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ERROR ANALYSIS OF THE PHOTOELECTRIC CATALOGUE *

M. P. FITZGERALD
Astronomy Program, Department of Physics
University of Waterloo, Canada

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The data contained in the Photoelectric Catalogue has been analyzed in order to ascertain the internal consistency of the observations, detect transcribing errors, and detect possible variable stars. Of the 20705 stars in the Catalogue roughly one third have two or more observations. Of these 532 were found to have discordant results in one or more of V, $B-V$, $U-B$, or between colour and spectral-luminosity class. Ten per cent of these results were caused by transcribing errors into the catalogue. Sixteen per cent are visual binary stars in which it is difficult to avoid either contamination of loss of light. Twenty-two per cent are reasonable candidates for variability, some of which were previously known. Sixty-eight per cent probably have errors in either the reported photometry (53%) or in the classification or photometry of the star (15%).

The standard deviations from the mean magnitudes and colours for stars of two or more observations (excluding the discordant results) are found to be $\pm$ 0^{m}015, $\pm$ 0^{m}011, and $\pm$ 0^{m}016 in V, $B-V$, and $U-B$ respectively. Tables of the deviations by individual reference number and by spectral class are also shown.

Key words: Photoelectric Catalogue - statistical accuracy - variable stars

1. INTRODUCTION

For many purposes it is important to have accurate photoelectric magnitudes of stars on the *UBV* system (Johnson and Morgan 1951). The Photoelectric Catalogue (Blanco *et al.* 1968) has provided a compilation of the available photometry from various sources. This collection of data enables us to make an estimation of the accuracy of the photometry of many different observers at many different sites, on the basis of stars observed by two or more observers. In this paper the internal consistency of the data from various sources is intercompared with a view to establishing an estimation of the accuracy of the data presented in the Catalogue as a function of both source of the data and the spectral class of the star. Possible new variable stars are also detected, as are errors in transcribing into the Photoelectric Catalogue, and possible errors in the original references which form the Catalogue.

The procedure adopted for this analysis is as follows:

a) Mean V, $B-V$, and $U-B$ values were obtained for all those stars observed two or more times.

b) Data for stars with individual observations differing from the mean values by more than 0^{m}05 in V and $B-V$ and 0^{m}06 in $U-B$ were checked in the original references. Also checked were stars whose spectral class and colours were incompatable, after allowing for reddening where appropriate. A total of 532 stars were found to have such discrepancies and these are given in Table 1.

c) For all the data not shown in Table 1, the difference between the individual observations and the mean of the observations was formed. From these differences a standard deviation was formed in V, $B-V$, and $U-B$, both as a function of spectral class and for each reference in the Catalogue. Overall standard deviations were also formed. The results are given in Tables 2 and 3, and shown graphically in Figures 1 and 2, respectively.

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2. RESULTS

2.1. Possible Errors and Variables

The results of the above calculations may be summarized as follows: The technique employed to check for possible errors should pick out most errors in photometry for stars with either duplicate observations or spectral-luminosity classes. These errors could arise from either copying errors in the original reference, or errors in the original photometry. Of course it is not always possible to distinguish between an incorrect observation of a star, and a correct observation of a star that is variable. A check of the 532 stars in Table 1 turned up 56 errors in transcribing from the original reference to the Photoelectric Catalogue. This indicates an approximate 0.8% chance that there is one or more transcribing error among all of the observations for any single star. Where an error was found it is indicated by an E in Table 1. For instance HD 37023D in reference 333 should have $U-B = -0\overset{m}{.}67$.

Stars for which the intrinsic colours, as determined from their spectral-luminosity class, are in disagreement with their observed colours are indicated by a C in Table 1. In a few cases a better spectral type was available from the Catalogue of Jaschek *et al.* (1964) and such a type is indicated. For example HD 4744 has a designation in the table of: C(J = K0 III). In order to make the colour-spectral class comparison the intrinsic colours and reddening lines of FitzGerald (1970) and Havercan (1971) were used. If a star deviated by more than 2.75 standard deviations from the reddening line it was examined for possible errors. A total of about 80 such discrepancies are listed in Table 1.

For stars for which no error was found in transcribing from the original reference, and yet discrepancies exist between different observations, a number of reasons are possible, namely:

i) the star is variable (*V*)

ii) the observation reported is incorrect (D)

iii) the star is misidentified (M).

It is not possible, without further observations, to distinguish between these three possibilities (except in cases where a known variable star, such as γ Cas, HD 5394, was included in the Catalogue). One can, however, make an educated guess at the more probable possibility. In cases where the photometry gives markedly different results a misidentification is likely. Such cases are designated M in Table 1, with the reference number suspected shown in brackets if it is apparent which reference is likely to be wrong. In cases where only the colours disagree, or where only one of several visual magnitudes given disagree, then the discrepant observation is likely to be incorrect. Such cases are designated D for discrepancy. In brackets after the D is indicated, *V*, *Y* or *U* if the discrepancy is in visual magnitude or $B-V$ or $U-B$ colour index respectively. This is followed by the reference number in which the discrepancy occurs. About 280 stars fall into the discrepancy and misidentification categories. Some of these could be variables; if this seems possible the designation D is followed by a comma (representing *or*) and the indication for a possible variable star (described below) is given. Several of the stars above are visual binaries, and if it is possible that the photometry is incorrect due either to inclusion or exclusion of one of the components in whole or in part, then this is noted by an *a* (for *A component only ?*), or *ab* (for *Both components?*)

For stars where variability is strongly suspected Table 1 shows a *V*. About 114 stars fall in this class. Of these 9 were previously known variables, based on the notes in the Photoelectric Catalogue, the Bright Star Catalogue (Hoffleit 1964), or the Variable Star Catalogue (Kukarin *et al.* 1958). In brackets after the *V* is shown the range in visual magnitudes based only on observations given in the Photoelectric Catalogue. Proceeding this number is the following designation:

K for a previously known variable

? for a previously suspected variable

Δ for a possible variable, not previously known or suspected

B for a possible variable, not previously known or suspected, but which is a known spectroscopic binary.

In the case of suspected variable stars, where these is reason to suspect the apparent variability is possibly due to incorrect data, the *D* designation follows the *V* designation in Table 1. Of the 114 stars designated as possibly variable 9 were previously known, 39 were previously suspected and 10 are spectroscopic binaries. It is suggested that the remaining stars and the spectroscopic binaries would be well worth investigating, particularly since many of them are intrinsically bright stars.

2.2. Accuracy of Observations

Once the suspected data and variable stars given in Table 1 were eliminated the remaining data was analyzed for the approximately 7000 stars with observations in common. For each star average magnitudes and colours were calculated. The deviations of individual observations from the average were then formed. These were then combined to form root mean square standard deviations in V, $B-V$, and $U-B$ for each spectral class and for each reference. These results are given in Tables 2 and 3, and in Figures 1 and 2 respectively.

From this data it is evident that different observers are consistent with the mean values to within about ± 0.02 in V, $B-V$, and $U-B$ in most cases. Some references show somewhat larger standard deviations, and some very small ones. Interpretation of the results for individual references should be done with caution. Some observations have probably been included twice despite efforts to the contrary (Blanco *et al.* 1968). Such references include 39, 51, 62, and 396 which are probably also in reference 75 in whole or in part. Such duplication will clearly lower the standard deviations found for the references concerned. On the other hand some references with apparently high standard deviations could be devoted to stars of type M, say, many of which could be slightly variable, hence giving artificially large estimates of the standard deviations of the photometry. That M stars tend to be more variable than others is clearly seen in Figure 1. Here the O, M, and Carbon stars show much larger standard deviations than the other stars, though the result for 0 stars is based on only 20 stars, and might not be significant.

3. CONCLUSION

We conclude from this study that, apart from a few references, the accuracy of photometry on the *UBV* system, as done at different observatories, is quite consistent. The overall standard deviations, based on all observations in common, excluding possible errors and variables cited above, is $\pm 0\overset{m}{.}015$, $\pm 0\overset{m}{.}011$, $\pm 0\overset{m}{.}016$ in V, $B-V$, and $U-B$ respectively. It further appears that about 114 stars are possibly variable, for which 48 where known or suspected previously. It therefore seems to be possible to pick out variable stars from photometric data which differs from the mean of the visual observations by more than about $0\overset{m}{.}05$.

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M. P. FitzGerald

Astronomy Program,
Department of Physics,
University of Waterloo,
Waterloo, Ont./Canada

Table 1 Stars for which discrepancies were found in the Photoelectric Catalogue

Column 1 Photoelectric Catalogue number
Column 2 HD or other number
Column 3 Comments, indicating the discrepancies

The code is fully explained in the text, and briefly below:

C	Spectral-luminosity class and colours inconsistent, allowing for reddening.
D(V, 999)	Discrepancy in the visual magnitude given in reference 999.
D(Y, 999)	Discrepancy in the $(B-V)$ colour index given in reference 999.
D(U, 999)	Discrepancy in the $(U-B)$ colour index given in reference 999. If the D(. . . . .) contains an *a* or an *ab* this indicates the discrepancy might be caused by difficulty in measuring the star because of its visual binary nature. *a* indicates *A component only? ab* indicates *Both components?*
E(999, $V = -2.63$)	Error in the photoelectric catalogue in reference 999. The visual magnitude should read $V = -2.63$. Y and U have the same meaning as above. S refers to the spectral type.
M(999)	Possible misidentification of the star in reference 999.
V(K. 99)	Previously known variable, range $0^{m}.99$ in Photoelectric Catalogue.
V(?. 99)	Previously suspected variable.
V(Δ. 99)	Possible variable, not previously known or suspected.
V(B. 99)	Possible variable, not previously known or suspected, but which is a known spectroscopic binary.

Star #	HD or other	Comments
52	358	V(B.17)
148	1013	D(V,378)
153	1038	V(?.14)
229	1522A	D(U,120)
233	BD+61 39	C
283	1942A	D(U,320)
334		C
380	2772AB	D(V,122,a)
469	3360	D(V,119), V(?.07)
484	3457	D(V,3)
506	3627A	D(V,119)
508	3628	V(Δ1.42), M(197)
566	3989	D(U,355)
595	4180A	V(Δ.15), M(197)
601	4211	D(Y,353)
676	4744	C(J=KO III)
684	4813	V(Δ.09)
686	4817	V(Δ.07), D(V,355)
748	5031	C
752	5045	E(277,U-B=0.48)+M
795	5233	V(Δ.24)
804	5277	C
833	5394	V(K.24)
1138	6668	D(Y,68)
1173	6832 AB	D(V,a)
1215	6960	V(?.22), D(V,118)
1228	7014	D(U,378)
1320	7439A	V(?.18)
1345	7586	V(Δ.11), D(V)
1378	BD+57 243	D(Y,182)
1406	7927A	D(V,77)
1571	9138	D(U,3)
1725	10362	C
1741	10494	D(U)
1771	232522	V(Δ.49),M
1826		C
1830	11092A	D(U)
1842	11171A	E(20,omit entry 2)
1869	11397	E(97,V=8.98,B-V=0.70)
1907	11636	E(4,V=2.62,U-B=0.11)
1955	BD-14 363	M,V(Δ.08)
1971	11973B	D(V,84ab),V(?.08)
2036	12323	D(Y,83)
2053	12438	C
2080	12573	D(U)
2086	12641A	V(Δ.15),D(V)
2101	12727	V(Δ.08),D(V)
2161	13136	D(U,10,110)
2170	13267	D(V,119)
2173	13338	E(119,omit)
2214	BD+2 348	D(U,75)
2217	13579AB	D(V,ab)
2226	13612AB	D(V,355,a)
2231	13658	D(U)
2284	13959AB	D(Y)
2335	14134	D(V,119)
2341	14143	D(V,119)
2361	14242	D(U)
2357		C
2364	14270	D(U)
2372	14322	D(V,296)
2385	14404	D(V,296)
2436	14520	D(V,12)
2444	BD+56 595	V(Δ=0.16)
2449	14580	V(?=0.19)
2470	14826	D(Y,83,373)
2488	BD+60 478	M,V(Δ=0.24)
2525	15497	V(Δ=0.12),D(V,12)
2530	15558	D(V,10)
2586	16160A	D(U,256)
2588	16161AB	D(V,7,a)
2596	16246B	D(V,84,ab)
2724	17145	D(V,333)
2811	BD+60 594	D(V,69)
2855	18326	D(U)
2973	19065	D(U)
3005	19305	D(V,Y,17)
3013	19373	D(U,120)
3022	19445	V(Δ=0.12),D(V)
3039	19548	D(Y,U)
3082	19887	D(V)
3086	19926	D(U)
3161	20319AB	D(U,71)
3198	20559AB	V(Δ.09),D(V,362)
3256	20902	D(V,355),V(?.08)
3307	21362	E(48,B-V=-.044)
3312	21389	D(V,119)
3329	21483	D(V,252)
3479	22764	D(Y)
3499	22928	E(120,U-B=-.50)

Star #	HD or other	Comments
3527	23139	E(384,omit)
3604	23475	V(?.13)+E(384,omit)
3847	24760AB	D(Y,77; U,48)
3852	24805	·C
3862	24912	V(?.08),D(Y,77)
3987	25631	D(Y,34)
4085	26571	E(127,omit)
4099		V(K.37)
4109		V(K.11)
4127	26846AB	E(116, omit U-B, $(U-B)_c$=2.25)
4148		D(Y,U)
4153		D(Y,U)
4176	27371	D(V,34),V(?.08)
4183	27397	E(127,B-B=.08)
4203		V(K.16)
4242	27778A	D(U,49)
4262	27946	E(127,V=5.29)+V(Δ1.04)
4265	27989AB	V(Δ.74),D(V,a)
4280		V(?.27),D(V)
4281		V(K.63),D(V)
4313		V(K.23),D(V)
4313		D(U,277)
4319	28424	C
4330	28497	V(Δ.31),D(V,212)
4426	29139	D(V,U,1),V(?.15)
4432	29169	V(Δ.32),D(V)
4474	29479	D(U,122)
4632	30649	D(U,3)
4643	30712	V(Δ.37),D(V)
4729	31295	D(V,122)
4742	31398	V(?.14),D(V,355)
4772	31647AB	D(V,122,a)
4841	32273ABC	D(U)
4912	32964A	V(?.11),D(V,120)
4929	33111	D(V.7),V(?.08)
4972	33604	V(Δ.14)
4999	33904	D(U,63)
5016	34085	V(?.22),D(V,122)+E(4,B-V =-.033)
5077	34797B	D(U)
5237	36003	D(V,Y,197)
5384	36646	V(Δ.17),D(78)
5395	36673	D(U,34,75)
5513	37023D	E(333,U-B=-0.67)
5523	37041A	D(V,Y,11),V(?.17)
5526	37043AB	D(Y,234)

Star #	HD or other	Comments
5642	37330	V(Δ.16),D(V,Y)
5703	37479E	V(Δ.18).D(V)
5706	37490	V(Δ.18)
5760	37674	D(U)
5832	37967	V(V.23),D(V)
5945	39003A	D(U,65)
5979	39357	V(B.11)
6021	39780	C+E$(U-B)_c$=1.45)
6090	250310	C
6153	41398	C
6291	43247	E(49,V=5.36,S=B9 II-III)
6305	43445	D(U,356)
6311	43544	V(Δ.22),D(V)
6315	43582	V(Δ.34),M
6358	44021	V(Δ.10,D(V)
6357	44007	C
6364	44112	D(V,415)
6372	44402	D(Y,120)
6424	45239	E(62,omit U-B,$(U-B)_c$=1.58)
6435	45394	C
6525	46553	V(Δ.22),D(V)
6560	260655	D(Y,355)
6650	48279	V(Δ.13)
6744	49435	C
6834	BD+40 1758	V(Δ.48)
6842	50896	D(U)
6909	52432	V(Δ.30)
6967	53975	D(V,378)
6983	54605	D(U)
7018	BD+28 1343	C
7059	56169	D(U)
7093	56855	C
7106	57061	V(?.17)+D(U,120)+E (120,B-V=-.19)
7111	57150	V(Δ.19)
7126	57435	D(Y)
7160	58142	D(V,122)
7271	60107	V(Δ.20),D(V)
7316	60863	D(U,122)
7337	61224	D(Y,79)
7466	CP-37 1531	V(Δ.13),D(V)
7514	63291	E(421,omit)
7520	63359	V(Δ.12),D(V)
7580	64096AB	D(V,197)
7619	CD-26 5134	C
7638	64657	E(75,V=7.1)+V(Δ.2)

Star #	HD or other	Comments
7647	64938	D(Y,378)
7672	65575	C
7697	65875	V(Δ.15),D(V)
7751	66811	D(U,120)
7872	CP-49 1528	D(Y,75)
7917	68980	E(75,V=4.7; V=4.82)
7935	69267	D(V,34)
7964	69665	V(Δ.19),D(V)
7967	69830	D(V,67)
8011	70555	C+E(120,S=F5)
8019	70673	V(Δ.16),D(V)
8042	71129	V(?.10),D(34)
8251	73598	D(V,U,378)
8270	73666	M(355)
8282	KW 275	V(Δ.19),D(V)
8393	74146AB	D(V,30,a),V(B.08)
8401	74180	V(Δ.10),D(V)
8429	74371	E(34,V=5.23),D(Y,18)
8442	74438	C
8500	74874ABC	D(U,120)V(B.04)
8513	75021	D(Y)
8543	75276	D(Y,18;U)
8582	75632AB	D(381,a)
8719	77327AB	D(V,122)
8822	79186	D(Y,18;U,34)
8842	79469	E(10,B-V=-.06)
8858	79752	V(Δ.29),D(V)
8908	80558	V(Δ.10)
8996	81471	D(Y,U)
9046	81997A	D(V,197)
9108	82536	E(62,V=5.90)
9232	84567	C
9239	84737	D(U,120)
9336	86590	V(B.70),M
9494	88647	V(Δ.29),D(V)
9527	89025	D(Y,118,363)
9536	89125AB	E(13,B-V=.50)
9555	89484/5AB	D(V,ab)
9579	89774	D(U,378)
9659	90610	C
9669	90772	D(U,18),V(?.07)
9722	91619	D(Y,U,18)
9741	91889	D(V,311)
9745	91906A	V(Δ.12),D(V)
9764	92139AB	E(120,omit entry 1)

Star #	HD or other	Comments
9772	92207	D(Y,U,18),V(B.07)
9854	92964	V(.15),E(34,V=5.39.B-V=.32)
9932	93662	E(75,V=6.4,U-B=-.60)
9963	94028	C(J=F4V+:)
9991	94367	D(Y,18)
10164	96638	C
10181	96918	D(34),V(B.13)
10182	96919	D(Y,18)
10217	97393	D(V,34),V(Δ.12)
10244	97633	V(Δ.11)
10288	98230/1AB	D(V,197,a),V(B.11)
10291	98262AB	D(V,80)
10304	BD+66 717	D(V,197)
10346	99171	C
10360	99383	V(Δ.14)
10364	99492B	D(U,355)
10380	Feige 43	D(V)
10402	100041	C(J=M3 III+)
10413	100261	V(?.18)
10414	100262	V(Δ.10)
10425	100393	V(Δ.12),D(V)
10459	100889	E(107,V=4.9)
10500	101153	D(U)
10502	CP-62 2158	C
10522	CP-62 2179	C
10576	101947	V(Δ.13),D(V)
10604	102249	D(U,34)
10612	BD+32 2188	D(298)
10675	103095	E(422,U-B=.17)
10733	103813	C
10775	104304	D(V,197)
10827	BD+32 2217	D(U,298)
10842	105004AB	D(U,74)
11029	106819	V(Δ.24),D(V)
11112	107700A	D(V,65),V(B.11)
11226	108767A	D(Y,65)
11287	109379	D(V,34),V(?.08)
11327	BD+25 2534	D(U,298)
11388	110432	V(?.12),D(V)
11392		C
11467	111028	C
11501	111284	C
11545	111613	D(Y,18)
11587	111904	D(Y,18)
11623	BD+31 2419	V(Δ.54)
11630	112142	C

Star #		HD or other	Comments
11639		112172	C
11737		113001	V(K.98)
11754		113139AB	E(10,U-B=.01)
11825		113797	V(?.19)
11839		113904AB	D(V,34),V(Δ.14)
11981		115103	V(Δ.13),D(V)
12059		116061	V(Δ.41),D(V)
12075		116329	C
12102		116656/7AB	D(Y,122)
12110		116842	E(7,V=4.01)
12182		118098	D(U,122)
12220		118623AB	D(U,120)
12316		120315	E(1,V=1.86)
12363		121130	V(?.13),D(V)
12421		122408A	D(V,7)
12513	F	92	V(.17),D(V)
12536		124679AB	D(V,ab)
12551		124897	E(351,V=-.04)
12554		124953	V(Δ.12),D(V)
12621		126129A	D(U,ab)
12717		127726AB	D(V,ab)
12782	BD+20	3004	V(Δ.11),D(V)
12928		130841A	D(U,34)
12949		131156AB	D(V,ab)
12969		131511	D(Y,251)
13011		132475AB	D(V),V(Δ.12)
13042		133216	D(V,34)
13046		133332	V(?.35),D(V)
13272		137744	M(378)
13275		137763	V(Δ.14)
13297	BD+65	1055	V(K.21)
13301		138481	C
13389		140283	D(U,3)
13394		140436AB	D(Y,203)
13431		141003A	D(V,7)
13433		141004	D(V,208)
13459		141680	D(V,7)
13512	T	13 3 18	C
13531		142860	D(V,197)
13563		143275	D(V,34)
13625		144334	C
13685		145206	C
13661		144900	C
13727		145328	E(80,V=4.82)+B(V,80),V(?.10)
13744	CP-53	7419	C
13799		146143	D(U,34)
13855		147084	D(U)
13858		147165A	V(K.13)
13869		147379A	D(V,77)
13870		147379B	E(94,B-V=1.50)
13883		147550	D(U,378)
13905		147971AB	D(V,120),V(B.50)
13909		148112	V(Δ.08)
13919		148379	D(Y,18)
13937		148605	D(U,75)
13940		148653AB	D(V,381)
13945		148688	C
13950	BD+19	3109	V(Δ.11),D(V)
13987		330950	V(Δ.19),D(V)
13992		330946	C
14042		149661	D(U,256)
14051		149882	D(Y)
14144		328862	C
14177		150997	V(Δ.14),D(V,80)
14201		151288	D(Y,251)
14217		151431A	V(Δ.46),D(V)
14230	BD+23	2998	V(?.80)
14234		151680	D(V,34),V(?.07)
14238		151804	V(Δ.28),D(V)
14260		152060	D(V,406),V(Δ.25)
14274		152198	V(Δ.80),D(V)
14282		152234	M(18)
14284		152236	M(18)
14290		152249	D(Y,18)
14406		154363A	D(34)
14408		154368AB	D(V,Y,U,ab)
14434		154783	C
14520		155603AB	E(88,V=6.6)+D(V,34,ab)
14784		157038/9ABC	D(V,341;Y,ab)
14794		157089	D(U,239)
14806		157246	C
14819		157546	E(378,omit)
14866		157881	D(V,34)
14908		158408	C
14920	BD+29	3029 AB	D(V,ab)
14930	BD+2	3336	V(Δ.14),D(V)
15007	MCC	169	D(Y)
15012		160269AB	D(V,121,a)
15082		161471	D(U)
15094		161573	E(160,U-B=-.58)

Star #		HD or other	Comments
15099	Kopff	63	C
15116		161695	D(U,378)
15136		161797A	D(V,197,ab)
15149		161868	E(75,U-B=.04,$(U-B)_c$=1.52)
15153	Kopff	101	M
15154		161940	C
15156		161941	D(U)
15162		162003	D(Y,118,363)
15195		162374	C(J=B8 V)
15299		164284	V(?.25),D(V,212)
15357	Roberts	82	V(Δ.13),D(V)
15372		165222	V(Δ.10),D(V,17)
15383		165402	D(U)
15428		166097	V(?.30),D(V)
15454		166524	V(Δ.33),D(V)
15478		166917	C
15487	BD-20	5043	C
15553	BD-12	4975	D(Y,U,21)
15560		168021AB	D(V),V(Δ.39)
15563	BD-13	4924	C
15566		168075	C
15568	BD-13	4928	M(187),V(Δ.18)
15569	BD-13	4927	M,V(Δ.48)
15571		168097	E(187,S=K0 II)
15573		168137	C
15584		168227	V(?.21)
15670		169820	D
15693		170153	D(V,197),V(B.07)
15750	CP-19	6896	D(U)
15751	CP-19	6897	D(U)
15754	CP-19	6904	D(U)
15760	CP-19	6910	C
15782	BD-11	4672	D(Y)
15831		171978	D(V,7),V(B.09)
15842		172167	D(V,197),V(?.16)
15883	BD-6	4834	C
15910		173032	D(V),V(Δ.12)
15969		173739A	D(V,17)
15979		173880	E(122,U-B=.08)
16016		174602A	D(U,224)
16033		174974	E(8,omit)
16055		175305	C
16083		175638A	D(V,363)
16164		177196	D(V,7),V(Δ.09)
16245			C
16316		180617A	D(U,75)
16322		180777	D(V),V(Δ.11)
16324		180809	D(U,296)
16330		180953	V(?.12)
16350	LDS	678A	D(V,Y,U),M,V(Δ.63)
16384		181828	D(U)
16411		182255	E(363,U-B=-.134)
16472		182835	D(U)
16543		231564	E(12,32,U-B=-.25)
16553	BD+30	3594	D(Y)
16584		184279	D(V,333),V(Δ.07)
16609		184606	D(V),V(Δ.09)
16658	DB+35	3631	C
16670		185342A	D(V,ab)
16674		232078	D(Y)
16750		186155	D(V,122),V(Δ.16)
16751	BD+24	3843	C
16767	BD+23	3745	C
16781		186449	D(Y,378;U)
16885		187642	D(197)
16906		187923	V(Δ.35),D(V)
16919		188031	C
17015		188971	E(V=6.47)
17026		189090	D(Y,U)+E(63,V=5.38)
17076		189711	V(?.11),D(V)
17082		189763	V(?.13),D(120)
17156		190360	D(V,362)
17179		190467	V(Δ.12),D(V,192)
17211		190603	D(V,192)
17232		227535	C
17247		190813	V(Δ.16,D(V)
17250		227586	E(192,addV+8.73, B-V=.21, U-B=-.68),M(192)
17260		227611	V(Δ.13)
17268	BD+35	3956	D(192)
17272		227634	D(192)
17301		191139	D(V,192)
17332		191292AB	D(V,ab)
17351		191456	D(V,192)
17359		191495	D(V)
17366		227960	D(V)
17380		191612	D(V,192)
17383		191615	C
17387		228007	C
17401		191765	D(192)
17445		192103	V(?.10),D(V)

Star #		HD or other	Comments
17448		192107	E(S=gK5),C
17540		192806	C
17555	BD-32	3761	C
17597		193370	D(V,119),V(?.15)
17650		229033	V(Δ.33),D(V)
17660		193928	V(Δ.08),D(V,359)
17664		194012	C
17710			C
17732		194765A	D(V,65)
17788		195407	E(419,U-B=-.67)
17806	VI	CYG -2	V(Δ.24),D(V)
17814	BD+40	4212AB	D(V,ab),V(Δ.15)
17827			E(11,V=11.51),D(Y)
17924		196867	D(U,34)
17990		197964A	D(U,355)
17998		198001	D(Y,398)
18041		198542	D(U,120)
18081		199098	D(V,378),V(B.28)
18285		201091A	D(Y,67,84)
18304		201371	C
18356		202214AB	D(V,252),V(Δ.12)
18453		203608	D(U)
18525		204827	V(Δ.17),D(V,252)
18560		205435	D(V,7),V(Δ.11)
18575		205637	V(?.12)
18579		205765A	D(V,7)
18636		206487	V(Δ.12),D(V)
18694		207203	D(U)
18734		207971	D(U,79)
18764		208392A	D(V,ab),M(84)
18765		208392B	D(Y,U)
18792		208816	C
18837		209481	V(?.10),D(V,118)
18859		209688	D(V,34)
18874		209750	D(V,34)
18909		210071	E(63,V=6.22),M(63)
18910		210072	E(25,B-V=.28)
18914		210129	D(U,49)
18954		210459	D(V,7)
18997		210873	D(Y)
19011		210934	D(V,122)
19186		212754	D(V,ab)
19250		213442	V(Δ.13),D(V)
19306		213998	D(U,34)
19398		214734	D(Y)
19399		214748	D(U,79)
19421		214987	C
19514		215648	D(U,34)
19547		215943	V(Δ.36),D(V)
19563		216092	C
19578		216228	D(V,355)
19583	BD+61	2353	E(15,S=B8-A0e),C
19596		216386	C
19704		217271	C
19726		217476	V(Δ.17),D(V,Y,U)
19772	BD+61	2389	C
19775		218045	E(119,V=2.49)
19797		218329	D(U)
19855		219080	D(Y,251)
19867		219215	E(75,U-B=omit)
19894		219460	D(V,359),V(Δ.21)
19937		219688	D(Y,68)
19940			E(12,U-B=-.09)
19988	BD+59	2699	V(Δ.12),D(V)+E(119,S=B2,Ia)
19990	F	110	V(Δ1.00),D(V)
20036		220278AB	D(Y,121)
20106		220704	D(V,7),V(Δ.10)
20126	BD+59	2723	D(239)
20138	BD+60	2542	D(V,119),V(Δ.14)
20144	BD+59	2727	D(V,86),V(Δ.11)
20153	BD+60	2548	D(V,119),V(Δ.11)
20172		221143	E(119,omit)
20193		221237	C
20293	BD+60	2582	C
20450	BD+1	4774	D(U,355)
20529		224085	V(B.11)
20566	BD+66	1661	C
20639		224927AB	D(U,353)
20641		224930AB	D(V,67)
20646	BD+66	1675	C
20698	BD+67	1598	C

Table 2 Standard deviations from the mean for different spectral classes

Class	σ_v	#	σ_y	#	σ_u	#
0	.020	20	.016	21	.009	19
B0-B4	.015	2020	.012	2354	.017	2327
B5-B9	.017	1065	.013	1240	.016	1199
A0-A4	.015	1535	.011	1702	.016	1681
A5-A9	.016	743	.012	788	.017	788
F0-F4	.015	931	.011	950	.017	933
F5-F9	.015	860	.010	565	.018	565
G0-G4	.014	1259	.010	1310	.015	1308
G5-G9	.014	663	.011	698	.015	679
K0-K9	.014	2438	.011	2518	.016	2462
M0-M10	.020	515	.015	553	.020	492
RNC	.019	53	.017	69	.018	71
Other	.015	3589	.011	3987	.016	3832
Average	.015	15381	011	16655	.016	16356

Table 3 Standard deviations from the mean for individual Photoelectric Catalogue References

Given in the Table are Reference Number (Ref), the standard deviations found for V, $B-V$, and $U-B$ in units of 1/1000 magnitude, namely σ_v σ_y, and σ_u, respectively. Also given is the number of observations (#) that the standard deviation in V was based on. This number is usually a little less than the number of $B-V$ observations, and greater than the number of $U-B$ observations. The last column refers to notes at the bottom of the table.

Ref	σ_v	σ_y	σ_u	#	Note
1	015	009	014	259	
3	018	013	017	290	
4	017	010	016	64	
6	009	006	009	107	
7	024	015	016	94	
8	015	013	017	92	
9	016	011	018	45	
10	013	007	011	320	
11	013	007	008	43	
12	016	011	012	352	
13	018	010	016	77	
14	029	020	015	9	1
15	016	005	009	16	
16					*2*
17	026	019	015	11	1
18	028	034	026	29	
19	013	010	012	14	1
20	007	007	016	203	
21	012	007	015	76	
22	016	012	015	58	3
24	020	014	019	28	
25	016	018	016	87	
26	028	010	015	35	
28	015	009	011	68	
29	016	003	007	18	
30	025	015	023	15	
32	012	008	007	47	
33	015	013	018	108	
34	023	019	024	189	
36	012	007	016	10	1
39	003	003	015	56	4
40	012	012	022	47	
41	010	009	010	8	1
46 to 47					*2*
48	014	008	022	31	
49	016	012	020	52	
51	007	008	009	30	5
52					*2*
53	015	016	013	37	
54	017	010	014	46	
58 to 59					*2*
60	017	013	017	66	
61	013	011	019	71	
62	006	006	020	72	5
63	017	019	021	40	3
64	019	016	019	43	
65	018	011	014	232	
66	015	011	029	17	
67	020	018	020	34	
68	019	011	015	123	
69	020	015	023	34	
70	023	018	019	37	
71	013	009	018	50	
72	010	006	021	70	
74	013	011	018	125	
75	010	008	016	2654	
76					*2*
77	032	020	014	83	
78	010	009	016	58	
79	014	013	018	140	3
80	014	011	015	242	
81	016	013	019	20	
82					*2*
83	012	009	006	64	
84	015	014	019	109	
85					*2*
86	033	015	018	18	
87					*2*
88	012	009	017	158	
89	014	009	013	54	
90 to 91					*2*
92	014	010	010	43	
93	023	023	028	9	1
94	012	008	013	27	
95	020	018	029	10	1
96	020	017	010	13	1
97	024	012	014	19	
98	010	008	014	60	
99 to 101					*2*
102	017	009	019	32	
103	016	021	013	26	
104	014	008	012	52	
105	019	013	017	8	1
107	008	007	019	13	1
108					*2*
109	014	012	018	45	
110	015	006	007	49	
111 to 112					*2*
116	013	015	018	100	
117	021	016	019	14	1
118	016	014	017	431	
119	024	017	017	157	
120	015	012	017	1169	
121	017	011	011	102	
122	013	009	014	441	
123	025	011	015	9	1
124	018	013	016	12	1
126					*2*
127	014	007	010	92	
129 to 137					*2*
140	006	004	012	13	1
141 to 148					*2*
149	008	010	018	12	1
150 to 153					*2*
159	011	009	022	26	
160	019	011	016	43	
161					*2*
163	011	013	032	10	1
165 to 173					*2*
174	015	020	015	10	
175 to 176					*2*
178	015	015	016	106	
181 to 184					*2*
185	026	019	017	13	1
186 to 191					*2*
192	027	021	020	14	3
193	014	014	017	14	1
194	017	008	017	16	
195	043	025	027	8	1
196	009	014	018	46	
197	021	017	017	173	
198					*2*
199	003	008	020	8	1,3
200 to 201					*2*
202	020	012	016	33	
203	015	016	014	99	
204	016	010	025	17	

Table 3 *(continued)*

Ref	σ_v	σ_y	σ_u	#	Note
205 to 206					*2*
207	015	010	011	32	
208	015	011	017	133	
209 to 210					*2*
211	011	012	027	9	1
212	019	016	017	73	
213 to 217					*2*
218	016	024	016	13	1
219 to 220					*2*
221	023	014	032	7	1
222					*2*
223	015	009	014	32	
224 to 225					*2*
226	011	013	032	10	1
227 to 233					*2*
234	015	017	011	25	
235					*2*
236	014	013	013	14	1
237					*2*
238	023	020	021	7	1
239	018	016	019	73	
240	018	009	014	40	
241 to 250					*2*
251	020	017	018	120	
252	039	021	017	12	1
253					*2*
254	027	020	013	8	1
255					2
256	014	009	016	115	
257					*2*
258	019	014	021	31	
259	011	008	028	18	
260 to 261					*2*
262	012	016	022	9	1
263	018	013	021	13	1
264 to 276					*2*
277	028	015	014	23	
278	020	015	014	7	1
279	016	015	018	34	
280					*2*
281	014	006	011	21	
282 to 285					*2*
286	015	012	022	9	1
287 to 295					*2*
296	014	009	011	69	
297					*2*
298	027	013	018	23	
299	011	007	012	15	
300 to 309					*2*
310	012	012	013	40	
311	016	011	014	119	
312 to 323					*2*
324	021	015	027	10	1
325					*2*
326	018	009	009	43	
327	023	012	019	42	
328 to 330					*2*
331	007	005	017	11	1
323					*2*
333	011	014	013	63	
334 to 340					*2*
341	013	007	021	75	
342 to 350					*2*
351	014	008	018	33	
352					*2*
353	015	012	017	85	
354	007	023	020	31	
355	014	009	016	449	
356 to 358					*2*
359	022	026	017	12	1
360					*2*
361	005	003	017	173	
362	015	010	013	141	
363	014	011	015	768	
364 to 366					*2*
367	029	015	035	14	1
368 to 370					*2*
371	025	017	010	11	1
372	017	006	018	10	1
373					*2*
375	020	011	017	12	1
376 to 377					*2*
378	023	020	023	129	
379	017	016	016	39	
380					*2*
381	018	015	014	54	
382 to 391					*2*
392	007	009	025	10	1
393 to 395					*2*
396	004	004	015		5
397					*2*
398	020	012	018	72	
399	019	006	011	11	1
401 to 402					*2*
403	006	012	009	12	1
404 to 405					*2*
406	013	016	019	13	1
407					*2*
408	020	013	016	43	
409	016	013	011	17	
410 to 413					*2*
414	013	008	000	9	1
415	012	009	019	103	
416	010	007	018	135	
417	015	010	021	57	
418 to 420					*2*
421	021	013	028	31	
422					*2*
423	017	023	031	8	1

Notes to Table 3

1. Less than 15 observations in common, not shown in Figure 2.
2. Less than 6 observations in common.
3. About twice as many *B–V* and *U–B* data as *V* data.
4. Included in another reference.
5. Included in part in another reference.

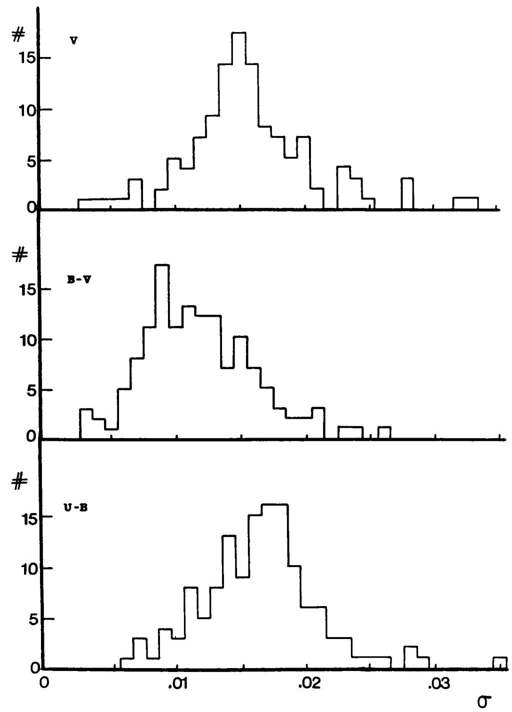

Figure 1 The number of observers having a standard deviation σ in V, $B-V$, and $U-B$, versus σ. Only these observers having 15 or more observations in common with other observers are shown.

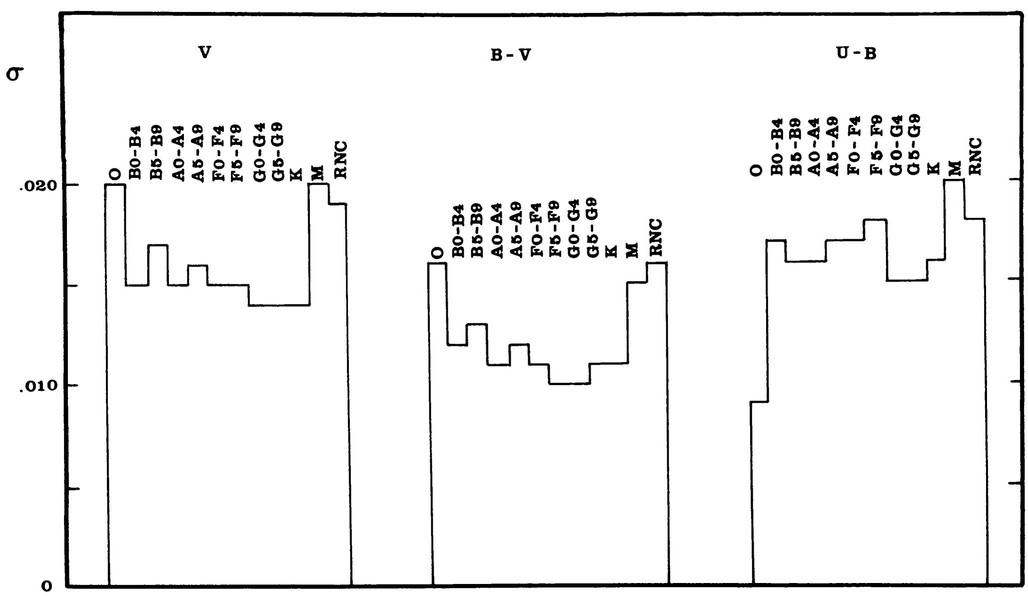

Figure 2 The average standard deviation in V, $B-V$, and $U-B$ as a function of spectral class.