Introduction

This catalogue comprehends the results of some series of meridian circle observations which were carried out during the years 1939–1944 at the same time as the author's investigations into the spatial distribution of bright diffuse galactic nebulae were commenced and advanced [1]. In connection with the work mentioned it was considered desirable to ensure accurate positions of stars associated with galactic nebulae. Observable stars of this kind exhibit a very uneven distribution in right ascension, and in compiling the programs of observation the author had to look for supplementary objects. Then the late Professor W. GYLLENBERG called attention to those variable stars which are accessible to observation for limited intervals of time only, and as he was at the same time able to furnish a list of suitable objects of this type, a number of them was included in the program. To fill up the gaps still remaining the author selected a sample of stars in the Boss General Catalogue [2] which have been marked by an asterisk, indicating that the computation of their proper motions has been based on two catalogues only. Later on, in 1942, the author planned a contribution to the current discussion of space reddening [1]. The upshot of these observations are to be found in this catalogue in the form of positions of 246 stars selected from STEBBINS, HUFFER and WHITFORD's catalogue of 1332 O and B stars [3]. Finally, some hundred stars with high positional accuracy were picked from the Boss GC and utilized in an attempt to determine the observer's magnitude equation which will be discussed below. As to the limitations of the material with regard to brightness and distribution over the sky, the following remark may be made. Due to the relative scarceness of stars connected with nebulae, the limits accepted have been defined by the power of the instrument and by its geographical latitude, which preclude observations of stars fainter than $m_{BD} = 9^m.3$, and of declinations south of $-15°$. Concerning the remaining stars, however, the limits have been set narrower. Thus, in this case, the main part of the observations have been restricted to objects with m_{BD} brighter than $9^m.0$ which have declinations between $0°$ and $+40°$.

As will be seen from the above survey, the contents of this catalogue are rather inhomogeneous. The author would have preferred to present the respective subgroups of the material in separate catalogues, a plan which, however, had to be abandoned for obvious practical and economic reasons.

The Observations

The observations were performed by the aid of the Repsold Meridian Circle (aperture 15.7 cm, focal length 228 cm) of the Lund Observatory. A detailed description of this instrument has been given by A. LINDSTEDT [4]. The orientation of the system instrument–observer was one and the same throughout the observations and may be described by the words "clamp west", "feet south".

The right ascensions and the declinations of the program stars were determined differentially with respect to a system of fundamental stars which will be discussed below. The transits of the stars across eleven fixed vertical wires were registered by means of a chronograph and a telegraph key. The definitive adjustment in declination with respect to two horizontal wires was generally made immediately after the passage of the first four vertical wires, which form a separate subgroup. In reading the circle scale two diametrically placed microscopes, designated A and D, were used. All observations at the ocular end of the tube were made by the author, whereas the microscope readings partly were performed by assistants.

The Reduction of the Observations

The chronograph records were read off with an accuracy of $0^s.1$, and the readings reduced to the middle wire by the aid of the values of the wire intervals given by GYLLENBERG [5]. The mean value of the reduced transits was then computed with an accuracy of $0^s.01$.

The mean value of an observed transit was reduced to right ascension of apparent place by Bessel's formula, including corrections due to instrumental and collimation errors. The instrumental error was determined from transit observations of one polar and one equatorial star, at least once every night of observation. The amount of the daily aberration for Lund, $-0^s.012$, was added to the collimation error, which was determined regularly once a week.

The differences: ephemerid values *minus* observed values of right ascension of the fundamental stars, were plotted against the times of transit, and a smoothed curve was drawn through the points. The residuals of the differences as brought out by the diagram were tested for an additional dependence on declination in a similar graphical way. Corrections derived from these reduction curves were then applied to the observed coordinates of the program stars.

The microscope readings were corrected for the effects caused by the run of the micrometer screws (separate determination by the writer) and the division errors of the circle scale as given by LINDSTEDT [4]. The declination readings were further corrected for the influence of the refraction by means of L. DE BALL's tables [6]. The differences: ephemerid values *minus* observed values of the apparent declinations of the fundamental stars were then plotted against the times of transit and the residuals tested for dependence on declination in the same way as in the case of the right ascensions. Finally, the coordinates thus obtained were reduced to mean place for the beginning of the year of observation.

The Magnitude Equation

In consequence of the mode of observation: full aperture, no unpersonal micrometer, we should expect the appearance of systematic errors in the right ascensions depending on the stellar magnitudes. In order to correct appropriately for this effect, the following two methods were tried. In a series of transit observations an absorbing screen was alternately inserted and removed before and after the star's passage across the central wire. The times of transit of the undimmed respectively screened down star were separately determined and intercompared. In this way the author arrived at a magnitude equation practically identical with the values of this quantity derived earlier by Lund observers using the same method, *viz.* $+0^s.015$ per magnitude class.

A serious objection may, however, be raised against the procedure in question. The "magnitude equation" is probably not a function of the stellar magnitude *in se*, but varies in the first place with the appearance of the diffraction images of the stars. This being the case, we should expect a pronounced effect in the case of stars brighter than 4^m, whereas the refraction discs of the stars between 5^m and 8^m, say, do not differ very much in magnitude and thus these fainter stars should be affected by a slight, if any, amount of magnitude equation. A graphical representation of the absolute magnitude equation as a function of stellar magnitude ought to show a relatively steeper gradient at the beginning of the magnitude scale, whilst decidedly slower variations are to be expected in the interval 5^m to 8^m. As the accuracy of the screen determinations increases with the amount of absorption, bright stars must necessarily play a dominant part in observations of this kind. If the above assumptions as to the nonlinearity of the magnitude equation are valid, the corrections computed from screen observations should not be appropriate in the case of stars fainter than 5^m.

A special observation program was carried through for the sole purpose of determining the writer's magnitude equation. Hereby, some hundred stars were selected from the Boss GC according to the principles that the probable error in the catalogue position (1950.0) must not exceed $0''.30$, and that the stars chosen

Table 1. Systematic differences Δ = GC–C 1950

α	$\Delta\alpha_\alpha$	$\Delta\delta_\alpha$
0^h	$+^s.024$	$-''.05$
1	.024	− .04
2	.023	− .04
3	.023	− .03
4	.022	− .01
5	+ .022	.00
6	.021	+ .01
7	.020	+ .02
8	.019	+ .03
9	.018	+ .03
10	+ .017	+ .02
11	.017	+ .01
12	.017	.00
13	.017	− .01
14	.018	− .02
15	+ .018	− .03
16	.019	− .04
17	.019	− .05
18	.020	− .06
19	.021	− .06
20	+ .022	− .07
21	.022	− .06
22	.023	− .06
23	.023	− .05
24	+ .024	− .05

δ	$\Delta\alpha_\delta$	$\Delta\delta_\delta$
$+80^\circ$	$+^s.019$	$-''.13$
+70	+ .012	− .12
+60	+ .006	− .11
+50	+ .002	− .10
+40	.000	− .08
+30	− .001	− .06
+20	− .003	− .02
+10	− .004	+ .01
0	− .005	+ .05
−10	− .006	+ .11
−20	− .007	+ .16

m	$\Delta\alpha_m$
2	$+^s.010$
3	+ .005
4	.000
5	− .004
6	− .009
7	− .013
8	− .018
9	− .022

ought to be fairly well distributed according to brightness, within the limits 2^m–9^m. These stars were then observed as usual program stars together with a number of fundamental stars selected from the Berliner Jahrbuch. The residuals resulting from a comparison between he observed positions and the positions given in Boss GC were plotted against apparent magnitude. No correlation was displayed, a fact which should be interpreted in the sense that the magnitude equation must be small enough to be completely masked by the accidental errors in the quantities discussed.

The present catalogue, C, and the Boss GC have altogether 472 stars in common. When the right ascension differences (GC–C) had been corrected for dependence on right ascension and declination (c.f. below), a plot of the still remaining residuals against apparent magnitude revealed a systematic run of $0^m.0045$ per magnitude class. This value has thus to be accepted as the magnitude equation of the system instrument–observer.

The System Instrument–Observer

The fundamental stars of the observation programs were chosen from the Berliner Jahrbuch (System FK 3). From 1942 on — when the observations of stars from STEBBINS, HUFFER and WHITFORD's catalogue were begun — stars of high positional accuracy in Boss GC were added to the programs to serve as an intermediary standard with the ultimate purpose of facilitating a comparison with the catalogue mentioned. In this case, the objects used are of apparent magnitude 4^m–7^m, having probable errors in the 1950.0 position less than $0''.11$.

Table 2. Weights corresponding to number of observations

n	p_α	p_δ
1	.5	.3
2	.8	.5
3	1.0	.7
4	1.2	.8
5	1.5	1.0

From 472 stars common to the present catalogue and Boss GC, systematic corrections and weights were derived according to the procedure set forth by GYLLENBERG [7]. The results are listed in Tables 1 and 2. The unit of weight corresponds to a probable error of 0″.30.

Definitive Positions

The observations being reduced to the beginning of the year of observation, the mean values of the separate observations were formed for each star. The positions were then reduced to the equinox of 1950.0, using NEWCOMB's precession constant. The corrections contained in Table 1 have *not* been applied.

The annual precession and the secular variation for the equinox 1950.0 were calculated for each star by means of the Hamburger-Sternwarte Präzessionstafeln [8] and the Greenwich Tables [9].

Acknowledgements

In presenting this catalogue it is an agreeable duty for the author to express his indebtedness to those persons who have furthered his work in various respects.

The late Professor W. GYLLENBERG was my teacher in all questions connected with meridian observations. I bear in grateful remembrance his personal, always inspiring instruction as well as his unsparing helpfulness in the case of the practical details of the observations and their reduction.

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Finally, my warmest thanks are due to my wife for valuable assistance in reading the microscopes.

Arvika, Sweden, May 1953. *S. C.*

Description of Catalogue

1 Current number for use on footnotes.
2 Visual magnitude and Spectral type.
3, 4 Right Ascension for 1950.0, referred to the mean epoch, Precession and Secular Variation in right ascension. The precession constants are Newcomb's. The positions are in the FK3 system.
5, 6 Similar data for the Declination.
7 Epoch of Observations.
8 Number of Observations.
9 BD number.
10 Remarks.

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