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PART 1 (Catalogue)

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ABSTRACT:

The catalogue contains 4174 stars in the Northern Milky Way, range $32° \leq l^{II} < 214°$, $-10° < b^{II} < +10°$, having the Hα line in emission.

The HBH list (main list, Schmidt camera Hamburg-Bergedorf, red plates taken in the years 1964-70) contains 1979 objects partly identical with those in other lists of Hα emission-line stars given in the literature up till 1994.

Non-stellar objects (e.g. HII regions, planetary nebulae) have not been included in this catalogue except for those objects containing central stars which have the Hα line in emission, and also for some doubtful cases.

The catalogue is divided into two parts:
Part 1 - text, object list with remarks;
Part 2 - finding charts.

In Part 1 we give the equatorial (2000.0) and galactic coordinates, the brightness and the spectrum (if existing in the literature), the membership of HBH, our estimation of continuum and Hα-line intensity, the reference to the finding chart in Part 2 and the cross-identification of 100 lists mostly of Hα emission line stars.

In Part 2 we present the finding charts for more than half of the objects; they have the “normal” orientation and mainly size 7 arcmin square.

At the end we give elementary statistics of the present data showing also gaps in the material.

1) Introduction

Originally we intended to publish a new list of stars having the Hα emission line and being visible on our survey plates taken in the years 1964-70 (HBH stars). We found out that many stars in our list were not new but already known and contained in previous lists given in the literature. The comparison of the HBH list with the already existing lists (not only comparison of the coordinates but also of the charts if possible) was necessary. Moreover we have noticed that several stars appearing in the existing lists are identical with one another. Finally, this catalogue presents not only the HBH list but it also gives cross-identifications. In some doubtful cases we express in the remarks our opinion about the possible identity of the objects. In even more uncertain cases we preferred to leave the respective objects in two separate lines hoping that either detailed comparison or future investigation would decide about their possible identity.

In Section 6 we give a brief statistics of the presented data. We would also like to point out the existent gaps in the material, e.g. not-measured brightnesses or missing spectral classifications.

The existing old catalogues of early-type emission line stars (Bertiau, McCarthy, 1969; Wackerling, 1970; Jaschek et al., 1971) were useful for our present publication.

We hope that the main data, the given cross-identifications and the finding charts will be of use for further investigations of these interesting stars. This is the main purpose of the present catalogue.

2) Scope of the Catalogue and General Remarks

The catalogue contains stars in the Northern Milky Way having the Hα line in emission. The range is $32° \leq l^{II} < 214°$ and $-10° < b^{II} < +10°$. The Schmidt camera (80/120, f = 240 cm; 4°-Prism, dispersion 1590 A/mm at Hα) of the Hamburg Observatory in Bergedorf was used. The plates, Kodak 103a-E + Schott RG1, exp. 60 min., widening $10''$ in RA, were taken by one author (L.K.) in the years 1964-1970. Within the framework of the programme "Hamburg Schmidt-camera Survey of faint Planetary Nebulae" he classified 154 planetary nebulae (K3-) or possible planetary nebulae (K4-) according to the presence of the Hα emission line and the absence of a continuous spectrum in the red (Kohoutek, 1965, 1969, 1972). Unfortunately, no spectra in the blue region were available, so that many of these objects turned out to be not planetary nebulae but mainly various Hα emission-line stars (Kohoutek, 1978, 1989, 1992).

The plates with the parameters described above are the main plate material used in this catalogue - they are named for brevity "Hα-plates". They were taken in 166 fields (one field covers about 25 sq. degrees) along the galactic equator, in RA between $18^h58.5^m$ and $7^h02.0^m$ and in Decl. between $-2.5°$ and $+72.5°$. The centres of the fields are given in Kohoutek (1965, 1969, 1972). All stars having the Hα line in emission (given in various lists in Table 1) were inspected not only on the Hα-plates, but partly also on short exposed spectral red plates existing in the archives of the observatory. These plates were taken either in Hamburg-Bergedorf, or later at the German-Spanish Astronomical Centre, Calar Alto, Spain, using the same Schmidt camera.

It is difficult to give the limiting magnitude of the catalogue. The presence or not of a star in the catalogue depends strongly on the contrast between the Hα emission line and the surrounding continuous spectrum. We hope that this catalogue is complete to about 13 mag (pv); nevertheless we have listed many stars (1107 stars, which is about 26% of the catalogue) having pv brightness fainter than that limit.

The spectral types of the Hα emission-line stars are very diverse (see Sec. 6). The spectral type was not a criterium for including the stars in the catalogue.

There are altogether 1979 HBH stars, 1570 of which are identical with the stars given in Table 1, and 409 are the new Hα em. line stars. 841 HBH stars have a spectral classification, 1138 stars were not classified. The brightness of the stars was estimated using the strength of the continuous spectrum. The following mean visual magnitudes m(e) and their mean errors were derived by us for HBH stars from either photoelectric (weight 3) or photovisual (weight 1) measurements of other authors:

cont.	m(e) [mag]	m.e. [mag]	n
a	15.09	±0.21	28
b	13.58	0.09	80
c	12.47	0.08	116
d	11.05	0.07	175

(n - number of stars)

We used these values in MAG as a rough estimate of the brightness of the remaining HBH stars.

The equatorial coordinates are given in different accuracy and were mostly taken from the literature. The authors together with their collaborators measured the positions of numerous HBH stars and improved the coordinates of some other objects (altogether about 1550 stars).

For easier identification we present the rectangular coordinates measured in mm on POSS O-charts for HBH stars (except of BD stars) as well as for some other objects, for example 600000 216 192 means $+60°$, 00^h 00^m, x = 216 mm, y = 192 mm.

The given brightnesses and spectral types were extracted from the literature and are only of informative character. We used especially the catalogues of Mermilliod and Mermilliod (1994) and of Buscombe (1980-1995).

We would like to emphasize that our references to the literature used are given in **two places**: concerning new objects in Tables 1, 2 and 3; general references to the text as well as to the individual stars in Remarks at the end of this catalogue.

3) Stars Included and Omitted

All stars with the Hα line in emission having been listed up till the end of 1994 are included in the catalogue. There are eight main lists (columns B2, B4-B10; see Section 4 for description) and 91 short lists (B11 and in "remarks") which give a cross-identification as well as an identification with HBH stars (column A9). The abbreviations used and the corresponding references can be found in **Table 1** (Sources included). Altogether 7970 entries of stars having the Hα emission line are in various lists, which means that each star of the present catalogue (n=4174) appears in about 1.9 lists in the average.

There are further 11 lists which were omitted for various reasons. The main reason was that some of these had been replaced later by corrected definitive lists, e.g. we omitted the lists of Dolidze (1959-60) and included only his definitive general list D (1975). **Table 2** (Sources omitted) gives the omitted lists.

We omitted non-stellar objects with the Hα line in emission. These are mainly HII regions as well as planetary nebulae. We used the following catalogues: Maršálková (1974) for HII regions; Perek, Kohoutek (1967 - CGPN) as well as Acker et al. (1992 - SECGPN) for planetary nebulae. In doubtful cases (compact HII regions, star-like planetary nebulae) we included them in the HBH list as suspected members (S). For stars in the clusters and associations the standard catalogue was that of Alter, Balázs and Ruprecht (1970).

We were not able to find 18 stars having the Hα emission line as given in the literature. The stars were

1. not visible (perhaps novae?), or
2. with very uncertain coordinates and without charts, or
3. without coordinates at all, or
4. having a discrepancy between the coordinates and the charts (errors?).

The list of such stars is given in **Table 3** (Stars not found).

The list of HBH stars (Hamburg-Bergedorf stars having Hα in emission) is the product of a visual inspection of spectral plates taken with the Schmidt camera in the red region of the spectrum. The HBH numbers contain the declination zone, the number of the field in the zone and the running number of the object (e.g. 3207-53 means +32.5° in the declination, field No.7 and object No.53). As the plates are approximately of 5 degrees x 5 degrees, the declination zones in the neighbourhood of this field are +27.5° and +37.5°, respectively. The letter "S" (suspected) added to the number expresses our doubts concerning

a) the reality of the Hα emission line,
b) the "star-like" appearance of the object.

The HBH numbers are given in column A9 (see Section 4). We estimated the intensity of the Hα em. line (1: very faint,... 5: overexposed) and the strength of the continuous spectrum (−: invisible or very faint,.. D: overexposed). Our estimates are given in A10 (SC). They depend on the exposure-time of the respective plate: for the classification of the spectrum we used mainly the "standard" exposure 60 min., sometimes also other long exposed plates (at least exp. 30 min. and at most exp. 75 min. at Calar Alto). If the Hα emission line was visible only on short-exposed plates, the classification was considered to be unreliable in the adopted system and "−−" is given in A10.

Table 1. Sources included

Notation:	References:
AJD	Hardie, R.H., Seyfert, C.K., Gulledge, I.S.: 1960, ApJ 132, 361.
ANDREWS (1968)	Andrews, P.J.: 1968, Mem. RAS 72, 35.
ANDRILLAT et al. (1986)	Andrillat, Y., Jaschek, M., Jaschek, C.: 1986, A&AS 65, 1.
AP 3	Apriamashvili, S. P.: 1962, Astron. Tsirk. No.232, 3.
ARKHIPOVA et al. (1976)	Arkhipova, V.P., Dokuchaeva, O.D., Saveleva, M.V.: 1976, Pis'ma Astron. Zh. 2, 122; English translation Sov. Astron. Lett. 2, 47.
BD, HD (numerous stars)	Jaschek, M., Egret, D.: 1987, Catalog of Be Stars, Centre de Données Stellaires, Strasbourg (magnetic tape, Version 1987); See also: IAU Symp. No.98 (1982), p. 261 (eds. M. Jaschek, H.-G. Groth), D. Reidel Publ. Co., Dordrecht, Boston, London.
BH	Tsvetkov, M.K.: 1975, Astrofiz. 11, No.4, 579; English translation Astrophys. 11, 389.
BID 1001-1685	Bidelman, W.P.: 1954, ApJS I, No.7, 175, Table 1
2001-2109	ibid., Table 2
3001-3016	ibid., Table 3
4001-4049	ibid., Table 4
5001-5023	ibid., Table 5
6001-6009	ibid., Table 6
7001-7074	ibid., Table 7
8001-8067	ibid., Table 8
9001-9035	ibid., Table 9
10001-10008	ibid., Table 10
11001-11039	ibid., Table 11
BIDELMAN (1965)	Bidelman, W.P.: 1965, PASP 77, 388.
BIDELMAN (1981)	Bidelman, W.P.: 1981, PASP 93, 129.
BLANCO (1962)	Blanco, V.M.: 1962, PASP 74, 330.
BLANCO, FITZGERALD (1964)	Blanco, V.M., FitzGerald, M.P.: 1964, PASP 76, 438.
BONSACK, GREENSTEIN (1960)	Bonsack, W.K., Greenstein, J.L.: 1960, ApJ 131, 83.
BOPP, TALCOTT (1978)	Bopp, B.W., Talcott, J.C.: 1978, AJ 83, 1517.
BOULON et al. (1974)	Boulon, J., Doazan, V., Letourneur, N.: 1974, A&A 33, 473.
CALVET, COHEN (1978)	Calvet, N., Cohen, M.: 1978, MNRAS 182, 687.
CGH	McCarthy, M.F.: 1976, Vatican Obs. Publ. 1, No.7, 213.
CHARGEISHVILI (1988)	Chargeishvili, K.B.: 1988, Bull. Abastumani AO No.66, 19.

Table 1. (continued)

Notation:	References:
COHEN (1976)	Cohen, J.G.: 1976, ApJ 203, L127.
COHEN, KUHI (1979)	Cohen, M., Kuhi, L.V.: 1979, ApJS 41, 743.
COHEN et al. (1983)	Cohen, M., Aitken, D.K., Roche, P.F., Williams, P.M.: 1983, ApJ 273, 624.
D	Dolidze, M.V.: 1975, Bull. Abastumani AO No.47, 3.
DIBAI (1969)	Dibai, E.A.: 1969, Astrofiz. 5, 249; English translation Astrophys. 5, 115.
DIBAI, ESIPOV (1968)	Dibai, E.A., Esipov, V.F.: 1968, Astron. Zh. 45, 566; English translation Soviet Astron. 12, No.3, 448.
DOAZAN et al. (1977)	Doazan, V., Bourdonneau, B., Letourneur, N.: 1977, A&A 56, 481.
DOKUCHAEVA (1978)	Dokuchaeva, O.D.: 1978, Astron. Tsirk. No.983, 3.
DOKUCHAEVA et al. (1976)	Dokuchaeva, O.D., Balazs, Vizi : 1976, IAU Circ. No.2995.
DOLIDZE (1959)	Dolidze, M.V.: 1959, Bull. Abastumani AO No.24, 7.
DOLIDZE (1960a)	Dolidze, M.V.: 1960, Bull. Abastumani AO No.25, 105.
DOLIDZE (1960b)	Dolidze, M.V.: 1960, Astron. Tsirk. No.211, 23.
DOLIDZE (1960c)	Dolidze, M.V.: 1960, Bull. Abastumani AO No.25, 111.
DOLIDZE (1960d)	Dolidze, M.V.: 1960, Astron. Tsirk. No.213, 12.
DOLIDZE (1971)	Dolidze, M.V.: 1971, Astron. Tsirk. No.629, 6.
DOLIDZE (1975a)	Dolidze, M.V.: 1975, Bull. Abastumani AO No.47, 145.
DOLIDZE et al. (1965)	Dolidze, M.V., Apriamashvili, S.P., Jimsheleishvili, G.N.: 1965, Astron. Tsirk. No.340, 3.
DOLIDZE et al. (1977)	Dolidze, M.V., Dokuchaeva, O.D., Kimeridze, G.N.: 1977, Astron. Tsirk. No.943, 1.
DP	Dolidze, M.V., Ponomareva, G.A.: 1965, Astron. Zh. 42, 205; English translation Soviet Astron. 9, No.1, 157.
DV	Dolidze, M.V., Vyasovov, V.V.: 1959, Bull. Abastumani AO No.24, 3.
FEIGELSON, KRISS (1981)	Feigelson, E.D., Kriss, G.A.: 1981, ApJ 248, L35.
GOODRICH (1987)	Goodrich, R.W.: 1987, PASP 99, 116.
GRASDALEN et al. (1973)	Grasdalen, G.L., Kuhi, L.V., Harlan, E.A.: 1973, PASP 85, 193.
GREENSTEIN, GICLAS (1978)	Greenstein, J.L., Giclas, H.: 1978, PASP 90, 460.
HAENNI (1981)	Hänni, U.: 1981, Publ. Tartu AO 48, 100.
HBC	Herbig, G.H., Bell, K.R.: 1988, Lick Obs. Bull. No. 1111.
HE 3	Henize, K.G.: 1976, ApJS 30, 491.
HERMAN, DUVAL (1962)	Herman, R., Duval, M.M.: 1962, Annd'Ap 25, 9.
HI	Hiltner, W.A.: 1956, ApJS Vol.2, No.24, 389.
HUENEMOERDER, BARDEN (1986)	Huenemoerder, D.P., Barden, S.C.: 1986, AJ 91, 583.

Table 1. (continued)

Notation:	References:
IRVINE (1975)	Irvine, N.J.: 1975, ApJ 196, 773.
IRVINE (1986)	Irvine, C.E.: 1986, IAU Circ. No.4286.
IRVINE (1990)	Irvine, N.J.: 1990, PASP 102, 669.
KAZARYAN (1976)	Kazaryan, M.A.: 1976, Astrofiz. 12, No.2, 385; English translation Astrophys. 12, 238.
KP	Kazaryan, M.A., Parsamyan, E.S.: 1971, Astrofiz. 7, No.4, 671; English translation Astrophys. 7, 401.
KKT	Kazaryan, M.A., Kazaryan, E.S., Terzyan, A.: 1976, Astrofiz. 12, No.1, 27; English translation Astrophys. 12, 19.
KUV	Wegner, G., Swanson, S.R.: 1990, AJ 100, 1274.
LICK	Becker, R.H., White, R.L.: 1988, ApJ 324, 893.
LKCA	Herbig, G.H., Vrba, F.J., Rydgren, A.E.: 1986, AJ 91, 575.
LKH 1-84	Herbig, G.H.: 1954, ApJ 119, 483.
101	Herbig, G.H.: 1956, PASP 68, 353.
120,274	Herbig, G.H.: 1962, Adv. Astron. Astrophys. 1, 47.
131-195	Herbig, G.H.: 1958, ApJ 128, 259.
196-234	Herbig, G.H.: 1960, ApJS 4, 337.
235-257	Herbig, G.H.: 1960, ApJ 131, 516.
259	Herbig, G.H.: 1961, ApJ 133, 337.
321-350	Herbig, G.H., Rao, N.K.: 1972, ApJ 174, 401.
360-377	Marcy, G.W.: 1980, AJ 85, 230.
LS I	Hardorp, J., Rohlfs, K., Slettebak, A., Stock, J.: 1959, Luminous Stars in the Northern Milky Way I., Hamburg-Bergedorf; Supplement to LS I: Voight, H.H., 1965, Hα Emission of LS I.
II	Stock, J., Nassau, J.J., Stephenson, C.B.: 1960, Luminous Stars in the Northern Milky Way II., Hamburg-Bergedorf.
III	Hardorp, J., Theile, I., Voigt, H.H.: 1964, Luminous Stars in the Northern Milky Way III., Hamburg-Bergedorf.
IV	Nassau, J.J., Stephenson, C.B.: 1963, Luminous Stars in the Northern Milky Way IV., Hamburg-Bergedorf.
V	Hardorp, J., Theile, I., Voigt, H. H.: 1965, Luminous Stars in the Northern Milky Way V., Hamburg-Bergedorf.
VI	Nassau, J.J., Stephenson, C.B., MacConnell, D.J.: 1965, Luminous Stars in the Northern Milky Way VI., Hamburg-Bergedorf.

Table 1. (continued)

Notation:	References:
LSS	Stephenson, C.B., Sanduleak, N.: 1971, Publ. Warner & Swasey Obs. Vol.1, No.1.
MAC	MacConnell, D.J.: 1968, ApJS 16 (No.147), 275.
MAC 3	MacConnell, D.J.: 1981, A&AS 44, 387.
MAC 4	MacConnell, D.J.: 1982, A&AS 48, 355.
MANOVA (1959)	Manova, G.A.: 1959, Astron. Zh. 36, 187; English translation Sov. Astron. AJ 3, 188.
MB	Morgan, W.W., Bidelman, W.P.: 1946, ApJ 103, 378.
MC	Cohen, M., Kuhi, L.V.: 1976, ApJ 210, 365.
McCARTHY, TREANOR (1965)	McCarthy, M.F., Treanor, P.J.: 1965, Ric. Astron. 7, No.3, 177.
MH-ALPHA	Joy, A.H.: 1949, ApJ 110, 424.
MSM	Melikian, N.D., Shevchenko, V.S., Melnikov, S.Yu.: 1987, I.B.V.S. Budapest No.3073.
MWC 1-416	Merrill, P.W., Burwell, C.G.: 1933, ApJ 78, 87.
417-666	Merrill, P.W., Burwell, C.G.: 1943, ApJ 98, 153.
667-1088	Merrill, P.W., Burwell, C.G.: 1949, ApJ 110, 387; also ApJ 111 (1950), 666.
AS 1-519	Merrill, P.W., Burwell, C.G.: 1950, ApJ 112, 72.
AS 520,521	Miller, W.C., Merrill, P.W.: 1951, ApJ 113, 624.
NASSAU, STEPHENSON (1961)	Nassau, J.J., Stephenson, C.B.: 1961, ApJ 133, 920.
NASSAU et al. (1964)	Nassau, J.J., Stephenson, C.B., Caprioli, G.: 1964, ApJ 139, 864.
OGURA, HASEGAWA (1983)	Ogura, K., Hasegawa, T.: 1983, PASJ 35, 299.
PERRAUD (1961a)	Perraud, H.: 1961, J. Obs. 44, 149.
PERRAUD (1961b)	Perraud, H.: 1961, J. Obs. 44, 247.
PERRAUD, PELLETIER (1959)	Perraud, H., Pelletier, B.: 1959, J. Obs. 42, 142.
PETERSON (1982)	Peterson, R.C.: 1982, ApJ 258, 499.
RAZMADZE (1960)	Razmadze, N.A.: 1960, Bull. Abastumani AO No. 25, 119.
RJ	Robertson, T.H., Jordan, T.M.: 1989, AJ 98, 1354.
RNO	Cohen, M.: 1980, AJ 85, 29.
ROSENDHAL (1973)	Rosendhal, J.D.: 1973, ApJ 186, 909.
SANDULEAK (1990)	Sanduleak, N.: 1990, AJ 100, 1239.
SB	Sanduleak, N., Bidelman, W.P.: 1980, PASP 92, 72.
SCUDERI et al. (1990)	Scuderi, S., Bonanno, G., Spadaro, D., Panagia, N.: 1990, in Boulder-Munich Workshop “Properties of Hot Luminous Stars” (ed. C.D. Garmany), p. 253, ASP Conference Series Vol. 7.
SEYFERT, POPPER (1941)	Seyfert, C.K., Popper, D.M.: 1941, ApJ 93, 461.
SMOLINSKI (1971)	Smolinski, J.: 1971, in Colloquium on Supergiant Stars, ed. M. Hack, Osserv. Astron. di Trieste, Trieste, p. 68.

Table 1. (continued)

Notation:	References:
SR	Schild, R., Romanishin, W.: 1976, ApJ 204, 493.
SS	Stephenson, C.B., Sanduleak, N.: 1977, ApJS 33, 459.
STEPHENSON (1966)	Stephenson, C.B.: 1966, AJ 71, 477.
STEPHENSON (1986)	Stephenson, C.B.: 1986, ApJ 300, 779.
TON G1 1-192	González, G., González, G.: 1954, Bol. Obs. Tonantz. & Tacub. 1, No.9, 3.
G1 193-411	González, G., González, G.: 1956, Bol. Obs. Tonantz. & Tacub. 2, No.14, 19.
G3	González, G., González, G.: 1956, Bol. Obs. Tonantz. & Tacub. 2, No.15, 16.
H1	Haro, G., Iriarte, B., Chavira, E.: 1953, Bol. Obs. Tonantz. & Tacub. 1, No.8, 3.
I1	Iriarte, B., Chavira, E.: 1954, Bol. Obs. Tonantz. & Tacub. 2, No.11, 27. (Table I)
I2	Iriarte, B., Chavira, E.: 1954, Bol. Obs. Tonantz. & Tacub. 2, No.11, 27. (Table II)
I4	Iriarte, B., Chavira, E.: 1955, Bol. Obs. Tonantz. & Tacub. 2, No.13, 12. (Table II)
I5	Iriarte, B., Chavira, E.: 1955, Bol. Obs. Tonantz. & Tacub. 2, No.13, 19. (Table I)
I6	Iriarte, B., Chavira, E.: 1955, Bol. Obs. Tonantz. & Tacub. 2, No.13, 19. (Table II)
I7	Iriarte, B., Chavira, E.: 1956, Bol. Obs. Tonantz. & Tacub. 2, No.14, 31.
I8	Iriarte, B., Chavira, E.: 1955, Bol. Obs. Tonantz. & Tacub. 2, No.13, 12. (Table III)
M2	Münch, L.: 1953, Bol. Obs. Tonantz. & Tacub. 1, No.7, 23.
TSVETKOVA, TSVETKOV (1982)	Tsvetkova, K.P., Tsvetkov, M.K.: 1982, I.B.V.S. Budapest No.2134.
UH	Welin, G.: 1973, A&AS 9, 183; see also 1975, Astrofiz. 11, No.2, 261; English translation Astrophys. July 1976, 176.
VARIABLE STARS (GCVS)	Kholopov, P.N. (ed.) et al., Samus', N.N. (ed.) et al.: 1985-1990, General Catalogue of Variable Stars (4th edition), I.-IV., Moscow," Nauka".
VAR. STARS SUSPECTED (NSV)	Kholopov, P.N. (ed.) et al.: 1982, New Catalogue of Suspected Variable Stars, Moscow," Nauka".
VES 1-132	Coyne, G.V., Lee, T.A., De Graeve, E.: 1974, Vatican Obs. Publ. 1, No.5, 181. (Part I)
133-249	Coyne, G.V., Wisniewski, W., Corbally, C.: 1975, Vatican Obs. Publ. 1, No.6, 197. (Part II)

Table 1. (continued)

Notation:	References:
250-324	Wisniewski, W., Coyne, G.V.: 1976, Vatican Obs. Publ. 1, No.8, 225. (Part III)
325-419	Wisniewski, W., Coyne, G.V.: 1977, Vatican Obs. Publ. 1, No.11, 245. (Part IV)
596-680	Coyne, G.V., Wisniewski, W., Otten, L.B.: 1978, Vatican Obs. Publ. 1, No.12, 257. (Part V) See also: MacConnell, D.J., Coyne, G.V.: 1983, Vatican Obs. Publ. 2, No.5, 63. (Revised Catalogue of Parts I-V)
681-977	Coyne, G.V., MacConnell, D.J.: 1983, Vatican Obs. Publ. 2, No.6, 73. (Final Zones)
WALTER (1992)	Walter, F.M.: 1992, PASP 104, 508.
XUEFU, HUISONG (1984)	Xuefu, L., Huisong, T.: 1984, I.B.V.S. Budapest No.2606.

Table 2. Sources omitted

References:

Dolidze, M.V., Vyasovov, V.V.: 1959, Bull. Abastumani AO No.24, 3; except 17 stars. *)
Dolidze, M.V.: 1959, Bull. Abastumani AO No.24, 7; except 31 stars. *)
Dolidze, M.V.: 1960a, Bull. Abastumani AO No.25, 105; except 7 stars. *)
Dolidze, M.V.: 1960b, Astron. Tsirk. No.211, 23; except 2 stars. *)
Dolidze, M.V.: 1960c, Bull. Abastumani AO No.25, 111; except 29 stars. *)
MacConnell, D.J.: 1968, ApJS 16, No.147, 275.: Table 4B except sH15.
Razmadze, N.A.: 1960, Bull. Abastumani AO No.25, 119; except No.1, 2, 22, 27, 35. **)
Tsvetkov, M.K., Tsvetkova, K.P.: 1978, I.B.V.S. Budapest No.1447.
Tsvetkova, K.P., Tsvetkov, M.K.: 1982, I.B.V.S. Budapest No.2134; except star No.15.
Uranova, T.A.: 1958, Publ. Astron. Inst. Sternberg (Moscow) 29, 71.
Welin, G.: 1979, Astrofiz. 15, No.4, 712; English translation Astrophys. 15, No.4, 467.

*) See: Dolidze, M.V.: 1975, Bull. Abastumani AO No.47, 3.
**) These stars are already listed in other sources.

Table 3. Stars not found

Star:	References and remarks:
Chargeishvili (1988), No.22	Chargeishvili, K.B.: 1988, Bull. Abastumani AO No. 66, 19; not visible
Chargeishvili (1988), No.36	ibid.
Chargeishvili (1988), No.72	ibid.
Chargeishvili (1988), No.77	ibid.
D 02-111	Dolidze, M.V.: 1975, Bull. Abastumani AO No.47, 3.
D 05-132	ibid.
D 06-005	ibid.
D 22-130	ibid.
D 23-012	ibid.
G1,280	González, G., González, G.: 1956, Bol. Obs. Tonantz. & Tacub. 2, No.14, 19.
G3,57	González, G., González, G.: 1956, Bol. Obs. Tonantz. & Tacub. 2, No.15, 16.
I6,78	Iriarte, B., Chavira, E.: 1955, Bol. Obs. Tonantz. & Tacub. 2, No.13, 19. (Table II)
LKH 199	Herbig, G.H.: 1960, ApJS 4, 337; both coordinates and chart are missing.
MWC AS 324	Merrill, P.W., Burwell, C.G.: 1950, ApJ 112, 72.
VES 696	Coyne, G.V., MacConnell, D.J.: 1983, Vatican Obs. Publ. 2, No.6, 73. (Final Zones)
VES 736	ibid.
VES 812	ibid.
VES 815	ibid.

4) Description of the Catalogue (Object List, Remarks)

The object list and remarks contain the following columns:

LEFT SIDE (A):

Column	Name	Description
A1	NO	Running line number of stars on pages 1 - 70;
A2,3	RA DECL	Equatorial coordinates (equ. 2000.0) given in four categories which correspond to the following accuracy of RA and DECL: a) $\pm 0.01^s$ $\pm$ 0.1$''$ b) $\pm 0.1^s$ $\pm$ 1$''$ c) $\pm 1^s$ $\pm$ 0.1$'$ d) $\pm 0.1^m$ $\pm$ 1$'$
A4,5	LII,BII	Galactic coordinates given in 0.01°;
A6	MAG	Brightness (in 0.1 mag) and colour system given in the literature: (blank) photoelectric in the V system, B photoelectric in the B system, v visual or photovisual, p photographic, r red or photored, m spectral region not known, e estimated on our Schmidt-camera plates (A10) according to the classification of the spectra of HBH stars (see Section 2); V following the magnitude means variable star; the given brightness corresponds to that of the maximum. We confirmed the variability of many stars and found several new variable stars. : uncertain magnitude;
A7	SP	Spectrum given in the literature; r at the end of the column refers to the remark (the brightness or the spectrum);
A8	POSS	POSS O–chart on which the x, y coordinates have been measured; x-coordinate in mm measured from the left inner edge of the black border line; y-coordinate in mm measured from the lower inner edge of the black border line;
A9	HBH	Hamburg-Bergedorf star having the Hα line in emission, S (not part of the designation) – star having a suspected Hα emission line or perhaps a non-stellar object. There are two reasons for a designation as "suspected": a) the contrast between the Hα emission line and the continuum in the neighbourhood is small, b) the object may not be a stellar one: e.g. the object is a compact HII region, a knot of the large HII region or a planetary nebula;

A10	SC	Classification of the spectrum of HBH stars on the Schmidt camera long-exposed (⩾30 min) red plates. Hα emission line is: 1 - very faint, 2 - faint, 3 - moderate, 4 - strong, 5 - overexposed; continuum is: – - invisible or very faint, A - faint, B - moderate, C - strong, D - overexposed, – – - no classification of the spectrum in the above system possible, mainly because Hα emission line visible on short-exposed (<30 min) plates only, or because of variability;
A11	C	Existence of the finding chart in Part 2: 1 - one chart, 2 - two charts. See the range of RA given on Plates.

RIGHT SIDE (B):

Column	Name	Description
B1	NO	Running line number of stars on pages 1 - 70;
B2	HD	Star number in Henry Draper Catalogue or its Extensions (n=681);
B3	NAME	Name of the star (name of the variable);
B4	BD	Star number in Bonner Durchmusterung (n=1002);
B5	MWC	Star number in Mount Wilson Catalogue or in Additional Stars (Burwell, Merrill, Miller: 1933-51; n=905); AS: star number in lists of Additional Stars to MWC;
B6	LS	Star number in the catalogue “Luminous Stars in the Northern Milky Way” (Hardorp, MacConnell, Nassau, Rohlfs, Slettebak, Stephenson, Stock, Thiele, Voigt: 1959-65; n=1006);
B7	BID	Star number in Bidelman (1954) (n=154);
B8	HE3	Star number in Henize (1976) (n=180);
B9	TON	Star number in the lists of Tonantzintla and Tacubaya Observatory (Chavira, Gonzales, Haro, Iriarte, Münch: 1953-56; n=701);
B10	VES	Star number in the catalogue of the Vatican Observatory (Corbally, Coyne, De Graeve, Lee, MacConnell, Otten, Wisniewski: 1977-83; n=491);
B11	OTHER	Star number in further 91 lists of stars having Hα line in emission (n=1525);
B12	R	Existence of remarks is denoted by * .

REMARKS (C):

Column	Name	Description
C1	RA	Right ascension (equ. 2000.0) in accuracy which corresponds to A2, of the star to which the remark refers.
C2	NO	Running line number of the star with the RA given on the pages A and B respectively to which the remark refers;
C3	REM	The remark contains further discovery numbers, information on the brightness and the spectrum (see "r" in A7) and general information on the star. If the remark exceeds a line, the letter C appears at the end of a corresponding line.

5) Finding Charts

The finding charts were generally reproduced from the blue (O) prints of the National Geographic Society - Palomar Observatory Sky Survey (POSS). Occasionally, the red (E) print was used when the respective object was invisible or too faint on the blue print. This is explicitly mentioned in the remark referring to the object.

Some objects lie in nebulae so that the POSS prints are too dark. In these cases we used the plates which were taken with the Schmidt camera (80/120, f=240 cm) or occasionally with other cameras of the Hamburg Observatory, mostly in the blue spectral region (never in the red).

The charts have normal orientation, North is at the top and East to the left; the size of the charts is 7 arcmin square (scale about 1mm = 12 arcsec); an exceptional deviation from this scale is indicated by the respective bar. The charts are displayed on Plates 1 to 102 in Part 2 of the catalogue.

The majority of the objects is marked on small charts (20 charts per plate). If appropriate, two or more small charts have been put together either with the same scale or indicated by a bar. In 11 cases of large charts (Plates 100-102) the scale is different from the standard one and is also indicated by a bar.

The finding charts are given for 2307 objects which is more than half of the objects of the catalogue. We present the finding charts of all HBH stars except of those which are BD stars. We also marked objects given in other lists which occur on charts with HBH stars. In these cases the HBH stars were usually indicated only by arrows, without numbers. We also give for convenience some charts of stars from other than HBH lists. In the catalogue, column A11, the stars with finding charts are indicated: 1 – one finding chart (n=2284), 2 – two finding charts (n=23). The finding charts are given in order of RA (2000.0); the range of RA in hours and minutes is written on plates 1-100. Plates 100, 101 and 102 give mostly additional large charts of 11 objects lying in dense fields - the presence of these charts is noted in the remarks to the respective objects. The clear identification of all marked objects was of course our highest aim.

The identification charts are published with the permission of Palomar Observatory/California Institute of Technology.

6) Elementary Statistics

Distribution on the Celestial Sphere

We have divided the stars of the catalogue into two groups:
a) early-type stars (spectral types O, B, OB and WR; n=1662);
b) late-type stars (spectral types A and later; n=580).
The distribution of the stars in longitude (stars having different latitudes were collected together) is visible in **Figs.1a** (early-type) and **1b** (late-type); the distribution of the stars in latitude (stars having different longitudes were collected together) is in **Figs.2a** (early-type) and **2b** (late-type).

The presence of the Perseus spiral arm is reflected in the l-distribution of early-type stars in Fig.1a (l^{II} from 70° to 140°). Moreover the observed increase of Hα emission-line stars near 80° and 130°-135° corresponds to the known increase of OB stars as well as to the presence of young open clusters projected onto the galactic plane in these longitudes. There are altogether 31 OB associations in our range of longitudes and latitudes, strongly concentrated towards the galactic equator. Some of the associations which correspond to the peaks are marked in the figure. Our figure is similar to that given by Wackerling (1970) in his "Catalogue of Early-Type Stars whose Spectra have Shown Emission Lines".

As to the l-distribution of late-type stars (Fig.1b): our distribution presents "a mixture" of giant and dwarf stars of very different spectral types, so that a comparison with the distribution given in the literature is not possible. The observed peaks correspond more or less to the star clouds in the Milky Way and are associated with the following regions: $l^{II} \approx 75°$ (Cygnus), 86° (Cygnus, NGC 7000), 119°-133° (Cassiopeia), 203° (Monoceros, NGC 2264). The l-distributions of both types are very different from one another.

The distributions of stars in latitude (Figs.2a and 2b) show significant differences too: the b-distribution is
a) shifted to negative latitudes,
b) more concentrated towards the galactic equator
for early-type stars compared with late-type stars. Especially the difference in the concentration is conspicuous: in the central region $-5° < b^{II} < +5°$ the fraction of early-type stars is 87.0% whereas it is only 78.4% of late-type stars.

We do not believe that the difference of the distributions between the early-type and the late-type stars is influenced by the very different numbers of stars in each group (approximately 3:1). Nevertheless, the scatter of the distributions of the late-type stars is larger than that of the early-type stars.

Stars in Clusters

There are 339 stars in or near 50 open clusters and 1 globular cluster in our region (n - number of stars):

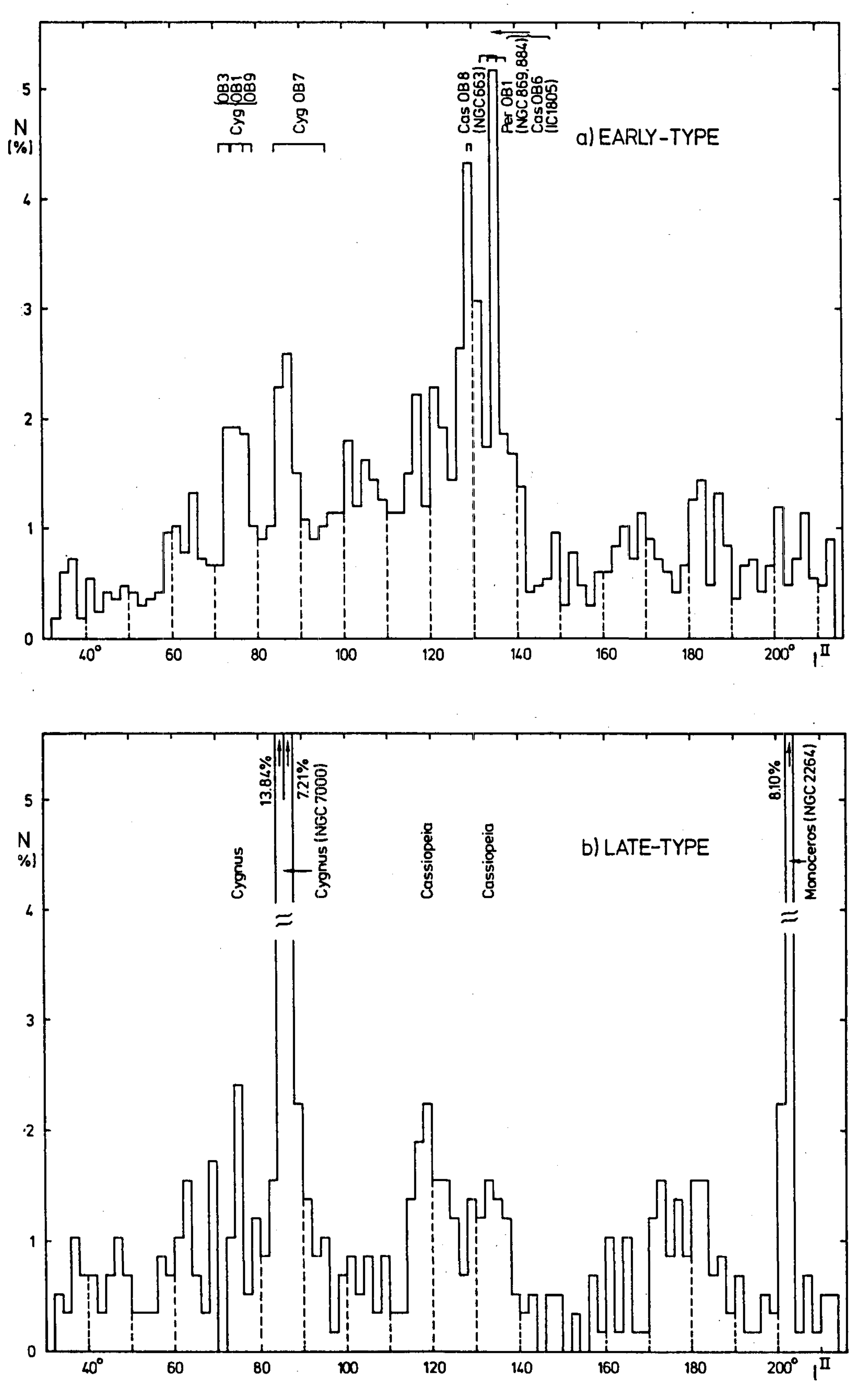

Fig.1 The relative distribution of the stars (N - number given in % of the whole sample) in longitude: a) early-type stars, b) late-type stars.

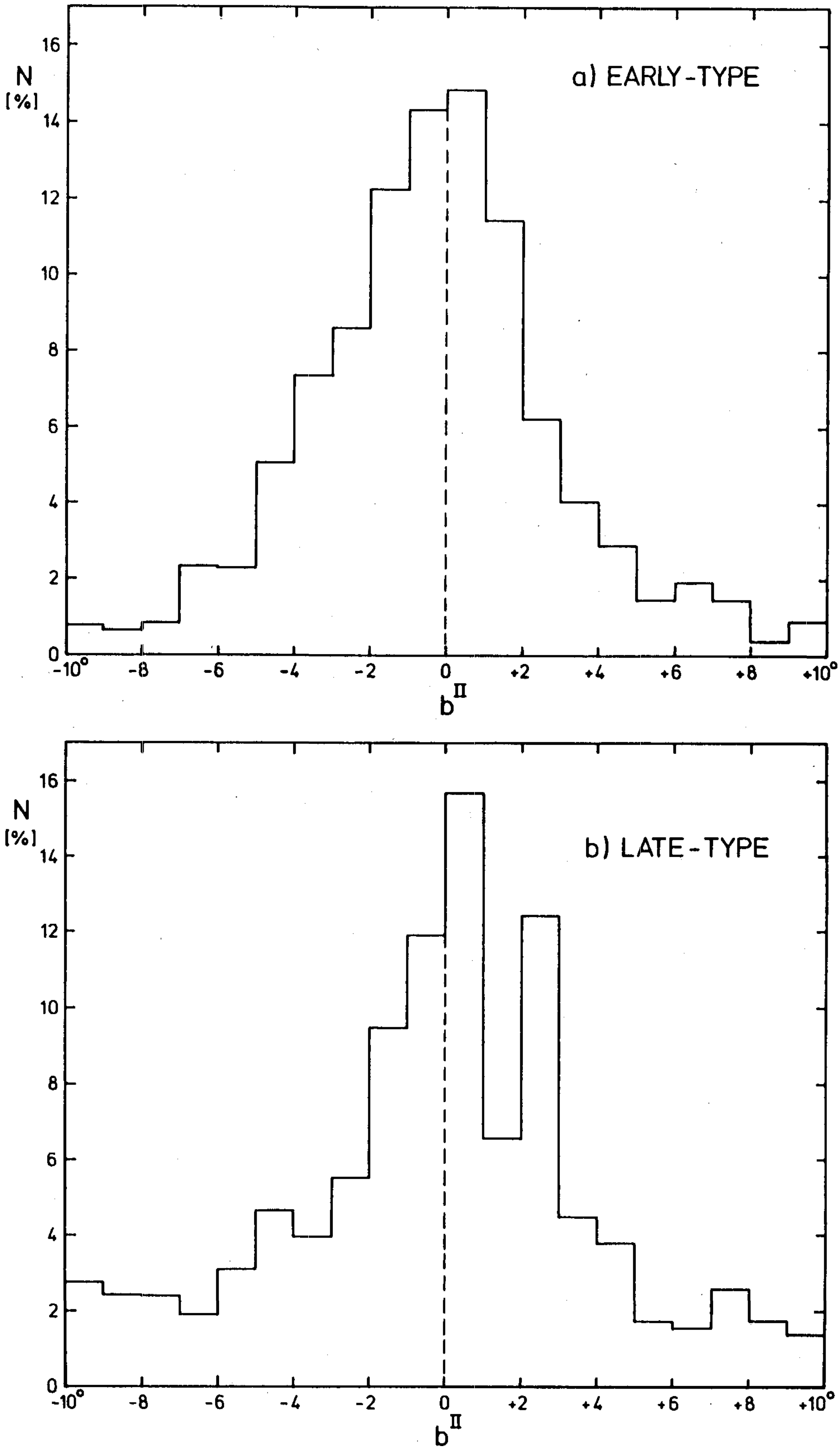

Fig.2 The relative distribution of the stars (N as in Fig.1) in latitude: a) early-type stars, b) late-type stars.

OCl-	Name:	n	OCl-	Name:	n
OCl-100	NGC 6709	2	OCl-294	NGC 129	4
109	Berkeley 47	1	305	NGC 225	3
124	NGC 6823	5	313	NGC 281	2
125	NGC 6830	2	321	NGC 457	6
133	NGC 6882	2	326	NGC 581	5
134	NGC 6834	3	328	Tr 1	4
148	NGC 6871	2	330	NGC 654	2
161	Berkeley 87	5	332	NGC 659	5
167	Berkeley 86	3	333	NGC 663	25
168	NGC 6913	1	350	NGC 869	15
213	IC 5146	16	352	IC 1805	1
218	NGC 7128	2	353	NGC 884	28
222	IC 1396	1	362	NGC 957	5
229	NGC 7235	1	364	IC 1848	3
236	NGC 7160	1	365	Tr 2	1
237	NGC 7261	2	385	Tombaugh 5	1
240	NGC 7129	4	393	IC 361	1
242	Berkeley 95	11	428	NGC 1857	2
244	NGC 7380	4	433	NGC 1912	1
248	King 10	6	439	NGC 1893	4
250	NGC 7419	14	445	NGC 1960	2
256	NGC 7510	2	466	NGC 2168	2
260	NGC 7654	8	467	NGC 2129	2
262	King 20	1	495	NGC 2264	112
OCl-276	NGC 7790	1	OCl-515	NGC 2244	2
GCl-110	NGC 6779	1			

The richest cluster is NGC 2264 = OCl-495 in Monoceros. Also the clusters NGC 663 = OCl-333 and NGC 884 = OCl-353 contain many Hα emission-line stars.

Positions

The distribution of the stars of the catalogue in position accuracy classes is as follows:

Accuracy class	a	b	c	d
ΔRA, ΔDECL	$\pm 0.01^s$ $\pm 0.1''$	$\pm 0.1^s$ $\pm 1''$	$\pm 1^s$ $\pm 0.1'$	$\pm 0.1^m$ $\pm 1'$
Number	881	1435	1533	325

About half of the objects have a sufficiently accurate determination of the positions (55%, class a+b). The authors together with collaborators determined or improved numerous positions of objects which are now in the accuracy classes a-c. Wrong cross-identifications are not quite impossible especially for objects of the accuracy class d. Their coordinates particularly should be improved.

Brightnesses

Altogether 3654 stars (88%) are indicated with brightness, 482 of which are variable. The brightness of 3172 constant stars (or stars the variability of which has not yet been reported) is reliable in 2464 cases: photoelectric, photographic or photovisual brightness determination. Let us point out 520 missing brightness determinations. The variable (or suspected variable) stars will be treated later in more detail in a separate publication.

Spectral Types

Only 2351 stars (56%) are indicated with spectral types with the following distribution:

Sp. Type	Number
OB	411
O	59
B	1233
WR	48
A	164
F	58
G	41
K	107
M	168
S,C	31
others	31

The largest group consists of early-type stars (n=1751). Let us point out 1823 stars without spectral type determinations.

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