

PHOTOELECTRIC PHOTOMETRY OF FAINT BLUE STARS AT HIGH GALACTIC LATITUDES

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SUMARIO

Treinta y tres estrellas azules a altas altitudes galácticas fueron observadas en *UBV* usando el telescopio de 40" de Tonantzintla.

Los resultados muestran que la mayoría de los objetos observados son estrellas de la secuencia principal pertenecientes a la población joven del disco galáctico y al brazo horizontal de la población del halo galáctico.

The concern among astronomers in blue stars at high galactic latitudes has grown enormously since the discovery of the possible extragalactic nature of some of them. Furthermore, the great variety of new objects revealed in several investigations makes these stars a rewarding subject of study.

TABLE 1

<i>Ton</i>	<i>No.</i>	<i>V</i>	<i>B-V</i>	<i>U-B</i>	<i>Obs.</i>	
SGP	90	14.69	+0.08	+0.07	3	
	97	16.32	-0.27	-1.11	2	
	98	15.66	-0.13	-0.59	3	
	99	15.08	+0.12	+0.13	3	
	108	14.59	-0.04	-0.29	3	
	113	15.10	0.00	+0.01	3	
	130	15.24	-0.26	-0.94	3	
	135*	13.32	-0.25	-0.94	5	
	143	14.53	-0.27	-1.03	1	
	144*	12.86	-0.12	-1.16	3	
	145	16.58	-0.15	-1.28	1	
	148	14.47	-0.17	-1.07	3	
	151	15.74	-0.33	-0.99	1	
	154	14.45	-0.33	-1.23	3	
	NGP	913	13.94	+0.29	+0.16	3
		914	14.99	+0.13	-0.79	3
		918	14.30	+0.06	+0.06	3
		924	14.05	+0.20	+0.12	3
925		14.52	0.00	-0.04	4	
927		11.48	-0.19	-0.82	3	
930		13.16	-0.23	-1.00	3	
943		14.94	-0.23	-0.93	3	
1020		14.70	-0.03	+0.06	1	
1054		16.07	-0.16	-1.00	3	
1059		14.83	-0.29	-0.97	1	
1253		14.52	-0.01	+0.17	3	
1312		15.59	-0.07	-0.88	3	
1375		13.47	+0.04	+0.13	3	
1381		14.12	+0.04	+0.08	1	
1383	14.16	-0.13	-0.37	3		
1384	13.21	-0.23	-0.95	3		
1388	14.83	+0.10	-0.96	3		
1421	14.96	+0.28	+0.11	1		

NOTES TO TABLE 1

*No. 135 There is a disagreement between the magnitude and colors published before for this star, (a single observation, Iriarte 1958) and the ones that are given here.

*No. 144 The results obtained in a previous observation of this star (Iriarte 1958) agree well with the new values.

Although a large amount of research has been done on quasi stellar objects by many workers in the field, the systematic spectroscopic study of blue stars, regardless of their being QS0 or not, has been carried out mainly by Humason, Greenstein and Zwicky; the photoelectric determinations of the colors have been obtained by Harris, Eggen, Sandage and Iriarte and the proper motions through the extensive studies of Luyten.

In this note thirty three stars from Chavira's (1958, 1959) lists were observed in the course of other photometric programs carried out by the author with the 40" reflector at the Tonantzintla Observatory. The stars were chosen at random with no particular bias in mind for a special kind of star; moreover, the reason why these objects were observed was to provide the spectroscopist with new data that undoubtedly should help to the better understanding of the blue stars at high latitudes.

The results of the observations are given in Table 1, which is self explanatory; the letters SGP and NGP mean South Galactic Pole and North Galactic Pole, respectively. As some comments have been made about the precision of the author's photometry in his previous work on blue stars (Iriarte 1058, 1959), Table 2 is presented containing the original data. In this table individual observations are given in order to enable those interested to judge on their own the quality of the photometry. All observations are given equal weights.

TABLE 2

<i>Ton</i>	<i>No.</i>	<i>V</i>	<i>B-V</i>	<i>U-B</i>
SGP	90	14.652	0.134	0.053
		14.829	0.010	0.069
		14.595	0.096	0.076
	97	16.261	-0.212	-1.161
		16.382	-0.323	-1.051
	98	15.684	-0.187	-0.565
		15.663	-0.108	-0.536
		15.644	-0.104	-0.674
	99	15.090	0.106	0.129
		15.088	0.091	0.123
		15.069	0.164	0.124
108		14.557	-0.011	-0.311
		14.626	-0.071	-0.302
		14.583	-0.032	-0.241
113		15.118	-0.019	0.009
		15.145	-0.060	0.006
		15.037	0.067	0.011
130		15.287	-0.291	-0.969
		15.196	-0.226	-0.931
		15.231	-0.254	-0.905
135		13.318	-0.262	-0.960
		13.332	-0.286	-0.946
		13.287	-0.262	-0.893
		13.339	-0.244	-0.927
		13.311	-0.211	-0.978
143		14.525	-0.274	-1.025
144		12.812	-0.119	-1.129
		12.902	-0.131	-1.147
		12.865	-0.119	-1.191
145		16.578	-0.154	-1.282

TABLE 2 (cont.)

<i>Ton</i>	<i>No.</i>	<i>V</i>	<i>B-V</i>	<i>U-B</i>
	148	14.442	-0.161	-1.094
		14.481	-0.142	-1.050
		14.484	-0.194	-1.067
	151	15.743	-0.329	-0.986
	154	14.428	-0.309	-1.276
		14.491	-0.385	-1.245
		14.425	-0.297	-1.157
NGP	913	13.962	0.314	0.124
		13.978	0.270	0.149
		13.900	0.284	0.200
	914	15.068	0.050	-0.780
		14.983	0.144	-0.842
		14.913	0.203	-0.747
	918	14.250	0.090	0.081
		14.350	0.029	0.094
		14.304	0.062	0.013
	924	13.990	0.189	0.168
		14.021	0.220	0.148
		14.148	0.179	0.035
	925	14.591	0.005	-0.071
		14.450	0.058	-0.023
		14.515	-0.052	-0.018
		14.509	-0.012	-0.053
	927	11.497	-0.210	-0.861
		11.469	-0.178	-0.770
		11.291	-0.164	-0.765
	930	13.166	-0.215	-0.946
		13.149	-0.239	-1.007
		13.130	-0.248	-0.893
	943	14.867	-0.210	-0.912
		14.952	-0.251	-0.880
		14.986	-0.234	-0.995
	1020	14.698	-0.027	0.056
	1054	16.067	-0.169	-1.084
		16.091	-0.144	-0.917
		16.061	-0.154	-0.983
	1059	14.828	-0.293	-0.968
	1253	14.554	-0.051	0.243
		14.521	0.005	0.127
		14.490	0.024	0.142
	1312	15.654	-0.079	-1.022
		15.459	-0.059	-0.804
		15.650	-0.077	-0.807
	1375	13.522	0.038	0.123
		13.506	0.056	0.099
		13.393	0.036	0.165

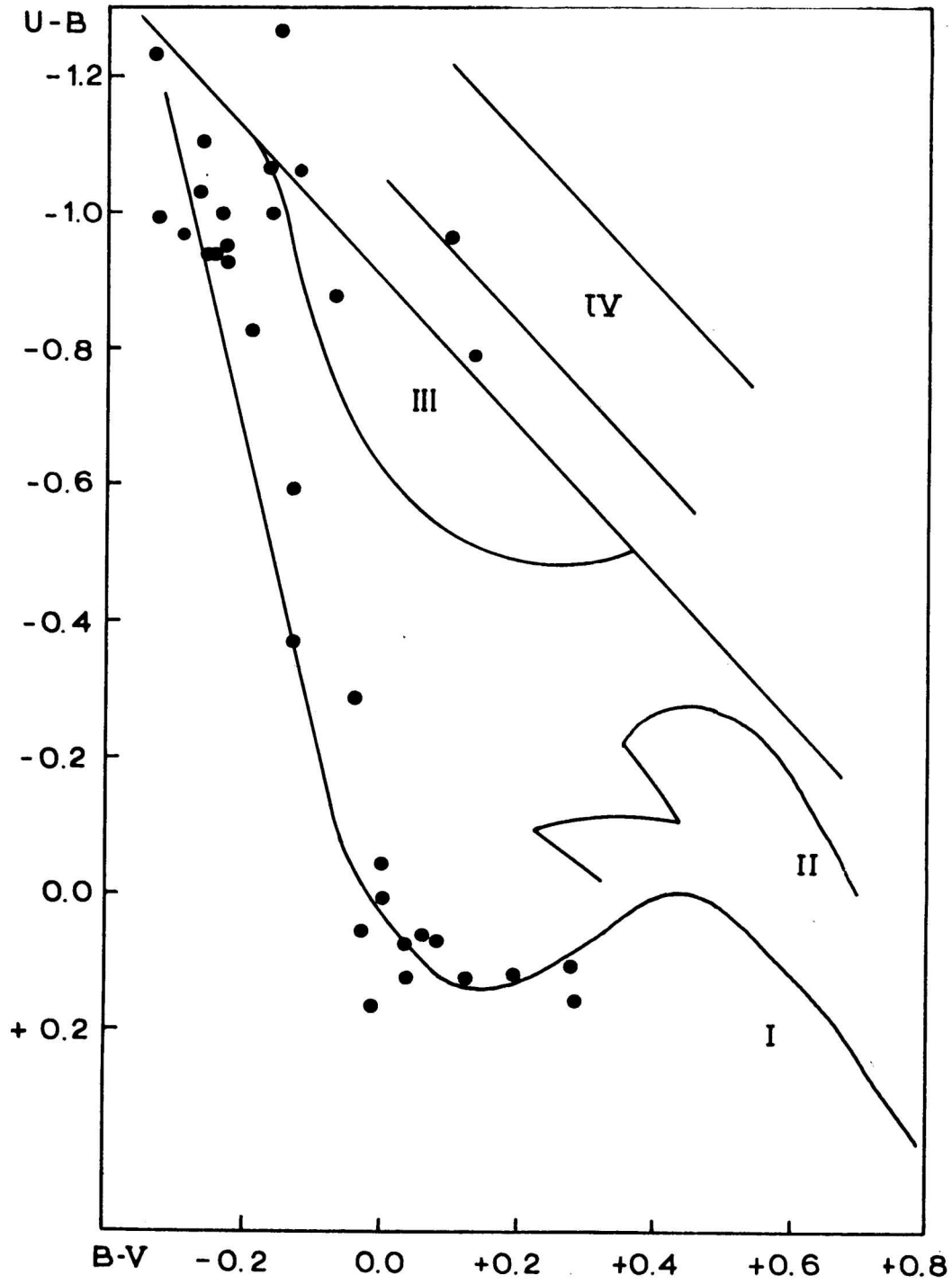


Fig. 1.—U-B, B-V color diagram for the observed stars.

TABLE 2 (cont.)

<i>Ton</i>	<i>No.</i>	<i>V</i>	<i>B-V</i>	<i>U-B</i>
	1381	14.117	0.040	0.084
	1383	14.126	-0.098	-0.337
		14.190	-0.149	-0.381
		14.152	-0.131	-0.376
	1384	13.183	-0.204	-0.942
		13.224	-0.228	-0.966
		13.236	-0.257	-0.955
	1388	14.802	0.097	-0.931
		14.850	0.104	-0.934
		14.848	0.100	-1.020
	1421	14.955	0.279	0.108

Eggen and Sandage (1965) observed some of the stars in the list of Feige (1958) and of Slettebak and Stock (1959). In this paper they plotted the observed stars in a diagram in which the standard ($U-B$, $B-V$) relation for main sequence stars (Sandage and Eggen 1959, Eggen 1963) is shown as a continuous curve and the black-body relation derived by Matthews and Sandage (1963) as a straight line. They added to their observations, observations done by Klemola (1962) and by Slettebak, Bahner, and Stock (1961). From the resulting diagram they found that the plotted stars could be segregated in four groups defined, and I quote, "(I) main sequence stars of the young-disk population, (II) the intermediate and extreme subdwarfs of the disk and halo population, (III) the white dwarfs of DB, DM and DC types, and (IV) the 3C 48-like sources and a new class of objects like those found near the radio source 3C 280".

Eggen and Sandage's (1965) diagram has been described in detail because the stars listed in Table I are plotted in Figure 1 against the same ($U-B$, $B-V$) relation for the main sequence and the same black body relation used by them. Moreover, Figure 1 includes the areas of the diagram in which the four groups fell.

Figure 1 shows that the most populated groups in this sample of stars is: group (I) that is to say, main sequence stars of young-disk population and horizontal branch stars of halo population. In this group star No. 151 lies blueward of the intrinsic line but the data rely on a single observation of the star. Star No. 145 shows the largest ($U-B$) in the diagram but again the data are based on just one observation. Four stars Nos. 144, 148, 940 and 1050 appear on the border line in group (III). Star No. 1312 falls clearly in group (III), the white dwarf region. Finally star No. 1388 is a member of group (IV). It is somewhat surprising that not a single star in Figure 1 lies in group (II).

REFERENCES

- Chavira, E., 1958, Bol. Obs. Tonantzintla y Tacubaya No. 17, 15.
 ———, 1959, Bol. Obs. Tonantzintla y Tacubaya No. 18, 3.
 Eggen, O. J., and Sandage, A. R. 1965, Ap. J., 141, 821
 Eggen, O. J., 1963, Ap. J. Suppl., 76, 125.
 Feige, J. 1958, Ap. J., 128, 267.
 Iriarte, B., 1958, Ap. J., 127, 507.
 ———, 1959, Lowell Obs. Bull., 4, 130.
 Klemola, A. R. 1962, A. J., 67, 740.
 Matthews, T., and Sandage, A. R. 1963, Ap. J., 138, 30.
 Sandage, A. R., and Eggen, O. J. 1959, M. N., 119, 278.
 Slettebak, A., and Stock, J. 1959, Astr. Abhandlungen, Hamburger Sternw. Vol. 5, No. 5.
 Slettebak, A., Bahner, K., and Stock, J. 1961, Ap. J., 134, 195.