I2I.	2^h39^m	0.0I(22^h38^m),0.0I(23^hI6^m), 0.0I(23^h46^m),0.0I(00^h24^m), 0.0I(00^h54^m).
August			
7-8	22^hII^m-22^h40^m,2242-2308, 23II-2340, 2354-0020, 0022-0049, 0052-0II8.	2^h43^m	0.03(22^hI2^m),0.04(22^h45^m), 0.03(23^hI3^m),0.03(23^h39^m), 0.03(00^hI3^m),0.03(00^h48^m) 0.03($0I^hI6^m$).
9-I0	2035-2I02, 2I05-2I37, 2I48-22I7, 2227-2248, 2250-2320, 233I-2359, 0043-0II4.	3^hI8^m	0.02(20^h37^m),0.02($2I^h06^m$), 0.02($2I^h49^m$),0.02(22^h28^m), 0.02(22^h54^m),0.02(23^h32^m), 0.02(23^h58^m),0.02(00^h44^m), 0.02($0I^hI3^m$).
I0-II	2239-2306, 2308-2332, 2335-0008, 002I-0044, 0047-0I20.	2^h20^m	0.02(22^h40^m),0.02(23^hI0^m), 0.02(23^h47^m),0.02(00^h22^m), 0.02(00^h53^m),0.02($0I^hI6^m$).
II-I2	20I2-2040, 2042-2II2, 2II5-2I44, 2I59-2227, 2230-2259, 2303-2330, 00I2-0057, 0059-0II9.	3^h56^m	0.0I(20^hI3^m),0.02($2I^hI8^m$), 0.0I($2I^h43^m$), 0.02(23^h28^m),0.02(00^hI6^m).

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Table I (Continued)

I3-I4	I947-20I2, 20I6-2043, 2049-2054, 2056-2I24, 2I35-2207, 22I0-2239, 2242-2309, 2329-2348, 003I-005I, 0054-0II9.	3^h57^m	0.02($I9^h49^m$), 0.0I(20^hI6^m), 0.02(20^h52^m), 0.02($2I^h23^m$), 0.02(22^h00^m), 0.02(22^h34^m), 0.02(23^h05^m), 0.02(23^h37^m), 0.0I(00^h42^m), 0.02($0I^h08^m$).
I4	I956-20I7, 20I9-2029, 203I-2059, 2I02-2I3I.	I^h28^m	0.02($I9^h57^m$), 0.02(20^h33^m), 0.0I($2I^h04^m$), 0.02($2I^h30^m$).
22-23	I935-200I, 2003-2033, 2036-2I02, 2I22-2I52, 2200-2224, 2225-2300, 2347-00I7.	3^h2I^m	0.02($I9^h37^m$), 0.02(20^h05^m), 0.02(20^h32^m), 0.0I($2I^h0I^m$), 0.0I($2I^h34^m$), 0.02(22^h06^m), 0.0I(22^h38^m), 0.02(23^h59^m).
23-24	I905-I932, I934-I958, 2000-203I, 2043-2II0, 2II2-2I43, 2I48-2209, 2220-2248, 225I-23I3, 0005-0028, 003I-0I02, 0I04-0I37.	4^h58^m	0.02($I9^h07^m$), 0.02($I9^h37^m$), 0.0I(20^hII^m), 0.0I(20^h56^m), 0.0I($2I^h25^m$), 0.0I(22^h00^m), 0.0I(22^h36^m), 0.0I(23^h04^m), 0.0I(00^h05^m), 0.02(00^h45^m), 0.02($0I^hI5^m$).
24-25	I925-I952, I955-2026, 2029-2056, 2I07-2I4I, 2I44-2205, 2208-2236, 2249-23II, 0003-00I8.	3^h25^m	0.02($I9^h39^m$), 0.02(20^h09^m), 0.02(20^h39^m), 0.02($2I^hI5^m$), 0.0I(22^h00^m), 0.02(22^h30^m), 0.02(23^h03^m), 0.02(00^h06^m).
25-26	I938-2002, 2005-2034, 2036-2I05, 2II6-2I4I, 2I44-22I4, 22I7-2244, 2257-23I7, 00II-0033, 0036-0I09, 0II2-0I38.	4^h25^m	0.03($I9^h52^m$), 0.03(20^h22^m), 0.02(20^h56^m), 0.02($2I^h30^m$), 0.02(22^h00^m), 0.02(22^h30^m), 0.02(23^h00^m), 0.02(00^h20^m), 0.0I(00^h52^m), 0.0I($0I^h20^m$).
3I	2040-2II0, 2II3-2I42, 2I44-22I5, 2228-2257, 2307-2325.	2^hI7^m	0.04(20^h44^m), 0.04($2I^hI6^m$), 0.04($2I^h47^m$), 0.04(22^h3I^m), 0.04(23^hII^m).
September			
2-3	I94I-20I4, 20I7-202I, 2026-2048, 205I-2I2I, 2I34-2202, 2205-2238, 2240-2309, 0000-0029, 0032-0I02.	3^h58^m	0.04($I9^h45^m$), 0.04(20^hI9^m), 0.04(20^h54^m), 0.04($2I^h39^m$), 0.03(22^hII^m), 0.03(22^h43^m), 0.05(00^h05^m), 0.03(00^h35^m).

Table I (Continued)

3-4	2050-2II5, 2309-2335, 2343-00I0, 00I3-0043, 0058-0I09.	I^h59^m	0.03(20^h55^m), 0.04(23^hI6^m), 0.04(23^h46^m), 0.04(00^hI6^m), 0.03($0I^h00^m$).
4-5	2I23-2I54, 2I57-2224, 2226-2256, 2345-00I5, 00I7-0045, 0047-0II5.	2^h54^m	0.02($2I^h27^m$), 0.02(22^h0I^m), 0.02(22^h3I^m), 0.03(23^h48^m), 0.03(00^h20^m), 0.03(00^h50^m).
5-6	2026-2052, 2055-2I23, 2I26-2I53, 2206-2223, 2322-2347, 2350-00I9, 0022-005I, 0053-0III,	3^hI9^m	0.03(20^h30^m), 0.02($2I^h00^m$), 0.03($2I^h3I^m$), 0.03(22^h09^m), 0.05(23^h26^m), 0.03(23^h54^m), 0.04(00^h27^m), 0.05(00^h57^m).
6-7	2I07-2I34, 2I37-2205, 2208-2235, 2328-2356, 2358-0025, 0028-0I0I.	2^h50^m	0.04($2I^hI0^m$), 0.02($2I^h40^m$), 0.02(22^hI2^m), 0.02(23^h3I^m), 0.02(00^h02^m), 0.02(00^h3I^m).
9-I0	2024-205I, 2054-2I25, 2I27-2I56, 2236-2303, 2306-2340, 2344-000I, 0003-00I3, 0025-0054, 0057-0I22.	3^h49^m	0.0I(20^h29^m), 0.0I(20^h59^m), 0.0I($2I^h30^m$), 0.0I(22^h40^m), 0.0I(23^h27^m), 0.0I(00^h06^m), 0.0I(00^h36^m), 0.02($0I^h03^m$).
I4	2026-2056, 2059-2I29, 22I6-2245, 2247-23I5, 23I8-2322, 2326-2347.	2^h22^m	0.0I(20^h3I^m), 0.0I($2I^h00^m$), 0.0I(22^hI9^m), 0.0I(22^h55^m), 0.0I(23^h28^m).
I5	20I3-2040, 2043-2II0, 2II3-2I40, 2227-2249, 2252-23I6, 23I9-2329, 2333-2350.	2^h34^m	0.0I(20^hI7^m), 0.0I(20^h56^m), 0.0I($2I^h27^m$), 0.0I(22^h40^m), 0.0I(23^h09^m), 0.02(23^h44^m).
I7	I956-2024, 2027-2055, 2057-2I3I, 2220-2234, 2236-2305.	2^hI3^m	0.0I($I9^h58^m$), 0.0I(20^h28^m), 0.02($2I^h00^m$), 0.02(22^h25^m), 0.0I(22^h39^m).
I9	I95I-2020, 2022-2039, 204I-2I2I, 2220-2253.	I^h59^m	0.02($I9^h53^m$), 0.0I(20^h26^m), 0.02(20^h45^m), 0.0I(22^h23^m).
	Total	74^h33^m	

Flare Star EV Lac, 1974

Table II

Characteristics of the Flares Observed

Flare No.	Date 1974 July	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	11	$00^{h}54^{m}.2$	0.5	1.8	2.3	0.09	0.09	0.10	0.02	1.03
2	13	01 26.75	0.35	1.15	1.5	0.08	0.04	0.09	0.01	1.01
3	18	00 02.3	0.2	5.7	5.9	0.14	0.15	0.14	0.01	1.05
	August									
4	10	22 56.65	2.0	3.9	5.9	0.10	0.18	0.11	0.02	1.03
5	10	23 49.6	0.5	3.4	3.9	0.18	0.21	0.17	0.02	1.01
6	11	00 04.0	2.9	3.3	6.2	0.10	0.22	0.10	0.02	1.01
7	11	01 17.8	0.2	0.7	0.9	0.08	0.04	0.08	0.02	1.02
8	11	22 49.5	0.3	9.4	9.7	2.51	1.92	1.37	0.02	1.03
9	12	00 35.5	1.0	46.0	47.0	1.07	4.81	0.80	0.02	1.04
10	23	20 17.9	0.9	1.8	2.7	0.08	0.08	0.08	0.01	1.18
11	24	00 55.2	0.4	2.8	3.2	0.17	0.18	0.17	0.02	1.07
12	24	01 29.05	1.1	4.0	5.1	0.28	0.37	0.27	0.02	1.13
13	24	21 33.6	0.9	4.5	5.4	0.11	0.21	0.12	0.01	1.05
14	24	21 49.65	0.7	6.6	7.3	0.25	0.28	0.24	0.01	1.04
15	25	20 26.95	2.6	6.2	8.8	0.13	0.39	0.13	0.03	1.15
16	25	20 45.55	1.7	2.5	4.2	0.10	0.14	0.10	0.02	1.11
17	26	00 42.8	0.2	0.8	1.0	0.04	0.02	0.05	0.02	1.07
	September									
18	2	19 48.6	2.0	12.8	14.8	0.93	3.75	0.71	0.04	1.04
19	5	20 37.0	5.65	7.85	13.5	0.67	3.16	0.56	0.03	1.06
20	9	23 29.2	1.1	4.5	5.6	0.14	0.24	0.14	0.01	1.05
21	10	01 07.4	0.9	10.5	11.4	0.84	1.83	0.66	0.02	1.23
22	15	23 11.6	0.5	2.8	3.3	0.18	0.16	0.18	0.01	1.06
23	15	23 23.5	1.5	0.8	2.3	0.21	0.14	0.21	0.01	1.07

ratio $(I_f-I_o)/I_o$ corresponding to flare maximum, where I_o in the intensity deflection less sky backgroung 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 noice fluctuation $\sigma(mag)=2.5\ \log(I_o+\sigma)/I_o$ 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. 1-23.

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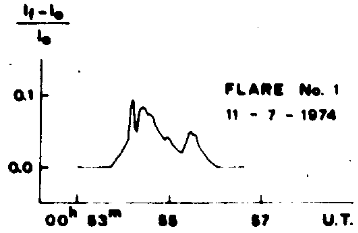
Reference :

Andrews, A.D., Chugainov, P.F., Gershberg, R.E. and Oskanian, V.S.: 1969, I.B.V.S. No. 326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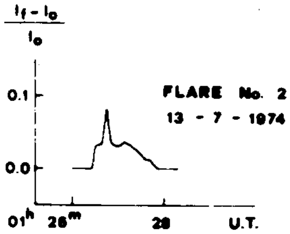
0.0
FLARE No. 1
11 - 7 - 1974
00h 53m
55
57
U.T.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0.0
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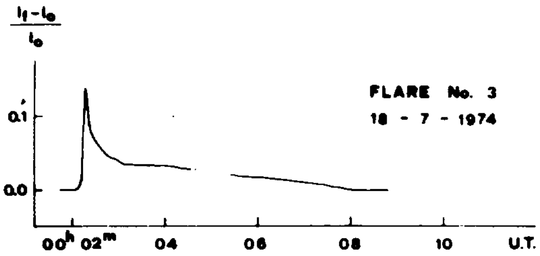
13 - 7 - 1974
01h 26m
28
U.T.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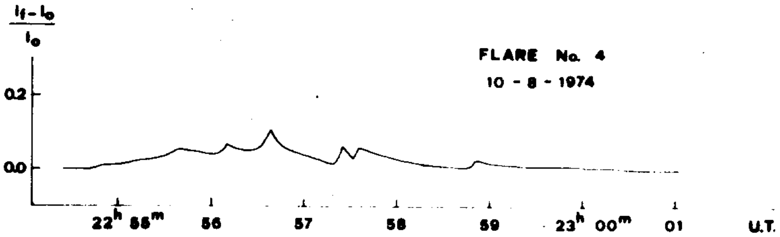
0.1
0.0
FLARE No. 3
18 - 7 - 1974
00h 02m
04
06
08
10
U.T.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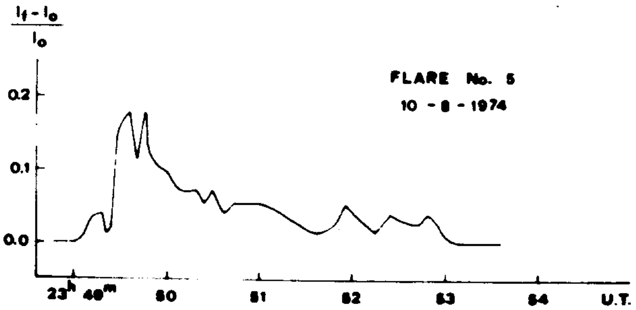
0.2
0.0
FLARE No. 4
10 - 8 - 1974
22h 55m
56
57
58
59
23h 00m
01
U.T.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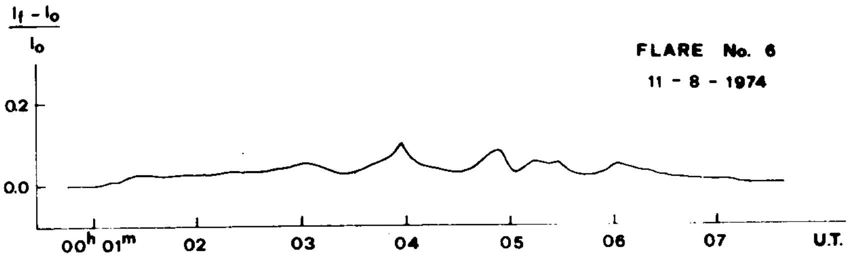
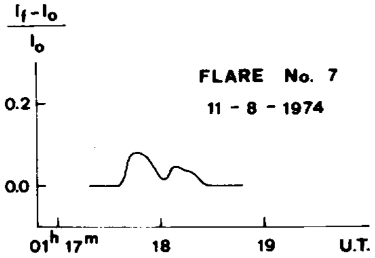
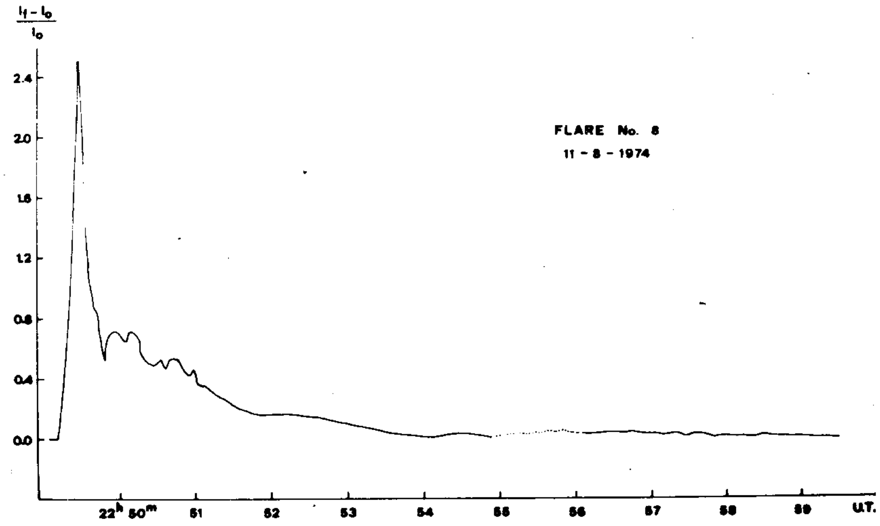
0.2
0.1
0.0
FLARE No. 5
10 - 8 - 1974
23h 49m
50
51
52
53
54
U.T.



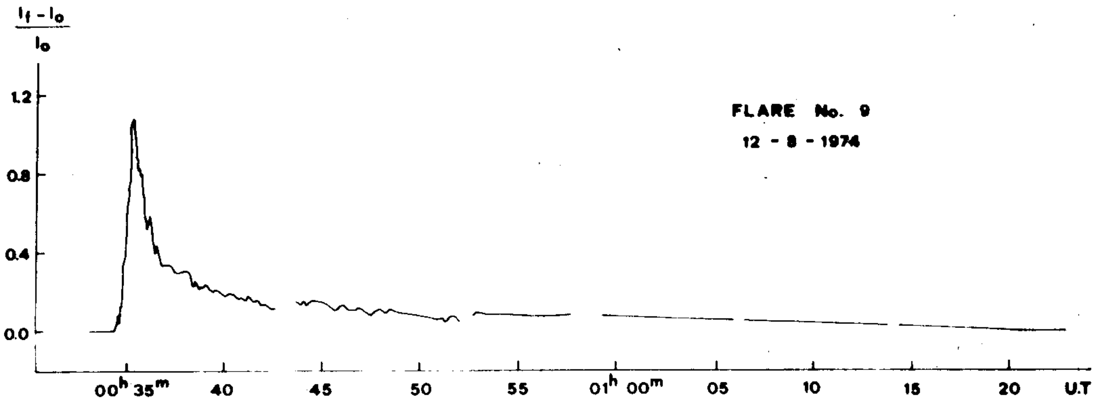
$\frac{I_f - I_o}{I_o}$
FLARE No. 6
11 - 8 - 1974
0.2
0.0
00h 01m
02
03
04
05
06
07
U.T.



$\frac{I_f - I_o}{I_o}$
FLARE No. 7
11 - 8 - 1974
0.2
0.0
01h 17m
18
19
U.T.



$\frac{I_f - I_o}{I_o}$
FLARE No. 8
11 - 8 - 1974
2.4
2.0
1.6
1.2
0.8
0.4
0.0
22h 50m
51
52
53
54
55
56
57
58
59
U.T.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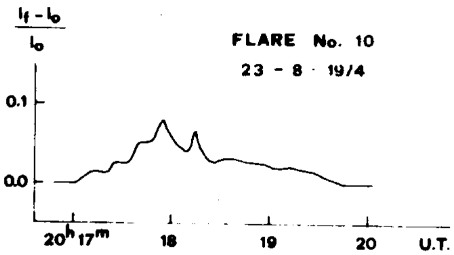
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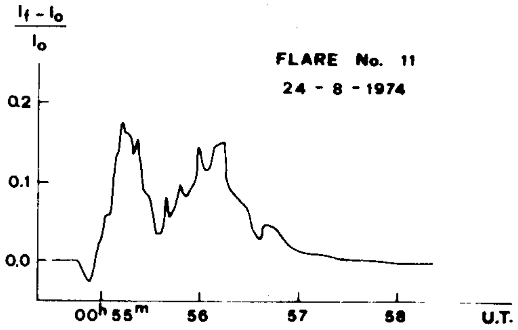
23 - 8 · 19/4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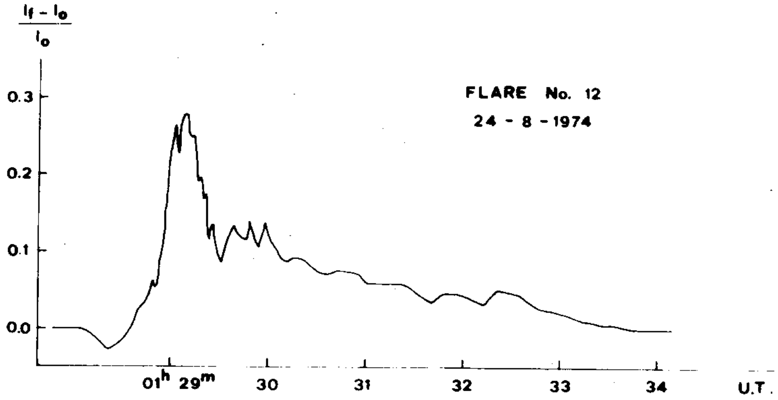
24 - 8 - 1974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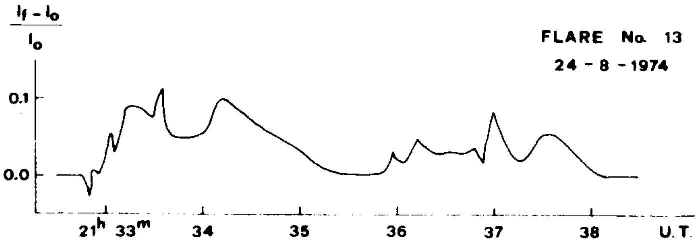
0.2
0.1
0.0
FLARE No. 12
24 - 8 - 1974
01h 29m
30
31
32
33
34
U.T.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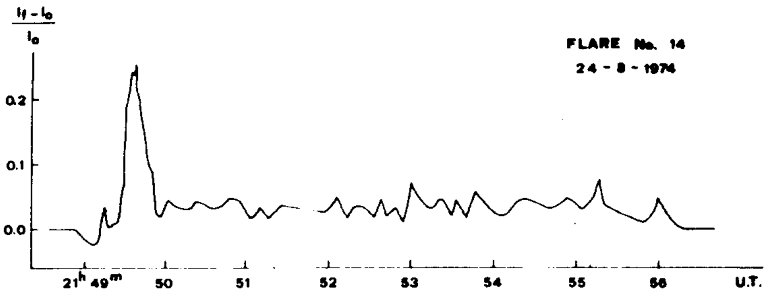
0.0
FLARE No. 13
24 - 8 - 1974
21h 33m
34
35
36
37
38
U.T.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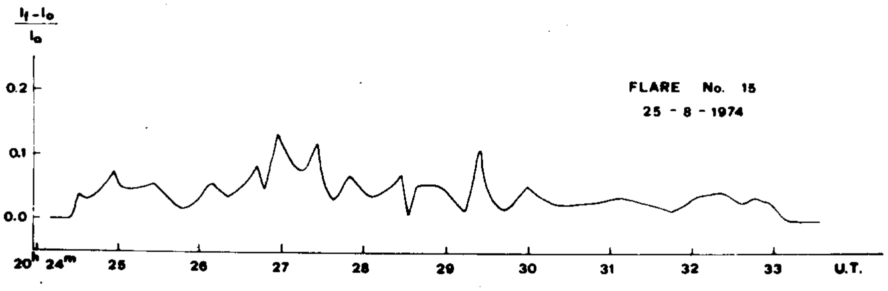
0.1
0.0
FLARE No. 14
24 - 8 - 1974
21h 49m
50
51
52
53
54
55
56
U.T.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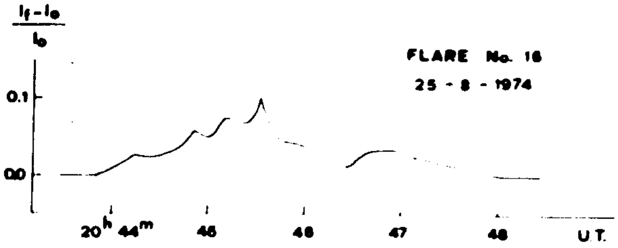
0.2
0.1
0.0
FLARE No. 15
25 - 8 - 1974
20h 24m
25
26
27
28
29
30
31
32
33
U.T.



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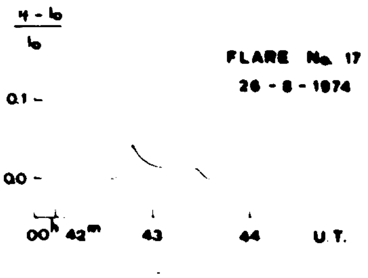
25 - 8 - 1974



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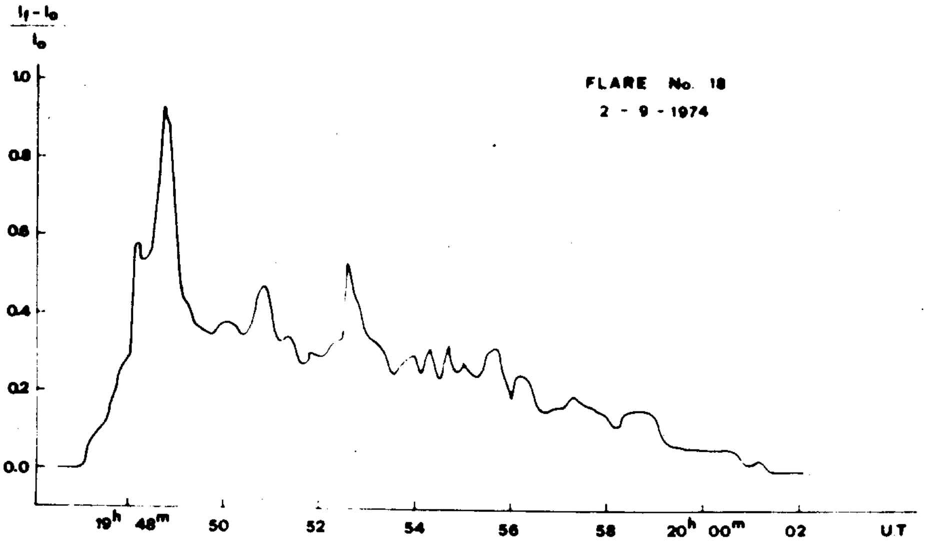

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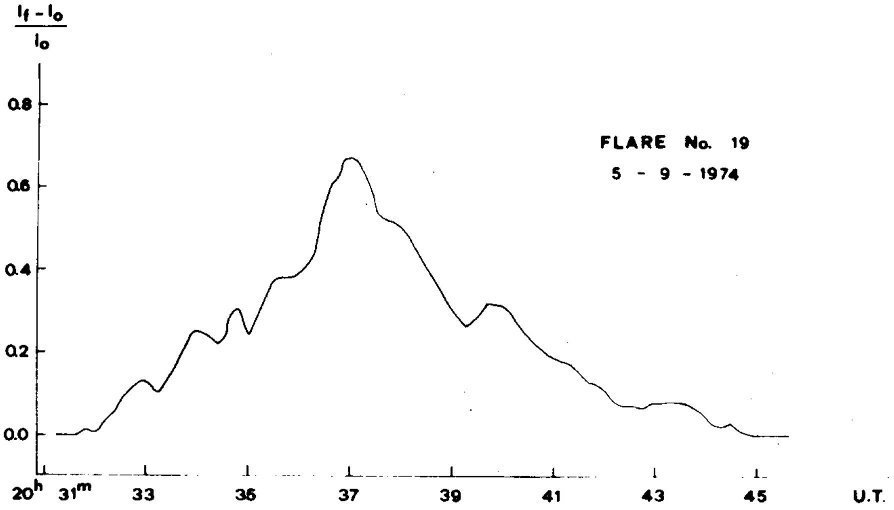
2 - 9 - 1974



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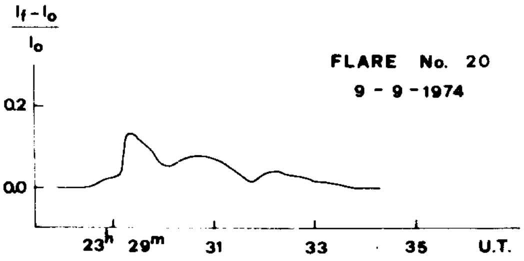
5 - 9 - 1974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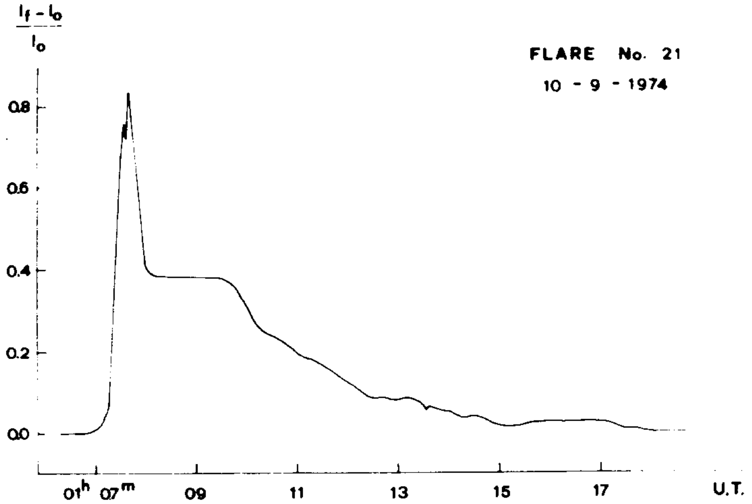
9 - 9 - 1974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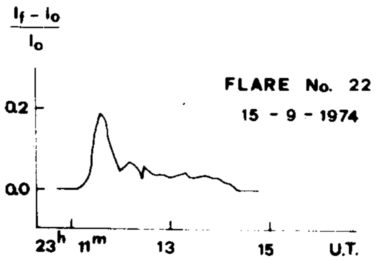
10 - 9 - 1974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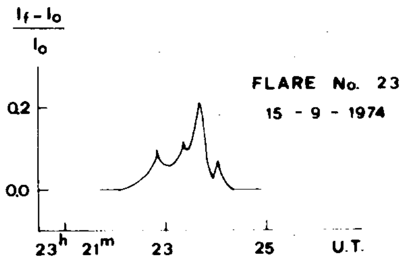
FLARE No. 23
15 - 9 - 1974

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1654

Konkoly Observatory
Budapest
1979 August 1

PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR UV Cet IN 1974,1975

Continuous photoelectric monitoring of the flare star UV Cet has been carried out at the Stephanion Observatory ($\lambda=-22^{\circ}49'44''$ $\varphi=+37^{\circ}45'15''$) during the years 1974, 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 and photometer will be described elsewhere. Here we mention only that the transformation of our instrumental ubv system to the international UBV system is given by the following equations:

$$V = v_o - 0.018(b-v) + 2.297,$$
$$(B-V) = 0.886 + 1.004(b-v)_o,$$
$$(U-B) = -1.818 + 0.974(u-b)_o.$$

The monitoring intervals in UT as well as the total monitoring time for each night are given in the Tables Ia, Ib. Any interruption of more than one minute has been noted. In the fourth column of Tables Ia, Ib the standard deviation of random noice 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 41 hours of the monitoring time 23 flares were observed the characteristics of which are given in Table II. For each flare following characteristics (Andrews et al., 1969) are given: a) the date and universal time of flare maximum, b) the duration before and after the 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

Table Ia

Monitoring Intervals in 1974

Date 1974 Sept.	Monitoring Intervals (U.T.)	Total Monitoring Time	σ(U.T.)
11	00^h02^m-00^h26^m,0029-0057,0100-0131, 0134-0200.	1^h49^m	0.10(00^h40^m),0.09 (00^h39^m),0.09(01 15).
15	0014-0045,0048-0117,0210-0227,	1 17	0.08(00 18),0.06 (00 54),0.08(02 12).
16	0019-0049,0052-0120,0123-0149	1 24	0.09(00 28),0.11 (00 59),0.10(01 30).
17-18	2338-0005,0007-0035,0037-0105, 0107-0134	1 50	0.07(23 47),0.06 (00 11),0.05(00 46) 0.07(01 16).
18-19	2359-0029,0031-0059,0101-0129, 0131-0215	1 10	0.06(00 03),0.06 (00 36),0.06(01 06) 0.07(01 34).
19-20	2312-2339,2341-0012,0013-0043 0049-0117,0122-0155	2 29	0.11(23 14),0.08 (23 47),0.07(00 17) 0.08(00 52),0.10(01 27).
Oct.			
8-9	2115-2143,2145-2213,2216-2248, 2300-2328,2330-2358,0000-0016, 0020-0028,0038-0105,0108-0136, 0138-0148,0150-0202,0216-0224, 0227-0232,0235-0242,0245-0300.	4 40	0.07(21 16),0.11(21 45), 0.08(22 13),0.10(22 48), 0.16(23 00),0.16(23 30), 0.13(00 10),0.19(00 28), 0.17(00 38),0.14(01 05), 0.21(00 36),0.25(02 16), 0.20(02 45).
9-10	2114-2141,2143-2211,2213-2249, 2258-2328,2330-2400,0003-0020, 0021-0026,0037-0056,0100-0109, 0111-0138,0140-0202,0216-0226, 0228-0234,0238-0252,0254-0259.	4 45	0.08(21 17),0.08(21 46), 0.06(22 15),0.09(22 46), 0.11(23 28),0.10(00 08), 0.14(00 22),0.13(01 13), 0.15(01 55),0.19(02 16), 0.18(02 40).
11-12	2303-2331,2333-2400,0000-0002, 0005-0041,0052-0121,0125-0144, 0146-0154,0156-0219,0224-0232, 0234-0253.	3 19	0.12(23 03),0.07(23 35), 0.09(00 07),0.12(00 52), 0.11(01 25),0.14(01 54), 0.29(02 26).
16	2048-2112,2115-2130,2132-2141.	0 48	0.10(20 48),0.13(21 17).
17-18	2152-2217,0002-0025,0027-0049, 0053-0118,0131-0156,0159-0206, 0208-0223.	2 22	0.08(21 52),0.07(22 17), 0.08(00 03),0.08(00 29), 0.09(00 54),0.11(01 32), 0.16(02 00),0.16(02 21).
18-19	2248-2315,2317-2343,2345-2400, 0000-0012,0027-0052,0055-0124, 0127-0146.	2 33	0.10(22 52),0.08(23 21), 0.08(23 47),0.08(00 10), 0.11(00 27),0.12(00 56), 0.11(01 37).
21-22	2103-2131,2133-2159,2201-2234, 2245-2313,2316-2352,2354-0008.	2 45	0.08(21 03),0.06(21 33), 0.08(22 03),0.07(22 32), 0.06(23 11),0.09(23 37), 0.09(23 58).
	Total	31^h11^m	

Table Ib

Monitoring Intervals in 1975

Date 1975	Monitoring Intervals (U.T.)	Total Monitoring Time	σ(U.T.)
January			
4	18^h08^m-18^h36^m,1840-1845,1847-1908 1911-1936,1946-1951.	1^h24	0.09(18^h09^m),0.07 (18 41),0.07(19 15).
5	1731-1758,1801-1831,1835-1854, 1910-1941,1944-1955,1957-2006, 2009-2015,2018-2027,2030-2037, 2053-2059,2103-2106.	2 38	0.07(17 53),0.06(18 20), 0.06(18 48),0.09(19 27), 0.08(20 00),0.08(20 22), 0.15(20 55).
6	1742-1814,1816-1847,1849-1922, 1932-1949,1952-2005,2008-2018, 2020-2032,2038-2054.	2 44	0.08(17 51),0.08(18 05), 0.08(18 40),0.07(19 05), 0.19(19 56),0.11(20 28), 0.11(20 48).
7	1721-1750,1753-1827,1830-1907, 1919-1945,1949-2013,2015-2048.	3 03	0.07(17 23),0.06(17 50), 0.07(18 26),0.07(19 06), 0.11(19 44),0.12(02 15).
	Total	9^h49^m	

TABLE II

Characteristics of the Flares Observed

Flare No.	Date	U.T. max.	t_b min	t_a min	Duration min	I_f-I_o/I_o max.	P min	Δ m mag.	σ mag.	Air mass
	I974									
	September									
I	II	$0I^h I8^m.9$	0.7	I0.I	I0.8	8.0I	9.37	2.39	0.09	I.80
2	II	0I 44 .6	9.6	I4.0	23.6	0.93	7.46	0.7I	0.09	I.86
3	I7	23 48 .9	0.2	0.3	0.5	0.68	0.08	0.56	0.07	I.80
	October									
4	8	2I I9 .95	0.57	3.36	3.93	I.07	0.65	0.79	0.07	2.02
5	8	23 I4 .6	0.2	0.5	0.7	0.6I	0.I2	0.52	0.I6	I.78
6	9	22 34 .65	0.2I	2.I9	2.40	0.84	0.63	0.66	0.08	I.79
7	I0	00 22 .3	0.8	2.7	3.5	0.66	0.60	0.55	0.I4	I.97
8	I0	0I 55 .35	0.I4	3.I0	3.24	2.29	I.38	I.29	0.I5	2.96
9	I8	23 47 .8	0.I5	I.6	I.75	I.80	0.4I	I.I2	0.08	I.96
I0	I9	00 27 .6	0.5	I.5	2.0	0.75	0.48	0.6I	0.II	2.24
II	I9	0I 37 .7	0.3	9.2	9.5	5.4I	6.07	2.02	0.I0	3.38
I2	2I	23 37 .65	3.4	I0.3	I3.7	0.86	3.37	0.67	0.09	I.97
I3	2I	23 58 .0	0.I	3.4	3.5	I.84	0.52	I.I3	0.09	2.08
	I975									
	January									
I4	4	I8 I8 .5	8.5	I5.7	24.2	4.50	9.37	I.85	0.09	I.88
I5	5	I8 03 .65	I.65	2.35	4.I	0.29	0.45	0.27	0.07	I.85
I6	5	I8 50 .4	0.7	0.7	I.4	0.29	0.II	0.27	0.06	2.05
I7	5	I9 30 .0	0.I	I5.0	I5.I	0.65	(2.25)	0.54	0.09	2.37
I8	6	I7 53 .I	0.I	0.2	0.3	0.54	0.06	0.47	0.08	I.83
I9	6	I8 6 .5	0.I	2.5	2.6	I.52	0.27	I.00	0.08	I.87
20	6	20 2I .35	0.I	I.5	I.6	0.65	0.24	0.54	0.II	3.33
2I	6	20 29 .05	0.I	I.7	I.8	I.09	0.28	0.80	0.II	3.56
22	7	I8 42 .0	0.2	0.9	I.I	0.65	0.24	0.54	0.08	2.05
23	7	20 2I .2	0.I	2I.3	2I.4	28.34	54.34	3.67	0.I2	3.44

total duration, including pre-flare, 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 noice fluctuation $\sigma(mag)=2.5\log(I_o+\sigma)/I_o$ 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. 1-23.

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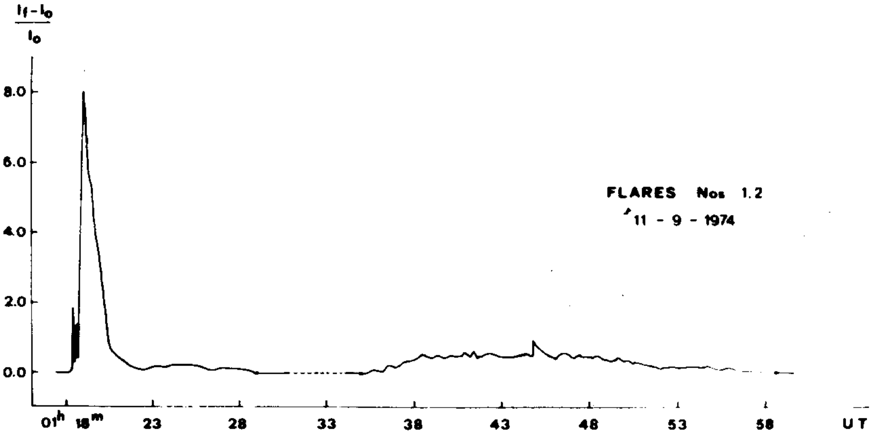
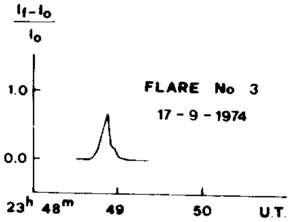
Reference:

Andrews, A.D., Chugainov, P.F., Gershberg, R.I., and Oskanian, V.S.: I.B.V.S. No. 326, 1969



FLARES Nos 1.2
11 - 9 - 1974



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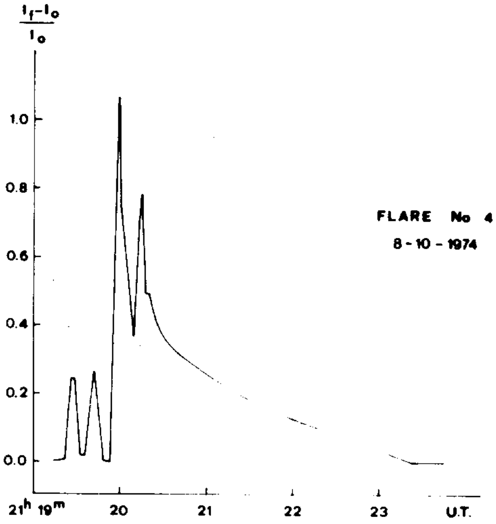
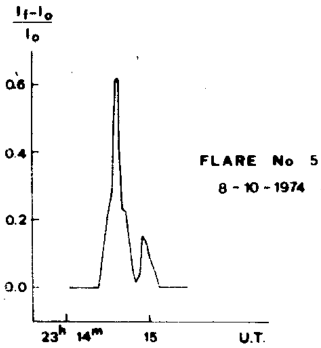
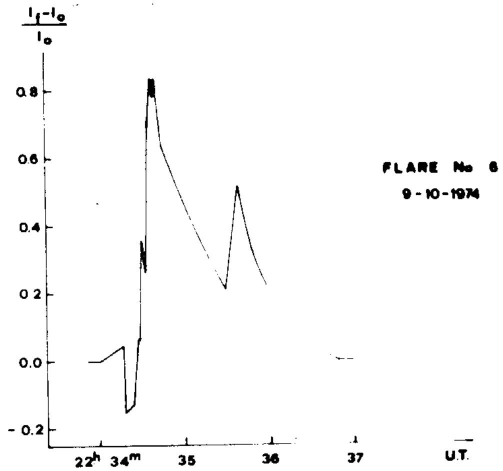
17 - 9 - 1974



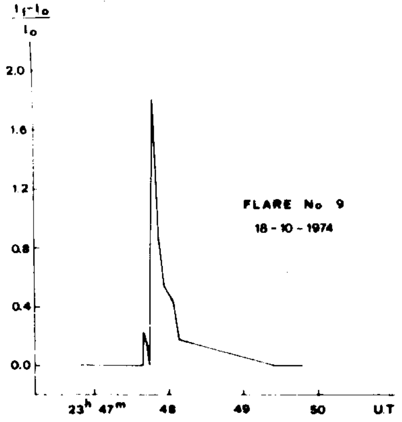
FLARE No 4
8 - 10 - 1974



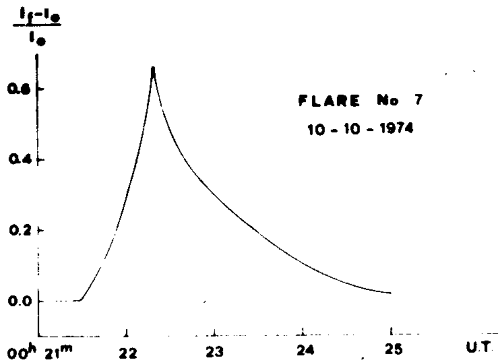
FLARE No 5
8 - 10 - 1974



FLARE No 6
9-10-1974



FLARE No 9
18-10-1974



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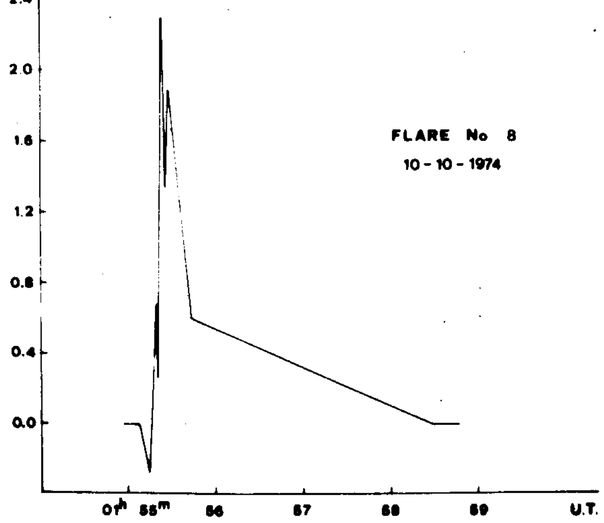
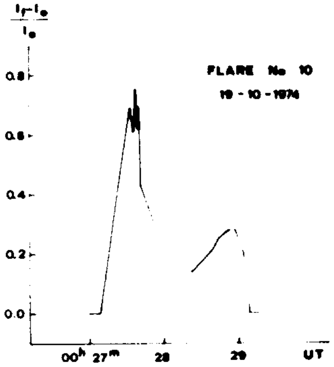
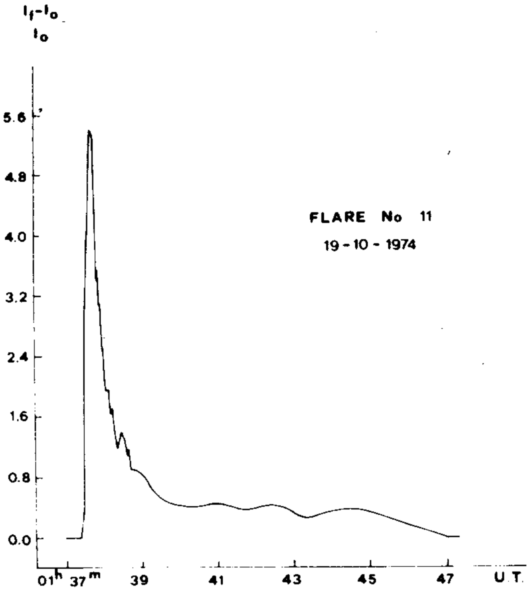
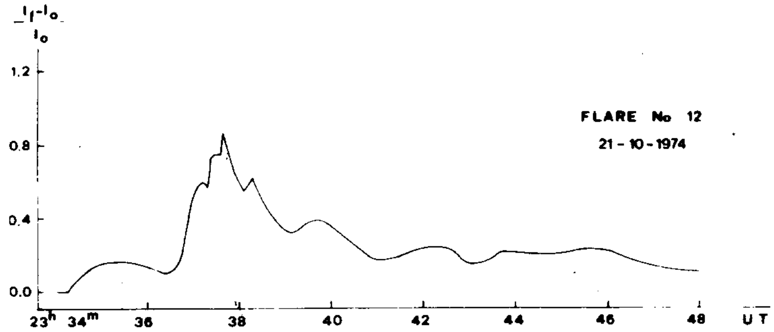
10-10-1974

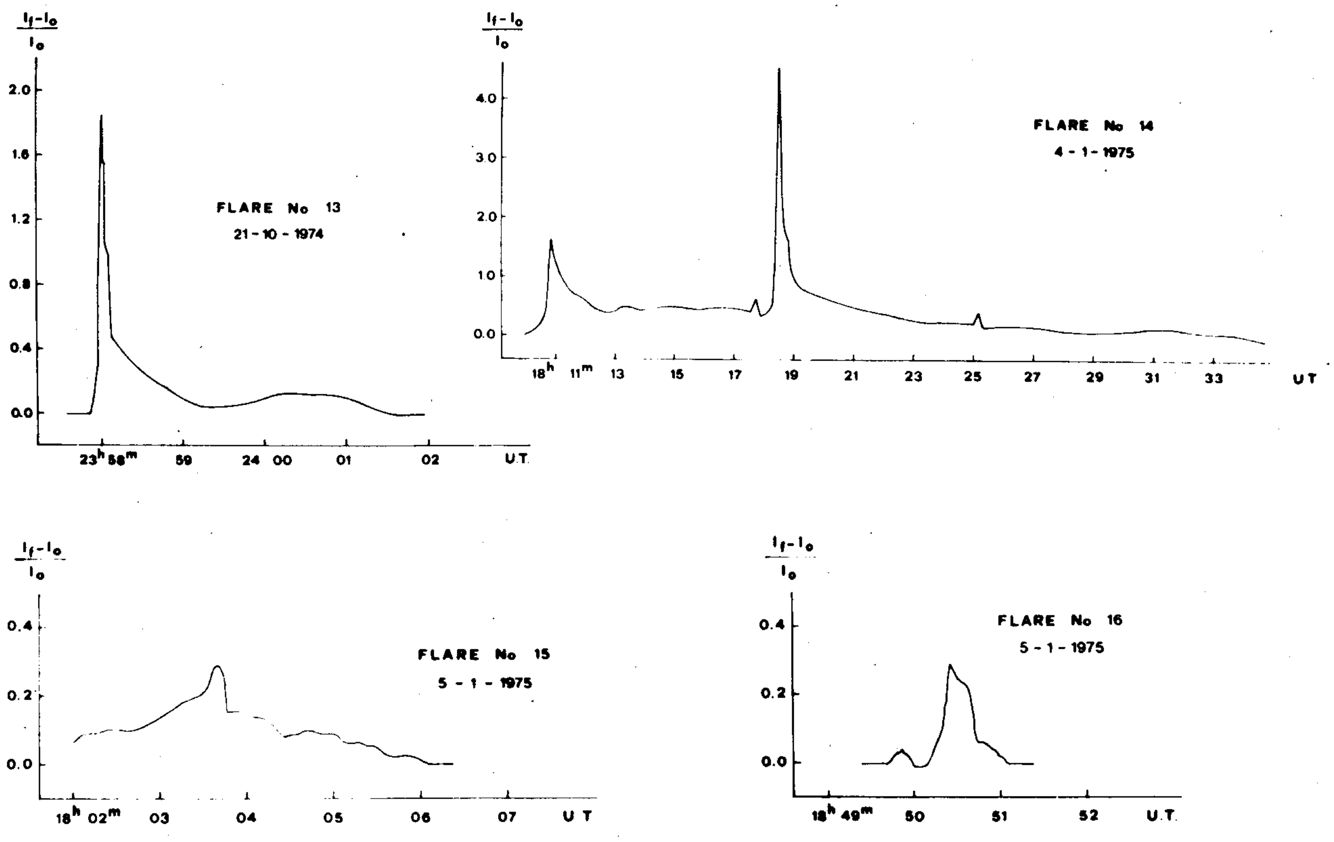


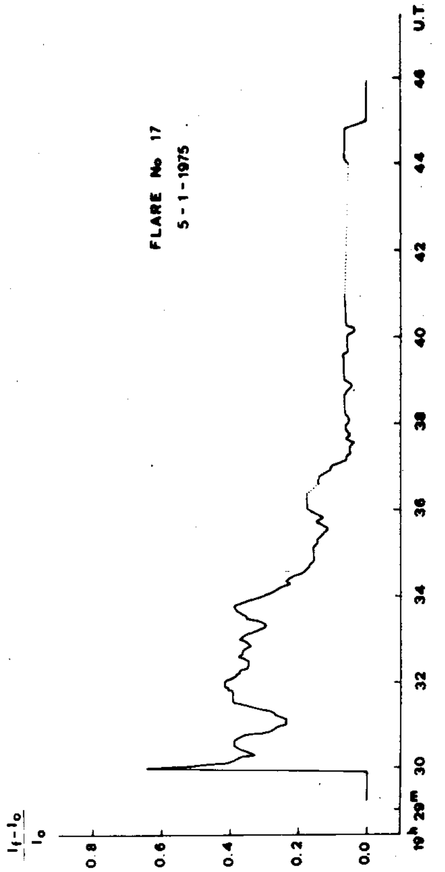
FLARE No 8
10-10-1974

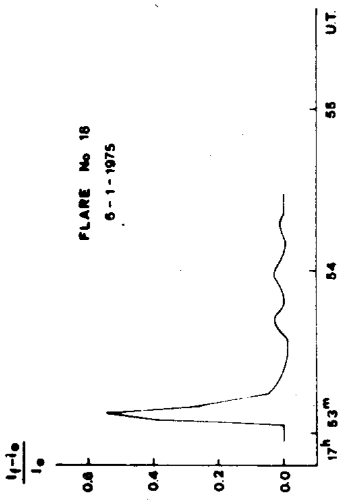

$\frac{I_f - I_o}{I_o}$
0.8
0.6
0.4
0.2
0.0
FLARE No 10
19 - 10 - 1974
00h 27m
28
29
UT

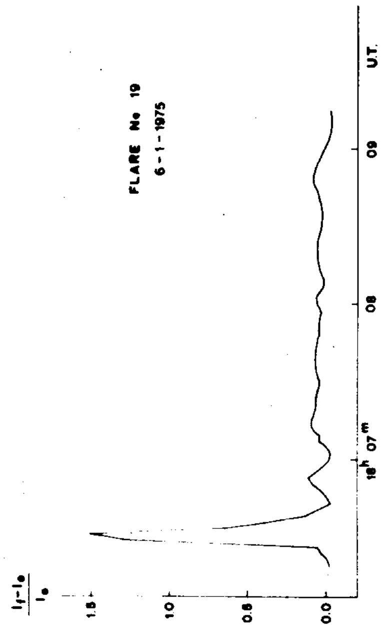

$\frac{I_f - I_o}{I_o}$
5.6
4.8
4.0
3.2
2.4
1.6
0.8
0.0
FLARE No 11
19 - 10 - 1974
01h 37m
39
41
43
45
47
U.T.

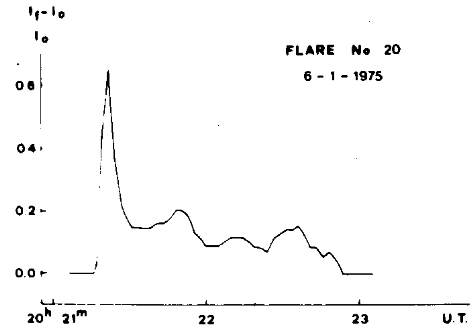

$\frac{I_f - I_o}{I_o}$
1.2
0.8
0.4
0.0
FLARE No 12
21 - 10 - 1974
23h 34m
36
38
40
42
44
46
48
U T


$\frac{I_f - I_o}{I_o}$
2.0
1.6
1.2
0.8
0.4
0.0
FLARE No 13
21-10-1974
23h 58m
59
24 00
01
02
U.T.
$\frac{I_f - I_o}{I_o}$
4.0
3.0
2.0
1.0
0.0
FLARE No 14
4-1-1975
18h 11m
13
15
17
19
21
23
25
27
29
31
33
UT
$\frac{I_f - I_o}{I_o}$
0.4
0.2
0.0
FLARE No 15
5-1-1975
18h 02m
03
04
05
06
07
U T
$\frac{I_f - I_o}{I_o}$
0.4
0.2
0.0
FLARE No 16
5-1-1975
18h 49m
50
51
52
U.T.

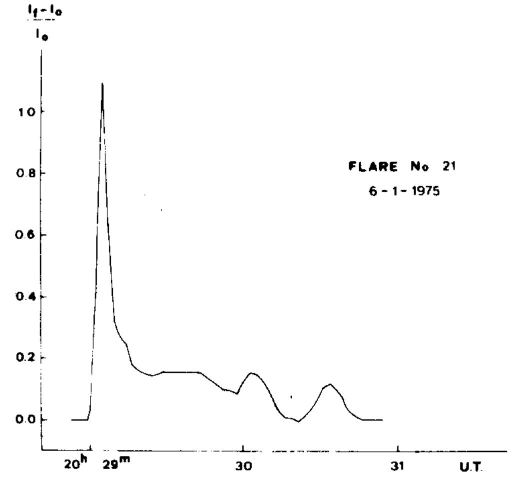

FLARE No 17
5-1-1975
$\frac{I_f - I_o}{I_o}$
0.8
0.6
0.4
0.2
0.0
19^h 29^m
30
32
34
36
38
40
42
44
46
U.T.


FLARE No 18
6-1-1975
$\frac{I_f - I_o}{I_o}$
0.6
0.4
0.2
0.0
17^h 53^m
54
55
U.T.

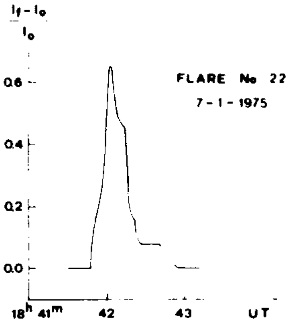

FLARE No 19
6-1-1975
$\frac{I_f - I_o}{I_o}$
1.5
1.0
0.5
0.0
18^h 07^m
08
09
U.T.



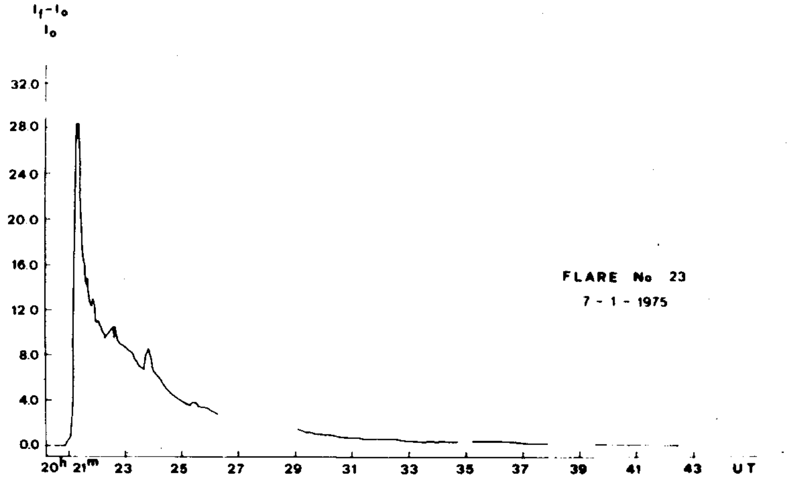
$\frac{I_f - I_o}{I_o}$
FLARE No 20
6 - 1 - 1975
0.8
0.4
0.2
0.0
20h 21m
22
23
U.T.



$\frac{I_f - I_o}{I_o}$
FLARE No 21
6 - 1 - 1975
1.0
0.8
0.6
0.4
0.2
0.0
20h 29m
30
31
U.T.



$\frac{I_f - I_o}{I_o}$
FLARE No 22
7 - 1 - 1975
0.6
0.4
0.2
0.0
18h 41m
42
43
UT



$\frac{I_f - I_o}{I_o}$
FLARE No 23
7 - 1 - 1975
32.0
28.0
24.0
20.0
16.0
12.0
8.0
4.0
0.0
20h 21m
23
25
27
29
31
33
35
37
39
41
43
UT

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1655

Konkoly Observatory
Budapest
1979 August 3

VARIABILITY OF CSV 6645

In the course of finding new variables in a field near Praesepe, I detected the suspected variable CSV 6645 which is in the Second Cat. of Susp. Var. Stars, 1965. The position of the star in the catalogue is

$$\alpha = 8^h 32^m 22^s, \quad \delta = +20^\circ 44' \ (1900.0)$$

The star was measured on 130 photographs taken between October 1977 and May 1979, with a camera of 50 cm focal length. Super panchromatic emulsion was used with yellow-green filter, giving the brightness very close to visual magnitude.

The star was discovered by R. Kippenhahn and was designated as 1.1954 Cnc. He described the type to be irregular and range to be $12^m\!.0 - 12^m\!.6$(p).

My observations are plotted in the Figure, and it shows the type to be SR. The range is $10^m\!.4 - 11^m\!.7$(v) so far, and the large colour index coincides with the type of the star. The variation was fairly regular in 1977-78, but was less regular in the 1978-79 observing season. The period is almost 100 days.

The finding chart of the star is given in Kippenhahn's paper.

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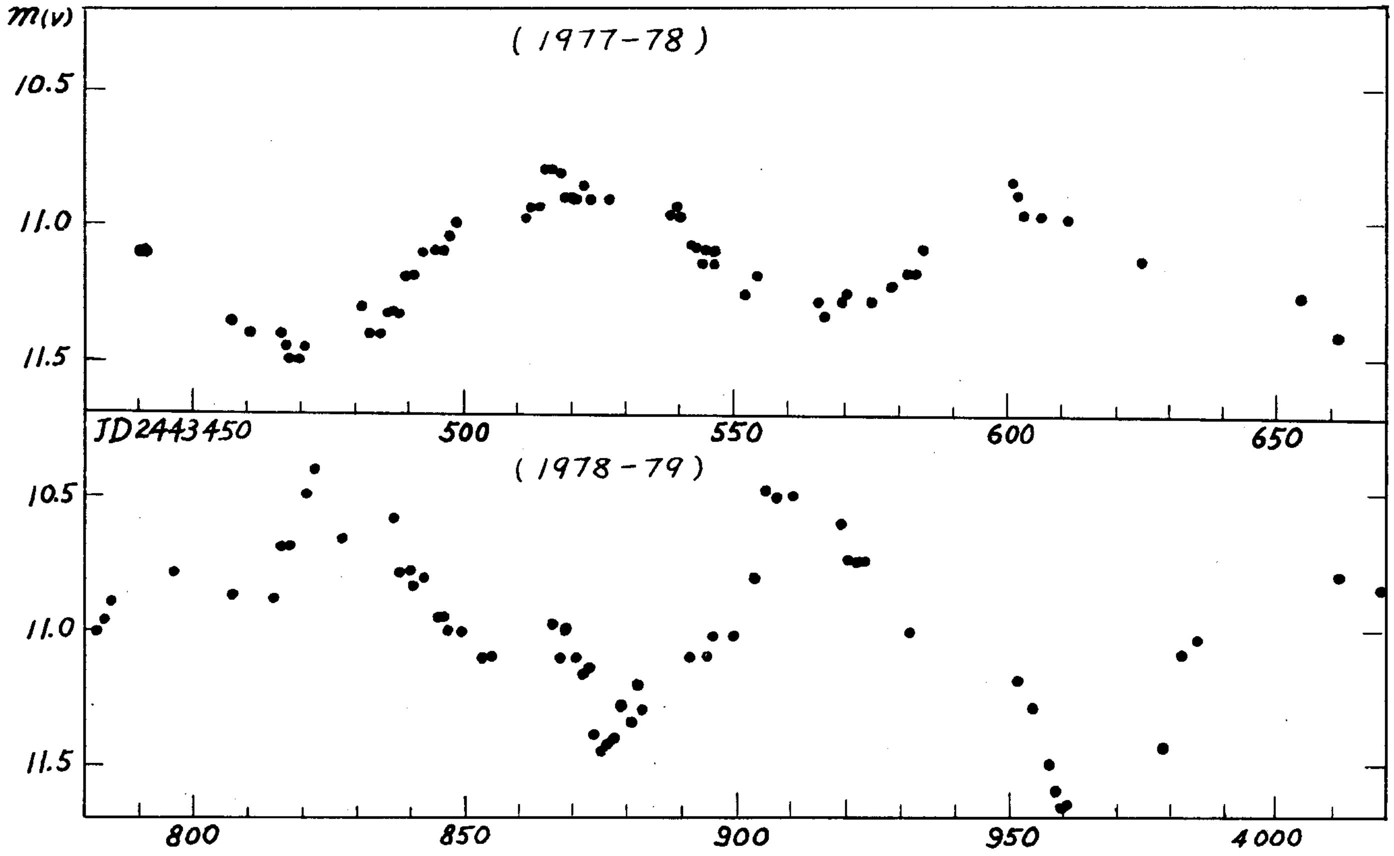
412 Japan

Reference:

Kippenhahn, R., 1955 A.N., 282, 73


m(v)
10.5
11.0
11.5
(1977-78)
JD2443450
500
550
600
650
(1978-79)
10.5
11.0
11.5
800
850
900
950
4000

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1656

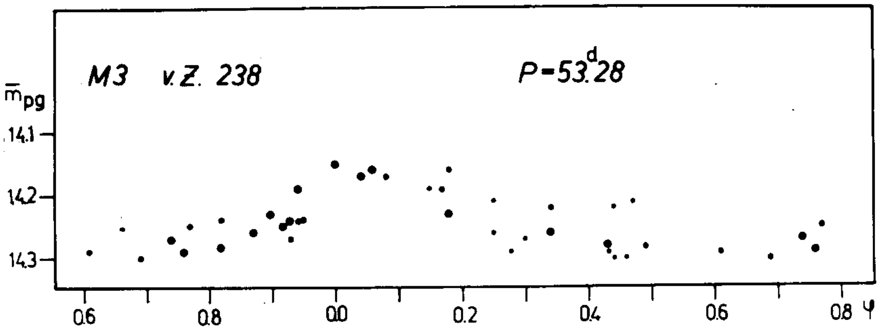
Konkoly Observatory
Budapest
1979 August 4

ON THE VARIABILITY OF THE RED GIANT v.Z. 238 = No. 138 IN M3

This red giant (CI=$1\overset{m}{.}53$) star was first investigated and found to be variable by Russev (Russev, 1971) with a period of $82\overset{d}{.}53$ and an amplitude of $0\overset{m}{.}24$ relying on the measurements of 114 plates made at the Byurakan Observatory and Sternberg Institute in Moscow.

A recent study of the plate material of the Konkoly Observatory showed that 73% of the measured magnitudes of this star were within a range of $\pm 0\overset{m}{.}06$ around the mean and no light change was suspected.

Rediscussing this latter material the star has, indeed, proved to be variable with a period of $53\overset{d}{.}28$ which is approximately 2/3 of the period found by Russev. The amplitude of the variable is about $0\overset{m}{.}15$, a slightly more than the observing errors. The size of the dots in the Figure is proportional with the number of observations made in one night.



Our new result does not change the conclusion of Olah's paper. v.Z. 238 with its colour index (1.53) is the third reddest giant star in the cluster, therefore indeed, from a given colour index all red giants are variable in M3.

We would like to emphasize that the investigations of the variability of red giants in globular clusters are extraordinarily interesting because of their evolutionary stage. Accurate photoelectric observations are especially needed.

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Hungary

R.M. RUSSEV
Department of Astronomy
University of Sofia
Bulgaria

References:

R.M. Russev, 1971, Per. Zvezdy 18,171
K. Olah, 1979, Mitt. Sternw. Budapest, No. 73.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1657

Konkoly Observatory
Budapest
1979 August 8

FURTHER OBSERVATIONS OF ET ANDROMEDAE

A solution for the spectroscopic orbit of the binary Ap variable ET And = HD 219749 has recently been published by Ouhrabka and Grygar (1979; hereafter OG). Here we report independent spectroscopic observations which support their solution. Also, we briefly describe the variations in spectral line strengths which occur in this star and which, we suggest, will be found ultimately to correlate with the photometric variations.

Twenty-six radial velocities measured by this writer and not previously published are available. Four of these are from 1.2 nm mm^{-1} grating plates obtained at the David Dunlap Observatory (DDO); three are from Dominion Astrophysical Observatory (DAO) archival prism plates of dispersion 5.1 and 3.0 nm mm^{-1}; the remainder are from 1.5 nm mm^{-1} DAO grating plates. All plates were measured on oscilloscopic-setting comparators.

The data are presented in Table 1, where the phase is relative to the time of periastron passage, and the (O-C)s are relative to the velocity curve as determined by OG. These radial velocities are plotted in Figure 1, where the DDO velocities are represented by crosses, the higher dispersion DAO velocities by large open circles, and the other DAO velocities by small circles. The solid curve is the velocity curve from OG. The broken line results from a least-squares correction procedure applied to these new velocities and using the OG elements as preliminary values. The differences between these two curves are not considered to be significant. In particular, the orbital period of 48.304 days is confirmed.

Spectral line variations have long been known to occur in this system (cf. Renson 1977 and references therein). While visual examination of these plates does not permit a completely reliable estimation of the degree of variation of relatively strong lines such as the SiII λ4128-30 pair, it is strikingly apparent that relatively weaker lines are variable in strength. To the eye, the most obvious variations occur in the λ3954 line which can be attributed to SiII. In this respect HD 219749 is similar to HD 73340 (Hube and Walker 1976). This line varies from complete invisibility to approximately two-thirds the strength of the K-line. (Note that the K-line is of interstellar origin although there may be a weak, blending stellar component since the plate-to-plate velocity is not as constant as one would expect. The average heliocentric K-line velocity is -5.7 km s^{-1}.) An unidentified line near λ3906, the Sr-Si complex near λ4077, and groups of lines in the regions λ4150-4230 and λ4500-4630 are also clearly variable in strength. These lines do not seem to vary relative to one-another in a consistent manner. For example, when λ3954 is near maximum strength λ3906 is not visible; when λ3954 is near half-maximum λ3906 may, or may not, be visible.

The line strengths do not vary in phase with the orbital velocity. In Figure 1 we have indicated with strokes the approximate line strengths at various phases in the orbit.

In their present form the data on line strengths are not sufficient to permit an independent search for periodicities, nor to make a reliable comparison with the several photometric periods which have been proposed. However, it is interesting to note that the intervals between the three maxima of λ3954 do correspond to integral multiples of the 1.618 day period suggested by Renson (1977).

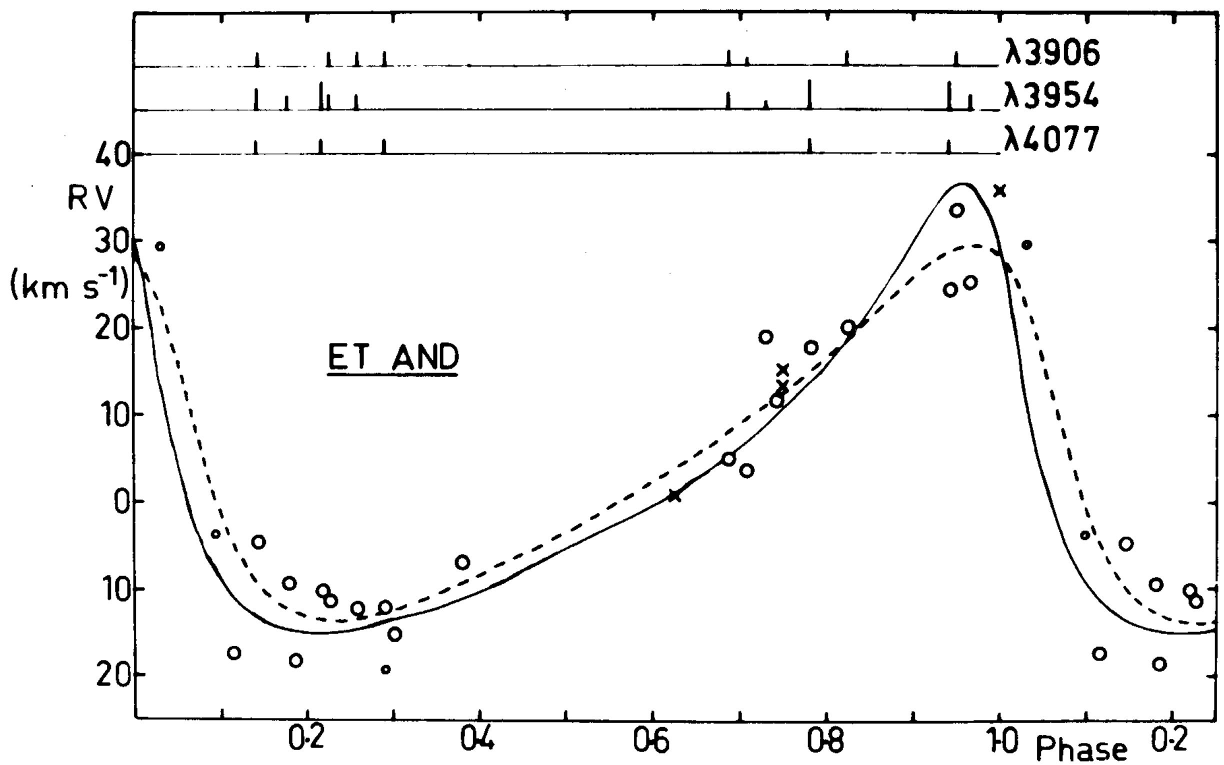

Fig.1. Radial velocity curve of ET And and spectral line strength variations.

Table 1

J.D.(⊙) 2400000+	Dispersion (Å mm^{-1})	RV (km s^{-1})	O-C (km s^{-1})	Phase
38613.976	51	-19.3	-5.8	0.292
38987.836	30	29.4	17.2	0.031
38990.886	30	-3.8	4.4	0.095
39680.959	15	-7.0	3.7	0.381
40449.955	15	-15.4	-2.1	0.301
40803.722	12	0.5	-0.6	0.624
40809.805	12	13.4	2.7	0.750
40835.855	15	-12.3	1.3	0.290
41147.850	12	15.2	4.6	0.749
41159.747	12	35.9	6.3	0.998
42644.977	15	11.7	1.7	0.742
42648.982	15	19.8	0.8	0.825
42955.890	15	-9.7	4.9	0.179
42992.957	15	33.5	-2.8	0.946
43054.819	15	-11.4	3.3	0.227
43081.726	15	17.6	3.4	0.784
43102.732	15	-10.3	4.5	0.219
43104.638	15	-12.3	2.0	0.258
43330.886	15	24.1	-11.8	0.942
43331.924	15	24.8	-11.6	0.964
43366.890	15	4.9	-0.6	0.688
43367.804	15	3.6	-3.3	0.706
43368.828	15	18.9	10.6	0.728
43823.687	15	-4.8	8.6	0.144
43825.666	15	-18.7	-3.7	0.185
44063.817	15	-17.5	-6.4	0.115

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References:

Hube, D.P. and Walker, E.N., 1976. Astron. Astrophys. 50, 55.

Ouhrabka, M. and Grygar, J., 1979. I.B.V.S. No. 1600.

Renson, P., 1977. Astron. Astrophys. 54, 277.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1658

Konkoly Observatory
Budapest
1979 August 8

NEW RESEARCH FOR PERIODS OF Ap STARS OBSERVED AT THE ESO-III

A new series of six Ap stars has been observed in the uvby system with the photometer attached to the ESO 50-cm telescope. However the measurements are somewhat less accurate than for the previous series (see IBVS Nos.1280,1391,1451) because less time has been devoted to the new stars in order to reobserve Ap stars previously measured. These new measurements have been made from the end of November to December 20, 1978. They have still been analysed with the same method (P. Renson, Astron. and Astrophys. <u>63</u>, 125, 1978) to find periods. This gives the following results.

star	sp.type	period	range(mag.)
HD 24155=HR 1194	B9pSi	$2^{d}.53\pm0^{d}.03$	from 0.06 in y to 0.1 in u
HD 27376=υ^4Eri	B9pMn	$0^{d}.51$?	very small
HD 32549=11 Ori	B9pSi	$4^{d}.63\pm0^{d}.09$	from 0.03 in y to 0.1 in u
HD 39317=137 Tau	B9pSiEuCr	$2^{d}.63$?	near 0, except in u (0.05)
HD 42536=HR 2195	A0pSrCr	($3^{d}.6$?)	small,mainly in y and b
HD 42657=HR 2202	B9pHgMn	$0^{d}.724\pm0^{d}.008$	from 0.02 in y to 0.04 in

Due to the lack of precision (one measurement for each comparison star instead of two, and two for the Ap star instead of three, for many individual values of Ap-$(C_1+C_2)/2$) and the smallness of some ranges, several results are very uncertain. The periods given with a question-mark, especially for HR 2195, are probably spurious periods; these stars may have periods which are too long to show significant variations during our observations.

It is noteworthy that HR 2202, which is a Hg-Mn star, is clearly periodic; however the range of the variation is small. We think that the Hg-Mn stars may be periodic variables such as the other Ap stars, but that they are believed to exhibit no periodic variations, only because the variation range is generally very small.

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COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1659

Konkoly Observatory
Budapest
1979 August 8

COMMISSION 27 ARCHIVES OF UNPUBLISHED OBSERVATIONS OF VARIABLE STARS: 1978/9 DATA

The usefulness of tables of unpublished photoelectric observations of variable stars can often not be judged until many years in the future. These observations might, for example become essential to deduce period or amplitude changes, or they could discriminate between different astrophysical theories. However, it is usually not practical to write a paper on all observed objects and attempted projects, or to add lengthy tables to scientific papers.

Commission 27 of the International Astronomical Union maintains a data bank for unpublished photoelectric observations of variable stars. Any astronomer can obtain, at cost, a copy of a particular file. We only ask that the original observers (and the file number) be referenced in any publications arising from the use of the data. Two depositories are maintained: at the Royal Astronomical Society in England, and in Odessa, USSR for the convenience of Eastern European astronomers. Copies of specific whole files (<u>not</u> partial files) may be obtained at cost by writing to <u>either</u>

Mrs. E. Lake, Librarian
Royal Astronomical Society
Burlington House
London, W1V ONL
Great Britain

or

Dr. E. Makarenko
Odessa Astronomical
Observatory
Shevchenko Park
Odessa 270014
USSR

We also invite astronomers to deposit their unpublished material in the Archives. If you intend to omit lengthy tabular material from a publication and deposit these tables in the Archives, you should request a file number in advance of publication. Your paper can then refer to the appropriate file number.

New material for deposit in these archives should be sent to Dr.M. Breger for assignment of the file number and forwarding to the R.A.S. Also, a duplicate copy should be sent to Dr. E. Makarenko.

A cover sheet giving a brief description of the tabular contents should accompany the files. This cover sheet will aid us in writing the final cover sheet, which will be published in the Pub.A.S.P.

The address for new observations is:

Dr. M. Breger
Department of Astronomy
University of Texas
Austin, TX 78712, U.S.A.

Listed below are the files received or assigned during the last twelve months. More extensive information on these and future files will be published regularly in the Publications of the Astronomical Society of the Pacific, where the cover sheets will also be printed.

The titles of older files, deposited while the Archives were supervised by Drs. G.H. Herbig and W.S. Fitch, can be found in various issues of the Information Bulletin on Variable Stars.

FILE 48 - U Cep - E. Olson (80 pages)
FILE 49 - TU Hor - H.W. Duerbeck (3 pages)
FILE 50 - EE Peg and S Equ - S.Catalano and M.Rodono (11 pages)
FILE 51 - KO Aql - C.Blanco and S.Cristaldi (12 pages)
FILE 52 - HR 3413 - A.Heck, J.Manfroid and P.Renson (1 page)
FILE 53 - TT Ari - H.W.Duerbeck (Number assigned)
FILE 54 - AH Tau - H.W.Duerbeck (Number assigned)
FILE 55 - HR 3413 - P.Renson and C.Sterken (1 page)
FILE 56 - ω Oph - P.Renson and H.M.Maitzen (2 pages)
FILE 57 - HD 125248, HD 134793, HD 184905 -
- C.Blanco, F.A.Catalano and G. Strazzulla (21 pages)
FILE 58 - 14 Aur - W.S.Fitch and W.Z. Wisniewski (31 pages)
FILE 59 - HD 59256, 66255, 66605, 83368, 83625, 94660
and 96616. - J. Manfroid (7 pages)
FILE 60 - Nova Cygni 1978 - Flower and Cook Observatory (15 pages)

We encourage astronomers to submit their unpublished photoelectric data to the Archives and invite requests for copies of previously deposited files.

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University of Texas at Austin
and
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U.S.A.

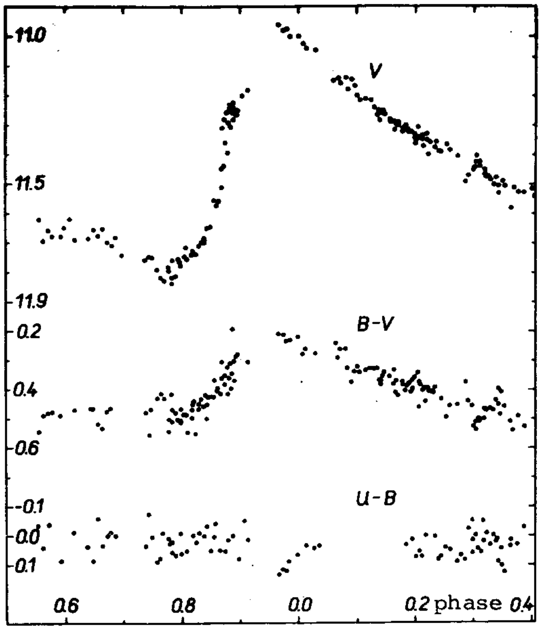
COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1660

Konkoly Observatory
Budapest
1979 August 10

PHOTOELECTRIC PHOTOMETRY OF THE VARIABLE ST Com

Photoelectric observations of ST Com, an RR Lyrae type star, were performed at Abastumani Astrophysical Observatory over 10 nights from April 30, 1976 till May 22, 1977 with the AZT-14A telescope (diameter 48 cm). About 170 light measurements in each region of the UBV system have been obtained. The r.m.s. errors of observations are $\sigma_U = \pm 0^m.019$, $\sigma_B = \pm 0^m.013$, $\sigma_V = \pm 0^m.010$.

V, B-V and U-B curves are shown in the Figure. The Table lists the extreme values of the light and colour curves.



Magnitude	Maximum	Minimum	Amplitude
U	11.30	12.31	1.01
B	11.17	12.28	1.11
V	10.96	11.82	0.86
U-B	+0.13	+0.03	0.10
B-V	+0.21	+0.46	0.25

Asymmetry of the B light curve equals to $0\overset{p}{.}21$. The elements $\mathrm{Max}_{\odot}=2427862.585+ 0.5989795\cdot E$ yield an O-C value of -0.022 day.

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Observatory, Georgia, U.S.S.R.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1661

Konkoly Observatory
Budapest
1979 August 27

ANOTHER OUTBURST OF THE UG? STAR V1454 CYGNI

V1454 Cygni is listed in the Third Supplement to the General Catalog of Variable Stars (Kukarkin et al.,1976) as a suspected U Gem type star. Two outbursts had been seen: J.D. 2437869 at photographic magnitude 13.9 and J.D. 2440116 at magnitude 14.8 (Pinto and Romano, 1972). Plates in the Nantucket collection from J.D. 2439760 to J.D. 2444044 were searched for outbursts.

The second of the known outbursts was visible at magnitudes 14.3 to 15.1 on four plates taken over a period of six days. In addition a later outburst was noted on a plate taken J.D.2441091 at magnitude 15.1. On another plate taken four days later the star was marginally visible close to the plate limit, however the reality of this image is somewhat doubtful.

In total the collection has usable plates of the region taken on 203 different nights. Five of these plates definitely show V1454 Cyg in outburst. These plates all have a limiting magnitude of 15.0 or fainter.

I feel confident that on these 203 nights I would not have missed an outburst. Therefore V1454 Cyg was seen in outburst about 2.5% of the observed time. If each outburst lasts six days, an outburst can be expected about once in 240 days according to these rough statistics.

The time intervals between observed outbursts were 2247 days and 975 days. Gaps of six days or more are common in the plate collection. Outbursts during these time intervals could easily have been missed, so these intervals give no additional information about the average interval between outbursts.

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References:

Kukarkin et al., 1976, Third Supplement to the Third Edition of the General Catalog of Variable Stars, Moscow

Pinto, G., and Romano, G., 1972, Padova Publ. 162

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1662

Konkoly Observatory
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STRÖMGREN y and b LIGHT CURVES OF W UMa

The short period eclipsing system W UMa was observed on 10 nights from April through July 1977. The observations were obtained using the 51 cm, f/13.5 Cassegrain reflector at Biruni Observatory, Shiraz, Iran. The photoelectric photometer is equipped with an unrefrigerated RCA 4509 multiplier photocell and a Leeds and Northrup Speedomax was used to record the amplified signal from the photomultiplier. Intermediate-bandpass blue and yellow interference filters having characteristics nearly identical with the b and y filters of the Strömgren uvby system were employed in making the observations. The comparison star was BD+56°1399 and BD+56°1398 served as the check star. The comparison star was the same used in previous investigations of W UMa. At the level of ±0.004 mag in yellow and ±0.007 mag in blue no significant variations were detected between the comparison and check stars. Several uvby standard stars were also observed.

The observing sequence was the usual pattern of sky-comparison-variable-comparison-sky, with each observation consisting of a 40 sec deflection. The faint ~12.5 mag companion star ADS 7494 B, about 7" from W UMa, was included in all measurements of the variable. The effects of differential atmospheric extinction were removed, but because of the angular proximity of the comparison star to the variable star, the extinction corrections were always very small. The differential y and b magnitudes in the sense (V-C) are plotted against phase in Figure 1 where the phases were computed according to: Min I = JD Hel. 2443863.7583 + 0.33363793· E.
The epoch is from the present study and the period was obtained from Rigterink (1972).

A determination of the time of secondary minimum was made by combining observations of four nights on which secondary eclipse was observed. The method of Szafraniec (1948) was used to compute the timing, yielding the epoch:

JD Hel. Min II = 2442863.5915. No precise determination of the time of primary eclipse could be made since only a portion of the ingress was observed. In computing the phases it was assumed that primary and secondary minima are separated by exactly 1/2 period.

The present light curves are well defined except for the descending branch of primary minimum which is only partially covered. As shown in Figure 1, both the y and b light curves are asymmetrical where the maximum near 0.25 phase is brighter than the corresponding maximum at 0.75 phase. The difference in the mean heights of the maxima at 0.25 phase relative to the maxima at 0.75 phase are 0.022 mag and 0.012 mag for the y and b observations, respectively. The loss of light at primary eclipse relative to the brighter maximum at 0.25 phase is 0.715 mag and 0.755 mag in

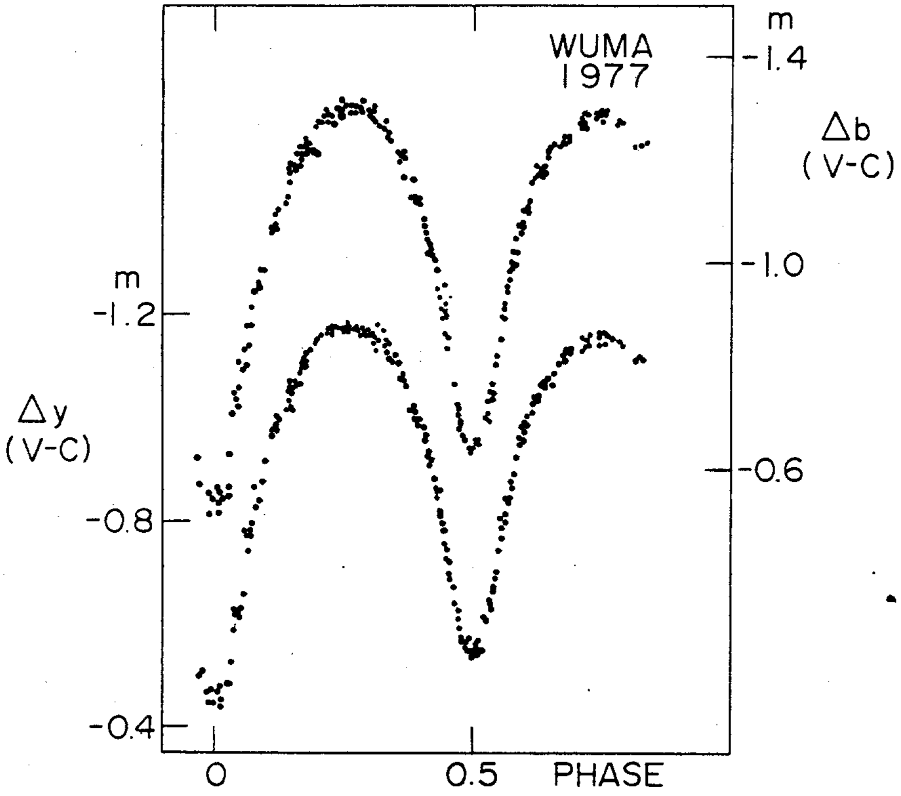

Figure 1. The y and b light curves of W UMa.

y and b, respectively. The loss of light at secondary minimum is 0.632 mag and 0.660 mag in y and b, respectively.

Rigterink (1972) has made a study of the long term behavior of the outside eclipse light variations of W UMa and found evidence that the changes may be periodic with possible periods of ∼500 days or ∼1000 days. An analysis of all the available photoelectric light curves of W UMa up to 1979 is currently underway. Preliminary results suggest the existence of a migrating wave with a light amplitude of about 0.025 mag in yellow and a period of ∼1100 days. It has already been pointed out by Hall (1976) that W UMa has several properties in common with RS CVn-type binaries-namely components of F to K spectral types, Ca II emission, and the possible migrating wave phenomenon. It has been suggested by Hall and others that many of the unusual properties of RS CVn systems can be accounted for by recourse to a model in which surface activity in the form of starspots cooler than their surroundings gives rise to the observed light variations. If the wave-like distortion apparently present in the light variation of W UMa arises from subluminous regions on one of the components, the migrating of the wave can be attributed to the effects of differential rotation where the subluminous region is centered perhaps 10° to 20° from the stellar equator. By analogy with the sun, differential rotation would cause the spotted region to move with a rotational period slightly longer than the equatorial rotational period. For W UMa where the rotational and orbital periods are expected to be synchronized, the small difference between orbital period and the rotational period of the spotted zone will cause the spotted region to move with the observed ∼1100 day period relative to the frame of reference of the binary system. The observations indicate that the spotted region has persisted for at least 25 years. Continued monitoring of the light curve of W UMa would be very useful.

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References:

Hall, D.S., (1976), IAU Colloq. No. 29, part 1. p. 287.

Rigterink, P.V., (1972), Astron. J., 77, 230.

Szafraniec, R., (1948), Acta Astron., 4, Series C, 81.

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W VIRGINIS STARS WITH PROPERTIES OF RV TAURI STARS

In the present paper the notion of properties of RV Tauri stars includes first of all a typical feature of their light curves, i.e. the interchange of deep and shallow minima as well as the instability of light curves. Many investigators pointed to the light curve changes mainly as possible ones. Generally these changes referred to the form. The knowledge on the difference of the light curves between odd and even cycles, i.e. the alternation is much scanter. For the first time this phenomenon was detected by Arp (1955, 1957) for two out of four observed Cepheids of globular clusters with periods more than 17 days. Later on Vasiljanovskaja and Erleksova (1966, 1969) considered the question if it is possible to explain the photoelectric observational scatter of W Virginis stars in the galactic field by the alternation. We found that explanation to be acceptable for three stars. However, the scantness and the small interval of observations left certain doubt in the reality of the alternation and did not enable to clear up its character. Finally Stobie (1970) and Lloyd Evans (1970) demonstrated clearly that SZ Mon, a classical cepheid according to GCVS 1969, showed the alternation of the light curve. This alternation was expressed in the difference of minimum magnitudes about $0^{m}.1$ in V and the form in two halves of the double period. These authors classified SZ Mon as a unique Type II Cepheid, possessing properties of the RV Tauri stars. Publications on the W Virginis star alternation are confined to the above works, as far as I know.

Our study of SZ Mon showed that during the whole observing interval J.D. 2426710-43248 the light curve must be considered with a double period. For all the 10 mean light curves the alternate minima differ by ~0.15 m_{pg} in depth. The average amplitude is 1.4 m_{pg}. No systematic difference between the maximum magnitudes has been observed, but on average the maximum following a deeper minimum is fainter than the other one by ~0.05 m_{pg}. In certain rare cycles it is possible to level of the minimum magnitudes. Asymmetry is about 0.16 of the double period in both halves. SZ Mon should be considered as a W Virginis star both by a peculiar light curve and a remarkable period change, as well as by a wide loop (V, B-V) and moderate radial velocity.

It turned out that SZ Mon is not an exception. Another W Virginis star MZ Cyg must also be considered as having twice its previous period. MZ Cyg observed for a long time and rather intensively, hid its alternation, i.e. the interchange of minimum depths because on small telescopes its brightness is always measured together with two neighbouring stars. This reduces the amplitude and distorts the real minimum magnitudes. Only the 40cm Zeiss photographic observations, representing estimates of the brightness of the variable together with the South neighbour which was fainter than 15^m enabled to detect the alternation.Six mean light curves in J.D. 2436730-43761 interval showed that as in the case of SZ Mon the deep minimum fell on one and the same phase and was deeper than the other one by 0.5-0,9 m_{pg}. The amplitude of the light curve is 2.4 m_{pg}. The maximum following the deep minimum is fainter than the other one by 0.2 m_{pg}.Thus the relation between the maximum magnitude in MZ Cyg is contrary to that most frequently found in RV Tauri stars. Asymmetry in both halves is about 0.15 of the double period. Sometimes the successive cycles can have equal maxima and equal minima.

The preliminary conclusions considering the light curves of MZ Cyg and SZ Mon are the following.

1. The alternation is of lasting character.
2. The resemblance of the RV Tauri light curve is restricted to the difference of the minimum depths without their mutual transposition. The distinction becomes apparent in the shape and greater stability as a whole.
3. The instability of individual cycles is sometimes possible up to levelling successive cycles.

The companions of MZ Cyg and SZ Mon seem to be found among the insufficiently studied W Virginis stars with large periods. V420 Cen, RX Lib, CC Lyr, RS Pav and others can be supposed as companion candidates. The presence of W Virginis stars with the properties of RV Tauri stars agrees with the contemporary theoretical conception on the closeness of the evolutionary stages of these stars.

It is proposed to publish the detailed analysis of MZ Cyg and SZ Mon light curves in Collected Articles "Variable Stars".

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References:
Arp, H.C. 1955, A.J. 60, 1
Arp, H.C. 1957, A.J. 62, 129
Lloyd Evans, T. 1970, The Observatory 90, 254
Stobie, R.S. 1970, M.N. 148, 1
Vasiljanovskaja, O.P. , Erleksova, G.E., Shakhovskaja, N.I., 1966, Tadjik Bull No.48, 9
Vasiljanovskaja, O.P. and Erleksova, G.E. 1969, Mitteilungen Budapest-Szabadsághegy, No.65, 321

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Budapest
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LOW INTENSITY FLARES OF V645 Cen

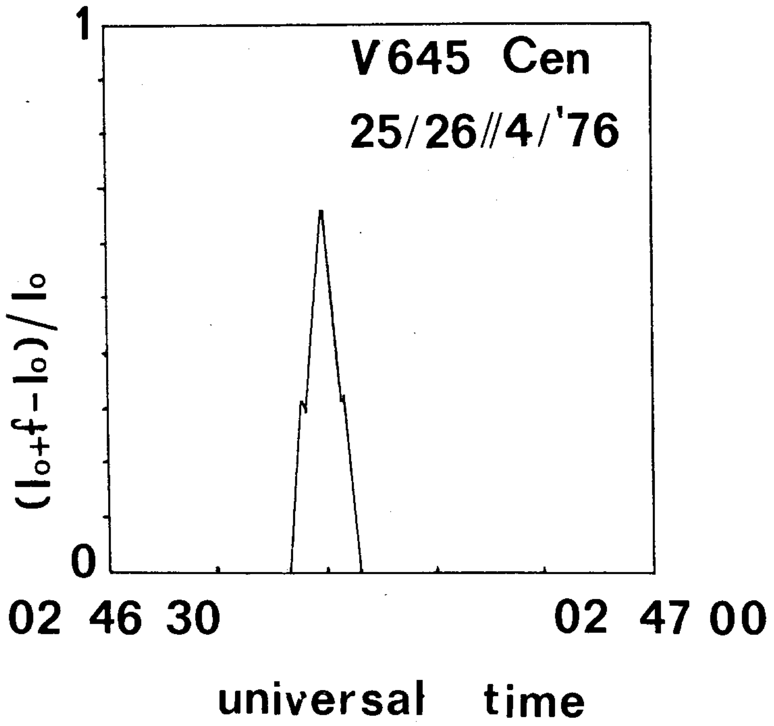
V645 Cen (R.A. $14^h26^m42^s$, declination $-62^\circ 29'$(1950), 11.3 visual magnitude at minimum, spectral type dM5e) was observed from Boyden observatory on the nights of 22/23 and 25/26 April 1976.

We used the 41 cm Nishimura reflector, fitted with a photometer consisting of an uncooled EMI 6256A photomultiplier tube and a standard Johnson B filter.

Observing conditions were very good throught the monitoring periods.

Of the seventeen low intensity flares recorded only the spike flare shown in the diagram was significantly above the noise level of the recording gear. The others we regard as probable flares; although they were of low intensity we nevertheless, in the light of previous experience, consider that they should be reported. They are similar in character to some of the V645 Cen flares we have previously recorded.

Date 1976	Monitoring time (U.T.)	Time of flare maximum (U.T.)	$\frac{I_{o+f}-I_o}{I_o}$	Comments
22 April	$20^h35^m00^s$	$21^h52^m57^s$	0.50	Probable small flare
	to 23 20 00	21 55 26	0.60	" " "
		21 59 41	0.57	" " "
		22 17 30	0.42	" " "
		22 45 29	0.48	" " "
		22 59 00	0.63	" " "
1976 25 April	17 40 00	19 04 52	0.59	Probable small flare
	to 23 00 00	19 05 00	0.52	" " "
	23 06 00	19 26 20	0.56	" " "
	to 24 00 00	21 28 03	0.44	" " "
		21 47 57	0.45	" " "
1976 26 April	00 00 00	02 01 38	0.53	Probable small flare
	to 03 36 00	02 03 37	0.56	" " "
		02 07 56	0.53	" " "
		02 09 04	0.58	" " "
		02 11 22	0.48	" " "
		02 46 42	0.76	Spike flare



The reductions were made with a Hewlett Packard Model 9 825 microcomputer and digitizer, kindly made available by Professor F.D.I. Hodgson, the Director of the Institute of Groundwater Studies at the university.

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Reference:

Jarrett, A.H. and van Rooyen, J. 1979, I.B.V.S., No. 1641

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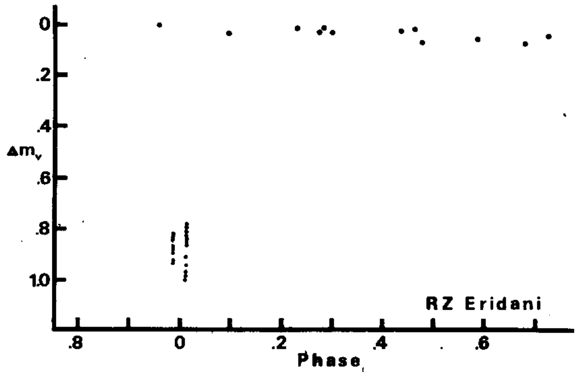
PHOTOMETRIC OBSERVATIONS OF RZ ERIDANI*

RZ Eridani (BD-10°993, R.A.(1970) 04^h42^m, Dec.(1970) -10°44', V = 7.70) has been included by Hall (1976) in his list of long-period RS CVn stars. Two characteristics often found in RS CVn stars are period changes and a distortion wave in the out-of-eclipse light curve. We report here on a search for these properties in the system RZ Eridani.

OBSERVATIONS: Observations were made in the winter of 1977/1978 using the 46 cm reflector at Rosemary Hill Observatory with a standard UBV Photometer. The comparison star was BD-10°977 and the check star was BD-10°982. The V-filter observations shown in the Figure are neither corrected for differential extinction nor transformed to the UBV system. The phases were computed from the ephemeris of Gadomski(1957),

J.D. 2423854.33 + 39.2826E.



DISCUSSION: Although both ingress and egress of the primary eclipse were observed, no observations were obtained during totality. No secondary eclipse was detected. There appears to be no significant distortion wave within the limits of the observational scatter. We note that there appears

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*Contribution of the Department of Astronomy of the University of Florida No. 5

to be no significant change in period. Primary eclipse ingress and egress observations were of the same eclipse and yield a graphical solution for the time of minimum of

$$\text{J.D. } 2443574.083 \pm 0.005.$$

This minimum, combined with that of Gadomski, yields a revised period of

$$P = 39\overset{d}{.}28238 \pm 0.00005,$$

in agreement with the results of Gadomski.

We have continued observation of this system and we plan to tabulate all observations in a future paper.

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References:

Gadomski, J. 1957. Acta Astronomica 7, No. 1, 83.

Hall, D. S. 1976. In IAU Colloquium No. 29, Multiple Periodic Variable Stars, Part I, ed. W. S. Fitch(Dordrecht: Reidel), p. 287.

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HO TELESCOPII: LIGHT ELEMENTS

The variability of HO Tel was discovered by Strohmeier, Knigge and Ott (1965). They published three times of minimum and gave the first light elements. Spoelstra and van Houten (1972) derived from five-colour photometry four times of minimum and have found that the period is abour twice that obtained by Strohmeier et al. Spoelstra and van Houten's light elements are based on minima covering 287.5 cycles. In this note we present four times of minimum light determined from 271 UBV observations obtained at the Bosque Alegre Station of Cordoba Observatory with the 1.54 m telescope. The photoelectric minima are now extended to a range of 2464.5 cycles. Our observations confirm the period as derived by Spoelstra and van Houten. In Table I are listed all known minima. A least squares solution gives the following linear light elements:

Table I

Min.	Hel.J.D. 2400000+	E	(O-C)	(O-C)'	References
I	38560.513	-2514.0	+0.021		1
II	38585.476	-2498.5	-0.019		1
I	38636.312	-2467.0	+0.004		1
II	38982.31713	-2252.5	-0.0016	0.0000	2
I	38986.34941	-2250.0	-0.0021	-0.0004	2
II	38990.38201	-2247.5	-0.0022	-0.0006	2
II	39024.25845	-2226.5	-0.0010	+0.0006	2
II	42274.6591	- 211.5	-0.0042	-0.0043	3
I	42275.4759	- 211.0	+0.0060	+0.0060	3
II	42574.7020	- 25.5	+0.0014	+0.0012	3
I	42957.8107	+ 212.0	-0.0020	-0.0024	3

References: 1. Strohmeier et al. (1965); 2. Spoelstra and van Houten (1972); 3. Present note.

$$\text{Min.I} = \text{Hel.J.D. } \underset{\pm .0051}{2442615.8348} + \underset{\pm .0000027}{1\overset{d}{.}6131037} \cdot E,$$

for all minima, while from photoelectric observations only we found

$$\text{Min.I} = \text{Hel.J.D. } \underset{\pm.0016}{2442615.8350} + \underset{\pm.0000010}{1.6131045} \cdot E,$$

which has smaller m.e.'s and residuals (O-C)' as compared with (O-C) from the elements including the first three photographic minima.

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References:

Spoelstra, T.A.Th. and van Houten, C.J., 1972, Astron.Astrophys. Suppl. 7. 83

Strohmeier, W., Knigge, R. and Ott, H., 1965, I.B.V.S. No. 81

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VARIABILITY OF V1165 Aql IS QUESTIONED

The light variation of V1165 Aql = BD $+12^{\circ}4134$ was reported by Golovatyj (Lvov Cirk., No.42, 13, 1967). On the basis of photographic observations the star was classified as a cepheid variable with an amplitude of 0.5 magnitude and a period of $6^{d}.82957$. However, the light curve based on the Lvov photographic observations is rather strange. The steepness of the descending branch in absolute value is equal to that of the ascending branch, and the star remains at minimum brightness during half of the period. Such kind of cepheid light curve is unique.

The other problem with this star is its identification, because the star BD$+12^{\circ}4134$ has a companion to the NW with almost the same brightness. The identification chart given by Golovatyj indicates only one star at the approximate place of the variable. The relative position of this star to the other bright stars in the chart suggests that the new variable is the NW companion to the star BD$+12^{\circ}4134$ (see Fig.1.).

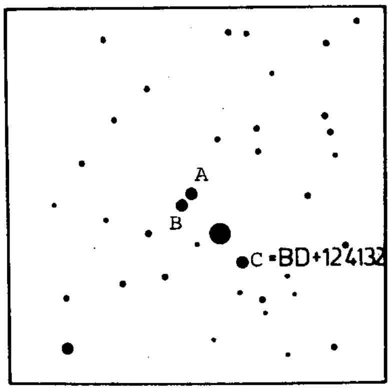

Fig.1. The identification chart of the observed stars.North is at the top.

The star V 1165 Aql was included in the photoelectric observational programme on cepheids carried out at the Konkoly Observatory. The observations were made with the 24" telescope in B and V colours of Johnson system. As to other information about the observing equipment and the programme see the author's paper published in the Mitteilungen der Sternwarte der Ungarischen Akad. der Wissenschaften, No.70 (1977). The star BD $+12^{\circ}4132$ was used as comparison star. Its magnitudes are:

$$V = 10^{m}.24, \qquad B - V = +0^{m}.28.$$

Both BD $+12^{\circ}4134$ and its companion were observed in order to decide which is the variable. But the first observations have shown that neither of these two stars shows as considerable light variation as several tenths of a magnitude.If either star does vary its light amplitude has to be smaller than $0^{m}.05$ in V (see Table I). Moreover, the B-V colour index of the star A is not appropriate to be a cepheid variable. This star is too blue for a cepheid variable even if there is no interstellar reddening in the given direction. The star B which is BD$+12^{\circ}4134$ might be a cepheid variable at least on the basis of its B-V colour index but this star shows even more stable light intensity than the star A. The observations of both stars are plotted in Fig.2, using the published period (6.82957) and an arbitrary zero point (J.D. 2430000.0) in the phase calculation.

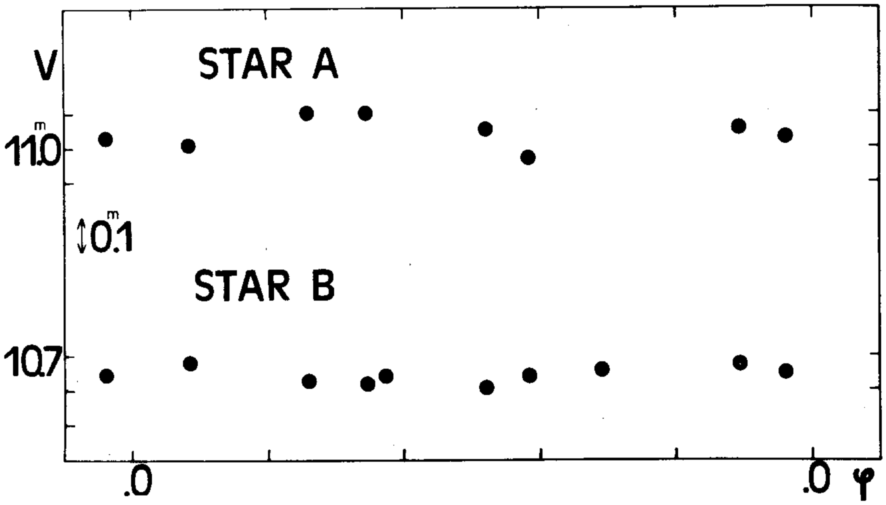

Fig. 2. The plot of the observations using the original determination of the period.

Table 1

The observations

J.D.Hel. 2440000+	Star A		Star B= BD+12°4134	
	V	B-V	V	B-V
2548.472			$10\overset{m}{.}76$	$1\overset{m}{.}10$
2623.420	$10\overset{m}{.}90$	$0\overset{m}{.}36$	10.78	1.03
2634.447	10.97	0.33	10.75	1.16
2636.491	10.90	0.40	10.77	1.21
2720.228	10.95	0.36	10.79	1.25
2728.209			10.74	1.24
2990.432	10.99	0.31	10.72	1.20
3287.517	11.03:	0.30:	10.76	1.13
3337.429	10.94	0.36	10.72	1.13

The above mentioned facts allow to draw the following conclusions:

1. Neither the star BD +12°4134 nor its NW companion is a cepheid variable, however, a more precise photometry would be necessary to decide whether small amplitude light variation exists in either star.
2. A revision of the original photographic observational material would be desirable to determine which star was reported to be variable later on designated as V 1165 Aql.

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A SEARCH FOR V567 SCORPII

Introduction

The Cepheid V567 Sco=HV 10793 was discovered by Henrietta Swope (1943). Unfortunately the published identification chart for this variable, which is located in a very crowded field, is of such small scale that positive identification proved to be impossible. In order to recover this object we therefore obtained photoelectric UBV photometry of a number of field stars located near the quoted position of the variable.

Observations

Observations of 13 non-variable stars situated near V567 Sco are listed in Table I. The stars in this table are identified in Fig. 1.

Table I

Observations of field stars

Star	V	B-V	U-B
1	10.42	0.14	-0.56
2	11.36	0.41	0.25
3	12.10	0.41	0.30
4	12.17	0.98	0.62
5	14.56	0.51	0.44
6	12.34	0.28	-0.05
7	13.38	0.48	0.37
8	12.72	1.29	1.06
9	14.84	0.75	0.21
10	12.17	0.99	0.61
11	13.90	0.52	0.41
12	13.58	0.57	0.33
13	13.01	1.59	1.80

The observations were carried out with the 1.5-m and 0.9-m telescopes of the Cerro Tololo observatory in 1978 (stars 1-9) and 1979 (stars 10-13). Star 10, which was originally thought to be the variable, was observed 4 times. All other stars were observed only once.

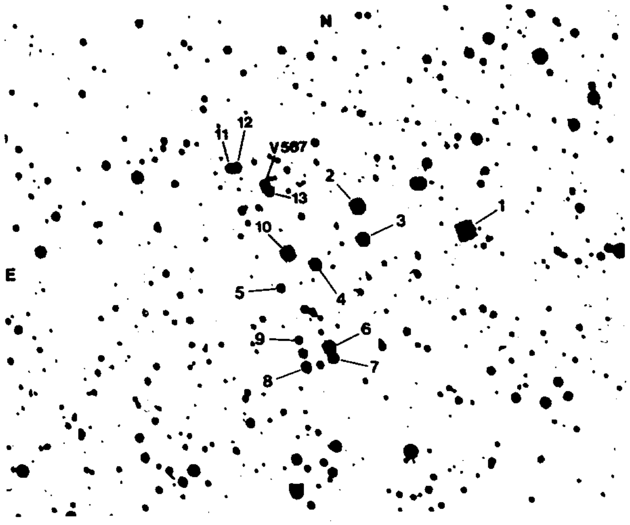

Fig.1. Identification chart for V567 Sco and comparison stars. The chart, prepared from a 103aO+GG385 plate obtained with the Curtis Schmidt has dimensions of 9.8x12.2 arc min.

Observations of the variable itself are given in Table II.

Table II

Observations of V567 Sco

Date	U.T.	V	B-V	U-B	Tel.
1979 Mar.21	08:40	12.21	2.17	2.21	1.5-m
Mar.23	07:55	12.42	2.18	2.32	1.5-m
Mar.31	08:17	13.31	2.13	-	0.9-m

Discussion

A color-magnitude and a color-color plot for the stars in Table I are shown in Figs. 2 and 3, respectively. Eight of the thirteen observed stars lie on, or close to, the loci that would be expected for a poor star cluster or association with $(m-M)_0 = 10.0 \pm 0.3$ (m.e.) and $E_{B-V} = 0.37$. Alternatively all of the field stars with $B-V < 0.6$ might be unrelated objects with $9.0 \lesssim (m-M)_0 \lesssim 11.0$ that are located behind a single absorbing cloud.

Unfortunately the three observations listed in Table II do not strongly constrain $\langle B \rangle$ and $\langle V \rangle$ for the Cepheid. Adopting

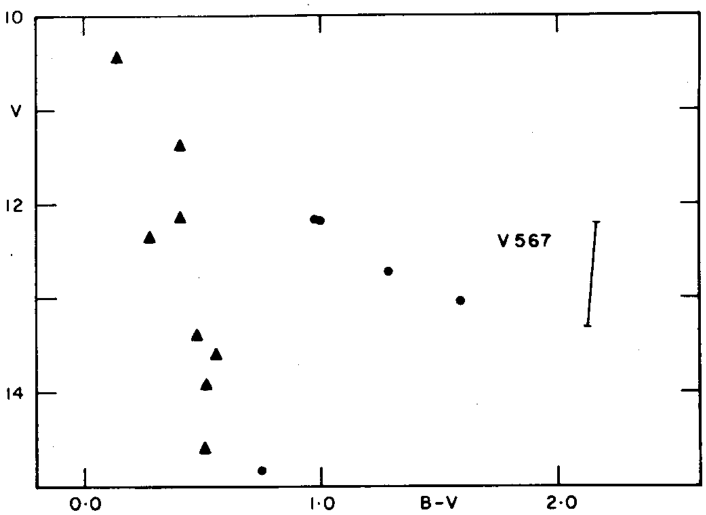

Fig.2. Color-magnitude diagram for field stars. Possible cluster members are shown as ▲.

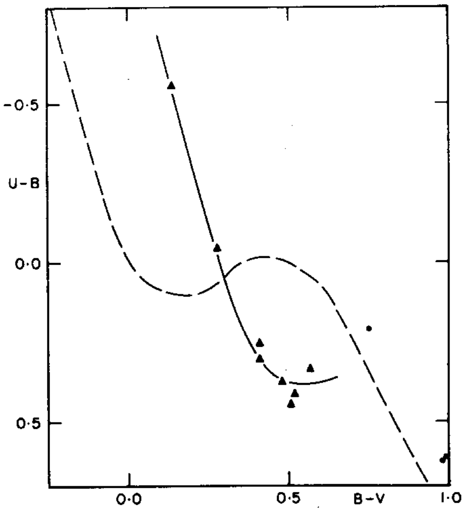

Fig.3. Color-color plot for field stars (●) and possible cluster members (▲). Also shown is the intrinsic color-color relation and the color-color relation for $E_{B-V}=0.37$.

$\langle V\rangle \sim 12.5$, $\langle B\rangle - \langle V\rangle \sim 2.15$, $M_{\langle V\rangle} = -5.62$ and $(\langle B\rangle - \langle V\rangle)_o = 1.00$, which are the values derived from van den Bergh's (1977) calibrations of the period-luminosity and period-color relations for a Cepheid with P = 34.04 days, yields $A_V \sim 3.8$ and $(m-M)_o \sim 14.3$. These values place V567 Sco well beyond the possible clustering of field stars discussed above.

One of us (SvdB) wishes to acknowledge the kind hospitality of the Cerro Tololo Observatory.

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References:

Swope, H.H. 1943 Harvard Ann. 109, No.9

van den Bergh, S. 1977 in Redshift and Expansion of the Universe eds. C.Balkowski and B.E. Westerlund (Paris-CNRS) p.14

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INFORMATION BULLETIN ON VARIABLE STARS
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Budapest
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RAPID Hα EMISSION VARIABILITY IN V711 TAURI (= HR 1099)

V711 Tau (HR 1099) is one of the few RS CVn binaries to show Hα as a pure emission feature during radio-quiet intervals (Bopp and Talcott 1978). Typically, the quiescent equivalent width (EW) of Hα is 0.5 - 1.0 Å, though there are significant night-to-night variations seen. We have previously reported (Weiler *et al*. 1978) Hα to be strongly enhanced during radio flares: in September 1976 the emission EW increased to ~1.5 Å during a radio flare, and during the great radio flare of February 1978 (Feldman *et al*. 1978) a

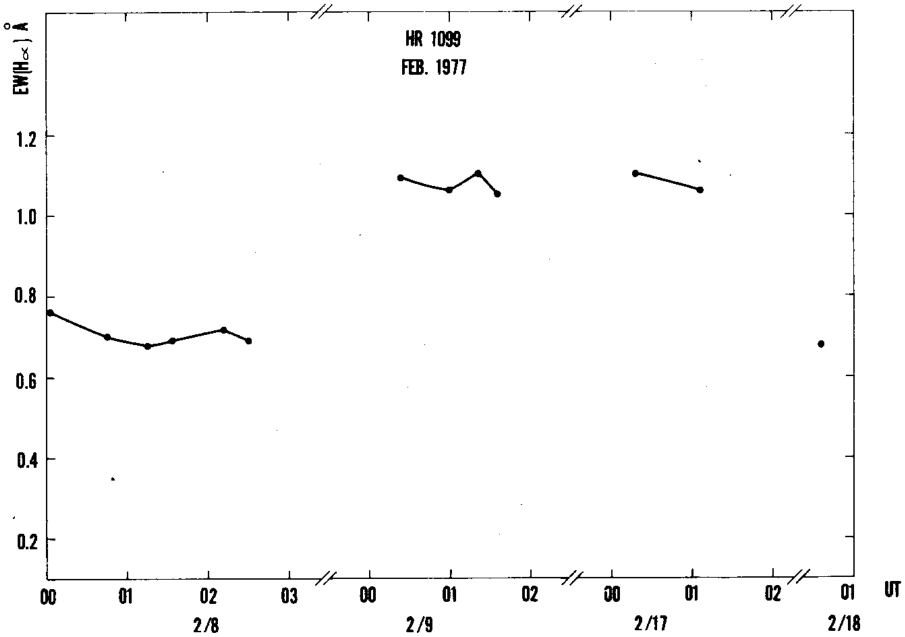

Figure 1: Hα emission EW data for HR 1099 during a non-flare interval in February 1977.

peak Hα EW of ~3 Å was seen (Popper 1978; Fraquelli 1978). We have also commented on the apparent presence of rapid (~10-15 minute) variations in Hα EW of V711 Tau during radio flares. In this note, we present our data for the February 1978 flare graphically. The case for rapid variability at Hα is strong, but we stress that additional measures, preferably by photoelectric scanner or Reticon, are desirable.

Figure 1 plots the Hα EW versus time for a radio quiet interval in February 1977. The EW's were obtained from spectrograms (dispersion 40 Å/mm, resolution ~1.3 Å) obtained with the 1 meter Ritter Observatory reflector and Cassegrain image-tube spectrograph. The sequence of spectrograms obtained on 8 February 1977 illustrates the typical scatter of our measures, about ±10% or less. Note that the next night shows Hα as ~50% stronger, but no rapid variations are seen. The flare data of February 1978 (Figure 2) are quite different. On 21 and 22 February, when the 10.5 GHz flux was 500-600 mJy,

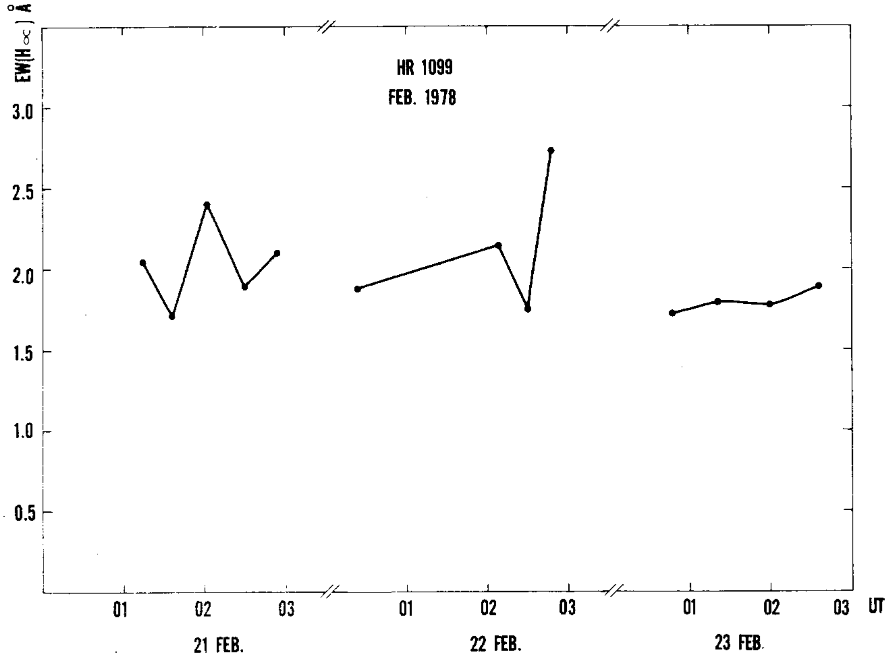

Figure 2: Same as Figure 1, during the radio-flare of February 1978.

the Hα EW was strongly enhanced and variable by about 40%. On 23 February, when the radio flux had declined to 200-300 mJy, the Hα EW was sensibly constant.

Since these Hα variations were present only at certain phases of the radio outburst, we believe they represent real changes in the Hα emitting region on a time-scale of 15 minutes or less. Certainly there is convincing evidence for variations in radio flux and polarization of V711 Tau on similar time-scales (Feldman et al. 1978; Brown and Crane 1978), though of course the emitting regions involved are quite different.

Though radio variations of ~20% were seen on 21 and 22 February, there is no correlation with the rapid Hα variations. The only possible correlation is with diminished radio flux on 23 February, and the lack of variations in Hα seen on that date.

The uncertainties in photographic spectrophotometry impose a limit on the precision of an EW measurement of ~10%. It would be quite useful to extend these observations using photoelectric techniques of greater precision; perhaps V711 Tau shows even non-flare Hα emission variations at the few percent level. The high signal to noise Reticon data obtained by Tomkin (reported in Fraquelli 1978) show ~20% Hα EW variations on 21 February 1978 between 3-4 hours UT, immediately after our observations.

The question of profile variability on short time-scales also requires further investigation. There is clear evidence of night-to-night profile changes (Hearnshaw 1978, Fraquelli 1978) but high-resolution spectroscopic observations with a time resolution of 10-15 minutes have not yet been obtained.

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References:

Bopp, B.W., and Talcott, J.C., 1978, Astron. J. 83, 1517.

Brown, R.L., and Crane, P.C. 1978, Astron. J. 83, 1504.

Feldman, P.A., Taylor, A.R., Gregory, P.C., Seaquist, E.R., Balonek, T.J., and Cohen, N.L., 1978, Astron. J. 83, 1471.

Fraquelli, D.A. 1978, Astron. J. 83, 1535.

Hearnshaw, J.B., 1978, Astron. J. 83, 1531.

Popper, D.M. 1978, Astron. J. 83, 1522.

Weiler, E.J., Owen, F.N., Bopp, B.W., Schmitz, M., Hall, D.S., Fraquelli, D.A., Piirola, V., Ryle, M., and Gibson, D.M. 1978, Astrophys. J. 225, 919.

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INFRARED LIGHT CURVES OF THE ECLIPSING BINARY VW CEPHEI

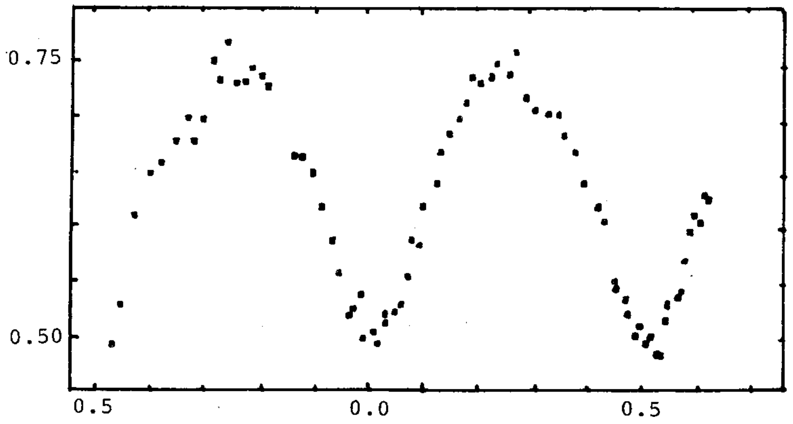
The VW Cephei system is a contact binary of W UMa type with a W type light curve (Binnendijk 1970). Variable period as well as variable light curve have been reported (Kwee 1966 a,b - Van't Veer 1973). A description of the system in terms of hot spot and shell has recently been suggested by Pustylnik and Sorgsepp (1976), as a tentative explanation for the peculiarities of the light curves. Three infrared light curves at 1.03 and 2.2 μm are reported here, each of them being obtained during a single night, by continuously alternating variable and comparison observations.

Observations

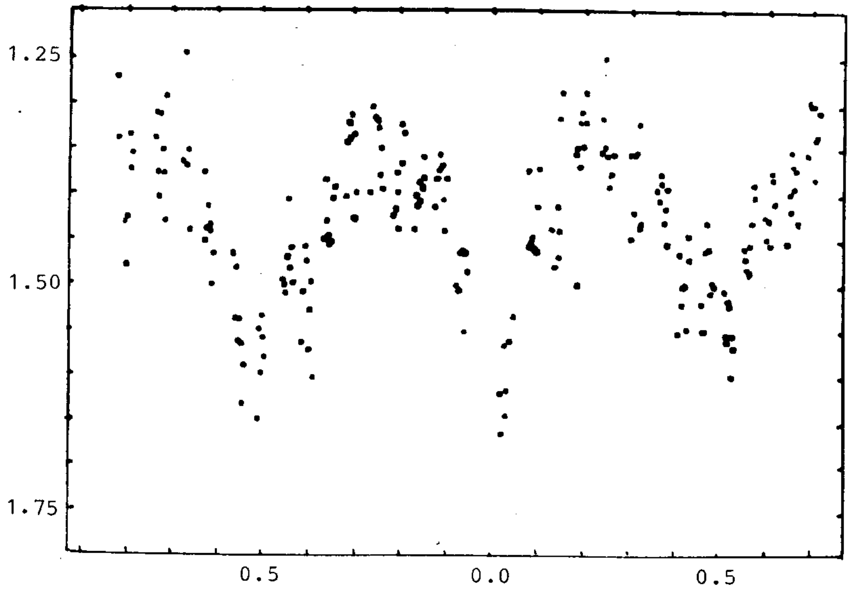
The light curve observed during the night April 17-18, 1971 is shown in Figure 1. The measurements were obtained with the

Figure 1

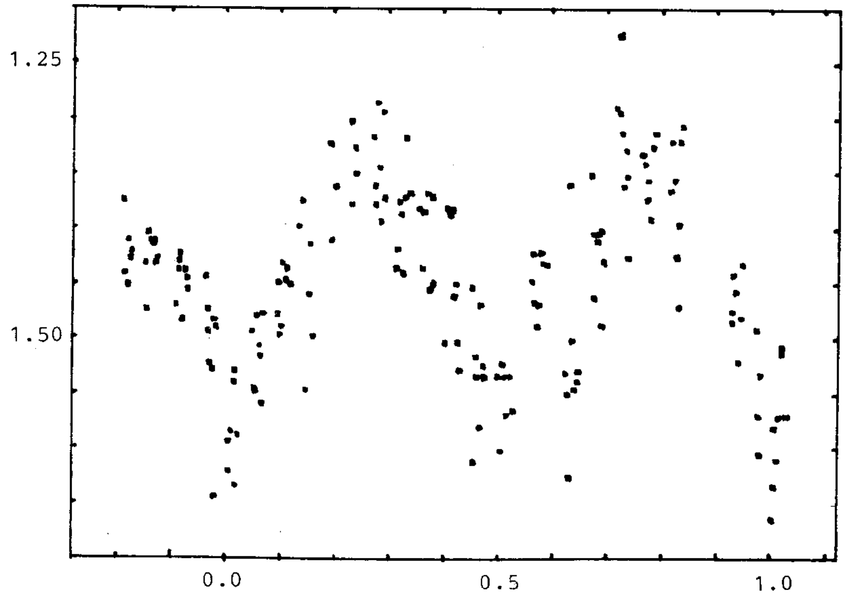
17 April 1971 VW Cephei I



I light curve of VW Cep in the sense BD +74°889 - VW.



21 January 1976 VW Cephei K



22 January 1976 VW Cephei K

Figures 2 and 3: K light curves of VW Cep in the sense VW - BD + 75°764

80 cm telescope of the Observatoire de Haute-Provence, a cooled S1 photomultiplier and a filter for the I band at 10 300 Å. The star BD +74°889 (G5, m_V=7.9) was used as a comparison star while BD +74°902 (F8, m_V=8.4) was a check star. The epoch for the observed primary minimum was determined by the method described by Kwee and Van Woerden (1956). We obtained: J.D. 2441059.4940 and O-C = -0.0674 in good agreement with the O-C diagram from Van't Veer (1973) and Hopp et al. (1976).

The light curves of Figures 2 and 3 were observed at the Cassegrain focus of the 193 telescope of the Observatoire de Haute Provence during the nights January 21-22 and 22-23, 1976. A 77° K/Pb S photometer was used together with a K band-filter (λ=2.2μm).

The star BD +75°764 (G5, V=6.1) was used as a comparison star, while BD +74°889 was a check star. The following elements were deduced for the primary minimum:

1976 January	21-22	J.D. 2442799.522	and O-C = -0.083
	22-23	J.D. 2442800.351	and O-C = -0.089

which gives a mean O-C =-0.086 in good agreement with the diagram of Hopp et al. (1976).

Discussion

The poor signal to noise ratio of the K observations does not allow to ascertain whether the perturbations of Figures 2 and 3 are intrinsic to the system or due to fast atmospheric variations. Minima I and II display about the same depth at both 1.03 μ and 2.2 μ, with nearly equal maxima. The mean amplitudes are 0.25 mag at λ=1.03 μm and 0.22 mag at λ=2.2 μm which can be compared to mean value 0.36 mag at λ=0.44 μm (B colour) and 0.33 mag at λ=0.55 μm (V colour) from Kwee (1966b) and Hopp et al. (1976). The amplitude decrease with increasing wavelength is thus confirmed throughout the infrared domain.

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References:

Binnedijk L., 1970,Vistas in Astronomy 12,217
Hopp, U.,Witzigmann, S., Kiehl, M.,1976 I.B.V.S. No.1599
Kwee, K.K., 1966a, Bull.Astron.Inst.Netherl. 18,448
Kwee, K.K., 1966b, Bull.Astron.Inst.Netherl.Suppl.1, 265
Kwee,K.K., Van Voerden,H.,1956, Bull.Astron.Inst.Netherl.12,327
Pustylnik,I.,Sorgsepp,L.,1976, Acta Astron. 26, 319
Van't Veer, F., 1973, Astron. and Astrophys. 26, 357

COMMISSION 27 OF THE I. A. U.
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Konkoly Observatory
Budapest
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COMMISSION No. 27 - WORKING GROUP ON FLARE STARS

A successful meeting of the Working Group was held during the IAU General Assembly in Montreal. Dr. C. Jordan delivered an informal presentation on interpretation of UV spectra and Dr. B. Bopp gave some opinions on possible future directions for optical observation. Lively discussions took place and it came to light that a number of groups (at Armagh, Catania and Sacramento Peak) are independently involved in UV spectroscopy of flare stars in their "quiescent" states. Indeed subsequent discussions with the Boulder group (J. Linsky *et al*.) showed that they and the Armagh group have contiguous programmes between September 6th and 11th. People interested in cooperative ground-based observations are invited to contact P. B. Byrne (Armagh Observatory) or J. Linsky (J.I.L.A., Colorado)

A broader definition of the working group's activities is necessary, these being no longer confined to the study of flaring. Rather there is now interest in applying all available diagnostic tools to the study of chromospheric activity in the latest type dwarfs. With this in mind it was decided to discontinue the international co-operative programme of optical monitoring of a selected group of flare stars on a regular year-to-year basis. In its place we would urge observers to search for activity in stars not hitherto shown to be active, to expand our knowledge of its occurrence in as wide a range of spectral types as possible. The importance of standardizing observations to the UBV or other commonly used photometric system was stressed, as was the need for two-channel data where possible. The latter type of observation is of particular importance in searching for out-of-flare "flickering" and intermediate timescale variations.

With the resignation of the previous chairman, Professor Mavridis, it was decided to form an organizing committee for the future. For details of the composition of this committee members are referred to coming issues of I.B.V.S. Future plans include a possible workshop meeting on flare stars to be held during September 1980. Those interested in joining the group should contact Dr. B.W. Bopp (Univ. of Toledo), Dr. P.B. Byrne (Armagh Observatory), Dr. M. Rodono (Catania Observatory) or Dr. S. P. Worden (Sacramento Peak Obs.)

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SH 2-71: NEW VARIABLE CENTRAL STAR OF A POSSIBLE PLANETARY NEBULA

Nebula Sh 2-71 (36-1°1) was discovered by Minkowski (1946) who classified it as a diffuse or peculiar nebulosity. Sharpless (1959) included this object ($AR_{1950} = 18^h59^m28^s.0$, $D_{1950} = +2^\circ04'56''$ - Milne, 1973) in his catalogue of H II regions and considered it as a possible planetary nebula. Our UBV photoelectric photometry from 1977, 1978 and 1979 shows the nucleus of this very little known nebula to be variable with an amplitude of at least 0.7 mag.

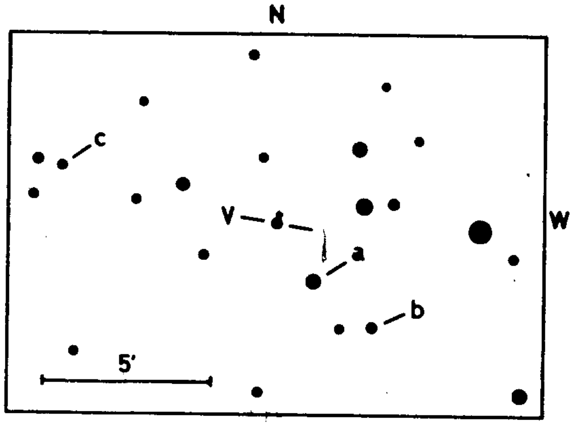

Fig.1 Finding chart for the central star of Sh 2-71 (V) and for comparison stars a, b, c

Our measurements of the planetary central star during eight nights are presented in Table 1. We observed in 1977 with the 1 m-telescope and a pulse counting photometer (RCA 8850 photomultiplier) of the Wise Observatory at Mitzpe Ramon,

Table 1

UBV observations of Sh 2-71 in 1977-1979

JD 2443000+	V	B	U	Dia. [arcsec]	m_{pg}
364.2986	13.96	14.71	15.09	14.5	14.66
.3070	13.89	14.67	15.06	21.8	14.68
.3143	13.95	14.74	15.08	14.5	14.69
.3229	13.93	14.69	14.99	21.8	14.70
365.3140	13.92	14.74	15.10	14.5	14.69
.3238	13.81	14.63	15.00	21.8	14.64
.3321	13.92	14.73	15.04	14.5	14.68
.3488	13.80	14.56	14.96	21.8	14.57
607.8724	13.24	14.03	14.40	22	14.04
.8771	13.27	14.09	14.44	16	14.04
608.8700	13.38	14.20	14.61	22	14.21
.8750	13.39	14.24	14.64	16	14.19
609.8381	13.45	14.22	14.63	22	14.23
.8404	13.43	14.22	14.61	22	14.23
.8454	13.45	14.26	14.72	16	14.21
.8829	13.51	14.31	14.80	22	14.32
.9034	13.45	14.29	14.74	16	14.24
963.8831	13.73	14.55	14.85	22	14.56
.8906	13.77	14.59	14.92	16	14.54
964.8806	13.77	14.55	14.94	22	14.56
.8892	13.81	14.61	14.99	16	14.56
965.8898	13.82	14.62	14.96	22	14.63
.8992	13.84	14.67	15.09	16	14.62

Israel. In 1978 and 1979 we used the 1 m-telescope and a pulse counting photometer (EMI 6256) of the European Southern Observatory at La Silla, Chile. As photometric standards we measured in 1977 the stars near IC 4665 (Johnson, 1954) and in several open clusters (Hoag et al., 1961), and in 1978-79 stars in E-regions (Cousins, 1973). The following standard deviation can be expected for the individual magnitudes given in Table 1: $\sigma_V = 0\overset{m}{.}03$, $\sigma_B = 0\overset{m}{.}03$, $\sigma_U = 0\overset{m}{.}04$.

Several local standards in the vicinity of Sh 2-71 were observed in order to investigate the interstellar extinction in this region. The photometrical results will be published in a separate paper in more detail. In Table 2 we give the magnitudes and their r.m.s. errors of three comparison stars together with the average UBV magnitudes of the central star of Sh 2-71 for 1977, 1978 and 1979.

Whereas the stellar magnitudes in Table 1 were affected by the nebula, the data in Table 2 represent the brightness of the central star only. We have eliminated the contribution of the nebula by comparing the stellar + nebular brightness in two different diaphragms assuming that the nebula was homogeneous near the central star.

Table 2

Mean UBV magnitudes of the central star of Sh 2-71 and of three comparison stars

Star		V	B-V	U-B	n
Sh 2-71 in	1977	13.95 ±2	+0.82 ±1	+0.36 ±1	8 m.e.
	1978	13.45 ±3	+0.85 ±1	+0.41 ±2	9 m.e.
	1979	13.85 ±1	+0.84 ±1	+0.36 ±2	6 m.e.
Comparison	a	11.400 ±2	+0.747 ±2	+0.239 ±5	4 m.e.
	b	13.169 ±9	+0.921 ±5	+0.630 ±15	10 m.e.
	c	13.944 ±10	+0.799 ±3	+0.222 ±8	4 m.e.

The variability of the nucleus of Sh 2-71 was confirmed on 28 plates (1897 - 1947) found in the plate files of the Harvard Observatory. Table 3 gives the visual estimates of the

Table 3

Photographic magnitudes of the central star of Sh 2-71 from Harvard plates

Plate No.	JD 2400000+	m_{pg}	Plate No.	JD 2400000+	m_{pg}
A 2572	14129.626	14.36	MC 21990	24686.756	14.10
A 2573	14129.658	14.30	MC 22525	25009.827	14.30
A 4443	15179.661	14.46	MC 22558	25037.759	14.32
A 10451	19241.696	13.96	MC 22649	25110.585	14.44
A 10460	19249.709	14.38	MC 22702	25147.526	14.00
MC 1226	19268.588	14.52	MC 23442	25408.771	13.96
A 10488	19292.584	13.83	MC 23500	25443.656	14.63
MC 1265	19293.541	13.82	MC 23596	25479.575	13.88
A 10493	19299.580	14.24	MC 24328	25796.753	14.63
MC 5706	20301.763	14.44	MC 24391	25826.629	14.10
MC 6407	20397.525	13.97	MC 24990	26155.713	14.29
MC 8861	20696.694	14.63	MC 35473	32379.773	14.33
A 13526	24404.619	13.90	MC 35477	32380.750	14.36
MC 21956	24670.753	13.84	MC 35493	32387.745	14.63

photographic magnitudes of this star: the internal error of one estimate lies between ±0.05 and 0.1 mag. In order to compare the values from Table 3 with the photoelectric observations from 1977-1979 we transformed our observed B magnitudes into m_{pg} (see last column in Table 1): $m_{pg} = B_* - 0.11$, where $B_* = B + 0.06$ was found for observations made through diaphragm 14.5 and 16 arcsec, and $B_* = B + 0.12$ for dia. 21.8 and 22 arcsec.

The following conclusions can be made concerning the variability of the central star of Sh 2-71:

1) The extreme values of m_{pg} from Harvard plates, 13.82 and 14.63, suggest an amplitude of about 0.8 mag. The UBV data from 1977-1979 show a value somewhat lower (about 0.7 mag), but very probably they do not cover the whole light-curve.

2) The existing data do not allow to describe the shape of the light-curve. Nevertheless, the distribution of the individual values of Table 3 favours a smooth sine-like curve.

3) According to the UBV data the period should exceed two days substantially as only a change of about 0.2 mag has been recorded within two days. We could estimate P between 17 and 22 days from the photographic data. Our observations, however, cannot exclude short periods between about 0.5 and 1 day.

4) There is no evidence for a secular change in the brightness of the central star. The mean value of its photographic magnitude was 14.24 from 1897-1915, and 14.23 from 1925-1947. In 1977-1979 we observed $\bar{m}_{pg} = 14.46$, but this lower mean brightness can be explained by an unequal distribution of the observed data.

The observed central star of Sh 2-71 cannot be responsible for the radiation of the surrounding nebula. The nebula is of very high-excitation (Glushkov et al., 1975) and the presence of He II $\lambda 4686$ emission line in its spectrum requires a radiation source of $T_* \gtrsim 60000^\circ K$. On the other hand, the mean colours of the central star, B-V = 0.84, U-B = 0.38, lead to spectral type B8 (and to visual interstellar absorption $A_V = 3.2\ E_{B-V} = 3.0$). This contradiction can be explained, as in case of some other planetary nebulae (NGC 1514, NGC 2346, NGC

3132, He 2-36), using a binary hypothesis for the central star: the visible B8 star should be accompanied by a hot subdwarf. The observed light changes of Sh 2-71 support this consideration.

This study is only preliminary. More photometric observations are planned in order to obtain the complete light-curve of Sh 2-71.

I acknowledge the Wise Observatory of Tel Aviv University and the Smithsonian Research Foundation Grant SFC-0-3005 for the use of their facilities at Mitzpe Ramon, Israel. A part of the observations has been collected at the European Southern Observatory, La Silla, Chile. My thanks are also due to the Directorate of the Smithsonian Astrophysical Observatory, Cambridge, Mass. for the possibility to investigate Harvard plates, and to Dr. Martha Liller for her valuable help.

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References:

Cousins, A.W.J., 1973, Mem.Roy.Astron.Soc. 77, 223
Glushkov, Y.I., Denisyuk, E.K., Karyagina, Z.V., 1975, Astron. Tsirk. USSR No.852
Hoag, A.A., Johnson, H.L., Iriarte, B., Mitchell, R.I., Hallam, K.L., Sharpless, S., 1961, Publ. US Naval Obs. Second Ser., Vol.XVII, Part VII
Johnson, H.L., 1954, Astrophys.J. 119, 181
Milne, D.K., 1973, Astron.J. 78, 239
Minkowski, R., 1946, Publ.Astron.Soc.Pacific 58, 305
Sharpless, S., 1959, Astrophys.J. Suppl.4, 257

COMMISSION 27 OF THE I. A. U.
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Number 1673

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Budapest
1979 September 18

MOMENTS OF MINIMA OF AK Her

The light of the eclipsing binary star AK Her is measured from photographs made by the "Sky Service," Astronomical Observatory, Odessa University within 1952 through 1978. The total number of photographic and photovisual light measurements obtained amounts to 248 and 579, respectively.

From all this observational material separately on photometric systems of observations 25 moments of primary and secondary minima have been determined. The photometric elements (T. Herczeg,Bonn.Veröf.,63,1962) used are

$$\text{Min.hel.J.D.} = 2436025.4730 + 0\overset{d}{.}42152421 \cdot E.$$

The results of determinations of moments of minimum with indexing the minimum-type as well as E and (O-C) with respect to the elements above are summarized in the Table.

Min.hel.J.D.	*	E	O-C
2434866.273	I pg	-2750	-0.008
.486	II pg	.5	-0.006
36545.211	I pv	+1233	-0.001
.414	II pv	.5	-0.009
36570.502	I pg	+1293	-0.002
.713	II pg	.5	-0.002
36908.565	I pv	+2095	-0.001
.765	II pv	.5	-0.012
37128.176	I pv	+2616	-0.004
.386	II pv	.5	-0.006
37612.513	I pv	+3765	+0.001
.722	II pv	.5	-0.001
37858.684	I pg	+4349	+0.002
.893	II pg	.5	0.000
38049.635	I pv	+4802	+0.002
.843	II pv	.5	0.000
38897.733	I pv	+6814	-0.006
.942	II pv	.5	-0.008
40017.724	I pv	+9471	-0.005

Table (cont.)

Min.hel.J.D.	*	E	O-C
2440581.316	I pv	+10808	+0.009
.506	II pv	.5	-0.011
41109.475	I pv	+12061	-0.002
.688	II pv	.5	0.000
42220.195	I pv	+14696	+0.002
.388	II pv	.5	-0.015

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COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
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Konkoly Observatory
Budapest
1979 September 19

SEVEN NEW VARIABLE STARS IN THE FIELD OF M 101

This communication contains the results of a survey in the field of M 101 for the discovery of new variable stars at high galactic latitudes.

The area of the sky covered by the plates taken with the 67/90/210 cm Schmidt telescope is of 6°x 6° centered on M 101.

With a blinckmicroscope five pair of plates have been examined and seven new variable stars have been discovered (GR 293-294-295-296-297-298-299).

The position (1950.0) of these stars and their characteristics are listed in Table I.

TABLE I

var.	R.A.	D.	max	min
GR	1950		B	
293	$13^{h}55^{m}07^{s}$	+ 56° 40'	14.9	15.4
294	13 57 24	+ 56 41	15.6	17.3
295	13 54 35	+ 53 08	15.1	15.9
296	13 57 00	+ 55 58	17.5	<18.2
297	13 58 03	+ 55 12	15.4	15.9
298	14 01 45	+ 56 36	16.1	16.9
299	14 10 00	+ 53 43	16.6	17.7

Comments to Table I

GR 293: Variations of small amplitude (0.5 in B and 0.6 in V). The B - V color varies between + 0.2 to + 0.6. It is not possible to determine the type of variability.

GR 294: This star is blue ($0 < B - V < -0.3$). Probabily this object belong to BL Lac type. The amplitudes are 1.7 in B and 0.7 in V.

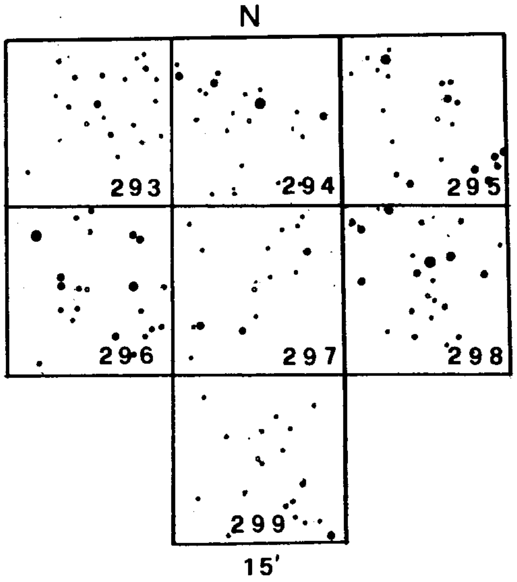
GR 295: The light variations in B are between 15.1 and 15.9; in V between 15.2 and 15.9. The B - V color varies from + 0.1 to + 0.3. RR Lyrae type.

GR 296: From the characteristics of light variations and color ($+0.1 < B - V < +0.5$) the star is likely to be an U Gem star.

GR 297: Variable with small amplitude (0.5 in B and 0.8 in V). The B - V color is high (+ 0.6 ; + 0.8). Type uncertain.

GR 298: Amplitude 0.8 in B and 0.4 in V. This star is red (+ 0.7 < B - V < + 0.9). Type uncertain.

GR 299: The amplitude is 1.1 in B and 0.7 in V ; the color is + 0.1 < B - V < +0.5. Possibly an RR Lyrae variable.



The B and V magnitudes of comparison stars have been determined with the SA 57. Since the material examined (27 B and 17 V plates) is spread from 1970 to 1977 it is difficult to determine exactly the type and elements of variability.

Figure 1 shows the finding chart.

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Budapest
1979 September 24

SEMIREGULAR 58 DAYS VARIATION IN VV Cep

The long period eclipsing binary system VV Cep was observed on nearly 100 nights from August 1976 to September 1978 in the Red and Infrared colours. A preliminary analysis of the red plates, 103aE with RGl filter, with a two minutes exposure at the focus of the 11 cm astrograph of the S.Vittore Observatory in Bologna, revealed a manifest semiregular variation with a period of approximately 58 days, as shown in Figure 1. Our period is about half of the period of 118

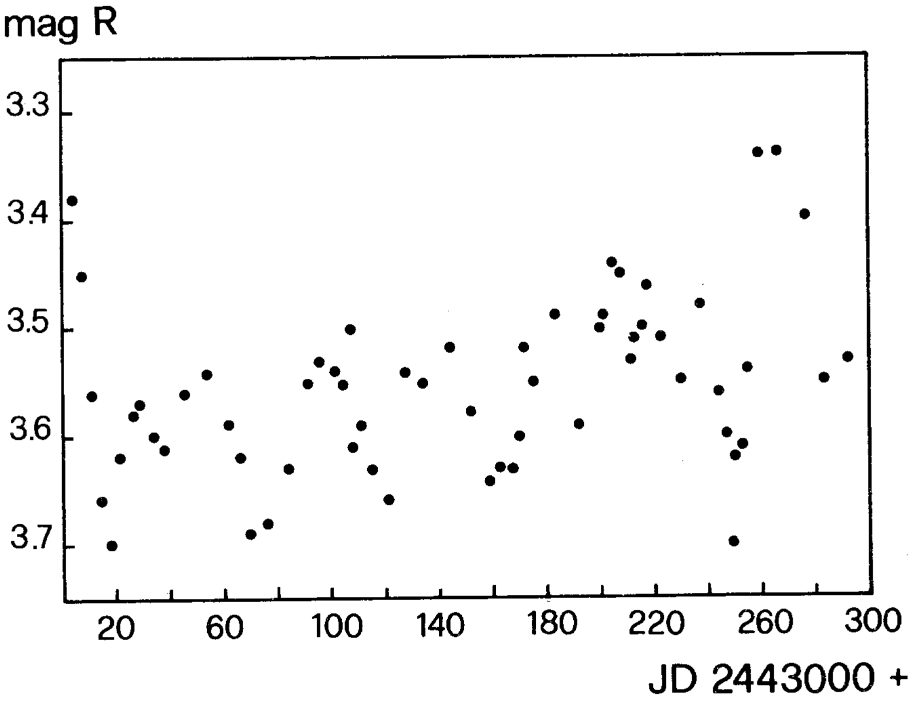

Figure 1: moving averages on three plates. The mean error of each point is about 0.04 mag.

days reported by McCook and Guinan (1978) based on Hα photoelectric observations on 850 days, but with big intervals of straight 200 days.

According to Hutchings and Wright (1971) these variations should come from the Hα emission region with a radius of 150 $R_\odot$, surrounding the Be star, the eclipse of which should be partial. Red and Infrared observations are continued and we hope to observe before long the star also in Hα. A complete analysis of the observations, including UBV photoelectric photometry of the eclipse, will be published elsewhere.

We would like to thank Vacchi, Sassi and Sette for having done the observations till now and L.Baldeschi, A.Dalle donne, R. Di Luca, A.Ferri, C.Frisoni, G.Mengoli, A. Prosperi for helping in the reductions.

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References:

Hutchings, J.B., Wright, K.O. 1971,M.N.R.A.S., 155, 203.
McCook, G.P., Guinan, E.F. 1978, I.B.V.S., 1385.

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SPECTROGRAPHIC OBSERVATIONS OF THE SUSPECTED DELTA SCUTI VARIABLE STAR 2 LYNCIS (HR 2238)

In a recent paper (Antonello et al., 1978) we have published the results of eighteen spectrographic observations of the suspected variable star 2 Lyn, obtained with the Zeiss prism spectrograph of the Merate Observatory. The equivalent width (W_λ) and the radial velocity (RV) of spectral lines of this star were found to be variable, with a period of about $0\overset{d}{.}04$ for the RV, and $0\overset{d}{.}3$ for the W_λ. Moreover smaller variations of W_λ, superimposed on the greater ones and partially in accordance with the RV were found.

At the beginning of 1978 thirteen new spectra of 2 Lyn were taken with the electronic camera of the Astronomical Observatory of Haute Provence (Reseau holographique, dispersion: 18.7 Å/mm; 152 cm telescope). Unfortunately the spectra are slightly underexposed. The methods of reduction are the same as in the previous paper, and the values obtained are listed in Table 1. The Figures 1 and 2 show the new results compared with some of the old ones reported in the previous paper.

Table 1

J.D.	RV (Km/s) MgII λ4481	W_λ (Å) MgII λ4481	W_λ (Å) Hγ
2443519.332	-8.3	0.42	14.11
.344	15.5	0.87	14.80
.359	7.1	0.62	13.68
.371	-15.2	0.48	13.75
.387	6.7	0.76	12.61
.398	- 5.0	0.50	14.94
.414	- 0.7	0.40	12.76
.426	0.9	0.46	13.18
.441	1.7	-	-
.457	13.4	0.41	15.05
.469	- 3.2	0.48	12.52
.484	- 6.7	0.48	13.25
.496	2.9	0.43	14.96

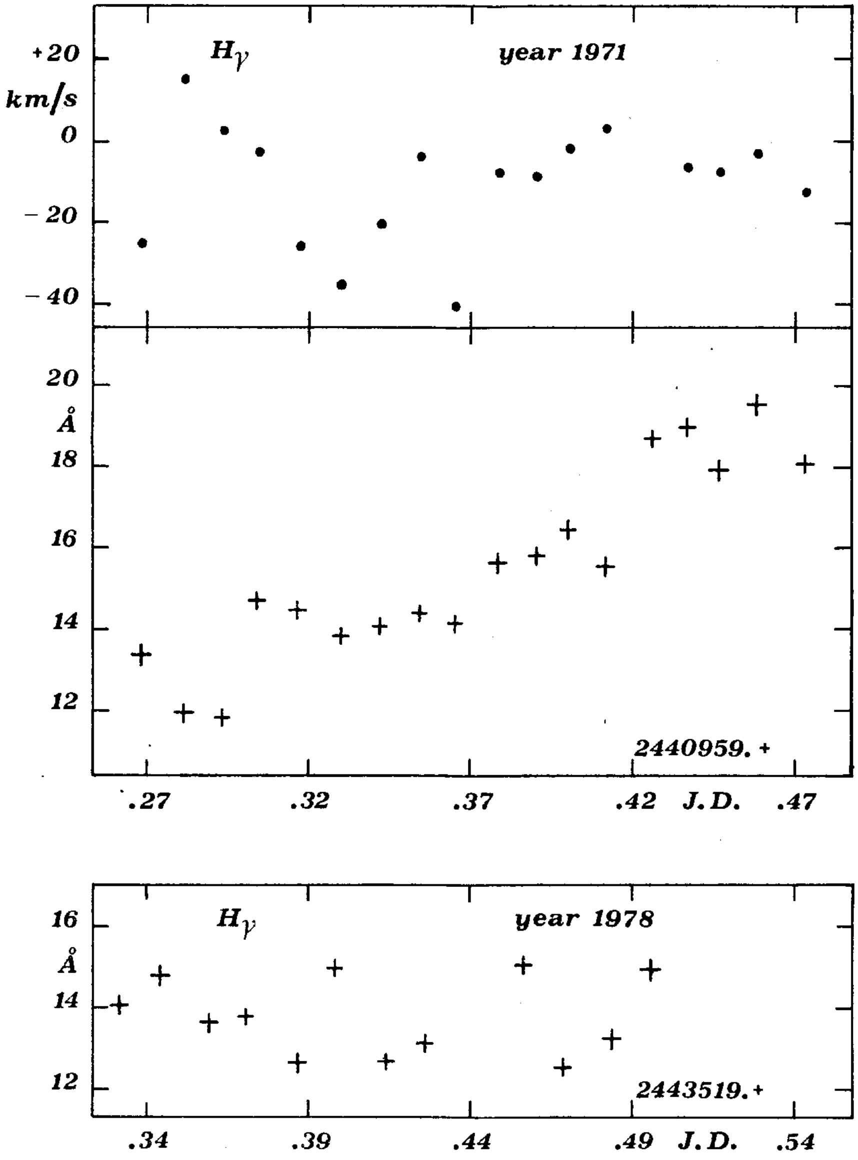

Fig.1. Radial velocities and equivalent widths of Hγ line versus Julian Days.

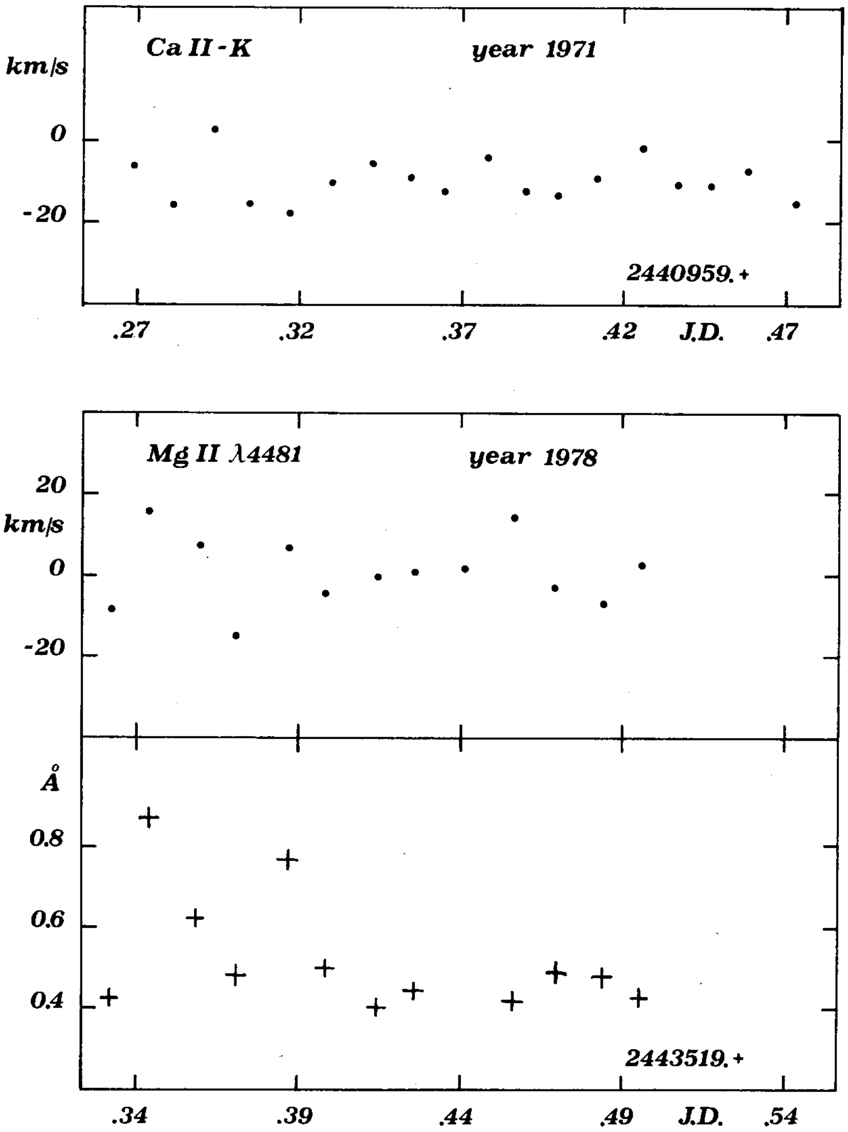

Fig.2. Radial velocities and equivalent widths of Ca II - K and Mg II λ4481 lines versus Julian Days.

As regards the short period variations, one can see that the present results are in agreement with the old ones, both for RV and for W_λ. However, these results are not sufficient to confirm (but neither to exclude) the longer period variation.

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Reference:

Antonello, E., Arienti, F., Fracassini, M., Pasinetti, L.E., 1978, Astron. and Astrophys., 66, 37

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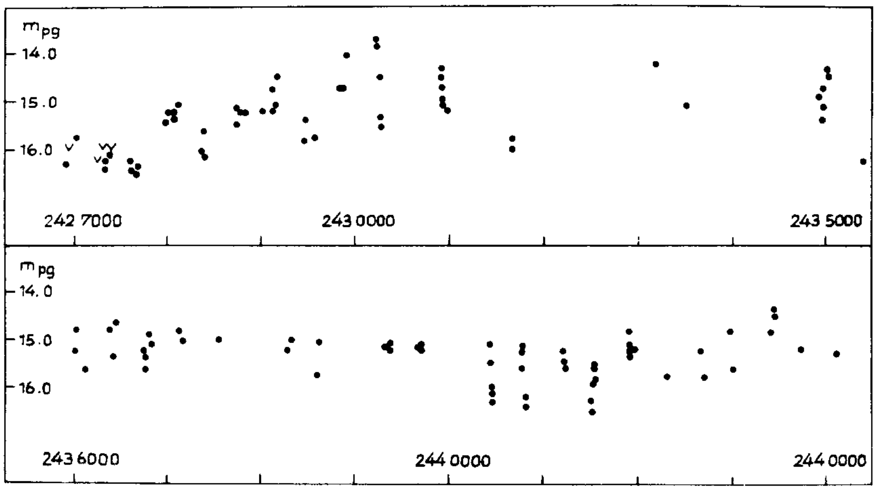
V794 AQUILAE - A NEW AN UMa-TYPE STAR ?

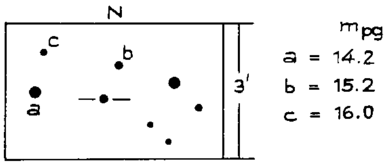
V 794 Aquilae was detected by Hoffmeister (1936). Ahnert (1949) believed that this star belongs to the group of long-periodic variable stars.

The spectrum was observed for the first time by Bond (1978), who found "slightly diffuse hydrogen emission lines, superposed on a blue continuum".

I observed V794 Aql on about 200 plates of the Sonneberg field 62 Aql taken between 1932 and 1979. The star shows a long-time variability which on all levels of brightness is superposed by fast variations (see light curve).



The optical and spectroscopic behaviour of V794 Aql resembles AN UMa (Meinunger 1976) and 2A 0311-227 (Griffiths et al. 1979). The latter two stars are short-periodic binaries, show soft X-ray emission (Hearn and Marshall 1979; Charles and Mason 1979) and belong to a new group of variable stars, the "polars" (Krzeminsky and Serkowski 1977).



Photoelectric, spectroscopic and X-ray observations of V794 Aql are therefore very desirable.

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References:
Ahnert, P.,1949, Veröff. Sternwarte Sonneberg 1, 208
Bond, H.E. 1978, PASP 90, 526
Charles, P.A. and Mason, K.O., 1979, ApJ. 232, L25
Griffiths, R.E. et al., 1979, ApJ. 232,L27
Hearn, D.R. and Marshall, F.J., 1979, ApJ. 232,L21
Hoffmeister, C, 1936, AN 259, 37
Krzeminsky, W. and Serkowski, K.,1977, ApJ. 216,L45
Meinunger, L.,1976, I.B.V.S. No. 1168

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1979 September 26

COMPARISON STARS FOR AM Her

Photoelectric BVRI observations of three comparison stars in the field of the X-ray source AM Her are presented. The comparison stars, along with a finding chart, are identified by Liller (1977).

The observations were begun in 1977 and continued through 1979. The instrumental system is described by Moffett and Barnes (1979). The following telescopes were used; the 91-cm and 208-cm at McDonald Observatory, the 61-cm at Table Mountain Observatory, and the No. 2 91-cm at Kitt Peak National Observatory.

The results are given in the following table where σ represents the standard deviation and n is the number of observations.

Comparison Stars for AM Her

Star	V	±σ	(B-V)	±σ	(V-R)	±σ	(R-I)	±σ	n
a	11.77	.02	0.94	.03	0.73	.02	0.49	.02	27
b	12.80	.02	0.58	.04	0.50	.03	0.33	.02	14
d	13.10	.06	0.61	.09	0.53	.05	0.36	.09	22

Our V magnitudes are in excellent agreement with those given by Liller (1977).

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References:
Liller, W., 1977, Sky and Telescope, 53, 351
Moffett, T.J., and Barnes, T.G.,1979, P.A.S.P., 91, 180

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INFORMATION BULLETIN ON VARIABLE STARS

Number 1679

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1979 September 28

OBSERVATIONS OF X PERSEI IN THE U B_2 V_1 COLOURS OF THE GENEVA SYSTEM

We have observed X Persei, the optical counterpart of the X-ray source 4U 0352+30, with the 1m telescope at Gornergrat,on the nights of Jan. 31, Feb, 3 and Feb. 14, 1979 (the only nights suited for photometry between Jan. 26 and Feb. 16). The instrument was equipped with the Geneva photometer (Rufener, 1964).We observed in the U B_2 V_1 colours of the Geneva system (cf. Golay, 1963).

The comparison stars are :

C1 : HR 1074 = HD 21856 (B1 V, m_V=5.90, U=0.383, B_2=1.592,V_1=1.751)
C2 : HR 1163 = HD 23625 (B2 V,m_V=6.56, U=0.649,B_2=1.530, V_1=1.586).

The colours cited are those given in the second catalogue of Geneva photometry (Rufener, 1976). HR 1074 has been used before as comparison star for X Per and is known to be non-variable (de Loore et al., 1979). HR 1163 was chosen from Rufener's catalogue; the small standard deviation on the measured colours makes it plausible that this star does not vary.

Table 1

		U	B_2	V_1
C1-C2	catalogue	-.266	+.062	+.165
	Jan. 31	-.251±.004	+.064±.004	+.160±.005
	Feb. 3	-.246±.003	+.067±.003	+.162±.003
	Feb. 14	-.258±.004	+.061±.005	+.153±.004
XPer-C1	catalogue	-.028	-.070	-.385
	Jan. 31	+.193±.004	+.150±.005	-.030±.006
	Feb. 3	+.191±.006	+.147±.007	-.034±.006
	Feb. 14	+.212±.006	+.158±.006	-.020±.006
XPer-C2	catalogue	-.294	-.008	-.220
	Jan. 31	-.058±.002	+.214±.002	+.128±.004
	Feb. 3	-.055±.005	+.214±.007	+.128±.007
	Feb. 14	-.046±.005	+.218±.003	+.133±.007

In Table 1 we compare our observed averages of the difference in colour with those computed from the catalogue.It is seen

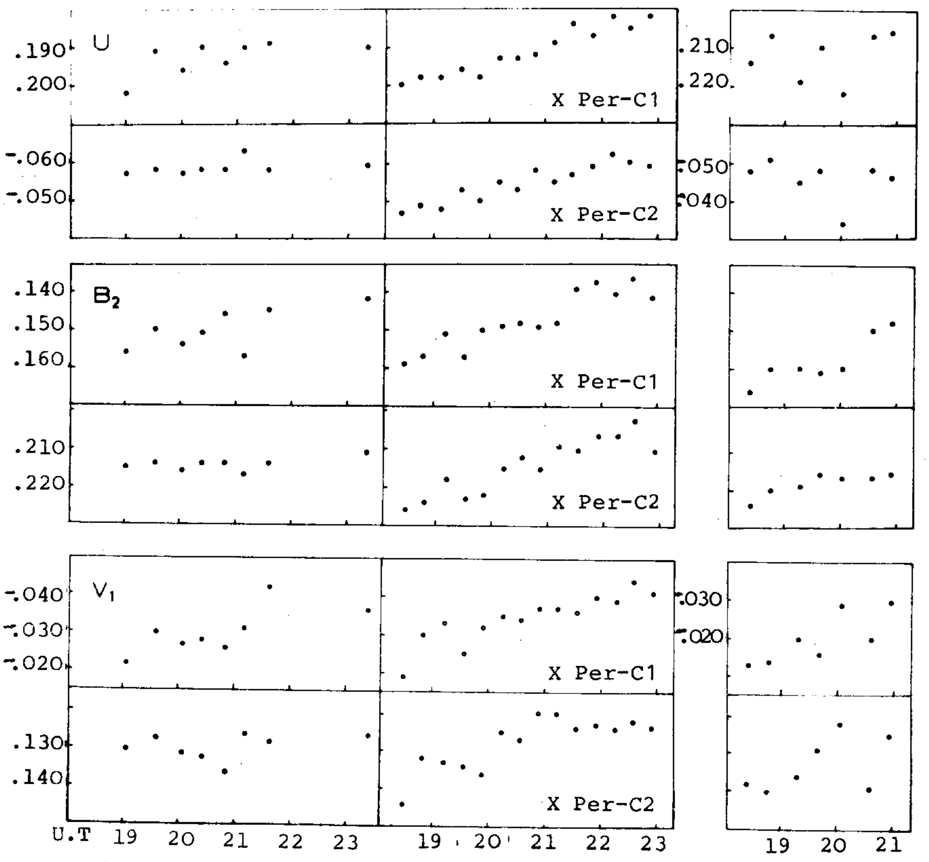

Figure 1 :

Differential measurements of X Per relatively to the comparison stars C1 and C2 on the three different nights (J.D. 2443000+905, 908 and 919). The phase (with arbitrary 0) in case of a 22.4 hour periodicity is also indicated.

that X Per is 0.2 to 0.3 magnitude fainter in our observations. Dorren, Guinan and McCook (1979) expect the star to be at its faintest towards the end of 1979.

The complete tables with the individual measures will be published in the Bull.Astron.Obs.Roy.Belg. 9, No.3. The results are shown graphically in Figure 1. As found earlier by other observers (e.g. Ferrari-Tonioli et al., 1977; Margon et al., 1976) there are indications of irregular activity, but not of the 22.4 hour period (or 11.2 hour) reported by White et al.(1976). At a first glance at the figure there seems to be a small drift in magnitude during the second night, of the order of 0.01 (which is slightly above the 1σ level). If one accepts the variation as real, it does not match the 22 hour periodicity, as one can see from the discontinuity at phase 0.5 on two different nights (the phase distribution is indicated in the figure; phase 0 was taken arbitrarily at JD 2443905.0). The distribution of our observations was such, that in case of a 22.4 hour period 42 % of this period is covered.

We were very happy to be able to use the photometer of the Observatoire de Genève and we thank N. Cramer for the advice he so kindly gave us.

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References:

Dorren, J.D.,Guinan,E.F. and McCook,G.P.: 1979, I.A.U.Circ.No.3352
Ferrari-Toniolo,M.,Natali,G.,Persi,P.and Spada, G.:1977,Astron. Astrophys. 61, 47
Golay, M.,:1963, Publ.Obs.Genève A66, 413
de Loore, C.,Altamore, A.,Baratta, G.B., Bunner,A.N.,Divan,L., Doazan,V.,Hensberge,H.,Sterken,C.and Viotti,R.,: 1979, Astron.Astrophys.
Margon,B.,Bowyer,S., and Penegor, G.:1976, Mon.Not.Roy.Astron.Soc. 176, 217
Rufener,F.: 1964, Publ.Obs.Genève A66, 413
Rufener,F.: 1976, Astron.Astrophys.Suppl. 26, 275
White,N.E.,Mason,K.O.,Sanford,P.W.and Murdin,P.: 1976 Mon.Not.Roy. Astron.Soc. 176, 201

COMMISSION 27 OF THE I. A. U.
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Konkoly Observatory
Budapest
1979 October 1

V 810 CENTAURI

On the basis of observations available until the end of 1978, it has been proposed that the bright star V 810 Cen = HD 101947 = HR 4511 is probably an extremely long-period low-amplitude classical Cepheid (Eichendorf and Reipurth, 1978,1979). The period is about 125 days, thus making it the hitherto longest period Cepheid known in our Galaxy. The amplitudes in the uvby-passbands are ranging from $0^m.13$ to $0^m.25$. A detailed discussion of the star, which is situated in the open cluster Stock 14, is given by Eichendorf and Reipurth (1979).

Further photometric and spectroscopic observations during 1979 confirm the published results; from IUE spectra it is evident that a hot blue companion is present which probably does not affect the lightcurve.

To establish the nature of this important star and to study its pulsations in more detail, it is necessary to observe V 810 Cen photometrically and spectroscopically over at least 4-5 months from the southern hemisphere - a program most observers (including the authors) cannot undertake.

During a meeting of commission 27 at the General Assembly of the IAU at Montreal it was agreed that all observers should be urged to include V 810 Cen in their running photometric and spectroscopic measurements. Unfortunately in most cases observers will not be able to obtain enough data to publish the material themselves. We would therefore be extremely grateful to all observers involved for sending us their reduced photometric measurements or copies of spectra taken. Otherwise we would be grateful for preprints. Due to the brightness of the star observations take only few minutes.

Since the star is observable from November to July we shall include all material sent to us until the end of September 1980 in a forthcoming publication together with our own observations. Hopefully this helps to reveal the nature of V 810 Cen better than it is possible at the moment.

Please forward this information to all southern observers who might not have seen it !

Data on V 810 Cen :

	V 810 Cen	Comparison 1	Comparison 2
HD	101947	102350	101021
HR	4511	4522	4475
α_{2000}	$11^h43^m31^s$	$11^h46^m30^s$	$11^h37^m01^s$
δ_{2000}	$-62^\circ29'$	$-61^\circ10'$	$-61^\circ17'$
Sp.	G0 Ia	G3 III	K1 III
V	$\sim5^m.0$	$4^m.10$	$5^m.14$

In general comparison star 1 should be used; if too bright please take comparison star 2 or use a neutral density filter. Both stars have been checked over a few years.

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Eichendorf, W., Reipurth, B.: 1978, I.B.V.S. No. 1450
Eichendorf, W., Reipurth, B.: 1979, Astron.Astrophys. 77, 227

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Budapest
1979 October 3

INTRINSIC POLARIZATION IN XZ CEPHEI

Polarimetric observations of XZ Cephei were carried out during and after primary eclipses from October 1970 to October 1972 with the 80 cm telescope of the Haute Provence Observatory. Two different one-channel polarimeters were used:

- the first one, PI, described by Martel and Martel (1964) and later modified (Martel,1971) was operate up to June 1971;
- the second one, PII, operated in October 1972 only (see also Chevreton et al, 1977).

The filters used are approximately the standard U,B and V filters, their inverse effective wavelengths being respectively $1/\lambda = 2.74$, 2.33 and 1.87 μm^{-1}. The determination of the amount of linear polarization, P , and of the orientation of the electric vector, θ, is made according to the scheme described in Martel and Martel (1964) and adopted so as to take account of the light variation with time. Orbital phases were calculated according to the ephemeris

$$\text{Min I} = \text{J.D. } 2426033.52 + 5\overset{d}{.}09972155 \cdot E$$

given by Woodward (1943) and adopted by Kukarkin (1969).

The instrumental polarization parameters were determined using our polarimetric measurements on unpolarized standard stars. From Chevreton et al. (1977) there results a negligible instrumental polarization for any filter, using PII in October, 1972. About the interstellar polarization our measurements on the comparison stars used (BD +65°1774 and +65°1778) and the data available in the literature for other stars did not allow us to deduce the right parameters in the immediate vicinity of XZ Cephei, as it appears clearly from Table I.

Table I

The interstellar polarization and absorption in a large neighbourhood of XZ Cephei. The colour excess and distance modulus for BD +65°1774 were determined on the basis of our indices B-V=0.50 and U-B=-0.50 and the spectral type B2 II given by Hill and Lynas-Gray (1977).

Star name	l_{II}	b_{II}	$3E_{B-V}$	m-M	P%	θ°	Source
HD 213087	109	+6.4	1.95	9.3	0.97	23	a
					0.78	33	b
HD 213405	109.2	6.4	2.25	9.3	0.97	2	a
					0.60	9	b
HD 213481	109.5	7.4	2.13	10.9	1.95	27	d
(BD +65°1774)					2.38	31	e
					2.39	29	f
HD 213571	111.9	10.6	-	-	0.28	174	a
HD 213832	109.8	7.5	-	-	0.44	11	d
(BD +65°1778)					1.14	54	e
HD 215371	109.2	6.1	-	-	0.74	132	a
HD 216014	110.9	5.3	1.77	8.6	1.89	38	a
					1.61	58	b
HD 216228	111.1	6.2	0.01	2.4	0.01	108	c
(ι Cep)							
BD +63°1907	111.5	4.3	3.33	12.6	3.69	40	b

Sources: a)Hall, 1958 (λ_{eff}= 4500 Å); b) Hiltner, 1956 (λ_{eff}= 5400 Å); c) Behr, 1959 (λ_{eff}= 4600 Å); d), e) and f) This work (λ_{eff}= 3650, 4300 and 5350 Å).

Table II

The journal of observations

Hel.J.D. 2440000	Date	Orbital phase	$1/\lambda_{eff}$	$(P\pm\Delta P)$%	$(\theta\pm\Delta\theta)^\circ$	Δm
866.4545	06 X 70	0.0073	2.74	3.83±0.30	65.2±1.9	1.50
.4550		.0074		3.60 0.27	62.3 1.8	1.51
.5386		.0238		3.68 0.19	69.3 1.2	1.40
.5391		.0239		3.73 0.27	73.0 1.7	1.39
.5424		.0246		3.37 0.16	75.1 1.1	1.37
.5430		.0247		3.79 0.23	71.1 1.4	1.37
913.2958	22 XI 70	.1969		3.25 0.17	74.5 1.3	0.58
.2964		.1970		3.49 0.15	70.8 1.0	0.59
1131.5221	28 VI 71	.0098		4.65 0.19	70.0 1.1	1.53
861.3296	01 X 70	.0019	2.33	5.89 0.21	72.6 0.9	1.27
.3301		.0020		5.84 0.13	71.2 0.6	1.28
866.4444	06 X 70	.0054		4.29 0.10	73.1 0.6	1.29
.4449		.0055		4.15 0.13	72.6 0.8	1.29
.4491		.0063		4.92 0.24	70.1 1.2	1.29
.4496		.0064		4.80 0.23	70.5 1.2	1.28
.5193		.0201		4.01 0.21	84.0 1.3	1.22
.5199		.0202		3.80 0.46	82.8 3.0	1.21
.5245		.0210		4.98 0.21	69.5 1.1	1.20
912.3868	21 XI 70	.0186		3.91 0.27	71.0 1.8	1.31
.4059		.0224		4.89 0.51	71.5 2.6	1.27

Table II (cont.)

Hel.J.D. 2440000	Date	Orbital phase	$1/\lambda_{eff}$	$(P\pm\Delta P)$%	$(\theta\pm\Delta\theta)^{o}$	Δm
913.3162	22 XI 70	0.2009	2.33	3.88±0.05	74.3±0.6	0.44
.3166		.2010		3.84 0.18	77.4 1.2	0.44
.3485		.2073		3.85 0.25	74.3 1.6	0.41
.3490		.2074		3.85 0.29	76.6 1.9	0.40
914.3601	23 XI 70	.4057		3.60 0.09	71.9 0.6	0.51
.3606		.4058		3.56 0.09	72.5 0.6	0.51
915.3310	24 XI 70	.5962		5.95 0.30	68.9 1.4	0.53
917.4054	26 XI 70	.0032		4.19 0.45	84.7 2.4	
1131.4799	28 VI 71	.0015		4.29 0.23	69.8 1.4	1.28
.4804		.0016		4.29 0.26	71.6 1.5	1.27
.5082		.0070		4.49 0.18	75.1 1.0	1.29
.5088		.0071		4.22 0.05	78.1 0.3	1.29
1600.4483		.0063		2.95 0.22	84.5 2.1	1.27
.4609		.0088		3.54 0.64	69.0 4.9	1.33
913.3382	22 XI 70	.2052	1.87	4.59 0.15	74.3 1.0	0.13
.3386		.2053		4.69 0.15	73.5 1.0	0.13
1131.4655	28 VI 71	.9987		4.29 0.04	75.2 0.2	0.97
.4660		.9988		4.40 0.04	74.6 0.3	0.97

Table II gives the journal of observations, in columns 1) the heliocentric Julian day, 2) the date, 3) the orbital phase φ of the system, 4) the effective wavenumber of the passband in inverse microns, 5) the intrinsic plus interstellar percentage of polarization P and the standard error ΔP, 6) the electric vector orientation θ and the standard error $\Delta\theta$, 7) the difference of magnitudes $\Delta m = m_* - m(\mathrm{BD}\ +65^{o}1774)$*. Figure 1 presents for B filter the percentage P of polarization (intrinsic plus interstellar) and the orientation θ of the electric vector as functions of phase from the time of primary minimum to $\varphi=0.0205$. The vertical bars correspond to twice the standard errors. We represented by a horizontal dotted line the approximate mean value of P_B and θ_B outside eclipse for $\varphi=0.205$, i.e. $P_B=3.86$ % and $\theta_B = 76°$. These values could be reasonably considered as a measure of the interstellar polarization at XZ Cephei, under the condition that no part of this polarization effect is due to scattering in an external envelope (we shall examine this point later.).

In a general way, no correlation of P or θ with φ is present, due to the poor distribution of our measurements with time. In particular:

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* Table II exhibits only some of the Δm values obtained from our polarimetric records.

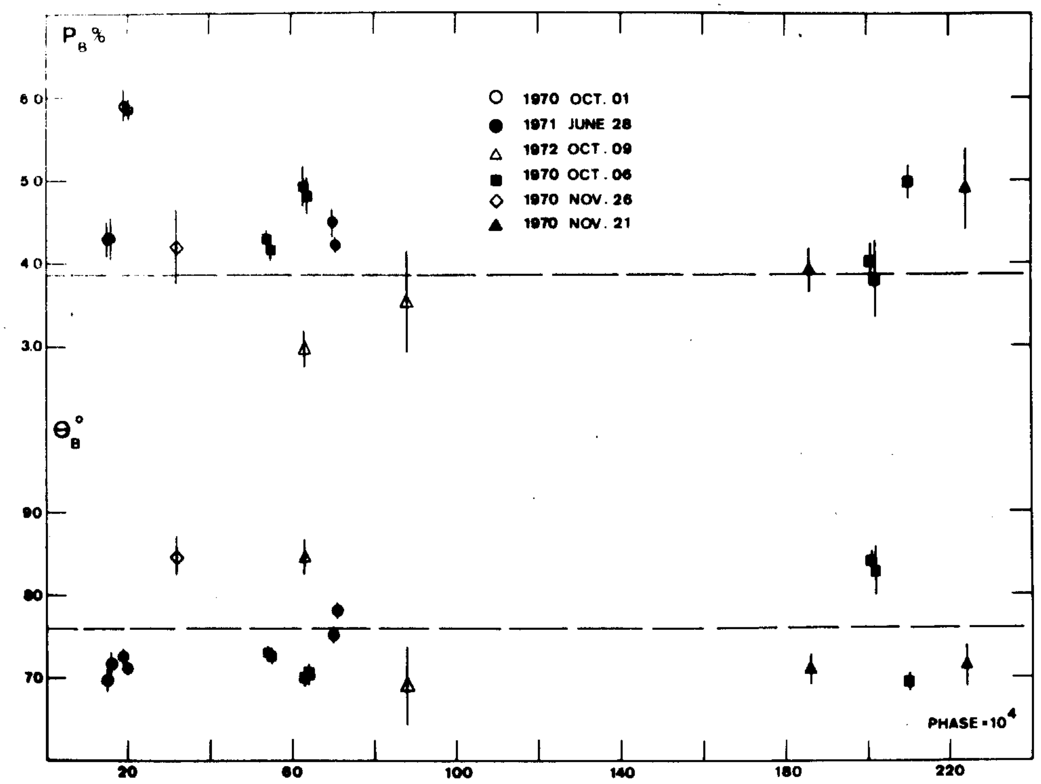

Figure 1. The polarization amount P_B and the orientation of the electric vector Θ_B ($1/\lambda=2.33\ \mu m^{-1}$) around and immediately after the primary minimum of XZ Cephei.

- From the comparison of P_B values on 1970 October 01, 1970 November 26 and 1971 June 28 at $\varphi=0.0016$, it follows that variations of P from cycle to cycle may exist, which could reveal the presence of non permanent circumstellar matter. We must notice that no corresponding variations of θ occur in the above cases, except the peak value $\theta_B= 84^{\circ}.7$ on 1970 November 26. Then, the enormous flow of matter necessary to produce an increase of 2% in the percentage of polarization should be highly concentrated in the equatorial plane so as to let θ unchanged.
- On 1970 October 06, we notice the occurrence of large instantaneous variations of P_B and $\theta_B$values, especially around $\varphi=0.0205$, and on the contrary the near constancy of P_U on the same date from $\varphi=0.0073$ to $\varphi=0.0247$. If real, these variations could originate only from very violent ejection of matter, inasmuch as the geometrical configuration remains the same. An identical conclusion holds on 1970 November 21.
- The peak values P_B=5.89% and 5.84% on 1970 October 01 and P_B=5.95% on 1970 November 24 are unhappily not related to simultaneous corresponding peak values in U or V colours. In U colour only one peak value is registrated, P_U=4.65% on 1971 June 28 and has to be compared to P_U=3.83% and 3.60% on 1970 October 06 at $\varphi=0.0073$.
- Finally, it is interesting to note that during the orbital cycle from 1970 November 21 to 1970 November 26, two very different values of P_B are recorded at $\varphi=0.4$ and $\varphi=0.6$, i.e. for two identical geometrical configurations of the system (under the condition of a circular orbit) apart a reflection in a plane through the line of sight and perpendicular to the orbital plane.

Very few data are available about the physical parameters of the system. Only one spectrum is known: O 9.5 from Roman (1956). The O character of the composite spectrum was born out owing to the U-B and B-V indices deduced from our polarimetric records for a number of values of φ representative of the entire orbital period. All the corresponding points in the $[(B-V)_o,(U-B)_o]$ diagram are scattered exactly around the reddening path for O stars (slope 0.72) in a circle of radius 0.06 centered on B-V =+0.80 and U-B=-0.33 (Let us mention that for BD +65°1774 our value B-V=+0.50 is in good agreement with the value B-V=+0.55 given by

Hill and Lynas-Gray (1977)). There results a high value of reddening A_V=3.3 magnitudes which would give a distance r=280 pc, on the basis of the absolute magnitudes M_1=-1.2 and M_2=-1.1 adopted by Dworak (1975). Indeed, this value of r is in serious disagreement with the photometric parallax π''= 0.0011±0.0005 calculated by Dworak with the above values for M_1 and M_2.

Instead, we shall adopt M = -4.5 which is probably not so far from the true value for a system consisting of an O 9.5 primary component and a somewhat cooler secondary component. This would give a distance r=920 pc: in this case too, the major part of the absorption would be of circumstellar origin, as shown from inspection of the (r,E_y) correspondence of Fitzgerald (1968).

From our polarimetric measurements, we suspected some variations of the instrinsic polarization of XZ Cephei. This preliminary study has to be supported by new extensive polarimetric and spectroscopic investigations.

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References:

Behr, A. 1959,Veröff.Göttingen Sternw. No.126
Chevreton, M., Gravina, R.,Martel, M.T., Vanderriest, Ch.,1977, Astron. and Astrophys. 54, 627
Dworak, T.Z. 1975, Acta Astronomica, 25, 383
Fitzgerald, M.P. 1968, Astron.J. 73, 983
Hall, J.S. 1958, Pub.U.S.Naval Obs.(Ser.II.) 17, Part 6
Hill, P.W., Lynas-Gray, A.E., 1977.Mon.Not.Roy.Astr.Soc.180, 691
Hiltner, W.A. 1956, Astrophys.J.Suppl. 2, 389
Kukarkin, B.V. 1969, Gen.Catalogue of Var. Stars, 3rd ed.Vol.I
Martel, M.T. 1971, Astr.Nach. 293, 9
Martel, M.T., Martel, L. 1964, Ann.Astrophys. 27, 203
Roman, N. 1956, Astrophys.J. 123, 246
Woodward, E.J., 1943, Harvard Bull. 917

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
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Konkoly Observatory
Budapest
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PHOTOELECTRIC ECLIPSE TIMINGS FOR AI Dra, SV Cam AND W UMa

Eclipses of these three binary stars were recorded with the 31 cm reflector at NASA's Goddard Space Flight Center, Greenbelt, Maryland, during 1977 and 1978. The commercially manufactured photoelectric unit contains a 1P21 photomultiplier tube, and B and V filters.

AI Dra was observed 18 times in each of the filters on May 27/28, 1977. Minimum light was found to occur at 02:58:15 UT in V, and 02:58:00 in B. These times correspond to JD hel. 2443291.6253 in V, and 2443291.6251 in B.

SV Cam was observed 23 times in the V passband during its eclipse on April 29/30, 1977. The eclipse light curve appears asymmetrical, with the descending branch being steeper than the ascending branch. See Figure 1. This asymmetry made determination of the time of minimum light slightly ambiguous. Data points near the bottom of the eclipse light curve point to a minimum at 02:15:30 UT, while data points 0.4 magnitudes above minimum light result in a time 7.5 minutes later. The average of these times corresponds to JD hel. 2443263.5948.

W UMa was observed 12 times on March 5/6, 1978. Minimum light is found to have occurred at 01:42:15 UT (± 1 minute), which corresponds to JD hel. 2443573.5746.

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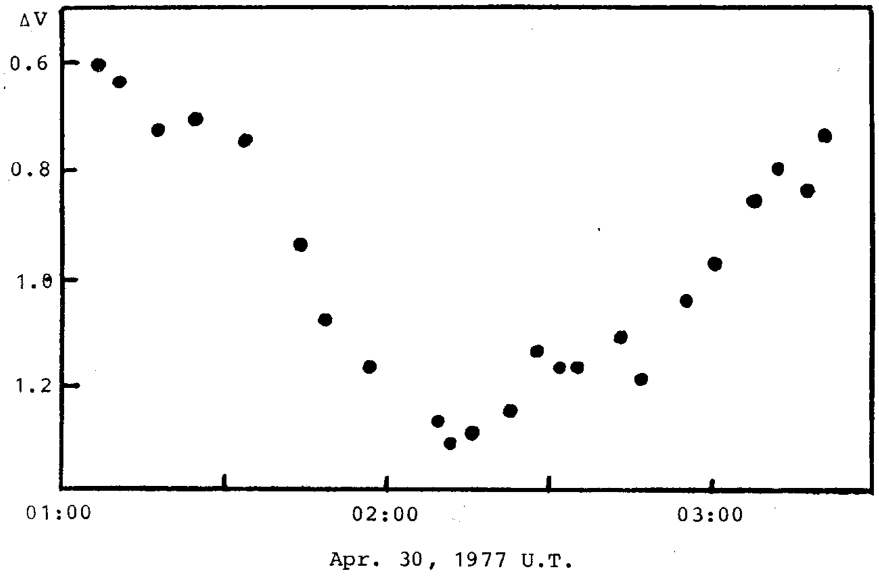

The V passband light curve of SV Cam. Notice that the brightness falls faster than it rises. Asymmetries have been seen in the light curve of this star for many years. The comparison star was SAO 001047.

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Budapest
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PHOTOELECTRIC OBSERVATIONS OF THE NOVALIKE OBJECT IN VULPECULA

Photoelectric observations of the novalike object in Vulpecula were obtained on several nights during the period April to June 1979, on the 104-cm reflector of the Uttar Pradesh State Observatory, using UBV filters of Johnson and Morgan system and EMI 6094S photomultiplier cooled to -20°C. Standard d.c. technique for recording the observations was employed.

BD $+21^{\circ}4165$ and BD $+21^{\circ}4167$ were used as comparison stars. However, the final reductions of the observations have been carried out with respect to BD $+21^{\circ}4165$. Standard stars were also observed to obtain the transformation equations and UBV magnitudes of the comparison star. The standard deviations of the comparison star are $\pm 0^{m}.005$, $\pm 0^{m}.011$ and $\pm 0^{m}.011$ in V, (B-V) and (U-B) magnitudes, respectively. The magnitudes and colours of the novalike object and the comparison star are given in Table I. The light and colour curves of the object are plotted in Fig.1.

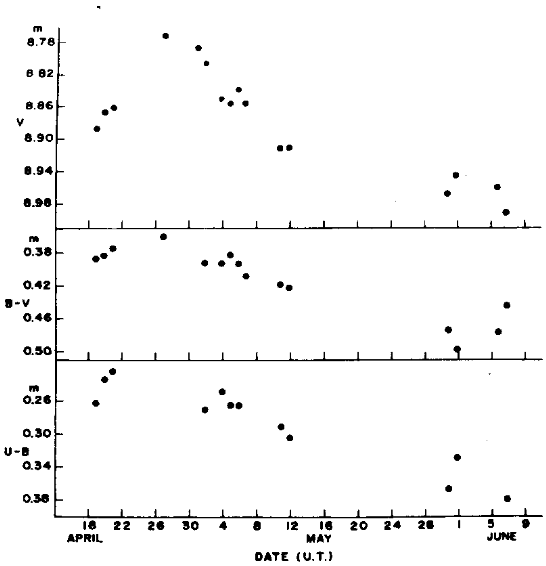
Table I

Magnitude and colours of the novalike object in Vulpecula and the comparison star BD$+21^{\circ}4165$

Date, U.T. 1979		V	B-V	U-B	No. of obs.
April	18.951	$8^{m}.888$	$0^{m}.387$	$0^{m}.262$	4
	19.920	8.868	.383	.233	6
	20.910	8.862	.374	.223	8
	26.985	8.772	.360	-	2
	30.961	8.788	-	-	2
May	1.929	8.807	.392	.269	7
	3.931	8.852	.392	.247	6
	4.928	8.857	.382	.264	6
	5.928	8.840	.393	.264	8
	6.784	8.857	.408	-	2
	10.879	8.912	.418	.290	17
	11.965	8.911	.422	.303	6

Table I (cont.)

Date, U.T. 1979		V	B-V	U-B	No. of obs.
May	30.860	$8^{\mathrm{m}}.967$	$0^{\mathrm{m}}.473$	$0^{\mathrm{m}}.366$	3
	31.867	8.945	.497	.328	6
June	5.817	8.960	.476	-	1
	6.854	8.991	.444	.379	5
Comparison Star BD $+21^{\circ}4165$		9.212	.521	.029	7



During the period of our observations the V light curve of the object shows a variation of $0^{\mathrm{m}}.18$. The novalike object attains its maximum brightness of $8^{\mathrm{m}}.78$ near 28 April 1979.

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PHOTOELECTRIC LIGHT CURVES AND PERIOD STUDIES OF CC CASSIOPEIAE AND V448 CYGNI

Photoelectric light curves of CC Cassiopeiae and V448 Cygni were obtained during the latter part of 1978 using an uncooled RCA 1P21 photomultiplier with a standard V filter (Schott GG495) attached to a 32cm f/15 Cassegrain telescope with all measurements being taken directly from a microammeter. Comparison stars used were BD + 34°3876(V448) and SAO 023846(CC Cas). The visual magnitudes of these stars were found to be 9.01 and 7.98 respectively, plus or minus 0.02. The variables were measured differentially with respect to their comparison stars with differential extinction being ignored.

CC Cassiopeiae

Sixty five estimates were made; the light curve is presented in Figure 1. The light curve is a Beta Lyrae type and the eclipses appear to be partial. The tracing paper method shows that the eclipses are occurring at phase .817±.01. Choosing a date near the middle of the observing period corresponding to a phase of .817 we have a time of minimum equal to 2443818.166. Pearce(1927) first discovered CC Cassiopeiae to be a spectroscopic binary. Its eclipsing nature was discovered photoelectrically by Guthnick and Prager(1930). Both papers list elements. The star was later observed photographically by Gaposchkin(1953), although his

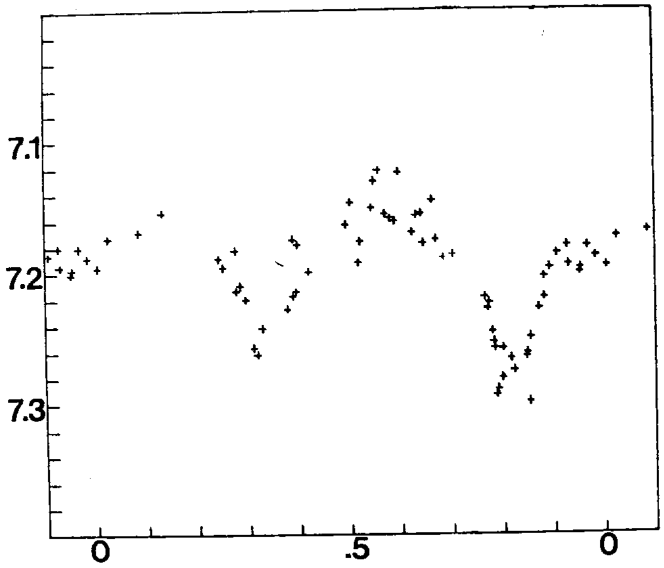

Figure 1: Photoelectric Light Curve of CC Cassiopeiae. Magnitude vs. Phase.

paper seems to be in error as he quotes a time of minimum equivalent to a phase of .77 using Pearce's elements or .69 using Guthnick and Prager's elements, but his published light curve shows primary minimum occurring at phase .27. It is likely that Gaposchkin's time of minimum was secondary and that he used Pearce's elements, implying that the primary minimum occurred .5 phase earlier than listed. If we now construct an O-C graph using the above timings of minimum we obtain Figure 2. A regression line indicates revised elements are:

$$\text{Min(Hel)} = 2443818.166 + 3.369491*E. \quad (1)$$

These elements satisfactorily explain the previous work done on this star with the possible exception of Hilditch and Hill's(1975) work. They published a rough photoelectric light curve which shows minima occurring at about phases .32 and .82. The minimum at phase .32 appears to be slightly deeper, although the sparse coverage of both minima does not preclude an interpretation of primary minimum at .82. A primary minimum at .82 in

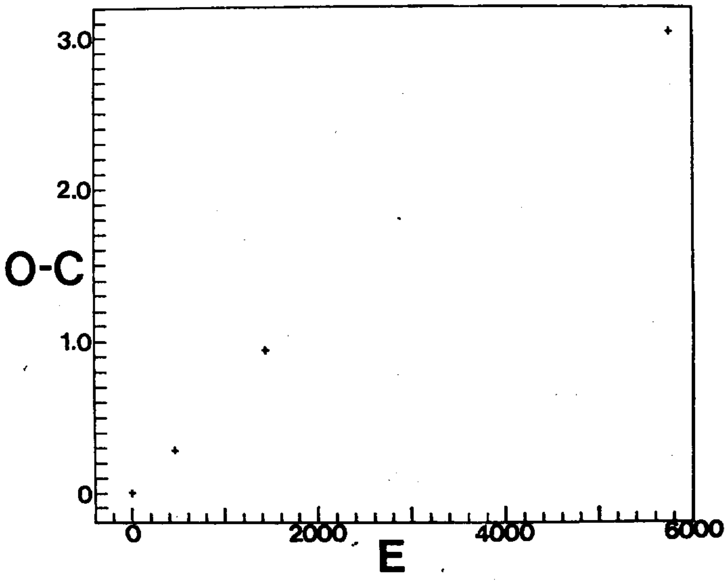

Figure 2: O-C graph for CC Cassiopeiae.
Residuals in Days vs. Elapsed Periods.

1975 is consistent with our elements, whereas a primary minimum at .32 would indicate CC Cassiopeiae has a dynamical period and merits further study.

V448 Cygni

One hundred and five estimates were made; the light curve is plotted in Figure 3. Primary minimum occurs at an O-C value of -.064 day. Choosing a date near the midpoint of the observations we obtain a time of minimum equal to 2443750.409.

V448 Cygni was first discovered to be an eclipsing binary by Wachmann (1939). In the following years, Ashbrook(1942) obtained a photographic light curve, established a Beta Lyrae type variation, and determined a set of period elements. Ashbrook found the eclipses to be total, although the duration of totality was short. A rough photographic light curve was later

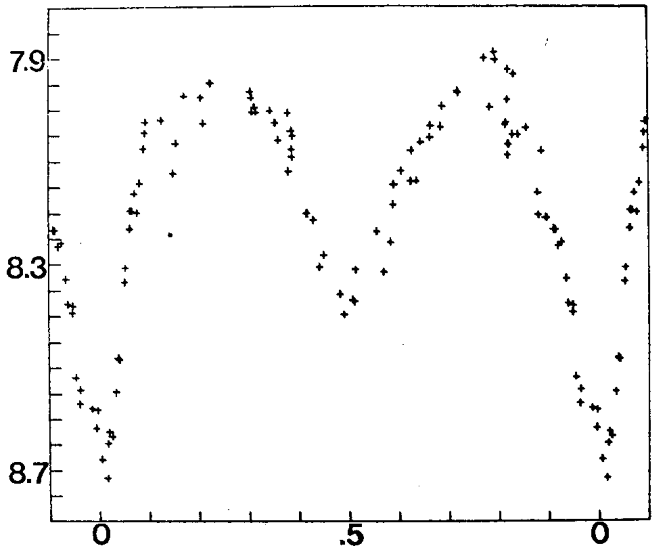

Figure 3: Photoelectric Light Curve of V448 Cygni.
Magnitude vs. Phase.

published by Smirnov(1946). Wachmann(1948) obtained four additional times of minimum. The system was observed spectrographically by Petrie(1956) who concluded that the eclipses must be partial if the spectrographic data were to be self consistent. Using Ashbrook's ten photographic timings, Wachmann's four photoelectric timings, and our time of minimum to construct an O-C graph we obtain revised elements:

$$\mathrm{Min(Hel)} = 2416361.107 + 6.5197162*E. \quad (2)$$

It would be unwise to conclude that the eclipses are definitely partial due to the lack of sufficient data at the minima. However, the observations do seem to favor this interpretation.

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References:

Ashbrook, J. 1942, HB 916, 7
Gaposchkin, S. 1953, HA 113, No.2
Guthnick, P. and Prager, R. 1930, AN 239, 5713
Hilditch, R. and Hill, G. 1975,,Mem. RAS 79, 107
Pearce, J. 1927, Publ.DAO IV, 67
Smirnov, M. 1946, VS 6, 13
Wachmann, A. 1939 BZAN 21, 136
Wachmann, A. 1948 Astr.Abh. 11, 25

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EPOCHS OF MINIMUM LIGHT, SW LACERTAE

SW Lacertae (BD+37°4717) is a W Ursae Majoris-type eclipsing binary system which undergoes partial eclipses. Jameson and Akinci (M.N.R.A.S. 188, 421, 1979) observed the light curve of this system at 1.2 and 2.2 μm. They kindly provided the present authors with the unpublished data.

Epochs of minimum light were determined from the observations defining one primary and one secondary eclipse curve. The bisection-of-chords technique was utilized since there is noticeable asymmetry in the primary eclipse curve. Table I includes the epochs of minimum light and the O-Cs calculated from the ephemeris given by Bookmyer (Astron. J. 70, 415, 1965), namely

$$\text{JD Hel. Min. I} = 2437572.57231 + 0^{d}.32072811\ E.$$

TABLE I

JD Hel.	Min.	O-C
2443411.4804	II	$-0^{d}.1075$
2443411.6343	I	-0.1140

The residuals are consistent with the O-C plot published by Faulkner and Bookmyer (IBVS #1503, 1978).

It should be noted that all the available epochs of minimum light for SW Lac - visual, photographic, and photoelectric - have been collected and tabulated by Bookmyer and Faulkner. Upon request, these will be sent to any investigator interested in them for future studies.

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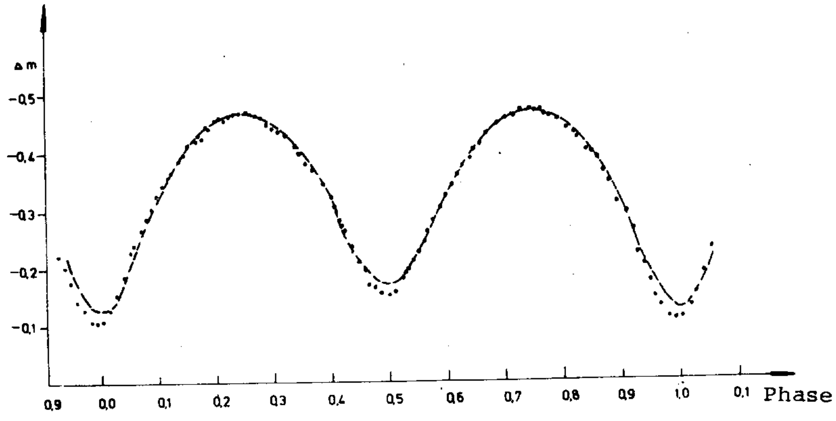
NEW ELEMENTS FOR VW CEPHEI

For the very complex eclipsing binary system VW Cephei new elements, both photometric and geometric, are obtainedusing the method by Wood (1972). Two sets of solutions are presented here: for the observations in yellow by Kwee (1966) and for the observations in 1977-78 obtained with a 50-cm telescope in Bucharest (with a V_{5500} filter).

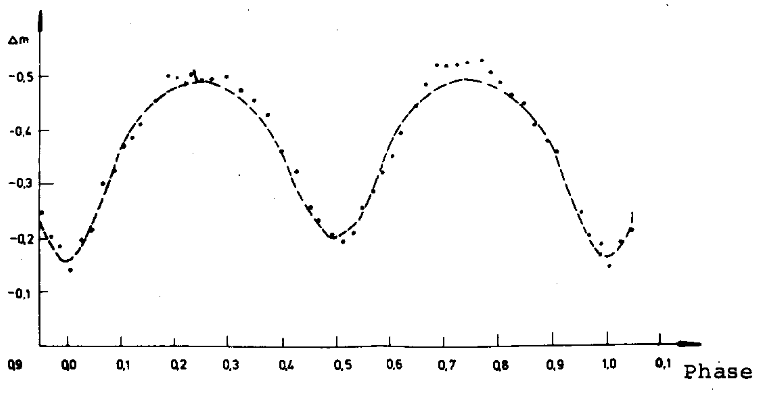
An approximate solution was obtained with a Horak type method. From various variants of models, obtained for different values of limb darkening coefficients and outer contact angle, was chosen the one with the smallest $(O-C)^2$. These elements were improved with the method by Wood, the results being given in Fig. 1 and Fig. 2 and in the Table. The limb darkening coefficients have been fixed $x_1=x_2=1$, since from all the light curves the values of these coefficients resulted greater than those



Table

	Model I	Model II	Model III
		Adjusted parameters	
i	66.6°	68.73°	69.08°
R	0.528	0.598	0.557
r	0.244	0.222	0.232
T_2(eq)	4953°K	4825°K	4920°K
		Auxiliary parameters	
a_1	0.567	0.671	0.611
b_1	0.533	0.605	0.562
c_1	0.483	0.519	0.498
a_2	0.259	0.231	0.243
b_2	0.241	0.220	0.230
c_2	0.233	0.215	0.224
L_1	0.929	0.896	0.899
L_2	0.071	0.103	0.100
$1-\varepsilon_1$	0.955	0.903	0.919
$1-\varepsilon_2$	0.931	0.954	0.947
		Fixed parameters	
T_1(eq)	5500°K	5500°K	5500°K
$\beta_1=\beta_2$	0.25	0.08	0.08
$q=$	0.34	0.34	0.34
$w_1=w_2$	0	0.5	0.5
$n_1=n_2$	5.0	5.0	5.0
$x_1=x_2$	1.0	1.0	1.0

corresponding to the respective spectral classes. In the same time, the mass ratio was considered constant and equal to $q=0.34$ though from the 1977-78 light curve it results $q \sim 0.6$. In Fig. 1 the comparison between theoretical and observed (Kwee) light curves is represented. The theoretical solution (called Model I) corresponds to a radiative atmosphere; a convective atmosphere model (Model II) was also used and the results are slightly different mainly during the secondary minimum, where this theoretical solution is above the radiative solution with about 0.01 magnitude. In Fig. 2 are represented the theoretical and observed light curves for 1977-78 period; a convective atmosphere model was used (Model III). The photometric and geometric elements for the three models are given in Table.



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Center for Astronomy and Space Sciences

References:

Wood, D.B., 1972, Goddard Space Flight Center, X-110-72-473

Kwee, K.K., 1966, BAN, Suppl.Ser., 1,6,245-264

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Budapest
1979 October 16

PERIOD CHANGES OF RT PERSEI

The rediscussion of the period changes of the close binary system RT Persei performed by Frieboes-Conde and Herczeg (1973) seems to be very interesting. They postulated a sudden change of the orbital period occurring somewhere around JD 2419550 (1912). Thus they were able to determine a light-time orbit which was in good agreement with the existent minima.

Now, if we keep up the hypothesis of a third component, it seems necessary to postulate another sudden change in the orbital period occurring somewhere around JD 2435433 (1956). That is why, in order to build up the corresponding O-C diagram, the following formulae are to be used:

Min.hel. = JD 2419550.251 + $0\overset{d}{.}8494135 \cdot E$ $t<1912$
Min.hel. = JD 2419550.251 + $0.8494061 \cdot E$ $1912<t\leq 1956$
Min.hel. = JD 2435433.296 + $0.8494033 \cdot E'$ $t>1956$

As is known, RT Persei is a semi-detached close binary system and the "observed" sudden period changes could be considered as real facts. In such cases the evaluation of the periodic variation caused by the presence of a third body will be very difficult. We have tried to do that and the following empirical formulae have been established:

$(O-C)_c = 0\overset{d}{.}017 \sin(0\overset{\circ}{.}0195E+81^\circ) + 0\overset{d}{.}0022 \sin 2(0\overset{\circ}{.}0195E+73^\circ)$, $t<1956$
$(O-C)_c = 0.017 \sin(0.0195E'+85) + 0.0022 \sin 2(0.0195E'+77)$, $t>1956$

If the second postulated sudden change in the orbital period was a real one, the corresponding light-time orbit would be characterized by the following constants:

$P' = 43$ years, $a' \sin i' = 3.04$ a.u.
$e' = 0.26$ $t_0 = $ JD 2432459
$\omega = 17^\circ$ $m_3 = 0.5\, m_\odot$.

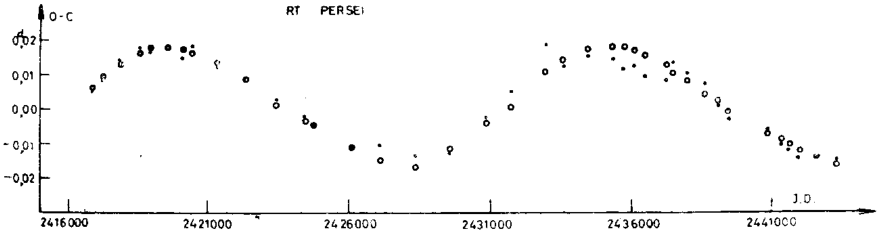

Fig. 1

● observations
○ computations

As we can see in Figure 1, new series of observed minima are required in order to see if there is a satisfactory agreement between "observed" and computed O-C differences, and to prove if the two postulated sudden changes in the orbital period are or are not real.

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Reference:

Frieboes-Conde, H., and Herczeg, T., 1973, Astron. Astrophys. Suppl. 12, 1-78

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Budapest
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NEW ELEMENTS FOR AP LEONIS

The eclipsing binary AP Leonis was discovered by Strohmeier and Knigge (1961) and was observed by H.Mauder (1967) during the years 1966-67 and the photometric and geometric elements were determined.

In 1978 and 1979 we have observed AP Leonis through B and V-filters with 50-cm telescope of Bucharest Observatory. Using the observations in B obtained in 1978, the photometric and geometric elements have been calculated; the approximate solution resulted from a Horak-type model (1970), while the improved solution was obtained with a Wood model (1972). It was confirmed that an annular type of eclipse occurs at primary minimum and a total type eclipse during the secondary minimum. The results are given in Table and in Fig. 1 where the observations (normal points) are represented by crosses.

Table

Adjusted parameters

$i = 83.131 \pm 0.01$

$r_1 = 0.5866 \pm 0.04$

$k = 0.534 \pm 0.03$

$T_2(\mathrm{eq}) = 6161 \pm 217^{\circ}\mathrm{K}$

Fixed parameters

$T_1(\mathrm{eq}) = 6000^{\circ}\mathrm{K}$

$q = 0.211$

$\beta_1 = \beta_2 = 0.25$

$x_1 = x_2 = 0.6$

$w_1 = w_2 = 0$

$n_1 = n_2 = 5.0$

Auxiliary parameters

$a_1 = 0.6355$	$a_2 = 0.3395$
$b_1 = 0.5980$	$b_2 = 0.2851$
$c_1 = 0.5263$	$c_2 = 0.2631$
$T_1(\mathrm{pol}) = 6608^{\circ}\mathrm{K}$	$T_2 = (\mathrm{pol}) = 6586^{\circ}\mathrm{K}$
$L_1(\mathrm{app}) = 0.862$	$L_2(\mathrm{app}) = 0.215$
$L_1(\mathrm{norm}) = 0.800$	$L_2(\mathrm{norm}) = 0.200$

The coefficients x_1, x_2 and the temperature T_1 correspond to the spectral classes dG0 + G2 of the stars. The mass ratio was fixed at the value obtained in a first approximation. Six iterations were necessary for the convergence of the solution with the model by Wood.

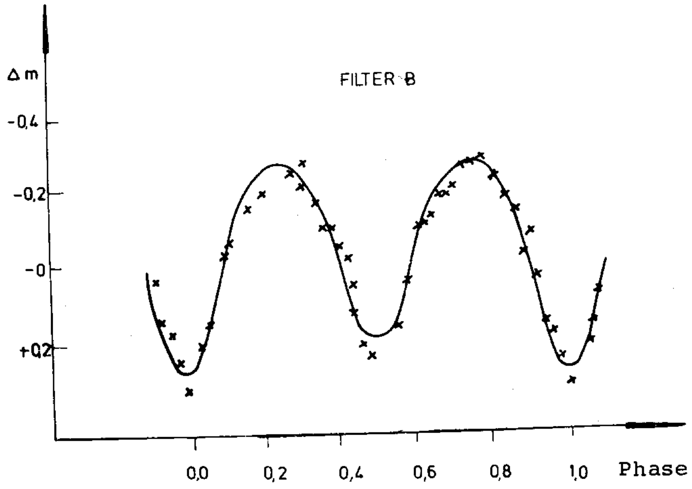

Figure 1

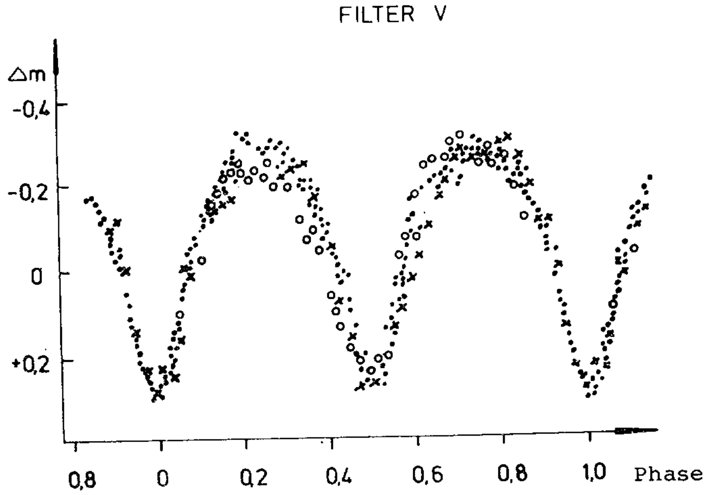

Figure 2

Comparing our observations with those by Mauder (Fig.2 where points are Mauder's observations, while circles and crosses are ours) one can see a change in the secondary maximum. The difference in magnitude between the values obtained in 1966-67 and 1978-79 is about 0.06.

The work concerning the interpretations of the observations in V filter is in progress as well as new improvements of model. More observations are needed in the future in order to determine more precisely the features of the light curve and the physical conditions in the system.

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References:

Horak, T.B., 1970, A.J. 75,10,1116
Mauder, H., 1967 Ver.Bamberg, VII, No.61
Strohmeier, W., Knigge, R., 1961, AN, 286, 133
Wood, D.B.,1972 , Goddard Space Flight Center, X-110-72-473

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Konkoly Observatory
Budapest
1979 October 17

THE LIGHT VARIATIONS OF BINARY Be STAR HD 187399

In the course of systematic UBV photoelectric photometry of selected Be stars, HD 187399 (MWC 321, V 1507 Cyg) was measured at the Hvar Observatory during 38 nights in 1976, 1977 and 1978.

Merrill (1949) found this star to be a spectroscopic binary and computed its elements. Already, the star was known as an emission-line object (Merrill et al., 1925; Swings and Struve, 1943). Hutchings and Laskarides (1972) classified it as a B8 III star. From high-quality coude spectrograms Hutchings and Redman (1973) redetermined its orbital elements and found that they have remained constant over some 30 years. They concluded that it seems unlikely that the velocity variations are the result of temporary shell effects in an unstable envelope, and that the star is almost certainly a binary. However, the second absorption system and the emission lines indicate that there is gas streaming and mass loss of some kind. They also suggested that the primary fills its Roche lobe and loses mass at periastron, while the secondary appears to be more massive and observationally undetectable. The possibility of its being a black hole is also discussed in their paper.

HD 187399 has a very complex light-curve as was found by Hill et al. (1976). Their measurements were done in the DAO system. Hutchings (1974) was able to reproduce some of the observed features in the light-curve using a single-star model with the parameter, T_{eff} = 16000 K and R_p varying from 0.61 to 1.00 of the Roche limiting value.

Observations reported in this communication were carried out at the Hvar Observatory using a 65-cm reflector. Methods of observational and reduction techniques have been described in detail by Harmanec et al. (1977). For each observing season, carefully checked colour transformation coefficients were used according to Pavlovski et al. (1979). So, all measurements were transformed to the international UBV system. The comparison star HD 188170 was used in 1976 while during the other two observing seasons this star served as a check and HD 186357 was used as a comparison. Accepted UBV magnitudes for these stars obtained from our UBV photometry relative to standard stars are as follows:

Star	V	B-V	U-B
HD 186357	6.506	0.325	0.114
HD 188170	7.319	- 0.082	- 0.377

The values for HD 188170 were derived differentially relative to HD 188170. All measurements are given in Table I. Cycles and phases are computed according to a spectroscopic ephemeris

$$T_{\mathrm{periastr.passage}} = \mathrm{JD}\ 2432465.98+27\overset{d}{.}9705\times E$$

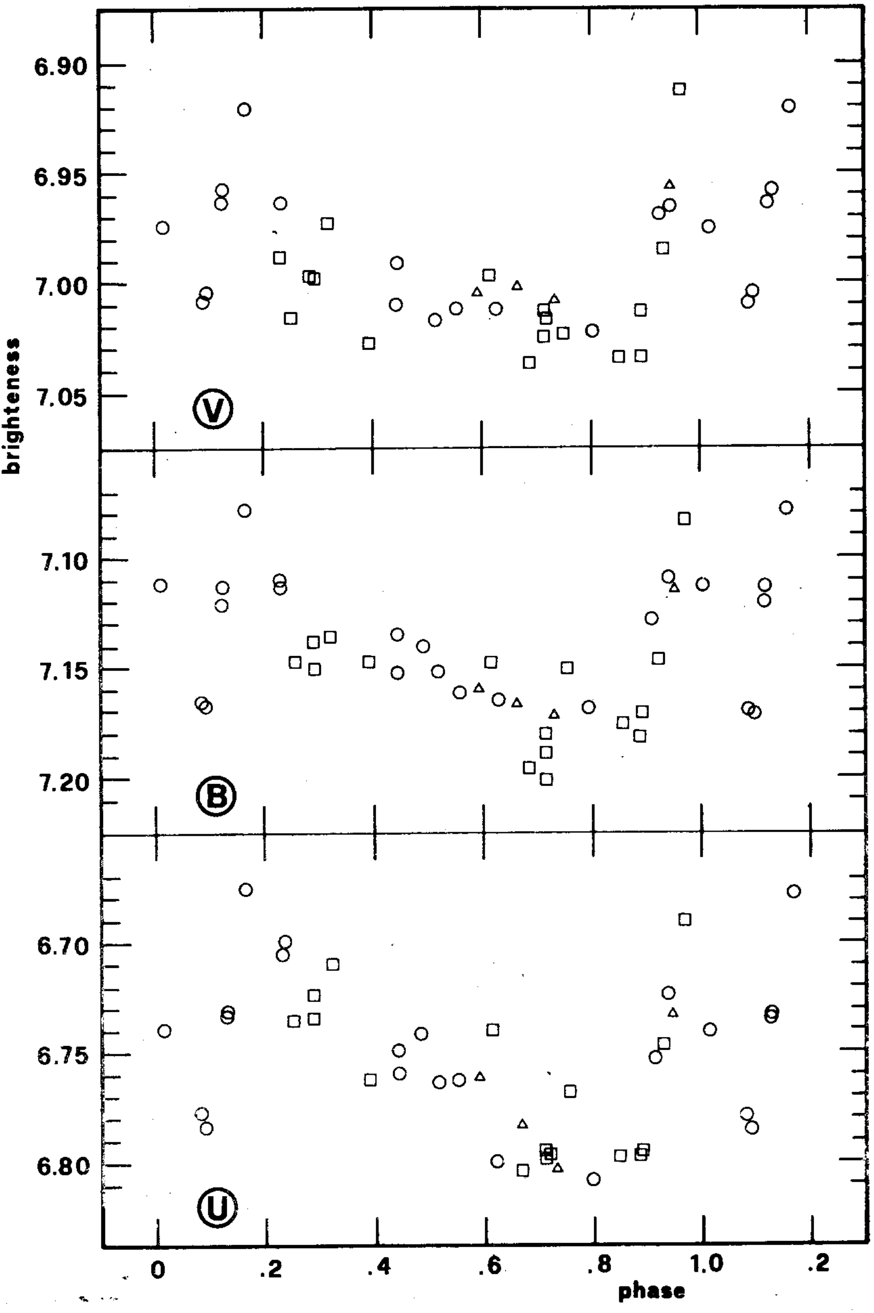
derived by Hutchings and Redman (1973).

V, B and U observations are illustrated in Fig. 1. A peculiar light-curve shape similar to light variations of eclipsing binaries and its small amplitudes are seen. The behaviour of light variations in different spectral bands is very similar. We also note that during our observational runs, which span over 3 years, the light curves have remained stable, as was also noted previously by Hill et al. (1976). Our light curve quite well reproduces peculiarities found by Hill et al. The only other existing UBV values for HD 187399 are those of Haupt and Schroll (1974), from their photometric survey of shell stars. They found V=6.99, B-V=0.18 and U-B=-0.46. The date of their observations is unknown, so that their phase cannot be computed and directly compared with our measurements. Generally, V magnitude is in agreement with our values. Most probably, the large difference between indices is due to the fact that Haupt and Schroll used another comparison star, not due to real long-term variations.

As Kříž and Harmanec (1975) and Harmanec and Kříž (1976), we believe that this system presents a steady-state mass transfer of case B mass-exchanging systems. Most probably, a mass-losing star dominates the spectrum. The gas stream between the stars is dense enough to produce continuous absorption by Thomson scattering. Therefore we observe a broad minimum in the light curve

Table I

2 400 000^d+	Cycles and phase	V	B-V	U-B	N
43024.370	377.483	7.026	0.160	-0.391	6
43027.370	377.590	7.004	0.157	-0.399	8
43029.368	377.662	7.001	0.165	-0.385	8
43031.342	377.732	7.009	0.161	-0.367	12
43037.291	377.945	6.955	0.156	-0.376	4
43326.543	388.286	6.997	0.153	-0.426	3
43327.488	388.320	6.972	0.163	-0.426	6
43337.491	388.678	7.037	0.162	-0.390	4
43338.442	388.712	7.025	0.154	-0.382	5
43366.431	389.712	7.012	0.168	-0.388	5
43371.413	389.891	7.013	0.168	-0.383	5
43372.429	389.927	6.982	0.164	-0.400	5
43373.404	389.962	6.911	0.164	-0.388	5
43381.345	390.246	7.018	0.131	-0.410	5
43382.415	390.284	6.997	0.138	-0.404	5
43385.376	390.390	7.028	0.118	-0.381	5
43391.406	390.605	6.997	0.147	-0.410	5
43394.393	390.712	7.019	0.181	-0.405	5
43395.417	390.749	7.023	0.126	-0.384	5
43398.303	390.852	7.034	0.143	-0.380	5
43399.357	390.890	7.034	0.139	-0.380	5
43710.473	402.013	6.974	0.137	-0.372	4
43712.454	402.083	7.009	0.155	-0.389	3
43713.466	402.120	6.961	0.150	-0.381	5
43716.462	402.227	6.971	0.138	-0.408	5
43722.471	402.442	6.989	0.144	-0.385	5
43723.509	402.479	6.973	0.165	-0.401	5
43724.459	402.513	7.017	0.136	-0.389	4
43725.443	402.548	7.011	0.150	-0.399	5
43735.456	402.906	6.968	0.158	-0.374	5
43736.405	402.940	6.964	0.145	-0.387	5
43740.483	403.086	7.004	0.166	-0.386	5
43741.470	403.121	6.958	0.163	-0.387	5
43742.449	403.156	6.920	0.156	-0.397	5
43744.398	403.225	6.962	0.151	-0.406	5
43750.427	403.441	7.013	0.138	-0.388	5
43755.385	403.618	7.012	0.152	-0.364	5
43760.371	403.797	7.021	0.144	-0.357	7


6.90
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phase

of the system in, or shortly after, the elongation with the mass-losing component approaching (phase around 0.8). Such a minimum is also wavelength-independent because of non-selective electron-scattering. The above discussion is qualitative only and a more quantitative and detailed study of such an important and interesting system is needed in the future.

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References:

Harmanec, P.,Grygar,J.,Horn,J.,Koubský,P.,Kříž,S.,Žďárský,F., Mayer, P., Ivanović, Z., Pavlovski, K.,1977, Bull. Astron.Inst.Czech, 28. 133
Harmanec, P.,Kříž,S. (1976). In "Be and Shell Stars" (Ed.A. Slettebak), D.Reidel,Dordrecht, p.385.
Haupt, H.F., Schroll, A. (1974).Astron.Astrophys.Suppl. 15, 311
Hill, G., Hilditch, R.W., Pfannenschmidt, E.L. (1976). Publ. Dominion Astrophys. Obs. 15, 1
Hutchings, J.B. (1974),Astrophys.J. 188, 341
Hutchings, J.B., Laskarides, P.G.(1972), Monthly Notices Roy. Astron.Soc. 155, 357
Hutchings, J.B., Redman, R.O. (1973), Monthly Notices Roy,Astron. Soc. 163, 209
Kříž, S., Harmanec, P. (1975), Bull.Astron.Inst.Czech. 26,65
Merrill, P.W. (1949). Astrophys.J. 110, 59
Merrill, P.W.,Humason, M.L., Burwell, C.G. (1925), Astrophys.J. 61, 389
Pavlovski, K., Harmanec, P., Grygar, J., Horn, J., Koubský, P., Žďárský, F., Kříž, S. (1979), Hvar Obs.Bull. No.3
Swings, P., Struve, O. (1943). Astrophys. J. 97, 194

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INFORMATION BULLETIN ON VARIABLE STARS
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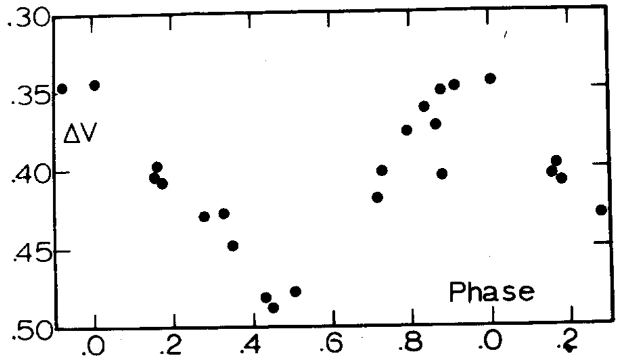
CONFIRMATION OF SUSPECTED VARIABILITY IN HD 86590

Our attention was drawn to HD 86590 by Bolton (1978ab), who pointed out that it is a short-period SB1 and that its light curve might show an RS CVn-type (= BY Dra-type) photometric wave and possibly also an eclipse. Therefore we obtained differential photoelectric photometry at two observatories in early 1979.

There are published accounts of some earlier photoelectric photometry. Table VII of Eggen (1964) gives $V_E = 7^m.75$, $B-V = +0^m.88$, and $U-B = +0^m.43$. Eggen (1978) explains that his February and May 1963 observations showed a range of $0^m.08$ in V, that two observations in March 1978 gave $V = 7^m.75$, and that the "visual magnitude" was $7^m.90$ on 2 April 1978. Table II of Argue (1966), however, gives very different magnitudes and color indices: $V = 8^m.45$, $B-V = +1^m.02$, and $U-B = +0^m.76$.

At Dyer Observatory the 24-inch (60 cm) reflector was used to obtain 34 two-color (BV) observations on 11 nights between JD 2,443,944.7 and 2,440,002.7; details are given by Vaucher (1979). At the other observatory the 11-inch (28 cm) reflector was used to obtain 18 one-color (V) observations on 6 nights between JD 2,443,951.7 and 2,443,987.7. Nightly means are plotted in the Figure versus



the spectroscopically determined orbital period of P = $1\overset{d}{.}0703544$ of Bolton (1978ab). The magnitudes ΔV are differential with respect to the comparison star HD 86857 and have been corrected for atmospheric extinction and transformed to the UBV system. The rms deviation of 16 differential observations of the check star HD 86818 with respect to our comparison star on 8 nights was only ± $0\overset{m}{.}007$.

HD 86590 is clearly variable. The light curve is nearly sinusoidal, with a full amplitude of $0\overset{m}{.}14$ in V. Such an amplitude is nicely consistent with the $0\overset{m}{.}15$ range indicated by Eggen's observations in 1978, assuming they were made on the same photometric system, i.e., both V or both V_E. It would be interesting to see if the 1963 observations of Eggen, which showed a range of $0\overset{m}{.}08$, give a light curve similar to ours when plotted with respect to the same orbital period. Zero phase in our figure is arbitrary, but an epoch of minimum light is JD 2,443,969.85.

The one errant point at ΔV = $0\overset{m}{.}40$ around phase $0\overset{P}{.}875$ made us at least consider the possibility of an eclipse but, even though there was no reason at all to suspect the accuracy of that point (which is a mean of three individual observations, each one bracketed by two comparison star measures), we are very reluctant to conclude we have observed an eclipse which, if real, must have been very shallow and extremely brief. Nevertheless, the question of eclipses remains open because there are larger unobserved phase intervals in which an eclipse could be hiding.

We are continuing photometry of this interesting binary, to search for possible eclipses and to establish how closely the photometric period coincides with the orbital period.

Our appreciation goes to Dr. C. T. Bolton for the help he provided by private correspondence.

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References:

Argue, A. N. 1966, M.N.R.A.S. 133, 475.

Bolton, C. T. 1978a, private communication on 4 April 1978.

Bolton, C. T. 1978b, I.A.U. Commission 42 Working Group on RS CVn Binaries, Circular No. 10.

Eggen, O. J. 1964, A.J. 69, 570.

Eggen, O. J. 1978, I.A.U. Commission 27, Inf. Bull. Var. Stars,No. 1426.

Vaucher, C. A. 1979, Master's Thesis, Vanderbilt University, Nashville, Tennessee.

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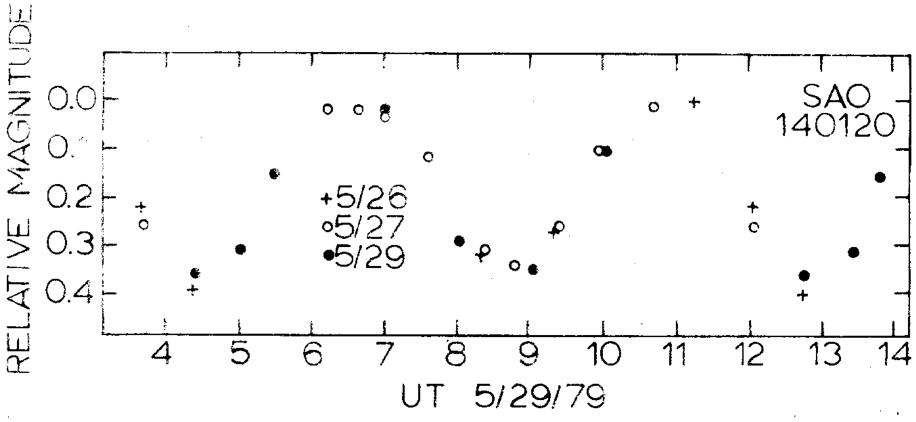
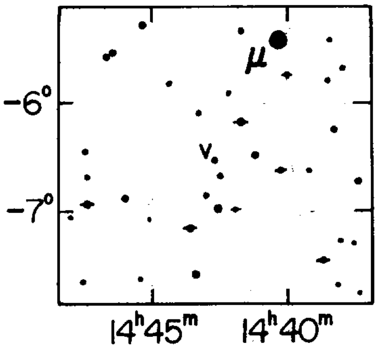
A PROBABLE ECLIPSING VARIABLE IN VIRGO

The star SAO 140120, not previously reported as variable, was observed photoelectrically on 26, 27 and 29 May, 1979 with the 61 cm reflector at the Table Mountain Observatory. A composite lightcurve from those observations is shown in Figure 1. The period derived from the observations is 8^h20^m with an amplitude of ∿ 0.4 magnitude. The observations are not corrected for light time.



The star is listed as $m_V = 7.8$ and spectral class G0 in the SAO catalog. The 1950 coordinates are $\alpha = 14^h42^m42^s$ and $\delta = -6^\circ31'30''$. A finding chart including all stars to $m_V \approx 9.5$ is given in Figure 2, with 1950 coordinates indicated. The 4th magnitude star μ Vir is about 1° away from the variable.



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PHOTOELECTRIC OBSERVATIONS OF WW DRA

The RS CVn-type eclipsing binary WW Dra (=HD150708A=BD+60°1691A=ADS 10152A) is the brighter component of the visual binary ADS 10152. Joy (1941) and Popper (1967) derived spectroscopic elements, whereas Plaut (1940) obtained a photographic lightcurve. Eggen (1963) measured the UBV magnitudes of WW Dra and of its visual companion; but no photoelectric lightcurve is as yet available in the literature.

Photoelectric observations of WW Dra were made by us on 7 nights in 1975 with the 50 cm Newtonian telescope of the Astronomical Observatory of Trieste and on 20 nights in 1976 with the 30 cm Cassegrain telescope of the same Observatory. Both telescopes were equipped with a photoelectric photometer bearing filters very close to the B and V standard system. BD+61°1595 was used as comparison star and was connected with the check stars BD+58°1645, BD+60°1682, BD+61°1600, and BD+63°1281. ADS 10152B, distant about 18" from the eclipsing pair, was always measured together with WW Dra. Our measures were not transformed to the B and V standard magnitudes, though they are expected to be close to them. The extra-atmospheric magnitude differences (variable minus comparison) were obtained by applying the extinction corrections.

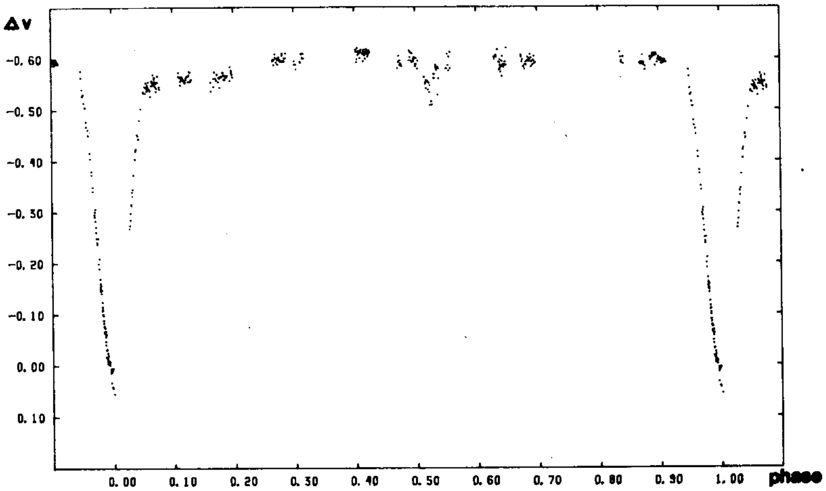

Figure 1

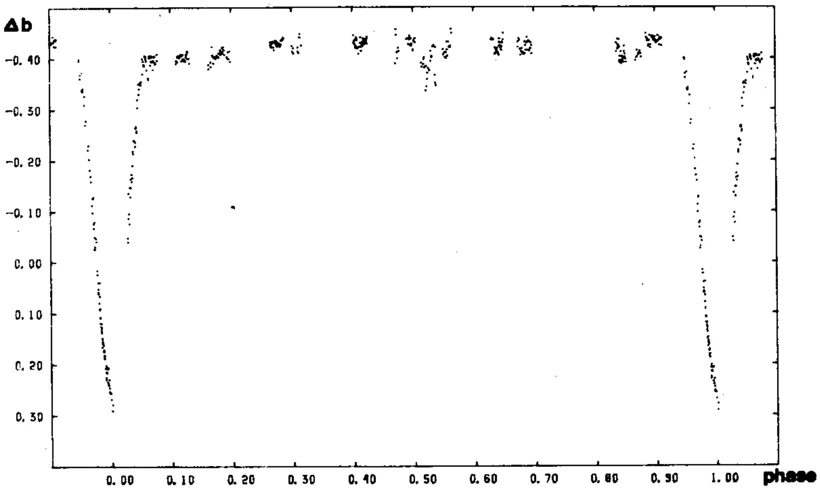

Figure 2

Figs. 1 and 2 show our yellow (Δv) and blue (Δb) observations (obtained in 1976), phased by means of Plaut's (1940) ephemeris.

Though coverage of the lightcurves of WW Dra at various phases is not very good, some general characteristics may be pointed out. The lightcurves characterized by two minima of quite unequal depth, show cycle-to-cycle intrinsic variations and appreciable asymmetry in the maxima. These photometric disturbances are common to the RS CVn-type binaries. The position of the ascending and descending branches of the primary eclipse shows a small displacement of the minimum from phase zero (about 0.03 in phase units). The secondary eclipse, though poorly delineated, seems to be displaced from phase 0.5 by a larger phase shift. An attempt at searching for a photometric solution of our data will be presented in a forthcoming paper.

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References:
Eggen, O.J., 1963, Astron.J. 68, 483.
Joy, A.H., 1941, Astrophys.J. 94, 407.
Plaut, L., 1940, Bull.Astron.Inst.Neth. 9, 121.
Popper, D.M., 1967, Astron.J. 72, 316.

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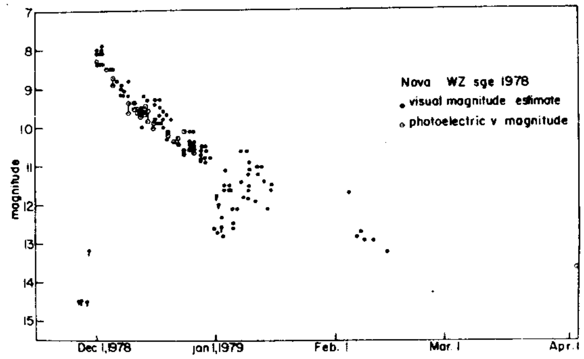
THE DEVELOPMENT OF THE 1978 OUTBURST OF WZ SAGITTAE

The December 1978 outburst of the recurrent nova WZ Sge was followed spectroscopically and photometrically at the Wise Observatory. However the entire light curve of the present outburst has not been published. In the Figure we display the curve for the first 4 months after the eruption. Most of the points have been reported by various observers in the I.A.U. Circulars and the I.B.V.S. Bulletins. A few points have been communicated directly to the author, while some represent measurements obtained with the Wise Observatory 40" reflector.



The light curve of the present outburst should be compared with those displayed after the 1913 and the 1946 eruptions (Mayall, 1946). In the table we compare the main characteristics of the outbursts, those of the previous events calculated from the plots in Mayall's paper. The range Δm was calculated assuming that at minimum the object's magnitude is 14.5.

Table: Outburst Characteristics of WZ Sge

Year	m_{Max}	Δm	t_3
1913	7.0	7.5	23^d
1946	7.7	6.8	21
1978	7.9	6.6	31

The 1978 gross photometric behaviour of WZ Sge was similar to that displayed in 1913 and 1946, namely that of a moderately fast nova. But the present eruption differs in one conspicuous detail from the previous ones. Near Jan 1.0, 1979 a sudden light drop of about 2 magnitudes occurred for about one day. This drop was followed by a one day recovery with a subsequent, shallower drop, also of about one day duration. In the next few days the magnitude variations of the object were apparently more pronounced than during the first month of the outburst. The subsequent development of the nova was characterized by a slow return to the quiet state.

Thus Jan. 1, 1979, the onset of the oscillatory behaviour, is revealed to be another important date in the recent history of WZ Sge, along with Dec. 1, 1978, the date of the outburst (Patterson, 1978), and Dec. 9 or 10, 1978, when the photometric period apparently increased by 0.8 min. (Targan, 1979; Bohusz and Udalski, 1979).

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References:

Bohusz, E., Udalski, A., 1979, I.B.V.S., No. 1583

Mayall, M.W., 1946, Harvard Bull. 918, 3

Patterson, J., 1978, I.A.U. Circular No. 3311

Targan, D., 1979, I.B.V.S., No. 1539

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PHOTOELECTRIC TIMES OF MINIMA FOR SELECTED ECLIPSING BINARIES AND UPDATED EPHEMERIDES

The following times of minima are derived from photoelectric V-filter observations during August-September of 1979 with the 40-cm reflector of the University of Montana. The observing procedure was identical to that described in IBVS No. 1478 (Margrave et al., 1978).

Each time of primary minimum in Table 1 was determined by the least-squares fitting of a parabola to the observations. Table 1 lists the heliocentric Julian Date for each primary minimum observed, the epoch number E, the O-C value, and N, the number of observations used in the determination (each observation is the average of three 10-second integrations). The ephemerides used to calculate the O-C values are given in Table 2.

Table 1. Heliocentric Times of Primary Minima

Star	Hel. JD - 2,440,000	E	O-C	N
KO Aql	4135.7568	785	$+0\overset{d}{.}0218$	36
RZ Cas	4096.7410	11,898	-0.0016	33
	4121.8392	11,919	-0.0036	52
	4127.8151	11,924	-0.0039	45
TV Cas	4094.9219	580	-0.0164	53
	4114.8601	591	-0.0169	70
TW Cas	4110.8729	1,472	-0.0109	32
	4123.7296	1,481	-0.0092	32
	4130.8694	1,486	-0.0110	42

Table 1. Heliocentric Times of Primary Minima (continued)

Star	Hel. JD - 2,440,000	E	O–C	N
DO Cas	4095.7981	14,853	-0.0026	66
XX Cep	4133.9256	2,495	+0.0162	52
AT Peg	4089.8201	3,186	-0.0534	76
	4128.7853	3,220	-0.0558	51
	4136.8079	3,227	-0.0559	32

Table 2. Ephemerides for Program Stars

Star	Hel. JD	Period (days)	Source
KO Aql	2,441,887.4714	2.86403	SAC 49
RZ Cas	2,429,875.6902	1.1952473	Herczeg and Friboes-Conde
TV Cas	2,443,043.6265	1.8126066	SAC 50
TW Cas	2,442,008.3850	1.428328	SAC 50
DO Cas	2,433,926.4573	0.68466595	SAC 50
XX Cep	2,438,302.3209	2.33731	SAC 50
AT Peg	2,440,438.383	1.146105	SAC 50

The residual of KO Aql has increased steadily since August 1975. A linear fit to the epoch given in SAC 50, the IBVS No. 1478 minimum, and that of this note yields

$$\text{Hel. JD (Min)} = 2{,}441{,}887.4733 + 2\overset{d}{.}864055 \cdot E,$$

which fits these minima with residuals of $-0\overset{d}{.}0019$, $+0\overset{d}{.}0001$, and $+0\overset{d}{.}0003$, respectively. Thus it appears that there has been an increase of $2\overset{d}{.}5 \times 10^{-5}$ in the period of KO Aql since 1973.

The residual behavior of RZ Cas will be discussed elsewhere, insofar as it is linked to the question of sudden period changes versus light travel time effects (Doolittle, 1976).

The provisional new ephemeris for TV Cas given by Margrave (1979) has been revised to include the minima of this note, with the following result:

$$\text{Hel. JD (Min)} = 2{,}441{,}595.3598 + 1^{d}.8125898\cdot E.$$

This ephemeris gives residuals less than $\pm 0^{d}.0015$ (except for one in 1978 of $-0^{d}.0035$) for observations back to 1972. The above result reflects a decrease by $1^{d}.68 \times 10^{-5}$, or 1.45 seconds, relative to the period given in SAC 50.

The residuals for TW Cas have generally become more negative since 1975, with primary eclipses now occurring about 15 minutes early. The epoch in SAC 50, the minima of IBVS Nos. 1478 and 1631, and those of this note yield the following linear ephemeris:

$$\text{Hel. JD (Min)} = 2{,}442{,}008.3856 + 1^{d}.4283216\cdot E.$$

The mean residual for the least-squares fit is $0^{d}.0026$. The new period reflects a decrease of $6^{d}.4 \times 10^{-6}$ with respect to the SAC 50 value.

The residual for XX Cep given here continues the trend to later eclipse occurrences evident in 1975 (Margrave et al., 1978). Increasing the SAC 50 period to $2^{d}.3373158$ reduces the residual of this note to $+0^{d}.0018$ and may perhaps be used for more accurate prediction over the next couple of years.

The situation of AT Peg presently appears to involve a continuous period decrease at the rather large rate of 19.3 seconds per century, with primary minima being predictable by the following revised quadratic ephemeris:

$$\text{Hel. JD (Min)} = 2{,}440{,}407.4368 + 1\overset{d}{.}14611077 \cdot E - 7.0158 \times 10^{-9} \cdot E^2.$$

This ephemeris fits the observations from 1969 to the present with a mean residual of $0\overset{d}{.}0026$. The epoch number for the last minimum of AT Peg in Table 1 is E = 3254 for the quadratic ephemeris. Continued timing of this system is necessary to determine the duration of the present stage of continuous period decrease.

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References:

Doolittle, J.: Master's Thesis, Univ. of Montana, 1976.

Ebersberger, J., Pohl, E., and Kizilirmak, A.: IBVS No. 1449, 1978.

Herczeg, T. and Friboes-Conde, H.: Astr. and Ap., 30, 259, 1974.

Kizilirmak, A. and Pohl, E.: IBVS No. 937, 1974.

Kordylewski, K.: Supplemento ad Annuario Cracoviense No. 49, Krakow 1978.

Margrave, T. et al.: IBVS No. 1478, 1978.

Margrave, T.: IBVS No. 1631, 1979.

Pohl, E. and Kizilirmak, A.: IBVS No. 1163, 1976.

Rudnicki, K.: Supplemento ad Annuario Cracoviense No. 50, Krakow 1978.

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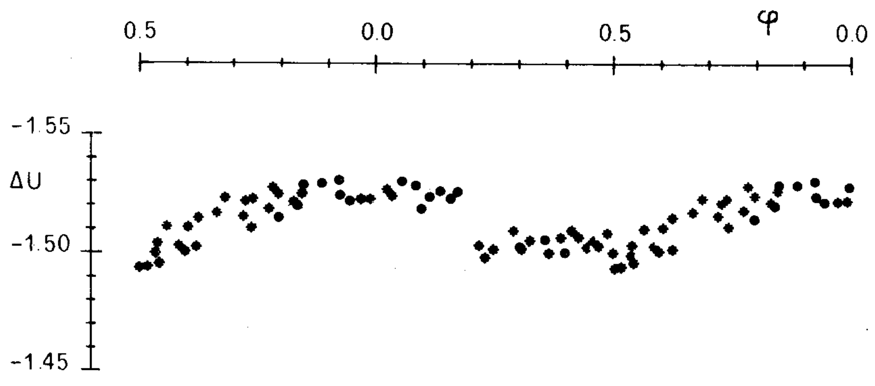
1979 October 23

LIGHT VARIATIONS OF THE Ap STAR HD 164429

The light variability of the B9p-SiSr star HD 164429 = BS 6718 has been ascertained by Winzer (1974) who found a period of $0^{\mathrm{d}}.51747$, one of the shortest known for the Ap stars. The magnitude and colours of HD 164429 in the UBV system, as given by Cowley et al. (1969), are V = 6.44, B-V = -0.06 and U-B = -0.17.

Photoelectric observations of HD 164429 have been carried out at the Catania Astrophysical Observatory in 1978 and 1979 with the 91 cm Cassegrain telescope equipped with an unrefrigerated EMI6256 S photomultiplier feeding a single channel pulse-counter.

The observations have been performed in our natural system (λ_{eq}^{U}= 3500±300 Å, λ_{eq}^{B}= 4370±450 Å, λ_{eq}^{V}= 5440±300 Å) using HD 164898 (A0) as comparison star since it is only 31′ far, and four other stars of various spectral types and colours as standards for the reduction to the UBV system. Among these standards we observed the Winzer's comparison star HD 165358 = BS 6753 (A2V).



From the first analysis of our observations the period found by Winzer (1974) is confirmed, since we obtain a slightly improved value of $0\overset{d}{.}517436$. In Fig. 1 the magnitude differences HD 164429 - HD 164898 in the U light are plotted versus the phase computed by the elements:

$$JD_{\odot}\ (\text{U light max}) = 2441450.86 \pm 0\overset{d}{.}517436\cdot E.$$

Dots and crosses refer to the 1978 and 1979 observations, respectively; each point is an average of thirty single measurements. The amplitude and the shape of our light curve are in good agreement with the Winzer's one.

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References:

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

Winzer J., 1974, PhD. Thesis, University of Toronto

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Konkoly Observatory
Budapest
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FLARE STARS OBSERVATIONS IN THE PLEIADES - REGION

Three new flare stars and seven new outbursts of already known Pleiades - region flare stars were discovered during 19^h33^m effective observational time on the plates obtained with the 60/90/180 cm Schmidt-telescope at Konkoly Observatory.

The observations were made on Kodak 103aO emulsion using Schott UG 2 filter. In most cases we have 6 - each 10 minutes long - exposures on every plate.

In Table I the first column gives the serial number for the new flare star found, columns two and three the approximate coordinates for 1900.0, in the fourth column we give the approximate photographic magnitude at minimum light, column five presents the observed amplitude of the flare in U-band and column six the date of the flare-up.

Table I

No.	R.A.	D.	m_u	Δm_u	Date
1	3^h38^m	$22^\circ15.7'$	>20.5	>4.4	04.11.1978
2	3 39.7	24 32	~20.0	>3.9	08.11.1978
3	3 41.8	24 28.7	~20.0	>5.8	05.11.1978

The data for the observed flare-ups of the known flare stars are presented in Table II. We have used the Byurakan designation and the Hertzsprung numbers are also given.

Table II

No.	H II	R.A.	D.	m_u	Δm_u	Date
19	1531	$3^h41^m.7$	$23^\circ40'$	15.7	3.3	04.11.1978
55	2411	3 43.7	24 01	16.9	1.8	03.11.1978
55	2411	3 43.7	24 01	16.9	1.9	08.11.1978
61		3 48.1	23 03	16.8	0.9	03.11.1978
82		3 41.5	24 13.3	18.3	3.3	04.11.1978
103		3 36.9	23 08	17.7	1.2	08.11.1978
119		3 37.8	23 25	>20.0	>6.4	24.11.1978

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Budapest
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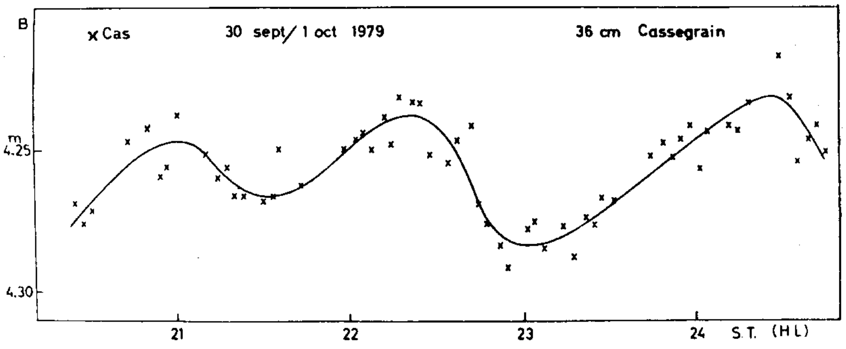
SPECTROSCOPIC AND PHOTOMETRIC VARIATION OF κ Cas

Although J.F. Heard (1949, Ap.J.109) did not find any periodic variation in the observed radial velocities of κ Cas (B1 Ia), we have reexamined his observations.

From this, by means of Fourier transform and a least squares sine curve, it appeared that the observations could be fairly well interpreted as periodic variable with a period equal to

$$P_{RV} = 0\overset{d}{.}14035$$

Therefore, we have observed κ Cas during several nights at the Hoher List Observatory, with the 36 cm Cassegrain photometric telescope. After a few hours of continuous observation it became clear that κ Cas is really variable, but with a period which differs remarkably from P_{RV} (Figure 1).



From the photometric investigation we have deduced the following value for the B-light periodic variation:

$$P_{\text{photom.}} = 0\overset{d}{.}09028 \ (\pm 0.00001)$$

κ Cas shows strong modulation features, which could explain why radial velocities (and photometric observations) from different epochs are hard to reconcile on the basis of a mean period.

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ON THE VARIABILITY OF THE SUSPECTED BETA CEPHEI STARS V351, V356, V357 Per

Hill (1967) has listed a number of suspected Beta Cephei stars. Out of these the stars V351 Per (HD 13051), V356 Per (BD 56°473) and V357 Per (HD 13866) were put on our observing programme, in order to determine their variability.

These stars were observed on a total of five nights between October 1978 to December 1978, on the 104-cm telescope of the Uttar Pradesh State Observatory, Naini Tal, using EMI 6094S photomultiplier tube cooled to -20°C and B filter of the Johnson and Morgan system. The star HD 12994 was used as a comparison star. The magnitudes were corrected for atmospheric extinction using nightly extinction coefficients. The differential magnitudes (Comparison-Variable) of V351, V356, V357 Per have been plotted against J.D. (Hel.) in Figs. 1,2 and 3, respectively.

From Figs. 1, 2 and 3 it is clear that none of the three stars show any systematic variation. The B magnitude of these stars are constant within $\pm 0\overset{m}{.}01$ which can be attributed to observational scatter. Therefore, we conclude that the stars V351 Per, V356 Per and V357 Per are not Beta Cephei variables.

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Reference:
Hill, G. 1967, Astrophys. J. Suppl. Ser. 14, 263

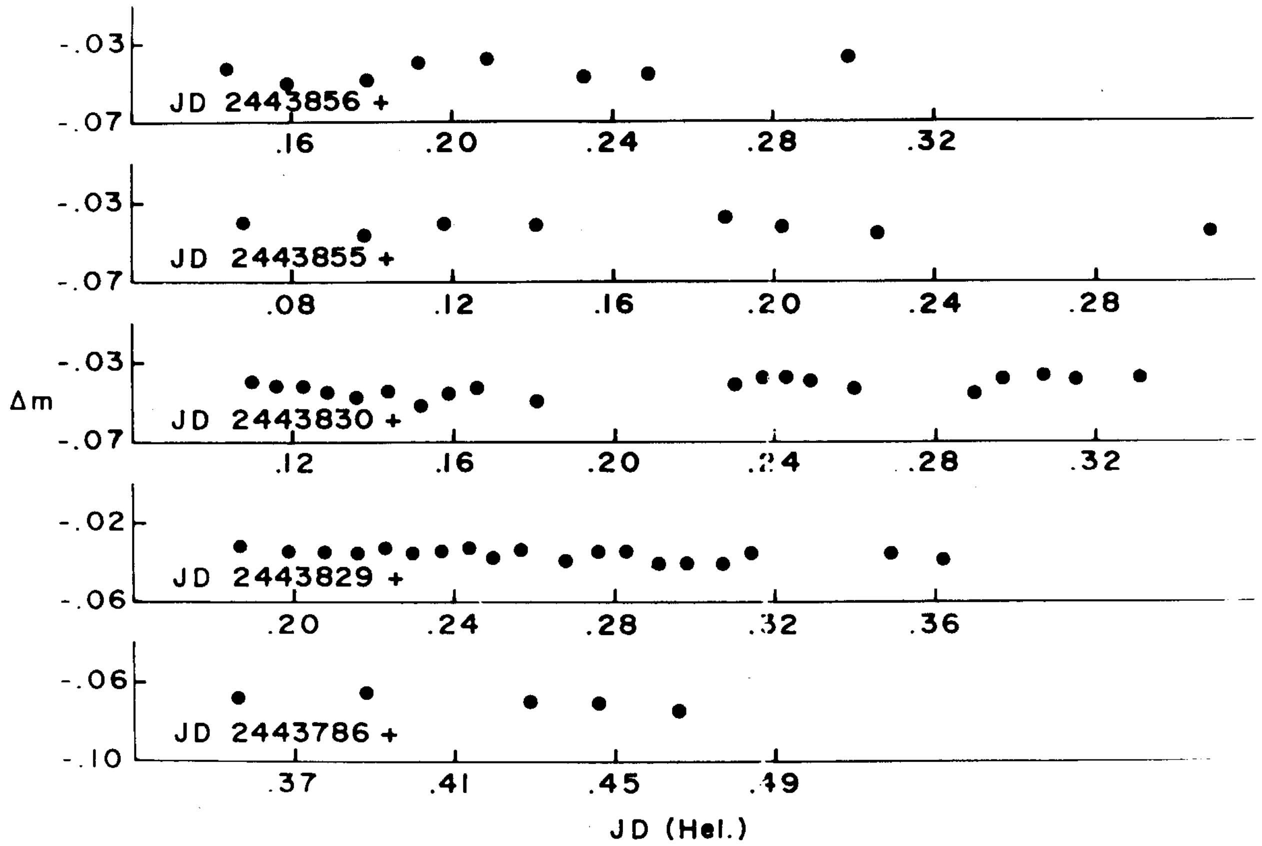

Fig. 1. Light curves of V351 Per.

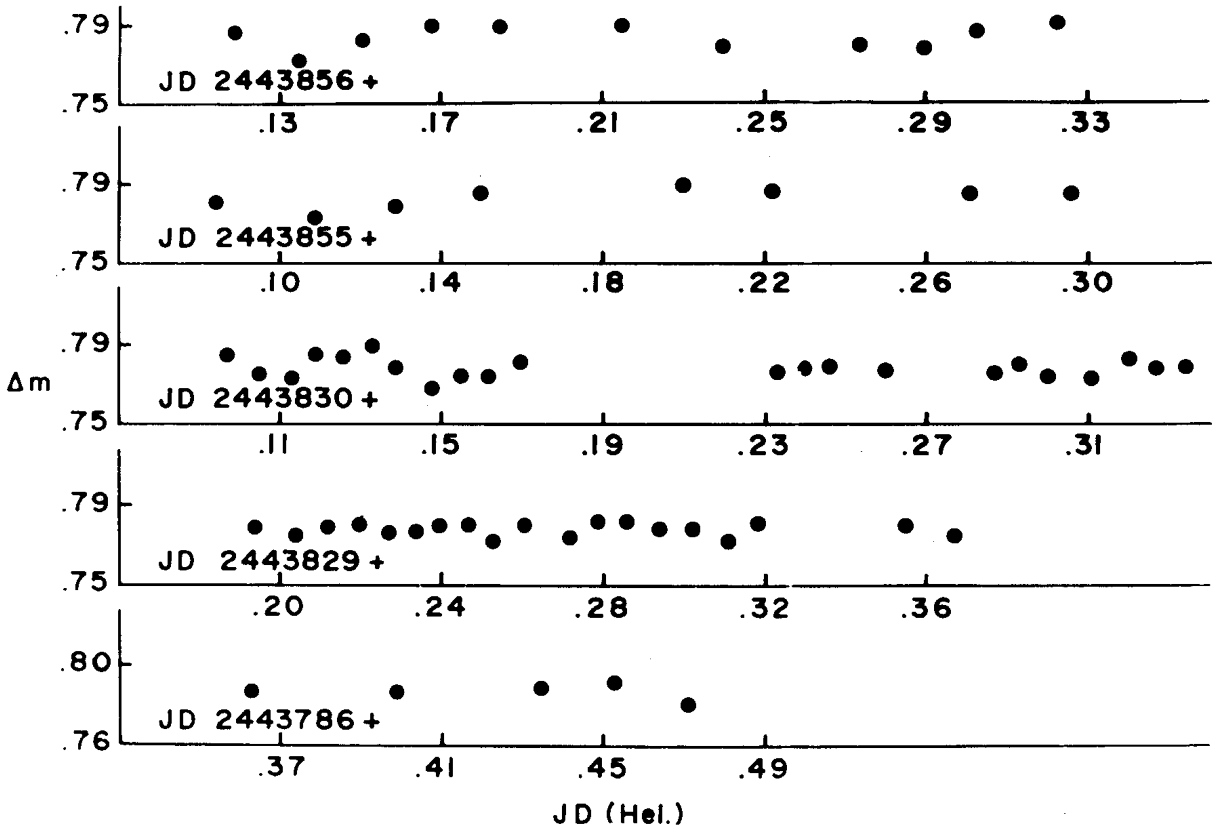

Fig. 2. Light curves of V356 Per.

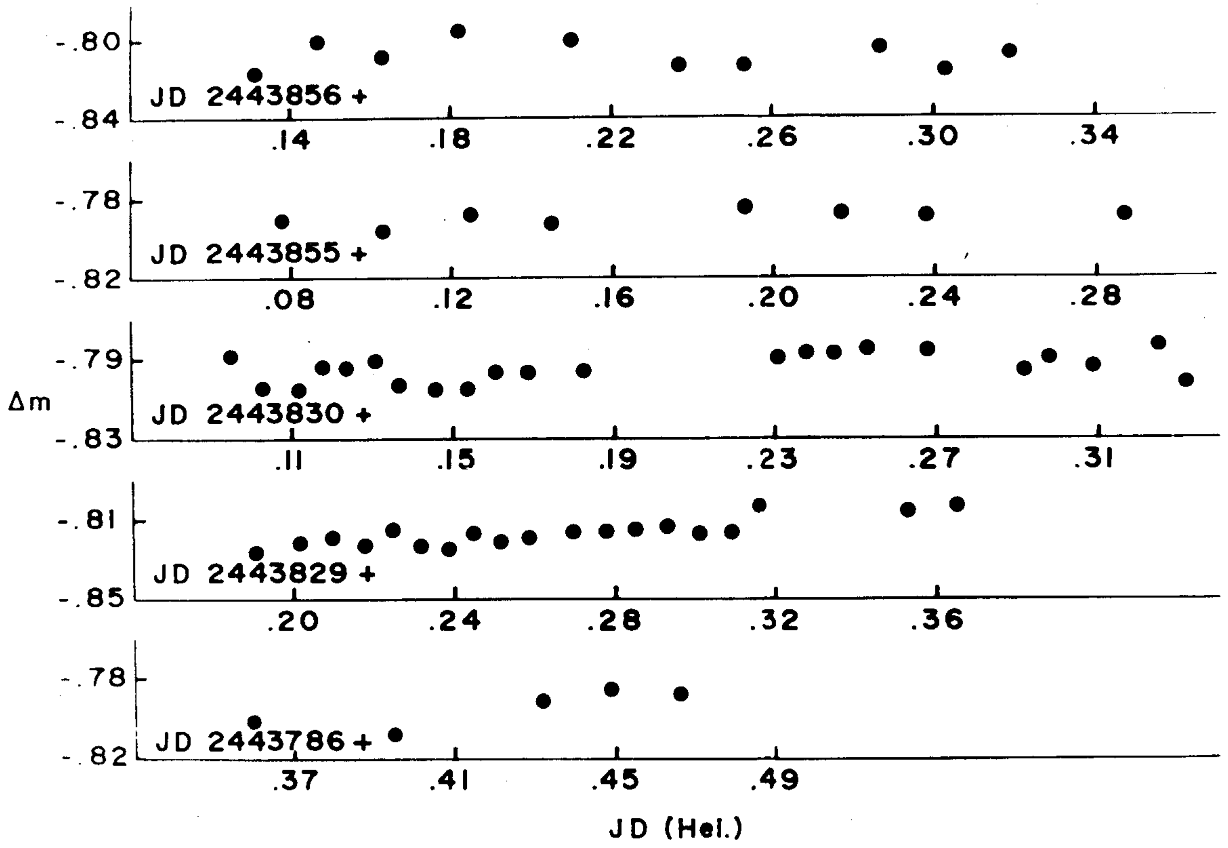

Fig. 3. Light curves of V357 Per.

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PHOTOGRAPHIC OBSERVATIONS OF OLD NOVAE II

Using the 30 cm f/5 four lens astrograph of the Observatorium Hoher List, blue plates (103 a-O) of some novae which were also observed last year (Hopp et al.,1979) were taken. The magnitudes listed in the Table were determined with an iris photometer, using the indicated sequences. The accuracy of the magnitudes is about $\pm 0^{m}.05$. In addition, an ESO 3.6 m telescope plate (III a-J + GG385) taken by W. Seitter and H. Duerbeck,of CP Pup was measured. The resulting magnitude, however, is only approximately a photographic one. A comparison with the results of the last year shows that:

i) the decline of V1500 Cyg still continues,
ii) HR Del and NQ Vul have reached their prae-nova magnitudes,
iii) V533 Her and CP Lac seem to be variable.

Nova	Outburst	Observing date	m_{pg}	Reference
IV Cep	1971	244 $4147^{d}.517$	17.00	Astron.Astrophys. Suppl.11, 360
V1500 Cyg	1975	4142.441	15.76	US Naval Obs. Publ. 17,462
HR Del	1967	4143.449	12.33	J. Obs.51, 354
DQ Her	1934	3374.471	14.59	Astron.J.61,36
		4156.285	14.45	
V533 Her	1963	4156.285	14.73	Acta Astron. 19, 82
CP Lac	1936	4147.517	16.15	Astron.Astrophys. Suppl. 11, 360
DI Lac	1910	3374.564	13.74	" " "
		4147.517	13.81	
CP Pup	1942	3895.7	14.32	Publ.Astr.Soc. Pacific 66,142
NQ Vul	1976	4143.317	17.55	US Naval Obs. Publ.17, 440

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Reference:

Hopp, U., Kiehl, M., Witzigmann, S., Duerbeck, H.W., 1979
I.B.V.S. No. 1573

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Budapest
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BH CENTAURI

BH Cen is a close (contact) system in the extremely young cluster Córdoba XXVI (NGC 2944). Oosterhoff (BAN, 4, 183, 1928; BAN, 5, 156, 1930) obtained photographic observations and derived from ten light minima a (half) period $P=0^{d}.3957907$. Previous photoelectric observations (Leung and Schneider, Ap.J.211, 844, 1977) do not cover completely the light curves and indicate that the period is slightly longer than that found by Oosterhoff. Since they covered only one minimum they obtained a period by trial and error based on the consistency of the light curves; they found $P = 0^{d}.791616$. Eggen (A.J. 83, 288, 1978) noted that the light curve of BH Cen is shifted by $-0^{p}.13$ when compared with Leung and Schneider's elements. We obtained more than 700 UBV observations at the Bosque Alegre Station of Córdoba Observatory and determined five times of minimum light (Table I).

Table I

Hel.J.D. 2400000+	E	(O-C)	E'	(O-C)'	Remarks
22084.297	-	-	-12209.0	-0.014	1
25025.434	-	-	-8493.5	-0.004	1
25329.408	-	-	-8109.5	+0.002	1
25331.392	-	-	-8107.0	+0.007	1
25351.536*	-	-	-8081.5	-	1
25362.267*	-	-	-8068.0	-	1
25385.228	-	-	-8039.0	+0.016	1
25386.404	-	-	-8037.5	+0.004	1
25404.209	-	-	-8015.5	-0.001	1
25714.497*	-	-	-7623.0	-	1
39621.7975(15)	-	-	+9946.0	-0.035	2,3
43987.8119(08)	-38.5	-0.0006	+15461.5	+0.0038	4,3
43989.7917(05)	-36.0	+0.0002	+15464.0	+0.0046	4,3
43990.5835(04)	-35.0	+0.0004	+15465.0	+0.0048	4,3
44028.5796(04)	+13.0	0.0000	+15513.0	+0.0049	4,3
44095.4693(05)	+97.5	0.0000	+15597.5	+0.0059	4,3

Remarks: 1 - Oosterhoff, 1928, see text; 2 - Leung and Schneider, 1977, see text; 3 - p.e. in parenthesis; 4 - present observations.

A least squares solution for our minima gives the following linear ephemeris:

$$\text{Min.I} = \text{Hel.J.D. } \underset{\pm .00020}{2444018.28888} + \underset{\pm .0000038}{0^{d}.7915942} \cdot E, \qquad (1)$$

with the cycles E and residuals (O-C) given in Table I. From Oosterhoff's photographic minima, excluding the three values marked with asterisks because their large residuals, we found:

$$\text{Min.I} = \text{Hel.J.D. } \underset{\pm .0028}{2424260.3709} + \underset{\pm .0000017}{0^{d}.7915877} \cdot E. \qquad (2)$$

The periods found from the two sets of observations are slightly different; the present value is somewhat longer than that for the 1920's, however shorter than that suggested by Leung and Schneider.

An ephemeris including photographic and photoelectric observations gives:

$$\text{Min.I} = \text{Jel.J.D. } \underset{\pm .0037}{2431748.7478} + \underset{\pm .00000031}{0^{d}.79158298} \cdot E'. \qquad (3)$$

The residuals (O-C)' of these elements are about $+0^{d}.0005$ for our observations, comparable to the p.e., however systematically shifted; the epoch of minimum light of Leung and Schneider's elements yields a residual twenty times larger than the published p.e..

The former considerations would indicate that the period of BH Cen is changing; if Leung and Schneider's minimum is correct within the quoted error the residuals of formula (3) may be caused by a light-time effect with an orbital period of about 50 years and a projected radius $R \cdot \sin i = 6 \times 10^{8}$ km. However, to decide on this point the system must be observed in the future. The use of ephemeris (1) should be preferred for the prediction of circumstances in the near future.

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