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PHOTOMETRY OF STARS IN THE FIELD OF CI CYGNI

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CI Cygni (19^h50^m11^s.83; +35°41'03".0 [2000]) is a well-studied symbiotic star with a typical range of variation between visual magnitudes 9 and 12. Most of this is due to the luminous cool component, which is of spectral type about M5 (*e.g.* Muerseet & Schmid 1999). Although otherwise quite well-studied, CI Cygni appears not have a convincing photometric sequence published for it. At the request of AAVSO chartmaker Charles Scovill, I have obtained $V/(b-y)$ photometry for selected stars appearing on this group's chart for the variable. The results were originally distributed via the 'vsnet' list-server (Skiff 1996).

The preliminary AAVSO (e)-scale chart dated December 1973 (AAVSO 2000) contains mainly visual estimates for the comparison stars. However, the results presented here indicate that both the magnitude zero-point and scale are reasonably good, apart from the usual scatter of a few tenths of a magnitude common on these charts.

I observed the stars on the UT dates 11 July 1994 and 13 October 1996 using the Lowell 53-cm photometric telescope, either a 19" or 29" aperture, and Strömgren y and b filters. The 1994 data were taken during a full night of observing that included over 30 primary and secondary standards whose residuals averaged 0^m007 in both V and $b-y$; the shorter second session involved thirteen standards with similar scatter. Mean extinction coefficients (Lockwood & Thompson 1986) were applied in the reductions.

Table 1 shows the results for the stars in order of decreasing brightness. An asterisk by the star name indicates a note following the table. The positions are from Tycho-2 (Høg *et al.* 2000) except for the last two stars, which are taken from USNO-A2.0 (Monet *et al.* 1998). These are assigned names based on the rounded J2000 coordinates. (The GSC becomes incomplete at a bright level in this very crowded field.) Most of the stars were observed on both nights, and the *rms* dispersion of these are given in the second line of the relevant entries. For the faintest star, measured once, the uncertainty given in parentheses is the scatter in the batch of integrations plus the error in the fit to the standards taken in quadrature.

Most of the spectral types are from a paper by Mikołajewska & Mikołajewski (1980), who give photographic UBV photometry and MK types for a couple hundred stars in the field of this variable. The photometry here unfortunately shows a lot of scatter ($\sim 0^m2$). However, the MK types for fainter stars appear to be consistent with those given in the HDE catalogue and with the present photometry assuming a modest amount of reddening. The region lies just outside the spectral surveys done at Case and Crimea (*e.g.* Numerova 1958).

Photometry for many of these stars and others in the field was published by Howarth & Bailey (1980). In comparison to my results, their V magnitudes range from $0^m.05$ to $0^m.2$ too bright as a function of color (redder stars are progressively too bright). A photographic-blue/visual sequence is given by Mjalkovskij (1977), which suffers mainly from zero-point offsets relative to Johnson B and V . Photoelectric photometry for a few isolated stars used as comparisons by various observers is more consistent, and two of these are mentioned in the notes to the table.

Among the individual stars, I was surprised to find that the very red star GSC 2677-1273 appears to be not variable. The relatively large error in the color results from it lying outside the range of the standard stars, which extended to only $b - y = 1.17$. The Tycho-2 photometry gives $V = 10.70 \pm 0.06$ and $B - V = 2.2 \pm 0.4$. It is not an IRAS source nor does it appear in the Dearborn catalogue of red stars. Perhaps it is an K-type bright-giant or Ib supergiant that is significantly reddened.

Table 1: Photometry of stars in the field of CI Cygni

Name	RA (2000)	Dec	V	$b - y$	n	spec
HD 226041	19 ^h 49 ^m 59 ^s .62	+35°40'14"/4	8.588	0.236	2	F5
			.022	.002		
HD 226107*	19 50 38.83	+35 50 27.6	8.620	-0.029	2	B9V
			.001	.003		
HD 226117	19 50 49.47	+35 47 44.6	9.009	0.812	2	K2III
			.011	.005		
HD 225992*	19 49 30.02	+35 50 01.7	10.487	0.188	2	F1V
			.004	.012		
GSC 2677-1273	19 50 39.72	+35 33 41.9	10.673	1.344	2	
			.010	.030		
GSC 2677-0784	19 50 32.60	+35 32 52.0	11.170	0.783	2	
			.009	.013		
GSC 2861-0298	19 50 33.06	+35 42 41.9	11.56	0.28	1	
GSC 2861-1332	19 50 24.58	+35 43 09.9	11.715	0.201	2	B6IV
			.015	.001		
J195019+3539.5	19 50 19.00	+35 39 31.7	12.52	0.43	2	
			.04	.02		
J195022+3541.1	19 50 21.63	+35 41 05.2	13.42	0.36	1	
			(.04)	(.04)		

Notes

HD 226107 $V = 8.55$ (Golay 1958).

HD 225992 $V = 10.49$ (Belyakina 1976).

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