Four-Color and Hβ Photometry for Bright Stars in the Southern Hemisphere*

D. L. CRAWFORD, J. V. BARNES, and J. C. GOLSON
Kitt Peak National Observatory† and Cerro Tololo Inter-American Observatory†
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Photoelectric data on the *uvby* and β systems for 392 B-, A-, and F-type stars south of declination −10° are given in Table I. Many of the stars can be used as standards for southern hemisphere photometry with these systems.

I. INTRODUCTION

A PROGRAM to obtain *uvby* and Hβ photometry for bright southern stars was begun at Cerro Tololo in 1963 with the portable site-survey 16-inch telescope, now overhauled and placed in a permanent dome and building, but then located in a temporary wooden shed. In succeeding years additional data were obtained, and the present paper contains the results of 3400 observations of 392 stars, which are essentially all those south of −10° declination, brighter than $m_V = 5.0$ and of spectral type earlier than G2. A number of stars have a sufficient number of observations so that they may be used as standard stars in these photometric systems.

II. THE OBSERVATIONS

The final data from this program appear in Table I. The first two columns contain the HR and HD numbers for the stars observed. Both are given to make use of the table more convenient. An asterisk after the HR number denotes a remark at the end of the table.

The last two columns of the table contain the values of the apparent visual magnitude and of the MK spectral type. The magnitudes were taken from several sources: Johnson *et al.* (1966); Blanco *et al.* (1968); or Hoffleit (1964). In some cases, the magnitude given refers to both components of a visual double star measured together, and in other cases to one component alone. In general, binaries with separations less than 30 seconds of arc were observed together. The MK types are taken from Hiltner *et al.* (1969); or if not contained in that list, from Hoffleit (1964). These last two columns are given in an effort to make the table more useful.

The columns headed $b-y$, m_1, c_1, and n list the *uvby* photometry: $b-y$ is the color index, $m_1 = (v-b)-(b-y)$ is the metallic-line index, and $c_1 = (u-v)-(v-b)$ is the Balmer-discontinuity index. The number of observations is given in the column labeled n. Some nights of lower quality than the average were given half weight; hence the nonintegral values of n.

Observations were obtained with both 16-inch telescopes (Nos. 1 and 2) and with four different *uvby* filter sets, two of which are in regular use at Kitt Peak and two at Cerro Tololo. One of the Kitt Peak sets (used in four of the twelve observing sessions) is the one that originally was used to define the system (No. 1 set). Care was taken to observe standard stars to declinations of +20° to assure a firm tie-in to the system as established in the northern hemisphere. The standard system and standard stars will be discussed in detail in a forthcoming publication, but it is worthwhile to note here that no declination or summer–winter effects were noticed in analysis of the data from nights used for this program. In addition, the system appeared very stable from the time of the first observations (March 1963) to the last (August 1969).

The observations were reduced at Kitt Peak with the aid of the currently available four-color computer program and the Observatory's CDC 6400 digital computer. The mean errors of one observation, as determined from the interagreement of measures of the program stars, omitting the half-weight observations, are $\pm 0^m.010$ in $(b-y)$, $\pm 0^m.013$ in m_1, and $\pm 0^m.015$ in c_1. In all there are 1636 four-color observations on 382 program stars, for an average of 4.3 per star. Figure 1 shows the relation between $(b-y)$ and $(B-V)$ of the *UBV* system, data from Johnson *et al.* (1966). Most of the points deviating from the average relation are reddened B-type stars, and the deviation is indicative of the different central wavelengths of the blue filters—about 4500 Å for B and 4700 Å for b. The point at $(b-y) = -0.4$ is for γ Vel, a Wolf–Rayet star, where through the b filter the measure is strongly affected by emission.

The indices for a number of stars probably are variable; these are denoted by a colon or the notation "var." in the table. For most such stars, a remark with further information is given at the end of the table. Most of these variables or possible variable stars are B-type emission stars or supergiants, and are deserving of further attention.

The Hβ measures are given in the column labeled β, and n is the number of observations. The observations were reduced to the standard β system of Crawford and Mander (1966). The mean error of one observation was calculated as $\pm 0^m.009$. There are 1764 Hβ observations on 388 program stars, an average of 4.5 per star. As with the *uvby* measures, no declination or summer–winter effects were apparent in the β system. The number of observations is large enough for many of the stars with data in the table that they may be

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TABLE I. Final data for *ubvy* and Hβ photometry of bright southern stars.

HR	HD	$b-y$	m_1	c_1	n	β	n	m_V	Sp.
77	1581					2.601	3	4.2	G2V
98	2151	0.394	0.186	0.362	2			2.8	G2IV
100	2262	.100	.192	0.915	12	2.842	16	3.9	A7Vn
125	2834	.032	.150	0.999	1	2.900	6	4.8	A0V
126	2884	- .026	.141	0.849	1	2.850	6	4.4	B8V
127	2885					2.839	7	4.5	A2V
191	4150	.012	.133	1.090	3	2.860	6	4.4	A0IV
280	5737	- .063	.095	0.506	3½	2.660	6	4.3	B8III
338	6882	- .039	.118	0.559	3	2.748	5	3.9	B7V
370	7570	.368	.167	0.384	3			5.0	F8V
472	10144					2.605	3	0.5	B3Vp
531	11171	.209	.184	0.648	7	2.738	10	4.7	F2IV
591	12311	.175	.193	0.869	1½	2.771	3	2.9	F0V
612	12767	- .071	.110	0.514	3½	2.710	6	4.7	A0si
674	14228	- .046	.102	0.631	3	2.761	3	3.6	B8V
705	15008					2.880	3	4.1	A2V
708	15130	.005	.114	1.102	2½	2.815	3	4.9	B9V
721	15371					2.692	3	4.2	B5IV
740	15798	.299	.134	0.482	4½	2.642	14	4.8	F5V
749	16046	- .002	.125	0.960	3	2.846	6	4.9	B9
789	16754	.033	.186	0.955	2	2.885	3	4.8	A2V
806	16978	- .027	.132	0.926	1	2.869	3	4.1	B9III
811	17081	- .048	.096	0.607	7½	2.719	20	4.2	B7V
818	17206	.328	.167	0.406	½	2.646	3	4.5	F6V
837	17566	.050	.178	0.983	½	2.878	3	4.8	A3
897/8*	18622/3	.084	.161	1.094	4	2.844	3	2.9	A3V, A2
919	18978	.101	.165	0.962	2½	2.850	3	4.1	A5V
963	20010	.339	.156	0.411	1½	2.624	3	3.8	F8IV
1083	22001	.262	.158	0.501	3½	2.667	3	4.7	F5V
1088	22203	- .036	.112	0.702	3	2.763	3	4.3	B8V
1134	23227	- .061	.096	0.421	5	2.667	3	5.0	B5IV
1173	23754	.275	.171	0.492	4½	2.668	11	4.2	F3V
1189/0*	24071/2	- .012	.163	0.945	4½	2.888	5	4.3	A0, A0
1213	24587	- .057	.107	0.507	5½	2.744	12	4.6	B6V
1240	25267	- .059	.128	0.617	3	2.733	8	4.7	Asi
1302	26612	.211	.173	0.771	3½	2.714	3	4.9	dF0
1338	27290	.195	.177	0.655	3½	2.742	4	4.2	F5V
1347	27376	- .047	.120	0.630	4	2.768	3	3.6	B8.5V
1465	29305	- .037	.122	0.646	3	2.767	3	3.3	A0si
1502	29875	.211	.170	0.617	5½	2.736	3	4.4	F2V
1611	32045	.171	.169	1.002	3	2.754	4	4.8	F0IV
1621	32309	- .020	.137	0.911	2½	2.837	3	4.9	B9
1674	33262	.335	.167	0.338	5½	2.618	4	4.7	F8V
1696	33802	- .041	.121	0.592	2½	2.756	3	4.4	B8V
1702	33904	- .038	.105	0.657	4	2.735	15	3.3	Ap

TABLE I (*continued*)

HR	HD	$b-y$	m_1	c_1	n	β	n	m_V	Sp.
1705	33949	-0.026	0.095	0.708	2½	2.720	3	4.4	B8V
1756	34816	- .112	.072	-0.061	2	2.603	13	4.3	B0.5IV
1762	34968	- .020	.122	1.062	3	2.832	3	4.7	A0V
1829	36079	.526	.245	0.451	3	2.579	3	2.8	G5III
1865	36673	.139	.148	1.504	14	2.730	6	2.6	F0Ib
1922	37350	.387	.244	0.811	3	2.641	3	3.4	F8Ia
1956	37795	- .046	.086	0.650	9	2.653	8	2.6	B8Ve
1983	38393	.317	.154	0.404	4	2.630	3	3.6	F6V
1998	38678	.055	.180	1.003	5	2.877	10	3.6	A3V
2015	39014	.124	.184	0.956	2	2.790	3	4.4	A6IV
2020	39060	.094	.196	0.891	3	2.860	3	3.8	A3V
2056	39764	- .076	.121	0.408	7	2.717	10	4.9	B5V
2085	40136	.223	.153	0.621	5	2.716	3	3.7	F0V
2106	40494	- .076	.092	0.363	7	2.645	13	4.4	B2.5IV
2128	40967	- .042	.091	0.348	3	2.679	3	4.9	B5IV
2155	41695	.023	.157	1.076	3	2.884	3	4.7	A1V
2212	42933	- .106	.073	-0.050	4	2.599	3	4.8	B0.5IV
2244	43445	- .022	.114	0.885	2½	2.747	3	5.0	B8V
2282	44402	- .092	.107	0.261	3	2.677	3	3.0	B2.5IV
2294	44743	- .090	.052	-0.002	7	2.596	11	2.0	B1II
2326	45348	.110	.128	1.512	4	2.732	3	-0.8	F0Ib
2361	45813	- .071	.095	0.367	5½	2.692	3	4.5	B4V
2387	46328	- .093	.064	-0.022	4½	2.583	3	4.3	B1III
2414	46933	- .007	.124	1.189	3	2.828	4	4.5	A0V
2435	47306	.023	.090	1.289	4	2.732	3	4.4	B9III
2451	47670	- .032	.079	0.763	5	2.680	3	3.2	B8III
2491	48915	.006	.124	1.002	1	2.901	3	-1.5	A1V
2538*	50013	- .077	.065	var.	5	2.508	3	4.0	B1.5IVne
2550	50241	.123	.178	0.999	4½	2.788	9	3.3	A5V
2571	50707	- .084	.070	-0.018	3	2.594	4	4.8	B1III
2590	51199	.248	.150	0.649	6½	2.686	3	4.7	gF2
2596	51309	.020	.063	0.214	4	2.582	4	4.4	B3II
2618	52089	- .081	.078	-0.002	3	2.577	3	1.5	B2II
2653	53138	.004	.042	0.126	4	2.539	4	3.0	B3Ia
2657	53244	- .045	.097	0.560	8	2.689	14	4.1	B8II
2693	54605	.375	.322	0.929	5½	2.661	3	1.8	F8Ia
2702	54893	- .079	.084	0.296	4	2.648	3	4.8	B2IV-V
2740	55892	.220	.155	0.614	1½	2.706	3	4.5	F0V
2745	56014	- .073	.078	0.190	3	2.563	3	4.6	B3IIIp
2749*	56139	- .012	.074	0.155	2	2.590	3	3.8	B2IV-Ve
2762	56456	- .040	.121	0.772	4½	2.765	3	4.8	B8
2781	57060	- .054	.098	-0.184	4	2.530	3	5.0	O7f
2782	57061	- .048	.054	-0.120	4	2.564	3	4.4	O9Ib
2787*	57150	- .016	.050	0.186	2	2.516	3	4.7	B2V
2803	57623	.474	.272	0.595	3½	2.627	3	4.0	F8II

TABLE I (*continued*)

HR	HD	$b-y$	m_1	c_1	n	β	n	m_V	Sp.
2812	57821	0.018	0.072	0.642	2½	2.699	3	5.0	B7
2827	58350	.015	.052	0.191	5	2.538	3	2.4	B5Ia
2874	59612	.171	.082	1.530	3	2.692	3	4.8	A5Ib
2881	59890	.560	.341	0.508	4	2.619	3	4.6	G1Ib
2906	60532	.340	.144	0.460	4	2.641	3	4.4	F7IV
2922	60863	- .047	.122	0.587	2½	2.752	3	4.6	B8
2937	61330	- .041	.127	0.711	5½	2.794	3	4.5	B8V
2944	61429	- .022	.087	0.754	2½	2.703	3	4.7	B9
2948/9*	61555/6	- .074	.114	0.402	6	2.714	6	3.8	B8, B5IV
2961	61831	- .082	.100	0.304	8½	2.662	6	4.8	B2.5V
2996	62623	.178	.015	1.182	3	2.600	3	4.0	A3IIep
3034	63462	.030	.026	-0.214	5	2.468	3	4.5	B1IV ? nne
3045	63700	.755	.519	0.378	5	2.624	3	3.4	G3Ib
3055	63922	- .053	.041	-0.078	5	2.592	3	4.1	B0III
3084	64503	- .083	.097	0.247	8½	2.664	4	4.5	B2.5V
3089	64740	- .107	.101	0.006	5	2.611	3	4.6	B1.5Vp
3090	64760	- .030	.042	-0.086	5	2.563	3	4.2	B0.5Ib
3102	65228	.450	.241	0.614	3	2.651:	3	4.2	F8II
3113	65456	.094	.133	1.492	3	2.777	3	4.8	A2V
3117	65575	- .083	.097	0.318	5	2.654	3	3.5	B3IVp
3129	65818	- .060	.060	-0.055	3	2.588	3	4.3	B1Vp + B2:
3131	65810	.049	.158	1.128	11½	2.834	15	4.6	A3V
3159	66591	- .079	.110	0.300	4	2.679	3	4.8	B3V
3165	66811	- .146	.115	-0.198	5	2.534	3	2.2	O5f
3185	67523	.260	.210	0.732	4	2.722	3	2.8	F6IIp
3192	67797	- .069	.103	0.393	5	2.684	3	4.4	B5V
3206*	68243	- .138	.158	-0.033	3	2.592	3	4.3	B1IV
3207*	68273	- .431	.671	-0.457	3	2.496	3	1.8	WC8
3220	68456	.288	.155	0.444	3	2.643	3	4.8	dF7
3223	68520	- .047	.105	0.532	3½	2.711	3	4.4	B6IV
3226	68601	.132	.092	1.546	2	2.700	3	4.8	A3p
3237*	68980	.001	.040	-0.129	2½	2.406	3	4.8	B1.5IIIe
3270	70060	.128	.194	0.860	3	2.807	2	4.4	A7III
3294	70930	- .052	.062	0.066	5	2.613	3	4.8	B1.5III
3318	71243	.261	.168	0.499	3	2.648	3	4.1	F6IV
3426	73634	.080	.127	1.537	3	2.763	3	4.1	A9II
3445	74180	.512	.033	1.399	3	2.609	3	3.8	F2Ia
3447	74195	- .080	.094	0.340	4	2.668	3	3.6	B3IV
3452	74272	.097	.115	1.542	3	2.767	3	4.8	A5II
3457	74375	- .019	.060	0.076	5	2.596	3	4.3	B1.5III
3468	74575	- .061	.068	0.044	4	2.606	3	3.7	B1.5III
3487	75063	.042	.098	1.448	2½	2.745	3	3.9	A0III
3498*	75311	- .061	.085	var.	5	2.601	3	4.5	B3Vne
3527	75821	- .072	.057	-0.083	5	2.590	3	5.1	B0III
3556	76483	.055	.206	1.086	4½	2.863	5	4.9	A3V

TABLE I (*continued*)

HR	HD	$b-y$	m_1	c_1	n	β	n	m_V	Sp.
3571	76728	-0.043	0.108	0.563	4½	2.701	3	3.8	B8II
3574	76805	- .056	.114	0.450	4	2.738	3	4.7	B5V
3591	77258	.404	.230	0.629	3	2.655	3	4.4	F8III
3615	78045	.077	.188	0.960	3	2.871	3	4.0	A5V
3642	78764	- .059	.080	0.128	3½	2.547	3	4.7	B2IVe
3643	78791	.376	.205	0.606	3	2.625	3	4.5	F6II-III
3654	79186	.222	.002:	0.162	4	2.536	3	5.0	B5Ia
3659	79351	- .083	.091	0.272	3	2.653	3	3.4	B2IV-V
3663	79447	- .086	.100	0.299	3½	2.661	3	4.0	B3III
3684	79940	.291	.166	0.671	2	2.668	3	4.6	F5III
3685	80007	.004	.140	1.273	2½	2.836	4	1.7	A1IV
3699	80404	.123	.130	1.542	3	2.755	3	2.2	F0I
3734	81188	- .072	.078	0.208	3	2.628	3	2.5	B2IV-V
3786	82434	.219	.174	0.615	2½	2.706	3	3.6	F2IV
3825	83183	.054	.054	0.393	3½	2.610	4	4.1	B5II
3836	83446	.086	.206	0.936	2	2.857	3	4.4	dA5
3849	83754	- .066	.107	0.394	Std	2.700	Std	5.0	B5V
3856	83944	- .042	.143	0.818	7	2.835	5	4.5	B9V
3858	83953	- .037	.090	0.387	4½	2.582	3	4.8	B6Ve
3871	84367	.327	.202	0.847	3	2.711	3	4.8	F7
3884	84810	.810	.468	0.256	2½	2.614	3	3.4	cG2
3890/1*	85123/4	.193	.116	1.400	3	2.724	3	3.0	A9II, F0
3940	86440	- .016	.078	0.356	2½	2.597	3	3.5	B5Ib
3970	87504	- .046	.123	0.821	3½	2.775	7	4.6	B8V
4023	88955	.021	.175	1.048	3	2.901	3	3.8	A2V
4037	89080	- .023	.097	0.867	4½	2.646	3	3.3	B8III
4074	89890	- .040	.086	0.437	3½	2.642	3	4.5	B3III
4102	90589	.231	.174	0.544	2½	2.695	3	4.0	F3IV-V
4110*	90772	.402	- .021	1.189	2	2.567	3	4.6	F0Ia
4114	90853	.190	.156	1.355	3½	2.725	3	3.8	F0II
4138	91375	.021	.148	1.164	3	2.865	3	4.7	A2m
4140	91465	- .017	.071	0.248	3½	2.522	3	3.3	B4Vne
4199	93030	- .102	.071	-0.075	7	2.600	11	2.8	B0.5Vp
4234	93845	- .100	.119	0.218	3½	2.682	2	4.4	B2.5IV
4293	95370	.060	.175	1.121	8	2.867	9	4.4	A2IV
4337	96918	.744	.469	0.522	3	2.663	3	3.9	G0Ia-O
4343	97277	.010	.161	1.201	8	2.864	13	4.5	A2IV
4352	97534	.420	- .014	1.188	2	2.572	3	4.6	F0Ia
4390	98718	- .072	.105	0.370	3	2.696	3	3.9	B5Vn
4405	99211	.117	.192	0.900	Std	2.821	Std	4.1	A7IV
4441	100261	.666	.265	1.100	2	2.637	3	5.1	G0Ia
4460	100673	- .033	.119	0.931	5	2.765	3	4.6	B9V
4467	100841	- .002	.096	1.158	5	2.743	3	3.1	B9II
4494	101431	- .021	.106	0.966	5	2.762	3	4.7	B9
4499*	101570	.714	.356	0.335	3½	2.608	3	4.9	cG6

TABLE I (*continued*)

HR	HD	$b-y$	m_1	c_1	n	β	n	m_V	Sp.
4520	102249	0.086	0.179	1.073	3	2.856	3	3.6	A7II-III
4522	102350	.549	.324	0.403	3	2.576	3	4.1	G3III
4537	102776	- .076	.106	0.365	4	2.648	3	4.2	B3V
4552	103192	- .047	.135	0.745	3	2.732	3	4.3	A0si
4599	104671	.180	.143	0.873	3½	2.718	3	4.3	Am
4603	104841	- .023	.084	0.300	3½	2.664	3	4.7	B2V
4616	105211	.216	.161	0.633	3	2.703	3	4.2	F0III
4618	105382	- .079	.102	0.264	9	2.679	13	4.5	B2IIIne
4621	105435	- .016	.048	-0.010	3	2.473	3	2.6	B2IVne
4623	105452	.211	.163	0.577	2½	2.707	3	4.0	F2V
4638	105937	- .087	.114	0.326	3	2.706	3	4.0	B3V
4656	106490	- .113	.086	0.043	3	2.617	3	2.8	B2IV
4662	106625	- .043	.106	0.761	3	2.715	3	2.6	B8III
4674	106911	- .051	.101	0.451	3½	2.714	3	4.3	B5Vn
4679	106983	- .089	.105	0.259	3	2.683	3	4.0	B2.5V
4730/1*	108248/9	- .104	.066	-0.014	3½	2.597	3	0.8	B0.5IV, B1V
4743	108483	- .089	.092	0.157	3½	2.656	3	3.9	B2V
4757	108767	- .024	.142	0.980	3	2.856	5	2.9	B9.5V ? n
4773	109026	- .077	.110	0.346	3	2.695	3	3.9	B5V
4775	109085	.247	.158	0.550	12	2.699	11	4.3	F0IV
4798	109668	- .104	.093	0.112	3	2.645	3	2.7	B2IV-V
4802	109787	.021	.159	1.087	11½	2.861	21	3.9	A2V
4817	110073	- .024	.089	0.654	4	2.719	3	4.6	Ap
4819	110304	- .011	.148	1.166	2½	2.862	6	2.2	A0III
4844	110879	- .090	.098	0.196	3	2.672	3	3.0	B2V
4848	110956	- .070	.096	0.301	4	2.698	3	4.6	B3V
4853	111123	- .103	.061	-0.041	3½	2.597	3	1.2	B0.5III
4889	111968	.128	.176	0.977	8	2.811	13	4.3	A7III
4897	112078	- .062	.086	0.364	3	2.681	3	4.6	B4Vn
4898	112092	- .082	.093	0.179	4	2.663	3	4.0	B2IV-V
4940	113703	- .063	.099	0.378	3	2.710	3	4.7	B5V
4942	113791	- .085	.088	0.163	3	2.653	3	4.3	B1.5V
4975	114529	- .025	.098	0.591	3	2.755	3	4.6	B8V
4993	114911	- .041	.108	0.641	3	2.784	3	4.8	B8V
5028	115892	.004	.190	1.026	4	2.902	3	2.7	A2V
5035	116087	- .069	.107	0.350	3	2.699	3	4.5	B3V
5041	116243	.512	.288	0.395	3	2.554	3	4.5	G5III-IV
5056	116658	- .114	.080	0.018	3	2.608	6	1.0	B1V
5132	118716	- .094	.058	0.043	3	2.610	3	2.3	B1III
5168	119756	.247	.155	0.562	13½	2.699	14	4.2	F2III
5190	120307	- .102	.076	0.084	3	2.609	3	3.4	B2IV
5193	120324	- .051	.054	-0.029	3	2.475:	3	2.9	B2IV-Ve
5210/1*	120709/0	- .062	.108	0.315	5½	2.704	9	4.3	B5III, B8V
5221	120955	- .046	.081	0.466	3	2.665	3	4.7	B4IV
5231	121263	- .108	.080	0.055	3	2.615	3	2.6	B2.5IV

TABLE I (*continued*)

HR	HD	$b-y$	m_1	c_1	n	β	n	m_V	Sp.
5248	121743	-0.105	0.082	0.145	3	2.628	3	3.8	B2IV
5249	121790	- .101	.090	0.162	3	2.636	3	3.9	B2IV-V
5260	122223	.379	.207	0.721	4	2.647	3	4.3	F7I-II
5267	122451	- .092	.045	-0.004	3	2.596	2	0.6	B1III
5285	122980	- .095	.089	0.176	9	2.655	13	4.4	B2V
5303	123998	.129	.215	0.807	3	2.811	3	4.9	A2p
5354	125238	- .082	.082	0.258	3	2.656	3	3.6	B2.5IV
5358	125288	.129	.018	0.482	3	2.626	3	4.3	B6Ib
5359	125337	.060	.206	1.008	4	2.866	3	4.5	Am
5367	125473	- .016	.137	1.001	2½	2.823	3	4.0	A0IV
5378	125823	- .086	.080	0.211	3	2.667	3	4.4	B7IIIp
5395	126341	- .054	.066	0.136	3	2.739	3	4.6	B2IV
5396	126354	.279	.133	0.916	4	2.705	3	4.4	dF7
5425	127381	- .074	.072	0.075	3	2.625	3	4.4	B2III
5453	128345	- .075	.109	0.389	3	2.715	3	4.0	B5V
5459/0*	128620/1	.438	.248	0.373	4	2.605	3	0.0	G2V, dK1
5463	128898	.136	.209	0.786	3	2.835	3	3.2	F0Vp
5469	129056	- .088	.058	0.098	3	2.604	3	2.3	B1.5III
5471	129116	- .078	.091	0.251	3	2.672	3	4.0	B3V
5528	130807	- .077	.092	0.358	3	2.699	3	4.3	B5IV
5531	130841	.074	.192	0.996	Std	2.863	Std	2.8	Am
5571	132058	- .098	.064	0.099	3	2.623	3	2.7	B2III
5576	132200	- .097	.080	0.191	3	2.646	3	3.1	B2IV
5605/6*	133242/3	- .067	.101	0.370	3	2.708	3	3.9	B5V, B5IV
5626	133955	- .080	.099	0.282	10	2.686	13	4.0	B3V
5646	134481	- .012	.129	0.960	4	2.823	6	3.9	B9V
5651	134687	- .084	.097	0.274	3	2.678	3	4.8	B3IV
5652	134759	- .053	.132	0.662	2½	2.745	3	4.5	Asi
5660	135153	.244	.136	1.381	6½	2.744	12	4.9	F0I
5671	135382	.004	.136	1.217	2½	2.814	3	2.9	A1V
5683	135734	- .034	.103	0.662	5	2.737	3	4.3	B8
5695	136298	- .097	.067	0.085	3	2.616	3	3.2	B1.5IV
5708	136504	- .089	.088	0.216	3	2.652	3	3.4	B2IV-V
5712	136664	- .069	.092	0.327	3	2.676	3	4.5	B4V
5724	137058	.014	.129	1.070	2½	2.823	5	4.6	A0IV
5776	138690	- .097	.082	0.142	3	2.638	3	2.8	B2IV
5781	138769	- .088	.096	0.271	3	2.685	3	4.5	B3IVp
5812	139365	- .081	.087	0.269	3	2.685	3	3.6	B2.5V
5825	139664	.264	.150	0.470	9	2.676	11	4.6	F5IV-V
5839	140008	- .064	.100	0.423	3	2.725	3	4.8	B5V
5883	141556	- .019	.126	0.948	5	2.841	3	4.0	Ap
5885	141637	.005	.068	0.127	8	2.638	11	4.7	B1.5Vn
5897	141891	.178	.166	0.746	5	2.750	3	2.8	F2IV
5904	142114	- .003	.065	0.246	3	2.680	4	4.6	B2.5Vn
5928	142669	- .089	.074	0.165	3	2.645	3	3.9	B2IV-V

TABLE I (*continued*)

HR	HD	$b-y$	m_1	c_1	n	β	n	m_V	Sp.
5941	142983	-0.022	0.083	0.768	3½	2.593	3	4.9	Bp
5944	143018	- .068	.058	0.028	Std	2.614	Std	2.9	B1V + B2
5948	143118	- .102	.077	0.114	3	2.615	3	3.4	B2.5IV
5953	143275	- .019	.038	-0.018	Std	2.602	Std	2.3	B0.5IV
5961	143474	.141	.177	0.828	3	2.813	3	4.6	A5V
5967	143699	- .067	.094	0.382	3	2.705	3	4.9	B6IV
5977/8*	144069/0					2.662	3	4.2	F5IV, F5IV
5980	144197	.116	.243	0.837	5½	2.850	3	4.7	Am
5984/5*	144217/8	.006	.046	0.013	5	2.602	3	2.6	B0.5V, B2V
5987	144294	- .084	.088	0.261	3	2.668	3	4.2	B2.5Vn
5993	144470	.033	.041	0.022	Std	2.621	Std	4.0	B1V
5997	144608	.521	.283	0.448	Std	2.579	Std	4.3	gG2
6027	145502	.072	.059	0.150	6	2.671	3	4.0	B2IV-V
6028	145482	- .070	.083	0.200	3	2.648	3	4.6	B2V
6030	145544	.668	.441	0.317	3	2.606	3	3.8	G2II
6058	146143	.496	.236	0.862	3	2.669	3	5.0	F8Iab
6070	146624	.004	.172	0.973	4	2.926	12	4.8	A0V
6081*	147084	var.	var.	var.	10½	2.788	12	4.6	A5II
6084	147165	.164	.002	0.030	4	2.609	3	2.9	B1III
6098	147584	.344	.174	0.317	3	2.632	3	4.9	G0V
6115	147971	- .012	.082	0.378	3	2.693	3	4.5	B4V
6118*	148184	.254:	- .054:	-0.147:	5	2.372	3	4.4	B2Ve
6141	148605	- .046	.085	0.202	Std	2.662	Std	4.8	B2V
6143	148703	- .060	.069	0.133	3	2.647	3	4.2	B2III
6153	148898	.066	.179	0.169	3	2.894	3	4.4	Ap
6165	149438	- .100	.051	-0.065	8	2.604	3	2.8	B0V
6175	149757	.085	.012	-0.061	12	2.578	12	2.6	O9.5V
6243	151769	.307	.161	0.536	10	2.650	12	4.7	F5IV-V
6247	151890	- .089	.078	0.103	3	2.625	3	3.0	B1.5IV
6252	151985	- .090	.076	0.103	5	2.620	3	3.6	B2IV
6262	152236	.425	- .095	-0.020	3	2.499	3	4.7	B1.5Ia$^+$p
6334	154090	.265	- .046	-0.010	4	2.538	3	4.9	B1Ia
6378	155125	.026	.184	1.084	10½	2.894	11	2.4	A2.5V
6380	155203	.254	.172	0.687	3	2.694	3	3.3	F0IVn
6445	156897	.248	.147	0.511	3	2.679	3	4.4	F2V
6446	156928	.026	.158	1.100	2½	2.889	3	4.3	A1V
6453	157056	- .092	.089	0.104	4	2.617	3	3.3	B2IV
6462	157246	- .023	.034	-0.040	3	2.560	3	3.3	B1Ib
6486	157792	.171	.198	0.791	5½	2.799	3	4.2	dA9
6492	157919	.257	.172	0.686	5½	2.709	3	4.3	F5IV
6500	158094	- .041	.098	0.783	5	2.772	4	3.6	B8V
6508	158408	- .107	.081	0.130	3	2.629	3	2.7	B2IV
6510	158427	- .061	.074	0.267	3	2.505	3	3.0	B2Vne
6519	158643	.039	.104	1.113	2½	2.765	3	4.8	A1
6527	158926	- .105	.072	0.074	4	2.614	3	1.6	B1.5IV

TABLE I (*continued*)

HR	HD	$b-y$	m_1	c_1	n	β	n	m_V	Sp.
6537	159217	0.000	0.107	1.128	3	2.799	3	4.6	A0
6553	159532	.234	.189	1.010	3	2.670	3	1.9	F0Ib
6561	159876	.149	.204	0.888	3	2.786	3	3.5	F0IV
6569	160032	.265	.148	0.483	3	2.662	3	4.8	dF4
6580	160578	- .100	.073	0.073	3	2.614	3	2.4	B1.5III
6581	160613	.047	.166	1.115	11½	2.878	12	4.2	A2V
6595	160915	.301	.150	0.413	11	2.646	11	4.9	F5V
6615	161471	.337	.107	1.459	3	2.676	3	3.0	F2Ia
6616*	161592	var.	var.	var.	3	2.639	3	4.2	F8
6628	161840	.012	.087	0.772	4	2.720	3	4.8	B8V
6631	161912	.212	.049	1.389	3	2.651	3	4.8	cA3
6700	163955	.021	.110	1.139	2½	2.826	4	4.8	A0
6742*	164975	var.	var.	var.	4	2.632	3	4.3	F8p
6743	165024	.004	.035	0.027	8	2.583	11	3.7	B2Ib
6745	165040	.119	.231	0.921	3	2.840	3	4.4	A5V
6812*	166937	.218	.009	0.280:	4	2.531	3	3.8	B8Iap
6879	169022	.016	.102	1.176	2½	2.778	3	1.8	B9IV
6897	169467	- .088	.099	0.317	3½	2.685	3	3.5	B3IV
6916	169978	- .048	.097	0.660	4	2.717	3	4.6	B8III
6930	170296	.044	.141	1.219	18½	2.837	10	4.7	A3V
7012	172555	.109	.205	0.837	3	2.825	3	4.8	A3
7029	172910	- .080	.088	0.219	3	2.676	3	4.9	B2.5V
7039	173300	- .049	.120	0.705	3	2.733	4	3.2	B8III
7074	173948	- .043	.041	0.072	3	2.573	3	4.2	B2II-III
7107	174694	.250	.215	1.156	2	2.642	4	3.9	F5p
7121	175191	- .091	.094	0.221	4½	2.668	3	2.0	B3IV
7152	175813	.255	.149	0.633	6	2.690	3	4.9	F0V
7188	176638	- .018	.144	1.006	4	2.861	3	4.8	A0
7194	176687	.031	.188	1.038	3	2.910	3	2.6	A2III
7254	178253	.018	.185	1.062	6	2.883	3	4.1	A2
7264	178524	.227	.161	1.082	3	2.702	3	2.9	F2II-III
7292	179950	.348	.228	0.711	3	2.699	3	4.8	dF5
7337	181454	- .038	.105	0.760:	7	2.765	3	3.9	B8V
7340	181577	.129	.188	0.955	6	2.812	3	3.9	F0IV
7343	181623	.213	.157	0.796	3	2.702	3	4.3	dF1
7348	181869	- .044	.117	0.720	4	2.782	3	4.0	B9III
7440	184707	- .052	.155	0.928	4	2.852	3	4.6	B9
7590	188228	- .008	.145	0.959	3	2.897	5	4.0	A0V
7623	189103	- .064	.089	0.292	4	2.661	7	4.4	B2.5IV
7747	192876	.571	.327	0.389	8½	2.617:	3	4.3	G3Ib
7773	193432	- .022	.135	1.025	11	2.856	22	4.8	B9V
7790	193924	- .092	.087	0.271	7	2.662	10	1.9	B2.5V
7822	194943	.243	.162	0.629	3	2.700	11	4.8	F2IV
7848	195627	.178	.169	0.752	4	2.777	3	4.8	F0V
7913	197051	.078	.184	1.090	3	2.828	3	3.4	A5IV

TABLE I (*continued*)

HR	HD	$b-y$	m_1	c_1	n	β	n	m_V	Sp.
7920	197157	0.158	0.196	0.749	5	2.784	3	4.5	dA9
7936	197692	.271	.157	0.481	8	2.670	4	4.1	F5V
8060	200499	.088	.186	0.949	6	2.857	3	4.8	A3m ?
8075	200761	.001	.158	1.051	3½	2.906	3	4.1	A0V
8135	202627	.032	.180	0.972	4½	2.871	3	4.7	A2p
8140	202730	.092	.213	0.868	4	2.849	3	4.4	A4V
8151	203006	- .010	.211:	0.855	6	2.837	3	4.8	Ap
8181	203608	.321	.124	0.323	10	2.611	11	4.2	F8V
8260*	205637	- .075	.072	var.	10	2.547	11	4.7	B3V ? p
8278	206088	.170	.267	0.810	3	2.780	3	3.7	Am
8305	206742	- .021	.141	0.954	3½	2.875	6	4.3	A0si
8322	207098	.185	.182	0.744	5	2.770	3	2.8	Am
8353	207971	- .048	.104	0.734	10	2.748	8	3.0	B8III
8368	208450	.170	.182	0.856	3	2.758	3	4.4	F0IV
8418	209819	- .038	.133	0.709	3	2.796	4	4.2	B8V
8425	209952	- .061	.105	0.576	16½	2.729	14	1.7	B7IV
8431	210049	.024	.172	1.084	8	2.872	11	4.5	A2V
8540	212581	- .014	.148	0.976	4	2.858	4	4.5	B8V
8573	213320	- .023	.137	1.017	3½	2.862	4	4.8	A0IV
8576	213398	- .005	.174	1.043	4	2.903	3	4.3	A0V
8628	214748	- .035	.083	0.765	3	2.677	3	4.2	B8Ve
8630	214846	.110	.198	0.908	7	2.820	10	4.2	dA9
8675	215789	.041	.168	1.154	6	2.850	10	3.5	A2V
8695	216336	- .012	.133	0.979	4½	2.831	3	4.5	A0V
8709	216627	.035	.161	1.172	8	2.881	10	3.3	A3V
8728	216956	.036	.207	0.986	13½	2.908	18	1.2	A3V
8787	218227	.253	.242	0.644	4	2.733	3	4.3	F6IV
8848	219571	.262	.146	0.579	7½	2.671	9	4.0	F0III
8937	221507	- .045	.119	0.685	3	2.776	6	4.4	Ap
8939	221565	.014	.149	1.106	4½	2.855	6	4.7	A1
8949	221760					2.877	6	4.7	Ap
8959	222095					2.885	6	4.7	A2V
8982*	222574	var.	var.	var.	14½	2.615	10	4.8	G0Ib
8988	222661	- .020	.151	0.913	2½	2.870	6	4.5	B9.5V
9016	223352	- .003	.160	1.019	3½	2.888	6	4.6	A0V
9076	224686	- .032	.104	0.894	6	2.718	7	4.5	B9IV
9091	224990	- .067	.107	0.461	8½	2.706	8	5.0	B5V
9098	225132	- .012	.127	1.018	2½	2.789	6	4.6	B9IV

Remarks to Table I

897 Both components.
1189 Both components.
2538 κ CMa, c_1 values: −0.11 in Feb. 1968, −0.02 in Jan. 1965, +0.06 in Mar. 1963.
2749 ω CMa, values in table are for Feb. 1968. In Jan. 1965 and Mar. 1963 $(b-y) = -0.06$, $m_1 = 0.09$, $c_1 = 0.28$.
2787 Possibly variable. Values in table are for Jan. 1966. Two additional measures, Feb. 1968 and Jan. 1965 are discordant in c_1 (= −0.07), but consistent in $(b-y)$ and m_1. Hβ from Jan. 1966.
2948 Both components.
3206 Companion to γ Vel. Values in the table are for Jan. 1966. Two additional measures in Jan. 1965 are discordant: $(b-y) = -0.10$, $m_1 = 0.09$, $c_1 = 0.04$. Variable? Hβ from Jan. 1966.
3207 γ Vel, values in table are from Jan. 1965. Two additional measures from Feb. 1967 are discordant: $(b-y) = -0.52$, $m_1 = 0.62$, $c_1 = -0.46$. Probably variable. Hβ from Jan. 1966.
3237 Values in table from Jan. 1965 and Jan. 1966. Two additional measures in Mar. 1963 are discordant in c_1 (= −0.06). Variable?
3498 Variable in c_1: 0.10 in Mar. 1963, 0.25 in Jan. 1965 and Feb. 1967, and 0.13 in Feb. 1968. Hβ from Jan. 1966.

3890 Both components.
4110 Values in table from Mar. 1963. Two measures in Jan. 1965 are discordant: $(b-y)=0.37$, $m_1=0.04$, $c_1=1.14$. Variable. Hβ from Feb. 1967 and Feb. 1968.
4499 One discordant c_1 measure was omitted.
4730 Both components.
5210 Both components.
5459 α Cen. Both components.
5605 Both components.
5977 Both components.
5984 Both components.
6081 ο Sco. Variable. $(b-y)=0.60$ to 0.64, $m_1=-0.05$ to $+0.01$, $c_1=1.53$ to 1.72, from four observing sessions. Hβ appears constant from two observing sessions.
6118 χ Oph. Probably variable. Two observing sessions give somewhat different averages. Hβ from one session.
6616 X Sgr, a Cepheid. Three discordant measures, from two sessions. Hβ from one session.
6742 W Sgr, a Cepheid. Discordant values, from three sessions. Hβ from one session.
6812 μ Sgr. Probably variable in c_1, values from 0.24 to 0.32. Hβ from two sessions.
8260 ε Cap. Variable in c_1, values from 0.43 to 0.57. Hβ may be slightly variable, but average is good.
8982 104 Aqr. Variable. $(b-y)=0.47$ to 0.53, $m_1=0.21$ to 0.30, $c_1=0.45$ to 0.53. Hβ may be slightly variable, but average is good.

used as southern hemisphere standard stars for the β system.

III. DISCUSSION

While much of the data contained in Table I will be used in forthcoming papers concerning the calibration of the *uvby* β indices in terms of intrinsic color and absolute magnitude, and concerning the space distribution and other properties of bright stars, some general remarks are in order here. Inspection of the data given in the table indicates numerous stars of interest: for example, supergiants, emission-line stars, reddened B-type stars, metallic-line stars, stars whose indices are discordant with published spectral types, and stars with variable indices.

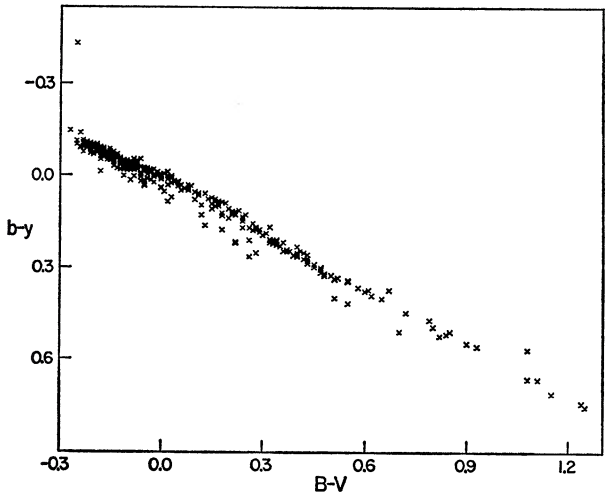

FIG. 1. The relation between the color index $(b-y)$ of the *uvby* system and $(B-V)$ of the *UBV* system.

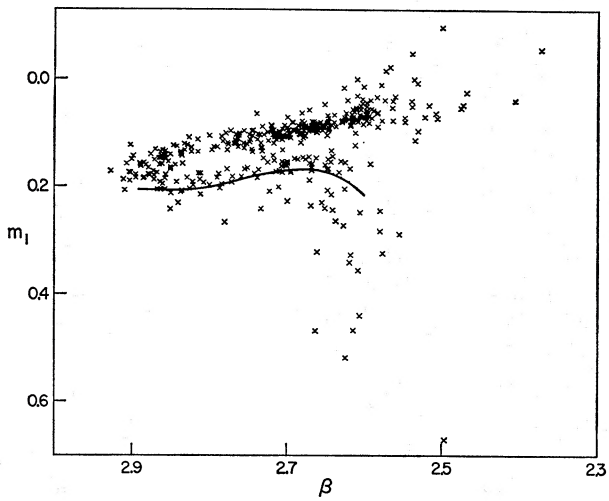

FIG. 3. The relation between the metallic-line index m_1 and the hydrogen-line parameter β for the data of Table I: The line is the standard Hyades relation. B-type stars are rather well separated from A and F stars.

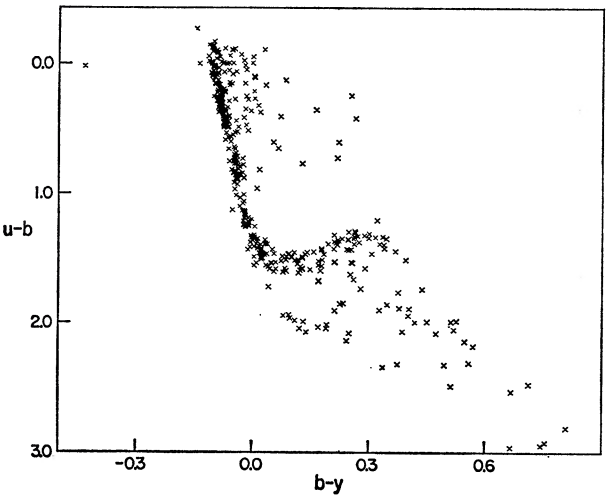

FIG. 2. The $(u-b)$ vs $(b-y)$ relation for the data of Table I. The color index $(u-b)$ has been calculated from the data in the table: $(u-b)=c_1+2m_1+2(b-y)$.

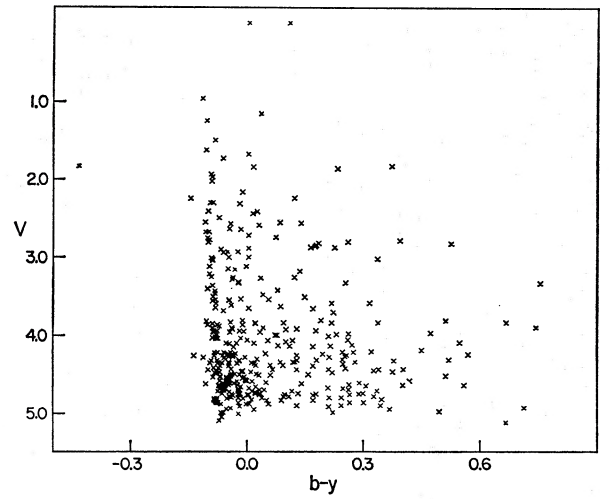

FIG. 4. The color–magnitude diagram for the stars with data in Table I: The V magnitudes have been taken from the published literature.

Figure 2 shows the two-color relation for the *uvby* system: $(u-b)$ vs $(b-y)$. The color index $(u-b) = c_1+2m_1+2(b-y)$. The relationship is, of course, very similar to the $(U-B)$ vs $(B-V)$ diagram of the *UBV* system, and shows the unreddened main-sequence stars, reddened B-type stars, reddened later-type supergiants, etc. Many southern B-type stars appear unreddened.

Figure 3 shows the m_1 vs β relation for the data in Table I. The line indicates the Hyades (Crawford and Perry 1966) "standard" relation. A rather clear separation of points for B- and A- or F-type stars exists in this diagram, with the data for B stars lying along a well-defined relation at lower m_1 values than for A or F stars of the same β. Reddening in this diagram moves a point to smaller m_1, hence reddened B stars are not confused with unreddened A or F stars.

Figure 4 shows the color–magnitude diagram, V vs $(b-y)$, as a good example of such a relationship for stars chosen on the basis of apparent magnitude.

It is hoped that this intermediate- and narrow-band photometry will prove useful to many investigations beyond those which are underway by the authors.

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