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HD 200776 : A NEW ECLIPSING BINARY IN CYGNUS

HD 200776 has been found to be an eclipsing variable with a period of 3.0239 days and primary and secondary eclipse depths in V of 0.43 and 0.40 magnitudes respectively.

There has been previous evidence for the star's variability. McCrosky and Whitney (1982) found abrupt decreases in brightness on five occasions in 1980-2, though they stated that the phases were not consistent with a simple eclipse model. Also, Abt et al. (1972) noted that the star was a single-lined spectroscopic binary of 2.9258 day period and calculated a preliminary orbit.

HD 200776 was observed on 22 nights during July-November, 1984 and B and V magnitudes with the single-channel photon-counting photometer (which utilizes an uncooled EMI 9924A photomultiplier tube) and 0.6-m. telescope of the Corralitos Observatory. HD 200595 (V = 6.48; (B-V) = -0.15) was chosen as the comparison star (the same used by McCrosky and Whitney). SAO 50404 was used as a check of its constancy. Measurements showed that the magnitude differences between check and comparison stars were constant at :

(check - comparison) $\Delta V = 1.374 \pm .018$ (s.e.)

$\Delta(B-V) = .053 \pm .017$

Instrumental magnitude differences were converted to BV magnitudes by observations of standard stars.

The observations soon revealed that HD 200776 is an eclipsing binary with a secondary eclipse nearly as deep as that of the primary. Two complete primary and two secondary minima were observed , along with portions of others, giving a preliminary ephemeris of:

JD (prim. min.) = 2445960.6758 + 3.0239 E

Primary minima were observed on JD 2445960.6758 and 63.6986 and secondary minima on 2446010.6101 and 13.6351.

The period found is slightly different from that of Abt et al. This would account for the difficulty of McCrosky and Whitney in fitting their observations to an eclipse model based on the spectroscopic period. In this study, no

Table I: Comparison - variable magnitudes

JD (2440000+)	V	(B-V)	JD (2440000+)	V	(B-V)
5911.7465	-1.25	-.17	5964.6938	-1.25	-.18
5911.7611	-1.23	-.20	5964.7438	-1.23	-.17
5911.7750	-1.25	-.19	5967.6368	-1.25	-.18
5939.7229	-1.33	-.15	5967.6799	-1.24	-.19
5939.7347	-1.28	-.11	5967.6910	-1.23	-.17
5956.6479	-1.25	-.17	5985.6167	-1.29	-.18
5957.6611	-1.67	-.15	5985.6903	-1.28	-.17
5957.6715	-1.65	-.15	5985.7521	-1.28	-.20
5957.6826	-1.61	-.16	5985.7625	-1.24	-.20
5957.6924	-1.60	-.13	5987.5854	-1.27	-.16
5957.7028	-1.53	-.16	5987.6479	-1.27	-.16
5959.6799	-1.25	-.14	5987.6778	-1.30	-.16
5959.6903	-1.22	-.21	5987.7014	-1.35	-.18
5959.7014	-1.22	-.19	5987.7278	-1.34	-.15
5959.7125	-1.24	-.19	5992.5785	-1.36	-.16
5959.7229	-1.24	-.20	5992.6056	-1.35	-.16
5959.7340	-1.23	-.18	5992.6319	-1.36	-.15
5960.6021	-1.47	-.16	5992.6604	-1.33	-.17
5960.6118	-1.50	-.15	5992.6931	-1.35	-.16
5960.6222	-1.53	-.16	5992.7208	-1.28	-.16
5960.6326	-1.57	-.15	6009.5639	-1.28	-.15
5960.6431	-1.59	-.16	6009.6104	-1.27	-.14
5960.6813	-1.67	-.16	6010.5701	-1.58	-.19
5960.6917	-1.64	-.17	6010.5903	-1.63	-.18
5960.7021	-1.60	-.19	6010.6118	-1.65	-.14
5960.7486	-1.48	-.15	6010.6368	-1.63	-.16
5960.7583	-1.38	-.14	6010.6667	-1.52	-.15
5961.6688	-1.27	-.17	6012.5785	-1.26	-.17
5961.6785	-1.26	-.19	6012.6174	-1.25	-.15
5961.6882	-1.24	-.18	6012.6729	-1.26	-.15
5961.7396	-1.27	-.14	6013.5618	-1.47	-.17
5961.7507	-1.22	-.19	6013.5813	-1.53	-.15
5961.7903	-1.27	-.19	6013.6021	-1.61	-.13
5961.8007	-1.24	-.12	6013.6222	-1.63	-.17
5962.6326	-1.24	-.19	6013.6438	-1.63	-.17
5962.6625	-1.25	-.19	6013.6667	-1.61	-.12
5962.7444	-1.23	-.18	6013.6917	-1.53	-.15
5962.8042	-1.26	-.17	6013.7132	-1.47	-.12
5962.8146	-1.25	-.17	6025.5646	-1.34	-.17
5963.6000	-1.39	-.18	6025.5840	-1.33	-.16
5963.6104	-1.43	-.15	6025.6021	-1.35	-.16
5963.6215	-1.45	-.17	6025.6292	-1.37	-.16
5963.6340	-1.48	-.17	6025.6486	-1.39	-.16
5963.6444	-1.52	-.16	6025.6819	-1.54	-.12
5963.6549	-1.57	-.16	6025.7035	-1.57	-.15
5963.6674	-1.61	-.14	6025.7278	-1.64	-.16
5963.6813	-1.62	-.19	6031.5694	-1.32	-.18
5963.6938	-1.64	-.15	6031.5986	-1.31	-.16
5963.7069	-1.64	-.16	6031.6639	-1.36	-.19
5963.7403	-1.57	-.16	6031.6938	-1.39	-.16
5963.7528	-1.61	-.17	6033.5632	-1.29	-.20
5963.7639	-1.52	-.15	6033.6000	-1.29	-.19
5963.7757	-1.45	-.21	6033.6389	-1.29	-.14
5964.6431	-1.26	-.17	6034.5771	-1.32	-.15
5964.6542	-1.24	-.18	6034.6368	-1.31	-.15

estimates of error are given in the values of the primary minima or period since so few minima were observed.

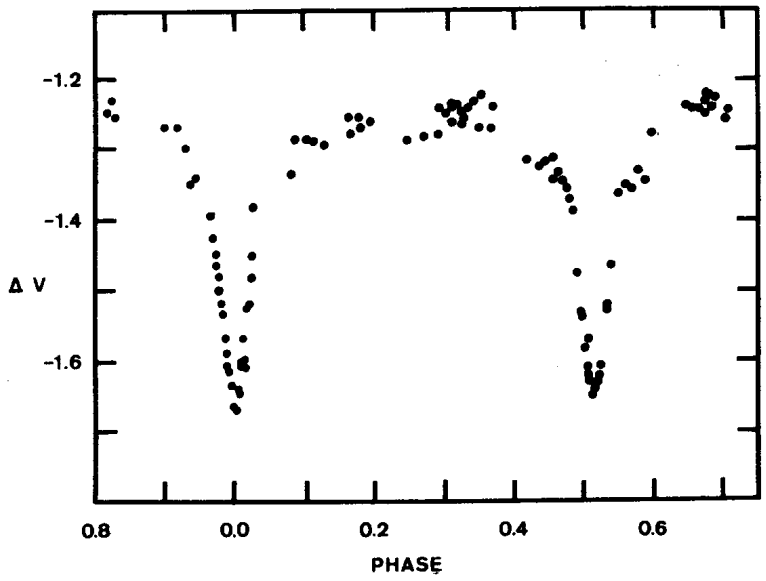

Figure 1 : Variation in magnitude for HD 200776 as a function of phase. ΔV is in the sense of V (comparison) - V (variable).

The phase diagram of the differential V magnitude values (comparison - variable) appears in Figure 1 and the magnitude differences in Table I.

Abt et al. give a spectral type of B1 IVp for the system and Buscombe and Kennedy (1974), one of B2 III. As there is little or no color change (the mean differential B-V = -0.16) during the cycle and from a consideration of the f(m) value calculated by Abt et al., it seems likely that the secondary star is of B/early A spectral type.

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