

PHOTOMETRIC CLASSIFICATION OF B-TYPE STARS

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Abstract. Several photometric techniques for classification of B-type stars exist. This note describes another one, now nearly ready for publication.

We have observed most of the stars with spectral types B5 and earlier, and brighter than $m_v = 6.5$ with the $uvby$ and $H\beta$ systems. In addition, we have data for the following clusters or associations: h and χ Per, NGC 6231, α Per, Pleiades, IC 2602, IC 2391, III Cep, and Sco-Cen. Good MK types exist for most of these stars, and UBV data is available for many of them.

Figures 1 and 2 show the relations between $(b-y)$ and $(B-V)$ and between $(u-b)$ and $(U-B)$ for the B, A, and F-type stars we use as standards. Table I gives the mean values of several MK spectral types. The unreddened values were determined as des-

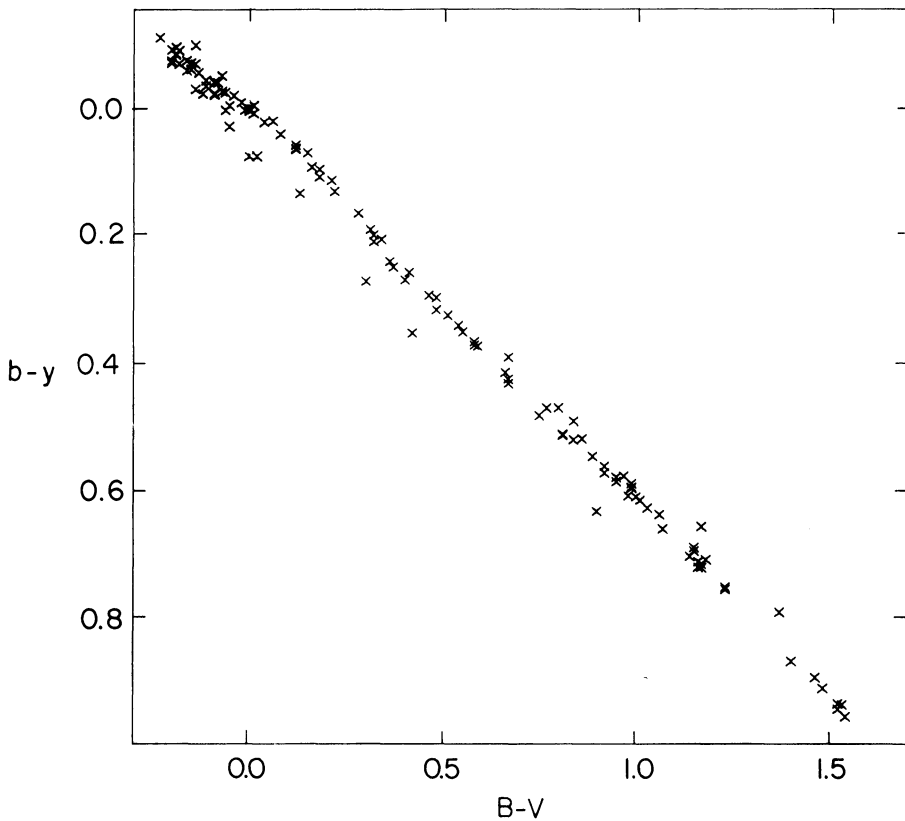


Fig. 1.

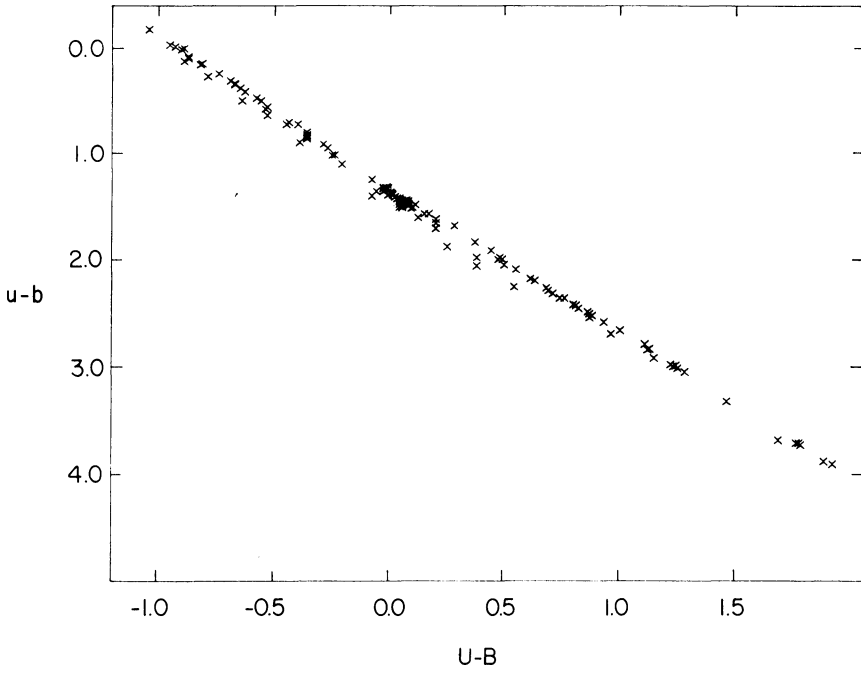


Fig. 2.

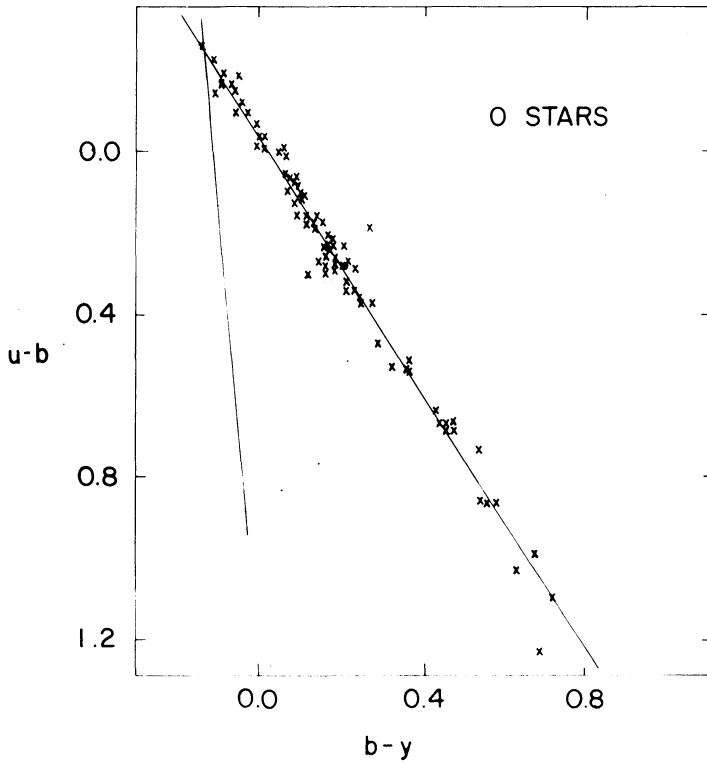


Fig. 3.

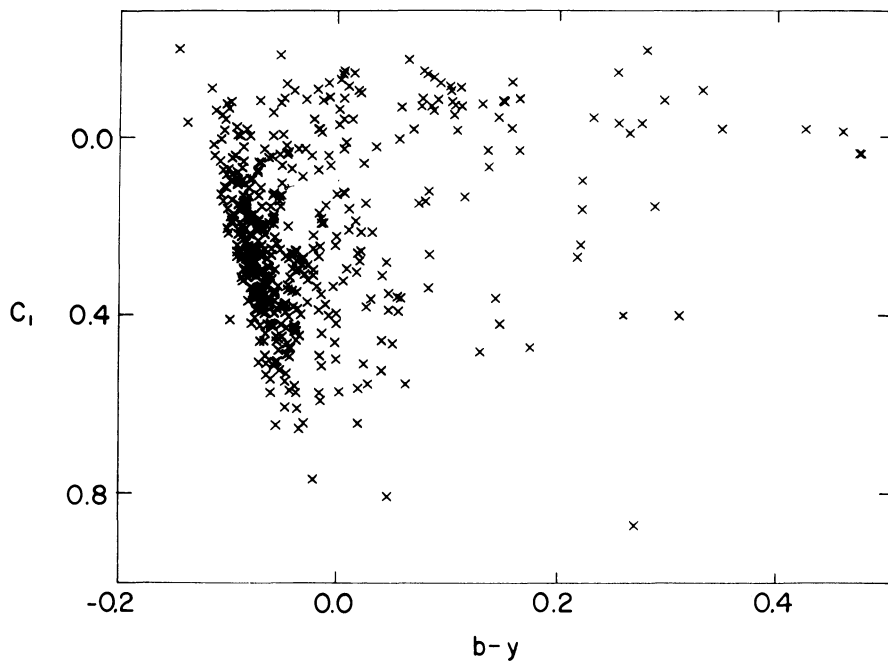


Fig. 4.

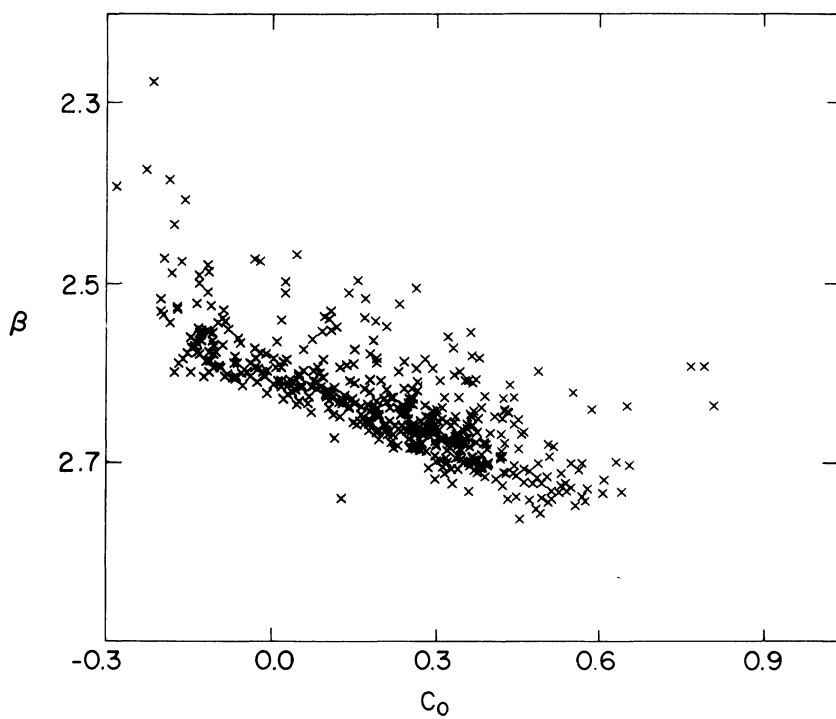


Fig. 5.

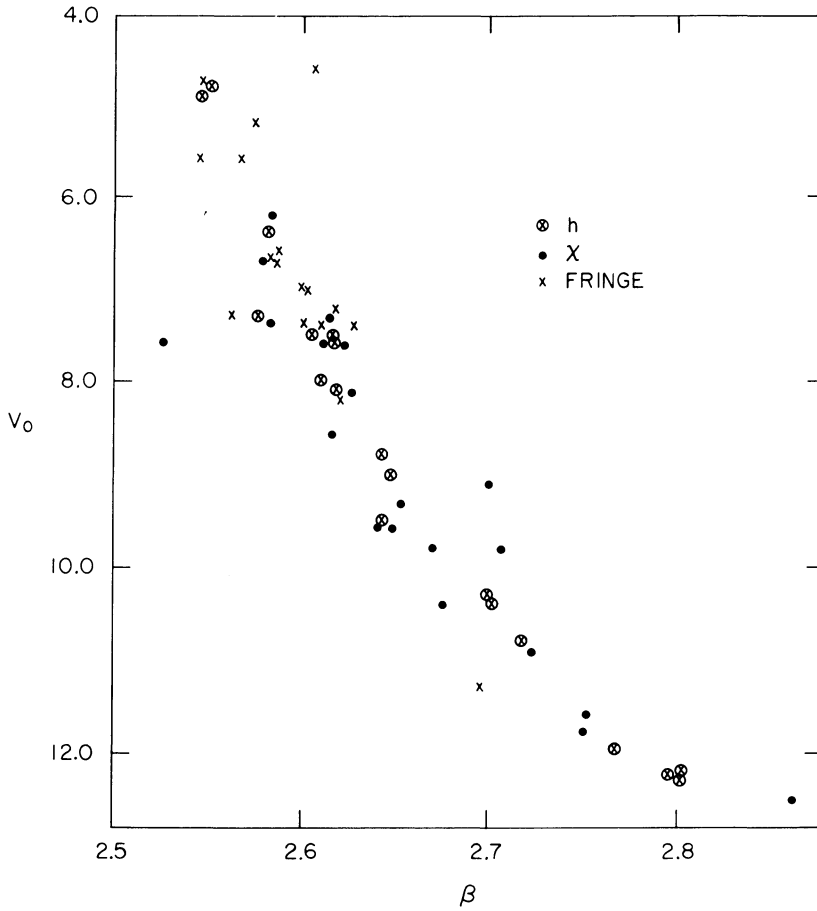


Fig. 6.

TABLE I

MK type	C_0	$(b-y)_0$	β (ZAMS)	M_v	$(U-B)_0$
$\leq O8$	-0.15		2.575:	-5.5	-1.15
O9	-0.12	-0.13	2.590	-4.6	-1.10
B0	-0.07	-0.12	2.608	-3.9	-1.05
B1	0.02	-0.11	2.629	-2.9	-0.96
B2	0.15	-0.10	2.658	-1.9	-0.84
B3	0.33	-0.09	2.701	-1.0	-0.67:
B4	0.37	-0.08	2.709	-0.8	-0.63:
B5	0.42	-0.07	2.720	-0.6	-0.59

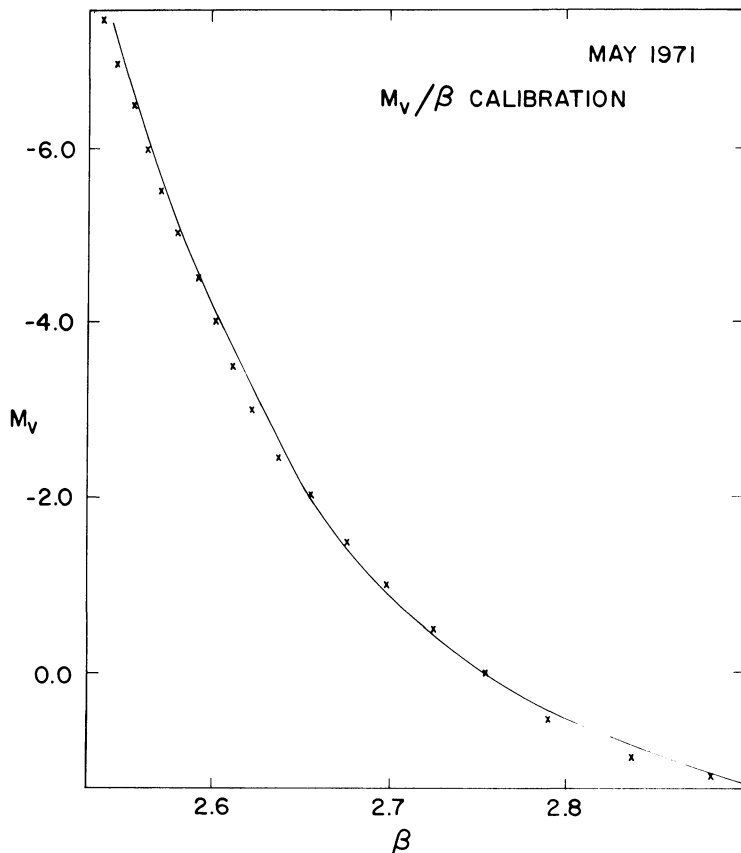


Fig. 7.

cribed by Crawford *et al.* (1970). Figure 3 shows the relations between $(u-b)$ and $(b-y)$ for a number of O-type stars.

The relation between the reddening lines for $(u-b)/(b-y)$ and the other indices are

$$\begin{aligned} E(c_1) &= 0.2E(b-y) \\ E(m_1) &= -0.3E(b-y) \\ E(b-y) &= 0.7E(B-V) \\ E(u-b) &= 1.7E(b-y). \end{aligned}$$

Figure 4 shows the relation between c_1 and $b-y$ for the bright B-type stars. The rather sharp left envelope can be taken as the preliminary intrinsic color relation: $(b-y)_0$ in terms of c_1 . Figure 5 shows the relation between β and c_1 for the bright B-type stars. The β parameter is primarily a measure of luminosity and the c_1 parameter a measure of temperature. The lower envelope is the zero age line; data for stars of the youngest clusters lie nearly along this envelope. Comparison of the location of the data points in this diagram with the star's MK type indicates a very good relation

between the two systems, though there are certainly some deviating stars. Effects due to emission of $H\beta$ or $V \sin i$ effects apparently do not cause serious problems.

Time, nor the conference subject, do not permit a discussion of calibration problems here, but Figure 6 shows the relations between β and V_0 for the stars of the h and χ Per group. Similar relations exist for other groups, and a fitting of such individual relations leads to a calibration of M_v in terms of β (see Figure 7) – the second dimension for the photometric classification: the c_0 parameter being the first dimension.

Details of the classification and the calibrations will be published shortly in the *Astronomical Journal*.

Reference

Crawford, D. L., Glaspey, J. W., and Perry, C. L.: 1970, *Astron. J.* **75**, 822.