

# INTRODUCTION

## BOOK II

**T**HIS second part of the *Atlas* has been provided to aid in the convenient use and study of the photographs contained in Part I, for reasons which were stated in notes by Professor Barnard as follows:

When comparing astronomical photographs made with long exposures with star charts I have frequently had much trouble through the want of an approximate position, in identifying stars and other objects on the photographs. Also, very often, the colors of the stars so change their relative intensities that they are not easily recognized on the chart. The photographs in the present work are intended as pictures of the sky and it would have been impossible to mark co-ordinates on them without spoiling their pictorial value. It was therefore decided to make a map, with co-ordinates, corresponding to each photograph and on the same scale. Though this has required much work, the charts assist greatly in the approximate location of any object shown on the photographs. They have been of great service to me in studying the photographs and I believe will be a welcome addition to the *Atlas*.

The photographs are not all enlarged in the same proportion, and therefore are not uniform in scale. All of the fainter stars shown on the *Durchmusterung* charts were not put on the diagrams, but it is believed enough of them are given to permit a ready identification of objects in any part of a photograph. Four stars on each photograph, located near the corners, were identified and used for determining its scale and for locating the system of co-ordinate lines. The epoch 1875.0 was adopted and is used throughout this work. A high degree of accuracy is not claimed for these charts, but they are sufficiently precise to

locate an object closely enough for identification in a catalogue.

All of the dark objects listed by Professor Barnard which fall within the limits of the various plates have been roughly outlined on the charts as to aid in their identification. Some of these are so indefinite that no mere outline can represent them. In general, a dotted line is used to indicate outlines that are vague, while a solid line implies more definiteness. Each of these dark objects is designated by the letter *B* followed by its number in Professor Barnard's list printed in the *Astrophysical Journal*<sup>1</sup> or in his supplementary list, both of which are given in Part I.

Nebulosity shown on the photographs is indicated on the charts by parallel lines.

Numbers have been given on the diagrams to such stars and objects as were mentioned in the text accompanying the photographs in Part I, and to such others as might assist in the easy location of details in any part of the plate. The numbers were carried consecutively through the whole series of diagrams but are not always repeated when they occur on several charts.

These numbered stars and objects are listed in the tables that face the diagrams, with their positions for 1875.0 and the other data which were thought to be useful.

The second column contains the number of the star or other object in the *Bonner Durchmusterung* (B.D.), the *Cordoba Durchmusterung* (C.D.), or the

<sup>1</sup> *Astrophysical Journal*, 49, 1, 1919.

*New General Catalogue* (N.G.C.) of the late J. E. L. Dreyer based on the observations of the Herschels and later astronomers. Numbers taken from Dreyer's extensions of the N.G.C., published in the first and second index catalogues, are designated as N.G.C. I and N.G.C. II. No attempt has been made to include all the objects of the N.G.C. that occur within the limits of the photographs, and only the more conspicuous of them are listed. Nebulous stars are generally noted.

The magnitude in the third column is the visual estimate for the star as given in the *Bonner* or the *Cordoba Durchmusterung*. Clusters and nebulae are also indicated in this column. The right ascensions and declinations as given are, in general, not the *Durchmusterung* positions but have been taken from the catalogues of the Astronomische Gesellschaft and have been rounded off to the tenth of a second of time in  $\alpha$  and the tenth of a minute of arc in  $\delta$ .

The data for the photometric (visual) and photographic magnitudes and for the type of spectrum have been taken from the *Henry Draper Catalogue, Annals of the Harvard College Observatory, 91-99*. For the benefit of those not technically acquainted with these matters it may be stated that types O, B, and A include the blue and bluish-white stars; F and G, the yellow stars; while K stars have an orange tinge and those of type M are distinctly red.

The column of "Remarks" gives the Greek letter and Flamsteed number of such stars as may have them, and Messier's numbers. The N.G.C. number is printed here when the object has a *Durchmusterung* number already entered in the second column. Nebulous stars are also indicated in this column.

The approximate positions of the dark objects shown on the various photographs are given below the table for each chart.

It is assumed that the user of the *Atlas* making a careful study of a particular photograph will open both parts to the corresponding place. He will then have at once before him, without the necessity of turning pages, the photograph, faced by the author's description of its features, while the chart will give the approximate co-ordinates in right ascension and declination and the designation of the stars and other objects, for which full details are given in the table opposite to it. This plan of publishing the *Atlas* in two parts had not been decided upon before Professor Barnard's death, but it is believed that it would have met his approval. Most of the charts had been prepared in a preliminary way by Miss Calvert under Professor Barnard's supervision. She later sketched in the dark objects and inserted their numbers and those of the reference stars, after completing the computations and checking necessary for the tables.