

## A CATALOGUE OF BRIGHT CLUSTERS AND NEBULAE.

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A BRIEF catalogue of bright clusters and nebulae, complete within well-defined limits, and uniform for the whole sky, has often been desired. The present investigation is an attempt to supply this need. Completeness and uniformity have been sought by the following methods:—Photographs of good quality covering the whole sky, made with Cooke anastigmatic lenses of about one inch aperture, and having exposures of one hour, were available. These plates were systematically examined, with suitable magnification, and every cluster and nebula, which appeared clearly as such, was recorded. No other objects were accepted. The photographs on which the examination was made show stars nearly as faint as the twelfth magnitude. Clusters, therefore, composed of stars of the twelfth magnitude and fainter do not appear upon the plates, with the exception of condensed clusters, the photographic images of whose components overlap, in which case they may appear as hazy stars. This is true of many of the globular clusters, which appear on the plates as hazy, star-like objects, even when the components are fainter than the twelfth magnitude. Comparatively few nebulae appear in the list, since there are few whose photographic brightness is equal in intensity to that of a star of the eleventh magnitude. No objects were included in the list, whatever their nature, which were indistinguishable from stellar images on these plates. Since the focal length of the lenses employed is only 13 inches, the resolving power is small; hence, very small and bright clusters appear on the plates as stars, and have not been included. The catalogue constitutes, therefore, a *Durchmusterung* of celestial objects which exceed a definite size and brightness.

Although, for the sake of brevity and uniformity, the list was made up from the examination of Cooke plates only, the description of the objects thus selected has been obtained, in general, from Bruce plates of about one hour exposure. Since the aperture of the Bruce Telescope is twenty-four

inches, the descriptions are thus much more complete than would have been possible from an examination of the Cooke plates. The results for all the objects are also fairly comparable. For a few of the regions, however, no Bruce plate having an exposure of one hour was available, especially of objects far north, and plates having shorter exposure were used, or plates made with a smaller instrument. Even when plates having longer exposures were available they have not been used in preparing the descriptions given in the catalogue, since it was desirable that the description should be comparable for all the objects, so far as possible. In the remarks at the end of the catalogue, however, additional facts are given, for which there was not space in the catalogue, as well as facts derived from plates of longer exposure, or from any source whatever. For the convenience of observers who use the Harvard Map of the Sky, the appearance of the objects on the Cooke plates is also given. When possible, the magnitude of the object as a whole has been estimated on the Cooke plates, where the small scale is an advantage, as it diminishes the size of the image, and makes it more comparable with the images of adjacent stars.

In various branches of Astronomy, as well as in other departments of science, a classification has proved of great value for comparison and reference. The following classification of nebulae and clusters is proposed, not only for use in the present catalogue, but with the hope that it may be found useful in the description and grouping of the great numbers of such objects now known.

#### A PROVISIONAL CLASSIFICATION OF NEBULAE AND CLUSTERS.

- A. Vast, faint, irregular nebulosities, shown on photographs of long exposure.  
Examples; Nebula in Cygnus, Great Spiral about Orion.
- B. Gaseous Nebulae. Objects having Gaseous Spectra.
  - B1. Large, diffused, irregular. Examples; Orion Nebula,  $\eta$  Carinae Nebula.
  - B2. Planetary, ring, and other small, well-defined gaseous nebulae.  
Examples; N. G. C. 3587 (planetary), N. G. C. 6720 (ring), N. G. C. 6618.
  - B3. Nebulous stars. Examples; N. G. C. 1514, N. G. C. 2003.
- C. White Nebulae and Globular Clusters. Objects having continuous Spectra.
  - C1. Nebulae, small, unresolved, of somewhat definite form, generally round or elliptical. This group probably includes the great majority of small nebulae, many thousands in number.

C2. Spiral Nebulae. Examples; N. G. C. 224 (The Great Nebula in Andromeda), N. G. C. 5194 (Spiral in Canes Venatici).

C3. Globular Clusters. Examples; N. G. C. 5139 ( $\omega$  Centauri), N. G. C. 104 (47 Tucanae), N. G. C. 6205 (Great Cluster in Hercules).

D. Irregular Clusters.

D1. Fairly condensed, somewhat regular, stars of comparatively uniform magnitudes. Examples; N. G. C. 2437, N. G. C. 6494.

D2. Fairly condensed, irregular, stars of different magnitudes. Examples; N. G. C. 869 and 884 (Double Cluster in Perseus), N. G. C. 4755 ( $\kappa$  Crucis).

D3. Coarse, irregular, stars of different magnitudes. Examples; Hyades, Pleiades.

The vast nebulae, which recent advances in celestial photography have shown to exist in different parts of the sky, have been assigned to Class A. They have been placed in a class by themselves, although they may be of the same nature as the nebulae given in B1, to which at least they appear to be somewhat related. No example of Class A occurs in the present catalogue.

The gaseous nebulae should obviously be placed in a class by themselves. The chief element of doubt in regard to Class B is concerning the sub-class, B3, consisting of the so-called nebulous stars. When photographs having long exposures are examined, especially of regions remote from the Milky Way, large numbers of hazy, somewhat star-like objects are found, which have in some cases been referred to as nebulous stars. For the most part, however, these objects appear to be white nebulae, of small size, bright at the centre, and shading off by insensible gradations to the margin. They are seldom nebulous stars in the sense in which that term was originally used. Sir William Herschel, who was the author of the term, applied it first to an object, later known as N. G. C. 1514, consisting of a star near the centre of a relatively faint nebula, or atmosphere, of great extent. It seems best not to change the signification of this term. Little is yet known of the nature of the nebulous stars, but it appears probable that the central stars have spectra of Class B, while the nebulous coronas or atmospheres are gaseous. As individual stars, such objects would have no place in a classification of nebulae and clusters, aside from the gaseous envelope. Hence, the surrounding nebula is the characteristic feature, and thus considered, these objects belong in Class B, where they have been designated B3.

Class C contains clusters as well as nebulae. That objections would be made to this procedure has been carefully considered. The reasons for this classification are in brief as follows:—Before the invention of the spectroscope, it was generally believed that nebulae were merely unresolved clusters. Later, the spectroscope showed that some of the nebulae were in their nature unresolvable. This fact has perhaps led to an exaggerated opinion as to the number of the gaseous nebulae. Less than 150 nebulae are known to be gaseous, and, while the nature of the remaining 10,000 nebulae is in general not known, evidence is not wanting that large numbers of these have a continuous spectrum. The late Professor Keeler found, on plates of long exposure made with the powerful Crossley Reflector, that more than half the objects which appeared with smaller instruments as small nebulous patches were in reality spiral nebulae. Spiral nebulae, so far as known, give continuous spectra, and may be stellar, at least in part. Some of the white nebulae, at first unresolved, have later proved, when examined with powerful instruments, to be globular clusters. Sub-class C1 appears to serve, therefore, for a large group of doubtful objects, many of which will eventually be transferred to C2 or C3. The globular clusters have a different distribution from that of other clusters, and do not appear to be related to them. The irregular clusters of Class D follow the Milky Way without any notable exceptions, while the globular clusters appear to have no such connection with it. Considering, therefore, the intimate relation between the sub-classes C1, C2, and C3, and the absence of positive evidence that any of these are really gaseous, it seems fitting to place them all in one general class.

All the clusters, with the exception of the globular clusters, have been called irregular, and placed in Class D. The differences between the sub-classes, D1, D2, and D3, consist chiefly in the amount of the condensation, and the magnitudes of the stars. In large part, they are merely condensations of the stars of the Milky Way. Many clusters are found to be involved in nebulosity. These are of such widely different types, that to place them all in a single class would present many difficulties. In the description of such clusters, therefore, it seems preferable to make use of two designations. For example, the Pleiades belong to the sub-class D3, while the enveloping nebula belongs either to A, or to B1. The Pleiades may, accordingly, be classified as D3,A, or D3,B1. Since nebulae and clusters pass by almost insensible steps from one to the other, it is often difficult to decide to which class an object belongs, especially where refined observations are lacking.

Table I contains the catalogue of clusters and nebulae. The first column gives the number in the New General Catalogue of Dreyer. Several objects occur in the present catalogue, which are not found in the N. G. C., notably the Pleiades and the Hyades. When the N. G. C. number is wanting, two dots have been inserted in its place. The second column contains the designation of the object, especially the number in the catalogue of Messier or Dunlop. These have been taken for the most part from the N. G. C. The N. G. C. position, brought forward to 1900, is given in the third and fourth columns. The number of the plate, in the Harvard Map of the Sky which shows the object to the best advantage, is given in the fifth column, and the coordinates on that plate, expressed in millimetres, in the sixth column. These coordinates are reckoned from the lower left-hand corner of the exposed portion of the plate. The next three columns give results derived from an examination of Bruce plates having an exposure of about one hour. The diameter of the object, which is given in the seventh column, is expressed to tenths of a minute of arc for small and well-defined objects, and to whole minutes for large and irregular objects. In many cases an exact determination of the dimensions is impossible. In the case of elliptical objects, the dimensions are generally given in the description on the opposite page. The approximate number of stars is given in the following column. This number is generally the result of a rough count of the stars, the aim being, however, not to give the whole number of stars in the region, but the number in excess of that in equal areas of the surrounding region. In dense globular clusters the number near the centre is estimated. In many clusters the number of stars is much less than the average number in regions of equal area in other and richer parts of the sky. Nevertheless, they may be true clusters. Not less than five stars, in excess of the average number in the surrounding region, has been accepted as a cluster. The number of stars is, in general, that obtained on a Bruce photograph, having an exposure of one hour. The estimated magnitudes of the stars composing the clusters are given in the ninth column. No approach to accuracy is claimed for these magnitudes, since no measurements of any kind have been made. They simply give a hint as to the brightness of the stars involved. In the case of nebulae, and globular clusters so condensed that an estimate of the brightness of the components could not be safely made, dots are used in the place of the numbers and magnitudes. The galactic longitude and latitude are given in the tenth and eleventh columns. A discussion of the



relation of the objects in the present catalogue to the Galactic Circle will be found on page 219. The class to which the cluster or nebula belongs, according to the classification proposed on page 200, is given in the twelfth column, and in the thirteenth column reference is made to the illustrations contained in Plates I, II, and III. When the cluster or nebula appears in one of the plates, the number of the figure is given, and when it does not appear, the number of some figure which it closely resembles is given, enclosed in parentheses. In a few cases, more than one object is shown in a figure. The preceding object is then called a, the following b, etc. For example, N. G. C. 869 is Fig. 3a, and N. G. C. 884 is Fig. 3b. Dots in this column indicate that the object in question does not closely resemble, so far as is shown by the photograph examined, any object which has been reproduced in the plates. The N. G. C. number is repeated in the first column on the opposite page. The second and third columns give the number, and duration of the exposure of the plate, from the examination of which the description which follows was derived. The letter A refers to plates made with the Bruce Telescope of 24 inches aperture, and the letter I, to those made with the Draper Telescope of 8 inches aperture. MA 223 was made by the Rev. Joel H. Metcalf, with a photographic doublet of 12 inches aperture, constructed by himself. All of the plates, with the exception of eight, were made with the Bruce Telescope. In the description, one exclamation point is used to indicate that the object is one of special interest, two exclamation points, that it is of great interest, and three, that it is of extraordinary interest. Three terms have been used in general to indicate the different degrees of condensation of the irregular clusters, coarse, fairly condensed, and condensed. For the globular clusters, the terms, open, fairly condensed, condensed, and extremely condensed, have been employed. The letter R refers to the remarks following the table.

## TABLE I.



## A CATALOGUE OF BRIGHT CLUSTERS AND NEBULAE.

N. G. C.	Designation.	R. A. 1900.	Dec. 1900.	H.M.	Coord.	Diam.	No.	Magn.	Gal. Long.	Gal. Lat.	Class.	Illus.
55	Dunlop 507.....	h. m. 0 10.0	° ' -39 46	34	89, 37	' ..	..	..	° 297	' -76	B2	(32)
104	47 Tucanae .....	19.6	-72 38	46	87, 24	30.	5000	13-15, 17	273	-46	C3	17
221	Messier 32 .....	37.2	+40 19	10	49, 167	..	..	..	89	-21	C1	18a
224	Messier 31 .....	37.3	+40 43	10	48, 169	120.	..	..	89	-20	C2	18b
253	Caroline Herschel ....	42.6	-25 51	34	45, 118	..	..	..	94	-88	B2	(32)
330	Dunlop 23 .....	52.8	-73 1	46	73, 20	1.5	15	10-13	268	-45	C3	(6)
346	Dunlop 25 .....	55.7	-72 43	46	71, 21	3.	25	11-14	268	-45	D2, B1	(23)
362	Dunlop 62 .....	58.9	-71 23	46	67, 29	10.	1000	13-15, 17	267	-46	C3	(17)
371	Dunlop 31? .....	1 0.2	-72 36	46	69, 21	8.	100	11-14	267	-46	D2, B1	(15)
376	Dunlop 36? .....	0.7	-73 22	46	70, 17	0.8	10	12-14	268	-45	C3?	(22)
395	.....	2.1	-72 32	46	68, 22	3.	40	12-14	267	-45	D2, B1	(23)
419	Dunlop 36? .....	5.3	-73 25	46	68, 16	2.	..	..	267	-45	C3?	(22)
456	Dunlop 7, 10? .....	11.0	-73 50	46	66, 13	2.	15	12-14	267	-44	D2, B1	(23)
460	Dunlop 8, 10? .....	11.9	-73 50	46	66, 13	1.	10	12-14	267	-44	D2, B1	(23)
457	.....	12.8	+57 48	2	37, 118	10.	15	8-11	95	-4	D3	(13)
465	Dunlop 9? .....	12.8	-73 52	46	65, 13	3.	25	10-14	267	-44	D2, B1	(23)
581	Messier 103 .....	26.6	+60 11	2	32, 135	5.	15	9-11	96	-1	D3	(13)
598	Messier 33 .....	28.2	+30 9	11	139, 87	..	..	..	102	-30	C2?	..
654	.....	37.2	+61 23	3	147, 118	4.	10	10-12	96	0	D3	(8)
659	Caroline Herschel ....	37.4	+60 12	3	148, 112	4.	10	10-14	97	-1	D3	(8)
663	.....	39.2	+60 44	2	24, 141	15.	25	10-13	97	0	D3	(12b)
752	.....	51.8	+37 11	11	108, 128	30.	40	9-11	105	-23	D3	(28)
869	Hipparchus .....	2 12.0	+56 41	3	126, 86	30.	400	7-12	103	-3	D2	3a
884	Hipparchus .....	15.4	+56 39	3	123, 86	30.	300	7-12	103	-3	D2	3b
1039	Messier 34 .....	35.6	+42 21	11	59, 159	30.	40	9-13	111	-15	D3	(28)
1261	Dunlop 337 .....	3 9.5	-55 36	47	92, 125	3.	..	..	236	-52	C3	(22)
1291	Dunlop 487 .....	13.7	-41 28	36	151, 22	0.6	..	..	214	-56	C3?	(22)
1316	Dunlop 548 .....	18.9	-37 35	36	147, 47	..	..	..	206	-55	C1	(22)
1380	Dunlop 574 .....	32.6	-35 19	36	131, 62	0.5	..	..	203	-53	C1	(18a)
1399	.....	34.6	-35 47	36	128, 59	0.5	..	..	203	-53	C3?	(22)
..	Pleiades .....	41.	+23 48	12	116, 68	120.	R	R	135	-23	D3, B1	1
1528	.....	4 7.8	+50 59	3	24, 60	20.	40	10-14	120	+1	D3	(28)
..	Hyades .....	14.	+15 23	12	60, 20	200.	R	R	147	-22	D3	(1)
1647	.....	40.2	+18 53	12	36, 38	30.	50	8-14	148	-15	D3	(28)
1711	Dunlop 76? .....	51.4	-70 9	48	131, 30	2.	..	..	249	-36	C3	(22)
1722	.....	52.4	-69 33	48	131, 34	2.	..	..	247	-36	D2?	..
1727	.....	52.8	-69 30	48	131, 34	2.	10	12-15	247	-36	D2?	..
1743	Dunlop 114 .....	54.6	-69 22	48	130, 35	0.4	..	..	247	-36	B2	..
1755	Dunlop 167 .....	55.4	-68 22	48	131, 41	1.0	..	..	247	-36	D2?	(23)
1761	.....	56.4	-66 38	48	133, 51	3.	25	10-14	243	-36	D2, B1	(23)
1763	.....	56.6	-66 34	48	133, 51	3.	20	10-14	243	-36	D2, B1	(23)
1770	Dunlop 169 .....	57.5	-68 34	48	130, 40	5.	25	10-14	246	-36	D2, B1	(23)
1769	.....	57.6	-66 36	48	132, 51	1.5	5	10-14	243	-36	D2, B1	(23)
1746	D'Arrest .....	58.0	+23 40	12	14, 69	30.	50	9-14	147	-9	D3	(2)
1783	.....	58.8	-66 8	48	132, 54	1.0	..	..	243	-36	B2?	..
1818	Dunlop 236 .....	5 4.1	-66 34	48	129, 52	2.5	75	10-14	244	-36	C3	(22)
1835	.....	5.8	-69 32	48	124, 35	0.4	..	..	247	-35	C1?	(22)
1850	Dunlop 170? .....	9.2	-68 53	48	123, 39	3.5	150	13-16	246	-34	C3	(6)
1855	.....	9.9	-68 58	48	123, 39	0.8	10	11-13	246	-35	D2?	..
1856	.....	10.1	-69 15	48	122, 37	3.	..	..	247	-35	C3?	(22)



N. G. C.	Plate.	Exp.	Description.
55	A 3340	80	!! Nebula, elongated at $110^\circ$ , $25'$ by $3'$ , several stars and nuclei involved.
104	A 3306	60	!!! Globular cluster, condensed.
221	A 2126	60	Nebula, elliptical, elongated at $165^\circ$ .
224	A 2126	60	!!! Nebula, spiral, elongated at $40^\circ$ , $40'$ by $15'$ . The Great Nebula in Andromeda.
253	A 3338	80	!! Nebula, elliptical, elongated at $50^\circ$ , $20'$ by $4'$ , irregular, mottled, stars involved.
330	A 6980	80	Globular cluster, fairly condensed, possibly involved in nebulosity. Small Mag. Cloud.
346	A 6980	80	Cluster, fairly condensed, involved in and surrounded by nebulosity. Small Mag. Cloud.
362	A 6980	80	!! Globular cluster, condensed.
371	A 6980	80	Cluster, fairly condensed, apparently involved in nebulosity. Small Mag. Cloud.
376	A 6980	80	Cluster, globular?, fairly condensed. Small Mag. Cloud.
395	A 6980	80	Cluster, fairly condensed, apparently somewhat nebulous. Small Mag. Cloud.
419	A 6980	80	Globular cluster?, not resolved, extremely condensed. Small Mag. Cloud.
456	A 6980	80	Cluster, fairly condensed, apparently involved in nebulosity. Small Mag. Cloud.
460	A 6980	80	Cluster, fairly condensed, apparently involved in nebulosity. Small Mag. Cloud.
457	A 6822	10	Cluster, coarse.
465	A 6980	80	Cluster, fairly condensed, irregular, apparently involved in nebulosity. Small Mag. Cloud.
581	A 6822	10	Cluster, coarse.
598	A 134	60	Nebula, oval, faint, two or three stars involved, spiral?
654	I 16696	14	Cluster, coarse.
659	A 117	60	Cluster, coarse.
663	A 117	60	Cluster, coarse.
752	I 19976	17	Cluster, coarse.
869	MA 223	90	! Cluster, fairly condensed.
884	MA 223	90	! Cluster, fairly condensed.
1039	A 6877	10	Cluster, coarse.
1261	A 4196	60	! Globular cluster, extremely condensed.
1291	A 3329	60	Globular cluster?, extremely condensed, not resolved on plate.
1316	A 3342	80	Nebula, elongated at $45^\circ$ , $1'.5$ by $0'.8$ , brighter at centre.
1380	A 3388	62	Nebula, round, brighter at centre, globular cluster?
1399	A 3388	62	Globular cluster?, extremely condensed, not resolved on plate.
..	A 2123	60	! Cluster, well known cluster of bright stars, not given in the N. G. C.
1528	A 7136	10	Cluster, coarse.
..	A 4031	60	Cluster, coarse, well known cluster of bright stars, not given in the N. G. C.
1647	A 4031	60	Cluster, coarse.
1711	A 4811	60	Globular cluster, extremely condensed, 5 to 10 rather bright stars involved. Large Mag. Cloud.
1722	A 4811	60	Cluster, few stars with a small nebula. Large Mag. Cloud.
1727	A 4811	60	Cluster, few stars and small nebulae. Large Mag. Cloud.
1743	A 4811	60	Nebula, irregular, nucleus. Large Mag. Cloud.
1755	A 4811	60	Cluster, condensed, almost globular, apparently involved in nebulosity. Large Mag. Cloud.
1761	A 4811	60	Cluster, irregular, fairly condensed, nebulous, one rather bright star. Large Mag. Cloud.
1763	A 4811	60	Cluster, fairly condensed, irregular, somewhat nebulous. Large Mag. Cloud.
1770	A 4811	60	Cluster, fairly condensed, apparently nebulous. Large Mag. Cloud.
1769	A 4811	60	Cluster, a few stars apparently involved in nebulosity. Large Mag. Cloud.
1746	A 4149	60	Cluster, coarse, irregular. Includes also N. G. C. 1750 and 1758.
1783	A 4811	60	Nebula, one star involved, round, brighter at middle. Large Mag. Cloud.
1818	A 4811	60	Globular cluster of few stars, fairly condensed. Large Mag. Cloud.
1835	A 4811	60	Nebula, round, brighter at middle, unresolved globular cluster? Large Mag. Cloud.
1850	A 4811	60	Globular cluster, fairly condensed, somewhat irregular. Large Mag. Cloud.
1855	A 4811	60	Cluster of a few stars and small nebulae. Large Mag. Cloud.
1856	A 2204	60	Globular cluster?, only partially resolved, extremely condensed. Large Mag. Cloud.

N. G. C.	Designation.	R. A. 1900.	Dec. 1900.	H.M.	Coord.	Diam.	No.	Magn.	Gal. Long.	Gal. Lat.	Class.	Illus.
1858	.....	<i>h. m.</i> 5 10.4	<i>° '</i> -69 1	48	123, 39	<i>'</i> 3.	25	10-13	247	-35	D2, B1	(23)
1851	Dunlop 508 .....	10.8	-40 9	36	17, 26	4.	400	15	211	-34	C3	(6)
1866	Dunlop 247? 248? ....	13.3	-65 35	48	125, 59	1.5	..	..	242	-35	C3	(22)
1874	.....	14.1	-69 29	48	120, 37	5.	..	..	247	-34	D2?	..
1910	Dunlop 129 .....	18.9	-69 19	48	118, 38	8.	50	10-14	246	-34	D2	..
1904	Messier 79 .....	20.1	-24 37	37	151, 127	4.	300	15	195	-28	C3	(6)
1907	Legentil .....	21.4	+35 14	13	133, 135	2.	15	10-13	140	+ 2	D3	(8)
1912	Messier 38 .....	22.0	+35 45	13	132, 138	15.	50	10-12	140	+ 2	D2	(10)
1929	.....	22.2	-68 0	48	117, 46	8.	50	10-14	245	-34	D2, B1	..
..	.....	23.4	-68 8	48	116, 45	4.	15	10-14	245	-33	D2, B1	..
1955	Dunlop 211 .....	26.4	-67 36	48	115, 49	3.	20	10-14	244	-33	D2, B1	(23)
1962	Dunlop 136? .....	27.0	-68 54	48	114, 41	5.	50	10-14	246	-33	D2, B1	(23)
1968	.....	27.6	-67 32	48	114, 49	4.	25	10-14	244	-34	D2, B1	(23)
1974	Dunlop 213 .....	28.2	-67 31	48	114, 50	3.	20	10-14	244	-33	D2, B1	(23)
1952	Messier 1 .....	28.5	+21 57	13	128, 57	..	..	..	153	- 4	B2	29
1986	.....	28.6	-70 3	48	112, 34	1.	..	..	247	-33	D2	(7)
1960	Messier 36 .....	29.5	+34 4	13	123, 127	15.	50	8-12	142	+ 2	D2	(10)
2001	Dunlop 178? .....	29.6	-68 49	48	112, 42	3.	20	10-14	245	-33	D2, B1	(23)
1976	Messier 42 .....	30.4	- 5 27	25	134, 72	50.	..	..	176	-18	B1	24a
1977	.....	30.4	- 4 54	25	134, 75	30.	..	..	176	-18	D3, B1	24b
2002	Dunlop 214? .....	30.4	-66 58	48	113, 53	1.	..	..	243	-33	D2, B1	(23)
1980	.....	30.5	- 5 59	25	134, 68	15.	..	..	177	-18	D3, B1	24c
1981	.....	30.6	- 4 25	25	134, 77	25.	..	..	175	-18	D3	24d
2003	.....	30.8	-66 32	48	113, 55	1.	..	..	243	-33	B3	..
2004	Dunlop 215 .....	30.8	-67 22	48	113, 51	2.	25	10-12	244	-33	C3?	(22)
2006	.....	31.4	-67 2	48	112, 52	1.5	..	..	244	-33	D2?	..
2018	.....	32.7	-71 9	48	109, 28	2.5	10	10-14	249	-33	D2, B1	(23)
2020	Dunlop 218 .....	33.4	-67 47	48	111, 48	6.	50	10-14	244	-33	D2, B1	(23)
2031	.....	35.0	-71 4	48	108, 28	2.	75	14	249	-33	C3	(6)
2029	Dunlop 240 .....	35.2	-67 38	48	110, 49	3.	10	..	243	-33	D2, B1	(23)
2030	.....	35.5	-66 5	48	111, 58	3.	20	10-14	243	-33	D2, B1	(23)
2040	.....	36.4	-67 38	48	109, 49	2.	10	11-14	244	-32	D2	(23?)
2024	.....	36.8	- 1 54	25	127, 92	..	..	..	174	-16	B1	(24a)
2050	.....	37.6	-69 27	48	108, 38	12.	300	10-14	247	-32	D2?	..
2058	Dunlop 102 .....	38.0	-70 13	48	107, 34	1.5	..	..	248	-32	C3	(22)
2065	Dunlop 103? .....	38.8	-70 17	48	107, 33	1.5	..	..	248	-32	C3	(22)
2070	Dunlop 142 .....	39.4	-69 9	48	107, 40	10.	40	10-14	246	-32	B1, D2	23
2074	.....	39.7	-69 32	48	107, 38	3.	25	10-14	246	-32	D2, B1	(23)
2077	.....	40.5	-69 43	48	106, 37	1.0	5	11-14	246	-32	B1, D2	(23)
2080	.....	40.6	-69 42	48	106, 37	1.0	10	11-14	246	-32	D2, B1	(23)
2083	.....	40.8	-69 47	48	106, 36	..	..	..	247	-32	B1?	(23)
2084	.....	40.9	-69 49	48	106, 36	..	..	..	247	-32	B1?	(23)
2064	D'Arrest .....	41.2	- 0 3	25	118, 103	4.	..	..	172	-13	B1?	(12a?)
2086	.....	41.2	-69 43	48	106, 37	0.3	..	..	247	-32	B3?	..
2100	Dunlop 147? 151? 154?	42.8	-69 15	48	105, 40	2.5	25	10-14	246	-32	C3	(6)
2103	.....	43.2	-71 23	48	104, 27	2.	10	10-14	249	-31	D2, B1	(23)
2099	Messier 37 .....	45.8	+32 31	13	104, 118	25.	200	10-12	145	+ 4	D1	(26)
2122	Dunlop 106 .....	49.9	-70 6	48	101, 35	3.	25	10-14	248	-31	D2, B1	(23)
2134	.....	53.3	-71 8	48	99, 29	1.	150	15	249	-30	C3	(22)
2136	Dunlop 160 .....	53.8	-69 31	48	99, 39	0.8	75	13	247	-30	C3	(22)

N. G. C.	Plate.	Exp.	Description.
1858	A 2204	m. 60	Cluster, fairly condensed, irregular, somewhat nebulous. Large Mag. Cloud.
1851	A 3450	66	! Globular cluster, fairly condensed.
1866	A 2204	60	! Globular cluster, extremely condensed, partially resolved. Large Mag. Cloud.
1874	A 2204	60	Cluster of stars and small nebulae, including N.G.C. 1876-1877, and 1880. Large Mag. Cloud.
1910	A 2204	60	Cluster, fairly condensed, irregular, nebulous? Large Mag. Cloud.
1904	A 2206	60	! Globular cluster, fairly condensed.
1907	A 1058	15	Cluster, coarse.
1912	A 1058	15	Cluster, coarse, irregular.
1929	A 2204	60	Cluster of stars and small nebulae, including also N.G.C. 1934-1937. Large Mag. Cloud.
..	A 2204	60	Cluster of a few stars and small nebulae. Large Mag. Cloud.
1955	A 2204	60	Cluster, fairly condensed, somewhat nebulous. Large Mag. Cloud.
1962	A 2204	60	Cluster, fairly condensed, nebulous, including N.G.C. 1965, 1966, and 1970. Large Mag. Cloud.
1968	A 2204	60	Cluster, fairly condensed, involved in nebulosity. Large Mag. Cloud.
1974	A 2204	60	Cluster, fairly condensed, involved in nebulosity. Large Mag. Cloud.
1952	A 161	65	Nebula, slightly condensed at centre, elliptical, 3' by 1'. The "Crab" Nebula.
1986	A 2204	60	Cluster, globular in form, few stars, apparently involved in nebulosity. Large Mag. Cloud.
1960	A 7530	10	! Cluster, fairly condensed.
2001	A 2204	60	Cluster, fairly condensed, apparently involved in nebulosity. Large Mag. Cloud.
1976	A 153	60	!!! Nebula, irregular, diffuse, Great Orion Nebula, central portion.
1977	A 153	60	Nebula, several bright stars involved in nebulosity, Great Orion Nebula, northern portion.
2002	A 2204	60	Cluster, fairly condensed, involved in nebulosity. Large Mag. Cloud.
1980	A 153	60	Nebula, 2 bright and several faint stars involved in nebulosity.
1981	A 153	60	Cluster of 8 rather bright, and many faint stars.
2003	A 2204	60	Nebula, apparently a nebulous star. Large Mag. Cloud.
2004	A 2204	60	Globular cluster?, a few stars apparently involved in nebulosity. Large Mag. Cloud.
2006	A 2204	60	Cluster of few stars and small nebulae. Large Mag. Cloud.
2018	A 2969	56	Cluster, fairly condensed, irregular, involved in nebulosity. Large Mag. Cloud.
2020	A 2204	60	Cluster, fairly condensed, apparently involved in nebulosity. Large Mag. Cloud.
2031	A 2969	56	Globular cluster, fairly condensed, somewhat irregular. Large Mag. Cloud.
2029	A 2204	60	Cluster, fairly condensed, nebulous, including N.G.C. 2032 and 2035. Large Mag. Cloud.
2030	A 2204	60	Cluster, fairly condensed, involved in nebulosity. Large Mag. Cloud.
2040	A 2204	60	Cluster, coarse, perhaps involved in nebulosity. Large Mag. Cloud.
2024	A 220	60	Nebula, 2 distinct, irregular patches, each 10' to 15' long.
2050	A 2204	60	Cluster of stars and small nebulae. Large Mag. Cloud.
2058	A 2969	56	Globular cluster, fairly condensed. Large Mag. Cloud.
2065	A 2204	60	Globular cluster, fairly condensed, irregular, stars faint. Large Mag. Cloud.
2070	A 2204	60	Nebula and cluster, stars involved in bright, irregular nebula. Large Mag. Cloud. 30 Doradus.
2074	A 2204	60	Cluster, fairly condensed, involved in nebulosity. Large Mag. Cloud.
2077	A 2204	60	Nebula and cluster, small group of stars involved in nebulosity. Large Mag. Cloud.
2080	A 2204	60	Cluster, small group of stars involved in nebulosity. Large Mag. Cloud.
2083	A 2204	60	Nebula with a few stars involved. Large Mag. Cloud.
2084	A 2204	60	Nebula with a few stars involved. Large Mag. Cloud.
2064	A 2199	117	Nebula, involved with double star, nebula extends especially to south.
2086	A 2204	60	Nebula with one star involved, nebulous star? Large Mag. Cloud.
2100	A 2204	60	Globular cluster, fairly condensed, apparently nebulous. Large Mag. Cloud.
2103	A 2969	56	Cluster, fairly condensed, irregular, apparently involved in nebulosity. Large Mag. Cloud.
2099	A 7541	10	! Cluster, fairly condensed, regular, almost globular.
2122	A 2969	56	Cluster, fairly condensed, apparently involved in nebulosity. Large Mag. Cloud.
2134	A 2969	56	Globular cluster, condensed. Large Mag. Cloud.
2136	A 2969	56	Globular cluster, condensed. Large Mag. Cloud.

N. G. C.	Designation.	R. A. 1900.	Dec. 1900.	H.M.	Coord.	Diam.	No.	Magn.	Gal. Long.	Gal. Lat.	Class.	Illus.
2157	Dunlop 161? .....	h. m. 5 58.3	° ' -69 12	48	97, 40	1.	..	..	247	-30	C3?	(22)
2164	Dunlop 194 .....	59.4	-68 31	48	96, 45	0.7	5	..	245	-30	C3?	(22)
2168	Messier 35 .....	6 2.7	+24 21	13	82, 71	30.	200	10-14	154	+ 4	D2	(10)
2244	.....	27.0	+ 4 56	25	59, 133	15.	15	8-11	174	0	D3	(2)
2264	.....	35.5	+ 9 59	25	41, 161	20.	20	8-11	170	+ 4	D3	(2)
2281	.....	42.3	+41 10	13	42, 173	15.	20	8-11	142	+19	D3	(2)
2287	Messier 14 .....	42.7	-20 38	37	39, 150	30.	25	8-11	199	- 9	D3	(2)
2301	.....	46.6	+ 0 35	25	23, 107	15.	25	8-12	180	+ 2	D3	(13)
2323	Messier 50 .....	58.2	- 8 12	25	5, 54	15.	40	9-11	190	0	D3	(13)
2360	Caroline Herschel ....	7 13.2	-15 27	38	168, 180	10.	40	10-14	197	0	D1	(26)
2362	.....	14.6	-24 46	38	158, 123	7.	30	8-12	206	- 4	D2	(14)
2403	.....	27.2	+65 49	4	45, 145	..	..	..	118	+30	C1	..
2422	.....	32.0	-14 16	38	140, 190	40.	50	6-10	199	+ 5	D2	28
2420	.....	32.5	+21 48	14	126, 56	3.	10	10-12	166	+21	D3	(8)
2437	Messier 46 .....	37.2	-14 35	38	133, 188	40.	100	11-13	200	+ 6	D1	27
2447	Messier 93 .....	40.4	-23 38	38	124, 133	10.	25	10-12	207	+ 2	D2	(14)
2451	.....	41.8	-37 44	38	115, 50	40.	20	6-12	220	- 5	D3	(2)
2477	Dunlop 535 .....	48.7	-38 17	38	107, 47	25.	300	11-12	221	- 5	D1	(27)
2516	Lacaille II 3.....	56.7	-60 36	49	144, 87	40.	50	6- 9	241	-15	D2	(10)
2539	.....	8 6.0	-12 32	26	91, 27	25.	50	10-14	201	+12	D1	(26)
2547	Dunlop 411 .....	7.7	-48 58	49	152, 157	20.	25	8-14	232	- 8	D3	(13)
2546	Dunlop 563 .....	7.9	-37 6	38	84, 55	50.	50	7-14	222	- 1	D3	(2)
2548	Caroline Herschel ....	8.8	- 5 30	26	88, 70	25.	40	8-12	195	+17	D3	(28)
2632	Praesepe, Messier 44..	34.3	+20 20	14	40, 48	60.	50	7-12	173	+34	D3	2
..	.....	37.5	-52 34	49	120, 139	15.	10	4- 8	238	- 6	D3	(13)
..	.....	40.0	-47 48	49	122, 168	10.	20	6-10	234	- 3	D3	(13)
2671	Dunlop 489? 490? ...	42.6	-41 31	38	44, 23	30.	10	6-10	230	+ 1	D3	(2)
2682	Messier 67 .....	45.8	+12 11	26	32, 175	15.	50	9-13	183	+34	D2	(10)
2808	Dunlop 265 .....	9 10.0	-64 27	49	92, 70	6.	1000	14	250	-11	C3	(19)
..	.....	24.6	-56 32	49	79, 116	8.	25	10-12	245	- 4	D3	(13)
2903	.....	26.5	+21 56	15	141, 57	..	..	..	176	+46	C2	(31)
3031	Messier 81 .....	47.3	+69 32	5	68, 160	1.	..	..	109	+42	C1?	(18a)
3034	Messier 82 .....	47.5	+70 10	5	68, 163	..	..	..	109	+42	B2	(32)
3114	Dunlop 297 .....	59.5	-59 38	50	183, 49	50.	200	8-15	251	- 3	D2	(10)
3201	Dunlop 445 .....	10 13.5	-45 54	49	23, 173	8.	250	12-14	245	+10	C3	7
3293	.....	32.0	-57 43	50	162, 71	8.	100	7-15	253	0	D2	(14)
3324	Dunlop 322? .....	33.5	-58 0	50	160, 70	6.	..	..	254	0	B1	(25)
..	.....	33.6	-58 6	50	159, 69	6.	..	..	269	+ 4	B1	(25)
..	.....	39.4	-63 52	50	145, 37	60.	20	3- 8	269	- 1	D3	(1)
3372	Dunlop 309 .....	41.2	-59 9	50	152, 65	80.	..	..	255	0	B1	25
3532	Dunlop 323 .....	11 2.2	-58 8	50	138, 74	60.	200	10-12	257	+ 2	D2	(10)
3572	.....	6.2	-59 42	50	135, 64	60.	500	7-14	258	0	D3?	(4)
..	.....	13.6	-62 10	50	125, 53	10.	50	10-13	260	- 2	D2	(10)
3766	Dunlop 289 .....	31.5	-61 3	50	113, 61	15.	100	9-15	262	0	D2	(10)
4051	.....	58.0	+45 5	16	94, 192	..	..	..	113	+71	C1	..
4103	Dunlop 291 .....	12 1.5	-60 41	50	92, 65	8.	50	10-15	265	+ 1	D3	(13)
4214	.....	10.6	+36 53	16	78, 143	..	..	..	124	+79	C2?	..
4254	Messier 99 .....	13.8	+14 58	28	75, 190	0.6	..	..	244	+75	C2	..
4258	.....	14.0	+47 52	6	75, 32	..	..	..	103	+70	C1?	..
4303	Messier 61 .....	16.8	+ 5 2	28	70, 130	2.	..	..	256	+66	C2	(31)



N. G. C.	Plate.	Exp.	Description.
2157	A 2969	<sup>m.</sup> 56	Globular cluster?, extremely condensed. Large Mag. Cloud.
2164	A 2969	56	Globular cluster?, apparently few stars involved in nebulosity. Large Mag. Cloud.
2168	A 4054	60	! Cluster, fairly condensed.
2244	A 7094	10	Cluster, coarse.
2264	A 7132	10	Cluster, coarse.
2281	A 7061	10	Cluster, coarse.
2287	A 4993	10	Cluster, coarse.
2301	A 7058	10	Cluster, coarse, extremely irregular.
2323	A 7057	10	Cluster, coarse.
2360	A 4220	60	Cluster, fairly condensed.
2362	A 4323	62	Cluster, condensed.
2403	A 1419	14	Nebula, faint, ill-defined.
2422	A 7237	60	! Cluster, fairly condensed.
2420	A 6665	10	Cluster, coarse unimportant.
2437	A 7237	60	! Cluster, fairly condensed.
2447	A 4307	60	Cluster, fairly condensed.
2451	A 5780	60	Cluster, coarse.
2477	A 5780	60	! Cluster, fairly condensed.
2516	A 2197	60	! Cluster, fairly condensed.
2539	A 5831	60	Cluster, coarse.
2547	A 3453	80	Cluster, coarse, irregular.
2546	A 5099	60	Cluster, coarse, irregular.
2548	A 64	10	Cluster, coarse.
2632	A 7203	60	Cluster, coarse, well known group of comparatively bright stars.
..	A 3464	61	Cluster, coarse, including $\alpha$ Velorum, magnitude 3.68.
..	A 3031	65	Cluster, coarse.
2671	A 2999	60	Cluster, coarse.
2682	A 433	12	Cluster, fairly condensed.
2808	A 3036	60	!! Globular cluster, condensed.
..	A 4254	64	Cluster, coarse.
2903	A 7241	60	! Nebula, spiral, bright nucleus.
3031	A 1421	17	Nebula, elliptical, 6' by 4' at 150°, bright nucleus, spiral?
3034	A 1421	17	Nebula, elongated at 60°, 6' by 1', one bright and several faint nuclei.
3114	A 4267	70	Cluster, fairly condensed, rich region of the Milky Way.
3201	A 2968	60	! Globular cluster, open.
3293	A 4263	60	! Cluster, fairly condensed, Milky Way.
3324	A 2549	60	Nebula, rather faint, one rather bright star involved, a portion of the Great Nebula in Carina.
..	A 2549	60	Nebula, faint, involved in stars, a portion of the Great Nebula in Carina.
..	A 1804	60	Cluster, coarse, including $\theta$ Carinae.
3372	A 4263	60	!!! Nebula, bright, irregular, rich in stars. Great Nebula about $\eta$ Carinae, central portion.
3532	A 2549	60	! Cluster, fairly condensed, Milky Way.
3572	A 2549	60	Cluster, rich field of the Milky Way.
..	A 5824	60	Cluster, fairly condensed.
3766	A 5306	60	! Cluster, condensed.
4051	I 22757	43	Nebula, elongated, mottled, spiral?
4103	A 5306	60	Cluster, coarse.
4214	A 7152	60	Nebula, elongated at 130°, 2' by 0'.5, nucleus, spiral?
4254	A 1875	62	Nebula, nucleus, spiral?
4258	A 571	21	Nebula, small, bright nucleus, not well shown on A 571.
4303	A 6789	60	Nebula, bright nucleus, spiral.



N. G. C.	Designation.	R. A. 1900.	Dec. 1900.	H.M.	Coord.	Diam.	No.	Magn.	Gal. Long.	Gal. Lat.	Class.	Illus.
		<i>h. m.</i>	<i>° ' "</i>			<i>' "</i>			<i>°</i>	<i>°</i>		
4321	Messier 100 .....	12 17.9	+16 23	16	64, 23	0.3	..	..	246	+77	C1	..
4349	Dunlop 292 .....	19.0	-61 20	50	79, 61	20.	100	10-15	267	+ 1	D1	(27)
4374	Messier 84 .....	20.0	+13 26	28	66, 181	0.5	..	..	251	+74	C1	(18a)
4382	Messier 85 .....	20.4	+18 45	16	61, 38	1.1	..	..	243	+80	C1	(18a)
4406	Messier 86 .....	21.1	+13 30	28	64, 181	0.5	..	..	251	+74	C1	(18a)
4449	.....	23.4	+44 39	16	67, 191	..	..	..	100	+73	C1?	(18a)
4450	.....	23.4	+17 38	16	57, 31	..	..	..	250	+79	C2	..
4472	Messier 49 .....	24.7	+ 8 33	28	58, 151	1.5	..	..	259	+70	C1	(18a)
4486	Messier 87 .....	25.8	+12 57	28	58, 178	0.8	..	..	256	+74	C1	(18a)
4490	d'Arrest .....	25.8	+42 12	16	64, 176	..	..	..	100	+76	C1	(18a)
4501	Messier 88 .....	26.9	+14 58	28	56, 191	1.5	..	..	256	+76	C2	(31)
4526	.....	29.0	+ 8 15	28	52, 149	..	..	..	262	+70	C1	..
4569	Messier 90 .....	31.8	+13 43	28	49, 183	3.	..	..	260	+75	C1	..
4590	Messier 68 .....	34.2	-26 12	40	51, 117	5.	150	12-15	268	+35	C3	(5)
4594	.....	34.8	-11 4	28	42, 33	..	..	..	267	+51	C1?	..
4609	Dunlop 272 .....	36.5	-62 25	50	68, 52	5.	20	10-14	269	- 1	D3	(13)
4631	.....	37.3	+33 6	16	45, 123	..	..	..	99	+85	C1?	..
4651	.....	38.7	+16 56	16	34, 28	..	..	..	268	+79	C1	(18a)
4656	.....	39.1	+32 43	16	43, 121	..	..	..	91	+85	C1?	(32)
4736	Messier 94 .....	46.2	+41 40	16	64, 176	0.5	..	..	76	+86	C1	(18a)
4755	Dunlop 301 .....	47.7	-59 48	50	58, 67	12.	75	9-14	271	+ 2	D2	14
4826	Messier 64 .....	51.8	+22 13	16	19, 61	..	..	..	295	+84	C2	..
4833	Dunlop 164 .....	52.7	-70 20	51	165, 16	6.	250	13-15	272	- 9	C3	(6)
5005	.....	13 6.3	+37 36	16	13, 155	..	..	..	61	+79	C1	(18a)
5024	Messier 53 .....	8.0	+18 42	17	158, 32	5.	350	13-14	307	+79	C3	(5)
5055	Messier 63 .....	11.3	+42 34	17	143, 175	1.	..	..	69	+74	C1	..
5128	Dunlop 482 .....	19.6	-42 30	50	4, 162	4.	..	..	277	+19	B1?	(12a)
5139	$\omega$ Centauri .....	20.8	-46 47	50	11, 135	35.	6000	13-15	277	+15	C3	16
5194	Messier 51 .....	25.7	+47 43	6	4, 45	5.	..	..	68	+71	C2	31
5236	Messier 83 .....	31.4	-29 21	41	137, 100	10.	..	..	283	+31	C2	(31)
5272	Messier 3 .....	37.6	+28 53	17	114, 91	12.	1000	13-17	8	+77	C3	20
5281	Dunlop 273 .....	39.7	-62 24	50	25, 41	5.	15	10-12	277	- 1	D2	(11)
5286	Dunlop 388 .....	40.1	-50 52	51	172, 138	10.	300	13-15	280	+10	C3	(5)
5316	Dunlop 282 .....	46.9	-61 22	50	18, 45	10.	25	11-14	278	0	D3	(13)
5460	Dunlop 431 .....	14 1.2	-47 50	51	156, 161	40.	25	8-12	284	+13	D3	(2)
5617	Dunlop 302 .....	22.3	-60 16	51	124, 91	15.	40	10-12	282	- 1	D2	(10)
5662	Dunlop 342 .....	28.0	-56 7	51	123, 116	20.	15	10-12	285	+ 3	D3	(2)
5866	.....	15 3.8	+56 9	7	87, 76	..	..	..	58	+52	C1?	..
5904	Messier 5 .....	13.5	+ 2 27	30	167, 116	12.	1000	13-15	333	+45	C3	21
5986	Dunlop 552 .....	39.5	-37 27	42	123, 52	4.	350	13-15	305	+13	C3	(5)
6025	Dunlop 304 .....	55.2	-60 13	51	57, 90	12.	25	7- 9	292	- 7	D3	(13)
6067	Dunlop 360 .....	16 5.4	-53 57	51	41, 125	20.	400	9-16	298	- 3	D2	(3a)
6087	Dunlop 326 .....	10.6	-57 39	51	42, 102	15.	15	8-12	296	- 6	D3	(13)
6093	Messier 80 .....	11.1	-22 44	42	84, 140	5.	500	12-15	320	+18	C3	(17)
6121	Messier 4 .....	17.5	-26 17	42	76, 118	18.	500	11, 16	319	+15	C3	6
6124	Dunlop 514 .....	18.8	-40 26	42	78, 35	25.	100	9-14	309	+ 5	D2	(10)
6134	Dunlop 412 .....	20.3	-48 55	51	18, 151	10.	50	10-14	303	- 1	D2	(12b)
6171	Méchain .....	26.9	-12 50	30	58, 24	3.5	50	13-14	331	+21	C3?	(7)
6205	Messier 13 .....	38.1	+36 39	18	51, 122	15.	3000	13-15	26	+40	C3	19
6218	Messier 12 .....	42.0	- 1 46	30	35, 90	10.	400	13-15	344	+25	C3	(5)

N. G. C.	Plate.	Exp.	Description.
4321	A 1875	<sup>m.</sup> 62	Nebula, bright nucleus, spiral?
4349	A 1813	62	Cluster, fairly condensed, Milky Way.
4374	A 6793	60	Nebula, somewhat brighter at centre, somewhat elongated, spiral?
4382	A 6758	60	Nebula, brighter at the centre, spiral?
4406	A 6793	60	Nebula, elongated, brighter at centre, spiral?
4449	A 346	11	Nebula, elongated at 40°, 1'.5 by 0'.3, brighter at the centre, spiral?
4450	A 6758	60	Nebula, elongated at 10°, 1'.5 by 0'.6, nucleus, spiral?
4472	A 6796	60	Nebula, much brighter at the centre, spiral or globular cluster?
4486	A 6793	60	Nebula, round, much brighter at the centre, spiral or globular cluster?
4490	A 346	11	Nebula, elongated at 135°, 1'.0 by 0'.3, brighter at the centre, spiral?
4501	A 6793	60	Nebula, spiral, elongated at 150°, 3'.0 by 1'.5, bright nucleus.
4526	A 6796	60	Nebula, elongated at 120°, 2' by 1', bright nucleus, spiral?
4569	A 6793	60	Nebula, elongated at 25°, 3' by 1', bright nucleus, spiral?
4590	A 3559	60	! Globular cluster, fairly condensed.
4594	A 3765	60	Nebula, elongated at 90°, 4'.0 by 0'.4, nucleus, spiral seen edgewise?
4609	A 4339	60	Cluster, coarse, with one sixth magnitude star involved.
4631	I 24940	60	Nebula, elongated at 80°, 6' by 1', several nuclei, faint star on northern edge, class uncertain.
4651	A 6758	60	Nebula, elongated at 85°, 2' by 1', spiral?
4656	I 24940	60	Nebula, much elongated at 35°, irregular, several nuclei.
4736	A 346	11	Nebula, almost round, brighter at the centre, spiral or globular cluster?
4755	A 2570	60	! Cluster, fairly condensed, $\kappa$ Crucis.
4826	A 6730	60	Nebula, elongated at 125°, 3'.0 by 1'.5, bright nucleus, spiral.
4833	A 2578	80	! Globular cluster, fairly condensed.
5005	A 5410	10	Nebula, much elongated at 65°, nucleus, spiral?
5024	A 1821	60	! Globular cluster, fairly condensed.
5055	A 347	18	Nebula, somewhat elongated, nucleus, spiral?
5128	A 3083	60	Nebula, peculiar, broken, 5 stars involved.
5139	A 3555	60	!!! Globular cluster, fairly condensed.
5194	A 1834	65	! Nebula, spiral, nucleus.
5236	A 3077	60	!! Nebula, spiral, nucleus, several branches.
5272	A 1840	70	!! Globular cluster, condensed.
5281	A 2522	72	Cluster, fairly condensed.
5286	A 2567	60	! Globular cluster, fairly condensed.
5316	A 2522	72	Cluster, coarse.
5460	A 2582	70	Cluster, coarse.
5617	A 2641	60	Cluster, fairly condensed.
5662	A 2641	60	Cluster, coarse.
5866	I 13239	20	Nebula, much elongated at 135°, 2'.0 by 0'.7, spiral?
5904	A 1809	60	!! Globular cluster, condensed.
5986	A 2678	80	! Globular cluster, fairly condensed.
6025	A 2670	66	Cluster, coarse.
6067	A 1827	62	! Cluster, fairly condensed.
6087	A 1985	60	Cluster, coarse.
6093	A 2763	60	! Globular cluster, condensed.
6121	A 2756	85	! Globular cluster, fairly condensed, irregular.
6124	A 2712	70	Cluster, fairly condensed.
2134	A 2583	70	Cluster, fairly condensed.
6171	A 3926	60	Cluster, globular?, fairly open, somewhat irregular.
6205	A 1806	60	!! Globular cluster, condensed. The Great Cluster in Hercules.
6218	A 1849	60	! Globular cluster, fairly condensed.

N. G. C.	Designation.	R. A. 1900.	Dec. 1900.	H.M.	Coord.	Diam.	No.	Magn.	Gal. Long.	Gal. Lat.	Class.	Illus.
6229	Schultz .....	h. m. 16 44.2	° ' +47 42	18	50, 190	0.4	..	..	° ' 40 +41		C1	(22)
6231	Dunlop 499 .....	47.0	-41 38	42	46, 24	15.	150	7-12	311	0	D2	11
6242	Dunlop 520 .....	48.8	-39 20	42	42, 38	10.	50	8-14	314	+ 1	D3	(13)
6254	Messier 10 .....	51.9	- 3 57	30	20, 76	12.	700	13-15	343	+22	C3	(5)
6259	Dunlop 456 .....	53.5	-44 31	42	41, 5	15.	100	11-14	310	- 2	D2	(26)
6266	Messier 62 .....	54.8	-29 58	42	29, 92	5.	1000	14-16	321	+ 6	C3	(20)
6273	Messier 19 .....	56.4	-26 7	42	24, 115	4.	800	13-15	325	+ 8	C3	(20)
6281	Dunlop 556 .....	58.0	-37 45	42	30, 45	10.	25	8-12	316	+ 1	D3	(13)
6284	.....	58.4	-24 37	42	20, 124	2.	..	..	326	+ 9	C3	(22)
6293	.....	17 4.0	-26 26	43	168, 120	3.	150	13-15	326	+ 6	C3	(19)
6304	.....	8.2	-29 20	42	10, 94	2.	..	..	324	+ 4	C3	(22)
6333	Messier 9 .....	13.3	-18 25	43	161, 170	5.	200	13-15	334	+ 9	C3	(19)
6341	Messier 92 .....	14.1	+43 15	18	14, 168	5.	100	13-15	35	+34	C3	(5)
..	.....	16.9	-49 50	52	137, 152	15.	75	10-14	308	- 9	D1	(26)
6352	Dunlop 417 .....	17.8	-48 19	52	138, 161	3.	50	12-13	309	- 9	D2	(14)
6356	.....	17.8	-17 43	43	155, 174	2.	..	..	335	+ 9	C3	(22)
6388	Dunlop 457 .....	29.0	-44 40	52	130, 185	3.	..	..	313	- 8	C3	22
6402	Messier 14 .....	32.4	- 3 11	31	136, 79	4.	250	14-15	349	+14	C3	(6)
6397	Dunlop 366 .....	32.5	-53 37	52	120, 131	20.	1000	13-15	306	-13	C3	(19)
6405	Messier 6 .....	33.5	-32 9	43	126, 89	30.	50	8-12	325	- 3	D2	10
..	B. A. C. 6012? .....	41.4	+ 5 45	31	123, 132	30.	10	7-10	358	+16	D3	(13)
6441	Dunlop 557 .....	43.4	-37 1	43	113, 61	2.	..	..	321	- 6	C3	(22)
6475	Messier 7 .....	47.3	-34 47	43	109, 75	50.	25	7- 9	324	- 6	D3	(10)
6494	Messier 23 .....	51.0	-19 0	43	107, 169	30.	100	10-14	337	+ 1	D1	26
6514	Messier 20 .....	56.3	-23 2	43	99, 145	20.	..	..	335	- 2	B1	12a
6523	Messier 8 .....	57.6	-24 23	43	96, 136	25.	..	..	334	- 3	B1	15
6531	Messier 21 .....	58.6	-22 30	43	96, 148	15.	25	8-13	336	- 2	D2	12b
6541	Dunlop 473 .....	18 0.8	-43 44	52	96, 193	8.	400	13-15	317	-12	C3	(19)
6584	Dunlop 376 .....	10.6	-52 15	52	86, 140	2.5	75	12-16	310	-18	C3	(7)
6603	Messier 24 .....	12.6	-18 27	43	80, 170	5.	25	11-14	341	- 3	D2	4
6611	Messier 16 .....	13.2	-13 49	43	75, 200	15.	25	8-12	345	- 1	D3	(13)
6618	Messier 17 .....	15.0	-16 13	43	72, 185	15.	..	..	342	- 2	B2	32
6624	.....	17.3	-30 24	43	72, 100	2.5	..	..	330	-10	C3	(22)
6626	Messier 28 .....	18.4	-24 55	43	69, 133	4.	1000	14-15	336	- 7	C3	(19)
6633	Caroline Herschel ....	22.7	+ 6 30	31	62, 135	30.	25	8-10	4	+ 7	D3	13
6637	Messier 69 .....	24.8	-32 25	43	63, 88	3.	100	14-16	329	-12	C3	(6)
..	.....	25.8	-19 19	43	58, 167	25.	50	9-12	341	- 6	D2	(10)
6642	.....	25.8	-23 32	43	53, 137	1.	..	..	338	- 8	C3	(22)
6645	.....	26.8	-16 58	43	56, 181	15.	100	11-15	344	- 5	D2	(10)
6652	Dunlop 607 .....	29.2	-33 4	43	57, 84	2.	100	15	329	-13	C3	(6)
6656	Messier 22 .....	30.3	-23 59	43	53, 138	12.	1500	13-15	338	- 9	C3	(16)
..	.....	34.0	+ 5 22	31	48, 130	40.	50	9-10	4	+ 4	D3	(2)
6681	Messier 70 .....	36.7	-32 23	43	48, 87	4.	100	13-15	330	-14	C3	(6)
6694	Messier 26 .....	39.8	- 9 30	31	37, 40	6.	25	8-15	351	- 4	D3	8
6705	Messier 11 .....	45.7	- 6 23	31	27, 58	12.	250	12-14	355	- 4	C3	5
6712	.....	47.6	- 8 50	31	25, 44	3.	75	16	353	- 6	C3?	9
6715	Messier 54 .....	48.7	-30 36	43	32, 96	2.	..	..	333	-16	C3	(22)
6720	Messier 57 .....	49.9	+32 54	19	13, 124	1.	..	..	30	+13	B2	33
6723	Dunlop 573 .....	52.8	-36 46	43	30, 59	8.	1000	13-15	327	-19	C3	(5)
6752	Dunlop 295 .....	19 2.0	-60 8	52	51, 88	15.	1000	12-15	303	-26	C3	(5)

N. G. C.	Plate.	Exp.	Description.
6229	A 363	<sup>m.</sup> 10	Globular cluster?, extremely condensed, not resolved on the Bruce plate.
6231	A 1981	60	! Cluster, fairly condensed.
6242	A 1905	60	Cluster, coarse.
6254	A 1849	60	! Globular cluster, fairly condensed.
6259	A 1981	60	Cluster, fairly condensed.
6266	A 5708	60	!! Globular cluster, condensed, unsymmetrical in form.
6273	A 5708	60	!! Globular cluster, condensed.
6281	A 1905	60	Cluster, coarse.
6284	A 7358	60	Globular cluster, condensed.
6293	A 5708	60	Globular cluster, fairly condensed.
6304	A 5629	60	Globular cluster, condensed.
6333	A 2849	61	Globular cluster, condensed.
6341	A 5235	10	Globular cluster, fairly condensed.
..	A 2658	60	Cluster, fairly condensed.
6352	A 2658	60	Cluster, condensed.
6356	A 2849	61	Globular cluster, extremely condensed.
6388	A 2679	80	Globular cluster, extremely condensed.
6402	A 4418	60	! Globular cluster, fairly condensed.
6397	A 1850	60	!! Globular cluster, fairly condensed.
6405	A 2725	61	! Cluster, fairly condensed.
..	A 565	32	Cluster, coarse.
6441	A 5555	60	Globular cluster, extremely condensed.
6475	A 2606	60	! Cluster, fairly condensed.
6494	A 2769	71	Cluster, fairly condensed.
6514	A 1808	60	!! Nebula, double, irregular, the larger part trifold, stars involved. The Trifid Nebula.
6523	A 1808	60	!! Nebula, irregular, similar to the Trifid Nebula which it surpasses in size and brightness.
6531	A 1808	60	Cluster, fairly condensed.
6541	A 6340	60	! Globular cluster, condensed.
6584	A 3169	71	Globular cluster, fairly condensed.
6603	A 2656	61	Cluster, fairly condensed, in one of the richest regions of the Milky Way.
6611	A 2716	10	Cluster, coarse.
6618	A 2656	61	! Nebula, irregular, mottled, nuclei. The "Horse Shoe," or "Omega" Nebula.
6624	A 2661	60	Globular cluster, extremely condensed, not well resolved on the Bruce plates.
6626	A 1846	54	!! Globular cluster, condensed.
6633	A 6421	60	Cluster, coarse.
6637	A 2673	60	Globular cluster, fairly condensed.
..	A 2757	80	Cluster, fairly condensed.
6642	A 7340	60	Globular cluster, few stars, condensed.
6645	A 2757	80	Cluster, fairly condensed.
6652	A 2673	60	Globular cluster, fairly condensed.
6656	A 7340	60	!! Globular cluster, fairly condensed.
..	A 6421	60	Cluster, coarse.
6681	A 2673	60	Globular cluster, fairly condensed.
6694	A 1851	60	Cluster, coarse.
6705	A 1851	60	! Globular cluster, rather open, somewhat irregular.
6712	A 1851	60	Cluster, globular?, somewhat irregular, fairly condensed.
6715	A 4800	60	Globular cluster, extremely condensed.
6720	A 2759	80	! Nebula, ring, elliptical, nucleus. The well-known "Ring" Nebula in Lyra.
6723	A 1988	69	!! Globular cluster, fairly condensed.
6752	A 1917	64	!! Globular cluster, fairly condensed.



N. G. C.	Designation.	R. A. 1900.	Dec. 1900.	H.M.	Coord.	Diam.	No.	Magn.	Gal. Long.	Gal. Lat.	Class.	Illus.
6779	Messier 56 .....	<i>h. m.</i> 19 12.7	<i>° '</i> +30 0	20	148, 106	2.5	25	13-15	30	+ 7	C3	(5)
6809	Messier 55 .....	33.7	-31 10	44	129, 88	15.	800	12-14	336	-25	C3	(5)
6811	.....	35.2	+46 20	20	116, 201	10.	20	10-12	47	+11	D3	(8)
6853	Messier 27 .....	55.3	+22 27	20	95, 59	5.	..	..	29	- 4	B2	30
6864	Messier 75 .....	20 0.2	-22 12	44	95, 142	2.5	..	..	348	-28	C3	(22)
6866	.....	0.5	+43 43	20	89, 185	5.	10	8-12	46	+ 6	D3	(8)
7078	Messier 15 .....	21 25.2	+11 44	33	145, 170	10.	1000	13-15	33	-29	C3	(17)
7089	Messier 2 .....	28.3	-1 16	33	140, 92	8.	800	13-15	22	-37	C3	(17)
7092	Messier 39 .....	28.6	+48 0	9	62, 35	30.	20	7-11	60	- 3	D3	(13)
7099	Messier 30 .....	34.7	-23 38	45	135, 129	8.	350	12-15	356	-48	C3	(5)
7331	.....	22 32.5	+33 54	21	49, 123	..	..	..	62	-21	C1?	(18a)
7654	Messier 52 .....	23 19.8	+61 3	2	121, 130	12.	50	9-13	81	+ 1	D3	(13)
7789	Caroline Herschel ....	52.0	+56 10	2	99, 100	10.	40	10-12	83	- 5	D1	(26)

## REMARKS.

55. A remarkable object, similar in many respects to N. G. C. 6618 (Plate III, Fig. 32). It is well shown on A 3340, but is better shown with a long exposure. The nebula has several condensations or nuclei, and is relatively bright for a distance of about 10', but fainter extensions are visible, especially in a south following direction.
104. Situated near the Small Magellanic Cloud, but apparently having no connection with it. One of the finest of the globular clusters. The stars appear to belong to two groups, as regards magnitude, one having stars from the thirteenth to the fifteenth magnitude, and the other, of about the seventeenth magnitude. The distribution of the stars of both groups appears to be similar. The number of stars in this cluster has been counted on a Bruce plate having a long exposure, except near the centre, where the images coalesce, and are burned out. On the assumption that the law of distribution is the same near the centre as near the margin, the number of stars in the cluster, as derived from the count, is 9500. Six of these are known to be variable. The only close rival to this cluster is  $\omega$  Centauri, N. G. C. 5139, but 47 Tucanae is much more condensed in the centre.
221. Probably associated with The Great Nebula in Andromeda, N. G. C. 224, whose fainter extensions, as shown on photographs having long exposures, include it.
224. The Great Nebula in Andromeda. On photographs having long exposures, especially those made with powerful reflectors, this object is seen to extend to three times the dimensions given in the catalogue, which are derived from a Bruce plate having an exposure of only one hour. It appears to be a gigantic spiral, having a condensed nucleus. A faint nebula north preceding, N. G. C. 205, which was discovered by Caroline Herschel, does not show on the Harvard Map, and has not been included in the catalogue.
253. On A 3386, having an exposure of 4 hours, this nebula is shown as a striking object, 30' by 5', somewhat resembling the Great Nebula in Andromeda, but without a central nucleus. It resembles more closely, however, N. G. C. 6618, which has a gaseous spectrum.
330. One of the numerous small clusters which are found in the Magellanic Clouds. These clusters present some peculiarities. Many of them appear to be globular, but they contain few stars, are somewhat irregular, and often appear to be involved in nebulosity. As globular clusters, they are not typical, nor are they of great interest.
346. This object is fairly typical of many which occur in the Magellanic Clouds. It consists of a few stars involved in a more or less irregular nebulosity. There appears to be every gradation from a cluster of stars with only a suspicion of nebulosity, to a nebula in which a few stars are involved. At the end of this series is N. G. C. 2070, 30 Doradus, the brightest and most interesting of them all. In this case, the irregular nebulosity is the important feature, but this involves a coarse cluster of stars. The scale of the Cooke plates is too small to show more than a few of the brightest objects which occur in the Magellanic Clouds.
362. An interesting globular cluster near the Small Magellanic Cloud, but distinct from it. Though far



N. G. C.	Plate.	Exp.	Description.
6779	A 5383	<sup>m.</sup> 60	Globular cluster?, somewhat irregular, fairly condensed.
6809	A 5627	60	! Globular cluster, open.
6811	A 5297	10	Cluster, coarse.
6853	A 1891	60	! Nebula, the well-known "Dumb-bell" Nebula.
6864	A 7389	60	Globular cluster, extremely condensed.
6866	A 4773	10	Cluster, coarse.
7078	A 6183	60	!! Globular cluster, condensed.
7089	A 4681	10	! Globular cluster, condensed.
7092	A 836	15	Cluster, coarse.
7099	A 2838	60	! Globular cluster, fairly condensed, unsymmetrical.
7331	I 13053	49	Nebula, much elongated at 170°, much brighter at the centre, spiral seen edgewise?
7654	I 31208	19	Cluster, fairly condensed.
7789	A 6488	10	Cluster, fairly condensed.

- inferior to 47 Tucanae, N. G. C. 104, it resembles it somewhat closely. It contains 14 known variable stars.
419. Not well resolved on the Bruce plates, but it appears to be a globular cluster.
581. This cluster contains one bright star, +59° 271, whose photometric magnitude is 7.26.
1291. This object is given as a globular cluster in the N. G. C. This appears probable, although it is not resolved on the Bruce plates.
- 1380, 1399. On the Bruce plates, 1380 and 1399 appear similar. In the N. G. C., 1399 is called a globular cluster, while 1380 is not thus designated. In this region of the sky many such objects are shown on plates having long exposures. It seems probable that many of these objects are faint globular clusters, although they appear on the photographs merely as small nebulae, brighter at the centre, similar to 1399.
- .. Pleiades. The number of stars which really belong to this cluster is doubtful. Several thousand stars have been photographed in this region, but there is no proof that many of these belong to the cluster, since even this large number is no greater, if, indeed, it is as great, as that in an equal area of the surrounding regions. Apparently the cluster itself consists of a few comparatively bright stars.
- .. Hyades. A widely scattered cluster consisting of a few bright stars, including  $\alpha$  Tauri, magnitude 1.06.
1743. The spectrum is gaseous.
1746. This object, with 1750 and 1758, forms one large irregular cluster. There seems to be no distinct division into different clusters.
1763. Several objects, in this and adjacent clusters, have a gaseous spectrum, in addition to which there appears to be a diffused nebulosity. See H.C. 60.
1904. This cluster contains 5 known variable stars.
1952. The spectrum is gaseous.
- 1976, 1977, 1980. Different portions of The Great Orion Nebula, the spectrum of which is gaseous. The best known of its class, and one of the finest nebulae in the sky.
2070. A remarkable object. The spectrum is gaseous. See Remark on 346. Many of the nebulous clusters, or stars involved in nebulae, in the Magellanic Clouds, resemble 2070, but no other is as bright, and many are extremely faint.
2077. The spectrum is gaseous.
2403. Perhaps a spiral nebula.
- 2422, 2437. These two fairly condensed clusters are situated a little more than one degree from each other. The former is composed of stars of different magnitude, many of them comparatively bright, the latter, of comparatively faint stars, of more uniform magnitude.
3293. The N. G. C. position of this object is in error.
3372. The spectrum of the nebula surrounding  $\gamma$  Carinae is gaseous. This is one of the largest and finest of the nebulae. The whole region is also very rich in stars.
4321. The spiral nature of this nebula is not well shown on A 1875, having an exposure of 62 minutes.
5139. A magnificent globular cluster, not extremely condensed. More than 6000 stars have been counted on a photograph of this cluster, having a moderate exposure. The whole number of stars can be little less than 10,000. Of these, 128 are known to be variable.
5272. A small globular cluster, containing, nevertheless, not far from 5000 stars. 132 of the brighter ones are known to be variable. The stars appear to be divided into two groups, one having stars from

- the thirteenth to the fifteenth magnitude, and the other, very faint stars of about the seventeenth magnitude.
5904. An interesting globular cluster, similar to 5272, Messier 3, containing 85 known variable stars.
6121. An interesting globular cluster. The separation of the stars into groups of widely different magnitude is especially well marked.
6266. A condensed, and very unsymmetrical globular cluster. The lack of symmetry is marked, not only in the distribution of all the stars, but especially in the distribution of the variables, 26 in number.
6514. A beautiful object. The spectrum is gaseous. The nebula, as shown in Figure 12, consists of two nearly distinct parts, each having a bright star near the centre. Faint stars are also involved, but these are little, if any, more numerous than the stars in the surrounding region.
6523. The spectrum is gaseous. This nebula is similar to the adjacent "Trifid" Nebula, which it surpasses in size and brightness, but the dark lanes which traverse it are less pronounced than those of the Trifid. It is closely associated with a fairly condensed cluster of stars, but the cluster and nebula are not concentric.
6611. A 5297 shows stars only. They are said, however, to be involved in a faint nebulosity.
6618. The spectrum is gaseous.
6626. An interesting globular cluster containing 9 known variable stars.
6656. A globular cluster somewhat resembling  $\omega$  Centauri, N. G. C. 5139. It contains 16 known variables.
6720. The spectrum is gaseous.
6723. Contains 16 known variable stars.
6853. The spectrum is gaseous.
7078. This globular cluster contains 51 known variable stars.
7089. This cluster contains 10 known variable stars.
7099. This cluster contains 3 known variable stars.

Altogether, 263 objects are included in the Catalogue. Of these, none have been assigned to Class A; 23, to Class B; 111, to Class C; 129, to Class D. 64, however, are in the Magellanic Clouds.

The distribution of these clusters and nebulae is not without interest, owing to the systematic nature of their selection, even though the number is small. The character of the objects found in the Magellanic Clouds is shown in the following Table.

TABLE II.  
OBJECTS IN THE MAGELLANIC CLOUDS.

Region.	B			C			D			Totals.
	1	2	3	1	2	3	1	2	3	
Small Cloud. . . . .	0	0	0	0	0	3	0	6	0	9
Large Cloud. . . . .	3	2	2	1	0	15	0	32	0	55
Totals . . . . .	3	2	2	1	0	18	0	38	0	64

In many cases, especially in the Magellanic Clouds, an object is a combined cluster and nebula. In the tabulation, for the sake of simplicity, only the leading characteristic has been considered. An object, for example, called B1,D2, has been regarded simply as B1; while an object, called D2,B1, has been regarded as D2. The above table gives a hint only, as to the nature of the large numbers of similar objects, which are found in

the Magellanic Clouds, on photographs having long exposures, made with telescopes of great power.

Omitting the Magellanic Clouds, we have, in the remainder of the sky, 199 clusters and nebulae, the distribution of which, referred to the Galactic Equator, is shown in Table III. This table gives the number of objects of the different classes, in each of four regions of equal area. The values in the last line are influenced by the omission of the Magellanic Clouds.

TABLE III.  
DISTRIBUTION OF CLUSTERS AND NEBULAE.

Galactic Latitude.	B			C			D			Totals.
	1	2	3	1	2	3	1	2	3	
+90° to +30°	0	1	0	22	9	6	0	1	1	40
+30° to 0°	3	1	0	1	0	18	6	10	22	61
0° to -30°	6	3	0	2	1	23	3	18	30	86
-30° to -90°	0	2	0	2	1	7	0	0	0	12
Totals. . . .	9	7	0	27	11	54	9	29	53	199

Of the objects classified as B1, the mean distance from the Galactic Circle is  $8^{\circ}.3$ , and all are found between  $+19^{\circ}$  and  $-18^{\circ}$ ; of B2, mean distance  $32^{\circ}.7$ , between  $+42^{\circ}$  and  $-88^{\circ}$ ; of C1,  $64^{\circ}.0$ , between  $+86^{\circ}$  and  $-55^{\circ}$ ; of C2,  $59^{\circ}.7$ , between  $+84$  and  $-30^{\circ}$ ; of C3,  $22^{\circ}.2$ , between  $+79^{\circ}$  and  $-56^{\circ}$ ; of D1,  $4^{\circ}.8$ , between  $+12^{\circ}$  and  $-9^{\circ}$ ; of D2,  $4^{\circ}.3$ , between  $+34^{\circ}$  and  $-15^{\circ}$ ; of D3,  $7^{\circ}.5$ , between  $+34^{\circ}$  and  $-23^{\circ}$ .

From these facts it appears that, for the objects given in this catalogue, omitting the Magellanic Clouds, those of B1 are found in the vicinity of the Milky Way, those of B2, over the whole sky, while those of B3 are so doubtful that they can be ignored. Those of C1 avoid the Milky Way, and are found for the most part not far from the north Galactic Pole, those of C2 are associated with C1, while those of C3 are perhaps independent of other aggregations of celestial objects, although they are found in large numbers in one portion of the Milky Way. They appear to have no intimate connection with it, however, but rather to occur in cloud-like groups, the greatest of which is projected on the Milky Way at about 18 hours of right ascension. D1, D2, and D3 are closely associated with the Milky Way, of which they form an intimate part.

It may also be of interest to point out that the southern sky is much richer in bright clusters and nebulae than the northern. Of the 263 objects given in the catalogue, 184 are in the southern, and only 79, in the northern hemisphere. Even excluding the Magellanic Clouds, there still remain 120 objects in the southern sky.

The coordinates of the nebulae and clusters on the Harvard Map of the sky will be found in the sixth column of Table I. The appearance of the objects on the original plates from which that map was made is described below. The magnitude when given is that of the object taken as a whole. The order is that of right ascension, as in Table I.

- |  |   |
|--|---|
| 55. Nebula, pretty bright, extremely elongated, a little brighter at centre. | 1727. Nebula or cluster, pretty faint, elongated.                             |
| 104. Hazy star, not resolved, magnitude 3.5.                                 | 1743. Hazy star, not resolved, magnitude 10.                                  |
| 221. Hazy star, almost round, magnitude 9.                                   | 1755. Hazy star, not resolved, magnitude 9.                                   |
| 224. Nebula, very bright, nucleus, elongated.                                | 1761. Cluster of few faint stars involved in nebulosity.                      |
| 253. Nebula, pretty bright, extremely elongated, nucleus.                    | 1763. Cluster of few stars involved in nebulosity.                            |
| 330. Hazy star, not resolved, magnitude 7.                                   | 1770. Cluster of few stars involved in nebulosity.                            |
| 346. Hazy star, not resolved, magnitude 7.                                   | 1769. Cluster of few stars involved in nebulosity.                            |
| 362. Hazy star, not resolved, magnitude 6.                                   | 1746. Cluster, coarse, including 1750 and 1758.                               |
| 371. Cluster of a few stars involved in nebulosity.                          | 1783. Hazy star, not resolved, magnitude 10.                                  |
| 376. Hazy star, not resolved, magnitude 9.                                   | 1818. Hazy star, not resolved, magnitude 9.                                   |
| 395. Cluster of few stars apparently involved in nebulosity.                 | 1835. Hazy star, not resolved, magnitude 10.                                  |
| 419. Hazy star, not resolved, magnitude 9.                                   | 1850. Hazy star, not resolved, magnitude 8.                                   |
| 456. Cluster of few stars apparently involved in nebulosity.                 | 1855. Hazy star, not resolved, magnitude 10.                                  |
| 460. Cluster of few stars involved in nebulosity.                            | 1856. Hazy star, not resolved, magnitude 9.                                   |
| 457. Cluster, coarse.  | 1858. Cluster with nebula involved.   |
| 465. Cluster of few stars involved in nebulosity.                            | 1851. Hazy star, not resolved, magnitude 5.                                   |
| 581. Cluster, coarse.  | 1866. Hazy star, not resolved, magnitude 9.                                   |
| 598. Nebula or close cluster, small, pretty faint, elongated.                | 1874. Cluster of stars and hazy stars, including 1876, 1877, and 1880.        |
| 654. Nebula or cluster, irregular.   | 1910. Cluster of stars and hazy stars, irregular.                             |
| 659. Nebulous streak, narrow, faint.   | 1904. Hazy star, not resolved, magnitude 8.                                   |
| 663. Cluster, coarse.  | 1907. Hazy star, not resolved, magnitude 9.                                   |
| 752. Cluster, coarse.  | 1912. Cluster, cruciform.   |
| 869. Cluster, fairly condensed.  | 1929. Cluster, multiple group, including 1934 and 1937.                       |
| 884. Cluster, fairly condensed.  | .. Cluster, small, coarse.  |
| 1039. Cluster, coarse.   | 1955. Cluster, small, involved in nebulosity.                                 |
| 1261. Hazy star, not resolved, magnitude 8.                                  | 1962. Cluster of stars involved in nebulosity, including 1965, 1966 and 1970. |
| 1291. Hazy star, not resolved, magnitude 9.                                  | 1968. Cluster, small, involved in nebulosity.                                 |
| 1316. Hazy star, irregular.  | 1974. Cluster, small, involved in nebulosity.                                 |
| 1380. Nebula, pretty small, round, magnitude 9.                              | 1952. Nebula, elliptical, density uniform.                                    |
| 1399. Hazy star, not resolved, magnitude 10.                                 | 1986. Hazy star, not resolved, magnitude 10.                                  |
| .. Pleiades. Coarse cluster.   | 1960. Cluster, fairly condensed.  |
| 1528. Cluster, coarse.   | 2001. Cluster of few stars, brighter at the centre.                           |
| .. Hyades, cluster, extremely coarse.  | 1976. Nebula, bright, irregular.  |
| 1647. Cluster, coarse.   | 1977. Cluster of 5 stars in irregular nebula.                                 |
| 1711. Hazy star, not resolved, magnitude 9.                                  | 2002. Hazy star, not resolved, magnitude 10.                                  |
| 1722. Hazy star, not resolved, magnitude 10.                                 | 1980. Cluster, coarse.  |
|  | 1981. Cluster, coarse.  |
|  | 2003. Hazy star, not resolved, magnitude 10.                                  |
|  | 2004. Hazy star, partially resolved, magnitude 9.                             |

2006. Hazy star, double or bi-nuclear.  
 2018. Two hazy stars close together.  
 2020. Cluster of few stars, small.  
 2031. Hazy star, not resolved, magnitude 10.  
 2029. Cluster and nebula, double or multiple, few stars.  
     Includes 2032 and 2035.  
 2030. Cluster involved in nebulosity, small.  
 2040. Cluster, small.  
 2024. Two faint nebulous wisps near  $\zeta$  Orionis.  
 2050. Cluster of stars involved in nebulosity, including 2055.  
 2058. Hazy star, not resolved, magnitude 10.  
 2065. Hazy star, not resolved, magnitude 11.  
 2070. Nebula, irregular, radiating streamers.  
 2074. Two bright stars with faint stars and nebulosity.  
 2077. Hazy star, not resolved, magnitude 11.  
 2080. Hazy star, not resolved, magnitude 9.  
 2083. Hazy star, faint.  
 2084. Hazy star, very faint.  
 2064. Nebula, irregular, on south-following side of a double star.  
 2086. Hazy star, faint, double, not resolved.  
 2100. Hazy star, partially resolved, magnitude 9.  
 2103. Hazy star, faint, not resolved, magnitude 10.  
 2099. Cluster, fairly condensed, resolved.  
 2122. Hazy star, not resolved, magnitude 10.  
 2134. Hazy star, not resolved, magnitude 10.  
 2136. Hazy star, not resolved, magnitude 10.  
 2157. Hazy star, not resolved, magnitude 9.  
 2164. Hazy star, not resolved, magnitude 9.  
 2168. Cluster, fairly condensed.  
 2244. Cluster, coarse.  
 2264. Cluster, coarse.  
 2281. Cluster, coarse.  
 2287. Cluster, coarse.  
 2301. Cluster, coarse, irregular.  
 2323. Cluster, coarse.  
 2360. Cluster, nebulous in appearance.  
 2362. Cluster, irregular, condensed.  
 2403. Nebula, faint, between 2 stars.  
 2422. Cluster, coarse.  
 2420. Cluster, small.  
 2437. Cluster, coarse.  
 2447. Cluster, coarse.  
 2451. Cluster, coarse.  
 2477. Cluster, fairly condensed.  
 2516. Cluster, fairly condensed.  
 2539. Cluster, coarse.  
 2547. Cluster, coarse.  
 2546. Cluster, coarse.  
 2548. Cluster, coarse.  
 2632. Cluster of rather bright stars, coarse.  
     .. Cluster, coarse.  
     .. Cluster, coarse.  
 2671. Cluster, coarse.  
 2682. Cluster, faint.  
 2808. Hazy star, not resolved, magnitude 5.  
     .. Cluster, coarse.  
 2903. Nebula, elliptical, pretty bright, elongated.  
 3031. Hazy star, magnitude 7.  
 3034. Nebula, elongated, pretty bright.  
 3114. Cluster, fairly condensed.  
 3201. Hazy star, not resolved.  
 3293. Cluster, condensed.  
 3324. Nebula, faint, stars involved.  
     .. Nebula, small, stars involved.  
     .. Cluster, coarse.  
 3372. Nebula, bright, dark lanes, many stars.  
 3532. Cluster, elliptical.  
 3572. Rich field of Milky Way.  
     .. Cluster, small.  
 3766. Cluster, small, fairly condensed.  
 4051. Nebula, small, irregular.  
 4103. Cluster, small, fairly condensed.  
 4214. Nebula, faint, elongated, brighter at centre.  
 4254. Nebula, pretty bright, almost round.  
 4258. Nebula, much elongated, nucleus.  
 4303. Nebula, small, faint, elongated.  
 4321. Nebula, small, faint, elongated.  
 4349. Cluster, small, faint.  
 4374. Nebula, faint, almost round, brighter at centre.  
 4382. Nebula, faint, round, brighter at centre.  
 4406. Nebula, faint, almost round, brighter at centre.  
 4449. Nebula, bright, much elongated, brighter at centre.  
 4450. Nebula, faint, elongated.  
 4472. Nebula, bright, small, elongated.  
 4486. Nebula, pretty faint, elongated.  
 4490. Nebula, elliptical, brighter at centre.  
 4501. Nebula, pretty faint, elongated, brighter at centre.  
 4526. Nebula, faint, elongated.  
 4569. Nebula, faint, elongated.  
 4590. Hazy star, not resolved, magnitude 7.  
 4594. Nebula, elongated.  
 4609. Cluster of few stars.  
 4631. Nebula, much elongated.  
 4651. Nebula, small, faint, almost round.  
 4656. Nebula, extremely elongated.  
 4736. Nebula, round, magnitude 7.  
 4755. Cluster, condensed.  
 4826. Nebula, elongated.  
 4833. Hazy star, not resolved.  
 5005. Nebula, somewhat elongated.  
 5024. Hazy star, not resolved, magnitude 5.  
 5055. Nebula, elliptical, brighter at centre.  
 5128. Nebula, irregular, faint.  
 5139. Globular cluster, slightly resolved.  
 5194. Nebula, nucleus, ring or spiral.  
 5236. Nebula, faint, ring or spiral.  
 5272. Hazy star, not resolved, magnitude 4.  
 5281. Cluster, coarse.  
 5286. Hazy star, not resolved, magnitude 7.  
 5316. Cluster, coarse.  
 5460. Cluster, coarse.  
 5617. Cluster of few stars.  
 5662. Cluster of few stars.  
 5866. Nebula, much elongated, brighter at centre.  
 5904. Hazy star, not resolved, magnitude 5.  
 5986. Hazy star, not resolved, magnitude 7.



- |  |  |
|--|--|
| 6025. Cluster, coarse.                           | 6541. Hazy star, not resolved, magnitude 5.              |
| 6067. Cluster, fairly condensed.                 | 6584. Hazy star, not resolved, magnitude 8.              |
| 6087. Cluster, coarse.                           | 6603. In rich region of Milky Way.                       |
| 6093. Hazy star, not resolved, magnitude 6.      | 6611. Cluster, coarse.                                   |
| 6121. Cluster, dense, barely resolved.           | 6618. Nebula, elongated.                                 |
| 6124. Cluster, fairly condensed.                 | 6624. Hazy star, not resolved, magnitude 8.              |
| 6134. Cluster, small.                            | 6626. Hazy star, not resolved, magnitude 6.              |
| 6171. Hazy star, not resolved, magnitude 9.      | 6633. Cluster, coarse.                                   |
| 6205. Hazy star, not well resolved, magnitude 4. | 6637. Hazy star, not resolved, magnitude 7.              |
| 6218. Hazy star, not resolved.                   | ... Cluster, fairly condensed.                           |
| 6229. Hazy star, magnitude 9.                    | 6642. Globular cluster, partially resolved.              |
| 6231. Cluster, fairly condensed.                 | 6645. Cluster, fairly condensed.                         |
| 6242. Cluster, fairly condensed.                 | 6652. Hazy star, not resolved, magnitude 7.              |
| 6254. Hazy star, not resolved, magnitude 7.      | 6656. Globular cluster, partially resolved.              |
| 6259. Cluster, very faint.                       | ... Cluster, coarse.                                     |
| 6266. Hazy star, not resolved, magnitude 5.      | 6681. Hazy star, not resolved, magnitude 7.              |
| 6273. Hazy star, not resolved, magnitude 5.      | 6694. Cluster, small.                                    |
| 6281. Cluster, coarse.                           | 6705. Globular cluster, partially resolved.              |
| 6284. Hazy star, not resolved, magnitude 8.      | 6712. Hazy star, not resolved.                           |
| 6293. Hazy star, magnitude 8.                    | 6715. Hazy star, not resolved, magnitude 6.              |
| 6304. Hazy star, not resolved, magnitude 9.      | 6720. Nebula, apparently of uniform density.             |
| 6333. Hazy star, not resolved, magnitude 7.      | 6723. Hazy star, not resolved, magnitude 6.              |
| 6341. Hazy star, not well resolved, magnitude 5. | 6752. Globular cluster, partially resolved, magnitude 5. |
| ... Cluster, fairly condensed.                   | 6779. Hazy star, not resolved.                           |
| 6352. Cluster, small.                            | 6809. Cluster, not well resolved.                        |
| 6356. Hazy star, not resolved, magnitude 9.      | 6811. Cluster, coarse.                                   |
| 6388. Hazy star, not resolved, magnitude 7.      | 6853. Nebula.  |
| 6402. Hazy star, not resolved, magnitude 6.      | 6864. Hazy star, not resolved, magnitude 8.              |
| 6397. Cluster, condensed.                        | 6866. Cluster of few stars.                              |
| 6405. Cluster, fairly condensed.                 | 7078. Hazy star, not resolved, magnitude 6.              |
| ... Cluster, coarse.                             | 7089. Hazy star, not resolved, magnitude 5.              |
| 6441. Hazy star, not resolved, magnitude 8.      | 7092. Cluster, coarse.                                   |
| 6475. Cluster, fairly condensed.                 | 7099. Hazy star, not resolved, magnitude 7.              |
| 6494. Cluster, fairly condensed.                 | 7331. Nebula, apparently of uniform density.             |
| 6514. Nebula, irregular.                         | 7654. Cluster, fairly condensed.                         |
| 6523. Cluster and nebula.                        | 7789. Cluster, fairly condensed.                         |
| 6531. Cluster, fairly condensed.                 |  |

## DESCRIPTION OF THE PLATES.

No attempt has been made in the first three plates, which accompany the present memoir, to show to the best advantage the individual objects, which appear in them. For that purpose, various instruments, and, in general, longer exposures would have been employed. To illustrate most clearly the construction of a dense globular cluster, for example, would require a very different instrument from that which would be employed in delineating the beautiful cloud-forms of the Milky Way. These plates have been made for the special purpose of illustrating the relative size and brightness of the 33 clusters and nebulae, which are contained in them, among which are the best known objects in the sky. More striking photographs of these objects are in the possession of the Harvard Observatory, in many cases, taken with

different instruments and with long exposures. For the present purpose, however, only photographs made with the Bruce 24-inch Refractor, and having an exposure of 1 hour, have been accepted. The scale of these photographs is  $1' = 0.1$  cm., or  $1^\circ = 6$  cm. The area of the small figures, such as Figure 5, is about one fourth of a square degree, or about one one-hundred and sixty thousandth part of the whole sky. In all cases, the upper edge of the figure is north and the lower edge, south; the right-hand edge is preceding and the left-hand edge, following. Under each figure is given its N. G. C. number, followed in general by its most common designation, or by its Messier or Dunlop number.

We have, therefore, all the objects shown on the same scale in these three plates, and taken with practically the same exposure, so that their relative size and brightness can be directly compared. Without some such basis of comparison, even the professional astronomer can hardly appreciate the true relationship of familiar objects. In regard to brightness, for example, attention may be called to the Orion Nebula, Figure 24. No other nebula of large area compares with it in intensity, although the nebula surrounding  $\gamma$  Carinae may equal it in extent. Other well-known nebulae, such as the Dumb-bell, Figure 30, the Trifid, Figure 12a, the Crab, especially, Figure 29, and some other small nebulae, are relatively extremely faint. The size of the Ring Nebula in Lyra, compared with that of the Orion and other large nebulae, is also worthy of notice. The inferiority of the well-known globular cluster in Hercules, Figure 19, to its southern sisters,  $\omega$  Centauri, Figure 16, and 47 Tucanae, Figure 17, is noticeable. Messier 3, Figure 20, and Messier 5, Figure 21, have been inserted on account of the large numbers of variable stars which they contain. It will be seen that the finest of the globular clusters, containing many thousands of stars, cover only a small portion of the area which is occupied by coarse clusters of comparatively few stars, such as the Pleiades, Figure 1.

Plates IV and V are given for a different purpose. They are intended to illustrate the advantages of different telescopes, and of long exposures, for the best delineation of special objects.

PLATE I. FIGURE 1. The Pleiades. The original photograph shows faintly the brighter nebulosities, but a much longer exposure is needed with the Bruce Telescope to show them to good advantage. See Mem. Amer. Acad. 11, 224. The area shown in this, and in each of the following three figures is a trifle more than two square degrees.

FIGURE 2. Praesepe. Messier 44. N. G. C. 2632. This cluster is of about the same size as the Pleiades, but is composed of much fainter stars.

FIGURE 3. The Double Cluster in Perseus. Fig. 3a is N. G. C. 869, and Fig. 3b is N. G. C. 884. The preceding cluster is the finer of the two. Both are good examples of the fairly condensed, irregular clusters, which abound in the vicinity of the Milky Way.

FIGURE 4. Messier 24. N. G. C. 6603. A small cluster of faint stars. This figure is given, not so much for the purpose of showing this unimportant cluster, as to indicate the great number of stars, which are shown in the Milky Way, using an exposure of one hour, with the Bruce Telescope. This region is in the constellation Sagittarius, the richest part of the Milky Way.

FIGURE 5. Messier 11. N. G. C. 6705. This cluster, and also N. G. C. 6121 and 3201, shown in Figures 6 and 7, appear to belong to the globular clusters, from the number of stars, the condensation, and the uniformity in magnitude of the components. They are, however, less regular, and less condensed than the typical globular clusters.

FIGURE 6. Messier 4. N. G. C. 6121. An irregular globular cluster. See Figure 5.

FIGURE 7. Dunlop 445. N. G. C. 3201. An open globular cluster. See Figure 5.

FIGURE 8. Messier 26. N. G. C. 6694. One of the many, relatively unimportant clusters, containing few stars.

FIGURE 9. N. G. C. 6712. This figure is introduced to show the appearance and relative brightness of the very faint clusters.

PLATE II. FIGURE 10. Messier 6. N. G. C. 6405. A fine example of the moderately condensed, irregular clusters. This figure, as well as the eight following, has an area slightly less than one square degree.

FIGURE 11. Dunlop 499. N. G. C. 6231. An interesting cluster similar to  $\kappa$  Crucis, Figure 14.

FIGURE 12. Messier 20. N. G. C. 6514; and Messier 21. N. G. C. 6531. Fig. 12a is N. G. C. 6514, the well-known Trifid Nebula. As shown on photographs having rather short exposures, it appears double, but these parts are seen to form only one nebula on plates having long exposures. The whole nebula is deeply cut up by dark lanes running through it in different directions. As in many other cases, the scale of Fig. 12 is too small to show the nebula to the best advantage. Fig. 12b is N. G. C. 6531, a fairly

condensed, irregular cluster, shown in the upper, following corner of the figure.

FIGURE 13. N. G. C. 6633. This cluster is fairly typical of a large number of unimportant irregular clusters.

FIGURE 14. Dunlop 301. N. G. C. 4755.  $\kappa$  Crucis is, perhaps, the finest example of the condensed, irregular cluster. The condensation, however, of the most condensed irregular cluster makes no approach to that of the globular clusters. A comparison of  $\kappa$  Crucis with  $\omega$  Centauri, Figure 16, is of interest. Each is a fine example of its class. In the former, we have comparatively few stars of a wide range of magnitude, in the latter, enormous numbers of closely massed stars, of nearly uniform magnitude.

FIGURE 15. Messier 8. N. G. C. 6523. Though apparently not so well-known, this nebula is larger and somewhat brighter than the adjacent Trifid Nebula. The relation of the coarse cluster of comparatively bright stars to the nebula is of interest.

FIGURE 16.  $\omega$  Centauri. N. G. C. 5139. Perhaps the finest of the globular clusters. Its size, compared to that of other well-known globular clusters, is well shown by a comparison of Figure 16 with Figures 17, 19, 20 and 21.

FIGURE 17. 47 Tucanae. N. G. C. 104. A somewhat smaller, but more condensed cluster than  $\omega$  Centauri, Figure 16.

FIGURE 18. Fig. 18b is the Great Nebula in Andromeda. N. G. C. 224. The central part is bright and well shown with a short exposure, but the fainter parts of this great nebula require a long exposure. N. G. C. 221, which is given in the present catalogue, is Fig. 18a, near the lower edge. N. G. C. 205, a fainter but larger nebula, discovered, in 1783, by Caroline Herschel, is also shown, in the upper, right-hand corner of the figure. It does not occur in the catalogue, however, since it was not seen on the Cooke plates. N. G. C. 221 is included in the fainter extensions of the nebulosity of N. G. C. 224. All three nebulae appear to be of the same nature.

FIGURE 19. The Great Cluster in Hercules. N. G. C. 6205. One of the best known of the globular clusters, but it does not rival  $\omega$  Centauri, or 47 Tucanae.

FIGURE 20. Messier 3. N. G. C. 5272. A condensed globular cluster.

FIGURE 21. Messier 5. N. G. C. 5904. A condensed globular cluster.

FIGURE 22. Dunlop 457. N. G. C. 6388. An extremely condensed globular cluster.

FIGURE 23. 30 Doradus. N. G. C. 2070. The brightest of the many irregular nebulae and clusters in the Magellanic Clouds.

PLATE III. FIGURE 24. The Great Orion Nebula. Fig. 24a is N. G. C. 1976. This is the central and brightest portion of the nebula, visible to the naked eye. It is, perhaps, the best known of all the nebulae. A detailed study of this object will be found in H. A. 5. Fig. 24b is N. G. C. 1977, the nebula situated about half-way from N. G. C. 1976 to the upper edge of the figure. Several fairly bright stars are involved in it. Still nearer the upper edge of the figure is N. G. C. 1981, a group of scattering stars, and near the lower edge is N. G. C. 1980, a coarse cluster involved in nebulosity. In this cluster the star  $\iota$  Orionis, magnitude 2.87, is surrounded by a halation ring. All these objects are connected by nebulosities of extreme faintness, not shown in this photograph, while the whole constellation is probably involved in a gigantic spiral.

FIGURE 25. Dunlop 309. N. G. C. 3372. The Great Nebula about  $\eta$  Carinae. One of the finest nebulae in the sky. See also Plate IV.

FIGURE 26. Messier 23. N. G. C. 6494.

FIGURE 27. Messier 46. N. G. C. 2437. This cluster is situated at a distance of only about one and a half degrees from N. G. C. 2422, Figure 28. There are marked differences, however, between the two clusters in the brightness and uniformity of the stars.

FIGURE 28. N. G. C. 2422. See Figure 27.

FIGURE 29. Messier 1. N. G. C. 1952. The well known "Crab" Nebula.

FIGURE 30. Messier 27. N. G. C. 6853. The well known "Dumb-bell" Nebula.

FIGURE 31. Messier 51. N. G. C. 5194. The so-called Great Nebula in Canes Venatici, one of the brightest and most beautiful of the distinctively spiral nebulae. Compared with such a nebula as that of Orion, however, it is extremely small and faint. The central nucleus is pretty bright, but the spirals are so faint that an exposure of one hour with the Bruce Telescope shows them only faintly. N. G. C. 5195, which is really only a condensation of one of the coils of N. G. C. 5194, is shown in the figure, following it about  $7^\circ$ , and  $4'$  north.

FIGURE 32. Messier 17. N. G. C. 6618. The "Horse-shoe" or "Omega" Nebula. A small, but remarkable object.

FIGURE 33. Messier 57. N. G. C. 6720. The well-known "Ring" Nebula in Lyra. A small object of very great interest.



PLATE IV. The  $\eta$  Carinae (Argûs) Nebula, N. G. C. 3372, and surrounding regions. This plate is given to illustrate the results obtained with the Bruce 24-inch Telescope, when long exposures are made. It is reproduced from a direct print of the original negative, A 2208, which was exposed during 4 hours. This region is one of the finest in the sky. The centre of the plate is in R. A.  $10^h 41^m.4$ , Dec.  $-59^\circ 20'$ . In addition to nebulosities of enormous extent, which cover a large portion of the original plate, this region is exceedingly rich in stars. The area shown on the plate extends about  $3^\circ$  in right ascension, and  $3^\circ.8$ , in declination, and includes between 11 and 12 square degrees. This is only a portion of the original Bruce plate, which is  $14 \times 17$  inches in size, and covers about 40 square degrees. The scale is the same as in Plates I, II, and III, where  $1' = 0.1$  cm. The original photograph shows about 10,000 stars to the square degree. Several of these are between the fourth and the sixth magnitudes, and are visible to the naked eye. The brightest of these is  $\mu$  Carinae, A. G. C. 14910 [24,172], magnitude 3.88. The coordinates are always given in millimetres, and are measured from the lower left-hand corner of the plate. This star is surrounded by a faint halation ring, caused by reflection from the back of the glass negative. A. G. C. 14902, magnitude 6.64 [25,170], is included in the ring. The photometric magnitudes of these two stars appear to differ much more than the photographic. Large differences, due to color, are common, however, between photometric and photographic magnitudes. [108,153] is A. G. C. 14656, magnitude 5.44. The remarkable variable,  $\eta$  Carinae, is [90,125], but is not well seen owing to the brightness of the enveloping nebulosity. It is now of about the seventh magnitude and recently has shown no evidence of change. The distribution of the brighter stars appears to have some relation to that of the nebulosity. The chief interest of the photograph centres in the Great Nebula, N. G. C. 3372, which is one of the largest and most beautiful in the sky. Dark lanes and holes abound. Some of these, in a small instrument, appear to be void of both stars and nebulosity, but are found to be filled with faint stars and extremely faint nebulosity, when examined with powerful instruments. One of the most interesting of these is at [103, 90]. Other N. G. C. objects which occur on the photograph are 3293 [162,212], a condensed, irregular cluster, and 3324 [148,188], a nebula. As pointed out in H. A. 26, 207, the right ascension of N. G. C. 3293 is in error by  $2^m$  in the N. G. C. There appear to be two nebulae near the position of N. G. C. 3324, one around the triple star A. G. C. 14524, 5, and 6, and

the other near A. G. C. 14528. The former is probably the object seen by Herschel, since he refers to a double star; but since he only gives one nebula, he may have included both objects as one, especially since they are really joined by nebulosity. In the present catalogue, they are given as separate objects, and the nebulosity near the star A. G. C. 14528, magnitude 5.57, is entered without a number. Both of these nebulae appear to be merely condensations of the faint extension of the Great Nebula.

PLATE V. The Milky Way. This plate is given to show the possibilities of small lenses in the delineation of the cloud-forms of the Milky Way. The photograph was made with a Cooke lens of about 1-inch aperture. This and a second similar instrument were used in making the Harvard Map of the sky. The exposure in this instance lasted for 24 hours, distributed over four nights. The focal length of the lens is about 13 inches, and the region shown extends from R. A.  $17^h$  to beyond R. A.  $19^h$ , and in Dec., from  $-10^\circ$  to  $-50^\circ$ . Less than 40 such plates, provided there were no overlapping, would cover the whole sky. This region of more than a thousand square degrees includes the richest parts of the Milky Way. The whole or portions of the constellations, Ara, Corona Australis, Ophiuchus, Sagittarius, Scorpius, Scutum, Serpens, and Telescopium, appear on the photograph. Some of the bright stars are,  $\eta$  Ophiuchi [173,195],  $\sigma$  Sagittarii [26,130],  $\epsilon$  Sagittarii [69,86], and  $\lambda$  Scorpii [129,68]. Among the many interesting objects which are found in this region, are the nebulae, N. G. C. 6523 [93,145] and N. G. C. 6514, the Trifid Nebula [95,153], the cluster, N. G. C. 6531 [93,156], the cluster, N. G. C. 6405 [122,98], the cluster, N. G. C. 6618 [71,209], the nebula, N. G. C. 6618 [68,194], and many others. Globular clusters are here more numerous than in any other part of the sky, if we except the Large Magellanic Cloud, where small globular clusters abound. Among the globular clusters may be mentioned N. G. C. 6266 [174,105], N. G. C. 6273 [176,129], N. G. C. 6626 [61,138], N. G. C. 6656 [49,146], and N. G. C. 6723 [27,69]. Though found in the vicinity of the Milky Way, these globular clusters seem to avoid the regions of greatest brilliancy. The difference in structure between the preceding and following borders of the Milky Way is one of the most remarkable features shown in the photograph. The region preceding the central and brightest portion is exceedingly irregular. Dark lanes and holes abound in great apparent confusion. The more luminous areas have the appearance of nebulous masses, cut through and through by darker belts and openings. A large part of this

effect is doubtless caused by faint stars, rather than nebulosity, since the scale of the photograph is insufficient to separate close stars. The following portion, on the other hand, shows a gradual and regular diminution in light, especially to the south. The small nebulous object, which appears at [81,116], is a defect.

The advantage of a small doublet, like the Cooke lens, in the representation of large celestial objects, such as the Milky Way, is rendered more obvious by a comparison of the fields having good definition, which are obtained with different telescopes. As compared with other large instruments, the Bruce Telescope has an exceptionally large field of good definition, the whole area shown on a photograph,  $14 \times 17$  inches, amounting to 40 square degrees. This is a small area, however, when compared with the 1200 square degrees shown on a photograph,  $8 \times 10$  inches, taken with the Cooke lens. On Plate V, the area covered by a Bruce plate would be represented by a rectangle about one and a half inches in width by a little over an inch in height. The great reflectors, however, which are so powerful in the detailed delineation of individual objects, have good definition, usually, over only about one square degree. 1200 such photographs would be necessary to cover the region shown in Plate V, and more than 40,000, to cover the entire sky.