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PHOTOELECTRIC UBV PHOTOMETRY OF NORTHERN CEPHEIDS I.

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ABSTRACT

New UBV photoelectric observational data on 38 northern cepheids with periods of less than 5 days are presented. The period changes of the observed cepheids are investigated. Four variables (SU Cyg, DT Cyg, V 532 Cyg, SZ Tau) show a period jump and a subsequent "rejump" to the earlier value of the period, which results in the overall constancy of the period. DT Cyg pulsates with the same period for at least the fourth time which is in keeping with the recent hypothesis on the evolution of cepheids along the lines of constant period in the HRD. AU Peg, a Population II variable, shows extremely strong period changes.

In three cases, secular light curve variation was discovered.The amplitude of the light variation of AS Per is decreasing; the other type of light curve variation is the variation in the steepness of the rising branch (SU Cyg, FF Aql). The effect of the orbital motion on the O-C diagram is also investigated for FF Aql.

Finally, the instability of the period for different types of cepheids is discussed.

INTRODUCTION

This paper is the first part of a series dealing with the new UBV photometry of northern cepheids started at the Konkoly Observatory in 1971 and it contains the observational data and O-C diagrams of cepheids with periods of less than 5 days. The following papers in the series will deal with the photometry of northern cepheids with periods greater than 5 days. Observations on about 70 variables are in progress.

Although in several respects broad-band UBV photometry cannot compete with observations made using intermediate band systems (e.g. Pel 1976), the UBV system is still the most generally used photometric system so the major part of the observations on cepheids have been made in this way. With this large amount of homogeneous observations it is possible to investigate the cepheids from several different points of view. Nevertheless, the available photoelectric observational material on cepheid variables is not sufficient. Three UBV photoelectric observational series on northern cepheids were made in the fifties almost simultaneously (Bahner et al. 1962, Walraven et al. 1958, Weaver et al. 1960). Even more cepheids were observed by Mitchell et al. (1964). Since then no extensive northern cepheid photometry has been carried out. The cepheid programme of Wisniewski and Johnson (1968) and that of Takase (1969) contained a small number of northern cepheids. It was therefore desirable to collect a new set of observations on a comparatively large number of northern cepheids.

The main purposes of the present programme are as follows:

1/ To search for double mode cepheids in the northern sky;

2/ To investigate period changes;

3/ To examine secular variations of the light curves provided that they can be determined;

4/ To obtain photoelectric light curves from those cepheids which have not previously been observed photoelectrically.

During the course of the first part of this work, 40 cepheids and 3 stars which proved to be misclassified variables were observed. 19 stars were observed in 3 colours of Johnson UBV system, the other 24 stars in B and in V light only.

THE OBSERVATIONS

The programme stars were selected from the General Catalogue of Variable Stars (Kukarkin et al. 1969-1970), its 1st and 2nd Supplements (Kukarkin et al. 1971, 1974) and from the current astronomical literature (newly discovered cepheids), with the restrictions that their declination should be north of 0^{o} and B magnitude (or m_{pg} for lack of photoelectric observations) at light minimum brighter than $12\overset{m}{.}5$. The first part of the programme contains cepheids of both populations with a period of less than 5 days. Only α UMi (Polaris) was omitted because of its brightness (there being no suitable nearby comparison star) and very small amplitude. These two factors did not allow a reliable light curve to be obtained.

The stars investigated are listed in Table 1. The number of observations on each star, the colours, serial numbers of the pages where the individual observations and the O-C diagram with additional remarks on the given star can be found, are indicated

Table 1 The programme

Star	N	Col.	Page obs.	Page rem.	Remarks	Star	N	Col.	Page obs.	Page rem.	Remarks
DQ And	20	BV	11	57		V 1334 Cyg	22	UBV	22	63	
FF Aql	21	UBV	11	92		BC Dra	102	BV	—	6	RR Lyrae type star
V 572 Aql	11	BV	12	68	the light curve is not complete	AD Gem	17	BV	22	70	
Y Aur	20	BV	12	77		BB Gem	22	BV	23	43	
RT Aur	20	UBV	13	65		DX Gem	19	BV	23	53	
SU Cas	28	UBV	13	38		BL Her	23	BV	23	33	
SY Cas	27	BV	14	82		V Lac	22	UBV	24	102	
TU Cas	311	UBV	—	6	double mode cepheid	Y Lac	21	UBV	25	86	
XY Cas	17	BV	14	95		BE Mon	17	BV	25	50	
BD Cas	22	BV	15	64		V 465 Mon	21	BV	25	51	
BY Cas	24	BV	15	59		V 508 Mon	17	BV	26	84	
DF Cas	24	BV	16	72		AU Peg	45	UBV	26	44	
V 395 Cas	15	BV	17	81		SX Per	21	BV	27	85	
V 445 Cas	50	BV	—	6	eclipsing binary	AS Per	29	BV	28	100	
IR Cep	52	UBV	17	42		V 361 Per	56	UBV	—	6	irregular variable
BD+56°2806	32	BV	18	52		BQ Ser	122	BV	—	6	double mode cepheid
SU Cyg	21	UBV	19	73		ST Tau	20	UBV	28	80	
VZ Cyg	25	UBV	19	96		SW Tau	40	UBV	29	36	
DT Cyg	27	UBV	20	47		SZ Tau	20	UBV	29	55	
V 402 Cyg	16	BV	20	88		EU Tau	28	UBV	30	41	
V 532 Cyg	36	BV	21	62		T Vul	19	UBV	31	89	
V 1154 Cyg	26	UBV	21	99							

in the successive columns. The total number of observations is more than 1500. Most of the observations were made in the years 1972-1974, but some cepheids with changing period were reobserved in 1976-1977.

Three variables proved to be misclassified. The star V445 Cas is an eclipsing binary of β Lyrae type with a period of $0^{d}.67352$ (Szabados 1974a); V361 Per is an irregular variable in the cluster h and χ Per (Szabados 1974b); the third misclassified variable is BC Dra. This last star was announced as being a double mode cepheid (Szabados 1976a), but a recent more precise period analysis has shown that it is, in fact, an RR Lyrae type variable with a period of $0^{d}.71957$ (Szabados, Stobie and Pickup 1976). The observational data on these misclassified variables as well as on the double mode cepheids are not given here.

There are two double mode cepheids in the northern sky, namely TU Cas and BQ Ser. The stars SW Tau and V 439 Oph classified as double mode cepheids (Latyshev 1963 and Gusev 1967, respectively) are simple cepheids of Population II with a long flat light maximum. The present set of observations has clearly shown that there are not more double mode cepheids among the known northern cepheid variables brighter than $B = 12^{m}.5$ in minimum light. The observations and a detailed analysis of the data on TU Cas and BQ Ser will be published elsewhere. Short communications have been published on the recent photometry of these stars (Illés and Szabados 1976, Szabados 1976a).

All the observations were made with two telescopes of the Konkoly Observatory:

1/ The 24 in. reflector (Budapest, Szabadsághegy) combined with an unrefrigerated EMI 9502B photomultiplier;

2/ The 20 in. Cassegrain reflector (Piszkéstető Mountain Station) combined with an integrating photometer equipped with an unrefrigerated EMI 9058QB photomultiplier.

The standard UBV photometric system was realised with the aid of the following Schott filters:

	20 in. telescope	24 in. telescope
U	UG 2 2mm	UG 1 2mm
B	BG12 1mm + GG13 2mm	BG12 1mm + GG13 2mm
V	GG11 2mm	GG11 2mm

Because of the changeable sky conditions differential photometry was performed with a nearby comparison star being selected for each programme star. As a means of verifying the constancy of the comparison stars, check stars were regularly observed. The V magnitudes and the colour indices of the comparison and check stars are listed in Table 2. The data concerning the double mode cepheids and misclassified variables are omitted. The tie-in observations were made with the aid of UBV standard stars taken from the catalogue of Blanco et al. (1968). An asterisk instead of the name of the star in Table 2 denotes that the star is not in the Bonner Durchmusterung in which case the identification charts in Fig. 1a-f should be consulted. In these charts the letter *a* denotes the comparison star and the star marked *b* is the check one. (The size of the charts is about 25" x 25", north is at the top.)

Each observation of a cepheid is a result of at least 15 individual measurements or 80 sec of integration in each colour. One complete measurement of the variable, background and comparison star took on average of about twenty minutes. The mean error of an observation is about $0\overset{m}{.}010$ in V and B and $0\overset{m}{.}020$ in U.

When the distance between the comparison star and the variable was greater than 1°, the effect of the atmospheric extinction was removed. The observational data have been transformed from the instrumental to the international UBV system using average values of transformation coefficients determined for both telescopes. After having transformed the data no systematic differences were found between the observations made with the 20" and those with the 24" telescope. The observations made with the 20" telescope are marked with asterisks in Table 3.

The comparison between my photometric system (UBV_{sz}) and Schaltenbrand and Tammann's (1971) standard one (UBV_{scht}) gives the following transformation formulae:

$$V_{sz} \approx V_{scht} \quad \text{(on the basis of 25 common stars)}$$

$$(B-V)_{sz} = 1.034(B-V)_{scht} - 0.066 \quad \text{(25 common stars)}$$

$$(U-B)_{sz} = 0.90\ (U-B)_{scht} + 0.04 \quad \text{(13 common stars)}$$

The present V magnitudes and B-V colour indices are in good agreement with the standard values, while the deviation of $(U-B)_{sz}$ from the standard U-B colour index may be explained by the fact

Table 2

Variable	Comp.	V	B-V	U-B	Check	V	B-V	U-B	Remark
DQ And	*	$10^m.86$	$1^m.04$		$+44^\circ$ 212	$10^m.57$	$0^m.54$		
FF Aql	$+17^\circ$ 3779	5.69	1.09	$1^m.06$	$+17^\circ$ 3778	6.69	-0.05	$-0^m.32$	
V 572 Aql	$+ 0^\circ$ 4391	10.50	1.27		$+ 0^\circ$ 4397	10.46	0.82		
Y Aur	$+42^\circ$ 1288	9.48	0.38		$+42^\circ$ 1297	10.16	0.25		1
RT Aur	$+29^\circ$ 1154	4.33	1.02	0.80	$+29^\circ$ 1190	6.45	0.05	-0.05	
SU Cas	$+67^\circ$ 215	6.64	0.47	0.25	$+67^\circ$ 224	5.95	0.21	0.17	
SY Cas	$+57^\circ$ 41	9.44	1.12		$+57^\circ$ 38	9.28	1.70		
XY Cas	$+59^\circ$ 119	8.74	0.50		$+59^\circ$ 132	8.70	0.40		
BD Cas	*	11.88	1.55		*	11.38	1.65		1
BY Cas	$+60^\circ$ 345	9.77	0.58		$+60^\circ$ 346	9.90	1.24		
DF Cas	$+60^\circ$ 558	10.19	0.52		*	11.20	0.47		1
V 395 Cas	$+62^\circ$ 356	10.01	1.15		$+62^\circ$ 359	9.18	1.86		
IR Cep	$+60^\circ$ 2324	8.90	0.15	0.12	$+60^\circ$ 2320	7.93	-0.03	-0.27	
BD$+56^\circ$ 2806	$+56^\circ$ 2815	8.67	0.15		$+56^\circ$ 2808	9.38	0.11		
SU Cyg	$+28^\circ$ 3447	6.54	0.35	0.28	$+29^\circ$ 3724	8.08	0.20	0.28	
VZ Cyg	$+42^\circ$ 4226	7.68	0.94	0.65	$+42^\circ$ 4225	9.39	1.14	0.95	
DT Cyg	$+29^\circ$ 4324	5.63	-0.08	-0.31	$+30^\circ$ 4322	7.56	-0.14	-0.59	2
V 402 Cyg	$+36^\circ$ 3898	9.92	1.20		$+36^\circ$ 3904	9.51	0.46		
V 532 Cyg	$+45^\circ$ 3498	9.59	1.10		$+45^\circ$ 3496	9.85	0.50		
V 1154 Cyg	$+42^\circ$ 3473	9.25	1.23	0.99	$+42^\circ$ 3472	8.37	0.38		
V 1334 Cyg	$+36^\circ$ 4470	6.07	0.29	0.21	$+36^\circ$ 4557	5.92	-0.02	-0.84	

Table 2 (cont.)

Variable	Comp.	V	B-V	U-B	Check	V	B-V	U-B	Remark
AD Gem	+21° 1358	$8^m.96$	$1^m.10$		+21° 1355	$9^m.35$	$1^m.86$		
BB Gem	+13° 1315	10.49	1.28		+13° 1309	9.72	0.23		
DX Gem	*	10.44	0.45		*	10.92	1.50		
BL Her	+19° 3491	10.27	0.41		*	11.65	0.61		3
V Lac	+55° 2824	9.57	0.49	$0^m.12$	+55° 2819	9.33	1.14	$0^m.50$	
Y Lac	+50° 3582	8.71	0.12	0.13	+50° 3596	8.26	0.01	-0.25	
BE Mon	+ 7° 1388	9.75	0.41		+ 7° 1390	10.63	0.13		
V 465 Mon	+ 0° 1811	10.53	0.09		+ 0° 1809	9.40	0.84		
V 508 Mon	+ 4° 1437	10.25	0.01		+ 3° 1398	8.56	0.49		
AU Peg	+17° 4575	9.29	0.97	0.70	+18° 4788	8.79	0.29	-0.03	
SX Per	+41° 841	10.73	0.73		*	11.09	0.54		
AS Per	+48° 1075	9.45	1.37		+48° 1074	10.51	1.12		
ST Tau	+13° 974	8.78	0.19	-0.21	+12° 889	7.44	0.80	0.45	
SW Tau	+ 3° 596	8.11	0.98	0.56	+ 4° 683	8.81	0.50	-0.09	
SZ Tau	+19° 744	6.34	0.74	0.33	+19° 731	7.11	0.46	0.08	
EU Tau	+18° 966	7.79	1.10	1.04	+18° 959	7.53	0.14	0.17	
T Vul	+26° 4017	4.57	0.84	0.46	-				

Remarks: 1 The comparison star has a faint companion within the edge of the diaphragm.

2 The comparison star is identical with V 389 Cyg, but the star seems to be non-variable (see page 47).

3 The comparison star slightly varies.

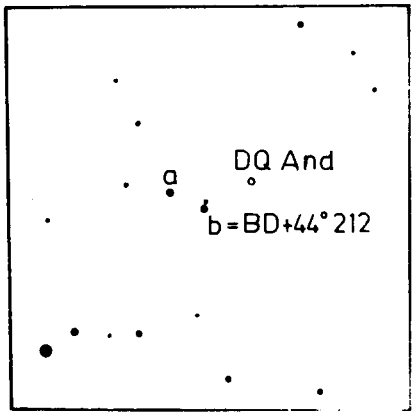

Fig. 1a DQ And

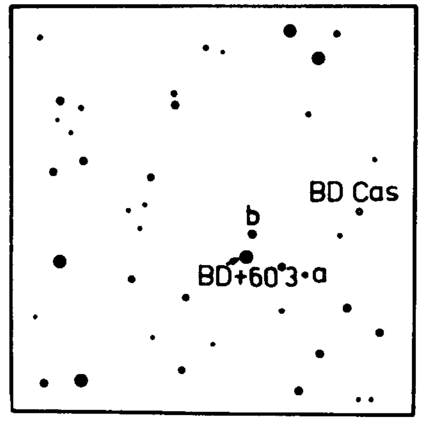

Fig. 1b BD Cas

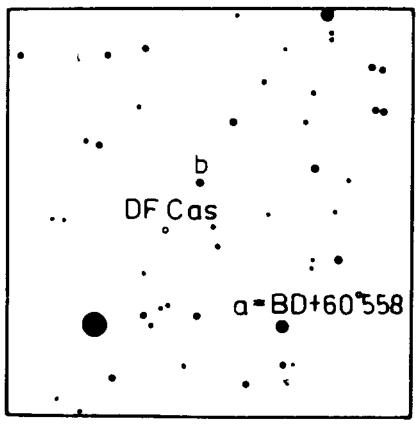

Fig. 1c DF Cas

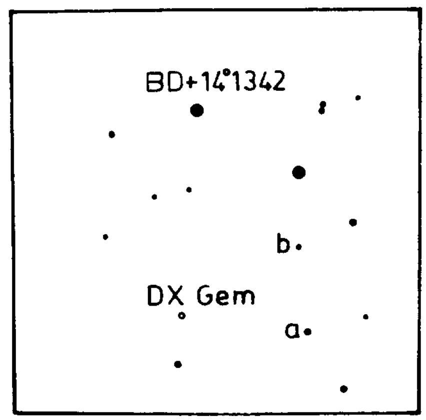

Fig. 1d DX Gem

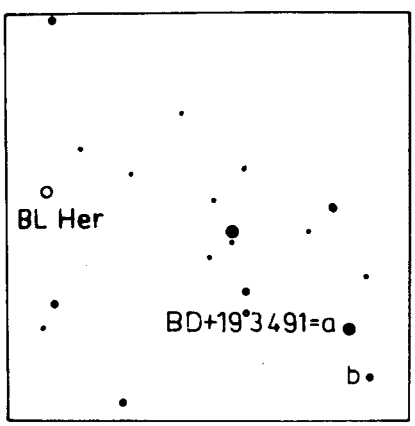

Fig. 1e BL Her

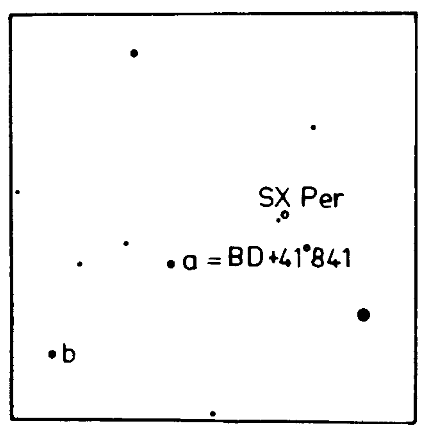

Fig. 1f SX Per

Figure 1a-f Identification charts

Table 3 The observations

DQ Andromedae

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1567.523*	11.85	0.80		1918.531*	11.46	0.58	
1596.415*	11.87	0.80		1921.368*	11.27	0.49	
1597.450*	11.98	0.84		1921.518*	11.34	0.55	
1625.339*	11.91	0.86		1944.375*	11.60	0.67	
1650.248*	11.66	0.74		2008.560*	11.63	0.72	
1651.244*	11.97	0.85		2095.225*	11.74	0.73	
1651.382*	11.99	0.84		2273.336*	11.28	0.52	
1688.242*	11.56	0.61		2276.342*	11.54	0.52:	
1898.518*	11.81	0.77		2276.474*	11.32	0.54	
1918.347*	11.38	0.54		2426.210*	12.03	0.81	

FF Aquilae

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1392.586	5.28	0.73	0.45	1459.544	5.34	0.68	0.48
1396.589	5.45	0.74	0.47	1466.435	5.47	0.83	0.50
1399.558	5.53	0.82		1467.498	5.53	0.77	0.53
1400.621	5.51	0.76	0.52	1472.478	5.46	0.77	
1401.577	5.31	0.70	0.43	1487.468	5.29	0.69	0.46
1412.510	5.49	0.81	0.49	1489.534	5.55	0.79	0.56
1415.507	5.21	0.69	0.43	1501.409	5.38	0.75	0.52
1436.440	5.52	0.80	0.52	1529.389	5.56	0.78	
1437.471	5.24	0.70	0.45	1554.312	5.25	0.66	0.46
1438.437	5.33	0.77		1758.629	5.44	0.76	0.52
1439.546	5.47	0.81	0.53				

Observations in 1953

J.D.hel. 2430000+	Δv	Δb	J.D.hel. 2430000+	Δv	Δb
4583.367	-0.520	-1.042	4588.408	-0.641	-1.086
4585.392	-0.378	-0.685	4590.451	-0.266	-0.562

Table 3 (cont.)

(FF Aql)

J.D.hel. 2430000+	Δv	Δb	J.D.hel. 2430000+	Δv	Δb
4591.404	-0.257	-0.620	4623.440	-0.348	-0.794
4596.368	-0.334	-0.772	4624.451	-0.562	-0.945
4597.406	-0.547	-1.030	4625.401	-0.328	-0.658
4598.406	-0.365	-0.755	4626.384	-0.201	-0.533
4600.397	-0.219	-0.529	4628.425	-0.425	-1.021
4602.458	-0.415	-0.822	4629.354	-0.435	-0.847
4608.381	-0.218	-0.498	4630.357	-0.280	-0.583
4609.520	-0.270	-0.605	4654.314	-0.285	-0.626
4614.435	-0.409	-0.759	4656.328	-0.381	-0.755
4619.366	-0.542	-0.975	4660.319	-0.493	-0.929
4621.427	-0.265	-0.547	4663.303	-0.286	-0.618
4622.410	-0.221	-0.452	4664.310	-0.578	-1.015

V 572 Aquilae

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1567.365*	11.05	0.86		1918.325*	11.01	0.88	
1568.291*	11.08	0.85		1921.335*	11.15	0.89	
1896.479*	11.20	0.98		1944.280*	11.04	0.86	
1897.371*	11.40	1.08		2194.520*	11.29	1.02	
1898.422*	11.23	0.97		2224.508*	11.28	1.00	
1917.365*	11.23	0.92					

Y Aurigae

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1292.471	9.75	1.07		1401.352	9.99	1.04	
1332.565	9.93	1.01		1402.362	9.67	0.87	
1336.587	9.85	0.94		1679.540	9.97	1.06	
1352.547	9.17	0.70		1682.524	9.82	1.04	
1389.423	9.89	1.04		1694.462	9.93	1.04	
1394.365	9.89	1.07		1696.485	9.28	0.79	

Table 3 (cont.)

(Y Aur)

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1939.471	9.23	0.71		1990.399	9.52	0.92	
1961.494	9.94	1.09		1990.577	9.60	0.97	
1981.458	9.39	0.74		2039.378	9.29	0.73	
1982.492	9.43	0.90		2141.295	9.63	0.95	

RT Aurigae

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1292.586	5.54	0.71		1697.402	5.12	0.45	0.28
1331.520	5.74	0.73	0.41	1758.360	5.44	0.67	0.39
1332.539	5.10	0.49	0.29	1990.478	5.76	0.76	0.47
1336.610	5.20	0.59		1990.660	5.77	0.77	0.55
1352.519	5.63	0.75	0.43	2018.648	5.15	0.52	0.28
1610.636	5.77	0.79	0.53	2066.404	5.20	0.55	0.32
1682.551	5.07	0.43	0.26	2100.296	5.01	0.43	0.28
1695.468	5.61	0.73	0.48	2108.301	5.27	0.54	0.35
1696.507	5.82	0.77	0.49	2148.281	5.47	0.59	0.19:
1697.358	5.20	0.45	0.26	2159.303	5.65	0.67	0.38

SU Cassiopeiae

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1301.349	5.93	0.75		1401.381	6.12	0.86	0.54
1352.578	6.15	0.80		1402.379	5.79	0.67	0.50
1389.450	6.09	0.83	0.49	1403.366	6.13	0.84	0.52
1390.447	5.80	0.68	0.44	1408.387	5.85	0.72	
1391.386	6.10	0.81	0.54	1415.371	6.07	0.81	0.50
1392.404	5.76	0.71	0.45	1608.475	5.99	0.76	0.48
1393.385	6.11	0.83	0.49	1617.369	6.05	0.82	0.50
1394.388	5.77	0.69	0.45	1672.267	6.14	0.83	0.45
1396.420	5.76	0.65	0.49	1673.283	5.77	0.68	0.48
1399.363	6.11	0.82		1682.567	5.93	0.77	0.43

Table 3 (cont.)

(SU Cas)

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1694.441	5.82	0.71	0.49	1758.379	6.11	0.81	0.46
1695.441	6.09	0.82	0.50	1988.658	5.94	0.72	0.44
1753.396	5.81	0.73	0.44	1989.389	5.91	0.74	0.46
1754.334	6.12	0.84	0.58	1989.534	5.98	0.77	0.50

<u>SY Cassiopeiae</u>

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1302.383	10.16	1.12		1934.490	9.51	0.75	
1586.499*	10.05	1.11		1942.372	9.76	0.92	
1589.518*	9.76	1.01		1954.360	10.02	1.06	
1594.472	9.96	1.06		1959.451	9.53	0.83	
1596.463*	9.58	0.85		1960.414	9.90	1.01	
1597.462*	9.66	0.92		1961.365	10.12	1.12	
1606.455	9.91	1.09:		2008.506*	9.61	0.90	
1631.395	10.06	1.06:		2070.213	9.82	0.99	
1634.345	9.75	0.95		2990.528	9.89	1.08:	
1681.254	10.18	1.08		3045.535	9.96	0.94	
1682.250	9.42	0.79		3048.541	10.16	1.06:	
1689.227*	10.17	1.16:		3050.525	9.59	0.84	
1917.528*	10.16	1.08		3078.380	9.55	0.80	
1918.499*	9.44	0.80					

<u>XY Cassiopeiae</u>

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1589.548*	10.00	1.21		1651.351*	9.66	1.01	
1596.448*	10.05	1.11		1688.223*	9.86	1.14	
1597.473*	9.67	1.01		1689.242*	10.04	1.25	
1625.386*	9.91	1.14		1898.530*	9.69	1.01	
1647.344*	9.77	1.07		1918.519*	10.03	1.18	
1650.363*	10.11	1.19		1948.292*	9.62	0.98	

Table 3 (cont.)

(XY Cas)

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
2095.247 *	10.16	1.23		2276.492 *	9.83	1.05	
2275.542 *	10.17	1.21		2424.343 *	10.19	1.20	
2276.351 *	9.92	1.07					

Observations in 1967-1968

J.D.hel. 2430000+	Δv	Δb	J.D.hel. 2430000+	Δv	Δb
9777.620	1.181	0.730	9806.350	0.864	0.351
9787.385	0.648	0.050	9807.660	1.068	0.576
9791.406	1.020	0.497	9808.502	1.255	0.859
9795.344	1.246	0.890	9810.287	0.666	0.023
9796.489	0.639	0.007	9821.351	1.174	0.829
9799.305	1.199	0.875	9864.284	0.689	0.052

BD Cassiopeiae

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1566.517 *	10.88	1.52		1651.296 *	10.95	1.46	
1567.445 *	10.96	1.54		1651.370 *	10.95	1.53	
1568.410 *	11.15	1.61		1688.206 *	11.05	1.57	
1596.323 *	10.87	1.48		1689.203 *	11.17	1.62	
1596.400 *	10.91	1.48		1896.490 *	11.04	1.63	
1596.510 *	10.93	1.52		1897.463 *	11.12	1.55:	
1597.420 *	11.10	1.63		1898.374 *	10.95	1.61	
1597.513 *	11.11	1.64		1949.304 *	10.99	1.58	
1625.369 *	10.85	1.50		2008.462 *	10.84	1.50	
1629.262 *	10.89	1.51		2299.441 *	11.05	1.62	
1650.372 *	10.89	1.57		2299.595 *	11.04	1.57	

BY Cassiopeiae

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1586.530 *	10.31	1.23		1594.492	10.42	1.19	

Table 3 (cont.)

(BY Cas)

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1596.524*	10.25	1.16		1682.267	10.46:	1.36:	
1606.472	10.23:	1.14:		1933.445	10.56	1.30	
1625.353*	10.31	1.18		1935.378	10.14	1.15	
1631.411	10.41	1.31		1935.535	10.16	1.19	
1634.383	10.56	1.31		1949.413*	10.47	1.28	
1647.391*	10.51	1.26		1961.511	10.23	1.18	
1650.273*	10.55	1.29		3045.560	10.59	1.28	
1651.400*	10.24	1.17		3048.552	10.53	1.26	
1662.283	10.41	1.28		3050.537	10.18	1.13	
1680.271	10.32:	1.11:		3078.316	10.56	1.30	
1681.267	10.28	1.23		3140.259	10.34	1.19	

Observations in 1967

J.D.hel. 2430000+	Δv	Δb	J.D.hel. 2430000+	Δv	Δb
9763.519	-0.196	-0.216	9791.423	-0.265	-0.302
9769.494	-0.385	-0.437	9795.531	-0.289	+0.020
9770.458	-0.067	+0.008	9796.469	-0.002	-0.325
9776.494	-0.175	+0.151	9799.324	-0.113	+0.072
9777.528	+0.017	-0.144	9810.303	-0.106	-0.137
9787.363	+0.021	+0.120			

<u>DF Cassiopeiae</u>

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1330.355	10.97	1.25		1679.271	11.02	1.21	
1594.518	10.90	1.15		1680.294	11.09	1.28	
1596.546*	10.85	1.15		1681.300	10.55	0.95	
1634.430	11.14	1.19		1682.298	10.79	1.12	
1650.308*	10.71	1.07		1689.323*	10.56	1.04	
1650.453*	10.60	0.99		1917.555*	11.04	1.25	
1651.323*	10.66	1.09		1921.536*	11.10	1.23	
1651.427*	10.68	1.10		1960.430	11.04	1.21	
1662.323	10.53	1.00		1978.454	11.07	1.[illegible]	

Table 3 (cont.)

(DF Cas)

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1981.403	10.81	1.19		3140.278	11.14	1.27:	
2101.330	11.08	1.11:		3162.384	11.07	1.12	
3078.332	11.02	1.24		3202.315	10.89	1.08:	

V 395 Cassiopeiae

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1596.483*	10.92	1.26		1917.541*	10.46	1.07	
1597.500*	10.83	1.22		1918.567*	10.74	1.22	
1625.463*	10.92	1.27		1921.377*	10.40	1.05	
1650.261*	10.64	1.14		2008.572*	10.95	1.26	
1650.423*	10.52	1.05		2276.502*	10.39	1.00:	
1651.309*	10.55	1.10		2299.490*	10.95	1.24	
1651.411*	10.57	1.11		2302.423*	10.75	1.21	
1688.293*	10.71	1.20					

IR Cephei

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1407.620	7.85	0.75		1881.423	7.85	0.88	0.53
1415.557	7.62	0.71	0.43	1882.538	7.59	0.73	0.44
1436.527	7.61	0.68	0.42	1897.475*	7.61	0.68	0.40
1495.507	7.68	0.75	0.39	1898.542*	7.91	0.86	
1554.447	7.92	0.80	0.44	1904.505	7.82	0.84	0.52
1579.341	7.91	0.90	0.52	1905.583	7.77	0.76	0.46
1584.343	7.68	0.73	0.45	1906.440	7.71	0.81	0.48
1586.390*	7.71	0.73	0.43	1907.415	7.90	0.86	0.55
1617.300	7.94	0.89	0.55	1907.529	7.88	0.81	0.64
1629.277*	7.68	0.76	0.43	1908.531	7.77	0.76	0.51
1651.252*	7.99	0.87		1911.393	7.99	0.88	0.56
1803.520*	7.96	0.89		1911.579	7.93	0.88	0.55
1807.563	7.90	0.89	0.61	1917.386*	7.89	0.84	

Table 3 (cont.)

(IR Cep)

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1917.489 *	7.92	0.86	0.47	1944.299 *	7.70	0.76	0.42
1917.588 *	7.96	0.85		1960.280	7.91	0.83	0.56
1918.309 *	7.75	0.76	0.38	1960.446	7.85	0.81	0.48
1918.541 *	7.61	0.67	0.40	1961.289	7.68	0.78	0.48
1921.354 *	7.79	0.80	0.44	1965.292	7.61	0.75	
1921.472 *	7.85	0.83		1965.494	7.73	0.75	0.46
1921.569 *	7.89	0.83		1981.248	7.95	0.87	0.55
1932.510	7.97	0.87	0.60	1983.349	7.93	0.92	0.56
1933.333	7.59	0.67	0.44	2939.440	7.74	0.71	0.54
1933.422	7.59	0.68	0.50	3045.500	7.59	0.72	0.44
1934.373	7.90	0.85	0.64	3050.482	7.87	0.85	0.56
1934.470	7.93	0.87	0.53	3064.338	7.61	0.69	0.47
1935.497	7.55	0.76	0.38	3078.299	7.96	0.85	0.48

BD $+56^{o}$ 2806 (Cep)

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
2634.479	9.28	0.79		2720.376	9.53	0.89	
2635.405	9.52	0.85		2728.315 *	9.54	0.97	
2636.519	9.41	0.81		2738.372	9.28	0.80	
2639.355	9.38	0.86		2743.344 *	9.33	0.88	
2640.358	9.30	0.83		2756.239	9.53	0.97	
2642.393	9.30	0.84		2767.190	9.50	0.85	
2645.477	9.26	0.79		2770.195	9.51	0.94	
2646.379	9.48	0.80		2776.185 *	9.56	0.98	
2669.406	9.55	0.94		2776.305 *	9.55	0.96	
2675.413	9.49	0.94:		2777.271 *	9.27	0.83	
2676.397	9.25	0.83		2782.204	9.55:	0.84:	
2685.490	9.40	0.82		2787.202	9.56	0.87	
2712.420 *	9.37	0.87		2939.453	9.47	0.91	
2714.374	9.58	0.92		2971.374	9.27	0.80	
2715.330	9.34	0.84		2990.444	9.28	0.81	
2715.433	9.31	0.81		3075.416	9.37	0.84	

Table 3 (cont.)

SU Cygni

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1412.596	7.16	0.68	0.43:	1880.362	6.90	0.63	0.46
1415.610	7.07	0.68	0.49	1881.375	7.16	0.68	0.40:
1436.484	6.67	0.43	0.42	1908.423	7.17	0.68	0.43
1476.478	6.86	0.65	0.47	1915.433	7.05	0.68	0.49
1495.446	6.81	0.60		1932.299	7.00	0.57	0.49
1554.349	7.09	0.66	0.44	1937.405	6.72	0.50	0.43
1561.482	6.98	0.66	0.46	1967.282	6.49	0.43	0.34
1584.309	6.96	0.62	0.51	1998.217	6.45	0.40	0.40
1606.325	6.53	0.46	0.41	1998.282	6.45	0.42	0.32
1610.294	6.59	0.46	0.42	2143.591	7.13	0.63	0.54
1789.582	7.16	0.69	0.54				

Observations in 1953

J.D.hel. 2430000+	Δv	Δb	J.D.hel. 2430000+	Δv	Δb
4584.492	0.097	0.383	4597.490	0.572	1.039
4585.496	0.428	0.906	4598.462	0.667	1.147
4590.530	0.614	1.184			

VZ Cygni

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1472.515	8.62	0.80		1898.354*	9.16	1.03	0.77
1589.443*	8.66	0.79	0.63:	1900.446	8.62	0.72	0.44
1594.448	8.74	0.77	0.51	1904.490	9.01	0.84	0.55
1596.370*	9.15	1.02	0.78	1914.398	8.86	0.76	0.42
1597.381*	9.24	1.03	0.75	1914.566	8.71	0.72	0.42
1629.236*	8.88	0.93	0.71	1929.338	8.64	0.70	0.42
1651.204*	9.18	0.99	0.60	1942.430	9.22	1.08	0.59:
1860.466	9.16	0.97	0.58	2939.470	9.25	1.03	0.61:
1887.452	9.01	0.94	0.58	3045.466	9.05	1.00	
1896.550*	8.83	0.91	0.68	3048.490	8.59	0.73	0.42
1897.344*	8.99	1.01	0.71	3064.324	8.91	0.90	0.68

Table 3 (cont.)

(VZ Cyg)

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
3075.394	9.12	1.06		3140.209	8.88	0.77	0.50
3078.280	8.75	0.86	0.45:				

<u>DT Cygni</u>

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1467.511	5.73	0.45	0.25	1877.536	5.67	0.46	0.25
1472.494	5.70	0.46	0.25	1881.445	5.91	0.56	0.28
1476.512	5.87	0.54	0.29	1882.522	5.67	0.44	0.24
1487.537	5.68	0.45	0.24	1884.541	5.85	0.50	0.25
1495.466	5.63	0.42	0.23	1908.349	5.75	0.51	0.23
1544.442	5.88	0.55	0.26	1908.472	5.81	0.51	0.27
1554.506	5.86	0.51	0.24	1911.560	5.91	0.54	0.28
1562.337	5.75	0.47	0.23	2307.473	5.66	0.41	0.21
1562.520	5.70	0.43	0.21	2990.473	5.81	0.48	0.28
1583.274	5.73	0.46	0.21	3045.313	5.73	0.45	0.32:
1606.304	5.83	0.54	0.28	3046.333	5.92	0.51	
1613.247	5.71	0.47	0.20	3048.439	5.93	0.54	0.30
1634.272	5.94	0.56	0.25	3064.292	5.75	0.48	0.21
1860.531	5.67	0.45	0.23				

<u>V 402 Cygni</u>

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1415.590	9.76	0.95		1629.195*	9.62	0.96	
1487.520	10.07	1.16		1803.506*	9.56	0.93	
1544.473	10.13	1.13		1874.437*	9.82	1.06	
1589.372*	9.56	0.93		1900.369	9.78	1.03	
1596.305*	10.04	1.16		1901.521	10.00	1.18	
1597.351*	10.04	1.11		1902.439	10.17	1.16	
1606.369	9.92	0.99		1949.282*	9.97	1.15	
1617.273	9.91	1.11		1981.231	10.20	1.05:	

Table 3 (cont.)

V 532 Cygni

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1436.556	9.05	1.10		1904.520	9.07	1.13	
1437.556	8.87	1.09		1906.409	9.07	1.00	
1439.564	9.16	1.16		1907.550	9.00	1.06	
1476.494	8.92	1.05		1915.555	9.22	1.16	
1487.503	9.11	1.08		1917.470 *	9.00	1.12	
1541.390 *	9.15	1.12		1921.453 *	9.18	1.18	
1545.407	8.99	1.00		1930.389	8.92	1.08	
1589.424 *	9.09	1.14		1933.371	8.90	1.04	
1606.391	9.22	1.19		1934.441	9.12	1.22	
1803.561 *	9.19	1.21		1944.451 *	9.19	1.19	
1807.541	9.13	1.08		1961.270	9.21	1.21	
1808.565	8.85	1.08		1978.422	9.12	1.10:	
1869.479 *	9.19	1.18		2928.439	8.93	1.06	
1874.417 *	8.89	1.08		2990.490	8.92	1.03	
1897.328 *	8.89	1.07		3030.363	9.00	0.99	
1898.388 *	9.16	1.19		3045.355	9.10	1.17	
1901.544	9.16	1.16		3064.310	9.23	1.19	
1903.509	8.91	1.00		3075.381	8.99	1.07	

V 1154 Cygni

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1389.644	9.30	1.04		1412.488	9.20	1.02	0.89
1390.516	9.02	0.94		1415.459	8.95	0.89	0.52
1391.636	9.01	0.91	0.66	1436.403	9.03	0.95	
1392.557	9.14	1.04	0.83	1436.578	9.13	0.97	0.71
1393.614	9.27	1.09	0.91	1437.439	9.12	1.06	
1394.508	9.33	1.03	0.82	1437.587	9.19	1.09	
1396.538	9.01	0.91		1438.391	9.35	1.07	
1396.634	9.01	0.98		1439.396	9.17	0.99	
1399.539	9.37	0.96:		1466.409	9.15	1.11	0.70
1400.609	8.97	0.87		1475.503	9.10	0.81:	0.70:

Table 3 (cont.)

(V 1154 Cyg)

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1487.448	9.27	1.08	0.89	1765.601	8.88	0.86	
1495.422	9.07	0.99	0.62	1808.549	9.25	0.97	0.70
1764.606	9.08	0.93		1900.426	9.15	1.12	0.79

V 1334 Cygni

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1554.404	5.78	0.52	0.19	1904.326	5.79	0.52	0.18
1561.501	5.80	0.54	0.19	1906.360	5.93	0.57	0.20
1562.377	5.93	0.56	0.19	1906.596	5.91	0.54	0.24
1579.296	5.96	0.56	0.17	1908.365	5.80	0.55	0.17
1606.347	5.94	0.57	0.18	1908.497	5.86	0.54	0.16
1607.354	5.80	0.53	0.20	1931.278	5.79	0.54	0.22
1853.517	5.89	0.52	0.21	1935.300	5.82	0.55	0.19
1877.397	5.78	0.54	0.17	1938.461	5.85	0.56	0.18
1881.389	5.80	0.53	0.19	1939.450	5.92	0.59	0.16
1900.331	5.83	0.57	0.14	1962.277	5.92	0.56	0.23
1903.332	5.90	0.55	0.19	1965.277	5.86	0.57	0.18

AD Geminorum

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1392.386	9.71	0.58		1954.643	10.11	0.81	
1393.367	10.02	0.71:		1982.645	9.73	0.55	
1394.334	10.20	0.77		1989.553	10.23	0.76	
1679.496	9.87	0.58		1990.607	9.62	0.49	
1680.490	9.78	0.63		2044.413	9.83	0.70	
1681.481	10.03	0.77		2066.469	9.64	0.51	
1682.489	10.16	0.80		2069.459	10.06	0.69	
1764.338	9.94	0.76		2100.275	9.59	0.49	
1766.319	10.20	0.72					

Table 3 (cont.)

BB Geminorum

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1608.599	11.56	0.89		1709.402	11.67	0.83	
1610.614	11.73	0.79:		1954.631	11.74	0.80:	
1634.552	11.00	0.64		1962.583	11.24	0.71	
1662.469	11.26	0.67		1980.614	10.85	0.61:	
1679.519	11.68	0.83		1982.629	11.34	0.62	
1680.394	10.75	0.56		1987.643	10.97	0.63	
1680.506	10.77	0.51		1988.592	11.57	0.80	
1681.365	11.52	0.76		1989.618	10.93	0.61	
1681.496	11.59	0.81		1990.524	11.37	0.81	
1682.396	11.68	0.85		2066.286	11.20	0.60	
1682.507	11.51	0.71		2069.298	11.52	0.85	

DX Geminorum

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1634.534	10.55	0.86		2018.468	10.83	0.91	
1662.490	10.65	0.91:		2018.624	10.86	0.94	
1679.400	10.72	0.95:		2039.548	10.55	0.88	
1680.412	10.90	0.98:		2101.302	10.85	0.83	
1681.402	10.57	0.89		3124.520	10.63	0.86	
1682.415	10.67	0.92		3138.489	10.80	0.90	
1709.389	10.72	0.85		3162.433	10.56	0.82	
1980.628	10.78	0.85:		3192.353	10.84	1.03	
1981.638	10.86	0.94:		3210.281	10.60	0.87	
1990.592	10.89	0.93					

BL Herculis

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1366.648	9.79	0.25		1390.632	10.03	0.40	
1390.618	10.03	0.40		1391.621	9.82	0.30	

Table 3 (cont.)

(BL Her)

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1392.537	10.64	0.50		1932.328	10.48	0.51	
1396.566	10.43	0.46		1933.294	10.18	0.44	
1412.467	9.83:	0.19:		2132.616 *	10.50	0.51	
1415.486	10.03	0.44		2152.602	9.89	0.49	
1438.422	10.43	0.43		2159.524	10.27	0.49	
1753.603	10.04	0.35		2161.495	10.28	0.36	
1772.598	10.33	0.49		2255.366	10.51	0.56	
1887.372	9.98	0.39		2277.357	10.25:	0.63:	
1900.354	9.95	0.44		2314.302	10.57	0.56	
1932.278	10.39	0.58					

V Lacertae

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1467.531	9.30	1.11	0.83:	1658.191	8.65	0.83	0.44
1475.517	8.89	0.91	0.41:	1900.561	9.16	1.13	0.71
1476.529	9.14	1.02:		1901.566	9.28	1.14	0.84:
1544.414	8.55	0.67	0.43:	1903.563	8.65	0.90	0.46
1545.517	8.88	1.02	0.58	1904.571	8.96	1.03	0.68
1589.465 *	8.62	0.82	0.45	1907.566	8.43	0.71	0.45
1594.433	8.61	0.82	0.55	2278.535	9.00	1.06	0.69
1597.407 *	9.32	1.13	0.57:	2297.493	8.77	0.93	0.48
1606.413	9.15	1.11	0.68	2316.475	8.42	0.72	0.41
1625.311 *	8.93	0.98	0.50	2350.274	9.30	1.07	0.63:
1634.236	8.60	0.80	0.46	2350.442	9.23	1.02	0.71

Observations in 1967

J.D.hel. 2430000+	Δv	Δb	Δu	J.D.hel. 2430000+	Δv	Δb	Δu
9720.526	-0.582	-0.363	0.460	9739.533	-0.209	+0.128	0.911
9724.510	-0.106	+0.249	1.028	9753.379	+0.228	+0.770	1.771
9726.476	-0.249	+0.153	0.985	9763.576	+0.208	+0.738	1.785
9731.498	-0.217	+0.175	1.278	9795.263	-0.586	-0.361	0.445
9732.447	+0.029	+0.525	1.657				

Table 3 (cont.)

Y Lacertae

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1466.514	8.97	0.67	0.60	1902.402	8.75	0.52	0.52
1589.490 *	9.45	0.74:	0.76:	1903.491	9.06	0.72	0.69
1594.410	9.42	0.80	0.67	1905.558	9.44	0.85	0.64
1596.388 *	9.05	0.69	0.47:	1906.456	8.85	0.56	0.49
1597.394 *	9.30	0.79	0.50:	1907.375	8.90	0.64	0.63
1604.414	8.82	0.60	0.48	1930.434	9.30	0.80	
1606.435	9.33	0.86	0.69	1931.332	9.40	0.86	0.62
1629.285 *	9.32	0.76	0.44:	1932.473	8.82	0.56	0.47
1651.219 *	9.05	0.59	0.45	1980.390	8.78	0.54	0.54
1860.501	9.13	0.73	0.66	2027.224	9.15	0.73	0.49
1882.443	9.21	0.78	0.61				

BE Monocerotis

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1329.470	10.67	1.24:		1982.599	10.66	1.08	
1608.622	10.84	1.15		2018.550	10.36	1.00	
1679.469	10.78	1.14		2044.369	10.79	1.19	
1680.470	10.45	1.01		2069.483	10.34	0.97	
1681.465	10.82	1.09		2070.358	10.53	1.04	
1682.474	10.55	1.00		2101.404	10.77	1.09	
1960.616	10.86	1.05:		2429.393	10.28	0.96	
1961.598	10.32	0.95		2429.470	10.24	0.93	
1981.625	10.71	1.24:					

V 465 Monocerotis

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1329.502	10.20	0.60		1679.441	10.23	0.59	
1331.493	10.47	0.72		1680.451	10.42	0.69	
1332.479	10.19	0.63		1681.445	10.54	0.70	

Table 3 (cont.)

(V 465 Mon)

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1682.456	10.20	0.62		2044.520	10.50	0.80	
1961.611	10.23	0.60		2066.447	10.54	0.79	
1962.602	10.42	0.69		3124.537	10.58	0.68:	
1982.553	10.57	0.73		3138.474	10.44	0.80	
1988.575	10.30	0.59		3162.403	10.57	0.74	
1989.566	10.36	0.68		3209.293	10.38	0.68	
1990.558	10.54	0.83		3210.293	10.25	0.68	
2044.391	10.56	0.77					

V 508 Monocerotis

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1311.527	10.56	0.86		1982.567	10.74	0.94	
1679.423	10.53	0.90		1989.633	10.56	0.89	
1680.433	10.69	0.93		1990.643	10.65	1.01	
1681.423	10.76	0.90		2066.341	10.55	0.84	
1682.436	10.34	0.72		2066.514	10.44	0.81	
1764.311	10.66	0.79:		2070.378	10.55	0.83	
1765.308	10.32	0.78		2089.366	10.64	0.96	
1980.598	10.40	0.81		2148.302	10.70	0.96	
1981.570	10.55	0.95					

AU Pegasi

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1495.491	9.30	0.75		1613.227	9.33	0.78	
1561.409	9.23	0.64		1617.226	9.20	0.62	
1562.360	9.20	0.74	0.43:	1623.253*	9.47	0.84	0.51:
1589.399*	9.40	0.83	0.39:	1629.213*	9.14	0.73	0.44
1596.341*	9.32	0.83	0.51:	1853.536	9.38	0.75	
1597.364*	9.23	0.69	0.41:	1860.484	9.32	0.82	
1610.306	9.12	0.77		1869.501*	9.15	0.74	0.42:

Table 3 (cont.)

(AU Peg)

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1874.453*	9.19	0.79	0.56:	1938.444	9.09	0.73	
1875.518*	9.42	0.78	0.48:	1942.407	9.46	0.79	
1897.360*	9.31	0.76	0.43	1944.436*	9.33	0.82	0.51
1898.336*	9.14	0.78		1960.300	9.09:	0.65:	
1900.468	9.15	0.65	0.39:	1961.379	9.32	0.87	
1904.451	9.38	0.81	0.35:	1978.247	9.36	0.80	
1906.396	9.45	0.78		1982.311	9.16	0.72	
1907.449	9.13	0.66		1983.304	9.35	0.88	
1917.457*	9.12	0.74	0.48	2939.489	9.38	0.77	
1921.440*	9.27	0.70	0.39	2990.461	9.14	0.64	
1928.441	9.42	0.77		3030.386	9.51	0.82	
1930.451	9.39	0.80		3045.344	9.34	0.67	
1931.353	9.18	0.64	0.29:	3048.425	9.12	0.68	0.37
1932.315	9.24	0.75		3075.368	9.20	0.80	
1933.355	9.39	0.71		3078.266	9.41	0.81	
1934.412	9.15	0.80					

SX Persei

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1304.349	11.02	1.19		1961.401	11.24	1.25	
1596.581*	11.18	1.35:		1980.457	11.19	1.20	
1650.492*	10.77	0.88		1980.586	11.05	1.10	
1651.478*	10.91	1.18:		1981.378	10.73	1.04	
1679.294	11.38	1.35:		1982.384	11.03	1.27	
1681.323	10.84	1.07		1988.607	11.45	1.32	
1682.315	11.14	1.26		1989.586	10.69	0.91	
1931.539	11.25	1.22		2039.336	11.39	1.27	
1932.583	11.38	1.32		2069.222	11.38	1.22	
1954.565	11.38	1.18		2101.351	10.68	1.07	
1960.508	10.96	1.12					

Table 3 (cont.)

AS Persei

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1304.404	9.94	1.61		2001.459	9.92	1.56	
1401.333	9.32	1.32		2066.272	9.85	1.50	
1402.342	9.60	1.50		2066.488	9.62	1.38	
1606.633	9.71	1.53		2070.399	10.02	1.57	
1634.453	9.20	1.21		2141.277	9.35	1.32	
1679.314	9.19	1.24		3078.406	9.75	1.47	
1680.522	9.54	1.46		3124.504	9.93	1.60	
1681.507	9.81	1.50:		3140.298	9.88	1.51	
1694.476	9.28	1.27		3162.342	9.53	1.45	
1772.308	10.01	1.57		3176.417	9.30	1.35	
1931.596	10.00	1.55		3178.223	9.81	1.50	
1935.460	9.80	1.55:		3191.239	9.22	1.37	
1935.612	9.90	1.61		3209.253	9.98	1.59	
1942.484	9.30	1.24		3210.313	9.51	1.28	
1963.476	9.42	1.39					

ST Tauri

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1302.503	7.89	0.78		1696.286	8.53	1.06	0.62
1352.433	8.39	0.99	0.69	1697.334	7.81	0.69	0.50
1366.311	8.04	0.77	0.48	1712.247	8.54	1.01	0.76:
1392.359	8.27	0.96	0.51:	1761.314	8.41	0.95	0.63
1608.578	7.81	0.71	0.45	1960.526	8.09	0.86	0.52
1610.554	8.37	1.01	0.58	1980.470	7.97	0.82	0.51
1673.347	7.81	0.68	0.49	1981.497	8.29	1.00	0.70:
1680.351	8.53	1.03	0.63	2018.424	8.45	1.04	0.66
1682.362	8.11	0.93	0.54	2018.581	8.50	1.02	0.61:
1695.416	8.41	1.03	0.66	2039.570	8.54	1.04	0.67:

Table 3 (cont.)

SW Tauri

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1303.532	9.87	0.70		1961.525	9.40	0.46	0.17
1352.378	9.81	0.52:		1961.570	9.41	0.44	0.20
1366.270	9.38	0.44	0.23	1961.631	9.40	0.45	0.19
1586.591*	9.48	0.58		1981.476	10.02	0.72	0.60:
1589.589*	9.34	0.49		1982.540	9.58	0.57	0.24:
1596.603*	9.93	0.75:	0.46:	1982.617	9.70	0.64	
1606.603	10.04	0.62		1984.534	9.94	0.69	
1606.609	9.96	0.68		1989.650	10.11	0.74	
1610.597	9.79	0.62	0.31	2018.446	9.52	0.47:	
1617.437	10.08	0.80		2039.358	9.39	0.43	0.17
1680.318	9.82	0.63		2039.418	9.49	0.48	0.19
1681.343	9.41	0.44		2044.285	9.54	0.60	0.24
1682.348	10.10	0.77		2044.335	9.68	0.58	0.22
1689.346*	9.37	0.45	0.39:	2044.439	9.77	0.62	0.45
1694.355	9.61	0.58		2066.381	9.46	0.50	
1695.333	9.81	0.60		2070.257	10.09	0.74	0.27
1695.341	9.78	0.56		3124.487	9.75	0.75:	
1929.592	10.17	0.70	0.30:	3162.323	9.60	0.56	0.36
1930.598	9.84	0.67	0.32:	3202.262	9.90	0.66	
1954.617	10.05	0.75	0.41:	3209.265	9.56	0.58	0.09

SZ Tauri

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1303.555	6.39	0.74		1694.369	6.41	0.80	0.43
1352.405	6.71	0.91	0.42:	1695.389	6.66	0.95	0.54
1366.293	6.34	0.77	0.42	1696.263	6.56	0.82	0.45
1608.646	6.39	0.75	0.41	1754.303	6.44	0.81	0.34:
1610.576	6.69	0.91	0.48	1954.594	6.50	0.81	0.41
1673.308	6.68	0.92	0.55	1966.565	6.68	0.91	0.43:
1680.334	6.60	0.84	0.43	1981.657	6.64	0.88	0.50
1682.331	6.59	0.89	0.49	1982.473	6.65	0.88	0.58:

Table 3 (cont.)

(SZ Tau)

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1984.492	6.51	0.89	0.45	1990.626	6.51	0.83	0.40
1989.505	6.42	0.78	0.39	2018.509	6.39	0.77	0.41

Observations in 1967

J.D.hel. 2430000+	Δv	Δb	Δu	J.D.hel. 2430000+	Δv	Δb	Δu
9770.518	0.049	0.104	0.165	9806.424	0.351	0.521	0.734
9776.536	0.029	0.061	0.130	9810.561	0.174	0.227	0.293
9777.504	0.252	0.379	0.522	9815.603	0.314	0.509	0.698
9782.598	0.060	0.116	0.199	9825.652	0.375	0.562	
9787.546	0.349	0.544	0.666	9838.491	0.274	0.389	0.469
9791.476	0.250	0.318	0.368	9845.373	0.088	0.120	0.222
9796.575	0.296	0.426	0.686				

EU Tauri

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1302.577	8.21	0.73		1962.546	8.29	0.74	0.58
1352.462	8.23	0.75		1966.584	8.27	0.76	0.53
1364.385	8.01	0.66	0.48	1980.658	8.08	0.68	0.54
1395.370	8.06	0.69	0.56	1981.553	8.29	0.72	0.56
1610.533	8.03	0.67	0.50	1982.660	8.04	0.67	0.53
1673.328	7.93	0.64		1984.568	8.02	0.62	
1680.375	8.20	0.72	0.52	2018.527	8.10	0.69	0.52
1681.360	8.05	0.63	0.46:	2035.413	8.13	0.69	
1682.377	8.19	0.71	0.54	2044.309	8.29	0.75	0.55
1694.425	7.98	0.62	0.47	2066.245	8.00	0.61	0.53:
1695.368	8.27	0.76		2066.427	7.96	0.62	0.48
1759.317	8.01	0.61		2069.316	8.23	0.73	0.54
1939.630	8.25	0.70	0.64:	2070.234	8.10	0.66	0.54
1961.552	8.02	0.65	0.50	2108.253	8.01	0.64	

Table 3 (cont.)

T Vulpeculae

J.D.hel. 2440000+	V	B-V	U-B	J.D.hel. 2440000+	V	B-V	U-B
1472.536	5.98	0.77	0.46	1617.239	5.61	0.59	0.27
1475.537	5.66	0.65	0.26:	1868.431	5.97	0.74	0.36
1476.547	5.92	0.75	0.49	1877.382	5.96	0.65	0.24:
1477.538	6.04	0.79	0.45	1880.378	5.97	0.74	0.47
1495.525	6.05	0.77	0.48	1900.544	5.46	0.50	0.24
1496.472	5.44	0.51	0.26	1904.430	5.59	0.49	0.23
1554.374	5.42	0.49	0.23	1905.324	5.54	0.56	0.30
1561.463	6.00	0.79	0.41	1906.377	5.82	0.71	0.42
1579.318	6.03	0.76	0.47	1935.279	5.71	0.60	0.28
1584.406	6.08	0.72	0.41				

Observations in 1953

J.D.hel. 2430000+	Δv	Δb	J.D.hel. 2430000+	Δv	Δb
4584.534	-0.470	+0.760	4597.559	-0.527	+0.550
4585.545	-0.684	+0.392	4608.546	-1.281	-0.492
4590.569	-1.187	-0.395	4609.540	-0.884	+0.010

that my observations were made at less than 1000 metres above sea level.

Table 3 contains the observations in alphabetical order of the constellations. Some unpublished observations made by Prof. L. Detre in 1953 and by Dr. J. Abaffy in 1967-1968 are also listed in Table 3. Unfortunately, since the comparison stars used by them are unknown in several cases these two sets of observations have not been transformed to the standard system, and only the magnitude differences are given in the instrumental system.

THE LIGHT CURVES AND PERIOD CHANGES OF THE INDIVIDUAL VARIABLES

This section contains the light curves, the tables and the graphs of the O-C values and some remarks on the observed cepheids.The variables were arranged according to the length of their period. Such a sequence is obvious because both the form of the light curve and the rate of the period changes vary with the period itself.

The light and colour curves are constructed from the observations listed in Table 3 using the actual periods available after constructing the O-C diagrams. The value of the actual period is indicated for each light curve.

All the available observational material on each cepheid has been gathered so that the period changes can be studied. If the individual observations are available in published form, they were plotted with an approximately correct value of the period and the moment of the normal light maximum was determined. The moment of the median brightness on the ascending branch could also be determined in several cases.The median brightness is the brightness at half the amplitude. The moment of median brightness on the ascending branch can be determined more precisely than can the moment of the maximum because of steep rise in the brightness on the ascending branch. If, however, a light curve of good quality is available the moment of median brightness can be determined accurately. In the case of visual and photographic light curves with large scatter I determined the moments of maxima by fitting the new photoelectric light curve. For the earlier photoelectric observations the light curve in band B (or the band closest to B) was used for the determination of moments of maximum and median brightnesses. The difference between the moments of maxima in B and V lights can be ignored. Although there is a systematic difference in the sense that the longer the wavelength the later the moment of the maximum takes place, the scatter of the points on the O-C diagram is much larger than this difference.

In the case of individual observations not having been published, the normal maximum taken from the original reference was used for constructing the O-C diagram. If more than one maximum in the same year is published, the yearly mean of the O-C values was determined from these maxima.

The O-C values determined on the basis of visual, photographic and photoelectric observations are marked with open circles, filled circles and triangles, respectively. The size of these marks denotes the weight of the O-C values to be found in the figures of this section.

The formulae by which the O-C residuals have been calculated are indicated at each variable. These formulae usually refer to maximum light. If O-C diagrams for both maximum and median brightnesses are presented the two different calculated ephemerides are marked with C_{max} and C_{med}, respectively. O-C diagrams for the median brightness are published here only if they are fairly complete.

BL Herculis

This is a short period Population II cepheid. Its light curve is typical of the class to which this star belongs. Unfortunately,

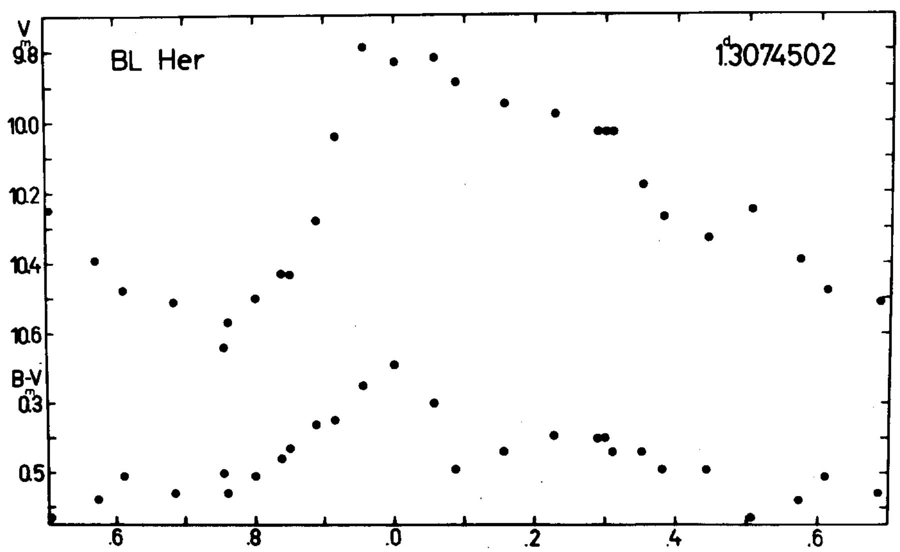

Figure 2 V and B-V curves of BL Her

the comparison star BD +19° 3491 seems to be slightly variable in V light therefore the V light curve shows larger scatter than might otherwise have been expected due to the observational errors (see Fig. 2). The B light curve shows no mark of variability of the comparison star. According to Madore (1977), BL Her has a blue photometric companion.

The O-C residuals have been computed by the formulae:

$$C_{max} = 2441841.289 + 1^{d}.3074502E \ ;$$

Table 4 O-C residuals for BL Her

Obs.Max.J.D.	Obs.Med.J.D.	E	$O-C_{max}$	$O-C_{med}$	Type	w	Source
2415196.499		-20379	$-0^{d}.262$		phg	0.5	Jacchia (1940)
2420005.423		-16701	-0.140		phg	1	Parenago (1939a)
2426222.400		-11946	-0.089		vis	1	Esch (1933)
2426503.16		-11731	-0.43		vis	0	Jacchia (1931)
2428384.974		-10292	-0.038		phg	2	Wachmann (1940)
2428734.030		-10025	-0.071		phg	1	Parenago (1939a)
2428955.025	2428954.874	-9856	-0.035	$-0^{d}.070$	phg	2	Wachmann (1940)
2429481.898	2429481.805	-9453	-0.064	-0.042	phg	2	Binnendijk (1950)
2430353.989	2430353.874	-8786	-0.043	-0.043	phg	2	Binnendijk (1950)
2431994.845	2431994.743	-7531	-0.037	-0.023	phg	2	Binnendijk (1950)
2433661.858		-6256	-0.023		phg	1	Solov'yov (1957)
2433661.872		-6256	-0.009		phg	1	Borzdyko (1965)
2433816.153		-6138	-0.007		phel	3	Eggen et al. (1957)
2433860.612		-6104	-0.001		vis	0.5	Koval' (1957)
2433861.986		-6103	+0.066		phg	0.5	Tschuprina (1954)
2433948.198		-6037	-0.014		phg	0.5	Vasil'yanovsk. et al.(1970)
2434200.543		-5844	-0.007		phg	0.5	Mandel' (1970)
2434200.547		-5844	-0.003		vis	0.5	Koval' (1957)
2434584.916		-5550	-0.024		phg	0.5	Mandel' (1970)
2434903.950	2434903.844	-5306	-0.008	+0.001	phel	3	Abt, Hardie (1959)
2435457.028		-4883	+0.018		phg	0.5	Vasil'yanovsk. et al.(1970)
2435488.388		-4859	0.000		phg	0.5	Mandel' (1970)
2435667.508		-4722	-0.001		phel	3	Abt, Hardie (1959)

Table 4 (cont.)

Obs.Max.J.D.	Obs.Med.J.D.	E	$O-C_{max}$	$O-C_{med}$	Type	w	Source
2435871.472		-4566	$+0^{d}.001$		phg	1	Borzdyko (1965)
2436023.157		-4450	+0.021		phg	0.5	Vasil'yanovsk. et al.[1] (1970)
2436083.265		-4404	-0.013		phg	0.5	Mandel' (1970)
2436387.912		-4171	-0.002		phg	0.5	Mandel' (1970)
2436416.659		-4149	-0.019		phg	0.5	Mandel' (1970)
2436771.011		-3878	+0.014		phg	0.5	Mandel' (1970)
2436780.171		-3871	+0.022		phg	1	Borzdyko (1965)
2436832.457		-3831	+0.010		phg	0.5	Huth (1963c)
2437080.876		-3641	+0.013		phg	0.5	Mandel' 1970)
2437143.625		-3593	+0.005		phg	0.5	Mandel' (1970)
2437287.457		-3483	+0.017		phg	0.5	Vasil'yanovsk. et al.[1] (1970)
2437454.801		-3355	+0.007		phel	2	Mitchell et al. (1964)
2437501.843		-3319	-0.019		phg	0.5	Mandel' (1970)
2437565.911		-3270	-0.016		phg	0.5	Borzdyko (1965)
2437871.855	2437871.746	-3036	-0.015	$-0^{d}.009$	phel	3	Michalowska-Smak, Smak(1965)
2437871.861		-3036	-0.009		phg	0.5	Mandel' (1970)
2438390.918		-2639	-0.010		phg	0.5	Mandel' (1970)
2438392.227		-2638	-0.008		phg	0.5	Mandel' (1970)
2438434.072		-2606	-0.002		phg	0.5	Vasil'yanovsk. et al.[1] (1970)
2438967.514		-2198	+0.001		phg	0.5	Mandel' (1970)
	2439328.253	-1922		-0.002	phel	2	Preston, Kilston (1967)
2441841.293	2441841.180	0	+0.004	+0.006	phel	3	present paper

Remark: [1] Observer: Shakhovskaya.

$$C_{med} = 2441841.174 + 1\overset{d}{.}3074502E \ .$$

The O-C diagram (Fig. 3) for the maximum light can be interpreted in two different ways. It may consist of two straight lines, or can be represented by a negative parabola. This uncertainty results from the smallness of the period variation. Assuming the

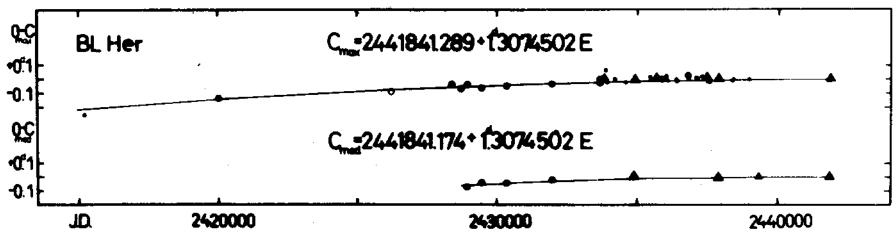

Figure 3 O-C diagram of BL Her

case of sudden period change the values of the period were $1\overset{d}{.}3074604$ before J.D. 2435000 and $1\overset{d}{.}3074502$ after J.D. 2435000. The approximation of the O-C diagram with a parabola is as follows:

$$C'_{max} = 2434999.402 + 1\overset{d}{.}307457E - 3\overset{d}{.}9 \cdot 10^{-10}E^2 \ .$$

SW Tauri

This star is a short period Population II cepheid. This classification is supported by the shape of the light curves and the phase shift between the minimum value of U-B colour index and the light maximum in V (see Fig. 4).According to Mandel's (1970) photographic observations there is a small bump on the light curve of SW Tau near its minimum brightness. Unfortunately, neither the photoelectric observations made by Milone (1970) nor the present observations provides enough data about the minimum, to prove the presence of this bump. Nevertheless, the photoelectric observations show a stable light curve though Latyshev (1963) listed SW Tau among double mode cepheids. SW Tau is a representative of short period flat-topped cepheids. The star reaches its light maximum after a very slow increase of brightness. The point of maximum is at the right end of the flat top. Earlier the maximum was thought to be at the mid-phase of the top, therefore a small correction has been applied in determining O-C residuals should the original observations not be pub-

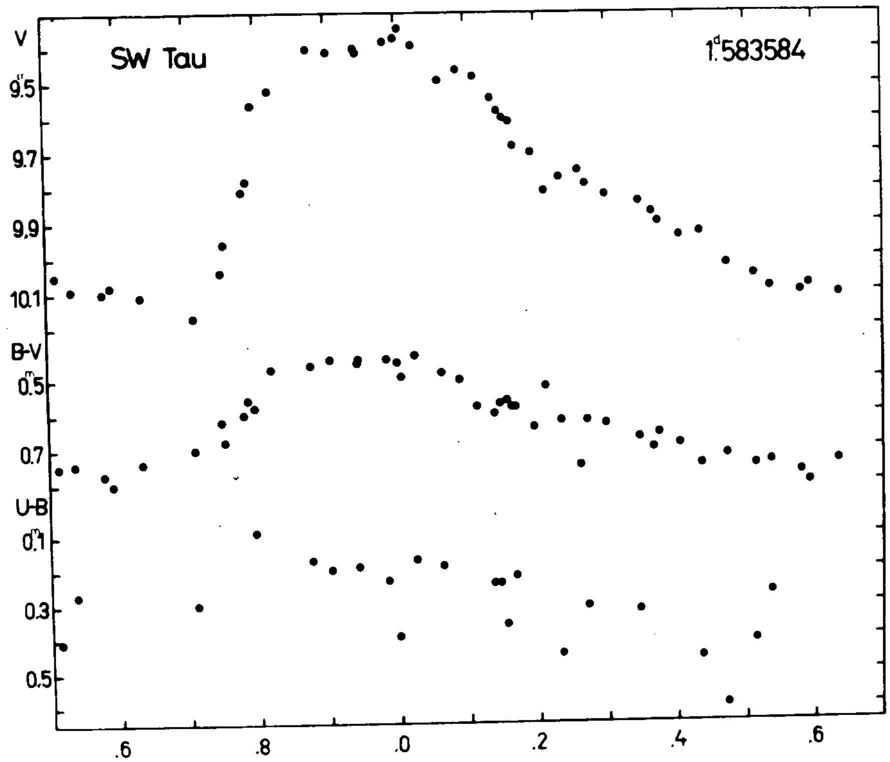

Figure 4 V, B-V and U-B curves of SW Tau

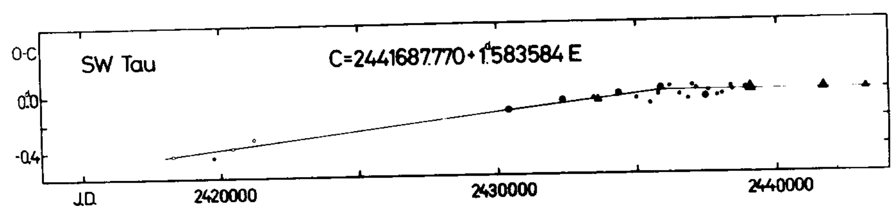

Figure 5 O-C diagram of SW Tau

Table 5 O-C residuals for SW Tau

Obs.Max.J.D.	E	O-C	Type	w	Source
2418240.787	-14806	-0.d438	vis	0.5	Münch (1909)
2419730.929	-13865	-0.449	phg	0.5	Robinson (1930)
2420440.44	-13417	-0.38	vis	0.5	Hoffmeister (1919)
2420842.84	-13163	-0.21	vis	0	Hoffmeister (1919)
2421200.62	-12937	-0.32	vis	0.5	Hoffmeister (1919)
2430434.692	-7106	-0.130	phg	1	Solov'yov (1957)
2432354.063	-5894	-0.063	phg	1	Borzdyko (1965)
2433473.67	-5187	-0.05	phg	0.5	Vasil'yan. et al.(1970)
2433638.348	-5083	-0.065	phel	2	Eggen et al. (1957)
2434377.922	-4616	-0.024	phg	1	Borzdyko (1965)

Table 5 (cont.)

Obs.Max.J.D.	E	O-C	Type	w	Source
2435000.23	-4223	$-0^d.06$	phg	0.5	Vasil'yan. et al.(1970)
2435502.195	-3906	-0.096	phg	0.5	Stilijanow (1966)
2435774.64	-3734	-0.03	phg	0.5	Vasil'yan. et al.(1970)
2435879.196	-3668	+0.012	phg	1	Borzdyko (1965)
2436197.508	-3467	+0.024	phg	0.5	Stilijanow (1966)
2436555.339	-3241	-0.035	phg	0.5	Mandel' (1970)
2436846.699	-3057	-0.055	phg	0.5	Stilijanow (1966)
2437003.558	-2958	+0.029	phg	0.5	Borzdyko (1965)
2437147.64	-2867	+0.01	phg	0.5	Vasil'yan. et al.(1970)
2437465.884	-2666	-0.051	phg	1	Mandel' (1970)
2437584.694	-2591	-0.010	phg	0.5	Stilijanow (1966)
2437907.713	-2387	-0.042	phg	0.5	Stilijanow (1966)
2438083.498	-2276	-0.035	phg	0.5	Stilijanow (1966)
2438376.52	-2091	+0.02	phg	0.5	Vasil'yan. et al.(1970)
2438441.416	-2050	-0.007	phg	0.5	Stilijanow (1966)
2438894.340	-1764	+0.012	phg	0.5	Mandel' (1970)
2439059.029	-1660	+0.008	phel	3	Milone (1970)
2439063.790	-1657	+0.019	phg	0.5	Stilijanow (1966)
2439078.025	-1648	+0.001	phel	3	Wamsteker (1972)
2441687.773	0	+0.003	phel	3	present paper
2443176.335	+940	-0.004	phel	2	present paper

lished. The true maximum in B is $0^d.1$ later than the mid-phase of the top.

The O-C residuals have been computed with the formula:

$$C = 2441687.770 + 1^d.583584E \ .$$

Figure 5 shows a period change at J.D. 2436000. Before this change the value of the period was $1^d.583623$, after J.D. 2436000 the period is $1^d.583584$.

<u>SU Cassiopeiae</u>

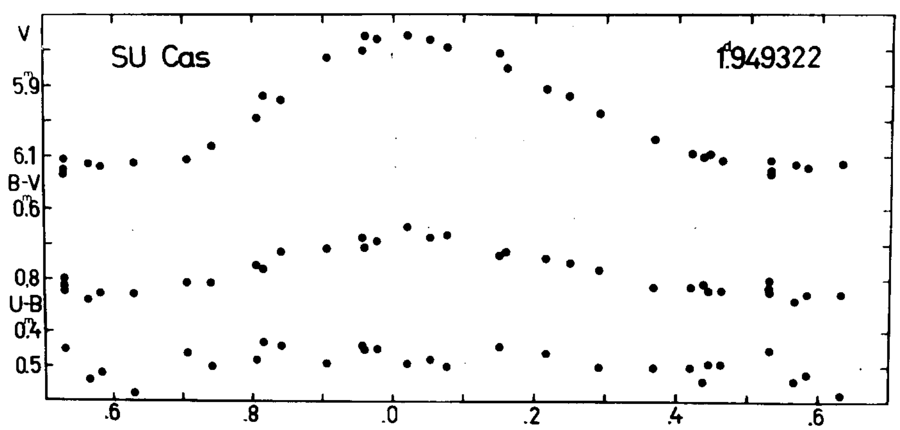

Figure 6 V, B-V and U-B curves of SU Cas

Table 6 O-C residuals for SU Cas

Obs.Max.J.D.	Obs.Med.J.D.	E	$O-C_{max}$	$O-C_{med}$	Type	w	Source
2417287.164	2417286.809	-12496	$-0^{d}.028$	$+0^{d}.005$	vis	1	Müller, Kempf (1907)
2417347.775		-12465	+0.164		vis	0	Münch (1910)
2417482.181		-12396	+0.067		vis	0.5	Müller, Kempf[1] (1907)
2417770.629	2417770.223	-12248	+0.015	-0.013	phg	2	Parkhurst (1908)
2417794.090		-12236	+0.084		vis	0.5	Zeipel (1908)
2418055.209		-12102	-0.006		vis	0.5	Nijland (1923)
2418873.924		-11682	-0.006		vis	0.5	Nijland (1923)
2420025.890		-11091	-0.090		vis	0.5	Hoffmeister (1915)
2421394.42		-10389	+0.02		vis	1	Vogelenzang (1922)
2422285.552		-9932	+0.308		vis	0	Ellsworth (1928)
2423115.771		-9506	+0.116		vis	0	Ellsworth (1928)
2423386.570		-9367	-0.041		vis	0.5	Hellerich (1926a)
2423677.080		-9218	+0.020		vis	0.5	Hopmann (1926a)
2424148.790	2424148.410	-8976	-0.006	-0.008	vis	1	Parenago (1938)
2424840.855	2424840.524	-8621	+0.050	+0.097	vis	0.5	Kukarkin (1940)
2425051.298	2425050.955	-8513	-0.034	+0.001	phg	1	Hellerich (1935)
2425096.155	2425095.820	-8490	-0.011	+0.032	vis	1	Parenago (1938)
2425283.360	2425282.981	-8394	+0.059	+0.058	vis	1	Kukarkin (1940)
2425630.257	2425629.916	-8216	-0.023	+0.014	vis	1	Zverev (1936)
2425698.552	2425698.248	-8181	+0.043	+0.119	vis	0.5	Kukarkin (1940)
2425747.254	2425746.862	-8156	+0.014	0.000	vis	1	Parenago (1938)
2425969.403		-8042	-0.059		vis	0.5	Florya, Kukarkina (1953)
2426086.404	2426086.094	-7982	-0.018	+0.050	vis	1	Zverev (1936)
2426560.123		-7739	+0.016		vis	0.5	Kukarkin (1940)
2426755.064	2426754.688	-7639	+0.025	+0.027	phg	1	Kox (1935)
2426766.766	2426766.362	-7633	+0.031	+0.005	vis	1	Florya, Kukarkina (1953)
2426895.330	2426894.938	-7567	-0.060	-0.074	phg	1	Hassenstein (1954)
2427127.283	2427126.900	-7448	-0.077	-0.082	vis	1	Parenago (1938)
2427881.760		-7061	+0.013		vis	1	Krebs (1937a)
2428144.865		-6926	-0.041		vis	1	Krebs (1937a)

Table 6 (cont.)

Obs.Max.J.D.	Obs.Med.J.D.	E	$O-C_{max}$	$O-C_{med}$	Type	w	Source
2429181.912		-6394	$-0^d.033$		phg	1	Mandrykina (1949)
2430404.167	2430403.793	-5767	-0.003	$+0^d.001$	phel	3	Walter (1943)
2430905.119	2430904.784	-5510	-0.027	+0.016	phel	3	Groeneveld (1944)
2432639.97		-4620	-0.07		vis	0.5	Pohl[2] (1950)
2435755.041	2435754.663	-3022	-0.018	-0.018	phel	3	Prokof'yeva (1961)
2436199.516		-2794	+0.012		phel	2	Svolopoulos (1960)
2436836.942		-2467	+0.009		phel	2	Bahner et al. (1962)
2437439.297	2437438.927	-2158	+0.024	+0.032	phel	3	Mitchell et al. (1964)
2437987.089		-1877	+0.054		vis	0.5	Kunicki (1972)
2438384.671	2438384.291	-1673	-0.023	-0.025	phel	3	Wisniewski, Johnson (1968)
2439055.269	2439054.887	-1329	+0.008	+0.004	phel	3	Milone (1970)
2439361.299	2439360.919	-1172	-0.006	-0.008	phel	3	Takase (1969)
2439447.074	2439446.719	-1128	-0.001	+0.022	phel	3	Wamsteker (1972)
2439751.198	2439750.759	-972	+0.029	-0.032	phel	2	Sudzius (1969)
2439864.198	2439863.859	-914	-0.032	+0.007	phel	3	Reed (1968)
2441645.925	2441645.537	0	+0.015	+0.005	phel	3	present paper
2441930.480		+146	-0.021		phel	3	Gieren (1976)

Remarks:

[1] Observer: Graff
[2] Observer: Pocher

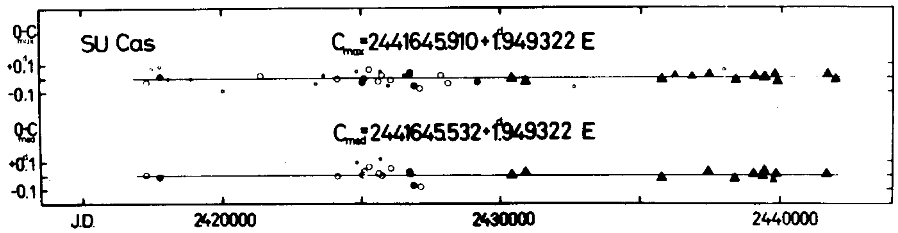

Figure 7 O-C diagram of SU Cas

This is a cepheid with small amplitude (see Fig. 6). According to Kukarkin et al. (1971) its period probably varies. However, neither the O-C diagram of the maximum brightness, nor that of the median brightness shows any changes in the period. The O-C residuals plotted in Fig. 7 have been computed with the formulae:

$$C_{max} = 2441645.910 + 1\overset{d}{.}949322E \; ;$$
$$C_{med} = 2441645.532 + 1\overset{d}{.}949322E \; .$$

The period of SU Cas has been constant since the discovery of its light variation.

EU Tauri

EU Tau is a cepheid with small amplitude (see Fig. 8). There are only four valuable sets of observations within a short time interval therefore the O-C residuals given in Table 7 are not plotted in a separate figure. The residuals have been derived using the formula:

$$C = 2441704.785 + 2\overset{d}{.}10248E \; .$$

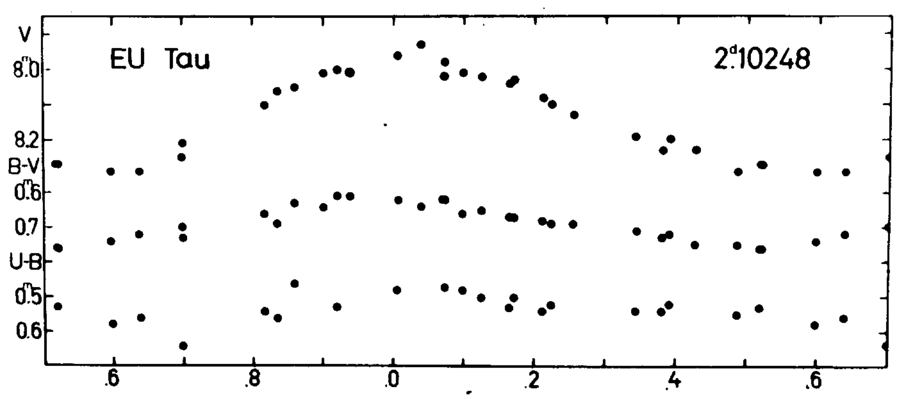

Figure 8 V, B-V and U-B curves of EU Tau

Table 7 O-C residuals for EU Tau

Obs.Max.J.D.	E	O-C	Type	w	Source
2438973.668	-1299	+0.ᵈ005	phel	3	Guinan (1972)
2440998.346	-336	-0.006	phel	3	Wachmann (1976)
2441334.746	-176	-0.003	phel	3	Sanwal et al. (1974)
2441704.788	0	+0.003	phel	3	present paper

IR Cephei

The newly discovered cepheid variable IR Cep = HBV 476 belongs to the group of small amplitude cepheids (see Fig. 9). However,

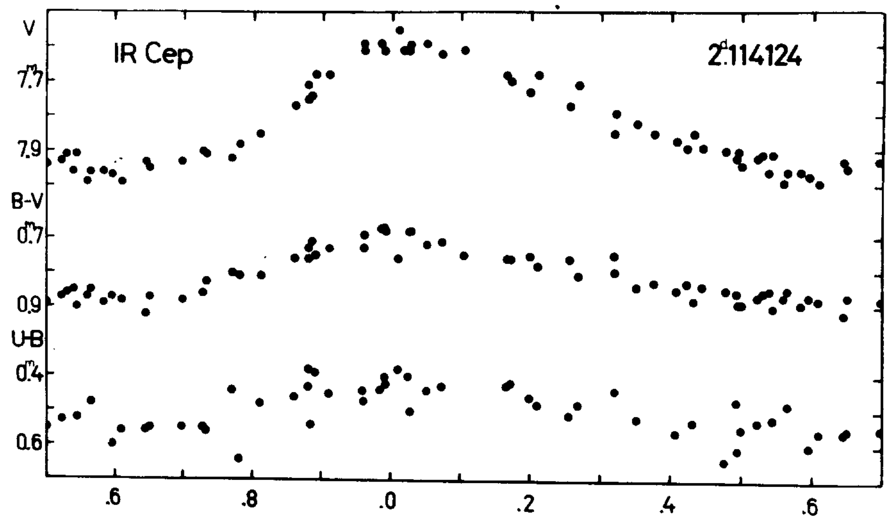

Figure 9 V, B-V and U-B curves of IR Cep

the light curve is not symmetrical (or "sinusoidal"), i.e. it differs markedly from the other small amplitude cepheids in the shape of the light curve. There are two possible explanations for resolving this difference:

1/ the variable star has a companion that reduces the amplitude of the light variation;

2/ the group of cepheids with small amplitude is not homogeneous, it includes cepheids with nearly symmetrical as well as non-symmetrical light curves.

In order to decide whether the first explanation is valid, spectroscopic observations are highly desirable.

The O-C residuals have been computed with the formula:

$$C = 2441696.582 + 2.^{d}114124E \; .$$

These residuals are plotted in Fig. 10. The period of IR Cep

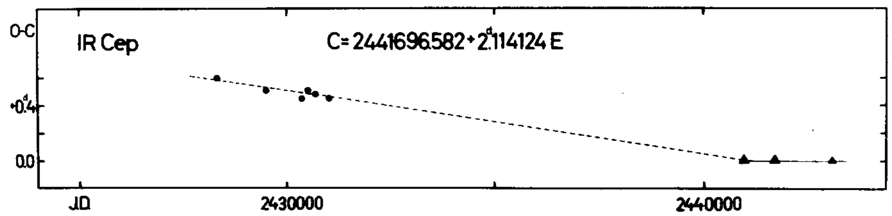

Figure 10 O-C diagram of IR Cep

Table 8 O-C residuals for IR Cep

Obs.Max.J.D.	E	O-C	Type	w	Source
2428335.914	-6320	$+0^{d}.596$	phg	1	Klawitter (1971)
2429515.512	-5762	+0.512	phg	1	Klawitter (1971)
2430373.783	-5356	+0.449	phg	1	Klawitter (1971)
2430517.605	-5288	+0.511	phg	1	Klawitter (1971)
2430703.620	-5200	+0.483	phg	1	Klawitter (1971)
2431033.395	-5044	+0.454	phg	1	Klawitter (1971)
2440965.096	-346	+0.001	phel	3	Wachmann (1976)
2441696.580	0	-0.002	phel	3	present paper
2443045.394	+638	+0.001	phel	2	present paper

shows one strong change. Before J.D. 2440900 the period was $2^{d}.114027$ or even smaller, after J.D. 2440900 the period is $2^{d}.114124$.

BB Geminorum

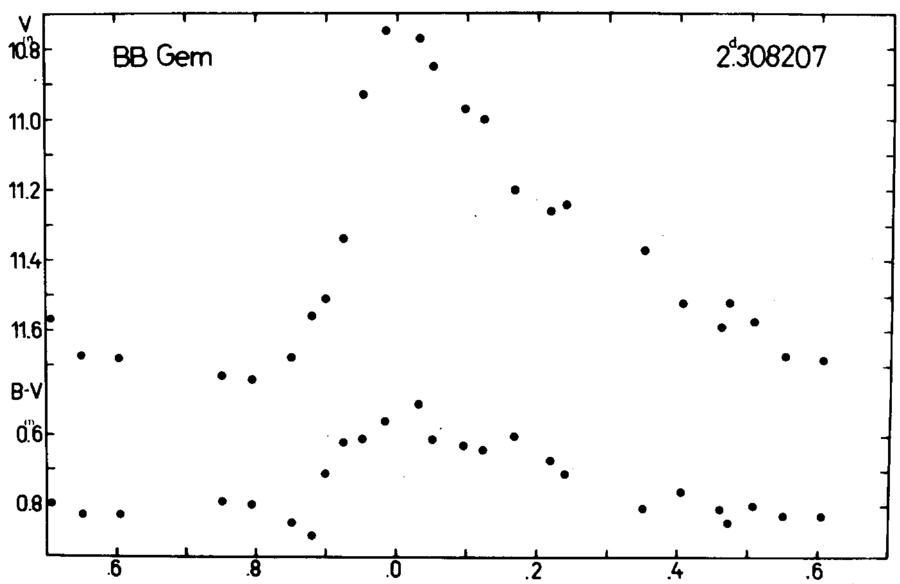

Figure 11 V and B-V curves of BB Gem

The star BB Gem is a Population II cepheid. According to Efremov (1968b) the maximum value of the light amplitude of classical cepheids in the blue band is about $0^m.85$ at $\log P = 0.36$. BB Gem has an amplitude of $1^m.27$ in band B (see Fig. 11). This extremely large amplitude supports the above-mentioned new classification for this cepheid.

The O-C residuals for this star have been obtained by the formula:

$$C = 2441839.695 + 2^d.308207E \ .$$

These residuals are plotted in Fig. 12. The period of BB Gem has remained constant for more than 7000 epochs.

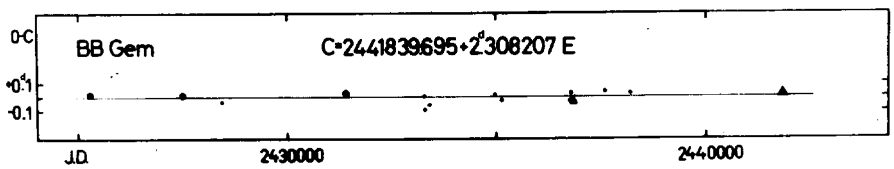

Figure 12 O-C diagram of BB Gem

Table 9 O-C residuals for BB Gem

Obs.Max.J.D.	E	O-C	Type	w	Source
2425296.787	-7167	$+0^d.012$	phg	2	Zonn (1935)
2427482.659	-6220	+0.012	phg	2	Zonn (1935)
2428454.365	-5799	-0.038	vis	0.5	Solov'yov (1940)
2431425.091	-4512	+0.026	phg	1	Teplitskaya (1951)
2433315.399	-3693	-0.088	phg	0.5	Satyvaldiev (1970)
2433317.80	-3692	+0.01	phg	0.5	Solov'yov (1951)
2433421.608	-3647	-0.056	phg	0.5	Borzdyko (1964)
2434975.100	-2974	+0.013	phg	0.5	Borzdyko (1964)
2435157.412	-2895	-0.024	phg	0.5	Satyvaldiev (1970)
2436784.690	-2190	-0.032	phg	0.5	Borzdyko (1964)
2436800.905	-2183	+0.026	phg	0.5	Satyvaldiev (1970)
2436849.315	-2162	-0.036	phel	2	Oosterhoff (1960)
2437606.48	-1834	+0.04	phg	0.5	Ahnert (1963)
2438201.986	-1576	+0.025	phg	0.5	Satyvaldiev (1970)
2441839.711	0	+0.016	phel	3	present paper

AU Pegasi

This is usually classified as a Population II cepheid (Kukarkin et al. 1969-1970, Opolski 1968, Petit 1960). Several authors (Gascoigne and Eggen 1957, Kolesnik and Kheilo 1970) classified it among classical cepheids. The phase shift between the maxima of its light and colour curves as the only population criterion at the small amplitude cepheids based on optical observations unambiguously shows that AU Peg belongs to Population II (see

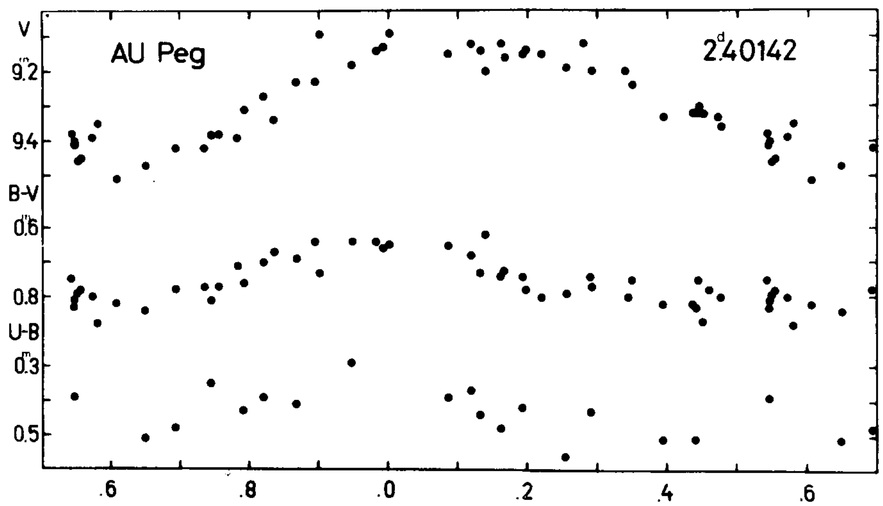

Figure 13 V, B-V and U-B curves of AU Peg

Fig. 13). Moreover, the strong changes in the period of AU Peg (see Fig. 14) also support this classification. The short period classical cepheids do not show such strong period changes.

The O-C diagram shows an interesting structure. It was computed with the ephemeris:

$$C = 2435801.832 + 2\overset{d}{.}390048E\ .$$

I was unable to find a unique representation of the O-C diagram. At earlier epochs two different O-C residuals are listed and plotted for each maximum. It is hard to decide which curve is the real one. However, the light curves plotted from the observations serving as a basis for computing O-C values show less scatter when using the smaller value of the period, i.e. the upper curve is more suitable. This curve shows a continuous increase of the period, but it cannot be approximated with a parabola. The minimum value of the period was about $2\overset{d}{.}3844$ at J.D. 2427000, the maximum value at present is $2\overset{d}{.}40142$. The total change of the period is about 1%. There are no other short period cepheids showing such a large period variation. For example, V1 in M15 has a quasi-parabolic O-C graph with considerable period change but the total change in its period is about 0.01% during 23000 days (Barlai 1977).

The central part of the O-C diagram in Fig. 14 is in accordance with the O-C diagram published by Kwee (1967).

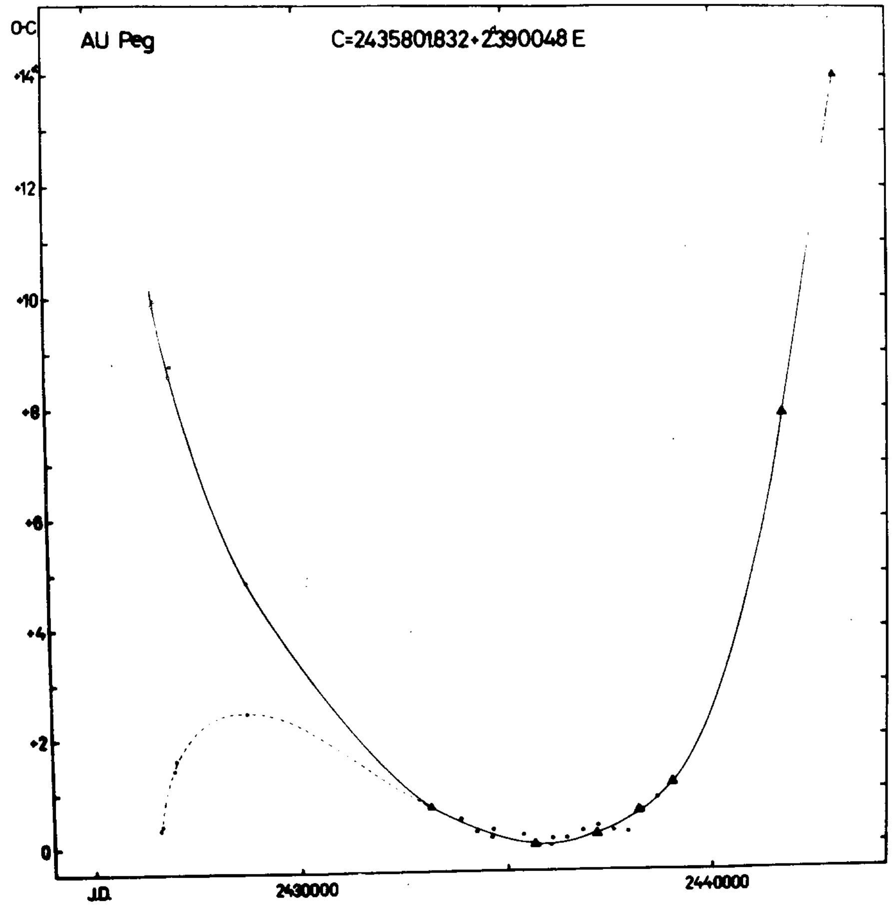

Figure 14 O-C diagram of AU Peg

Table 10 O-C residuals for AU Peg

Obs.Max.J.D.	E	O-C	Type	w	Source
2419080.201	?	?	phg	0.5	Parenago (1934)
2426578.959	{-3863 / -3859	+9.d882 / +0.322}	vis	0.5	Florya (1933)
2426636.40	{-3839 / -3835	+9.96 / +0.40 }	vis	0.5	Lause (1932)
2426952.911	{-3706 / -3703	+8.597 / +1.427}	vis	0.5	Florya (1933)
2427000.90	{-3686 / -3683	+8.78 / +1.61 }	vis	0.5	Lause (1933)
2428729.76	{-2961 / -2960	+4.86 / +2.47 }	vis	0.5	Kukarkin (1938)
2433151.976	-1109	+0.709	phel	2	Eggen et al. (1957)
2433156.727	-1107	+0.678	phg	0.5	Vasil'yan. et al[1] (1970)
2433875.952	-806	+0.499	phg	0.5	Vasil'yan. et al[1] (1970)

Table 10 (cont.)

Obs.Max.J.D.	E	O-C	Type	w	Source
2434258.118	-646	+0ᵈ.257	phg	0.5	Vasil'yan. et al.[1] (1970)
2434614.133	-497	+0.155	phg	0.5	Vasil'yan. et al.[1] (1970)
2434654.90	-480	+0.29	phg	0.5	Günther (1955)
2435383.768	-175	+0.194	phg	0.5	Vasil'yan. et al.[1] (1970)
2435667.965	- 56	-0.024	phel	3	Walraven et al. (1958)
2435751.615	- 21	-0.026	phg	0.5	Vasil'yan. et al.[1] (1970)
2436076.678	+115	-0.010	phg	0.5	Vasil'yan. et al.[1] (1970)
2436093.540	+122	+0.122	phg	0.5	Korovkina (1958)
2436442.493	+268	+0.128	phg	0.5	Vasil'yan. et al.[1] (1970)
2436829.821	+430	+0.268	phg	0.5	Vasil'yan. et al.[1] (1970)
2437185.841	+579	+0.171	phel	3	Mitchell et al. (1964)
2437207.539	+588	+0.359	phg	0.5	Vasil'yan. et al.[1] (1970)
2437580.286	+744	+0.258	phg	0.5	Vasil'yan. et al.[1] (1970)
2437941.154	+895	+0.229	phg	0.5	Vasil'yan. et al.[1] (1970)
2438228.339	+1015	+0.608	phel	3	Kwee and Braun (1967)
2438300.062	+1045	+0.630	phg	0.5	Vasil'yan. et al.[1] (1970)
2438654.026	+1193	+0.867	phg	0.5	Vasil'yan. et al.[1] (1970)
2439039.083	+1354	+1.126	phel	3	Wamsteker (1972)
2441739.439	+2481	+7.898	phel	3	present paper
2443031.402	+3019	+14.015	phel	2	present paper

Remark: [1] Observer: Shakhovskaya

DT Cygni

This variable is a cepheid with small amplitude. The light and colour curves (Fig. 15) have no excess scatter in spite of the fact that the comparison star BD +29° 4324 is included in the GCVS as the variable V 389 Cygni. For this reason the check star BD +30° 4322 was observed at each observation of DT Cygni. The magnitude differences between the comparison and check stars indicate that one or other of the two stars varies. If the light curve of DT Cyg is constructed by using the magnitude differences between DT Cyg and the check star the scatter on the curve is much larger. Consequently, the check star BD +30° 4322 is a suspected variable and V 389 Cyg has a constant light. The constancy of the comparison star V 389 Cyg was also checked by observing DT Cyg at almost the same phases on different nights. In order to determine the nature of light variation of this new suspected variable further observations of BD +30° 4322 are planned.

As to the O-C diagram of DT Cyg, a new interpretation of period changes of this cepheid is proposed (see Fig. 16). During long intervals (2000-4000 days) the period is constant and has the same value, whereas during the intermediate intervals the

Table 11 O-C residuals for DT Cyg

Obs.Max.J.D.	Obs.Med.J.D.	E	$O-C_{max}$	$O-C_{med}$	Type	w	Source
2424375.583	2424374.998	-6947	$-1^{d}.087$	$-1^{d}.117$	phel	3	Huffer (1928b)
2424695.538		-6819	-1.015		phel	2	Huffer (1928b)
2424785.340		-6783	-1.180		phg	1	Barabashev[1] (1928)
2425427.670		-6526	-1.114		vis	0.5	Kukarkin (1940)
2425802.466		-6376	-1.180		vis	0.5	Kukarkin (1940)
2425805.055		-6375	-1.090		vis	0.5	Zverev (1936)
2426047.562		-6278	-0.994		vis	0.5	Mustel' (1934)
2426344.978		-6159	-0.969		vis	0.5	Zverev (1936)
2426434.756		-6123	-1.156		vis	0.5	Kukarkin (1940)
2426922.178		-5928	-1.057		vis	0.5	Zverev (1936)
2427547.008	2427546.385	-5678	-0.997	-1.065	phel	2	Schneller (1936)
2427676.776		-5626	-1.182		vis	0.5	Krebs (1935)
2427976.728		-5506	-1.120		vis	0.5	Dziewulski (1962)
2428046.826		-5478	-0.996		vis	0.5	Krebs (1937a)
2428466.617		-5310	-1.051		vis	1	Kepinski (1937)
2432975.319	2432974.759	-3506	-0.693	-0.698	phel	2	Eggen (1951)
2433295.022		-3378	-0.872		vis	0	Dziewulski (1962)
2435259.67		-2592	-0.50		vis	1	Marks (1959)
2436099.527		-2256	-0.437		phel	2	Svolopoulos (1960)
2437176.700	2437176.118	-1825	-0.268	-0.295	phel	3	Mitchell et al. (1964)
2437579.091	2437578.504	-1664	-0.210	-0.162	phel	3	Johansen (1971)
2438496.241	2438495.722	-1297	-0.243	-0.207	phel	3	Johansen (1971)
2438871.112	2438870.575	-1147	-0.234	-0.216	phel	3	Wisniewski, Johnson (1968)
2441737.798	2441737.238	0	+0.005	0.000	phel	3	present paper
2443044.805		+523	-0.008		phel	2	present paper

Remark: [1] Observer: Shemejkin.

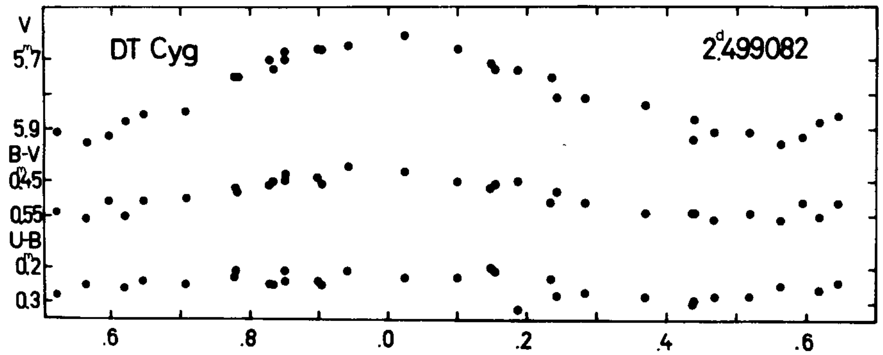

Figure 15 V, B-V and U-B curves of DT Cyg

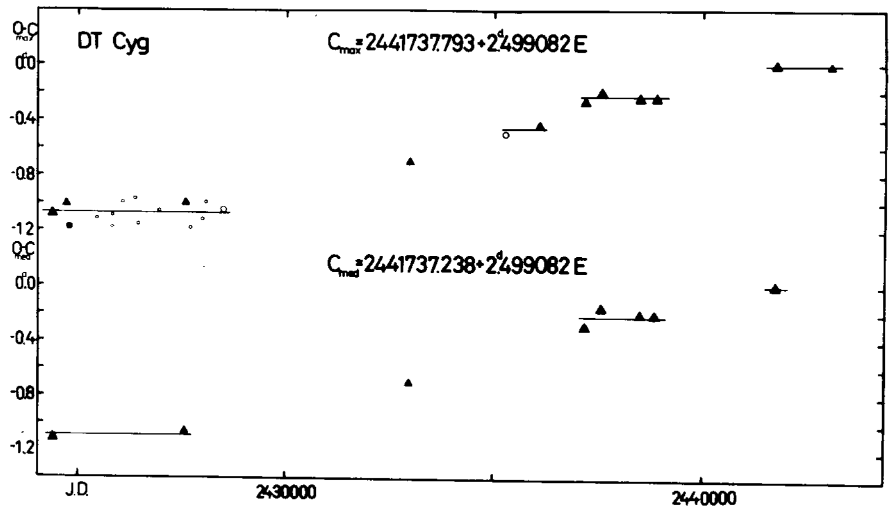

Figure 16 O-C diagram of DT Cyg

moments of maxima are submitted to phase shifts. The values of these shifts are $0^{d}.21$ - $0^{d}.23$ or their multiple. This gradual period change is very interesting and it is intended to continue observations on DT Cygni.

The O-C residuals given in Table 11 have been computed with the formulae:

$$C_{max} = 2441737.793 + 2^{d}.499082E \; ;$$
$$C_{med} = 2441737.238 + 2^{d}.499082E \; .$$

It is worthy of note that a change of -3 km/s in normal radial velocity occurred between J.D. 2432000 and J.D. 2433000 (Evans

1968), i.e. during the time of a phase lag of the maximum.

BE Monocerotis

Its light and colour curves are shown in Fig. 17. The O-C residuals have been computed with the formula:

$$C = 2441880.240 + 2\overset{d}{.}705510E \ .$$

These residuals are plotted in Fig. 18. The period of BE Mon is constant.

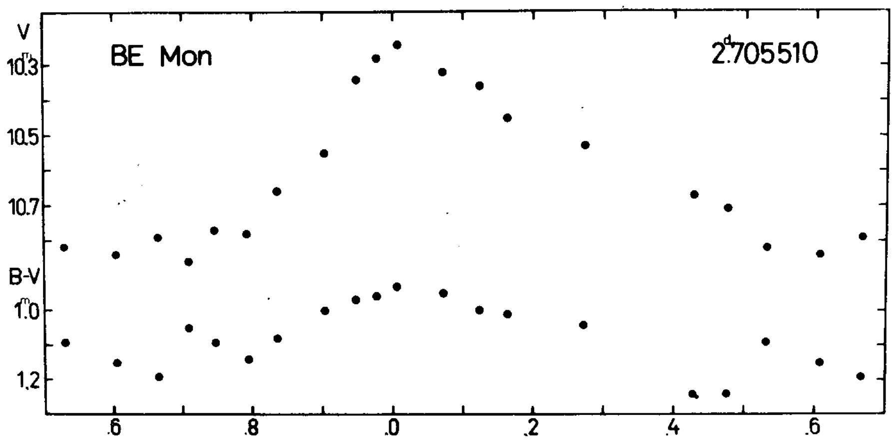

Figure 17 V and B-V curves of BE Mon

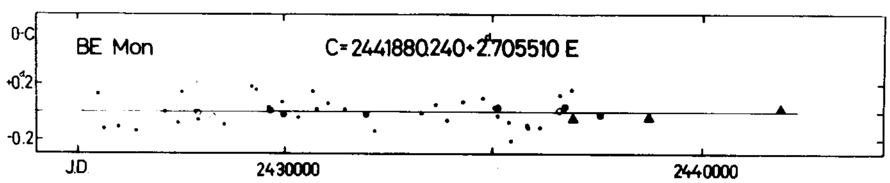

Figure 18 O-C diagram of BE Mon

Table 12 O-C residuals for BE Mon

Obs.Max.J.D.	E	O-C	Type	w	Source
2425506.624	-6052	+0^d.131	phg	0.5	Busch, Häussler (1963)
2425644.35	-6001	-0.12	phg	0.5	Ahnert[1] (1960)
2425974.73	-5879	-0.11	phg	0.5	Ahnert[1] (1960)
2426407.29	-5719	-0.14	phg	0.5	Ahnert[1] (1960)
2427124.38	-5454	-0.01	phg	0.5	Ahnert[1] (1960)
2427397.56	-5353	-0.08	phg	0.5	Ahnert[1] (1960)
2427516.83	-5309	+0.14	phg	0.5	Ahnert[2] (1960)
2427849.47	-5186	0.00	phg	0.5	Ahnert[3] (1960)
2427863.20	-5181	+0.21	vis	0.5	Kukarkin (1960)
2427892.751	-5170	-0.002	vis	1	Solov'yov (1952a)
2427914.34	-5162	-0.06	phg	0.5	Ahnert[2] (1960)
2428206.89	-5054	+0.30	phg	0	Ahnert[1] (1960)

Table 12 (cont.)

Obs.Max.J.D.	E	O-C	Type	w	Source
2428260.667	-5034	$-0^{d}.036$	vis	1	Solov'yov (1952a)
2428547.40	-4928	-0.09	phg	0.5	Ahnert[1] (1960)
2429229.46	-4676	+0.18	phg	0.5	Ahnert[1] (1960)
2429313.305	-4645	+0.159	phg	0.5	Busch, Häussler (1963)
2429629.72	-4528	+0.03	phg	0.5	Ahnert[1] (1960)
2429667.572	-4514	+0.004	phg	1	Kapko (1963)
2429943.60	-4412	+0.07	phg	0.5	Ahnert[1] (1960)
2429989.503	-4395	-0.021	phg	1	Kapko (1963)
2430346.61	-4263	-0.04	phg	0.5	Ahnert[1] (1960)
2430698.52	-4133	+0.15	phg	0.5	Ahnert[1] (1960)
2430790.37	-4099	+0.02	phg	0.5	Ahnert[2] (1960)
2431050.14	-4003	+0.06	phg	0.5	Ahnert[3] (1960)
2431466.75	-3849	+0.02	phg	0.5	Ahnert[1] (1960)
2431986.169	-3657	-0.021	phg	1	Kapko (1963)
2432188.96	-3582	-0.14	phg	0.5	Ahnert[1] (1960)
2433306.47	-3169	-0.01	phg	0.5	Ahnert[2] (1960)
2433658.25	-3039	+0.05	phg	0.5	Ahnert[4] (1960)
2433934.10	-2937	-0.06	phg	0.5	Ahnert[5] (1960)
2434307.59	-2799	+0.07	phg	0.5	Ahnert[5] (1960)
2434778.38	-2625	+0.10	phg	0.5	Ahnert[5] (1960)
2435062.38	-2520	+0.03	phg	0.5	Ahnert[5] (1960)
2435143.551	-2490	+0.031	phg	1	Kapko (1963)
2435146.20	-2489	-0.03	phg	0.5	Ahnert[6] (1960)
2435395.06	-2397	-0.07	phg	0.5	Ahnert[2] (1960)
2435454.46	-2375	-0.19	phg	0.5	Ahnert[7] (1960)
2435841.45	-2232	-0.09	phg	0.5	Ahnert[2] (1960)
2435860.367	-2225	-0.113	phg	0.5	Busch, Häussler (1963)
2436144.45	-2120	-0.11	phg	0.5	Ahnert[3] (1960)
2436612.62	-1947	+0.01	vis	1	Ahnert (1960)
2436615.44	-1946	+0.12	phg	0.5	Ahnert[1] (1960)
2436731.692	-1903	+0.038	phg	1	Kapko (1963)
2436899.56	-1841	+0.16	phg	0.5	Ahnert[2] (1960)
2436929.104	-1830	-0.053	phel	3	Detre, Chang (1960)
2437578.454	-1590	-0.025	phg	1	Ahnert (1963)
2438741.808	-1160	-0.040	phel	3	Buchancowa et al.(1972)
2441880.253	0	+0.013	phel	3	present paper

Remarks: [1] Observer: Busch; [2] Obs.: Löchel; [3] Obs.: Busch and Löchel; [4] Obs.: Busch and Götz; [5] Obs.: Busch, Götz and Löchel; [6] Obs.: Götz and Löchel; [7] Obs.: Götz.

V 465 Monocerotis

This star is a cepheid with small amplitude (see Fig. 19). The O-C residuals have been calculated with the formula:

$$C = 2441698.687 + 2^{d}.713176E\ .$$

The O-C diagram plotted in Fig. 20 shows two period changes. Before J.D. 2432000 the value of the period was uncertain; between J.D. 2432000 and J.D. 2441600 , $P = 2^{d}.713668$; after J.D. 2441600 , $P = 2^{d}.713176$.

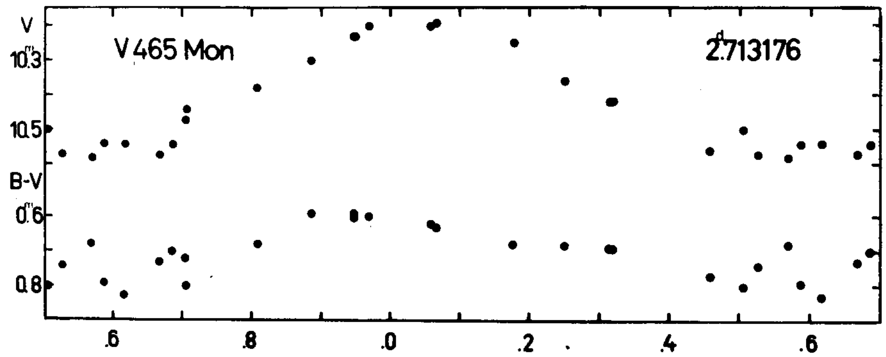

Figure 19 V and B-V curves of V 465 Mon

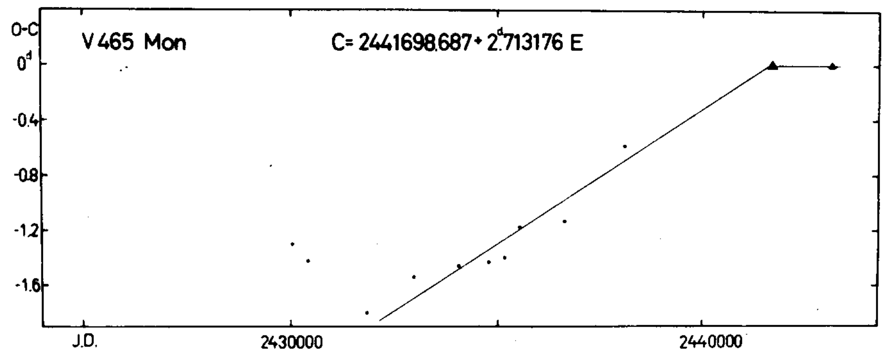

Figure 20 O-C diagram of V 465 Mon

Table 13 O-C residuals for V 465 Mon

Obs.Max.J.D.	E	O-C	Type	w	Source
2430025.3	-4302	$-1\overset{d}{.}3$	phg	0.5	Wachmann (1964)
2430421.308	-4156	-1.420	phg	0.5	Satyvaldiev (1970)
2431845.3	-3631	-1.8	phg	0.5	Wachmann (1964)
2432968.864	-3217	-1.536	phg	0.5	Satyvaldiev (1970)
2434040.646	-2822	-1.458	phg	0.5	Satyvaldiev (1970)
2434773.23	-2552	-1.43	phg	0.5	Wachmann (1964)
2435169.4	-2406	-1.4	phg	0.5	Wachmann (1964)
2435541.315	-2269	-1.176	phg	0.5	Satyvaldiev (1970)
2436632.053	-1867	-1.134	phg	0.5	Satyvaldiev (1970)
2438067.872	-1338	-0.586	phg	0.5	Satyvaldiev (1970)
2441698.687	0	0.000	phel	3	present paper
2443166.515	+541	0.000	phel	2	present paper

BD $+56^{o}$ 2806

Its variability was discovered by Fernie and Hube (1971); the first determination of its period was published by Szabados (1976b). The bump after the minimum light mentioned at the same

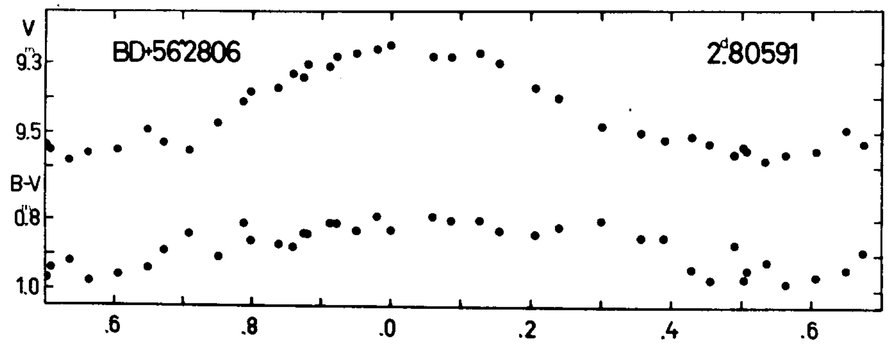

Figure 21 V and B-V curves of BD +56° 2806

paper may be not real. The light curve of BD +56° 2806 is presented in Fig. 21. The O-C curve cannot be constructed for lack of earlier observations. The observations made by Percy (1975) were used to improve the value of the period determined from the present observations. The O-C residuals have been computed with the formula:

$$C = 2442676.397 + 2^d.80591E \ .$$

Table 14 O-C residuals for BD +56° 2806

Obs.Max.J.D.	E	O-C	Type	w	Source
2442031.038	-230	$0^d.000$	phel	2	Percy (1975)
2442676.397	0	0.000	phel	3	present paper

DX Geminorum

This is a cepheid with small amplitude (see Fig. 22). The O-C residuals have been computed with the formula:

$$C = 2441866.664 + 3^d.137486E \ .$$

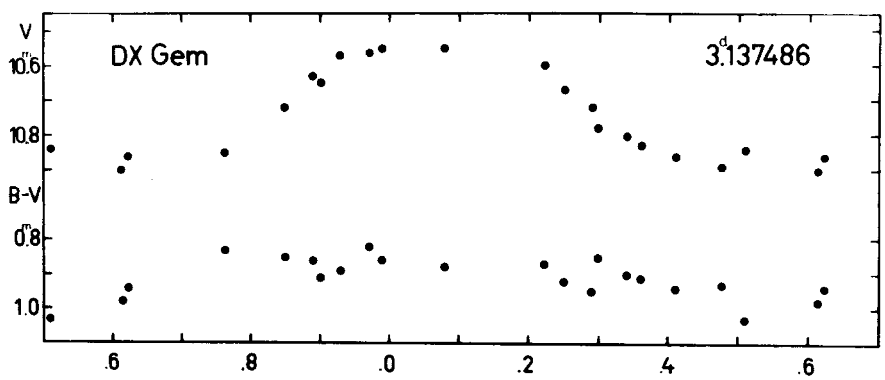

Figure 22 V and B-V curves of DX Gem

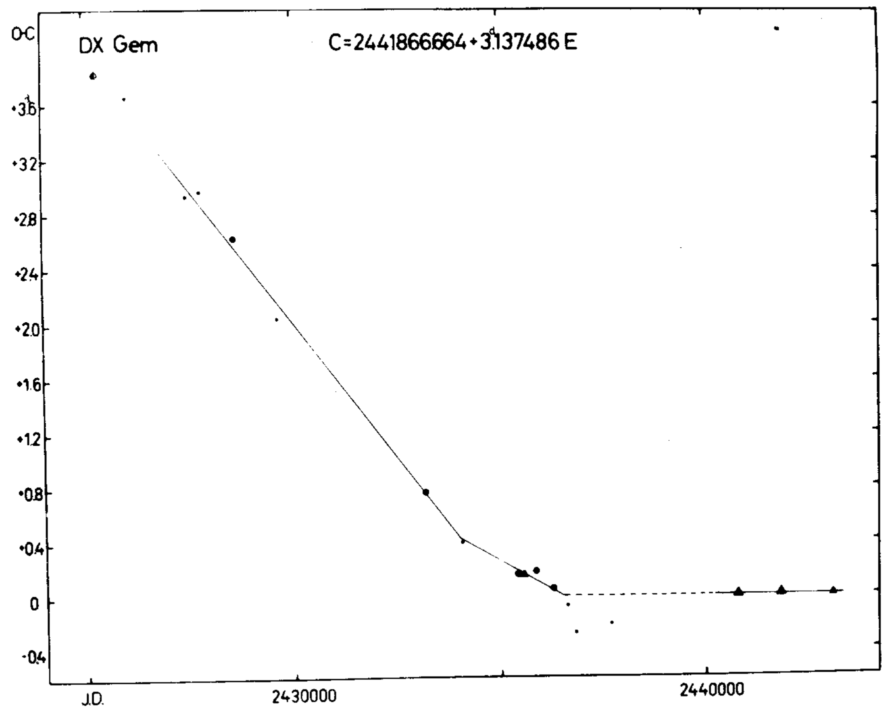

Figure 23 O-C diagram of DX Gem

Table 15 O-C residuals for DX Gem

Obs.Max.J.D.	E	O-C	Type	w	Source
2425295.158	-5283	$+3^{d}.833$	phg	1	Bartkus et al. (1961)
2426038.579	-5046	+3.669	phg	0.5	Bartkus et al. (1961)
2427449.718	-4596	+2.940	phg	0.5	Bartkus et al. (1961)
2427782.331	-4490	+2.979	phg	0.5	Bartkus et al. (1961)
2428594.596	-4231	+2.635	phg	1	Meshkova (1940)
2429638.790	-3898	+2.046	phg	0.5	Teplitskaya (1950)
2433182.876	-2768	+0.773	phg	1	Satyvaldiev (1970)
2434067.275	-2486	+0.401	phg	0.5	Satyvaldiev (1970)
2435413.021	-2057	+0.166	phg	1	Satyvaldiev (1970)
2435554.199	-2012	+0.157	phel	1	Walraven et al. (1958)
2435896.212	-1903	+0.184	phg	1	Bartkus et al. (1961)
2436275.716	-1782	+0.052	phg	1	Bartkus et al. (1961)
2436623.856	-1671	-0.069	phg	0.5	Satyvaldiev (1970)
2436815.042	-1610	-0.270	phg	0.5	Bartkus et al. (1961)
2437687.330	-1332	-0.203	phg	0.5	Satyvaldiev (1970)
2438744.322	-995	-0.543	phg	0	Satyvaldiev (1970)
2440793.641	-342	-0.003	phel	3	Pel (1976)
2441866.668	0	+0.004	phel	3	present paper
2443165.579	+414	-0.004	phel	2	present paper

The O-C diagram (Fig. 23) shows two changes in the period. The first period change was also suspected by Bartkus and Puchinskas

(1961). The following values of the period are valid for different time intervals:

before J.D. 2434000, $P = 3\overset{d}{.}136226$;
between J.D. 2434000 and J.D. 2436500, $P = 3\overset{d}{.}136955$;
after J.D. 2436500, $P = 3\overset{d}{.}137486$.

SZ Tauri

According to Kukarkin et al. (1974) SZ Tau is a possible member of the cluster NGC 1647. The phase relations of the colour curves (see Fig. 24) also support its belonging to Population I. However, several authors classified SZ Tau as a Population II variable (Walraven et al. 1958, Petit 1960, Mianes 1963, Kheilo 1969). According to Madore (1977), SZ Tau has a blue photometric companion.

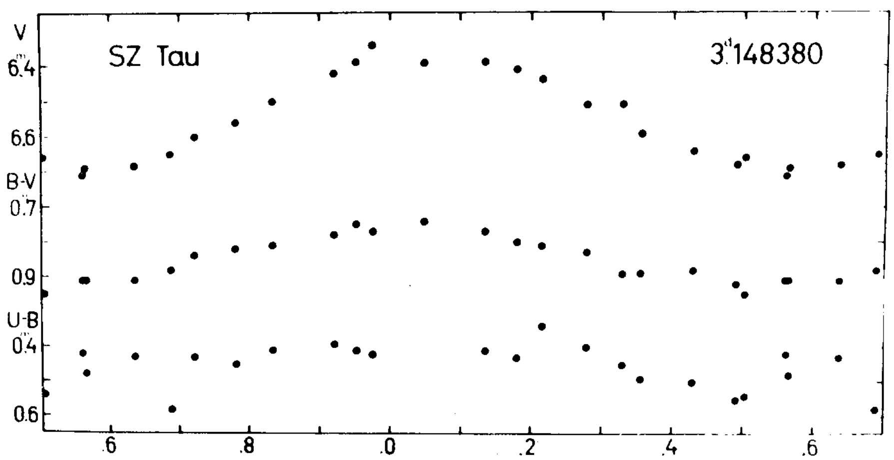

Figure 24 V, B-V and U-B curves of SZ Tau

The O-C residuals have been derived using the formula:

$$C = 2441659.194 + 3\overset{d}{.}14838E \ .$$

The O-C diagram (Fig. 25) shows three changes in the period of SZ Tauri:

before J.D. 2418500, $P = 3\overset{d}{.}14839$;
between J.D. 2418500 and J.D. 2425500, $P = 3\overset{d}{.}149235$;
between J.D. 2425500 and J.D. 2436300, $P = 3\overset{d}{.}149057$;
after J.D. 2436300, $P = 3\overset{d}{.}148380$.

This O-C diagram shows an interesting phenomenon: at present the period of pulsation of SZ Tau is nearly identical with the value of the period which was valid several decades ago. Such a return

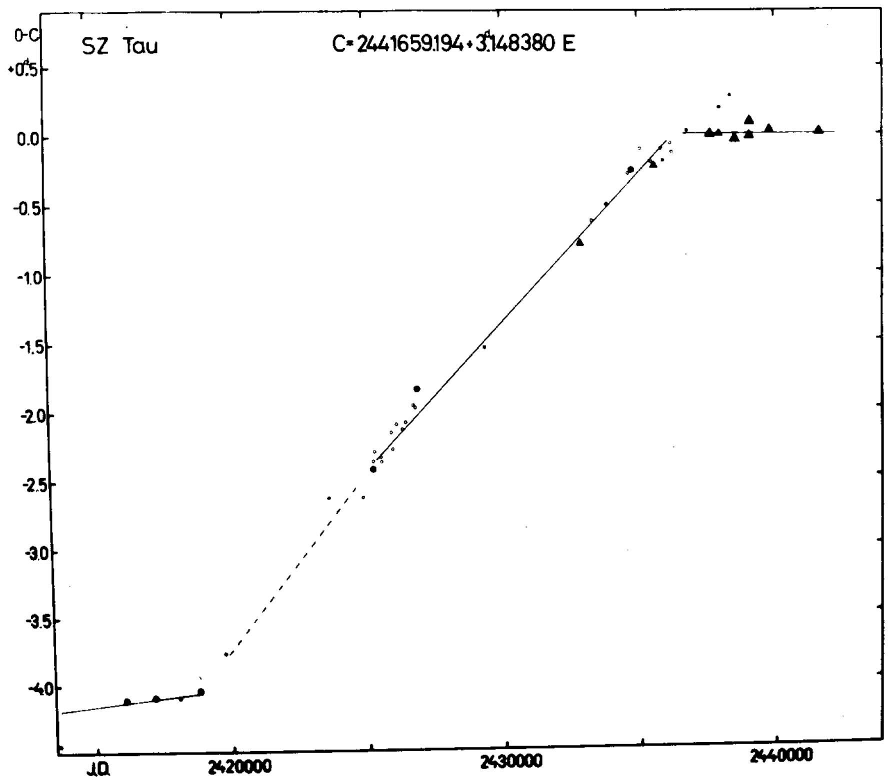

Figure 25 O-C diagram of SZ Tau

to an earlier period has been found for DT Cyg and other cepheids. A more detailed discussion of this phenomenon will be given in the next section.

Table 16 O-C residuals for SZ Tau

Obs.Max.J.D.	E	O-C	Type	w	Source
2413671.947	-8888	$-4^{d}.446$	phg	0.5	Pickering (1914)
2416118.575	-8111	-4.109	phg	1	Pickering (1914)
2417179.596	-7774	-4.092	phg	1	Pickering (1914)
2418086.326	-7486	-4.095	phg	0.5	Pickering (1914)
2418713.005	-7287	-3.944	vis	1	Schwarzschild (1911)
2418829.399	-7250	-4.040	phg	1	Pickering (1914)
2419267.519	-7111	-3.545	phg	0	Robinson (1930)
2419758.445	-6955	-3.766	phg	0.5	Pickering (1914)
2423619.49	-5729	-2.63	vis	0.5	Nielsen (1941)
2424878.851	-5329	-2.626	vis	0.5	Kukarkin (1940)
2425225.378	-5219	-2.421	phg	1	Hellerich (1935)
2425231.729	-5217	-2.367	vis	0.5	Kukarkin (1940)
2425301.067	-5195	-2.293	vis	0.5	Collmann (1930)
2425530.856	-5122	-2.336	vis	0.5	Kukarkin (1940)

Table 16 (cont.)

Obs.Max.J.D.	E	O-C	Type	w	Source
2425587.492	-5104	$-2^{d}.370$	vis	0.5	Zverev (1936)
2425934.028	-4994	-2.156	vis	0.5	Zverev (1936)
2425959.093	-4986	-2.278	vis	0.5	Terkán (1935)
2426119.843	-4935	-2.096	vis	0.5	Kukarkin (1940)
2426324.450	-4870	-2.133	vis	0.5	Zverev (1936)
2426440.993	-4833	-2.080	vis	0.5	Terkán (1935)
2426705.583	-4749	-1.954	vis	0.5	Kukarkin (1940)
2426781.131	-4725	-1.967	vis	0.5	Zverev (1936)
2426894.594	-4689	-1.846	phg	1	Kox (1935)
2429363.229	-3905	-1.541	phg	0.5	Koshkina (1963)
2432852.379	-2797	-0.796	phel	2	Eggen (1951)
2432858.695	-2795	-0.777	phg	0.5	Satyvaldiev (1970)
2433283.87	-2660	-0.63	vis	0.5	Pohl[1] (1950)
2433819.217	-2490	-0.511	phg	0.5	Koshkina (1963)
2434628.57	-2233	-0.29	vis	0.5	Marks[2] (1959)
2434776.562	-2186	-0.267	phg	1	Satyvaldiev (1970)
2435082.12	-2089	-0.11	vis	0.5	Marks (1959)
2435478.719	-1963	-0.205	vis	0.5	Azarnova (1957)
2435541.659	-1943	-0.233	phel	1	Walraven et al. (1958)
2435840.877	-1848	-0.111	vis	0.5	Azarnova (1960)
2435878.569	-1836	-0.199	phg	0.5	Satyvaldiev (1970)
2436162.052	-1746	-0.071	vis	0.5	Latyshev (1969)
2436206.061	-1732	-0.139	vis	0.5	Azarnova (1960)
2436574.589	-1615	+0.029	vis	0.5	Azarnova (1960)
2436766.632	-1554	+0.021	phg	0.5	Satyvaldiev (1970)
2437619.809	-1283	-0.013	phel	3	Mitchell et al. (1964)
2437962.988	-1174	-0.008	phel	1	Williams (1966)
2437969.481	-1172	+0.188	phg	0.5	Satyvaldiev (1970)
2438378.857	-1042	+0.275	phg	0.5	Satyvaldiev (1970)
2438529.659	-994	-0.045	phel	3	Wisniewski et al.(1968)
2439055.461	-827	-0.023	phel	3	Milone (1970)
2439077.600	-820	+0.078	phel	3	Wamsteker (1972)
2439807.965	-588	+0.018	phel	3	present paper[3]
2441659.204	0	+0.010	phel	3	present paper

Remarks: [1] Observer: Mielke; [2] Obs.: Wroblewski; [3] Obs.:Abaffy.

DQ Andromedae

This cepheid has not previously been observed photoelectrically. The presence of a bump on the descending branch $0^{p}.3$ after the maximum can be suspected on the first photoelectric light curve (see Fig. 26). Classical cepheids with such a short period do not show bumps on their light curves. Moreover, the galactic latitude of DQ And is -18^{o}. These two facts give reason to classify this cepheid as a Population II variable.

The O-C residuals have been computed with the formula:

$$C = 2441994.943 + 3^{d}.200557E .$$

DQ And has a constant period during 8000 cycles (see Fig. 27).

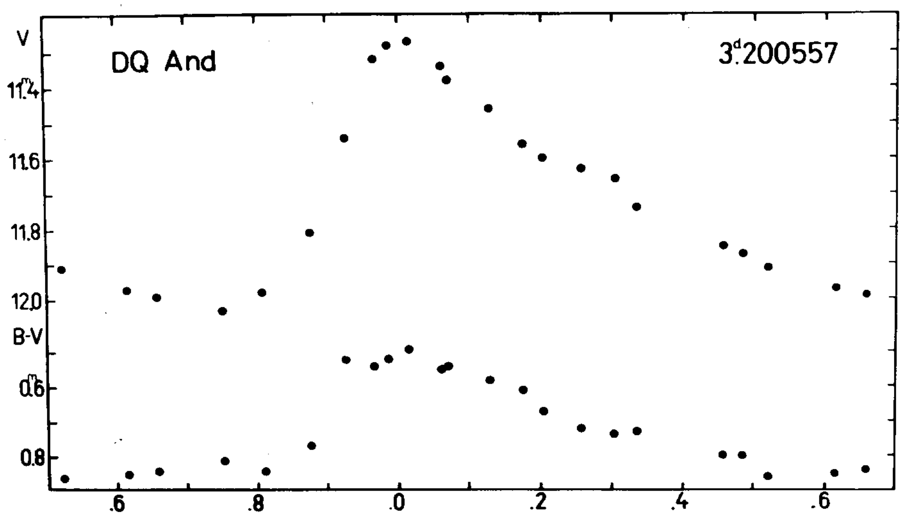

Figure 26 V and B-V curves of DQ And

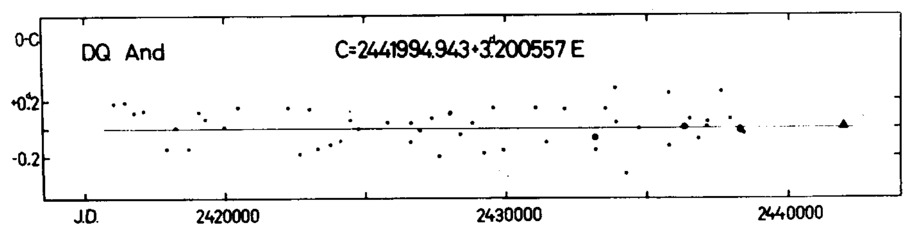

Figure 27 O-C diagram of DQ And

Table 17 O-C residuals for DQ And

Obs.Max.J.D.	E	O-C (^{d})	Type	w	Source
2416038.600	-8110	+0.174	phg	0.5	Strohmeier et al.(1968)
2416438.681	-7985	+0.186	phg	0.5	Strohmeier et al.(1968)
2416761.865	-7884	+0.113	phg	0.5	Strohmeier et al.(1968)
2417104.340	-7777	+0.129	phg	0.5	Strohmeier et al.(1968)
2417910.609	-7525	-0.143	phg	0.5	Strohmeier et al.(1968)
2418214.807	-7430	+0.003	phg	0.5	Strohmeier et al.(1968)
2418691.542	-7281	-0.145	phg	0.5	Strohmeier et al.(1968)
2419053.468	-7168	+0.118	phg	0.5	Strohmeier et al.(1968)
2419306.261	-7089	+0.067	phg	0.5	Strohmeier et al.(1968)
2419987.914	-6876	+0.001	phg	0.5	Strohmeier et al.(1968)
2420468.147	-6726	+0.150	phg	0.5	Strohmeier et al.(1968)
2422257.255	-6167	+0.147	phg	0.5	Strohmeier et al.(1968)
2422666.599	-6039	-0.180	phg	0.5	Strohmeier et al.(1968)
2423044.580	-5921	+0.135	phg	0.5	Strohmeier et al.(1968)
2423322.750	-5834	-0.143	phg	0.5	Strohmeier et al.(1968)

Table 17 (cont.)

Obs.Max.J.D.	E	O-C	Type	w	Source
2423758.055	-5698	$-0\overset{d}{.}114$	phg	0.5	Strohmeier et al.(1968)
2424788.747	-5376	-0.002	phg	0.5	Strohmeier et al.(1968)
2425825.770	-5052	+0.041	phg	0.5	Strohmeier et al.(1968)
2426651.375	-4794	-0.098	phg	0.5	Strohmeier et al.(1963)
2426654.712	-4793	+0.039	phg	0.5	Strohmeier et al.(1968)
2426987.516	-4689	-0.015	phg	0.5	Strohmeier et al.(1963)
2427397.279	-4561	+0.076	phg	0.5	Strohmeier et al.(1963)
2427665.853	-4477	-0.196	phg	0.5	Strohmeier et al.(1968)
2428043.819	-4359	+0.104	phg	0.5	Strohmeier et al.(1968)
2428069.427	-4351	+0.108	phg	0.5	Strohmeier et al.(1963)
2428408.537	-4245	-0.042	phg	0.5	Strohmeier et al.(1963)
2428818.289	-4117	+0.039	phg	0.5	Strohmeier et al.(1968)
2429240.546	-3985	-0.177	phg	0.5	Strohmeier et al.(1968)
2429567.324	-3883	+0.144	phg	0.5	Strohmeier et al.(1968)
2429912.686	-3775	-0.154	phg	0.5	Strohmeier et al.(1968)
2430641.964	-3547	-0.603	vis	0	Tsessevitsch (1957)
2431055.586	-3418	+0.147	phg	0.5	Strohmeier et al.(1968)
2431439.406	-3298	-0.100	phg	0.5	Strohmeier et al.(1968)
2432092.556	-3094	+0.136	phg	0.5	Strohmeier et al.(1963)
2433177.339	-2755	-0.069	phg	2	Satyvaldiev (1970)
2433183.656	-2753	-0.154	phg	0.5	Strohmeier et al.(1968)
2433532.810	-2644	+0.140	phg	0.5	Strohmeier et al.(1968)
2433865.814	-2540	+0.286	phg	0.5	Strohmeier et al.(1968)
2433926.387	-2521	+0.038	phg	0.5	Strohmeier et al.(1963)
2434252.475	-2419	-0.321	phg	0.5	Strohmeier et al.(1963)
2434707.274	-2277	-0.001	phg	0.5	Strohmeier et al.(1963)
2435766.931	-1946	+0.272	phg	0.5	Wenzel, Ziegler (1965)
2435779.332	-1942	-0.129	phg	0.5	Strohmeier et al.(1963)
2436320.362	-1773	+0.007	phg	2	Satyvaldiev (1970)
2436509.252	-1714	+0.064	phg	0.5	Wenzel, Ziegler (1965)
2436825.965	-1615	-0.078	phg	0.5	Wenzel, Ziegler (1965)
2437232.522	-1488	+0.008	phg	0.5	Wenzel, Ziegler (1965)
2437245.363	-1484	+0.047	phg	0.5	Strohmeier et al.(1963)
2437610.445	-1370	+0.265	phg	0.5	Wenzel, Ziegler (1965)
2437933.503	-1269	+0.067	phg	0.5	Wenzel, Ziegler (1965)
2438295.081	-1156	-0.018	phg	2	Satyvaldiev (1970)
2438295.102	-1156	+0.003	phg	0.5	Wenzel, Ziegler (1965)
2438432.689	-1113	-0.034	phg	0.5	Wenzel, Ziegler (1965)
2441994.950	0	+0.007	phel	3	present paper

BY Cassiopeiae

BY Cas is a cepheid with small amplitude (see Fig. 28). Its period shows large variations. As can be seen from Fig. 29, the period of BY Cas has had the following values:

between J.D. 2417000 and J.D. 2426900 there was a change in the period, but both the time of the change and the value of the period in this interval are unknown;

between J.D. 2426900 and J.D. 2434300, $P = 3\overset{d}{.}221297$;

between J.D. 2434300 and J.D. 2439400, $P = 3\overset{d}{.}222588$;

after J.D. 2439400, $P = 3^d.223316$.

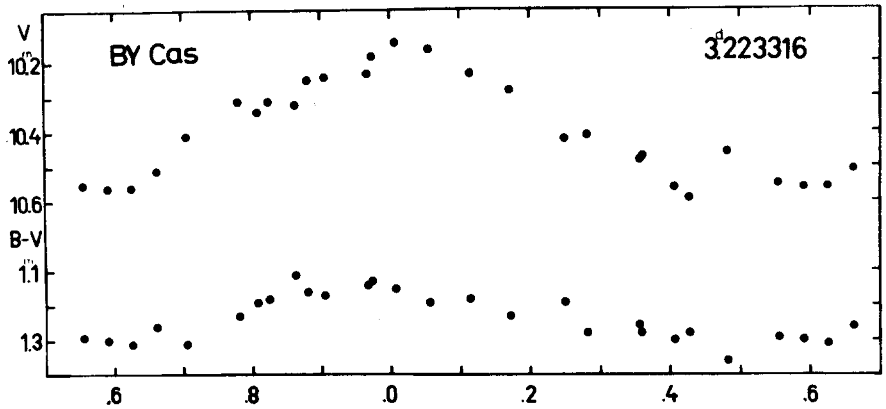

Figure 28 V and B-V curves of BY Cas

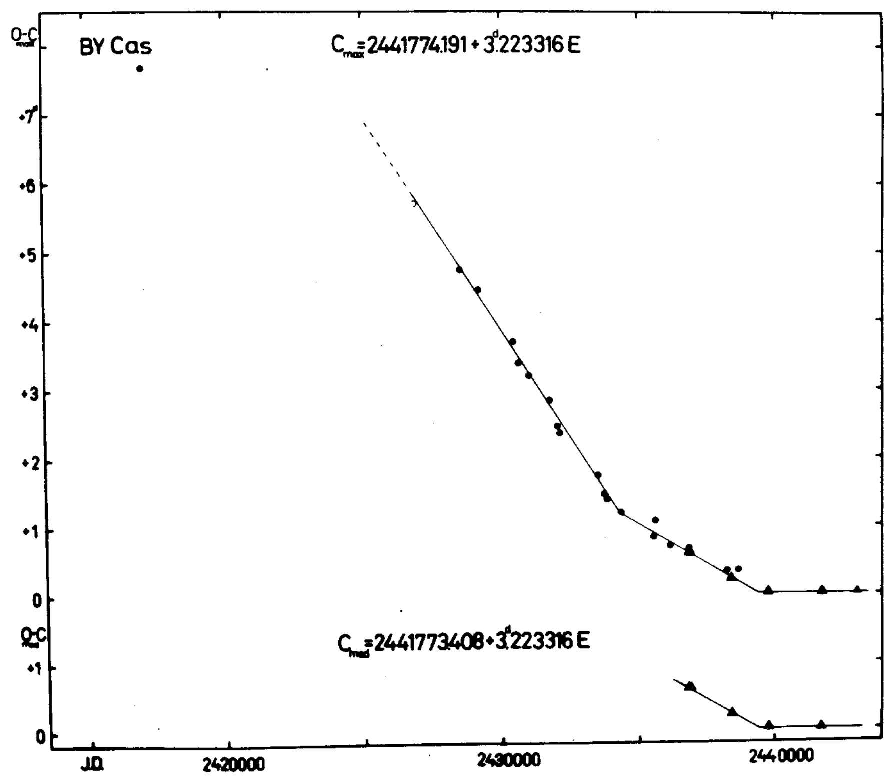

Figure 29 O-C diagram of BY Cas

The O-C residuals have been computed with the formulae:

$$C_{max} = 2441774.191 + 3^d.223316E \ ;$$
$$C_{med} = 2441773.408 + 3^d.223316E \ .$$

Table 18 O-C residuals for BY Cas

Obs.Max.J.D.	Obs.Med.J.D.	E	$O-C_{max}$	$O-C_{med}$	Type	w	Source
2417068.714		-7667	$+7^{d}.687$		phg	1	Kukarkina (1954a)
2426933.30		-4606	+5.70		vis	1	Lange (1933)
2428563.344		-4100	+4.749		phg	1	Parenago (1939b)
2429223.824		-3895	+4.449		phg	1	Kukarkina (1954a)
2430480.163		-3505	+3.695		phg	1	Satyvaldiev (1970)
2430650.693		-3452	+3.389		phg	1	Dirks, Vaucouleurs (1949)
2431014.735		-3339	+3.196		phg	1	Satyvaldiev (1970)
2431781.53		-3101	+2.84		phg	1	Ashbrook (1954)
2432048.696		-3018	+2.473		phg	1	Dirks, Vaucouleurs (1949)
2432132.390		-2992	+2.360		phg	1	Satyvaldiev (1970)
2433524.24		-2560	+1.74		phg	1	Satyvaldiev (1970)
2433736.708		-2494	+1.467		phg	1	Kukarkina (1954a)
2433878.46		-2450	+1.39		phg	1	Ashbrook (1954)
2434361.768		-2300	+1.204		phg	1	Kheilo (1962)
2435557.258		-1929	+0.844		phg	1	Kheilo (1962)
2435615.515		-1911	+1.081		phg	1	Satyvaldiev (1970)
2436143.784		-1747	+0.716		phg	1	Kheilo (1962)
2436820.545	2436819.781	-1537	+0.591	$+0^{d}.610$	phel	3	Oosterhoff (1960)
2436827.004	2436826.233	-1535	+0.603	+0.615	phel	3	Weaver et al. (1960)
2436843.175		-1530	+0.657		phg	1	Kheilo (1962)
2436910.801	2436910.027	-1509	+0.594	+0.603	phel	3	Bahner et al. (1962)
2438248.220		-1094	+0.337		phg	1	Satyvaldiev (1970)
2438409.256	2438408.479	-1044	+0.207	+0.213	phel	3	Malik (1965)
2438660.818		-966	+0.350		phg	1	Satyvaldiev (1970)
2439785.406	2439784.636	-617	+0.001	+0.014	phel	3	present paper[1]
2441774.189	2441773.395	0	-0.002	-0.013	phel	3	present paper
2443079.635		+405	+0.001		phel	2	present paper

Remark: [1] Observer: Abaffy

V 532 Cygni

This small amplitude cepheid is suspected as having a blue photometric companion (Madore 1977). Its light and colour curves and O-C diagram are shown in Figs. 30 and 31, respectively. The

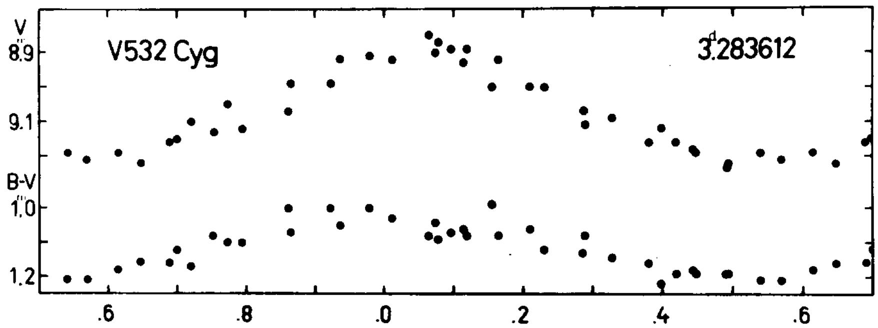

Figure 30 V and B-V curves of V 532 Cyg

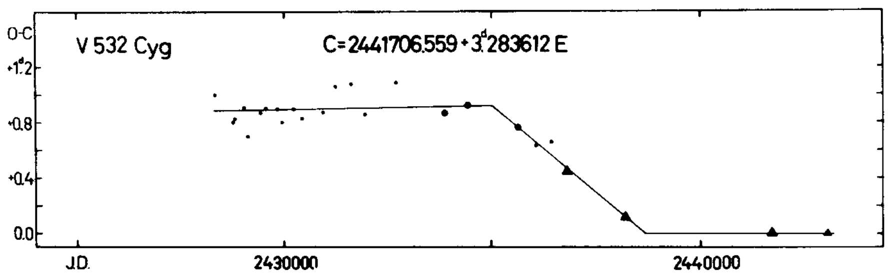

Figure 31 O-C diagram of V 532 Cyg

O-C residuals have been calculated with the elements:

$$C = 2441706.559 + 3\overset{d}{.}283612E\ .$$

The following values of the period are valid in the different time intervals:

between J.D. 2428000 and J.D. 2435000, $P = 3\overset{d}{.}283651$;
between J.D. 2435000 and J.D. 2438700, $P = 3\overset{d}{.}282792$;
after J.D. 2438700, $P = 3\overset{d}{.}283612$.

The structure of this O-C diagram resembles that of SZ Tauri, i.e. the period has returned to its earlier value.

Table 19 O-C residuals for V 532 Cyg

Obs.Max.J.D.	E	O-C	Type	w	Source
2428343.3	-4070	$+1\overset{d}{.}0$	phg	0.5	Ahnert (1949)
2428779.8	-3937	+0.8	phg	0.5	Ahnert (1949)
2428832.342	-3921	+0.826	phg	0.5	Ishchenko (1950)

Table 19 (cont.)

Obs.Max.J.D.	E	O-C	Type	w	Source
2429058.993	-3852	$+0^{d}.907$	phg	0.5	Ishchenko (1950)
2429140.9	-3827	+0.7	phg	0.5	Ahnert (1949)
2429452.989	-3732	+0.870	phg	0.5	Ishchenko (1950)
2429571.2	-3696	+0.9	phg	0.5	Ahnert (1949)
2429860.182	-3608	+0.895	phg	0.5	Ishchenko (1950)
2429984.9	-3570	+0.8	phg	0.5	Ahnert (1949)
2430260.8	-3486	+0.9	phg	0.5	Ahnert (1949)
2430447.883	-3429	+0.830	phg	0.5	Filin (1951)
2430956.887	-3274	+0.874	phg	0.5	Filin (1951)
2431265.733	-3180	+1.060	phg	0.5	Filin (1951)
2431643.365	-3065	+1.077	phg	0.5	Filin (1951)
2431991.211	-2959	+0.860	phg	0.5	Filin (1951)
2432710.549	-2740	+1.087	phg	0.5	Filin (1951)
2433889.147	-2381	+0.868	phg	1	Shteiman (1958)
2434434.284	-2215	+0.926	phg	1	Shteiman (1958)
2435642.491	-1847	+0.763	phg	1	Shteiman (1958)
2436092.219	-1710	+0.637	phg	0.5	Korovkina (1958)
2436443.59	-1603	+0.66	phg	0.5	Korovkina (1959)
2436817.703	-1489	+0.442	phel	3	Oosterhoff (1960)
2438229.332	-1059	+0.118	phel	3	Kwee and Braun (1967)
2441706.559	0	0.000	phel	3	present paper
2443026.571	+402	0.000	phel	2	present paper

V 1334 Cygni

This cepheid is a component of a visual binary (Millis 1969). The nonvariable component of this binary system reduces the observable amplitude of the cepheid. Figure 32 shows that the light and colour amplitudes of V 1334 Cyg are extremely low for a cepheid variable. The O-C residuals have been computed with the formula:

$$C = 2441760.900 + 3^{d}.333020E .$$

These residuals are not plotted in a diagram.

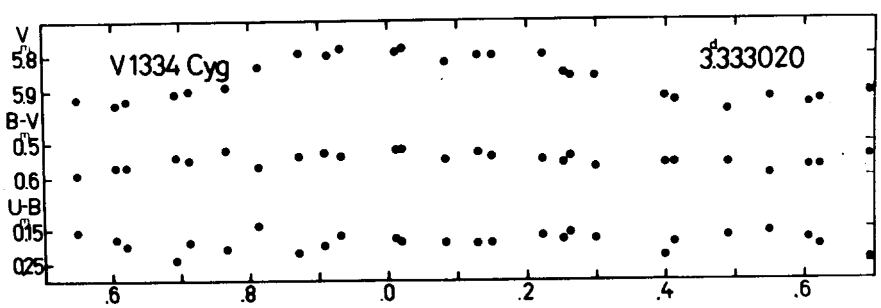

Figure 32 V, B-V and U-B curves of V 1334 Cyg

Table 20 O-C residuals for V 1334 Cyg

Obs.Max.J.D.	E	O-C	Type	w	Source
2440117.721	-493	$0\overset{d}{.}000$	phel	3	Millis (1969)
2441760.900	0	0.000	phel	3	present paper

BD Cassiopeiae

BD Cas is a cepheid with small amplitude. There is a bump on its light curve just after the minimum (see Fig. 33). Therefore it has been classified as a Population II variable.

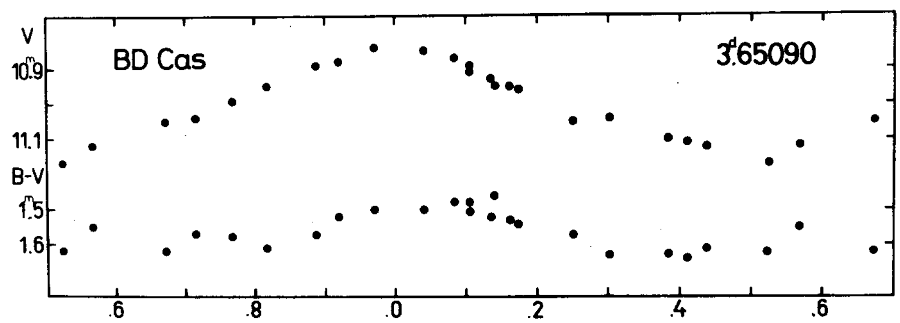

Figure 33 V and B-V curves of BD Cas

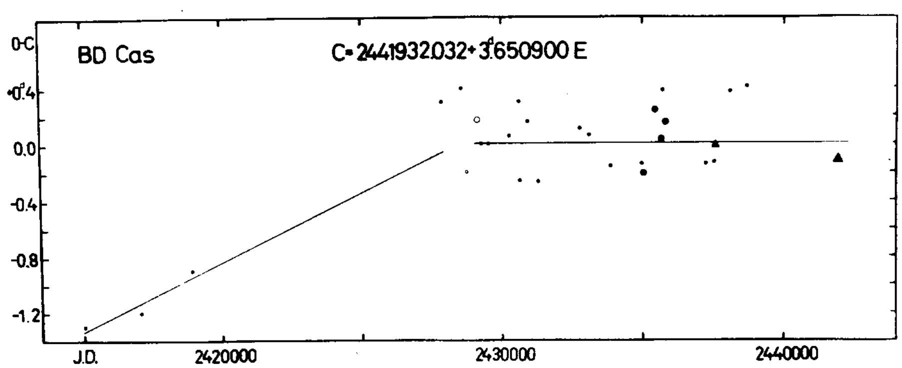

Figure 34 O-C diagram of BD Cas

The O-C residuals have been calculated with the formula:

$$C = 2441932.032 + 3\overset{d}{.}650900E \ .$$

The O-C curve (Fig. 34) consists of two straight lines. The values of the period are as follows:

before J.D. 2429000, $P = 3\overset{d}{.}65126$;

after J.D. 2429000, $P = 3\overset{d}{.}650900$.

Table 21 O-C residuals for BD Cas

Obs.Max.J.D.	E	O-C	Type	w	Source
2415038.2	-7366	$-1^{d}.3$	phg	0.5	Parenago (1947)
2417064.6	-6811	-1.2	phg	0.5	Parenago (1947)
2418926.8	-6301	-0.9	phg	0.5	Parenago (1947)
2427883.7	-3848	+0.3	phg	0.5	Parenago (1947)
2428573.8	-3659	+0.4	phg	0.5	Parenago (1947)
2428759.4	-3608	-0.2	vis	0.5	Zverev (1938)
2429124.84	-3508	+0.17	vis	1	Zverev (1938)
2429285.3	-3464	0.0	phg	0.5	Parenago (1947)
2429548.2	-3392	0.0	phg	0.5	Parenago (1947)
2430260.16	-3197	+0.06	phg	0.5	Vasil'yan. et al.(1970)
2430614.5	-3100	+0.3	phg	0.5	Parenago (1947)
2430643.19	-3092	-0.26	phg	0.5	Vasil'yan. et al.(1970)
2430939.33	-3011	+0.16	phg	0.5	Vasil'yan. et al.(1970)
2431300.34	-2912	-0.27	phg	0.5	Vasil'yan. et al.(1970)
2432768.38	-2510	+0.11	phg	0.5	Vasil'yan. et al.(1970)
2433118.82	-2414	+0.06	phg	0.5	Vasil'yan. et al.(1970)
2433863.38	-2210	-0.16	phg	0.5	Vasil'yan. et al.(1970)
2434962.32	-1909	-0.14	phg	0.5	Vasil'yan. et al.(1970)
2435042.57	-1887	-0.21	phg	1	Romano (1959)
2435430.02	-1781	+0.24	phg	1	Romano (1959)
2435670.77	-1715	+0.03	phg	1	Romano (1959)
2435700.33	-1707	+0.38	phg	0.5	Vasil'yan. et al.(1970)
2435835.18	-1670	+0.15	phg	1	Zonn, Semeniuk (1959)
2437211.28	-1293	-0.14	phg	0.5	Vasil'yan. et al.(1970)
2437525.27	-1207	-0.13	phg	0.5	Vasil'yan. et al.(1970)
2437572.843	-1194	-0.014	phel	1	Mitchell et al. (1964)
2438055.15	-1062	+0.37	phg	0.5	Vasil'yan. et al.(1970)
2438650.28	-899	+0.41	phg	0.5	Vasil'yan. et al.(1970)
2441931.916	0	-0.116	phel	3	present paper

RT Aurigae

Very many photoelectric observational series have been carried out on this star. The sets of photoelectric observations made in the UBV system do not verify the statement of the 3rd Supplement to the GCVS (Kukarkin et al. 1976), according to which the amplitude in V varies between $0^{m}.73$ and $0^{m}.85$. As Table 22 shows, A_V varies between $0^{m}.76$ and $0^{m}.83$, whereas A_B between $1^{m}.10$ and $1^{m}.19$. However, these amplitude variations are not real. The light curves with extreme values of the amplitude are rather uncertain around the maximum. For example, the maximum amplitude is based upon a single observation of the light curve observed by Winzer (1973). The well observed light curves (Wisniewski and Johnson 1968, and the present paper) have almost the same values for the amplitudes. Moreover, the variation in the amplitudes does not show any systematic trend.

Table 23 O-C residuals for RT Aur

Obs.Max.J.D.	Obs.Med.J.D.	E	$O-C_{max}$	$O-C_{med}$	Type	w	Source
2414000.60		-7436	$-0^d.25$		vis	1	Müller, Kempf (1899)
2416938.466		-6648	-0.202		vis	0.5	Astbury (1905)
2416942.3		-6647	-0.1		vis	0.5	Williams (1905a)
2417643.048		-6459	-0.248		vis	0.5	Zeipel (1908)
2417788.484	2417788.100	-6420	-0.211	$-0^d.167$	vis	1	Wendell (1913)
2417889.20		-6393	-0.16		vis	1	Kukarkin[1] (1931a)
2418015.92		-6359	-0.19		vis	1	Kukarkin[1] (1931a)
2418344.03		-6271	-0.17		vis	1	Kukarkin[1] (1931a)
2418739.18		-6165	-0.20		vis	1	Kukarkin[1] (1931a)
2418921.974		-6116	-0.091		phg	0.5	Robinson (1930)
2419044.99		-6083	-0.105		vis	0.5	Kukarkin[1] (1931a)
2419421.48		-5982	-0.16		vis	1	Hornig (1915)
2419451.27		-5974	-0.20		vis	1	Kukarkin[1] (1931a)
2419689.908	2419689.502	-5910	-0.164	-0.142	vis	1	Lacchini (1921)
2419813.015	2419812.627	-5877	-0.087	-0.047	vis	0.5	Nijland (1923)
2419824.13		-5874	-0.16		vis	1	Kukarkin[1] (1931a)
2419902.26		-5853	-0.32		vis	0.5	Kaiser (1922)
2420129.921	2420129.425	-5792	-0.078	-0.146	vis	1	Nijland (1923)
2420133.623		-5791	-0.104		vis	0.5	Hoffmeister (1915)
2420375.871	2420375.528	-5726	-0.188	-0.103	phg	2	Kiess (1915)
2420495.43		-5694	+0.07		vis	0	Kukarkin[1] (1931a)
2420502.691	2420502.266	-5692	-0.127	-0.124	vis	1	Nijland (1923)
2420972.434	2420972.042	-5566	-0.135	-0.100	vis	1	Nijland (1923)
2420991.000	2420990.680	-5561	-0.210	-0.102	vis	1	Luyten (1922)
2421475.879	2421475.417	-5431	+0.004	-0.030	vis	0.5	Lacchini (1921)
2421565.231	2421564.925	-5407	-0.121	+0.001	vis	1	Luyten (1922)
2422728.38		-5095	-0.17		vis	0.5	Viaro (1921)
2422739.73		-5092	0.00		vis	0.5	Kukarkin[2] (1931a)
2423112.38		-4992	-0.17		vis	0.5	Kukarkin[1] (1931a)
2423239.209		-4958	-0.100		vis	0.5	Strömgren[3] (1928)
2423272.767	2423272.331	-4949	-0.096	-0.104	vis	1	Hellerich (1934)
2423351.18		-4928	+0.03		vis	1	Kukarkin[4] (1931a)
2423791.110		-4810	+0.029		vis	0.5	Hopmann (1926b)
2423999.770	2423999.360	-4754	-0.090	-0.072	vis	1	Hellerich (1934)

Table 23 (cont.)

Obs.Max.J.D.	Obs.Med.J.D.	E	$(O-C)_{max}$	$(O-C)_{med}$	Type	w	Source
2424361.434	2424360.957	-4657	$-0^d.060$	$-0^d.109$	phg	1	Kowalczewsky (1931)
2424741.657	2424741.243	-4555	-0.113	-0.099	vis	1	Kukarkin (1940)
2425155.509	2425155.114	-4444	-0.090	-0.057	phg	2	Hellerich (1935)
2425293.462	2425293.000	-4407	-0.080	-0.114	vis	1	Kukarkin (1940)
2425535.844	2425535.475	-4342	-0.030	+0.029	vis	1	Zverev (1936)
2425744.619	2425744.198	-4286	-0.034	-0.027	vis	1	Kukarkin (1940)
2425990.618		-4220	-0.095		vis	0.5	Kukarkin[5] (1934)
2426232.946	2426232.551	-4155	-0.100	-0.067	vis	1	Zverev (1936)
2426400.773		-4110	-0.041		vis	1	Mergentaler (1941)
2426467.859		-4092	-0.063		vis	1	Nielsen (1939)
2426475.364		-4090	-0.014		vis	1	Kowalczewsky[6] (1931)
2426520.023	2426519.542	-4078	-0.093	-0.146	vis	0.5	Kukarkin (1940)
2426587.221	2426586.818	-4060	-0.004	+0.022	vis	1	Dufay (1947b)
2426911.538	2426911.169	-3973	-0.038	+0.021	phg	2	Grouillier (1947)
2427325.424	2427325.017	-3862	+0.019	+0.040	vis	1	Dufay (1947b)
2427452.125	2427451.752	-3828	-0.039	+0.016	phg	2	Grouillier (1947)
2427687.013	2427686.633	-3765	-0.027	+0.021	vis	1	Krebs (1937b)
2428358.074	2428357.686	-3585	-0.040	0.000	vis	1	Krebs (1937b)
2429070.198	2429069.769	-3394	0.000	-0.001	phg	2	Opolski (1948)
	2429267.393	-3341		+0.029	phel	3	Bennett (1941)
2429603.272		-3251	-0.057		phel	3	Bennett (1941)
2433141.392	2433140.952	-2302	+0.010	-0.002	phel	3	Eggen et al. (1957)
2434539.42		-1927	-0.03		vis	0.5	Marks[7] (1959)
2435057.79		-1788	+0.12		vis	0.5	Marks (1959)
2435799.601	2435799.198	-1589	+0.020	+0.045	phel	3	Prokof'eva (1961)
2437339.350		-1176	+0.026		phel	3	Mitchell et al. (1964)
2437872.454		-1033	-0.001		vis	0.5	Tsai (1972)
2437995.423		-1000	-0.062		phel	2	Williams (1966)
2438920.047	2438919.618	-752	-0.029	-0.030	phel	3	Wisniewski, Johnson (1968)
2439359.960	2439359.505	-634	-0.043	-0.070	phel	3	Takase (1969)
2441429.115	2441428.757	-79	-0.033	+0.037	phel	3	Winzer (1973)
2441723.711	2441723.282	0	+0.036	+0.035	phel	3	present paper
2441761.14		+10	+0.18		vis	0.5	Small (1973)

Remarks: [1] Observer: Sharbe; [2] Obs.: Tsarevsky, Tsessevitsch, Selivanov; [3] Obs.: Johansen; [4] Obs.: Tsessevitsch; [5] Obs.: Zverev; [6] Obs.: Dziewulski, Iwanowska; [7] Obs.: Wroblewski.

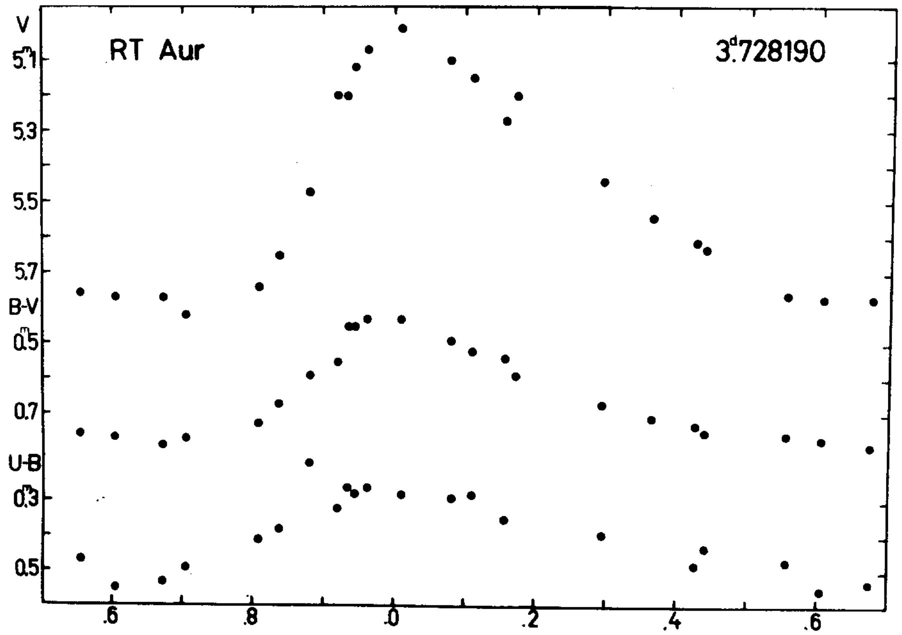

Figure 35 V, B-V and U-B curves of RT Aur

Table 22

Year	A_V	A_B	Source
1961	$0^m.77$:	$1^m.13$:	Mitchell et al. (1964)
1965	0.80	1.18	Wisniewski, Johnson (1968)
1966	0.76:	1.10:	Takase (1969)
1972	0.83:	1.19:	Winzer (1973)
1973	0.81	1.17	present paper

The light and colour curves based on the new observations are shown in Fig. 35. The small bump before the minimum light seems to be unreal. It appears in V light only, and the earlier photoelectric observations do not show such a bump at that phase. However, according to Winzer (1973), small fluctuations with amplitude of $0^m.02$ - $0^m.04$ may occur on the light curve.

The O-C residuals have been computed with the formulae:

$$C_{max} = 2441723.675 + 3^d.728190E \ ;$$
$$C_{med} = 2441723.247 + 3^d.728190E \ .$$

As the O-C diagram (Fig. 36) shows, the period has changed on one occasion:

before J.D. 2430000, $P = 3^d.728243$;

after J.D. 2430000, $P = 3^d.728190$.

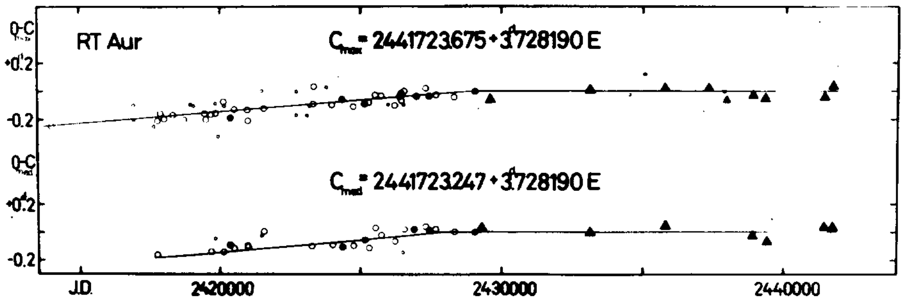

Figure 36 O-C diagram of RT Aur

V 572 Aquilae

According to the 2nd Supplement to the GCVS (Kukarkin et al. 1974) its period and form of the light curve vary. However, the present observations have shown (see Fig. 37) that the light curve is stable and very similar to earlier published ones if the observations are plotted with the correct period. Though the present observations were made in two colours, the U-B colour curve of V 572 Aql is available from the observations made by Oosterhoff (1960). The phase relation between the minimum values of U-B and B-V colour indices and the relatively large distance of this variable from the galactic plane ($b = -15\overset{\circ}{.}5$) give reason to classify V 572 Aql as a Population II cepheid.

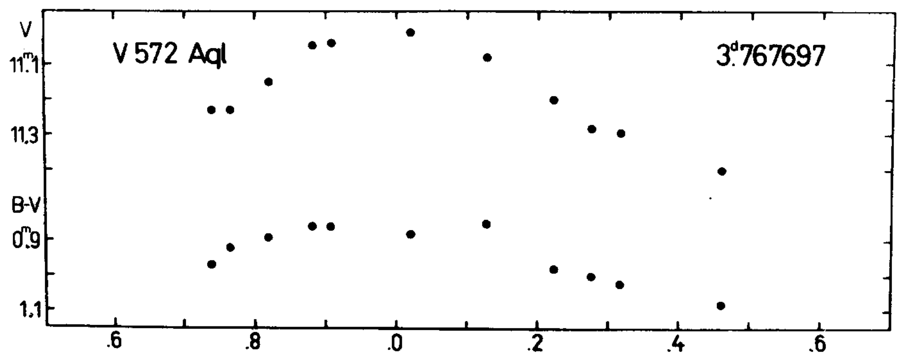

Figure 37 V and B-V curves of V 572 Aql

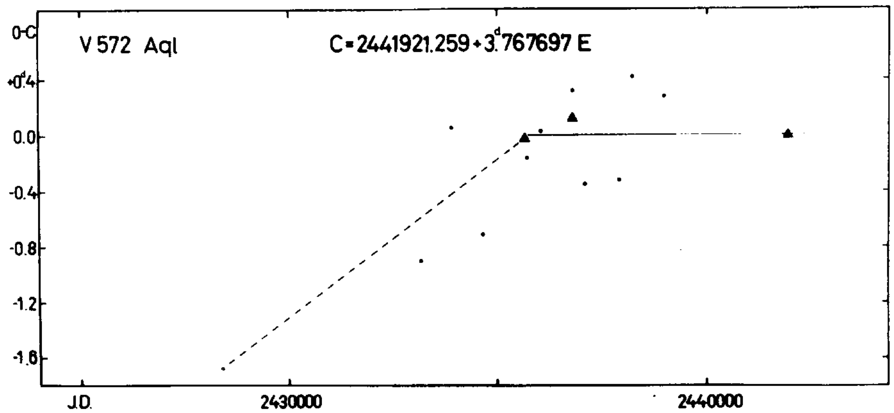

Figure 38 O-C diagram of V 572 Aql

The O-C residuals have been calculated with the formula:

$$C = 2441921.259 + 3\overset{d}{.}767697E \ .$$

For the time before J.D.2435500 the value of the period is rather uncertain (about $3\overset{d}{.}7686$). After J.D. 2435500 the period is $3\overset{d}{.}767697$ (see Fig. 38).

Table 24 O-C residuals for V 572 Aql

Obs.Max.J.D.	E	O-C	Type	w	Source
2428397.31	-3589	$-1\overset{d}{.}68$	vis	0.5	Solov'yov (1944)
2433171.77	-2322	-0.90	phg	0.5	Vasil'yan. et al.[1] (1970)
2433911.20	-2126	+0.06	phg	0.5	Vasil'yan. et al.[1] (1970)
2434660.20	-1927	-0.71	phg	0.5	Vasil'yan. et al.[1] (1970)
2435666.856	-1660	-0.026	phel	3	Walraven et al. (1958)
2435723.24	-1645	-0.16	phg	0.5	Vasil'yan. et al.[1] (1970)
2436036.15	-1562	+0.03	phg	0.5	Vasil'yan. et al.[1] (1970)
2436398.33	-1466	+0.51	phg	0	Vasil'yan. et al.[1] (1970)
2436789.776	-1362	+0.120	phel	3	Oosterhoff (1960)
2436801.28	-1359	+0.32	phg	0.5	Vasil'yan. et al.[1] (1970)
2437079.42	-1285	-0.35	phg	0.5	Vasil'yan. et al.[1] (1970)
2437908.34	-1065	-0.32	phg	0.5	Vasil'yan. et al.[1] (1970)
2438229.34	-980	+0.42	phg	0.5	Vasil'yan. et al.[1] (1970)
2438971.43	-783	+0.28	phg	0.5	Vasil'yan. et al.[1] (1970)
2441921.259	0	0.000	phel	3	present paper

Remark: [1] Observer: Satyvaldiev

AD Geminorum

The light and colour curves of this variable are shown in Fig. 39. The O-C residuals have been calculated with the formula:

$$C = 2441694.911 + 3\overset{d}{.}787980E \ .$$

The period has remained constant since the discovery of the light variation of AD Gem (see Fig. 40).

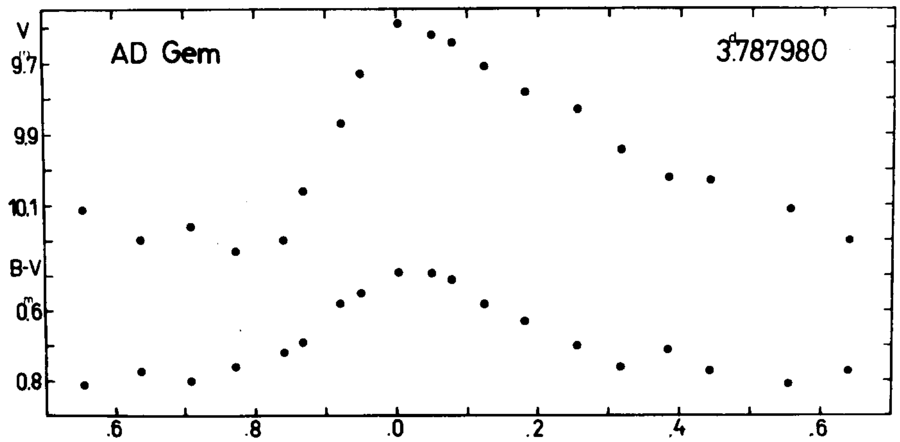

Figure 39 V and B-V curves of AD Gem

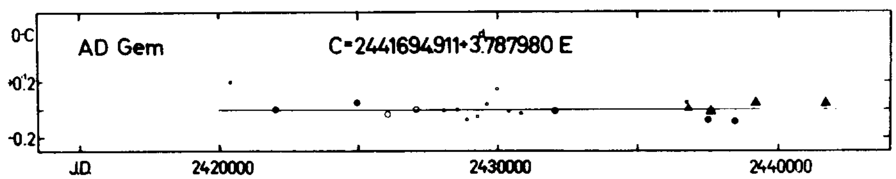

Figure 40 O-C diagram of AD Gem

Table 25 O-C residuals for AD Gem

Obs.Max.J.D.	E	O-C	Type	w	Source
2420410.450	-5619	$+0^d.199$	phg	0.5	Kukarkin (1930b)
2422031.507	-5191	0.000	phg	1	Kukarkina (1954b)
2424963.453	-4417	+0.050	phg	1	Prager (1929)
2426065.669	-4126	-0.037	vis	1	Beyer (1934a)
2427084.676	-3857	+0.004	vis	1	Beyer (1934a)
2428065.750	-3598	-0.009	vis	0.5	Martynov (1951)
2428558.196	-3468	0.000	vis	0.5	Martynov (1951)
2428899.045	-3378	-0.070	vis	0.5	Martynov (1951)
2429274.075	-3279	-0.050	vis	0.5	Martynov (1951)
2429611.295	-3190	+0.040	vis	0.5	Martynov (1951)
2429993.989	-3089	+0.148	vis	0.5	Martynov (1951)
2430395.357	-2983	-0.010	vis	0.5	Martynov (1951)
2430853.685	-2862	-0.027	vis	0.5	Martynov (1951)
2432081.011	-2538	-0.007	phg	1	Kukarkina (1954b)

Table 25 (cont.)

Obs.Max.J.D.	E	O-C	Type	w	Source
2436778.167	-1298	$+0^{d}.054$	phg	0.5	Huth (1963a)
2436834.942	-1283	+0.009	phel	2	Weaver et al. (1960)
2437524.267	-1101	-0.078	phg	1	Fridel' (1971)
2437630.387	-1073	-0.021	phel	3	Mitchell et al. (1964)
2438475.042	-850	-0.086	phg	1	Fridel' (1971)
2439202.459	-658	+0.039	phel	3	Takase (1969)
2441694.948	0	+0.037	phel	3	present paper

DF Cassiopeiae

The light and colour curves of DF Cas are shown in Fig. 41. The O-C residuals have been computed with the formula:

$$C = 2441719.622 + 3^{d}.832472E .$$

The O-C diagram (Fig. 42) can be represented by a straight line, i.e. the period is constant.

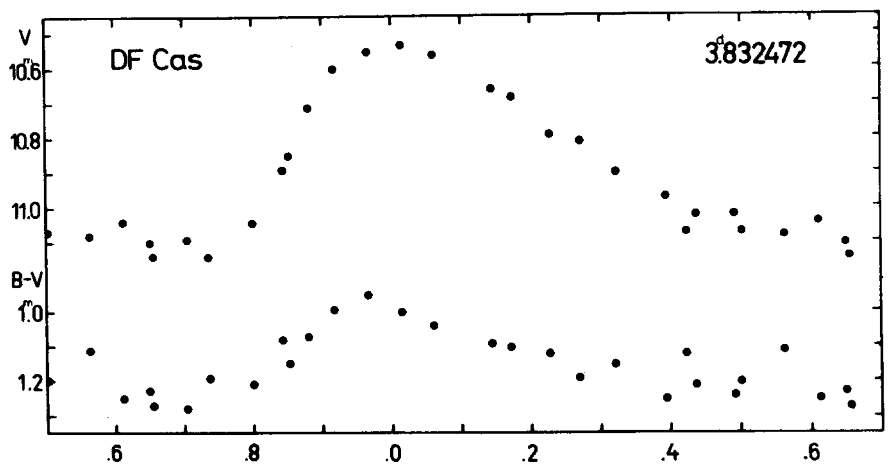

Figure 41 V and B-V curves of DF Cas

Table 26 O-C residuals for DF Cas

Obs.Max.J.D.	E	O-C	Type	w	Source
2417648.066	-6281	$+0^{d}.201$	phg	1	Perova (1954)
2428562.672	-3433	-0.074	phg	1	Meshkova (1940)
2428873.207	-3352	+0.031	phg	1	Perova (1954)
2432019.605	-2531	-0.030	phg	1	Perova (1954)
2433774.741	-2073	-0.167	phg	1	Perova (1954)
2434299.952	-1936	-0.004	phg	1	Perova (1954)
2436905.985	-1256	-0.052	phel	3	Bahner et al. (1962)
2437630.389	-1067	+0.015	phel	2	Mitchell et al. (1964)
2441719.659	0	+0.037	phel	3	present paper
2443149.118	+373	-0.016	phel	2	present paper

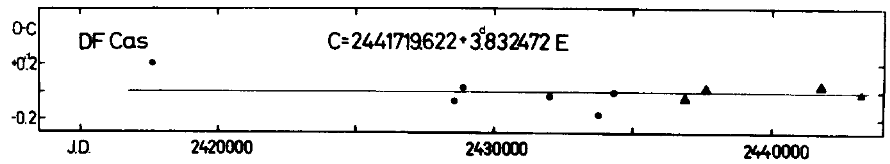

Figure 42 O-C diagram of DF Cas

SU Cygni

Its light and colour curves are typical of classical cepheids (see Fig. 43), nevertheless Kolesnik and Kheilo (1970) doubted this classification. According to Madore (1977), SU Cyg has a blue photometric companion.

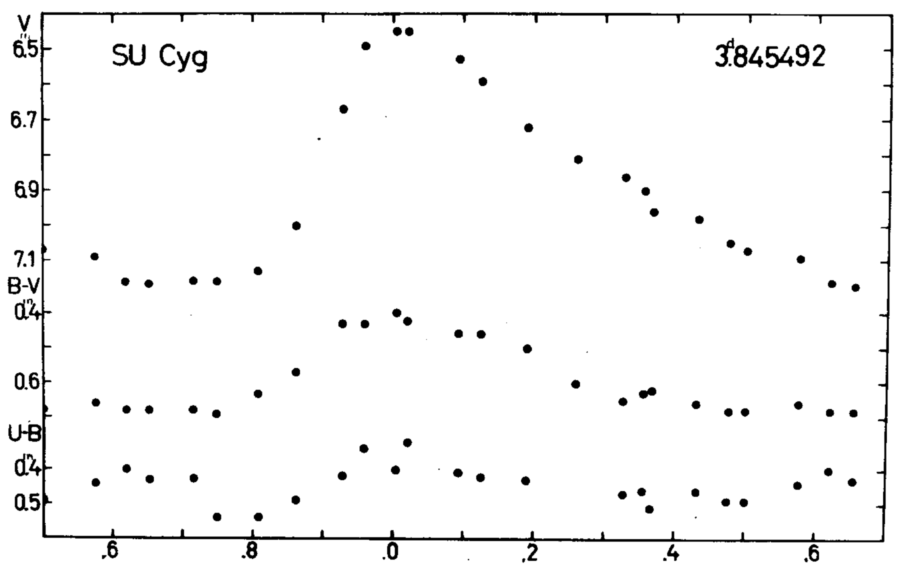

Figure 43 V, B-V and U-B curves of SU Cyg

The O-C residuals have been computed with the formulae:

$$C_{max} = 2441778.935 + 3^{d}.845492E \ ;$$

$$C_{med} = 2441778.589 + 3^{d}.845492E \ .$$

As Fig. 44 shows, a sudden period change took place at about J.D. 2430000 . After a short time the value of the period returned to its original. This phenomenon is similar to that mentioned for DT Cyg, SZ Tau and V 532 Cyg. This "rejumping" period is even more interesting because the O-C diagram for the median brightness could be also constructed. This latter O-C diagram

Table 27 O-C residuals for SU Cyg

Obs.Max.J.D.	Obs.Med.J.D.	E	$O-C_{max}$	$O-C_{med}$	Type	w	Source
2414256.621		-7157	$-0^{d}.128$		vis	1	Müller, Kempf (1897)
2414441.3		-7109	0.0		vis	0.5	Müller, Hartwig[1] (1920)
2414491.161		-7096	-0.163		vis	1	Zinner[1] (1932)
2414564.221		-7077	-0.167		vis	1	Luizet (1899)
2414591.118	2414590.722	-7070	-0.189	$-0^{d}.239$	vis	1	Wendell (1913)
2414864.138		-6999	-0.198		vis	1	Prittwitz (1901)
2414906.20		-6988	-0.44		vis	0	Yendell (1900)
2414986.89		-6967	-0.50		vis	0	Yendell[2] (1902b)
2415079.481		-6943	-0.203		vis	1	Zinner[1] (1932)
2415236.85		-6902	-0.50		vis	0	Yendell (1902a)
2415606.573		-6806	+0.057		vis	0	Luizet (1907)
2415663.71		-6791	-0.39		vis	0	Yendell (1902a)
2415748.613		-6769	-0.187		vis	0.5	Zinner[1] (1932)
2415940.97		-6719	-0.10		vis	0.5	Yendell (1905)
2415956.4		-6715	-0.10		vis	0.5	Müller, Hartwig[1] (1920)
2415968.020		-6712	+0.027		vis	0.5	Luizet (1907)
2416337.155		-6616	-0.005		vis	0.5	Luizet (1907)
2416690.815		-6524	-0.130		vis	0.5	Luizet (1907)
2416848.454		-6483	-0.156		vis	1	Prittwitz (1907)
2417052.191	2417051.794	-6430	-0.230	-0.281	phg	2	Wilkens (1906)
2417079.313		-6423	-0.027		vis	0.5	Luizet (1907)
2417086.3		-6421	-0.7		vis	0	Maddrill (1906)
2417367.769		-6348	+0.017		vis	0.5	Luizet (1907)
2417829.048	2417828.641	-6228	-0.163	-0.224	vis	1	Zeipel (1908)
2417882.822		-6214	-0.226		vis	1	Van der Bilt (1925)
2418175.117		-6138	-0.188		vis	1	Van der Bilt (1925)
2418528.908		-6046	-0.182		vis	1	Van der Bilt (1925)
2419271.104		-5853	-0.166		vis	1	Van der Bilt (1925)
2421086.203		-5381	-0.140		vis	1	Luyten (1922)
2421278.435		-5331	-0.182		phg	0.5	Robinson (1931b)
2421443.751		-5288	-0.222		vis	1	Luyten (1922)
2421943.616		-5158	-0.271		vis	1	Luyten (1922)
2422582.072		-4992	-0.167		vis	0.5	Doberck (1925)
2423308.866		-4803	-0.171		vis	0.5	Doberck (1925)

Table 27 (cont.)

Obs.Max.J.D.	Obs.Med.J.D.	E	$O-C_{max}$	$O-C_{med}$	Type	w	Source
2423320.515		-4800	$-0^{d}.058$		vis	1	Hellerich (1925)
2423658.842		-4712	-0.135		vis	0.5	Doberck (1925)
2423662.684		-4711	-0.138		vis	1	Hellerich (1925)
2424012.510		-4620	-0.252		vis	0.5	Parenago (1938)
2424028.020		-4616	-0.124		vis	1	Hellerich (1925)
	2424738.969	-4431		$-0^{d}.245$	vis	1	Moncibowitz[3] (1938)
2424816.453		-4411	-0.017		vis	0.5	Kukarkin (1940)
2425100.868	2425100.518	-4337	-0.168	-0.171	phg	2	Hellerich (1935)
	2425131.234	-4329		-0.220	vis	1	Moncibowitz[3] (1938)
2425147.039		-4325	-0.143		vis	0.5	Kukarkin (1940)
2425243.24		-4300	-0.08		vis	0.5	Lause (1938)
	2425323.499	-4279		-0.230	vis	1	Moncibowitz[3] (1938)
2425462.388		-4243	-0.124		vis	0.5	Kukarkin (1940)
2425696.940	2425696.552	-4182	-0.147	-0.189	vis	1	Zverev (1936)
2425804.661		-4154	-0.100		vis	0.5	Kukarkin (1940)
2425835.346		-4146	-0.179		vis	0.5	Parenago (1938)
2425904.749		-4128	+0.005		phg	0.5	Nassau, Townson (1932)
2426342.945		-4014	-0.185		vis	0.5	Kukarkin (1940)
2426423.739		-3993	-0.146		vis	1	Zverev (1936)
2426619.822		-3942	-0.184		vis	0.5	Kukarkin (1940)
2426908.262		-3867	-0.155		vis	0.5	Dziewulski et al. (1946)
2426923.669		-3863	-0.130		vis	1	Florya, Kukarkina (1953)
2427277.410	2427277.010	-3771	-0.175	-0.229	vis	1	Florya, Kukarkina (1953)
2427677.322	2427676.857	-3667	-0.194	-0.313	vis	1	Krebs (1935)
2427754.297		-3647	-0.129		vis	0.5	Dziewulski et al. (1946)
2427861.865		-3619	-0.234		vis	0.5	Miczaika (1937)
2428050.410		-3570	-0.119		vis	1	Krebs (1937a)
2428758.046		-3386	-0.053		phg	0.5	Dziewulski et al. (1946)
2429057.958		-3308	-0.089		phg	0.5	Kholopov (1947)
2429523.285		-3187	-0.067		vis	0.5	Remenchiz (1946)
2430238.647		-3001	+0.033		vis	0.5	Löchel[4] (1964)
2430588.687		-2910	+0.134		vis	0.5	Löchel[4] (1964)
2432861.300		-2319	+0.061		phg	0.5	Wachmann (1966)
2433126.659		-2250	+0.081		phel	3	Eggen (1951)
2433472.65		-2160	-0.02		vis	0.5	Domke, Pohl[5] (1952)

Table 27 (cont.)

Obs.Max.J.D.	Obs.Med.J.D.	E	$O-C_{max}$	$O-C_{med}$	Type	w	Source
2433538.118		-2143	$+0^d.072$		phg	0.5	Wachmann (1966)
2433680.364		-2106	+0.035		phg	1	Tschuprina (1952)
2434328.02		-1938	+1.65		phg	0	Fu (1964)
2434368.640		-1927	-0.032		phg	1	Shteiman (1958)
2434591.666		-1869	-0.044		phel	2	present paper[6]
2434603.406		-1866	+0.159		phg	0.5	Wachmann (1966)
2434922.43		-1783	+0.01		vis	0.5	Marks (1959)
2435172.32		-1718	-0.06		vis	0.5	Marks[7] (1959)
2435303.355		-1684	+0.229		phg	0	Wachmann (1966)
2435338.146		-1675	+0.410		phg	0	Tschuprina (1957)
2435356.949		-1670	-0.014		phel	2	Walraven et al. (1958)
2435380.180		-1664	+0.144		vis	0.5	Azarnova (1957)
2435645.305		-1595	-0.070		phg	1	Shteiman (1958)
2435922.056		-1523	-0.194		vis	0.5	Azarnova (1958)
2436087.339		-1480	-0.268		vis	0	Vinnik[8] (1958)
2436099.119		-1477	+0.024		phel	2	Svolopoulos (1960)
2436214.589		-1447	+0.081		vis	0.5	Latyshev (1969)
2436448.952		-1386	-0.131		vis	0.5	Azarnova (1958)
2436903.132		-1268	+0.281		phg	0	Wachmann (1966)
2436926.058		-1262	+0.134		vis	0.5	Azarnova (1962)
2437198.867		-1191	-0.087		vis	0.5	Kiperman (1963)
2437287.383		-1168	-0.017		phel	3	Mitchell et al. (1964)
2437494.980		-1114	-0.077		vis	0.5	Kiperman (1963)
2437941.117		-998	-0.017		phel	2	Williams (1966)
2438179.565		-936	+0.011		vis	0.5	Ross, Hartmann (1972)
2438971.724		-730	0.000		vis	0.5	Borisov[9] (1972)
2438987.18		-726	+0.07		vis	0.5	Braune, Hübscher (1967)
2438994.833	2438994.418	-724	+0.034	$-0^d.033$	vis	1	Borisov (1972)
2439014.054		-719	+0.028		phel	3	Wisniewski, Johnson (1968)
2439344.655		-633	-0.083		vis	1	Borisov (1972)
2439740.868		-530	+0.044		vis	1	Borisov (1972)
2440482.991		-337	-0.013		vis	1	Borisov (1972)
2441778.985	2441778.619	0	+0.050	+0.030	phel	3	present paper

Remarks: [1] Observer: Hartwig ; [2] Obs.: Flanery; [3] Obs.: Rybka; [4] Obs.: Model; [5] Obs.: Mielke; [6] Obs.: Detre; [7] Obs.: Wroblewski; [8] Obs.: Sazanova; [9] Obs.: Pantschuk.

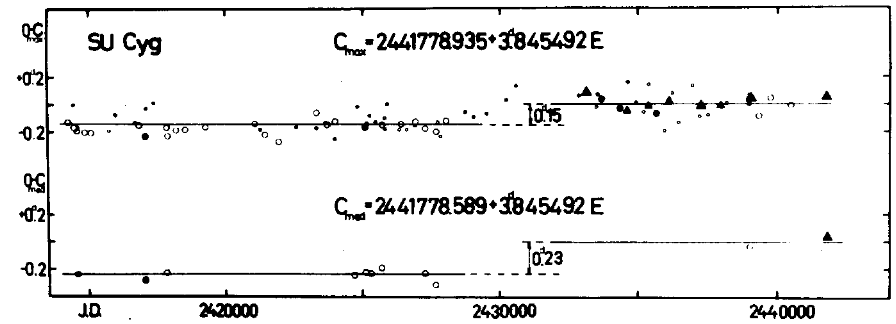

Figure 44 O-C diagram of SU Cyg

shows the jump of the period as well, but the variations in the O-C values are not equal. The difference in the O-C values is equal to $0^d.15$ in the case of the maximum, whereas it is equal to $0^d.23$ for the median brightness. This means that the light curve has become steeper after the rejump. The time difference between the moments of a maximum and the preceding moment of median brightness on the ascending branch is nearly $0^d.35$. Considering that the median point has moved nearer the maximum, the increase in the steepness is about 20%.

Y Aurigae

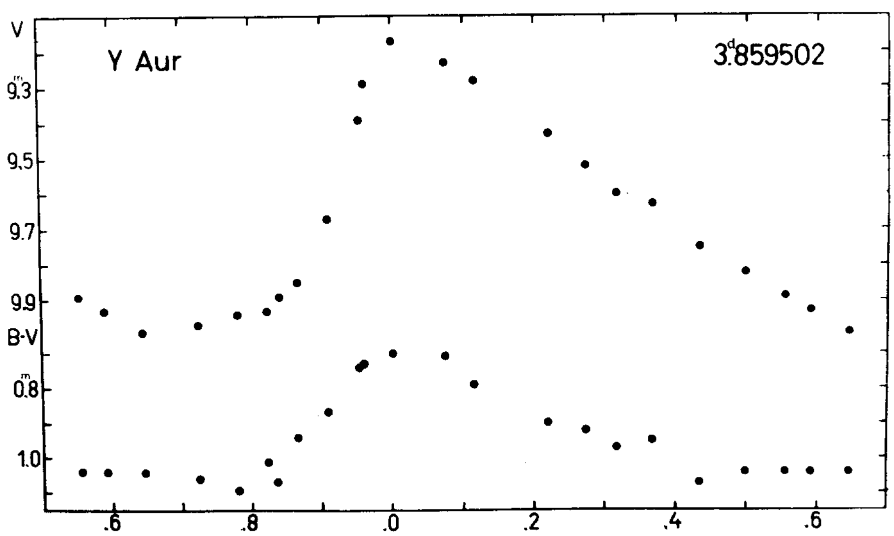

Figure 45 V and B-V curves of Y Aur

Table 28. O-C residuals for Y Aur

Obs.Max.J.D.	Obs.Med.J.D.	E	$O-C_{max}$	$O-C_{med}$	Type	w	Source
2415474.705		-6799	$+0^{d}.095$		vis	1	Williams (1905b)
2415737.096		-6731	+0.040		vis	1	Williams (1905b)
2416215.714		-6607	+0.080		phg	1	Kukarkin (1931c)
2416254.236		-6597	+0.007		vis	1	Williams (1905b)
2416466.565		-6542	+0.063		vis	0.5	Laü (1904)
2417277.43		-6332	+0.43		vis	0	Luizet (1917)
2417639.779	2417639.505	-6238	-0.012	$+0^{d}.068$	vis	1	Zeipel (1908)
2417663.23		-6232	+0.28		vis	0	Luizet (1917)
2417944.675	2417944.320	-6159	-0.016	-0.017	vis	1	Van der Bilt (1924)
2418446.412	2418446.045	-6029	-0.014	-0.027	vis	1	Van der Bilt (1924)
2418755.56		-5949	+0.37		vis	0	Luizet (1917)
2419133.69		-5851	+0.27		vis	0	Luizet (1917)
2419322.538	2419322.187	-5802	+0.005	+0.008	vis	1	Van der Bilt (1924)
2419488.74		-5759	+0.25		vis	0	Luizet (1917)
2419805.36		-5677	+0.39		vis	0	Luizet (1917)
2419866.903		-5661	+0.180		phg	0.5	Robinson (1929)
2420600.12		-5471	+0.09		vis	0.5	Luizet (1917)
2420982.11		-5372	-0.01		vis	0.5	Luizet (1917)
2421140.394		-5331	+0.035		vis	1	Doberck (1924c)
2421167.333	2421166.924	-5324	-0.042	-0.097	phg	2	Jordan (1929)

Table 28 (cont.)

Obs.Max.J.D.	Obs.Med.J.D.	E	$O-C_{max}$	$O-C_{med}$	Type	w	Source
2422163.161	2422162.756	-5066	$+0^{d}.034$	$-0^{d}.017$	vis	1	Nijland (1923)
2422170.849	2422170.525	-5064	+0.003	+0.033	phg	2	Martin, Plummer (1921)
2422564.478		-4962	-0.037		vis	1	Doberck (1924c)
2422676.465	2422676.102	-4933	+0.024	+0.015	vis	1	Nijland (1923)
2422761.3		-4911	-0.05		vis	0.5	Hacar (1921)
2423043.097	2423042.773	-4838	+0.004	+0.034	vis	1	Nijland (1923)
2423355.680		-4757	-0.033		vis	1	Nijland (1923)
2423502.536		-4719	+0.162		phg	1	Kukarkin (1931c)
2423594.853		-4695	-0.149		vis	1	Doberck (1924c)
2425972.82		-4079	+0.36		vis	0	Kukarkin (1930a)
2426165.401	2426165.034	-4029	-0.029	-0.042	phg	1	Kukarkin (1931c)
2426234.922		-4011	+0.021		vis	1	Kukarkin (1940)
2428150.02		-3515	+0.81		vis	0	Fu (1964)
2430244.803		-2972	-0.121		vis	0.5	Lagrula (1941,1942)
2430785.41		-2832	+0.16		vis	0.5	Stein (1944)
2436833.102		-1265	+0.008		phel	3	Weaver et al. (1960)
2436844.654		-1262	-0.018		phel	2	Oosterhoff (1960)
2439361.069	2439360.687	-610	+0.001	-0.027	phel	3	Takase (1969)
2441715.370	2441715.027	0	+0.006	+0.017	phel	3	present paper

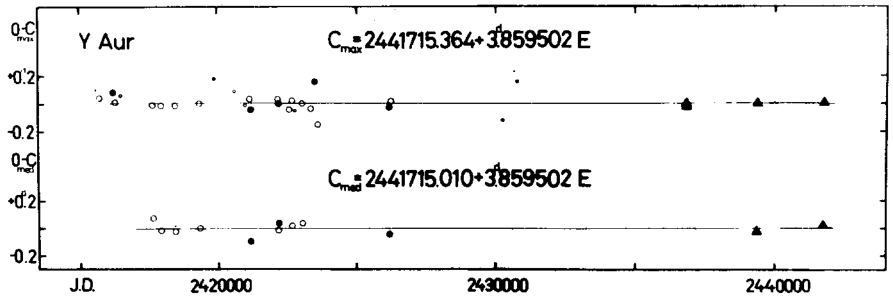

Figure 46 O-C diagram of Y Aur

The light and colour curves of this variable are shown in Fig. 45. The O-C residuals have been computed with the formulae:

$$C_{max} = 2441715.364 + 3^{d}.859502E \; ;$$
$$C_{med} = 2441715.010 + 3^{d}.859502E \; .$$

Both O-C diagrams (Fig. 46) show constant period and give the same value for the period.

ST Tauri

According to Michalowska-Smak and Smak (1965) this star is a Population II variable. This statement can be refuted with the aid of the light and colour curves shown in Fig. 47. These

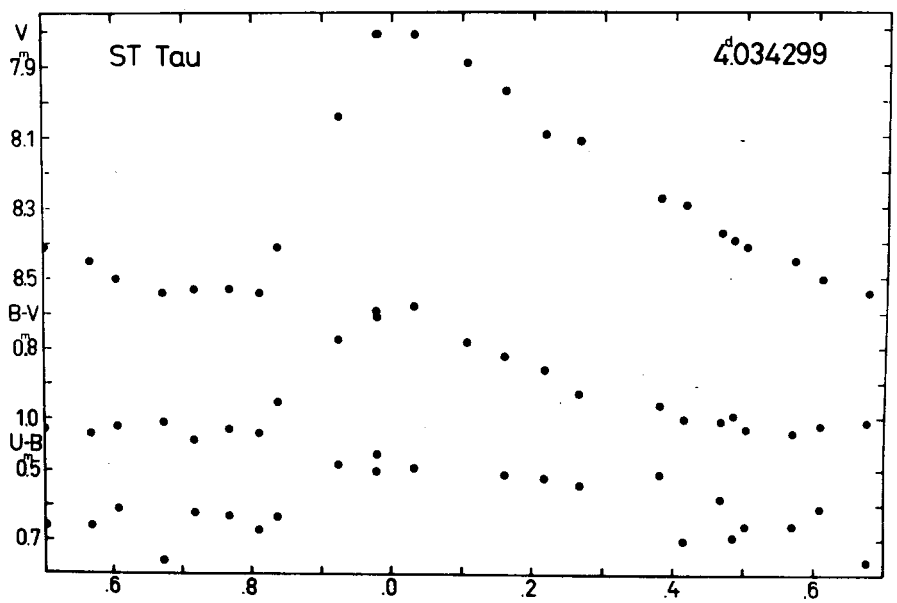

Figure 47 V, B-V and U-B curves of ST Tau

curves are typical of the classical cepheids.

The O-C residuals have been computed with the formula:

$$C = 2441761.963 + 4\overset{d}{.}034299E \ .$$

The 2nd Supplement to the GCVS (Kukarkin et al. 1974) reports on the period variation of ST Tau. The O-C diagram (Fig. 48) does not show any period variation.

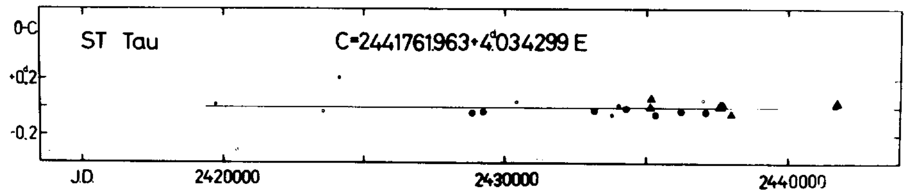

Figure 48 O-C diagram of ST Tau

Table 29 O-C residuals for ST Tau

Obs.Max.J.D.	E	O-C	Type	w	Source
2419718.565	-5464	$+0\overset{d}{.}012$	phg	0.5	Robinson (1930)
2420480.73	-5275	-0.31	vis	0.5	Hoffmeister (1919)
2420864.45	-5180	+0.16	vis	0.5	Hoffmeister (1919)
2421199.35	-5097	+0.21	vis	0.5	Hoffmeister (1919)
2423559.172	-4512	-0.034	vis	0.5	Doberck (1924c)
2424132.283	-4370	+0.207	phg	0.5	Kukarkina (1954b)
2428856.195	-3199	-0.045	phg	1	Koshkina (1963)
2429251.566	-3101	-0.036	phg	1	Koshkina (1963)
2430421.585	-2811	+0.036	vis	0.5	Model, Löchel (1964)
2433185.016	-2126	-0.027	phg	1	Borzdyko (1962)
2433806.267	-1972	-0.058	phg	0.5	Koshkina (1963)
2434024.192	-1918	+0.014	phg	0.5	Borzdyko (1962)
2434298.499	-1850	-0.011	phg	1	Koshkina (1963)
2435177.981	-1632	-0.006	phel	2	Walraven et al. (1958)
2435182.080	-1631	+0.059	phel	2	Irwin (1961)
2435323.165	-1596	-0.057	phg	1	Borzdyko (1962)
2436243.010	-1368	-0.032	phg	1	Borzdyko (1962)
2436993.473	-1182	+0.051	vis	0.5	Huth (1963b)
2437106.343	-1154	-0.039	phg	1	Borzdyko (1962)
2437622.781	-1026	+0.009	phel	3	Mitchell et al. (1964)
2437699.435	-1007	+0.011	phel	2	Michalowska et al.(1965)
2437989.839	-935	-0.054	phel	1	Williams (1966)
2441761.984	0	+0.021	phel	3	present paper

V 395 Cassiopeiae

This star has not previously been observed photoelectrically. The light and colour curves of V 395 Cas are presented in Fig. 49. Since the O-C diagram consists of two points only, these have not been plotted in a figure. The O-C residuals have been calculated with the formula:

$$C = 2441949.427 + 4^d.037728E .$$

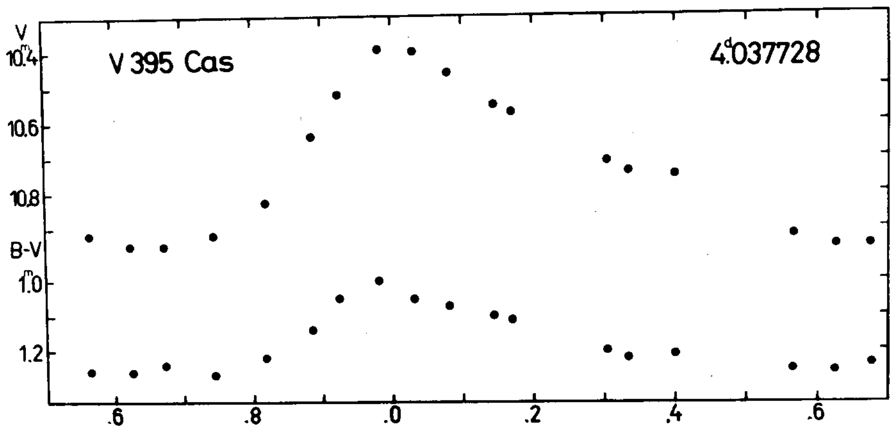

Figure 49 V and B-V curves of V 395 Cas

Table 30 O-C residuals for V 395 Cas

Obs.Max.J.D.	E	O-C	Type	w	Source
2435343.705	-1636	$+0^d.001$	phg	2	Kholopov et al. (1968)
2441949.427	0	0.000	phel	3	present paper

<u>SY Cassiopeiae</u>

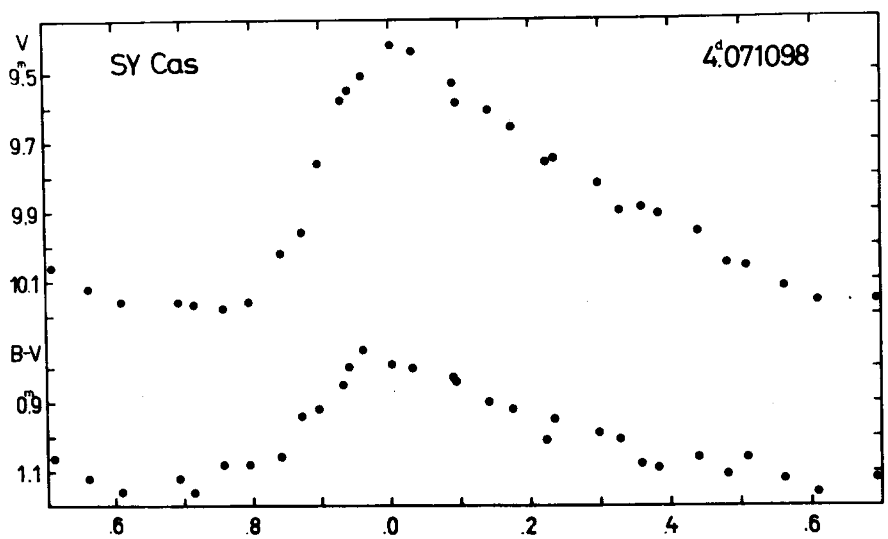

Figure 50 V and B-V curves of SY Cas

There is a faint companion SW at the variable within the diaphragm. The light and colour curves on SY Cas are presented in Fig. 50. The O-C residuals have been computed with the formula:

$$C = 2441682.230 + 4\overset{d}{.}071098E \ .$$

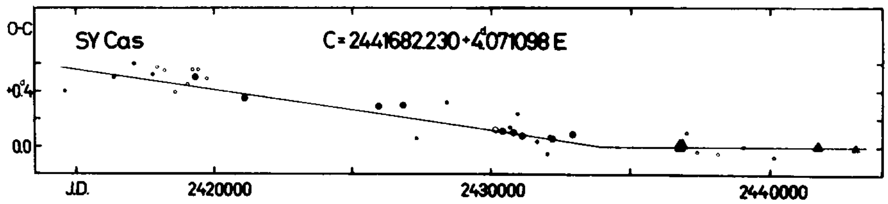

Figure 51 O-C diagram of SY Cas

The O-C diagram (Fig. 51) shows a sudden period change at J.D. 2434000. The corresponding periods are as follows:

before J.D. 2434000, $P = 4\overset{d}{.}070969$;

after J.D. 2434000, $P = 4\overset{d}{.}071098$.

Table 31 O-C residuals for SY Cas

Obs.Max.J.D.	E	O-C	Type	w	Source
2414605.8	-6651	$+0\overset{d}{.}4$	phg	0.5	Blazhko (1907b)
2416376.8	-6216	+0.5	phg	0.5	Blazhko (1907b)
2417121.9	-6033	+0.6	phg	0.5	Blazhko (1907b)
2417793.55	-5868	+0.52	phg	0.5	Blazhko (1907b)
2417911.2	-5839	+0.1	phg	0	Blazhko (1907b)
2417952.374	-5829	+0.574	vis	0.5	Luizet (1908)
2418229.18	-5761	+0.55	vis	0.5	Luizet (1913)
2418595.42	-5671	+0.39	vis	0.5	Luizet (1913)
2419047.38	-5560	+0.45	vis	0.5	Luizet (1913)
2419234.76	-5514	+0.56	vis	0.5	Luizet (1913)
2419336.475	-5489	+0.502	phg	1	Robinson (1931a)
2419466.81	-5457	+0.56	vis	0.5	Luizet (1913)
2419743.57	-5389	+0.49	vis	0.5	Luizet (1913)
2421131.676	-5048	+0.349	phg	2	Jordan (1929)
2425964.01	-3861	+0.29	phg	1	Oosterhoff (1935)
2426851.52	-3643	+0.30	phg	1	Oosterhoff (1935)
2427335.74	-3524	+0.06	phg	0.5	Oosterhoff (1935)
2428431.13	-3255	+0.32	phg	0.5	Fu (1964)
2430181.504	-2825	+0.126	vis	1	Conceicao-Silva (1950b)
2430433.905	-2763	+0.119	phg	1	Vasil'yanovskaya (1948)
2430629.53	-2715	+0.33	phg	0	Romano (1959)
2430678.192	-2703	+0.140	vis	0.5	Conceicao-Silva (1950b)
2430836.932	-2664	+0.107	phg	1	Solov'yov (1954)
2430979.55	-2629	+0.24	phg	0.5	Romano (1959)
2431146.305	-2588	+0.077	phg	2	Vasil'yanovskaya (1948)
2431687.72	-2455	+0.04	phg	0.5	Romano (1959)
2432041.82	-2368	-0.05	phg	0.5	Romano (1959)
2432127.439	-2347	+0.076	vis	0.5	Conceicao-Silva (1950b)
2432208.850	-2327	+0.065	phg	1	Vasil'yanovskaya (1948)
2432738.37	-2197	+0.34	phg	0	Romano (1959)
2432970.172	-2140	+0.092	phg	1	Solov'yov (1954)
2433121.25	-2103	+0.54	phg	0	Romano (1959)

Table 31 (cont.)

Obs.Max.J.D.	E	O-C	Type	w	Source
2435083.29	-1621	$+0^d.31$	phg	0	Romano (1959)
2435413.05	-1540	+0.31	phg	0	Romano (1959)
2435721.87	-1464	-0.27	phg	0	Romano (1959)
2436809.135	-1197	-0.009	phel	3	Oosterhoff (1960)
2436833.544	-1191	+0.008	phel	3	Weaver et al. (1960)
2436906.850	-1173	+0.018	phel	3	Bahner et al. (1962)
2437045.355	-1139	+0.106	vis	0.5	Häussler (1973)
2437399.402	-1052	-0.033	vis	0.5	Häussler (1973)
2438144.399	-869	-0.047	vis	0.5	Häussler (1973)
2439056.378	-645	+0.006	vis	0.5	Häussler (1973)
2440151.424	-376	-0.073	vis	0.5	Häussler (1973)
2441682.236	0	+0.006	phel	3	present paper
2443041.968	+334	-0.009	phel	2	present paper

V 508 Monocerotis

This star has not previously been observed photoelectrically. The amplitude of its light variation is small (see Fig. 52) but non-sinusoidal (resembling IR Cep). As was discussed in the case of IR Cep, this phenomenon may be due to the presence of a companion star or to the non-homogeneity of the group of cepheids with small amplitude. As the ratio of amplitudes in yellow and blue lights for both IR Cep and V 508 Mon is close to the value of the ratio derived for single cepheids (i.e. the possible companion star would be of the same spectral type as the cepheid in both cases), the latter explanation is more probable.

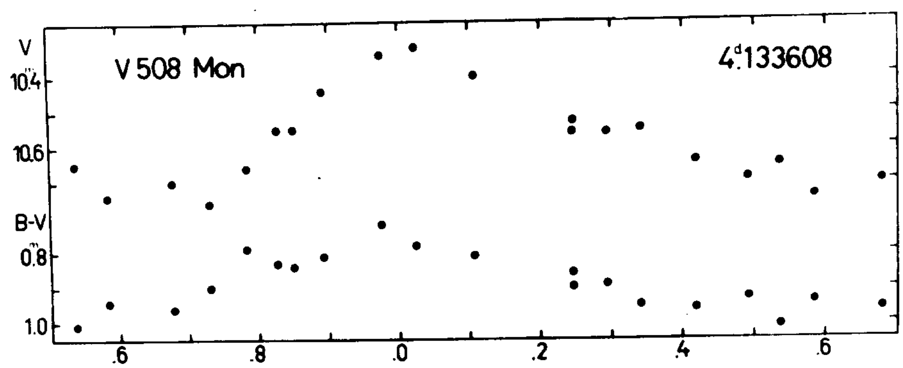

Figure 52 V and B-V curves of V 508 Mon

The O-C residuals have been computed with the formula:

$$C = 2441732.070 + 4^d.133608E .$$

As Fig. 53 shows, the period of V 508 Mon has remained constant since the discovery of its light variation.

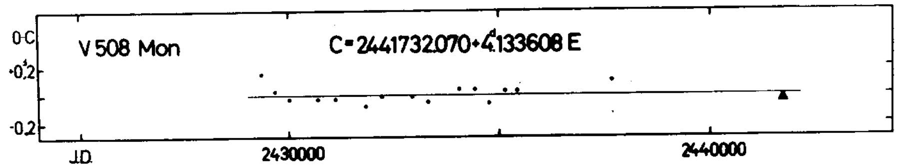

Figure 53 O-C diagram of V 508 Mon

Table 32 O-C residuals for V 508 Mon

Obs.Max.J.D.	E	O-C	Type	w	Source
2429343.80	-2997	$+0^{d}.15$	phg	0.5	Wachmann (1964)
2429670.23	-2918	+0.03	phg	0.5	Wachmann (1964)
2430021.53	-2833	-0.03	phg	0.5	Wachmann (1964)
2430699.44	-2669	-0.03	phg	0.5	Wachmann (1964)
2431116.93	-2568	-0.03	phg	0.5	Wachmann (1964)
2431852.67	-2390	-0.08	phg	0.5	Wachmann (1964)
2432233.03	-2298	-0.01	phg	0.5	Wachmann (1964)
2432948.14	-2125	-0.01	phg	0.5	Wachmann (1964)
2433332.53	-2032	-0.05	phg	0.5	Wachmann (1964)
2434068.40	-1854	+0.04	phg	0.5	Wachmann (1964)
2434444.56	-1763	+0.04	phg	0.5	Wachmann (1964)
2434775.15	-1683	-0.06	phg	0.5	Wachmann (1964)
2435163.80	-1589	+0.03	phg	0.5	Wachmann (1964)
2435453.15	-1519	+0.03	phg	0.5	Wachmann (1964)
2437693.63	-977	+0.10	phg	0.5	Wachmann (1964)
2441732.043	0	-0.027	phel	3	present paper

<u>SX Persei</u>

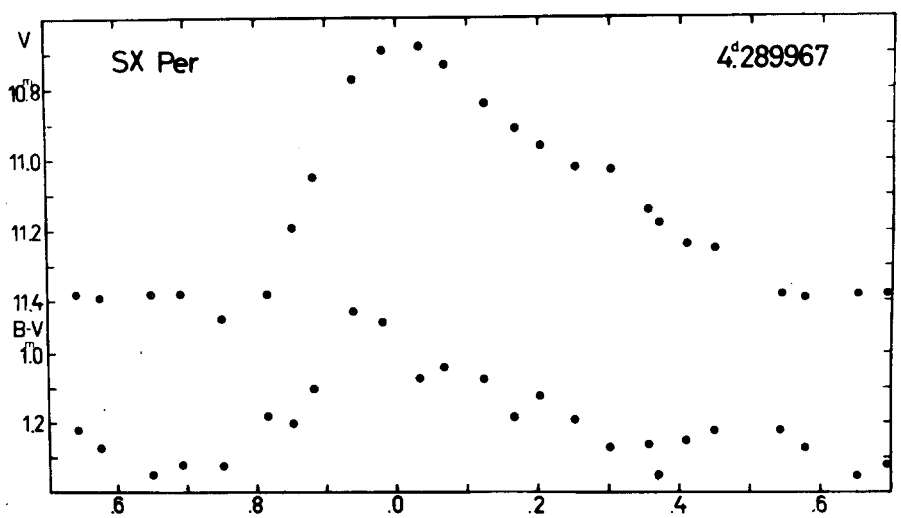

Figure 54 V and B-V curves of SX Per

The light and colour curves for this variable are shown in Fig. 54. The O-C residuals are computed with the formula:

$$C = 2441847.979 + 4\overset{d}{.}289967E \ .$$

As Fig. 55 shows, the period of SX Per has remained constant since the beginning of this century.

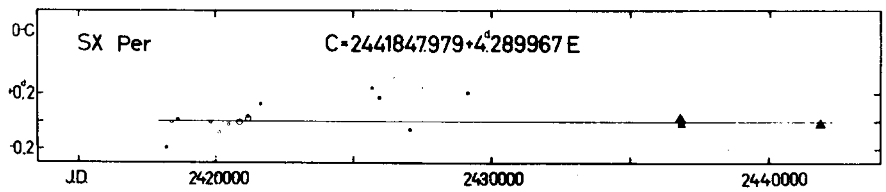

Figure 55 O-C diagram of SX Per

Table 33 O-C residuals for SX Per

Obs.Max.J.D.	E	O-C	Type	w	Source
2418210.070	-5510	$-0\overset{d}{.}191$	phg	0.5	Kukarkin (1931b)
2418390.436	-5468	-0.003	vis	0.5	Enebo (1911)
2418647.85	-5408	+0.01	phg	0.5	Oosterhoff (1935)
2419810.411	-5137	-0.008	vis	0.5	Nijland (1923)
2420127.795	-5063	-0.081	vis	0.5	Nijland (1923)
2420475.343	-4982	-0.020	vis	0.5	Nijland (1923)
2420857.163	-4893	-0.007	vis	1	Nijland (1923)
2421161.80	-4822	+0.04	phg	0.5	Oosterhoff (1935)
2421187.512	-4816	+0.014	vis	1	Nijland (1923)
2421638.07	-4711	+0.13	phg	0.5	Oosterhoff (1935)
2425692.20	-3766	+0.24	phg	0.5	Oosterhoff (1935)
2425966.69	-3702	+0.17	phg	0.5	Oosterhoff (1935)
2427064.69	-3446	-0.06	phg	0.5	Oosterhoff (1935)
2429145.60	-2961	+0.21	phg	0.5	Kurochkin (1950)
2436815.866	-1173	+0.018	phel	3	Weaver et al. (1960)
2436845.854	-1166	-0.023	phel	2	Oosterhoff (1960)
2441847.956	0	-0.023	phel	3	present paper

<u>Y Lacertae</u>

Table 34 O-C residuals for Y Lac

Obs.Max.J.D.	E	O-C	Type	w	Source
2417615.86	-5581	$+0\overset{d}{.}11$	phg	0.5	Blazhko (1907a)
2417715.193	-5558	-0.005	vis	0.5	Ichinohe (1909)
2417944.323	-5505	-0.035	vis	0.5	Zeipel (1908)
2418216.813	-5442	+0.057	vis	0.5	Ichinohe (1909)
2418424.295	-5394	-0.002	phg	0.5	Robinson (1930)
2421658.488	-4646	+0.006	phg	2	Jordan (1929)
2421818.386	-4609	-0.075	phg	2	Martin, Plummer (1919)
2424758.640	-3929	+0.011	vis	0.5	Schneller (1928)
2426228.749	-3589	+0.036	phg	0.5	Nekrasova (1938)
2429102.45	-2924	-1.57	phg	0	Shakhovskoj (1949)
2433125.147	-1994	+0.011	phel	3	Eggen (1951)
2433609.468	-1882	+0.069	phg	1	Solov'yov (1952b)

Table 34 (cont.)

Obs.Max.J.D.	E	O-C	Type	w	Source
2436834.936	-1136	$+0\overset{d}{.}001$	phel	3	Bahner et al. (1962)
2437366.745	-1013	-0.015	phel	3	Mitchell et al. (1964)
2441746.720	0	-0.025	phel	3	present paper

The light and colour curves for this variable are shown in Fig. 56. According to Madore (1977), Y Lac has a blue photometric companion. The O-C residuals have been calculated with the formula:

$$C = 2441746.745 + 4\overset{d}{.}323776E \ .$$

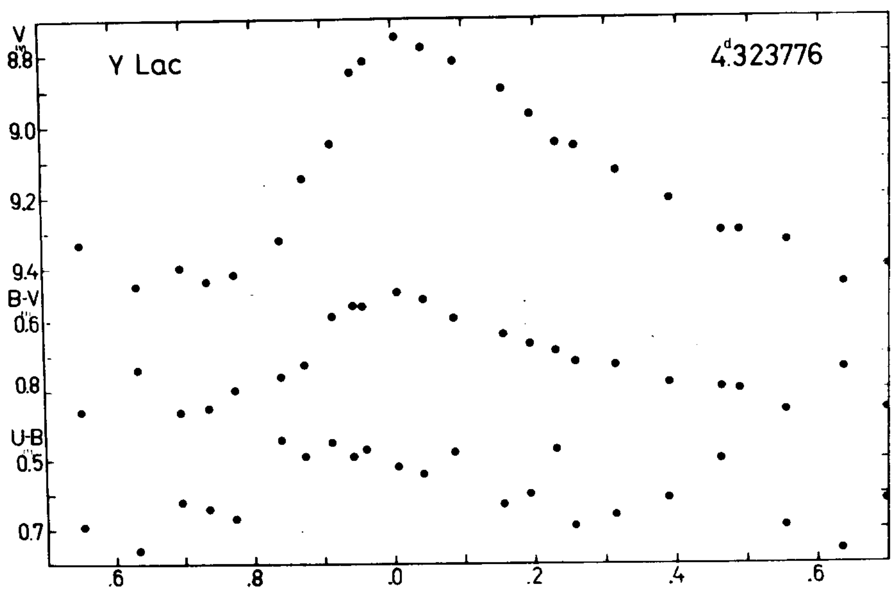

Figure 56 V, B-V and U-B curves of Y Lac

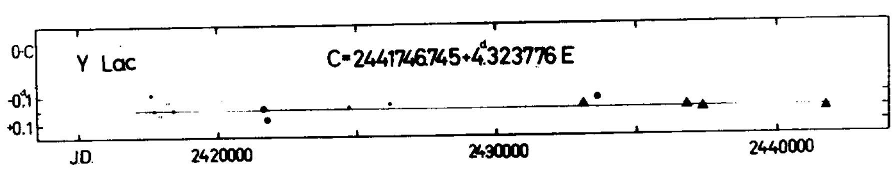

Figure 57 O-C diagram of Y Lac

The O-C diagram (Fig. 57) is a straight line, i.e. the period is constant.

V 402 Cygni

The light and colour curves of this variable are shown in Fig. 58. The O-C residuals have been computed with the formula:

$$C = 2441698.635 + 4^{d}.364836E \ .$$

These residuals which are plotted in Fig. 59 show constant period.

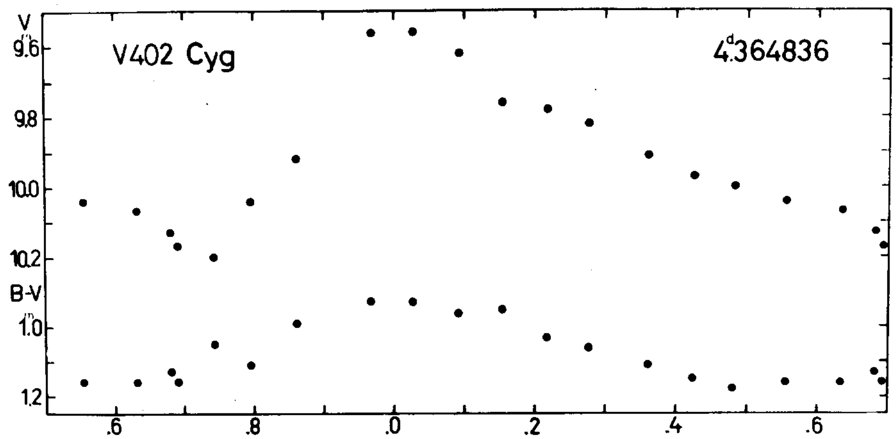

Figure 58 V and B-V curves of V 402 Cyg

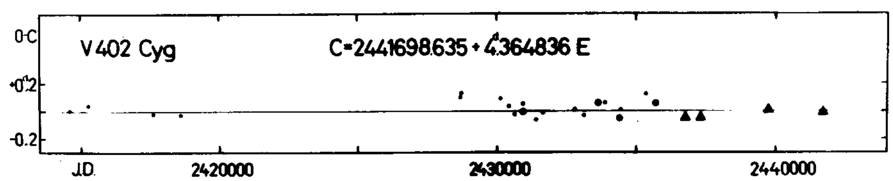

Figure 59 O-C diagram of V 402 Cyg

Table 35 O-C residuals for V 402 Cyg

Obs.Max.J.D.	E	O-C	Type	w	Source
2413841.80	-6382	$-0^{d}.45$	phg	0	Ikauniex (1946)
2414606.10	-6207	0.00	phg	0.5	Ikauniex (1946)
2415287.05	-6051	+0.04	phg	0.5	Ikauniex (1946)
2417613.45	-5518	-0.02	phg	0.5	Ikauniex (1946)
2418586.80	-5295	-0.03	phg	0.5	Ikauniex (1946)
2428717.71	-2974	+0.10	phg	0.5	Ikauniex (1946)
2428748.30	-2967	+0.13	phg	0.5	Suzuki, Huruhata(1938)
2430166.83	-2642	+0.09	phg	0.5	Ashbrook (1941)
2430446.124	-2578	+0.036	phg	0.5	Solov'yov (1946)
2430651.211	-2531	-0.024	phg	0.5	Filatov (1957)
2430956.765	-2461	-0.009	phg	1	Solov'yov (1946)
2430961.19	-2460	+0.05	phg	0.5	Ikauniex (1946)
2431410.654	-2357	-0.063	phg	0.5	Solov'yov (1946)
2431655.134	-2301	-0.013	phg	0.5	Filatov (1957)

Table 35 (cont.)

Obs.Max.J.D.	E	O-C	Type	w	Source
2432794.380	-2040	$+0\overset{d}{.}010$	phg	0.5	Filatov (1957)
2433121.697	-1965	-0.035	phg	0.5	Filatov (1957)
2433649.937	-1844	+0.060	phg	1	Filatov (1957)
2433890.004	-1789	+0.061	phg	0.5	Shteiman (1958)
2434400.571	-1672	-0.058	phg	1	Filatov (1957)
2434448.650	-1661	+0.008	phg	0.5	Shteiman (1958)
2435334.826	-1458	+0.122	phg	0.5	Filatov (1957)
2435692.675	-1376	+0.054	phg	1	Shteiman (1958)
2436761.948	-1131	-0.057	phel	3	Oosterhoff (1960)
2437307.560	-1006	-0.050	phel	3	Mitchell et al. (1964)
2439743.193	-448	+0.005	phel	3	Takase (1969)
2441698.620	0	-0.015	phel	3	present paper

T Vulpeculae

The light and colour curves for this cepheid are shown in Fig. 60. The O-C residuals have been calculated with the formula:

$$C = 2441705.121 + 4\overset{d}{.}435462E \ .$$

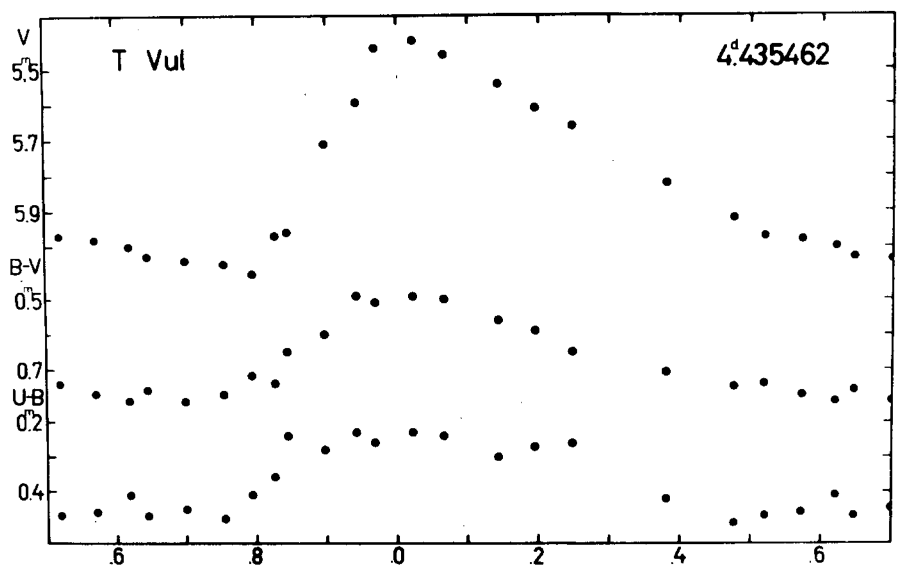

Figure 60 V, B-V and U-B curves of T Vul

The O-C diagram in Fig. 61 shows a small change in the period of T Vul at J.D. 2434000 . The value of the period before J.D. 2417000 is rather uncertain. The other values of the period are as follows:

between J.D. 2417000 and J.D. 2434000, $P = 4\overset{d}{.}435589$;

after J.D. 2434000, $P = 4\overset{d}{.}435462$.

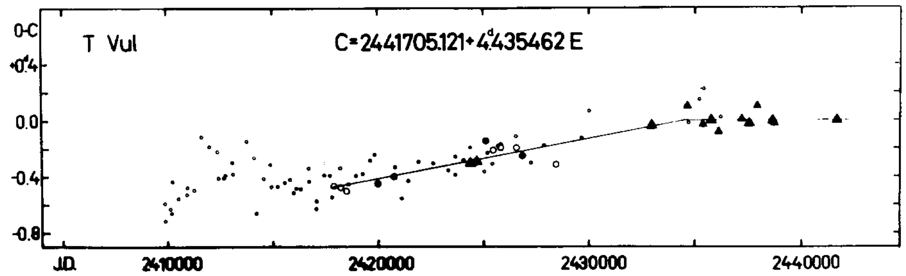

Figure 61 O-C diagram of T Vul

Table 36 O-C residuals for T Vul

Obs.Max.J.D.	E	O-C	Type	w	Source
2409884.531	-7174	-0.586 (d)	vis	0.5	Sawyer (1889)
2409897.709	-7171	-0.714	vis	0.5	Chandler (1886)
2410101.830	-7125	-0.624	vis	0.5	Chandler (1886)
2410199.373	-7103	-0.661	vis	0.5	Sawyer (1889)
2410212.91	-7100	-0.43	vis	0.5	Prager[1] (1936)
2410545.403	-7025	-0.557	vis	0.5	Sawyer (1896)
2410904.747	-6944	-0.526	vis	0.5	Sawyer (1896)
2410922.543	-6940	-0.472	vis	0.5	Yendell (1889)
2411272.927	-6861	-0.489	vis	0.5	Sawyer (1896)
2411313.392	-6852	+0.057	vis	0	Yendell (1890)
2411605.959	-6786	-0.117	vis	0.5	Yendell (1891)
2411991.774	-6699	-0.187	vis	0.5	Yendell (1893)
2412351.012	-6618	-0.221	vis	0.5	Yendell (1894)
2412404.048	-6606	-0.411	vis	0.5	Sawyer (1896)
2412670.178	-6546	-0.409	vis	0.5	Yendell (1895a)
2412736.725	-6531	-0.394	vis	0.5	Sawyer (1896)
2413056.175	-6459	-0.297	vis	0.5	Yendell (1895b)
2413096.011	-6450	-0.380	vis	0.5	Sawyer (1896)
2413761.565	-6300	-0.145	vis	0.5	Yendell (1897)
2414098.541	-6224	-0.265	vis	0.5	Yendell (1901)
2414213.467	-6198	-0.661	vis	0.5	Pickering (1907)
2414546.374	-6123	-0.413	vis	0.5	Luizet (1912)
2414870.265	-6050	-0.311	vis	0.5	Yendell (1901)
2414892.283	-6045	-0.470	vis	0.5	Luizet (1912)
2415211.636	-5973	-0.470	vis	0.5	Luizet (1912)
2415570.948	-5892	-0.431	vis	0.5	Luizet (1912)
2415801.604	-5840	-0.419	vis	0.5	Tass (1909)
2415925.05	-5812	-1.17	vis	0	Yendell (1905)
2415987.800	-5798	-0.512	vis	0.5	Luizet (1912)
2416120.895	-5768	-0.481	vis	0.5	Tass (1904)
2416324.921	-5722	-0.488	vis	0.5	Luizet (1912)
2416710.960	-5635	-0.333	vis	0.5	Terkán (1905)
2416715.297	-5634	-0.431	vis	0.5	Luizet (1912)
2417065.499	-5555	-0.631	vis	0.5	Luizet (1912)
2417069.989	-5554	-0.576	phg	0.5	Wilkens (1906)
2417433.887	-5472	-0.386	vis	0.5	Luizet (1912)
2417757.672	-5399	-0.390	vis	0.5	Zeipel (1908)
2417806.307	-5388	-0.545	vis	0.5	Luizet (1912)
2417872.917	-5373	-0.467	vis	1	Nijland (1923)
2418192.402	-5301	-0.335	vis	0.5	Luizet (1912)

Table 36 (cont.)

Obs.Max.J.D.	E	O-C	Type	w	Source
2418196.696	-5300	-0ᵈ.476	vis	1	Nijland (1923)
2418516.031	-5228	-0.495	vis	1	Nijland (1923)
2418551.555	-5220	-0.454	vis	0.5	Luizet (1912)
2418937.503	-5133	-0.392	vis	0.5	Luizet (1912)
2419283.487	-5055	-0.374	vis	0.5	Luizet (1912)
2419656.159	-4971	-0.280	phg	0.5	Robinson (1931a)
2419833.616	-4931	-0.242	vis	0.5	Dziewulski (1925)
2420001.954	-4893	-0.451	phg	1	Hertzsprung (1919)
2420747.163	-4725	-0.400	phg	1	Hertzsprung (1919)
2420813.763	-4710	-0.332	vis	0.5	Luyten (1922)
2421110.716	-4643	-0.555	vis	0.5	Luyten (1922)
2421439.068	-4569	-0.427	vis	0.5	Luyten (1922)
2421922.671	-4460	-0.289	vis	0.5	Luyten (1922)
2422641.203	-4298	-0.302	vis	0.5	Doberck (1924a)
2423333.034	-4149	-0.355	vis	0.5	Hellerich (1928b)
2423670.279	-4066	-0.254	vis	0.5	Hellerich (1928b)
2423674.582	-4065	-0.386	vis	0.5	Hopmann (1924)
2424029.526	-3985	-0.279	vis	0.5	Hellerich (1928b)
2424375.465	-3907	-0.306	phel	3	Huffer (1928a)
2424384.452	-3905	-0.190	vis	0.5	Hellerich (1928b)
2424721.445	-3829	-0.292	phel	3	Huffer (1928a)
2424770.258	-3818	-0.269	vis	0.5	Kukarkin (1940)
2425067.340	-3751	-0.363	vis	0.5	Kukarkin (1940)
2425116.349	-3740	-0.144	phg	2	Hellerich (1935)
2425218.28	-3717	-0.23	vis	0.5	Lause (1938)
2425426.662	-3670	-0.313	vis	0.5	Kukarkin (1940)
2425448.942	-3665	-0.211	vis	1	Zverev (1936)
2425701.800	-3608	-0.174	vis	0.5	Dziewulski et al.(1932)
2425781.623	-3590	-0.189	vis	1	Zverev (1936)
2425826.001	-3580	-0.166	vis	0.5	Kukarkin (1940)
2426531.289	-3421	-0.116	vis	0.5	Kukarkin (1940)
2426540.081	-3419	-0.195	vis	1	Zverev (1936)
2426859.380	-3347	-0.250	phg	2	Kox (1935)
2427289.6	-3250	-0.3	vis	0.5	Miczaika (1934)
2427875.176	-3118	-0.174	vis	0.5	Miczaika (1937)
2428451.646	-2988	-0.315	vis	1	Kepinski (1937)
2429631.665	-2722	-0.128	vis	0.5	Mandre (1950,1951)
2430004.44	-2638	+0.07	vis	0.5	Conceicao-Silva (1948)
2432967.224	-1970	-0.037	phel	3	Eggen (1951)
2434595.171	-1603	+0.096	phel	1	present paper[2]
2434701.51	-1579	-0.02	vis	0.5	Marks[3] (1959)
2435216.19	-1463	+0.15	vis	0.5	Marks (1959)
2435362.383	-1430	-0.027	phel	1	Walraven et al. (1958)
2435380.378	-1426	+0.226	vis	0.5	Azarnova (1957)
2435757.163	-1341	-0.003	phel	3	Prokof'eva (1961)
2436098.622	-1264	-0.075	phel	2	Svolopoulos (1960)
2436214.045	-1238	+0.026	vis	0.5	Latyshev (1969)
2437212.010	-1013	+0.012	phel	2	Mitchell et al. (1964)
2437562.372	-934	-0.027	phel	3	Johansen (1971)
2437939.516	-849	+0.102	phel	1	Williams (1966)
2438649.080	-689	-0.008	phel	3	Johansen (1971)
2438733.347	-670	-0.014	phel	2	Wisniewski et al.(1968)
2441705.118	0	-0.003	phel	3	present paper

Remarks: [1] Observer: Gore; [2] Obs.: Detre; [3] Obs.: Wroblewski.

FF Aquilae

This cepheid is a component of a spectroscopic binary system with an orbital period of 1435 days (Abt 1959). Its light and colour curves are presented in Fig. 62. The small bump before the minimum brightness seems to be real because it appears in all three colours and its presence can be suspected from some earlier photoelectric light curves, as well. The appearance of a bump at this phase is a unique phenomenon among the cepheids with such a short period.

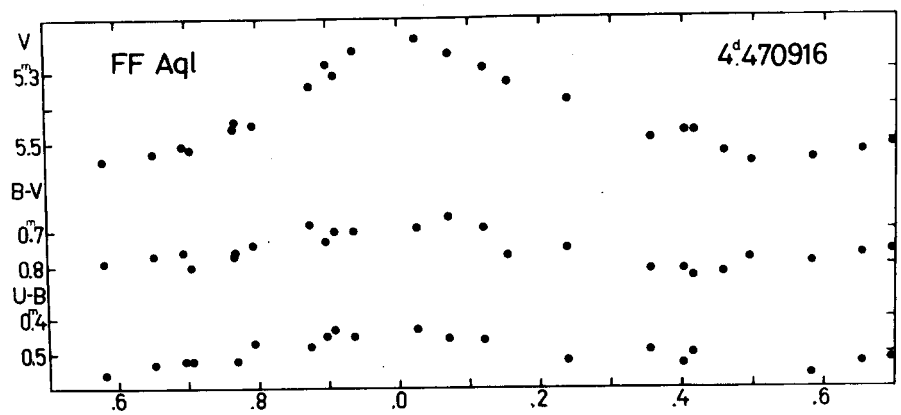

Figure 62 V, B-V and U-B curves of FF Aql

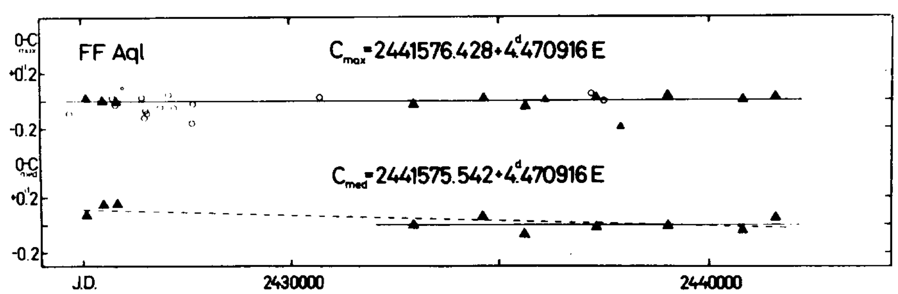

Figure 63 O-C diagram of FF Aql

The O-C residuals have been computed with the formulae:

$$C_{max} = 2441576.428 + 4^{d}.470916E \;;$$

$$C_{med} = 2441575.542 + 4^{d}.470916E \;.$$

These residuals are shown in Fig. 63 . It can be seen from this figure that either the period determined from the O-C diagram of the median brightness ($P = 4^{d}.470886$) differs from the period val-

Table 37 O-C residuals for FF Aql

Obs.Max.J.D.	Obs.Med.J.D.	E	$O-C_{max}$	$O-C_{med}$	Type	w	Source
2424703.102		-3774	$-0^d.089$		vis	1	Kukarkin (1931b)
2425096.650	2425095.823	-3686	+0.018	$+0^d.077$	phel	3	Huffer (1931)
2425490.067	2425489.334	-3598	-0.005	+0.148	phel	3	Huffer (1931)
2425735.99		-3543	+0.02		vis	1	Kukarkin (1929)
2425803.008		-3528	-0.028		vis	1	Kukarkin (1940)
2425811.968	2425811.248	-3526	-0.010	+0.156	phel	3	Huffer (1931)
2425973.030		-3490	+0.099		vis	0.5	Zverev (1936)
2426433.462		-3387	+0.026		vis	1	Kukarkin (1940)
2426495.904		-3373	-0.124		vis	1	Selivanov (1935)
2426504.899		-3371	-0.071		vis	1	Loreta (1933)
2426540.654		-3363	-0.083		vis	1	Zverev (1936)
2426594.117		-3351	-0.271		vis	0	Dufay (1947b)
2426867.069		-3290	-0.045		vis	1	Loreta (1933)
2427068.35		-3245	+0.04		vis	1	Selivanov (1934)
2427202.382		-3215	-0.051		vis	1	Selivanov (1935)
2427627.007		-3120	-0.163		vis	1	Selivanov (1935)
2427658.447		-3113	-0.019		vis	1	Krebs (1935)
2430703.186		-2432	+0.026		vis	1	Dziewulski (1962)
2432960.946	2432960.088	-1927	-0.027	+0.001	phel	3	Eggen (1951)
2434611.17		-1558	+0.43		vis	0	Marks[1] (1959)
2434628.641	2434627.796	-1554	+0.016	+0.057	phel	3	present paper[2]
2435625.598	2435624.685	-1331	-0.041	-0.068	phel	3	Walraven et al. (1958)
2436099.567		-1225	+0.011		phel	2	Svolopoulos (1960)
2437199.443		-979	+0.042		vis	1	Makarenko[3] (1968)
2437320.127	2437319.215	-952	+0.011	-0.015	phel	3	Mitchell et al. (1964)
2437494.473		-913	-0.009		vis	1	Makarenko[3] (1968)
2437878.791		-827	-0.189		phel	1	Williams (1966)
2439019.100	2439018.170	-572	+0.036	-0.008	phel	3	Wisniewski, Johnson (1968)
2440811.901	2440810.980	-171	0.000	-0.035	phel	3	Pel (1976)
2441576.448	2441575.590	0	+0.020	+0.048	phel	3	present paper

Remarks:[1] Observer: Wroblewski; [2] Observer: Detre; [3] Observer: Kiperman id for the maximum brightness or a phase jump took place at the median brightness. This phenomenon has already been discussed in the case of SU Cygni.

A worthy subject for further investigations would be to determine whether there is some kind of connection between the mentioned peculiarities (variable steepness of the rising branch, bump on the light curve) and the presence of a magnetic field at this star (Babcock 1958). The points in the O-C diagrams in Fig. 63 derived from photoelectric observations show larger scatter than expected. This scatter is a result of the orbital motion of FF Aql around the centre of mass of the binary system. Let us examine the deviations of the O-C residuals (derived from photoelectric observations) from the expected value of O-C (solid line at the upper O-C diagram in Fig. 63). These deviations and the related orbital phases are listed in Table 38. The orbital phases are computed with the formula:

$$\text{Epoch} + \text{phase} = (\text{J.D.} - 2420000)\cdot 0.0006969 \ .$$

Table 38

Max. Obs.	Δ(O-C)	Phase	Max. Obs.	Δ(O-C)	Phase
2425096.650	$+0\overset{d}{.}018$	.55	2435625.598	$-0\overset{d}{.}041$	.89
2425490.081	-0.005	.83	2437320.127	+0.011	.07
2425811.968	-0.010	.05	2439019.100	+0.036	.25
2432960.946	-0.027	.03	2440811.901	0.000	.50
2434628.641	+0.016	.19	2441576.448	+0.020	.04

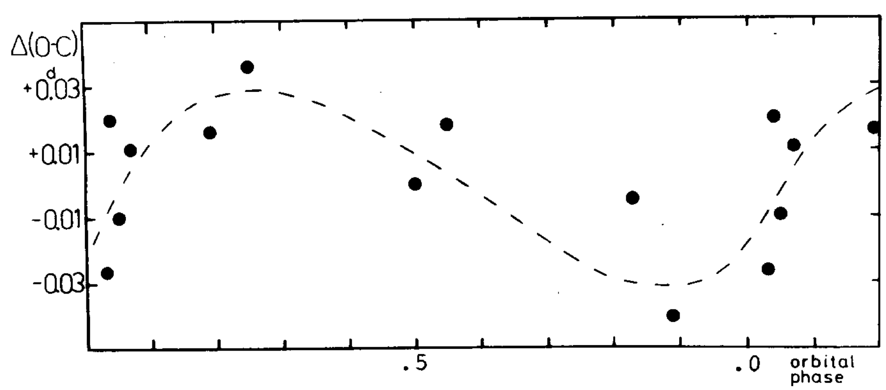

Figure 64 O-C variations due to the orbital motion

The data derived from the curve of O-C variations versus the orbital phase (Fig. 64) are in good agreement with those derived by Abt (1959). The value of a·*sini* can be determined from the amplitude of the O-C variation curve. The result is: $a \cdot sini = 78 \cdot 10^6$ km ($\pm 15 \cdot 10^6$ km). Abt obtained $68.3 \cdot 10^6$ km for this value from spectroscopic observations. Thus the spectroscopically and optically determined values of $a \cdot sini$ are very similar. Moreover, the moment of the point with largest positive deviation of O-C must coincide with the moment when the cepheid is the furthest from the observer during its orbital motion (i.e. at $0^P.23$ from periastron according to Abt). This coincidence is very good, but the time of the nearest point does not coincide so well with the largest negative deviation of O-C.

On the basis of the data given in Table 38 I suggest a slightly smaller value for the orbital period. The deviations of O-C plotted with a period of 1400^d results in a curve with smaller scatter. Moreover, the curve constructed from Abt's data on the mean velocity with the period of 1400 days shows less scatter than in the case of larger period (only two points with very low weight deviate considerably). Thus the suggested new value of the orbital period is $P_{orb} = 1400^d \pm 15^d$.

XY Cassiopeiae

The light and colour curves for this variable are shown in Fig. 65. The O-C residuals have been computed with the formula:

$$C = 2442006.786 + 4^d.501697E .$$

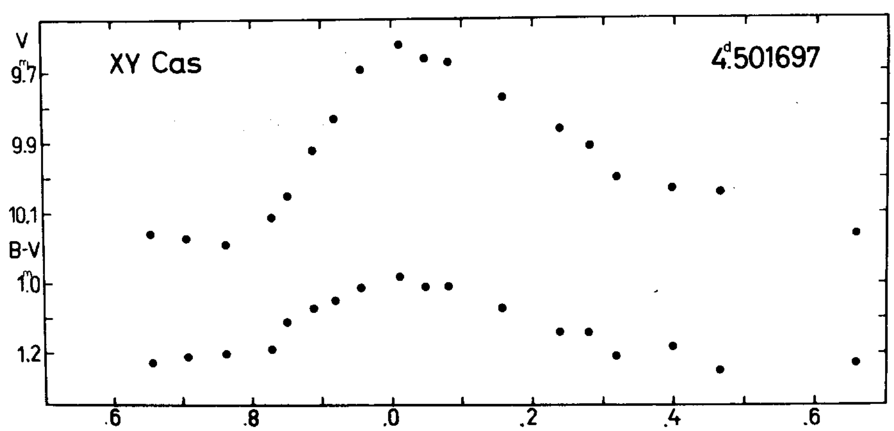

Figure 65 V and B-V curves of XY Cas

Figure 66 shows that the period has remained constant since the discovery of the light variation of XY Cas. The period change reported by Solov'yov (1954) cannot be confirmed.

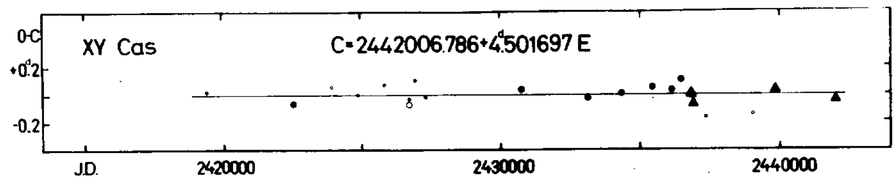

Figure 66 O-C diagram of XY Cas

Table 39 O-C residuals for XY Cas

Obs.Max.J.D.	E	O-C	Type	w	Source
2419403.784	-5021	$+0^{d}.019$	phg	0.5	Robinson (1929)
2422541.383	-4324	-0.065	phg	1	Lehmann-Balan. (1924)
2423919.026	-4018	+0.059	vis	0.5	Selivanov (1928)
2424859.820	-3809	-0.002	vis	0.5	Selivanov (1928)
2425845.76	-3590	+0.07	phg	0.5	Oosterhoff (1935)
2426287.00	-3492	-0.14	phg	0	Oosterhoff (1935)
2426705.737	-3399	+0.219	vis	0	Kukarkin (1940)
2426709.946	-3398	-0.074	vis	1	Dunst (1932)
2426714.49	-3397	-0.03	phg	0.5	Oosterhoff (1935)
2426948.71	-3345	+0.10	phg	0.5	Oosterhoff (1935)
2427335.74	-3259	-0.02	phg	0.5	Oosterhoff (1935)
2428466.03	-3008	+0.35	phg	0	Fu (1964)
2430761.585	-2498	+0.038	phg	1	Solov'yov (1954)
2433147.420	-1968	-0.026	phg	1	Solov'yov (1954)
2434340.403	-1703	+0.007	phg	1	Tsarevsky (1960)
2435456.868	-1455	+0.051	phg	1	Tsarevsky (1960)
2436136.605	-1304	+0.032	phg	1	Tsarevsky (1960)
2436474.306	-1229	+0.106	phg	1	Tsarevsky (1960)
2436820.826	-1152	-0.005	phel	3	Oosterhoff (1960)
2436829.852	-1150	+0.018	phel	3	Weaver et al. (1960)
2436901.796	-1134	-0.066	phel	3	Bahner et al. (1962)
2437365.373	-1031	-0.163	vis	0.5	Berthold (1973)
2439031.023	-661	-0.141	vis	0.5	Berthold (1973)
2439818.991	-486	+0.030	phel	3	present paper[1]
2442006.751	0	-0.035	phel	3	present paper
2442097.08	+20	+0.26	vis	0	Small (1974)

Remark: [1] Observer: Abaffy.

VZ Cygni

The light and colour curves of this variable are shown in Fig. 67. The O-C residuals have been computed with the formula:

$$C = 2441705.702 + 4^{d}.864453E .$$

The O-C diagram presented in Fig. 68 shows a period change:

before J.D. 2434000, $P = 4^{d}.864583$;

after J.D. 2434000, $P = 4^{d}.864453$.

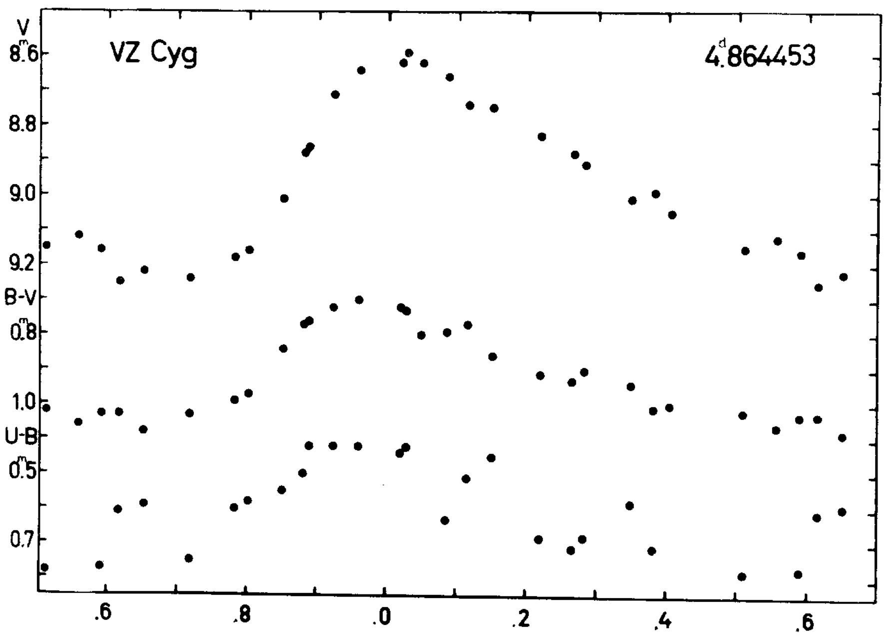

Figure 67 V, B-V and U-B curves of VZ Cyg

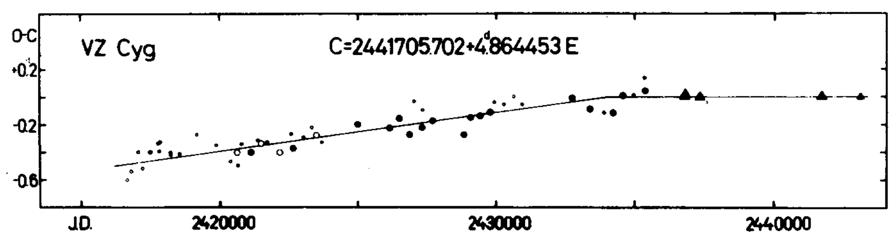

Figure 68 O-C diagram of VZ Cyg

Table 40 O-C residuals for VZ Cyg

Obs.Max.J.D.	E	O-C	Type	w	Source
2416658.035	-5149	$-0^{d}.599$	vis	0.5	Graff (1914)
2416799.165	-5120	-0.538	vis	0.5	Zinner[1] (1932)
2417062.0	-5066	-0.4	vis	0.5	Seares (1907a)
2417066.4	-5065	-0.8	vis	0	Blazhko (1906)
2417207.798	-5036	-0.519	vis	0.5	Zinner[1] (1932)
2417485.2	-4979	-0.4	vis	0.5	Seares (1907a)
2417499.783	-4976	-0.401	vis	0.5	Zinner[1] (1932)
2417762.528	-4922	-0.336	vis	0.5	Zeipel (1908)
2417815.980	-4911	-0.393	vis	0.5	Zinner[1] (1932)
2417820.912	-4910	-0.326	vis	0.5	Luizet (1909)
2418195.396	-4833	-0.405	vis	0.5	Zinner[1] (1932)
2418224.569	-4827	-0.418	vis	0.5	Luizet (1909)
2418560.219	-4758	-0.416	vis	0.5	Zinner[1] (1932)
2419158.686	-4635	-0.276	vis	0.5	Zinner[1] (1932)

Table 40 (cont.)

Obs.Max.J.D.	E	O-C	Type	w	Source
2419859.095	-4491	$-0\overset{d}{.}349$	vis	0.5	Zinner[1] (1932)
2420379.476	-4384	-0.464	vis	0.5	Zinner[1] (1932)
2420627.598	-4333	-0.405	vis	1	Doberck (1920a)
2420642.129	-4330	-0.493	phg	0.5	Robinson (1930)
2420768.758	-4304	-0.338	vis	0.5	Zinner[1] (1932)
2421084.891	-4239	-0.395	vis	0.5	Zinner[1] (1932)
2421114.079	-4233	-0.393	phg	2	Jordan (1929)
2421386.567	-4177	-0.315	vis	0.5	Zinner[1] (1932)
2421498.432	-4154	-0.332	vis	1	Doberck (1920a)
2421722.207	-4108	-0.322	vis	0.5	Zinner[1] (1932)
2422165.164	-4017	-0.030	vis	0	Zinner[1] (1932)
2422179.388	-4014	-0.400	vis	1	Doberck (1920a)
2422588.133	-3930	-0.269	vis	0.5	Zinner[1] (1932)
2422656.134	-3916	-0.370	phg	1	Jordan (1929)
2423040.508	-3837	-0.288	vis	0.5	Zinner[1] (1932)
2423327.580	-3778	-0.219	vis	0.5	Doberck (1924b)
2423507.509	-3741	-0.274	vis	1	Nielsen (1954)
2423692.305	-3703	-0.328	vis	0.5	Doberck (1924b)
2424996.109	-3435	-0.197	phg	1	Wachmann (1935)
2426163.550	-3195	-0.225	phg	1	Wachmann (1935)
2426513.862	-3123	-0.153	phg	1	Wachmann (1935)
2426898.035	-3044	-0.272	phg	1	Wachmann (1935)
2427029.614	-3017	-0.033	vis	0.5	Dziewulski et al.(1938)
2427321.296	-2957	-0.218	phg	2	Gesundheit (1938)
2427360.339	-2949	-0.091	vis	0.5	Dziewulski et al.(1938)
2427739.687	-2871	-0.170	phg	2	Gesundheit (1938)
2428848.680	-2643	-0.273	phg	1	Abidov (1963)
2429096.894	-2592	-0.146	phg	1	Abidov (1963)
2429452.007	-2519	-0.138	phg	1	Abidov (1963)
2429812.004	-2445	-0.110	phg	1	Abidov (1963)
2429933.686	-2420	-0.040	vis	0.5	Conceicao-Silva (1950a)
2430269.317	-2351	-0.056	vis	0.5	Conceicao-Silva (1950a)
2430571.42	-2289	+0.45	vis	0	Stein (1944)
2430624.483	-2278	+0.005	vis	0.5	Conceicao-Silva (1950a)
2430921.153	-2217	-0.057	vis	0.5	Conceicao-Silva (1950a)
2432755.06	-1840	-0.05	phg	1	Novikov (1951)
2433387.402	-1710	-0.085	phg	1	Abidov (1963)
2433903.002	-1604	-0.117	phg	0.5	Abidov (1963)
2434219.193	-1539	-0.116	phg	1	Abidov (1963)
2434589.022	-1463	+0.015	phg	1	Abidov (1963)
2434953.849	-1388	+0.008	phg	0.5	Abidov (1963)
2435323.677	-1312	+0.137	phg	0.5	Abidov (1963)
2435362.501	-1304	+0.046	phg	1	Vyskupaitis (1961)
2436773.146	-1014	-0.001	phel	3	Weaver et al. (1960)
2436802.348	-1008	+0.015	phel	3	Oosterhoff (1960)
2437352.009	-895	-0.008	phel	3	Mitchell et al. (1964)
2437556.280	-853	-0.044	vis	0.5	Schreier (1962)
2441705.698	0	-0.004	phel	3	present paper
2443062.886	+279	+0.002	phel	2	present paper

Remark: [1] Observer: Hartwig

V 1154 Cygni

The cepheid V 1154 Cygni has a faint companion about 20" S. The light and colour curves for this variable are shown in Fig. 69. Unfortunately, the U-B colour curve is not complete.

The O-C residuals have been calculated with the formula:

$$C = 2441494.442 + 4^{d}.925460E .$$

According to Fig. 70 this star has a constant period.

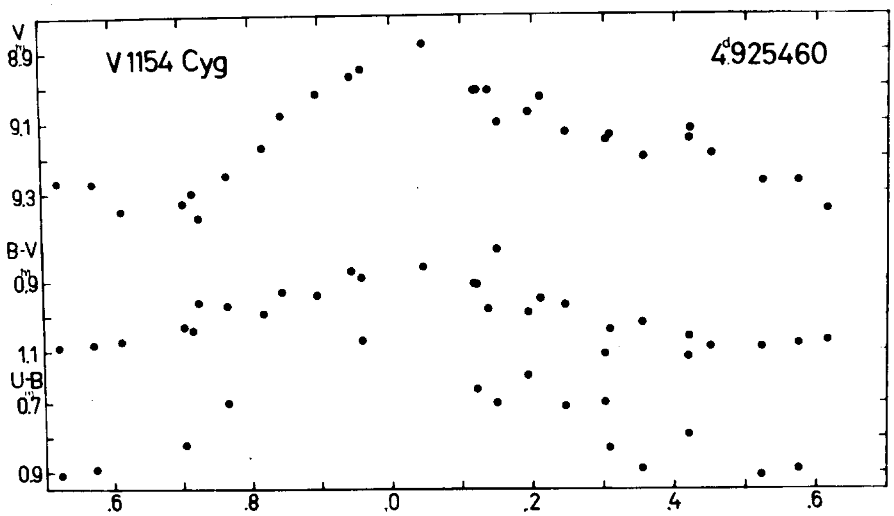

Figure 69 V, B-V and U-B curves of V 1154 Cyg

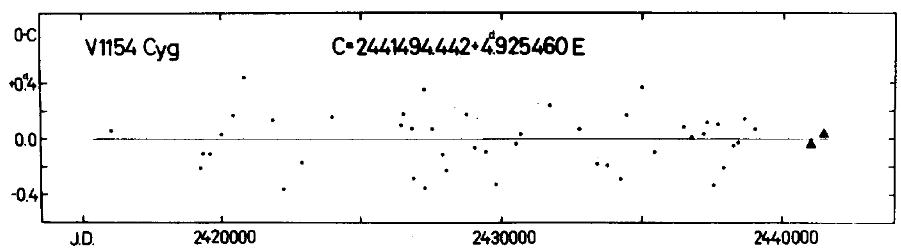

Figure 70 O-C diagram of V 1154 Cyg

Table 41 O-C residuals for V 1154 Cyg

Obs.Max.J.D.	E	O-C	Type	w	Source
2416044.647	-5167	$+0^{d}.057$	phg	0.5	Strohmeier et al.(1968)
2419265.632	-4513	-0.209	phg	0.5	Strohmeier et al.(1968)
2419349.471	-4496	-0.103	phg	0.5	Strohmeier et al.(1968)
2419595.739	-4446	-0.108	phg	0.5	Strohmeier et al.(1968)
2420009.616	-4362	+0.031	phg	0.5	Strohmeier et al.(1968)
2420423.492	-4278	+0.168	phg	0.5	Strohmeier et al.(1968)

Table 41 (cont.)

Obs.Max.J.D.	E	O-C	Type	w	Source
2420852.283	-4191	$+0\overset{d}{.}440$	phg	0.5	Strohmeier et al.(1968)
2421846.916	-3989	+0.134	phg	0.5	Strohmeier et al.(1968)
2422230.609	-3911	-0.359	phg	0.5	Strohmeier et al.(1968)
2422895.733	-3776	-0.172	phg	0.5	Strohmeier et al.(1968)
2423984.587	-3555	+0.156	phg	0.5	Strohmeier et al.(1968)
2426427.558	-3059	+0.098	phg	0.5	Ott (1966)
2426531.072	-3038	+0.178	phg	0.5	Strohmeier et al.(1968)
2426846.198	-2974	+0.074	phg	0.5	Strohmeier et al.(1968)
2426880.322	-2967	-0.280	phg	0.5	Ott (1966)
2427260.218	-2890	+0.356	phg	0.5	Strohmeier et al.(1968)
2427303.838	-2881	-0.353	phg	0.5	Ott (1966)
2427530.835	-2835	+0.072	phg	0.5	Strohmeier et al.(1968)
2427919.762	-2756	-0.112	phg	0.5	Strohmeier et al.(1968)
2428067.411	-2726	-0.227	phg	0.5	Ott (1966)
2428777.082	-2582	+0.178	phg	0.5	Strohmeier et al.(1968)
2429077.290	-2521	-0.067	phg	0.5	Ott (1966)
2429456.525	-2444	-0.093	phg	0.5	Strohmeier et al.(1968)
2429825.703	-2369	-0.325	phg	0.5	Strohmeier et al.(1968)
2430535.260	-2225	-0.033	phg	0.5	Strohmeier et al.(1968)
2430673.244	-2197	+0.036	phg	0.5	Nikulina (1970)
2431717.643	-1985	+0.239	phg	0.5	Nikulina (1970)
2432776.449	-1770	+0.071	phg	0.5	Nikulina (1970)
2433406.659	-1642	-0.177	phg	0.5	Nikulina (1970)
2433790.836	-1564	-0.186	phg	0.5	Strohmeier et al.(1968)
2434248.806	-1471	-0.284	phg	0.5	Strohmeier et al.(1968)
2434480.757	-1424	+0.170	phg	0.5	Nikulina (1970)
2434983.354	-1322	+0.370	phg	0.5	Nikulina (1970)
2435445.884	-1228	-0.093	phg	0.5	Nikulina (1970)
2436495.184	-1015	+0.084	phg	0.5	Nikulina (1970)
2436780.793	-957	+0.013	phg	0.5	Ott[1] (1966)
2437199.479	-872	+0.038	phg	0.5	Ott[2] (1966)
2437332.550	-845	+0.122	phg	0.5	Nikulina (1970)
2437583.294	-794	-0.332	phg	0.5	Ott (1966)
2437706.869	-769	+0.106	phg	0.5	Busch, Häussler (1966)
2437918.353	-726	-0.205	phg	0.5	Ott (1966)
2438287.920	-651	-0.047	phg	0.5	Ott[2] (1966)
2438425.857	-623	-0.023	phg	0.5	Nikulina (1970)
2438662.447	-575	+0.145	phg	0.5	Ott[2] (1966)
2439031.788	-500	+0.076	phg	0.5	Ott[2] (1966)
2441006.788	-99	-0.033	phel	3	Wachmann (1976)
2441494.482	0	+0.040	phel	3	present paper

Remarks: [1] Observer: Weber; [2] Obs.: Häussler.

AS Persei

The light and colour curves of this star based on the observations made between 1972-1974 are shown in Fig.71. It is highly interesting that the amplitude of the light variation is decreasing. In 1959 the amplitudes were $1\overset{m}{.}361$ and $0\overset{m}{.}957$ in B and V, respectively (Schaltenbrand and Tammann 1971). In 1972-1974 the

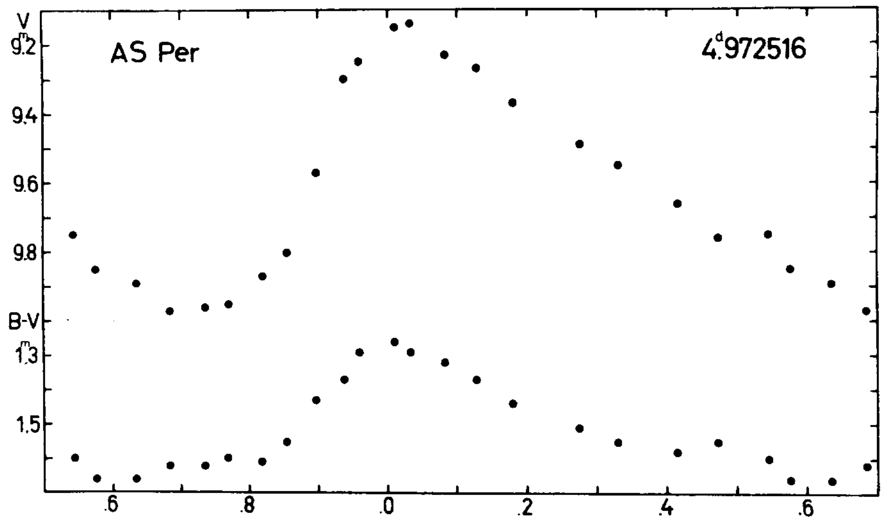

Figure 71 V and B-V curves of AS Per

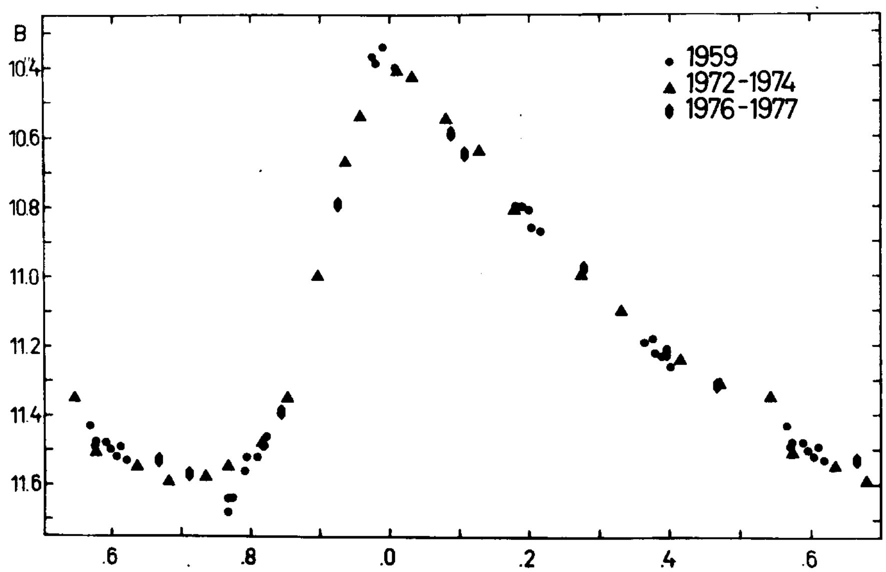

Figure 72 The composite B light curve of AS Per

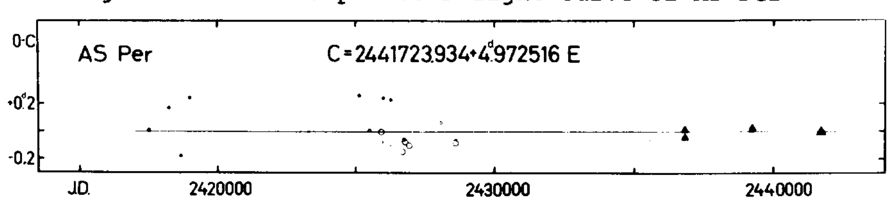

Figure 73 O-C diagram of AS Per

amplitudes were smaller: $1^m.20$ in B and $0^m.83$ in V. In order to check the reality of this unique behaviour AS Per was reobserved in 1976-1977. The amplitudes were even smaller in this season. The composite B light curve is shown in Fig. 72. The decrease of the amplitude is about $0^m.01$/year in B light. Unfortunately, the unfavourable period prevents getting a complete light curve during one observational season. Further continuous photometry is needed to study this interesting phenomenon.

The O-C residuals have been computed with the formula:

$$C = 2441723.934 + 4^d.972516E .$$

The O-C diagram (Fig. 73) shows the constancy of the period.

Table 42 O-C residuals for AS Per

Obs.Max.J.D.	E	O-C	Type	w	Source
2417522.706	-4867	$+0^d.007$	phg	0.5	Kukarkin (1949)
2418258.80	-4719	+0.17	phg	0.5	Oosterhoff (1935)
2418676.14	-4635	-0.18	phg	0.5	Oosterhoff (1935)
2419009.72	-4568	+0.24	phg	0.5	Oosterhoff (1935)
2420546.56	-4259	+0.57	phg	0	Oosterhoff (1935)
2421585.66	-4050	+0.42	phg	0	Oosterhoff (1935)
2423399.77	-3685	-0.44	phg	0	Oosterhoff (1935)
2423783.63	-3608	+0.53	phg	0	Oosterhoff (1935)
2425155.87	-3332	+0.26	phg	0.5	Oosterhoff (1935)
2425528.46	-3257	+0.01	vis	0.5	Guthnick (1928)
2425936.190	-3175	-0.006	vis	1	Beyer (1934b)
2425985.840	-3165	-0.081	vis	0.5	Rügemer (1933)
2426001.08	-3162	+0.24	phg	0.5	Oosterhoff (1935)
2426239.433	-3114	-0.086	vis	1	Beyer (1934b)
2426284.50	-3105	+0.23	phg	0.5	Oosterhoff (1935)
2426565.02	-3049	+2.29	vis	0	Lange (1931)
2426691.869	-3023	-0.149	vis	1	Rügemer (1933)
2426761.57	-3009	-0.06	phg	0.5	Oosterhoff (1935)
2426786.424	-3004	-0.072	vis	1	Beyer (1934b)
2426995.241	-2962	-0.101	vis	1	Rügemer (1933)
2427034.78	-2954	-0.34	phg	0	Oosterhoff (1935)
2428094.332	-2741	+0.064	vis	0.5	Ahnert (1947)
2428611.322	-2637	-0.081	phg	1	Kukarkin (1949)
2428631.23	-2633	-0.07	vis	0.5	Kukarkin (1949)
2436816.019	-987	-0.042	phel	2	Weaver et al. (1960)
2436821.041	-986	+0.008	phel	2	Oosterhoff (1960)
2439252.614	-497	+0.020	phel	2	Takase (1969)
2441723.922	0	-0.012	phel	3	present paper

V Lacertae

According to Oosterhoff (1960) there is a photometric companion at V Lac. Miller and Preston (1964) contradicted this statement. The ratios of light amplitudes in different colours do not confirm the presence of a companion (see Fig. 74).

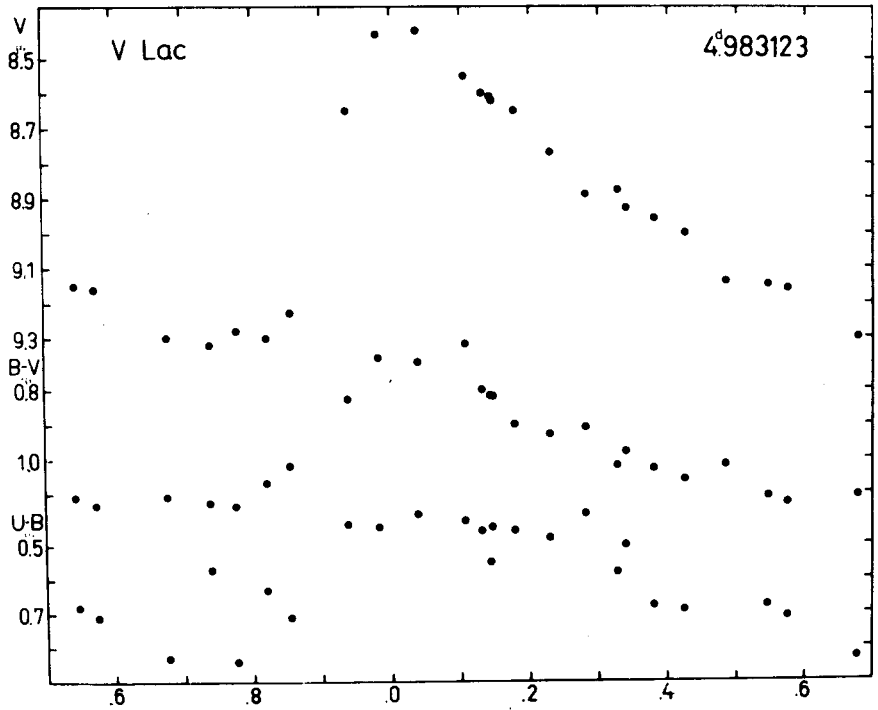

Figure 74 V, B-V and U-B curves of V Lac

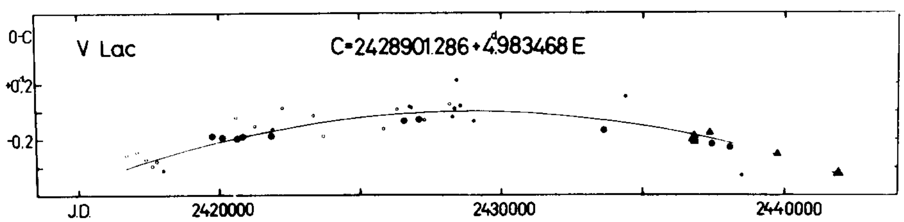

Figure 75 O-C diagram of V Lac

Table 43 O-C residuals for V Lac

Obs.Max.J.D.	E	O-C	Type	w	Source
2416716.392	-2445	$-0^{d}.314$	vis	0.5	Seares (1907b)
2417065.259	-2375	-0.289	vis	0.5	Seares (1907b)
2417353.6	-2317	-1.0	vis	0	Blazhko (1907a)
2417399.097	-2308	-0.344	vis	0.5	Seares (1907b)
2417613.341	-2265	-0.389	vis	0.5	Seares (1907b)
2417782.809	-2231	-0.359	vis	0.5	Zeipel (1908)
2417783.5	-2231	+0.3	vis	0	Müller, Hartwig[1] (1920)
2418031.919	-2181	-0.424	phg	0.5	Robinson (1931b)
2419716.574	-1843	-0.179	phg	1	Martin, Plummer (1916)
2420070.390	-1772	-0.189	phg	2	Martin, Plummer (1916)
2420578.848	-1670	-0.045	vis	0.5	Doberck (1920b)
2420633.512	-1659	-0.199	phg	2	Martin, Plummer (1916)

Table 43 (cont.)

Obs.Max.J.D.	E	O-C	Type	w	Source
2420817.920	-1622	$-0^{d}.181$	phg	2	Hertzsprung (1922)
2421266.507	-1532	-0.106	vis	0.5	Doberck (1920b)
2421844.515	-1416	-0.180	phg	2	Jordan (1929)
2421884.427	-1408	-0.136	vis	0.5	Doberck (1920b)
2422203.529	-1344	+0.024	vis	0.5	Doberck (1920b)
2423334.721	-1117	-0.031	vis	0.5	Doberck (1924b)
2423698.370	-1044	-0.175	vis	0.5	Doberck (1924b)
2425836.327	-615	-0.126	vis	0.5	Parenago (1938)
2426324.847	-517	+0.014	vis	0.5	Terkán (1935)
2426529.094	-476	-0.061	vis	0.5	Kukarkin (1940)
2426558.980	-470	-0.076	phg	1	Zonn (1933)
2426758.428	-430	+0.033	vis	0.5	Dziewulski[2] (1947)
2426818.224	-418	+0.028	vis	0.5	Dziewulski (1947)
2427092.226	-363	-0.061	phg	1	Zonn (1933)
2427281.593	-325	-0.066	vis	0.5	Florya, Kukarkina(1953)
2428173.748	-146	+0.048	vis	0.5	Gur'yev (1938)
2428283.296	-124	-0.040	phg	0.5	Dziewulski et al.(1946)
2428353.125	-110	+0.020	phg	0.5	Dziewulski et al.(1946)
2428423.09	-96	+0.22	phg	0.5	Fu (1964)
2428557.460	-69	+0.033	phg	0.5	Dziewulski et al.(1946)
2429045.74	+29	-0.07	phg	0.5	Kurochkin (1946)
2433635.445	+950	-0.136	phg	1	Solov'yov (1952b)
2434393.169	+1102	+0.101	phg	0.5	Nikulina (1970)
2436794.894	+1584	-0.205	phel	3	Weaver et al. (1960)
2436809.829	+1587	-0.221	phel	2	Oosterhoff (1960)
2436834.777	+1592	-0.191	phel	2	Bahner et al. (1962)
2437348.104	+1695	-0.160	phel	2	Mitchell et al. (1964)
2437422.781	+1710	-0.235	phg	1	Golovatyj (1964)
2437487.567	+1723	-0.234	phg	0.5	Nikulina (1970)
2438070.607	+1840	-0.260	phg	1	Golovatyj (1964)
2438474.068	+1921	-0.460	phg	0.5	Nikulina (1970)
2439754.969	+2178	-0.310	phel	2	present paper[3]
2441907.688	+2610	-0.449	phel	3	present paper

Remarks: [1] Observer: Hartwig; [2] Obs.: Iwanowska; [3] Obs.: Abaffy.

The O-C residuals have been computed with the formula:

$$C = 2428901.286 + 4^{d}.983468E \ .$$

The O-C diagram (Fig. 75) can be represented by a negative parabola:

$$C_{par} = 2428901.286 + 4^{d}.983468E - 6^{d}.7 \cdot 10^{-8}E^{2} \ .$$

This representation of O-C residuals contradicts Parenago's (1956) statement that only sudden period changes can exist at the cepheids.

GENERAL REMARKS

Period changes

The investigation of period changes of cepheids is of a great importance because an observational test of the cepheid evolution theory becomes possible by means of such investigations. The larger the number of epochs during which the observations have been made the more probable the detection of some evolutionary features on the basis of the observed period changes.

Parenago (1956) investigated period changes of 42 cepheids selected arbitrarily. His sample contains only 7 cepheids with periods less than 5 days, and the O-C diagrams published by him are not correct in the case of BL Her, SW Tau, BY Cas, SU Cyg and XY Cas.

Since 1956 many cepheids have changed their period. As photoelectric photometry has become general in the last decades, it has been possible to determine the recent period changes more accurately. The present study on the period changes of cepheids based on uniformly constructed O-C diagrams has therefore uncovered a number of previously unnoticed phenomena. However, Parenago's statements concerning the statistics of period changes are correct (cf. page 110).

Parenago found that the period changes were always sudden, i.e. the O-C diagram for a cepheid variable consists of straight lines. Detre (1970) distinguished three kinds of O-C diagrams for cepheids:

1. Those showing an evolutionary characteristic (parabolic curve), assuming that a cepheid changes its period while crossing the instability strip. Among cepheids with a period of less than 5 days there is only one star with an obviously parabolic O-C graph, viz. V Lac (see Fig. 75);
2. Those showing constant period. The number of cepheids with constant period diminishes continuously because each cepheid will change its period within a certain time;
3. Those showing irregular fluctuations of the period. Detre did not state that only sudden period changes could exist. The O-C diagrams presented in the previous section have shown that the

period changes are sudden in the overwhelming majority of cases. As a matter of fact the straight lines may be distorted because of the period noise. Moreover, the velocity of the period change is unknown, i.e. we do not know the real shape of the O-C diagrams at the intersections of these straight lines. Therefore, we only approximate the O-C diagrams with straight lines. Besides the parabolic O-C curve of V Lac only AU Peg and possibly BL Her show an O-C graph which cannot be represented by straight lines. However, these latter two stars are Population II cepheids.

Several cepheids which changed their period more than once have very interesting gradual, "stepwise" O-C variations. The original value of the period changed at a certain moment and in a short or somewhat longer time the period returned to its original value.Such a rejump may take place so suddenly (e.g. SU Cyg in Fig. 44) that the value of the intermediate period cannot be determined.If the rejump of the period is slower (e.g. V 532 Cyg in Fig. 31) the two opposite period jumps are well observable. In the case of SZ Tau there are two intermediate periods before returning to the original value of the period. These stepwise period changes can best be seen in DT Cyg (see Fig. 16). DT Cyg has changed its period and returned to the original period at least four times.

This kind of period change may well have an important role in checking the recent theory on the evolution of cepheids. Arp (1960) showed the path of cepheid evolution between the blue giants and the red supergiants to be very close to a period-equals-constant line for cepheids in Small Magellanic Cloud. Later, Efremov (1968a) constructed the composite colour-magnitude diagram for the galactic groups of stars containing cepheids. His composite diagram shows that the slope of the evolutionary path is close to the slope of lines of constant period for the galactic cepheids, as well.

The stepwise O-C diagram can be interpreted as a result of the evolution of the cepheid along the line of a given (constant) period.The deviations from this constant period are marks of small period fluctuations. The existence of this kind of O-C diagram is observational evidence supporting the hypothesis on the evolution of cepheids along the lines of constant period.

It is noteworthy that among RR Lyrae variables such kinds of period changes are very rare. Among the 195 field RR Lyrae variables investigated by Tsessevitch (1966), only two stars (UY Boo, AT Ser) showed a return to the earlier period. Among 117 investigated RR Lyrae stars in the globular cluster M3, three variables (V54, V81, V110) showed rejump of the period (Szeidl 1965).

There is another phenomenon observable for SU Cyg (a cepheid with a rejumping period), which leads us to treat secular variations of the light curves.

Secular variations of the light curves

The difference between the O-C values before the period jump and after the rejump for maximum brightness ($\Delta(O-C)_{max}$) differs remarkably from $\Delta(O-C)_{med}$ for median brightness in the case of SU Cyg (see Fig. 44).

The time difference between the moments of a maximum and the preceding median brightness were equal to about $0\overset{d}{.}43$ until the period jump and after the rejump became $0\overset{d}{.}35$. This means that the ascending branch of the light curve became considerably steeper than before the period jump.

Secular variation in the shape of the light curve can be observed in the case of FF Aql as well. As is shown in Fig. 63, the moments of the median brightness either repeat themselves with a period somewhat less than the period determined from the maxima or they are repeated with the period valid for the maximum but with a period jump and rejump at an unknown time between J.D. 2426000 and J.D. 2433000. In the case of FF Aql the ascending branch of the light curve has become less steep either suddenly or continuously.

The third case of the observed secular light curve variations is the amplitude decrease of AS Per. This very slight decrease (about 0.01 mag/year in B) may not mean that AS Per evolves out of the instability strip because the calculated decay time of the pulsation is not more than several years (Christy 1966). Moreover, the period of the light variation of AS Per is constant. This means that the star is in a quiet stage of its evolution.

The physical causes of above-mentioned sudden period changes and secular light curve variations are not yet known.

Cepheids with small amplitude

The first problem connected with these cepheids is the separation of cepheids with apparently small amplitude (photometric effect because of a companion) from the group of cepheids with really small amplitude. Cepheids with a nearly symmetrical light curve are undoubtedly true members of the group containing cepheids with small amplitude, since cepheids with large amplitude and nearly symmetrical light curve do not exist (except some cepheids with a period of 9-10 days for which the symmetrical light curve is caused by the presence of a bump). In order to decide whether a cepheid with small amplitude and light curve consisting of a steep rising branch and a less steep descending branch belongs either to large amplitude variables with apparently decreased amplitude or to small amplitude variables, spectroscopic observations of good quality are necessary. Spectroscopic observations are recommended in the cases of IR Cep and V 508 Mon.

The second and more important problem concerning the small amplitude cepheids is their evolutionary status. According to Efremov (1968b) these stars have not yet reached the red supergiant stage, they are just crossing the instability strip for the first time. A great many arguments support this hypothesis. However, the theoretical calculations on the crossing time predict far fewer small amplitude cepheids compared with the other classical cepheids (Hofmeister 1967). If the first crossing were slower, the number of observable small amplitude cepheids would be greater.

According to the theory of cepheid evolution the period of a cepheid must increase during the first crossing of the instability strip. During a given time interval the calculated change in the period is about a hundred times larger at the first crossing by comparison with other crossings of larger serial numbers in the case of low and intermediate cepheid masses (Hofmeister 1965). The cepheids with periods of less than five days are not massive for cepheids.

The period changes determined from the O-C diagrams show much less difference between the ratios of period variation for small amplitude cepheids (first crossing) and large amplitude cepheids (second, third and other crossings). Let ΔP be the difference between the new and old values of the period at any period change. The relative change of the period is $|\Delta P|/P \approx 0.00011$ for small amplitude cepheids averaged from 14 individual values. Seven variables showed no period changes. The three small amplitude cepheids showing both period jump and rejump are considered as cepheids with constant period, as well. The value $|\Delta P|/P$ for large amplitude classical cepheids is equal to 0.000007 (averaged from 17 values). Thus the relative period variation for small amplitude cepheids is only 10-20 times larger compared with the relative period variation for large amplitude classical cepheids. This can be explained in two different ways. Either the small amplitude cepheids evolve more slowly than predicted by the theory or the period variation does not mean the evolution of the cepheids – if these variables evolve along a path close to the lines of constant period. The latter case is more probable on the basis of O-C diagrams showing a rejumping period. Of course, in this case the rapid evolution (i.e. the short crossing time) at the first crossing takes place without greater period changes. However, the individual changes in period of small amplitude cepheids are usually much larger than in the case of large amplitude ones.

The instability of the period

Parenago (1956) suggested a new quantity $\Delta E \cdot |\Delta P|/P$, which is characteristic of the instability of the period. Here ΔE is the number of epochs during which the period remained constant. Table 44 gives a short summary on the instability of the period for different groups of cepheids. The successive columns contain the following data:

1. Name of the group
2. Average value of $\Delta E \cdot |\Delta P|/P$
3. Average value of ΔE
4. Average value of period of cepheids on which basis the preceding parameters are derived

5. Number of investigated cepheids in this group
6. Abbreviation of the name of the group in Table 45 .

Table 44

Group	$\overline{\Delta E\cdot\lvert\Delta P\rvert/P}$	$\overline{\Delta E}$	$\bar{P}$	n	Abbrev.
Classical cepheids with large amplitude	0.03	4000	$4^{d}.1$	17	I
Classical cepheids with small amplitude	0.26	2400	3.1	14	Is
W Vir type variables	0.15*	5500	2.6	6*	II

The asterisks in Table 44 denote that AU Peg is omitted from among W Vir stars because its extremely large period changes would distort the statistics.

Parenago derived 3-4 times larger values for $\overline{\Delta E\cdot\lvert\Delta P\rvert/P}$. He obtained 0.10 and 0.54 for the I and II groups, respectively. This systematic difference between his results and mine can be understood easily. The average period of cepheids investigated by Parenago is longer than 10 days (for both I and II groups), and it is well known that the longer the period, the greater its instability.

Summary of the observations

The fundamental parameters of the light variation of the observed cepheids are summarized in Table 45. The successive columns contain the following data:

1. Name of the cepheid
2. Period of light variation

3-4. The moments of the normal maximum and normal median brightnesses derived from the observations listed in Table 3
5-7. The maximum and minimum magnitudes and the amplitude in V
8-10. The corresponding quantities for B as under 5-7
11-13. The corresponding quantities for U as under 5-7
14. Type of cepheid

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Table 45 Summary of the observations

Name	Period	Norm.Max. Hel.J.D.2440000+	Norm.Med. Hel.J.D.2440000+	V_{max}	V_{min}	A_V	B_{max}	B_{min}	A_B	U_{max}	U_{min}	A_U	Type
DQ And	$3^d.200557$	1994.943	1994.620	$11^m.27$	$12^m.03$	$0^m.76$	$11^m.76$	$12^m.84$	$1^m.08$				II
FF Aql	4.470916	1576.428	1575.542	5.21	5.57	0.36	5.89	6.36	0.47	$6^m.33$	$6^m.91$	$0^m.58$	Is
V 572 Aql	3.767697	1921.259	1920.415	11.01	11.42	0.41	11.87	12.50	0.63				II
Y Aur	3.859502	1715.364	1715.010	9.17	9.99	0.82	9.87	11.04	1.17				I
RT Aur	3.728190	1723.675	1723.247	5.01	5.82	0.81	5.43	6.60	1.17	5.72	7.08	1.36	I
SU Cas	1.949322	1645.910	1645.532	5.76	6.13	0.37	6.32	6.88	0.56	6.79	7.42	0.63	Is
SY Cas	4.071098	1682.236	1681.792	9.42	10.18	0.76	10.20	11.31	1.11				I
XY Cas	4.501697	2006.786	2006.239	9.61	10.19	0.58	10.58	11.40	0.82				I
BD Cas	3.650900	1932.032	1931.225	10.84	11.16	0.32	12.34	12.79	0.45				II
BY Cas	3.223316	1774.189	1773.395	10.18	10.58	0.40	11.32	11.86	0.54				Is
DF Cas	3.832472	1719.659	1719.230	10.53	11.12	0.59	11.49	12.36	0.87				I
V 395 Cas	4.037728	1949.427	1949.027	10.39	10.95	0.56	11.39	12.20	0.81				I
IR Cep	2.114124	1696.580	1696.248	7.58	7.98	0.40	8.28	8.86	0.58	8.70	9.39	0.69	Is*
BD+56°2806	2.80591	2676.397	2675.735	9.26	9.56	0.30	10.07	10.53	0.46				Is
SU Cyg	3.845492	1778.935	1778.589	6.45	7.17	0.72	6.83	7.86	1.03	7.17	8.34	1.17	I
VZ Cyg	4.864453	1705.698	1705.089	8.60	9.24	0.64	9.32	10.29	0.97	9.74	11.00	1.26	I
DT Cyg	2.499082	1737.798	1737.238	5.62	5.93	0.31	6.04	6.49	0.45	6.27	6.76	0.49	Is
V 402 Cyg	4.364836	1698.635	1698.050	9.54	10.18	0.62	10.47	11.27	0.80				I
V 532 Cyg	3.283612	1706.559	1705.882	8.97	9.31	0.33	9.90	10.41	0.49				Is
V 1154 Cyg	4.925460	1494.442	1493.555	8.95	9.36	0.41	9.72	10.34	0.62	10.35:	11.26	0.91:	Is

Table 45 (cont.)

Name	Period	Norm.Max. Hel.J.D.2440000+	Norm.Med. Hel.J.D.2440000+	V_{max}	V_{min}	A_V	B_{max}	B_{min}	A_B	U_{max}	U_{min}	A_U	Type
V 1334 Cyg	$3^d.333020$	1760.900	1760.240	$5^m.78$	$5^m.95$	$0^m.17$	$6^m.31$	$6^m.52$	$0^m.21$	$6^m.48$	$6^m.69$	$0^m.21$	Is
AD Gem	3.787980	1694.911	1694.555	9.59	10.23	0.64	10.08	10.99	0.91				I
BB Gem	2.308207	1839.700	1839.520	10.75	11.74	0.99	11.28	12.55	1.27				II
DX Gem	3.137486	1866.668	1866.047	10.53	10.89	0.36	11.39	11.86	0.47				Is
BL Her	1.3074502	1841.293	1841.180	9.78	10.60	0.82	10.02	11.13	1.11				II
V Lac	4.983123	1907.688	1907.204	8.41	9.32	0.91	9.09	10.45	1.36	9.53	11.23	1.70	I
Y Lac	4.323776	1746.745	1746.278	8.74	9.44	0.70	9.27	10.28	1.01	9.78	10.94	1.16	I
BE Mon	2.705510	1880.240	1879.932	10.25	10.84	0.59	11.17	11.98	0.81				I
V 465 Mon	2.713176	1698.687	1698.131	10.20	10.56	0.36	10.80	11.36	0.56				Is
V 508 Mon	4.133608	1732.070	1731.528	10.32	10.74	0.42	11.05	11.68	0.63				Is*
AU Peg	2.40142	1739.439	1738.920	9.11	9.46	0.35	9.78	10.29	0.51	10.11	10.80	0.69	II
SX Per	4.289967	1847.979	1847.601	10.68	11.43	0.75	11.60	12.77	1.17				I
AS Per	4.972516	1723.934	1723.397	9.14	9.97	0.83	10.39	11.59	1.20				I
ST Tau	4.034299	1761.963	1761.507	7.79	8.55	0.76	8.47	9.58	1.11	8.95	10.23	1.28	I
SW Tau	1.583584	1687.773	1687.418	9.37	10.16	0.79	9.82	10.88	1.06	10.05	11.26	1.21	II
SZ Tau	3.148380	1659.194	1658.491	6.35	6.71	0.36	7.10	7.62	0.52	7.52	8.13	0.61	Is
EU Tau	2.10248	1704.785	1704.360	7.94	8.28	0.34	8.57	9.03	0.46	9.02	9.60	0.58	Is
T Vul	4.435462	1705.121	1704.584	5.40	6.06	0.66	5.90	6.83	0.93	6.14	7.30	1.16	I

* Small amplitude, but non-sinusoidal light curve

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