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BV PHOTOMETRY AND PERIOD VARIATION OF GO CYGNI

The variability of GO Cyg (=HD 196628 = BD + $34^{o}4095$) was discovered photographically by Schneller (1928). The star was classified as a short-period eclipsing binary by Kukarkin (1929). The first light elements were given by Szczyrbak (1932) considering the system to be of Algol type as follows:

$$\text{Min.I} = \text{JD Hel. } 2426509.467 + 0^{d}.717767.E. \qquad (1)$$

The visual observations made by Kukarkin (1932) from 1929 to 1931 showed a β Lyrae type variation. From the visual and photographic observations, several authors have found contradictory results about the shape of the light curve and the eccentricity of the orbit (see Ovenden, 1954). The only published spectrographic observation of the system was made by Pearce (1933). The complete two-colour photoelectric photometry of the star was made by Ovenden (1954), and Mannino (1963) who also analyzed their light curves. The period variation of the system was discussed by Purgathofer and Prochazka (1967) collecting all of the published minima in the literature. Using the recent photoelectric times of primary minima, they gave the following linear light elements:

$$\text{Min.I} = \text{JD Hel. } 2433930.40561 + 0^{d}.71776382.E. \qquad (2)$$

Assuming a parabolic O-C variation for all minima they also suggested the following quadratic light elements:

$$\text{Min.I} = \text{JD Hel. } 2433930.40614 + 0^{d}.71776314.E + 0^{d}.108.10^{-9}.E^{2}. \qquad (3)$$

The system was observed photoelectrically at the Ege University Observatory on eight nights during the summer of 1984. The observations were made in yellow and blue colours using a 48 cm Cassegrain telescope and a photoelectric photometer equipped with an unrefrigerated photomultiplier tube EMI 9781A and Johnson's standard B, V filters. A total of 398 individual points were obtained in each colour. BD + $35^{o}4180$ was used as the comparison and BD + $34^{o}4098$ as the check star. No evidence for the variability of the comparison

star was found. The extinction coefficients determined night by night were applied in the correction for differential extinction. During the observations three primary and two secondary minimum times were obtained. These minima are given in Table I together with all of the other published ones.

Table I. Times of minima of GO Cygni.

JD Hel.	Min	Method	E	$(O-C)_1$	$(O-C)_2$	Ref.
2425556.99	I	pg	-11666	0.02	0.00	1
864.905	I	vis	-11237	0.011	-0.009	2
26112.539	I	vis	-10892	0.017	-0.002	3
120.424	I	pg	-10881	0.007	-0.013	4
509.467	I	vis	-10339	0.022	0.004	5
540.327	I	vis	-10296	0.018	0.000	2
711.145	I	vis	-10058	0.008	-0.009	6
957.355	I	vis	-9715	0.025	0.009	7
27058.553	I	vis	-9574	0.018	0.003	8
140.3745	I	pg	-9460	0.0146	-0.0007	8
325.561	I	vis	-9202	0.018	0.003	8
330.589	I	pg	-9195	0.022	0.007	9
417.433	I	vis	-9074	0.016	0.002	8
28035.431	I	vis	-8213	0.020	0.007	10
398.612	I	vis	-7707	0.012	0.001	11
418.708	I	vis	-7679	0.011	0.000	11
797.688	I	vis	-7151	0.011	0.002	11
807.744	I	vis	-7137	0.019	0.009	11
823.529	I	vis	-7115	0.013	0.003	11
838.604	I	vis	-7094	0.015	0.005	11
33111.4392	I	pe	-1141	0.0021	0.0010	12
483.9573	I	pe	-622	0.0008	0.0000	13
496.8783	I	pe	-604	0.0020	0.0013	14
539.944	I	pg	-544	0.002	0.001	15
861.499	I	pe	-96	-0.001	-0.002	16
930.40600	I	pe	0	0.00039	0.00000	17
34309.38563	I	pe	528	0.00072	0.00057	17
516.818	I	pe	817	-0.001	-0.001	18
606.53982	I	pe	942	0.00069	0.00068	17
923.786	I	pg	1384	-0.005	-0.005	19
36782.442	II	pe	3973.5	0.002	0.002	20
37106.5092	I	pe(V)	4425	-0.0013	-0.0017	20
106.5116	I	pe(B)	4425	0.0011	0.0007	20
147.42258	I	pe	4482	-0.00047	-0.00085	21
189.41700	II	pe	4540.5	0.00477	0.00436	21
882.4140	I	pe	5506	0.0008	-0.0002	20
887.4377	I	pe	5513	0.0002	-0.0009	20
888.516	II	pe	5514.5	0.002	0.001	20
910.4056	I	pe	5545	-0.0004	-0.0014	20
45866.4836	II	pe(B,V)	16629.5	0.0245	0.0014	22
874.376	II	pe(B,V)	16640.5	0.022	-0.002	22
954.4082	I	pe(B,V)	16752	0.0231	-0.0005	22
972.3535	I	pe(V)	16777	0.0243	0.0006	22
972.3528	I	pe(B)	16777	0.0236	-0.0001	22
982.4010	I	pe(B,V)	16791	0.0231	-0.0006	22

References to Table I

1. Schneller,H.: 1928,Astron.Nachr.235,85.
2. Kukarkin,B.W.: 1932,VS 4,1,19.
3. Beyer,M.: 1936,Astron.Nachr.258,273.
4. Iwanowska,W. and Dziewulski,W.: 1932,Wilno Bull.13,30.
5. Szczyrbak,S.: 1932,SAC 10,44.
6. Kordylewski,K.: 1933,AAc 2,48.
7. Warmbier,E.: 1938,AAc 3,95.
8. Dziewulski,W.: 1936,Wilno Bull.Tome II,6.
9. Liau,S.P.: 1935,Publ.Lyon 1,Fasc.13.
10. Micaika,G.R.: 1939,BZ 21,78.
11. Pierce,N.L.: 1939,Astron.J.48,113.
12. Piotrowski,S.L. and Strzalkowski,A.: 1951,AA 4,129
13. Szafraniec,R.: 1962,AA 12,181.
14. Popper,D.M.: 1957,Astrophys.J.Suppl.III,107.
15. Kaho,S.: 1952,Tokyo Astr.Bull.Ser.II,No.49.
16. Ovenden,M.W.: 1954,MN 114,569.
17. Kwee,K.K.: 1958,BAN 14,131.
18. Fitch,W.S.: 1964,Astron.J.69,316.
19. Koch,J.C. and Koch,R.H.: 1962,Astron.J.67,462.
20. Mannino,G.: 1963,Publ.Bologna 8,No.15.
21. Purgathofer,A. and Widorn,Th.: 1964,Mitt.Univ.-Sternw.Wien 12,31.
22. This paper.

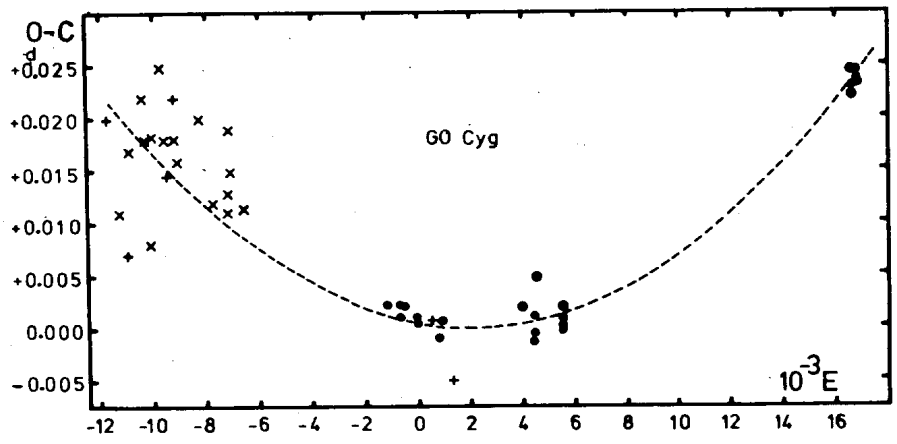

Figure 1 : O-C diagram of GO Cygni. The dots, circles, plusses and crosses denote photoelectric MinI, photoelectric MinII, photographic and visual MinI, respectively. The dashed line represents the computed parabola.

The $(O-C)_1$ residuals in the table were computed using Equation (2) and plotted in Figure 1 versus E. As it is seen from the figure, the distribution of the $(O-C)_1$ residuals seems to be a parabola. Using the two photographic and 23 photoelectric times of minima obtained after JD 2433000, the new quadratic light elements,

$$\text{Min.I} = \text{JD Hel. } 2433930.4060 + 0^d.71776331.E + 0^d.113.10^{-9}E^2 \quad (4)$$
$$\pm 5 \qquad \pm 22 \qquad \pm 12$$

have been derived by the least squares method. The $(O-C)_2$ values in the table are the differences between observations and calculations with these new light elements. Although the old visual and photographic observations are not taken into account in the computations because of their large scattering, they fit well to the parabolic curve. The parabolic curve has a minimum at about JD 2435600 (E ≈ 2300) and after this epoch the period is increasing. The increase in the period of the system is found to be about 0.99±0.11 second per century.

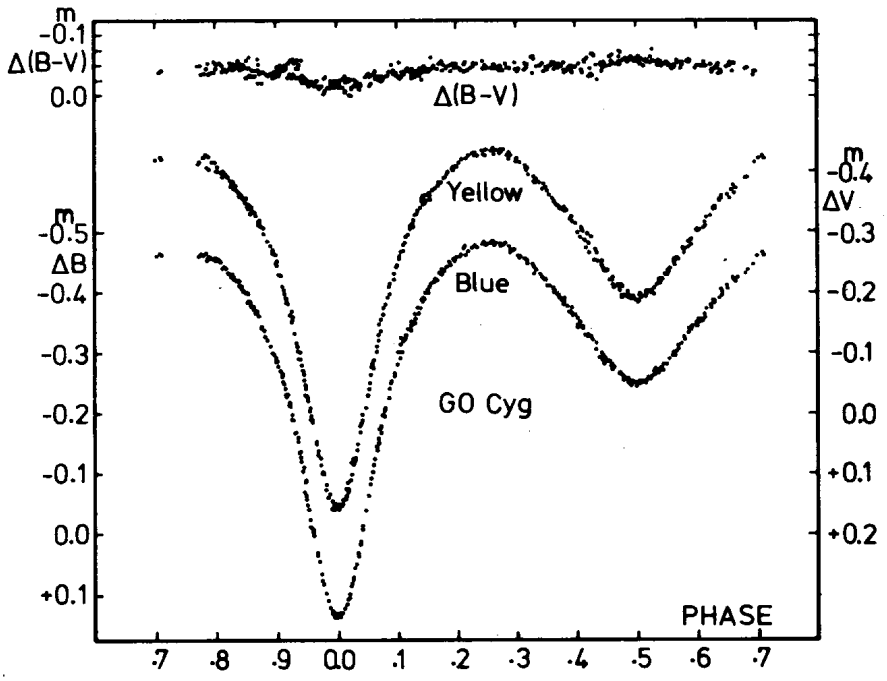

Figure 2 : The light and colour curves of GO Cygni.

The light and colour curves of GO Cygni are shown in Figure 2 where the phases have been calculated with the following linear light elements:

$$\text{Min.I} = \text{JD Hel.}\ 2445865.4056 + 0^{d}.71776707.E. \qquad (5)$$

These light elements have been obtained from the Equation (4) reducing the epoch and the period to June 13, 1984 and may be used in the near future. The shape of the light curve is typical of β Lyrae type. There is no asymmetry in the minima and no displacement in the secondary minimum, and the maxima are equal. The amplitudes are about $0^{m}.600$ and $0^{m}.580$ at the primary, $0^{m}.230$ and $0^{m}.240$ at the secondary minimum in the blue and yellow light, respectively. The system is slightly redder at the primary and bluer at the secondary minimum which is consistent with the spectral types of the components given by Pearce (1933).

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References:

Kukarkin, B.W.: 1929, N.N.V.S., 2, 26.
Kukarkin, B.W.: 1932, ibid 4, 19
Mannino, G.: 1953, Publ.Univ.Bologna, Vol.8, No. 15.
Ovenden, M.W.: 1954, Monthly Notices Roy. Astron.Soc., 114, 569.
Pearce, J.A.: 1933, J.R. Astron.Soc.Canada, 27, 62.
Purgathofer, A.and Prochazka, F.: 1967, Mitt.Univ.-Sternw.Wien, 13, 151.
Schneller, H.: 1928, Astron.Nachr. 235, 85.
Szczyrbak, S.: 1932, S.A.C., 10, 44.