ASTRONOMY.

CHAMBERS.

III.

THE STARRY HEAVENS.

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Reproduced, untouched, from a Photograph taken at the Paris Observatory, 1887.

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A HANDBOOK

OF

DESCRIPTIVE AND PRACTICAL ASTRONOMY.

BY

GEORGE F. CHAMBERS, F.R.A.S.,

OF THE INNER TEMPLE, BARRISTER-AT-LAW;

Author of "A Practical and Conversational English, French, and German Dictionary;" "The Tourist's Pocket-Book;" "A Digest of the Law relating to Public Health;" "A Digest of the Law relating to Public Libraries and Museums;" "A Handbook for Public Meetings;" and other Works.

" By the Word of the Lord were the Heavens made; and all the Host of them."—*Ps.* xxxiii. 6.

III.

THE STARRY HEAVENS.

FOURTH EDITION.

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PREFACE TO THE FOURTH EDITION.

FOR an explanation generally of the circumstances under which the matter comprising this volume is now published dissociated from the matter of which it formed a part in former editions reference may be made to the Preface to Vol. I.

Suffice it now to state generally that the contents of this volume have been thoroughly revised and brought up to date, and where necessary extended and re-arranged. Additional objects have been described as types in connection with the chapters on Clusters and Nebulæ, but the most important new features are the chapters furnishing a Photometric Catalogue of Naked-eye Stars, and on finding the constellations during the different months of the year. These supply a hiatus which I have long regretted in the earlier editions of this *Handbook.*

The remarkable developement of the study of Astronomy of late years amongst the middle classes in England has led to a demand for hints as to objects suited to telescopes of popular size, and I have great hopes that the additional woodcuts and letterpress explanation which are given in the text will meet the wishes and requirements of a wide circle of readers.

The proofs have been read for press as before by the Rev. *J. B. Fletcher*, M.A., and Mr. *W. T. Lynn*, F.R.A.S., whose zealous and valuable co-operation I desire again to acknowledge.

No one will doubt that science owes a debt of gratitude to the Delegates of the Clarendon Press for undertaking the publication of this new edition in its so greatly enlarged form. Nor must some words of commendation be withheld from Mr. *Horace Hart*, the Controller of the Clarendon Press, for the skill and patience which he has shown in conducting through the press in such splendid typographical style the three handsome volumes now in the reader's hands. Their publication has been delayed longer than I expected or desired, but for technical reasons slow progress in the printing was deemed expedient.

G. F. C.

NORTHFIELD GRANGE,
EAST-BOURNE, SUSSEX :
May, 1890.

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53, line 2, *for* "oberved" *read* "observed."

88, line 11. Schiaparelli has published a very interesting and important paper on Mercury in which he alleges that its rotation-period is the same as that of its revolution round the Sun. (*Ast. Nach.*, vol. cxxiii. No. 2944, Dec. 30, 1889.)

116, line 11. Mädler's calculation is however in error, for there are not 8646 but 8766 hours in a day. The figures in the first column, "At the Equator," should stand:—

4407
864
3495

and in the second, "At the Poles:"—

4450
2403
1913

200, line 8, *for* "the brothers Ball" *read* "Cassini."

229, footnote [1], *for* "king" *read* "ring."

304, line 10, *for* "Stéphan" *read* "Stephan."

323, line 25, *for* 478 *read* 479.

348, line 20, *for* "Iakutsk" *read* "Irkutsk."

409, line 11, Brooks's Comet of 1889, discovered after vol. i. went to Press, was seen at the Lick Observatory by E. E. Barnard on many occasions during the month of August to exhibit evident traces of a separation into parts. Besides the main comet, 4 offshoots were certainly visible. (*Astron. Journal*, No. 202.)

426, line 23, *for* "New Jersey" *read* "New York."

483, line 12, *for* 1611 *read* 1618.

537, line 8, "Date of Discovery," *for* "July 1" *read* "July 2;" "Discoverer," *for* "Valz" *read* "Schmidt;" footnote, *read* 1st clause thus, "Discovered by Tempel a few hours later on the same evening."

Page

547, line 5, *for* "— March 31" *read* "1889, March 31."

548, line 2. Add to the list of known hyperbolic comets: 1889 (i). No. 391 in the Catalogue on p. 546.

551, line 1, for "*théoretique*" read "*théorique.*"

625, line 13, *for* 35·134 *read* 35,134.

648, line 21, *for* "Abbo" *read* "Abbé."

668, col. "Name," *for* "Anabita" *read* "Anahita."

670, line 2. Small planets discovered since Volume I. was published are:—

282	Clorinde	Charlois	Nice	Jan. 28, 1889.
283	[Unnamed]	"	"	Feb. 8, "
284	[Unnamed]	"	"	May 29, "
285	[Unnamed]	"	"	Aug. 3, "
286	[Unnamed]	Palisa	Vienna	Aug. 3, "
287	Nephthys	Peters	Clinton, U.S.,	Aug. 25, "
288	[Unnamed]	Luther	Düsseldorf	Feb. 20, 1890.
289	[Unnamed]	Charlois	Nice	Mar. 10, "
290	[Unnamed]	Palisa	Vienna	Mar. 20, "

VOL. II.

295, line 23, *for* "Hadley" *read* "Halley."

348, line 12, *for* "second" *read* "third."

367, line 7, *for* "80 M. Capricorni" *read* "80 M. Scorpii."

495, Add to Catalogue of Stars:—

1889. ELLERY, R. L. J., *Second Melbourne General Catalogue* 1211 *Stars.* [Epoch 1880.]

1889. CHRISTIE, W. H. M., *Ten-Year Catalogue of* 4059 *Stars observed at Greenwich.* [Epoch 1880.]

Figure 56, Plate VI, for (*By Bardou.*) read (*By Secretan.*)

VOL. III.

158, line 15, *for* "Menkar" *read* "Menkab."

BOOK XIV.

THE STARRY HEAVENS.

CHAPTER I.

INTRODUCTION.

"O ye Stars of Heaven, bless ye the LORD: praise Him, and magnify Him for ever."—*Benedicite.*

The Pole-star.—Not always the same.—Curious circumstance connected with the Pyramids of Egypt.—Stars classified into different magnitudes.—List of 1st magnitude Stars.—Seidel's proposed standards of magnitudes.—Antiquity of the custom of forming them into groups.—Anomalies of the present system.—Distances of the Stars.—Stellar Parallax.—Stellar Photometry.—Experiments by Seidel, Pickering and Pritchard.—Comparison drawn by Monck of Pickering's results with Pritchard's.—The Stars how distinguished.—Antiquity of the custom of naming Stars.—Invention of the Zodiac.—Letters introduced by Bayer.—Effects of the increased care bestowed on observations of the Stars.—Ideas of the Ancients respecting the Stars.—Remarks by Sir J. Herschel.—Do the Stars radiate heat?—Experiments by Stone.—By Huggins.—The expression "Fixed Stars."—Proper motion of Stars.—Motion of the system through space.—Struve's conclusions.—Wright's hypothesis of a Central Sun.—Revived by Mädler.—Stars thought by Sir W. Herschel to be centres of systems.—Twinkling of Stars.—Humboldt's observations.—Researches of Montigny.

IF, on some clear evening, the reader will go out into the open air, and station himself, preferably (if that be possible), on the summit of any rising ground and look upwards, he will see the sky spangled with multitudes of brilliant specks of light; these are the *fixed stars,* so called, though we shall presently see that this appellation is not strictly correct. An attentive observer will soon notice, also, that the stars which he is contemplating seem to revolve in a body around one situated in the North, about (in England) midway between the horizon and the zenith; this is the *Pole-star,* so designated from its being near the Pole of the celestial equator. Owing, however, to the *Precession of the equinoxes*[a], the present Pole-star (α Ursæ Minoris) will not always be such; the true Pole is now about $1\frac{1}{2}°$ from this star, and this distance will gradually diminish until it is reduced to about $26' 30''$ in A.D. 2095; it will then increase again, and after the lapse of a long period of time, the Pole will depart from this star, which will then cease to bear the name of, or serve the purposes of, a Pole-star. About 4600 years ago the star α Draconis fulfilled this office; 12,000 years hence, it will fall to the lot of α Lyræ, a brilliant star of the 1st magnitude, which is now $51° 20'$ from the Pole, but which will then have approached to within less than $5°$ of the polar point[b].

Connected with this subject a curious circumstance was noticed during the researches which were made in Egypt many years ago by Colonel Vyse. Of the 9 pyramids which still remain standing at Gizeh, 6 have openings which face the North, leading to straight passages, which descend at inclinations varying from about $26°$ to $28°$, the direction of these passages being, in all cases, parallel to the meridian. Now if we suppose a person to be standing at the bottom of any one of these passages, and to look up it, as he would through the tube of a telescope, his eye will be directed to a point on the meridian $26°$ or $28°$ above the plane of the horizon. The altitude at which the star α Draconis must have passed the lower meridian, at the place in question, 4000 years before the present time, is $26\frac{1}{4}°$. Now the present age of these pyramids (the great pyramid bears the date of 2170 B.C.) corresponds so nearly with this period ($2170+1890=4060$), that it can hardly be doubted that the peculiar direction given to these passages must have had reference to the position of α Draconis, the then Pole-star[c]. C. P. Smyth however, pointing out the fact that

[a] See vol. i. p. 374 (*ante*).

[b] For a list of possible Pole-stars between 4800 B.C. and 13800 A.D. see a paper in *Ast. Reg.*, vol. viii. p. 244. Nov. 1870.

[c] *Phil. Mag.*, vol. xxiv. pp. 481–4. June 1844. Pytheas of Marseilles, who flourished about 330 B.C., was the first to notice that the so-called Pole-star was not situated exactly at the Pole.

the lower culmination of α Draconis alone would be recognised by this arrangement, and thinking that something connected with an upper culmination should assuredly be looked for, finds that something in the Pleiades, which would at the epoch alluded to culminate above the Pole coincidently with α Draconis below; and he suggests moreover that the 7 chambers of the great pyramid commemorate the 7 Pleiads.

The stars, on account of their various degrees of brilliancy, have been distributed into classes or orders. Those which appear largest are called stars of the 1st magnitude; next to these come stars of the 2nd magnitude; and so on to the 6th, which are the smallest visible to the naked eye. This classification having been made long before the invention of telescopes, those stars which cannot be seen without the assistance of such instruments are called *telescopic*, and are classed in magnitudes varying from the 7th to the 18th or 20th; these latter, of course, being only visible in the most powerful instruments hitherto constructed; nor does it seem reasonable to assign a limit to this progressive diminution, inasmuch as past experience has shown that every successive improvement in the construction of telescopes brings to light new objects, previously unknown because small and faint.

Some astronomers, when they wish to signify that a star occupies an intermediate place between 2 magnitudes, mark it thus:— 1·2: or thus:— 2·1. These dots are not intended to be decimal points, but mean that the star is below the 1st and above the 2nd magnitude; in the former case nearer the 1st than the 2nd, in the latter nearer the 2nd than the 1st. This is a very clumsy system, and its continuance is to be deprecated.

It may be worth while here to give a list of the stars of the 1st magnitude arranged as nearly as may be in the order of brightness:—

α Canis Majoris. (Sirius.)	α Aurigæ. (Capella.)
α Argûs. (Canopus.)	α Lyræ. (Vega.)
α Centauri.	α Canis Minoris. (Procyon.)
α Boötis. (Arcturus.)	α Orionis. (Betelguese.)
β Orionis. (Rigel.)	α Eridani. (Achernar.)

α Tauri. (Aldebaran.)	α Virginis. (Spica.)
β Centauri.	α Piscis Australis. (Fomalhaut.)
α Crucis.	β Crucis.
α Scorpii. (Antares.)	β Geminorum. (Pollux.)
α Aquilæ. (Altair.)	α Leonis. (Regulus.)

These stars—20 in number—will be found to be nearly equally divided between the Northern and Southern hemispheres, that is to say, 9 are Northern and 11 Southern stars.

Seidel[d] has submitted the following as standard stars for their respective magnitudes:—

Mag.	
1.	α Aquilæ, α Virginis, α Orionis.
2.	α Ursæ Majoris, γ Cassiopeiæ, Algol (at max.).
3.	γ Lyræ, δ Herculis, θ Aquilæ.
4.	ρ Herculis, λ Draconis, (too bright).
	μ Boötis, θ Herculis, (too faint).

From the earliest ages of antiquity it has been the custom to arrange the stars in groups or constellations, for the purpose of more readily distinguishing them; each group having appropriated to it some special figure to which the configuration of its stars may be supposed to bear a resemblance, though, in the majority of instances, this resemblance is imaginary. Modern astronomers have continued this arrangement chiefly on account of the confusion that would arise were it now to be abandoned. We often find that one constellation contains an isolated portion of another, just as one English county sometimes wholly surrounds a parish belonging to another. Stars, too, often occur under different names[e]. Many catalogue-stars have no existence, but owe their creation to mistakes of observers. Constellations are recognised by some and not by others; while the same names are repeated in different parts of the heavens: such are a few of the anomalies of the present system[f].

The constellations will again be referred to in a subsequent chapter.

Concerning the comparative brilliancy of the stars, we know little for certain. Sir W. Herschel gave the following table of

[d] *Resultate*, Munich, 1862.

[e] Baily, in the *Brit. Assoc. Cat.* of Stars, p. 75, gives a list of some of these.

[f] See remarks by Baily in the Introduction to the *B.A.C.*, p. 52 *et seq.*

the light emitted by stars of different magnitudes, as deduced from his own observations, an average star of the 6^{th} magnitude being taken as unity.

6^{th} magnitude	=	1	3^{rd} magnitude	=	12
5^{th} "	=	2	2^{nd} "	=	25
4^{th} "	=	6	1^{st} "	=	100

Sir J. Herschel ascertained that the light of *Sirius* (the brightest of all the fixed stars) is about 324 times that of an average star of the 6^{th} magnitude. From direct photometrical experiments, Dr. Wollaston found that the light of the Sun, as received by us, exceeded by 20,000,000,000 times that of Sirius; consequently, in order that the Sun might appear to us no brighter than Sirius, it must be removed from us not less than 13,433,000,000,000 miles—a distance utterly beyond the limits of human comprehension[g].

The different degrees of brilliancy observable in the stars might be due to one or other of the following reasons:—Either (1) they are all of the same size, but situated at different distances; or (2) they are of different sizes, but at the same distances. If we suppose the first to be the true hypothesis, and take the light of a star of each magnitude to be half that of the magnitude next above it, we find that the distance of a star of the 16^{th} magnitude cannot be less than 362 times that of a star of the 1^{st} magnitude[h]; and "as it has been considered probable from recondite investigations, that the average distance of a star of the 1^{st} magnitude from the Earth is 986,000 radii of our annual orbit," it follows that a 16^{th}-magnitude star is distant from us 32,634,292,000,000,000 miles—a distance which light, with a velocity of 186,660 miles per second, would occupy more than 5000 years in traversing! But calculations such as this may be pronounced valueless, for the simple reason that all analogy impels us to suppose that stars, like other celestial objects, are both of diverse size and situated at diverse distances.

[g] It must be pointed out that these experiments were made many years ago, and that the progress of science and the improved methods available for photometric purposes might now lead to very different results. Further information on the brightness of particular stars will find a place in a later chapter. (See chap. VIII., *post.*)

[h] Sir J. Herschel.

The actual distances from the Sun of a few stars have however been ascertained.

The determination of the distance of the stars is effected by ascertaining by instrumental observations the amount of their annual parallax, or apparent displacement in the heavens. The non-detection of stellar parallax afforded for a long time a much resorted to, and certainly to some extent plausible, argument against the soundness of the Copernican theory of the universe. Since it happens that the stars, with few exceptions, do not exhibit parallax, and since also the fact of the orbital motion of the Earth round the Sun rests on the most undoubted evidence, it follows that the general absence of parallax can only be ascribed to the fact that the stars must be placed at such distances from us, that, comparatively speaking, the Earth's orbit, which has a diameter of 186,000,000 miles, is something utterly insignificant,—a mere point, when considered in reference to the distances of the stars themselves.

It might be supposed that since the character and laws of parallax are so clearly understood as they are, the discovery of its existence could present no great difficulty. Nevertheless, nothing in the whole range of astronomical research has more baffled the efforts of observers than this question. This has arisen altogether from the extreme minuteness of its amount. It is quite certain that the parallax does not amount to so much as 1″ in the case of any of the numerous stars which have been as yet submitted to the course of observation which is necessary to discover the parallax. Now, since in the determination of the exact uranographical position of a star there are a multitude of disturbing effects to be taken into account and eliminated, such as refraction, precession, nutation, aberration, and others, besides the proper motion of the star, which will be explained hereafter; and since, besides the errors of observation, the quantities of these influences are all subject to more or less uncertainty, it will astonish no one to be told that they may entail, upon the final result of the calculation, an error of 1″; and, if they do this, it is vain to expect to discover such a residual phenomenon as parallax, the entire amount of which is less than 1″.

An object, whatever be its size, subtends an angle of 1″ when removed to a distance of 206,265 times its own dimensions.

If in any case the parallax could be determined, the distance of the star could be immediately inferred. For, if this value of the parallax be expressed in seconds, or in decimals of a second, and if r denote the semidiameter of the Earth's orbit, d the distance of the star, and p the parallax, we shall have—

$$d = r \times \frac{206265}{p}.$$

If, therefore, $p = 1''$, the distance of the star would be 206,265 times the distance of the Sun; and since it may be considered satisfactorily proved that no star which has ever yet been brought under observation has a parallax greater than this, it may be affirmed that the star in the universe nearest to the solar system is at a distance from it, *at least*, 206,265 times as great as that of the Earth from the Sun.

Let us consider more attentively the import of this conclusion. The distance of the Sun, expressed in round numbers (and this is sufficient for our present purpose), is 93 millions of miles. If this be multiplied by 206,265, we shall obtain,—not indeed the distance of the nearest of the fixed stars,—but the *inferior limit* of that distance, that is to say, a distance within which the star cannot lie. This limit, expressed in miles, is :—

$$d = 206{,}265 \times 92{,}890{,}000 = 19{,}160{,}000{,}000{,}000 \text{ miles},$$

or more than 19 *billions of miles.*

In the contemplation of such numbers the imagination is lost, and no clear conception remains, except that of the mere arithmetical expression of the result of the computation. Astronomers themselves, accustomed as they are to deal with stupendous numbers, are compelled to seek for units of proportionate magnitude to bring the arithmetical expression of the quantities within moderate limits. The motion of light supplies one of the most convenient moduli for this purpose, and has, by common consent, been adopted as the unit in all computations the object of which is to gauge the universe. It is known that light moves at the rate of 186,660 miles per second. If, then, the distance d above computed be divided by 186,660, the quotient will be the time, expressed in seconds, which light takes to move over that distance. But since even this will be an unwieldy number, it may be reduced to minutes, hours, days, or even to years.

In this manner we find that, if any star have a parallax of 1″, it must be at such a distance from our system that light would take 3·247 years, or 3 years and 90 days, to come from it to the Earth.

If then the space through which light moves in a year be taken as the unit of stellar distance, and p be the parallax expressed in seconds, or decimals of a second, we shall have

$$d = \frac{3{\cdot}247}{p}.$$

It will easily be imagined that astronomers have diligently directed their efforts to the discovery of some change of apparent position, however small, produced upon the stars by the Earth's motion. As the stars most likely to be affected by the motion of the Earth are those which are nearest to the system, and therefore probably those which are brightest and largest, it has been to such that this kind of observation has been chiefly directed; and since it was certain that, if any observable effect be produced by the Earth's motion at all, it must be extremely small, it is only from the nicest and most delicate means of observation that any discovery of this nature could be expected.

One of the earlier expedients adopted for the solution of this problem was the erection of a telescope, of great length and power, in a position permanently fixed—attached, for example, to the side of a pier of solid masonry, erected upon a foundation of rock. This instrument was screwed into such a position that particular stars, as they crossed the meridian, would necessarily pass within its field of view. Micrometric wires were, in the usual manner, placed in its eye-piece, so that the exact point at which the stars passed the meridian each night could be observed and recorded with the greatest precision. The instrument being thus fixed and immoveable, the transits of the stars were noted each night, and a record was made of the exact places where they passed the meridian. This kind of observation was carried on through the year; and if the Earth's change of position, by reason of its annual motion, should produce any effect upon the apparent position of the stars, it was anticipated that such effect would be discovered by these means. After, however, making all allowance for the usual causes which affect the apparent position of the stars, no change of position was discovered which could be assigned to the Earth's motion[1]. A tube of this kind was used at Greenwich by Pond.

Only a few stars are certainly *known* to possess a sensible parallax. Particulars of some of them are given in the table on p. 10, which has been calculated on the assumption that the Sun's parallax = 8·80, and that the velocity of light = 186,660 miles per second.

Stars are distinguished from one another in various ways. The ancients were in the habit of indicating the locality of a star by its position in the constellation to which it belonged; thus Aldebaran was called *Oculus Tauri*. This custom was also followed by the Arabians, and, indeed, many of the names applied by them are still retained in a corrupted form; thus Betelgueze (α Orionis) is a corruption of *ibt-al-jauza*, signifying "the shoulder of the Jauza (or 'Central one')." Bayer, the German astronomer, was the first to improve upon the old plan, which he did by publishing in 1603 a celestial atlas, in which the stars of each constellation were distinguished by the letters of the Greek alphabet; but the common supposition that the brightest received the distinctive mark of α, the next β, and so on, is only in some degree correct, except as regards the α's. Bayer's letters are still in common use, the name of the constellation in the genitive case being put after each; thus Procyon

[1] The preceding remarks on stellar parallax are taken (with slight alterations) from the *Museum of Science.*

is termed *a* Canis Minoris; Vega, *a* Lyræ; Arcturus, *a* Boötis. It should be understood that this alphabetical arrangement does not represent the relative brilliancy of the different stars in a constellation. To the stars observed by Flamsteed numbers were affixed by Baily, which numbers, referring to the order of R. A. in each constellation, are still in use.

Star.	Mag.	Proper Motion.	Parallax.	Distance.		Observer.
				Sun's distance = 1.	Time of its light reaching the Earth.	
		"	"		years.	
α Centauri	1	3·67	0·75	275,000	4·34	Gill.
61 Cygni	6	5·14	0·50	412,500	6·51	O. Struve.
21185 Lalande ...	7¼	4·75	0·50	412,500	6·51	Winnecke.
Sirius	1	1·24	0·38	543,000	8·57	Gill.
μ Cassiopeiæ ...	...	...	0·34	606,000	9·57	O. Struve.
34 Groombridge ...	8	2·81	0·29	711,000	11·23	Auwers.
9352 Lacaille ...	7½	6·95	0·28	737,000	11·62	Gill.
21258 Lalande ...	8½	4·40	0·26	793,000	12·52	Krüger.
Ö. Arg. 17415 ...	9	1·27	0·25	825,000	13·02	Krüger.
σ Draconis	5	1·87	0·25	825,000	13·02	Brunnow.
ϵ Indi	5¼	4·68	0·22	938,000	14·80	Gill.
α Lyræ	1	0·31	0·20	1,031,000	16·27	...
o^2 Eridani	4½	4·10	0·17	1,213,000	19·15	Gill.
ρ Ophiuchi	4½	1·00	0·17	1,213,000	19·15	Krüger.
ϵ Eridani	4½	3·03	0·14	1,473,000	23·24	Elkin.
ι Ursæ Majoris ...	3	0·52	0·13	1,586,000	25·04	C. A. F. Peters.
α Boötis	1	2·43	0·13	1,586,000	25·04	C. A. F. Peters.
γ Draconis	2	0·06	0·09	2,292,000	36·17	...
1830 Groombridge	7	7·05	0·09	2,292 000	36·17	Brunnow.
Polaris	2	...	0·07	2,947,000	46·50	C. A. F. Peters.
3077 Bradley ...	6	2·09	0·07	2,947,000	46· 0	Brunnow.
ζ Toucani	6	2·05	0·06	3,438,000	54·25	Elkin.
85 Pegasi	6	1·38	0·05	4,125,000	65·10	Brunnow.
α Aurigæ	1	0·43	0·04	5,157,000	81·37	C. A. F. Peters.
Canopus	1	...	0·03	6,875,000	108·50	Elkin.

The subject of the photometry of stars, though one of much importance, has received but little attention from practical astronomers. The common method of classifying stars into arbitrary magnitudes is both vague in theory and contradictory in practice. It is vague, inasmuch as the place of a star in the scale of magnitudes conveys but little definite idea of the actual brilliancy thereof; and it is contradictory in a remarkable degree, inasmuch as the same star has in numberless instances a different magnitude assigned to it by different authorities [k].

The first observer who attempted stellar photometry on any organised basis was Sir J. Herschel, who formed a Table of Stars arranged in order of brightness [l]. In Germany the subject has received a good deal of attention, especially from Heis, Seidel, and Zöllner. The most recent workers in this field are Pickering in America, and Pritchard in England and Egypt.

Seidel has published an elaborate catalogue of 206 conspicuous stars arranged progressively in the order of brightness as determined (I believe) by an "astro-photometer" invented by Steinheil. The following are the first 20 stars in Seidel's list, with the relative values assigned by him to each [m] :—

α Canis Majoris	4·286	α Leonis	0·325
α Lyræ	1·000	α Cygni	0·310
β Orionis	0·993	ε Canis Majoris	0·309
α Aurigæ	0·818	α Tauri	0·303
α Boötis	0·794	α Scorpii	0·291
α Canis Minoris	0·700	β Geminorum	0·289
α Aquilæ	0·489	α Geminorum	0·256
α Virginis	0·485	γ Orionis	0·255
α Orionis	0·359	β Tauri	0·229
α Piscis Australis	0·339	ζ Orionis	0·220

It will be seen that Seidel gives the second place to α Lyræ, but Pickering and Monck allot that place to α Aurigæ, whilst Pritchard gives it to β Orionis.

[k] Sir J. Herschel, *Results of Ast. Obs.*, p. 304. See remarks by Pogson in *Radcliffe Obs.*, vol. xv. p. 295. 1854.

[l] *Outlines of Ast.*, p. 705.

[m] Seidel's Table, together with that of Zöllner, will be found in Klein's *Handbuch der Fixsternhimmel*, p. 26. See a Paper by L. Seidel in *Abhandlungen der K. Bayr. Akademie der Wissenschaften*, 6th class, vol. iii. 1852.

The labours of Pickering at Harvard College Observatory have resulted in the publication of a very valuable catalogue of 4260 stars whose magnitudes have been determined on definite and intelligible principles. In friendly competition with this work stands Professor Pritchard's Book recording his results obtained partly at the University Observatory, Oxford, and partly in Egypt.

The *Harvard Photometry* and the *Uranometria Nova Oxoniensis* are both intended to arrange the stars according to magnitude on the assumption that the light of a star of the n^{th} magnitude is to that of a star of the $n+1^{\text{th}}$ magnitude in the ratio of 2·512 to 1. The logarithm of 2·512 is 0·4, so that a difference of $2\frac{1}{2}$ magnitudes on this scale corresponds to an increase or diminution of the light in the ratio of 10 to 1. Both authors adopt the Pole Star as their standard, and as the other stars are compared with it when at nearly the same altitude, the figures which express the relative magnitudes will be the same, whether the Zenithal or the actual value of the Pole Star's light is assumed as the standard. Pickering however rates the Pole Star as of the magnitude 2·15, while Pritchard put it at 2·05. Pickering is of opinion that this difference of standard is rather apparent than real—in other words, that the Pole Star appeared about one-tenth of a magnitude brighter to the Oxford observers than to those at Harvard. According to both, the Star which may be regarded as the typical 1st magnitude star is *α* Aquilæ (Altair). Its Oxford magnitude is 1·04, and its Harvard magnitude 0·97. Other stars which approach closely to this type are *α* Virginis (Spica), *α* Tauri (Aldebaran), *α* Scorpii (Antares), and *α* Orionis (Betelgueze), the variability of the last-named however interfering with its use as a type. Taking a mean between the Oxford and the Harvard results, the light of the 4 following stars is almost exactly equal, and about $\frac{5}{6}$ of a magnitude *above* the first magnitude, viz. *β* Orionis (Rigel), *α* Boötis (Arcturus), *α* Lyræ (Vega), and *α* Aurigæ (Capella). Procyon is about half a magnitude above the 1st magnitude, while Sirius is 1·95 magnitudes above it according to Oxford, and 2·43 according to Harvard. Owing to their great

Southern declinations, Canopus and *a* Centauri do not appear in either list. The Harvard catalogue terminates at about the 30th degree of South Declination, and the Oxford one at about the 10th degree.

Monck, who has studied both catalogues, is of opinion from a comparison of the stars whose magnitude approaches that of the Pole Star that there is a real difference in Scale between them, but that the amount would be better represented by 0·06 or 0·07 than by 0·10 of a magnitude. Pickering however has shown that any difference which may exist at this point soon disappears, and that between the 5th and 6th magnitudes the stars are as a rule fainter according to the Oxford measurements without any correction for scale. Monck has arrived at the same conclusion, but finds the stars on an average brighter according to the *Uranometria Nova Oxoniensis* up to about magnitude 4·25, from which to 4·50 the scales may be regarded as coincident, after which the Oxford values are lower than the Harvard, the difference reaching 0·08 at about magnitude 6·0. Pickering, taking the stars rated at Harvard at between 6·0 and 7·0 and comparing the Oxford values for the same stars, finds the latter brighter: but Monck, who took those rated at Oxford at between 6·0 and 7·0 and compared them with the corresponding Harvard values, arrived at a different result. As neither catalogue professes to be complete within these limits, further observations with the Meridian and Wedge Photometers are necessary to decide the question; but from the 2nd to the 6th magnitudes it would appear that a magnitude as estimated by the Wedge Photometer corresponds to about 0·96 or 0·97 of a magnitude as measured by the Meridian Photometer.

These catalogues are intended to be complete (within the limits of Declination already mentioned) up to about the 6th magnitude. Monck thinks they are probably defective below 5·80. According to him the number of stars of each magnitude in the catalogues is as follows:—

Magnitude.	No of Stars. Harvard.	No. of Stars. Oxford.
Above the 1st	9	8
1·0 to 1·5	7	6
1·5 to 2·0	11	11
2·0 to 2·5	30	28
2·5 to 3·0	41	21
3·0 to 3·5	81	59
3·5 to 4·0	148	102
4·0 to 4·5	264	165
4·5 to 5·0	477	292
5·0 to 5·5	845	615
5·5 to 6·0	1273	918

Monck thinks that the figures in the last subdivision are probably defective. It may be worth noticing that on the assumption of uniform arrangement and equal absolute brightness the number of stars comprised in any half-magnitude should, in round numbers, be double that comprised in the preceding half-magnitude and equal to the entire number of brighter stars. The departures from this law (to which there is nevertheless a certain degree of approximation) will be evident on examining the foregoing table.

The Bonn *Durchmusterung*, with Schönfeld's Southern extension, taken together embrace nearly the same portion of the sky as the *Harvard Photometry*, and Seeliger has given a summary of the number of stars for fainter magnitudes. It should be noted however that it is still uncertain whether the ratio of 2·512 to 1 is applicable to the fainter magnitudes in these catalogues. Seeliger's table, the stars below the 9th magnitude being omitted, is as follows:—

Magnitudes.	No. of Stars.
Above magnitude 6·5	5385
„ 6·5 to 7·0	5163
„ 7·0 to 7·5	7882
„ 7·5 to 8·0	14674
„ 8·0 to 8·5	30499
„ 8·5 to 9·0	71485

Traces of the law just suggested, but with similar fluctuations, will here be observed. It is certain however that the law cannot hold even approximately true as regards extremely distant stars, since if it did so the total light of the stars of the $n + 1^{th}$ magnitude would always exceed the total light of the stars of the n^{th} magnitude, and the total light of all the stars would be infinitely greater than that of the stars comprised in any given subdivision.

The practice of giving names to the stars is of early date, and probably originated with the Chaldeans. Intimations of this custom may be found in the Holy Scriptures. I cite the following passages from the Revised Version:—

"Which maketh the Bear, Orion, and the Pleiades, and the chambers of the south [n]."

"Canst thou bind the cluster of the Pleiades, or loose the bands of Orion? Canst thou lead forth the Mazzaroth in their season? Or canst thou guide the Bear with her train [o]?"

"Seek him that maketh the Pleiades and Orion [p]."

The invention of the Zodiac has been ascribed to the Egyptians [q]. Dupuis especially advocated this opinion, and thought that the constellations in question had reference to the division of the seasons, and to the agriculture in vogue at the time of their invention. He supposed Cancer to represent the retrogradation of the Sun at the solstice, and Libra the equality of the day and night at the equinoxes. This idea is undoubtedly supported by several curious coincidences: for instance, the inundation of the Nile, which takes place after the summer solstice, happens when the Sun is in Aquarius and Pisces; and Virgo, usually represented as a woman holding an ear of corn, coincides with the time of the Egyptian harvest.

The insuperable objection to this theory is the excessive

[n] *Job*, ix. 9.

[o] *Job*, xxxviii. 31–2.

[p] *Amos*, v. 8. Some of the renderings given in the A.V. rest on insufficient authority. It is probable that Mazzaroth means the circle of the zodiac (as indeed the Revisers of 1885 have hinted at by their use of this interpretation in the margin of their Version), but the others are more doubtful. Parkhurst (*Lexicon*) thinks that the application of the Greek names of certain constellations to the Hebrew originals, as is done in the Authorised Version here and elsewhere, and by the LXX previously, is only fanciful. Barnes (*Notes on Job* ix. 9) derives *Kimah* (translated above by "Pleiades") from a root signifying a heap, and so applicable to the Pleiades; and *Kesil* (translated above by "Orion") from another root signifying *to be strong*, and thus applicable to that constellation known as *the strong man*, corresponding, as may be conjectured, to what the Greeks called *Orion*. (See *Class. Dict.*) Apparently the Revisers have followed the line of thought suggested by Barnes.

[q] An engraving of the well-known Zodiac at Denderah will be found in *L'Astronomie*, vol. vii. p. 344, Sept. 1888.

antiquity which it assigns to the Zodiac (not less than 15,000 years). As this is historically inadmissible, and directly opposed to Divine Revelation, Dupuis got over the difficulty by supposing the names to have been given, not to the constellations in conjunction, but to those in opposition to the Sun. This only requires the constellations to have been devised B.C. 2500 ± ; in this form the idea is adopted by Laplace and others as correct[r]. It has been suggested that the Jews were acquainted with the Zodiac, and that in *Gen.* i. 14 the uses of the heavenly bodies—to divide the seasons, years, and days—are intended to be set forth.

The way in which the sky was portioned off by the ancients into 12 equal divisions to form the signs of the Zodiac is stated to have been as follows:—"They took a vessel with a small hole in the bottom, and allowed water to drop slowly through it into another placed beneath, from the time one star rose until its rising on the following night. The water thus caught was then divided equally into twelve parts, and poured once more into the strainer. As each twelfth part finished dropping through, they observed what star was rising in the quarter of the heavens where lay the Sun's path, and gave it and its constellation a name, generally that of some animal."

Seneca attributes the subdivision of the heavens into constellations to the Greeks,, 1400 or 1500 years B.C.[s] It may be mentioned as a somewhat singular fact, that the Iroquois, a North American Indian tribe, should have applied the name of "The Bear" to the group Ursa Major, in common with the earliest Asiatic nations, so remote from them, more especially as it cannot be said to offer much resemblance to that or any other animal.

The present system of constellations, though on the whole useful, presents many anomalies, which require reform. Thus Aries should no longer have a horn in Pisces and a leg in Cetus; nor should 13 Argûs pass through the flank of Monoceros into Canis Minor: 51 Camelopardi might with propriety be extracted from the eye of Auriga; and the ribs of Aquarius released from

[r] *Hist. of Ast.*, L.U.K., p. 16.

[s] *Quæst. Nat.*, lib. vii. cap. 25.

46 Capricorni. But these are all matters as to which it is probably hopeless (and perhaps not even desirable) to expect extensive improvements in the present day. The subject of the constellations is however one of such importance that an entire chapter must be devoted to it. (See Chap. VII., *post.*)

With reference to the present mode of identifying stars by letters, it may be remarked that though the idea was carried out practically by Bayer[t], as mentioned above, yet Piccolomini, who was born at Siena in 1508 and died there in 1578, did something of the same kind of thing when he applied Roman letters to a few stars. The letter system is defective in this respect, that in large constellations the alphabet is very soon used up: indeed, as Baily remarked, La Caille has, in the constellation Argo alone, besides the Greek alphabet, employed the whole of the Roman alphabet, both in small and capital letters, each of them more than 3 times; in fact he has used nearly 180 letters in that constellation alone. "Thus we have 3 stars marked *a*, and 7 marked A; 6 marked *d*, and 5 marked D; and so on with several others."

As increased attention came to be paid to the study of the heavens, the number of enumerated stars was, as might be expected, augmented. The following table[u] exemplifies this.

	Ptolemy.	Tycho Brahe.	Hevelius.	Flamsteed.	Bode.
Aries	18	21	27	66	148
Ursa Major	35	56	73	87	338
Boötes	23	28	52	54	319
Leo	35	40	50	95	337
Virgo	32	39	50	110	411
Taurus	44	43	51	141	394
Orion	38	62	62	78	304

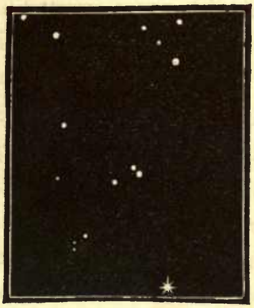
[t] Bayer was likewise an astrologer. In the 1st edition of the *Uranometria* he marked many objects supposed to have some influence over mundane affairs.

[u] A fuller one will be found in the *Encycl. Met.*, art. "Astronomy," p. 506.

It shows the number of stars reckoned in certain constellations by 5 different catalogue-makers living at different epochs.

Figs. 3 and 4 will illustrate this more clearly than any verbal description. The latter is a reproduction of one of Argelander's Maps representing the identical portion of the heavens, of which Fig. 3 is a naked-eye view.

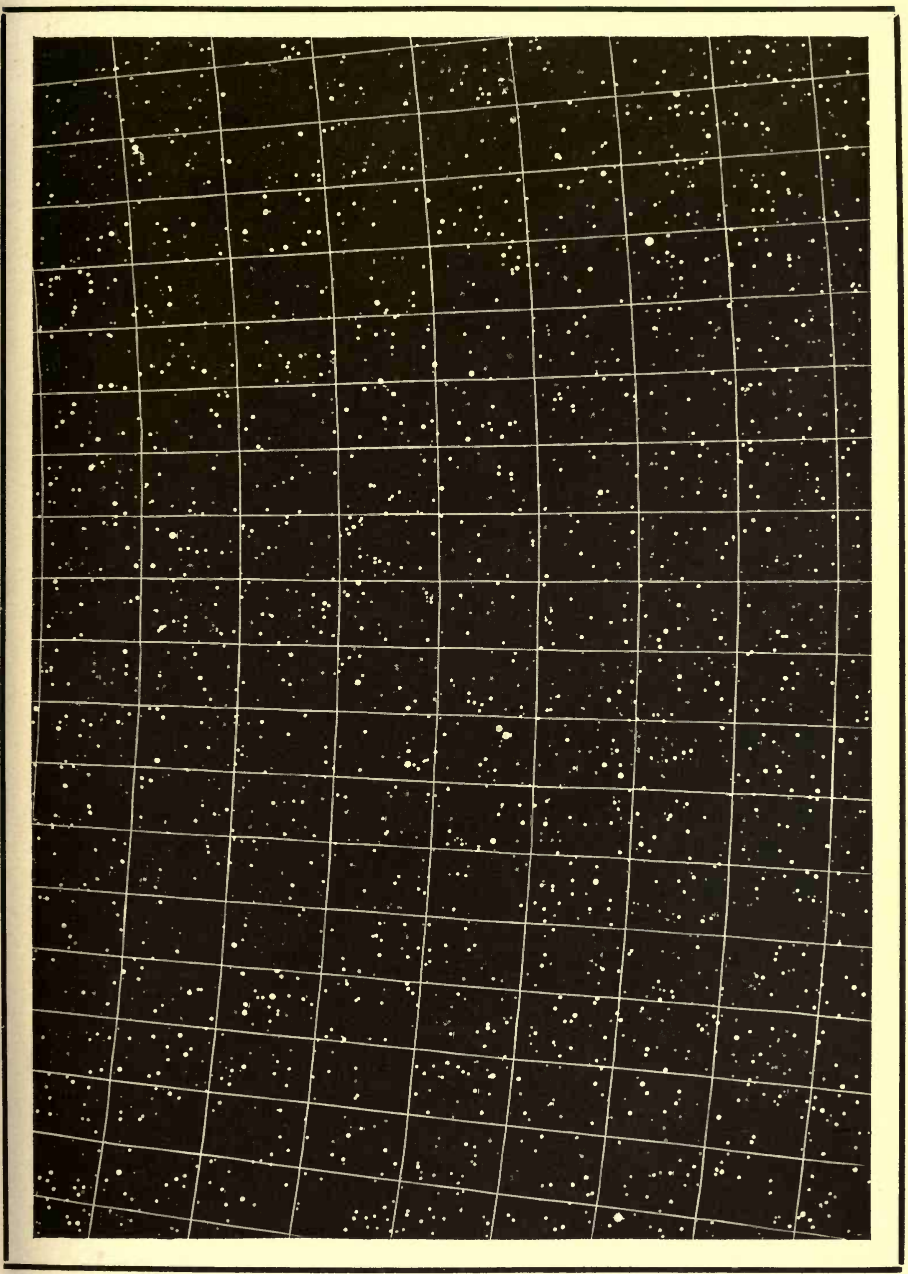
Fig. 3.



A NAKED-EYE VIEW OF THE HEAVENS CORRESPONDING TO ONE OF ARGELANDER'S CHARTS. (*Flammarion.*)

The ideas of the ancients on the fixed stars were very obscure. Anaximenes (550 B.C.) thought that the stars were designed for ornament, and nailed, as it were, like studs in the crystalline sphere. Pythagoras pronounced each star to be a distinct world with its own land, water, and air. The Stoics, Epicureans, and indeed almost all the ancient schools of philosophy, held that the stars were celestial fires nourished by the caloric or igneous matter which they believed streamed out perpetually from the centre of the universe. Anaxagoras (450 B.C.) considered that the stars were stones whirled upwards from the Earth by the rapid motions of the ambient ether, the inflammable properties of which setting them on fire caused them to appear as stars. Callimachus describes the circumpolar stars as feeding on air; and Lucretius, pondering on the subject, and not doubting the fact, asks "Unde æther sidera pascit?" (How does the æther nourish the stars?) Stars were at one time looked upon as the *spiraculæ*, or breathing-holes of the universe.

Sir John Herschel's remarks on the stars are very forcible. He says: "The stars are the land-marks of the universe; and amidst the endless and complicated fluctuations of our system, seem placed by its Creator as guides and records, not merely to elevate our minds by the contemplation of what is vast, but to teach us to direct our actions by reference to what is immutable in His works. It is indeed hardly possible to over-appreciate their value in this



TELESCOPIC VIEW OF THE SKY

Corresponding to the area exhibited in Fig. 3 (opposite).

point of view. Every well-determined star, from the moment its place is registered, becomes to the astronomer, the geographer, the navigator, the surveyor, a point of departure which can never deceive or fail him, the same for ever and in all places, of a delicacy so extreme as to be a test for every instrument yet invented by man, yet equally adapted for the most ordinary purposes; as available for regulating a town clock as for conducting a navy to the Indies; as effective for mapping down the intricacies of a petty barony as for adjusting the boundaries of transatlantic empires. When once its place has been thoroughly ascertained and carefully recorded, the brazen circle, on which that useful work was done, may moulder, the marble pillar totter on its base, and the astronomer himself survive only in the gratitude of his posterity: but the record remains, and transfuses all its own exactness into every determination which takes it for a groundwork, giving to inferior instruments, nay, even to temporary contrivances, and to the observations of a few weeks or days, all the precision attained originally at the cost of so much time, labour, and expense [x]."

Some investigations have been made by Stone having for their object the determination of the question whether the stars transmit to us any measureable amount of heat. The investigations alluded to were carried out at the Greenwich Observatory in 1869 by the aid of a thermo-electric pile connected with the great $12\frac{3}{4}$-inch refractor of that Observatory, and are thought to have yielded some sensibly affirmative results [y]. In the case of Arcturus it was found (or supposed) that when at an altitude of 25° that star gave out just so much heat as was equal to the heat received from a 3-inch cube of boiling water at a distance of 400 yards. Some experiments by Huggins led him to a similar conclusion [z]. Yet for all this one cannot but be a little sceptical, at least as to the measurability of star heat.

To the naked eye the stars appear to preserve the same positions

[x] *Mem.* R.A.S., vol. iii. p. 125. 1829.

[y] *Proc. Roy. Soc.*, vol. xviii. p. 159, Jan. 1870; *Phil. Mag.*, 4th ser., vol. xxxix. p. 376. May, 1870.

[z] *Ast. Reg.*, vol. vii. p. 85. April 1869.

relatively to one another from year to year, and hence they have been called the *fixed stars;* but, as I have already mentioned, this is not strictly true with many stars, for careful observations show that they are endued with a *proper motion* of their own through space. Inasmuch, however, as in no case does this proper motion exceed a few seconds per annum, there is no essential impropriety in retaining the designation "fixed stars," or, as Sir John Herschel put it, "Motions which require whole centuries to accumulate before they produce changes of arrangement such as the naked eye can detect, though quite sufficient to destroy that idea of mathematical fixity which precludes speculation, are yet too trifling, as far as practical applications go, to induce a change of language, and lead us to speak of the stars in common parlance as otherwise than fixed. Small as they are, however, astronomers, once assured of their reality, have not been wanting in attempts to explain and reduce them to general laws."

C. P. Smyth, from an investigation of the history of the star 793 B. A. C. Ceti, appears to believe in the existence of such a thing as periodical proper motion, that is to say, that the amount of a star's proper motion may vary by cycles [a]. If this idea should turn out to be, to any considerable extent, well founded, interesting discoveries may be looked for at some future time in this branch of sidereal astronomy, but at any rate, so far as regards this particular star, Smyth's views are without support from other authorities on star-places [b].

The researches of astronomers during the last quarter of a century in particular have led to the discovery of the fact that a very large number of stars are affected by proper motion.

Amongst the stars whose annual proper motion is considerable may be mentioned [c]:—

[a] *Month. Not.*, vol. xxxv. p. 356. May 1875.

[b] Dunkin, *Month. Not.*, vol. xxxvi. p. 254; Stone, *Month. Not.*, vol. xxxvi. p. 257, March 1876.

[c] See papers by Lynn, *Month. Not.*, vol. xxx. p. 703, June 1870; vol. xxxiii. p. 103, Dec. 1873; and a much older one by Baily in *Mem.* R.A.S., vol. v. p. 158, 1833.

Star's Name.	Mag.	R.A. 1890.			Decl.		Annual Motion in great circle.
		h.	m.	s.	°	′	″
1830 Groom. Ursæ Majoris ...	7	11	46	32	+38	32·2	7·03
9352 Lacaille Piscis Australis ...	7	22	58	39	−36	29·5	6·96
1534 XXIII Cordoba Sculptoris							6·20
61 Cygni $\frac{A+B}{2}$.	5, 6	21	1	57	+38	12·5	5·12
21185 Lalande	$7\frac{1}{2}$	10	57	24	+36	50·1	4·69
21258 Lalande	8	11	0	40	+44	4·1	4·37
o^2 Eridani	4	4	10	12	−7	46·7	4·09
μ Cassiopeiæ	$5\frac{1}{2}$	1	0	37	+54	22·8	3·19
α Centauri $\frac{A+B}{2}$.	1, 2	14	32	7	−60	23·0	3·64

The first astronomer to whom the idea of a proper motion of the stars presented itself was Halley. Comparing the ancient places of the 3 important stars Sirius, Arcturus, and Aldebaran, with his own places determined in 1717, and making every allowance for variation in the obliquity of the ecliptic, he found discordances in latitude amounting to 37′, 42′, and 33′ respectively. Thus he arrived at his surmise as to the existence of proper motion: scientific proof had yet to follow. This was obtained in 1738 by James Cassini, who ascertained that Arcturus had suffered a displacement of 5′ in 152 years, whilst the neighbouring star η Boötis had not been similarly or at all affected. Cassini further discovered the existence of proper motion in longitude, and it was remarked by Fontenelle, "There is a star in the Eagle (α) which, if all things continue their present course, will, after the lapse of a great number of ages, have to the West another star which at present appears to the East of it."

The existence of stellar proper motion being beyond question, it was a natural step forward to seek to determine what it involved. Sir W. Herschel entered upon an inquiry in 1783, and by carefully classifying all the proper motions then known he was led to infer that the solar system was moving towards a point indicated by R.A. 17^h 8^m, Decl. + 25°. This point is near the star λ Herculis. To review all that has been done in this department of physical astronomy would demand more space than it would be convenient for me to give [d]: suffice it, therefore, to say that several recent calculators, employing a considerable number of stars, both Northern and Southern, have one and all confirmed not only Sir W. Herschel's general deduction, but likewise his conclusion as to the precise point, to within a very few degrees of arc; or in the words of W. Struve (after a careful examination of the researches of MM. Argelander, O. Struve, and C. A. F. Peters): "*The motion of the solar system in space is directed to a point in the celestial sphere situated on the right line which joins the 2 stars of the 3rd magnitude π and μ Herculis, at ¼ of the apparent distance between these stars measured from π Herculis. The velocity of the motion is such that the Sun, with the whole cortége of bodies depending on him, advances annually in the direction indicated, through a space equal to 1·623 radii of the terrestrial orbit* [e]." The most recent result, and probably also the most trustworthy, having regard to the large number of stars on which it depends, is L. Struve's. He finds:—R.A. $18^h\ 13^m$; Decl. $+27°$ as the point of convergence.

Spectroscopic observations by Huggins, of an ingenious but elaborate character, confirm the main features of these conclusions [f].

As connected with the matter which has just been discussed, a passing allusion must be made to the Central Sun hypothesis, first started by Wright in 1750, and revived by Mädler in 1846 [g]. This theory simply supposes the existence of some central point around which the Sun, with its vast attendant *cortége* of planets and comets, revolves in the course of millions of years. Mädler thought he had sufficient ground for believing that this point is situated in or near the Pleiades, or, more exactly, at the star Alcyone (η Tauri). Grant very sensibly remarks: "It is manifest that all such speculations are far in advance of

[d] See Grant's *Hist. Phys. Ast.*, p. 555 *et seq.*

[e] *Etudes d'Ast. Stell.*, p. 108.

[f] See *Ast. Reg.*, vol. x. p. 165, July 1872; *Proc. Roy. Soc.*, vol. xx. p. 386, June 1872.

[g] In his *Die Centralsonne*, 4to. Dorpat. 1846.

practical astronomy, and therefore they must be regarded as premature, however probable the supposition on which they are based, or however skilfully they may be connected with the actual observation of astronomers." Vague ideas of the motion of the solar system around some common centre are to be found in Lucretius[h]: it was thought that but for such motion all celestial objects must have collapsed and formed a chaos.

There are some stars which Sir W. Herschel was disposed to consider to be in a great measure out of the reach of the attractive force of other stars, and as probable centres of extensive systems like our own. Among them he suggested:—

Vega (α Lyræ).	Bellatrix (γ Orionis).
Capella (α Aurigæ).	Menkab (α Ceti).
Arcturus (α Boötis).	Schedir (α Cassiopeiæ).
Sirius (α Canis Majoris).	Algorab (δ Corvi).
Canopus (α Argûs).	Propus (ι Geminorum).
Markab (α Pegasi).	

The twinkling, or scintillation[i], of the stars is a phenomenon which requires to be briefly noticed. The effect is too well known to need description, but the cause is involved in much obscurity, though it is referred by most observers to the interference of light[k]. Many ascribe it more immediately to the varying refrangibility of the atmosphere, and this latter theory has much to recommend it. Twinkling differs very much on different nights. Bright stars twinkle much more than faint ones; and indeed the faintest of the stars visible to the naked eye seem not to twinkle at all.

A quiescent condition of the air is unfavourable to the manifestation of twinkling. And in general the phenomenon is more marked with stars near the horizon (and therefore seen through dense strata of air) than with stars near the zenith; and at the surface of the Earth than in mountainous districts at high elevations where the air is more rarefied—all of which facts point out the atmosphere as an influential agent. In confirmation of

[h] *De Rer. Nat.*, lib. i.

[i] *Scintilla*, a spark of fire. It is only stars that twinkle; the planets as a rule do not exhibit the phenomenon: but Venus sometimes and Mercury more often are exceptions to this rule.

[k] *Eng. Cycl.*, Arts and Sciences Div., art. *Twinkling.*

this is Humboldt's statement that in the pure air of Cumana twinkling ceased after the stars attained an elevation of 15° above the horizon. Dunkin gives the useful caution that "This law of twinkling, according to the altitude of the object, is not however universal, for several of the principal fixed stars, on account of the nature and peculiarity of their own light, vary considerably in the intensity of their scintillations independently of their position in the heavens. Procyon and Arcturus are known to twinkle much less than Vega, the brilliant bluish-white star in Lyra[l]." According to Dufour, red stars twinkle less than white ones[m], and twilight appears to intensify the twinkling. Liandier, from repeated observation, says that he is convinced that twinkling is due to disturbances of the atmosphere, brought about by winds and currents of air. The greater the twinkling, the easier it is to see faint stars[n].

Regarded as a subject for exact observation twinkling appears only to have been systematically studied of late years by one man, Montigny of Brussels. But he has accumulated a large number of extremely interesting and curious facts. Some of these may be here stated in very condensed language. Twinkling goes on much more vigorously in rainy weather than at other times; in winter than in summer whatever be the weather. In dry weather in spring and autumn it is about the same, but wet has more effect in autumn than in spring in developing the phenomenon. Variations of pressure and humidity also affect the amount of twinkling; there is more when a rainy period likely to last 2 or 3 days is approaching than merely before a single casual rainy day: it also varies with the aggregate total rainfall of any group of days, being greater as the rainfall is greater, decreasing suddenly and considerably directly the rain has

[l] *The Midnight Sky*, p. 191.

[m] *Month. Not.*, vol. xviii. p. 51. Dec. 1857.

[n] A summary of some interesting spectroscopic observations of Twinkling Stars made by Respighi will be found in *Month. Not.*, vol. xxxii. p. 173, Feb. 1872, and should be consulted by the curious reader. But the most exhaustive account of Twinkling hitherto published is in the form of a Lecture by Ledger (*Observatory*, vol. i. pp. 44 and 82, May, June, 1877). C. Montigny of Brussels has written several interesting papers on the subject which have been read before the Belgian *Académie royale*.

passed away. The number of scintillations observable per second varies from a minimum of 50 during June to July to 97 in January and 101 in February, increasing and decreasing month by month in perfectly regular sequence. The Aurora Borealis has a marked effect in increasing the twinkling.

Even the foregoing highly epitomised statement is far from exhausting the striking facts ascertained by Montigny. He bethought him that possibly Secchi's 4 classes of stars (so classed according to their spectra [o]) might yield some definite results in the matter of twinkling, and he was not disappointed. From 225 observations of 16 stars belonging to Class I; 227 of 14 belonging to Class II; and 159 of 11 belonging to Class III, choosing for the most part stars larger than the 3rd magnitude, he obtained the following result:—

	Average Number of Scintillations per Second.
1st Class of Stars	86
2nd Class of Stars	69
3rd Class of Stars	56

He also found that the more perfectly any star possesses the distinguishing characteristics of its class the more nearly does the number of its scintillations agree with what is evidently the law indicated by the above table. This law may be stated thus: The more the spectrum of a star is interrupted by dark lines the less frequent are its scintillations. The individual character of the light emitted by each star appears therefore to affect its twinkling both as regards its frequency and the colours displayed. Montigny's explanation of this is simple and convincing, but it belongs rather to physics or spectroscopy than to astronomy.

Plate I is a reproduction by the French process of *hélio-gravure*, without any touching up by hand, of a photograph of a portion of the constellation Cassiopeia (R.A. $0^h\ 22^m$; Decl. $+61^\circ\ 0'$) taken at the Paris Observatory on November 6, 1886.

[o] See vol. ii. p. 354, *ante*.

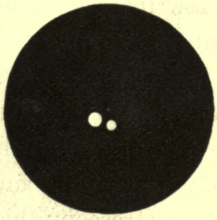
CHAPTER II.

DOUBLE STARS, ETC.

But few known until Sir W. Herschel commenced his search for them.—Labours of Sir J. Herschel and F. G. W. Struve.—Examples.—Optical Double Stars.—Binary Stars.—Discovered by Sir W. Herschel.—Examples.—List of Optical Doubles.—Coloured Stars.—Examples.—Generalisations from Struve's Catalogue.—Conclusions drawn by Niesten.—Stars changing colour.—Triple Stars.—Quadruple Stars.—Multiple Stars.

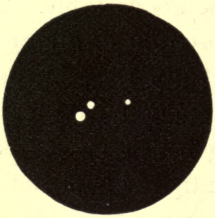
ALTHOUGH to the unaided eye all the stars appear single, yet in numerous instances the application of suitable optical assistance shows that many consist in reality of 2 stars, placed in apparent juxtaposition so close together that they appear to the unassisted eye as one. These are termed *double*

Fig. 5.



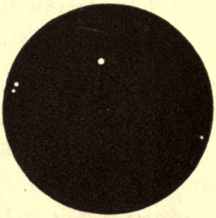
γ Leonis.

Fig. 6.



ξ Libræ.

Fig. 7.

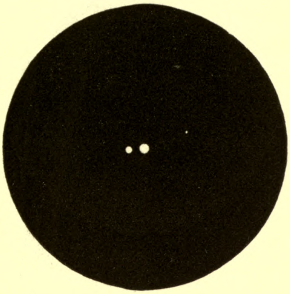


178 P. XX. Delphini.

DOUBLE, TRIPLE, AND QUADRUPLE STARS.

stars[a]. Only 4 of these objects were known until Sir W. Herschel, by means of his powerful telescopes, discovered a large number the existence of which had never before been suspected. He observed and catalogued altogether about 500, which subsequent observers, especially F. G. W. Struve and Sir J. Herschel, have augmented to nearly 10,000.

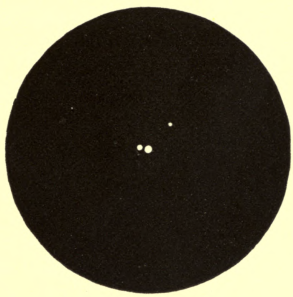
[a] The first application of this term was by Ptolemy, who called ν Sagittarii, διπλοῦς.



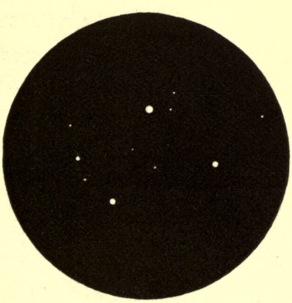
ι Cassiopeiæ.
Mags. 7, 4½, 9.

11 Monocerotis.
Mags. 6½, 7, 8.

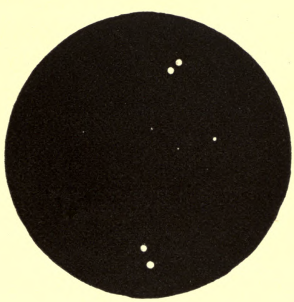
12 Lyncis.
Mags. 7½, 6, 6½.



ζ Cancri. (1865.)
Mags. 7, 6, 7½.



θ Orionis.
Mags. 8, 12, 7½, 6, 14, 7.



ε Lyræ.

MULTIPLE STARS.

(*Drawn to scale by G. F. Chambers.*)

Scale = 30″ to the inch (except ε Lyræ). The Magnitudes are noted from left to right.

The following stars (see Table on p. 32) have been selected by Sir J. Herschel[b] from Struve's Catalogue as remarkable examples of each class, well adapted for observation by amateurs who may be disposed to try by them the efficiency of telescopes.

Fig. 14.

TWO STARS AT DIFFERENT DISTANCES SEEN AS A "DOUBLE STAR."

If two stars lie very nearly in the same line of vision, whatever their distance from each other, they will form an *optical* double star, or one the components of which are only apparently and not really in juxtaposition. Fig. 14 will enable this to be understood. Two stars may appear to be in close contiguity as in the circle, representing a telescopic field of view, at the top of the diagram. But this contiguity may simply be the result of their being in the same visual line at the same time that they are absolutely a long distance apart, as shown in the lower part of the diagram.

Sir W. Herschel, thinking that a prolonged and careful scrutiny of some of these double stars (mere optical doubles as he regarded them) might ultimately afford data for determining their parallax, applied himself in 1779 and subsequent years to the formation of an extensive catalogue, embodying measurements of position and distance for future reference.

"On resuming the subject his attention was diverted from the original object of the inquiry by phenomena of a very unexpected character, which at once engrossed his whole attention. Instead of finding, as he expected, that annual fluctuation to and fro of one component of a double star with respect to the other—that alternate increase and decrease of their distance

[b] *Outlines of Ast.*, p. 609, kindly revised by Dawes for this work. But that able observer once told me that he attached no great importance to such lists so far as regards the *testing* of telescopes.

0″ to 1″.	R.A. h. m.	Mags.	1″ to 2″.	R.A. h. m.	Mags.	2″ to 4″.	R.A. h. m.	Mags.	4″ to 8″.	R.A. h. m.	Mags.
λ Cass. ..	0 25	6 —6½	36 Androm.	0 49	6 —7	α Piscium..	1 56	3 —4	η Cassiop...	0 42	4 —7½
66 Piscium	0 48	6 —7	ε Arietis ..	2 52	5 —6½	ε Trianguli	1 56	5½—15	ι Cassiop. ..	2 20	4½—7
γ^2 Androm.	1 57	5 —6½	2 Camelop.	4 31	5½—7½	ι Trianguli	2 5	5½—7	32 Eridani	3 48	5 —7
52 Arietis..	2 58	6½—7	52 Orionis..	5 42	6 —6½	γ Ceti ..	2 37	3 —6	μ Eridani	4 39	5
32 Orionis	5 24	5 —7	ζ Cancri ..	8 5	6 —7	12 Eridani..	3 7	3½—8	ω Aurigæ ..	4 51	5 —9
ω Leonis ..	9 22	6 —7	ι^2 Cancri ..	8 47	6 —6½	κ Leporis ..	5 8	5 —9	λ Orionis ..	5 29	4 —6
φ Ursæ ..	9 44	5 —5½	ε Chamæl...	11 54	6 —6½	ζ Orionis ..	5 35	3 —6½	δ Geminor.	7 13	3½—9
42 Comæ ..	13 4	5 —5	γ Centauri..	12 35	4 —4	ε Hydræ ..	8 40	4 —8½	α Geminor.	7 27	3 —3½
ζ Boötis ..	14 35	3½—4	γ Circini ..	15 14	5½—6	γ Leonis ..	10 13	2 —4	υ Argûs ..	9 44	3 —8
π Lupi ..	14 57	5½—6½	ξ Scorpii ..	15 58	4½—5	ξ Ursæ Maj.	11 12	4 —5½	α Crucis ..	12 20	1½—2
η Coronæ B	15 18	5 —6	λ Ophiuchi	16 25	4 —6	ι Leonis ..	11 18	4 —8	γ Virginis..	12 36	4 —4
γ Lupi ..	15 27	4 —4	ζ Herculis..	16 37	3 —7	β Hydræ ..	11 46	5 —5	π Boötis ..	14 35	3½—6
γ Coronæ B	15 38	4 —6½	τ Ophiuchi	17 57	5 —6	μ Canis Maj.	13 54	5½—9½	ξ Boötis ..	14 46	3½—6½
φ Draconis	18 18	5 —7	γ Cor. Aust.	18 59	6 —6	ε Boötis ..	14 40	3 —6	44 Boötis ..	15 0	5 —6
χ Aquilæ ..	19 36	6 —7	δ Cygni ..	19 41	3 —8	δ Serpentis	15 29	3 —5	ζ Coronæ B	15 35	5 —6
λ Cygni ..	20 43	5 —6	π Aquilæ ..	19 43	6 —7	μ Draconis	17 3	4 —4½	σ Coronæ B	16 10	6 —6½
4 Aquarii ..	20 45	6 —7	π Cephei ..	23 4	5 —10	ρ Herculi	17 19	4½—5½	α Herculis	17 9	3½—5½
						70 Ophiuchi	17 59	4½—7	95 Herculis	17 56	5½—6
						ε Draconis	19 48	5½—9½	κ Cephei ..	20 12	4½—8½
						ρ Capricorni	20 22	5 —9	ξ Cephei ..	22 0	5 —7
						μ Cygni ..	21 39	5 —6			
						ζ Aquarii ..	22 23	4 —4½			
						σ Cassiop...	23 53	6 —8			

8″ to 12″.	R.A. h. m.	Mags.	12″ to 16″.	R.A. h. m.	Mags.	16″ to 24″.	R.A. h. m.	Mags.	24″ to 32″.	R.A. h. m.	Mags.
γ Arietis ..	1 47	4½—5	8 Monocer.	6 17	4½—7	ζ Piscium..	1 7	6 —8	23 Orionis..	5 17	5 —7
θ Eridani ..	2 54	4½—5½	γ Volantis..	7 9	5 —7	α Ursæ Min.	1 18	2½—9½	κ^1 Herculis	16 3	5½—7
f Eridani ..	3 44	5 —5½	ζ Ursæ Maj.	13 19	3 —5	χ Tauri ..	4 15	6 —8	ψ^1 Draconis	17 43	5½—6
β Orionis ..	5 9	1 —9	κ Boötis ..	14 9	5½—8	24 Comæ B.	12 29	5½—7	η Lyræ ..	19 10	5 —9
ζ Antliæ ..	9 26	6 —7	α Centauri	14 32	1 —2	α Can. Ven.	12 50	2½—6½	χ Cygni ..	19 42	5 —9
2 Can. Ven.	12 10	6 —9	η Lupi ..	15 52	4 —8½	ε Normæ ..	16 19	5 —7			
γ Delphini	20 41	4 —7	β Scorpii ..	15 59	2 —5½	δ Herculis	17 10	4 —8½			
			β Cephei ..	21 27	3 —8	61 Ophiuchi	17 39	6 —7			
						41 Draconis	18 9	5½—6			
						κ Cor. Aust.	18 25	6½—7½			
						θ^1 Serpentis	18 49	4½—5			
						61^1 Cygni ..	21 1	5½—6			

and angle of position which the parallax of the Earth's annual motion would produce—he observed in many instances a regular progressive change; in some cases bearing chiefly on their distance, in others on their position, and advancing steadily in one direction, so as clearly to indicate a real motion of the stars themselves, or a general rectilinear motion of the Sun and whole solar system, producing a parallax of a higher order than would arise from the Earth's orbital motion, and which might be called systematic parallax."

To put the matter in a few words, in 1802 Herschel announced to the Royal Society, in a memorable paper, the existence of sidereal systems, consisting of 2 stars revolving about each other in regular elliptic orbits, and constituting *binary* stars—a term introduced to distinguish them from optical double stars, in which no periodic change of place is discoverable [c].

The double stars which after the lapse of 25 years were found by Herschel to possess an orbital motion were about 50 in number; subsequent observers have added many more, and fully 600 stars are now recognised to be thus in motion. But this phrase must not be taken to imply that in every case where 2 stars are observed to approach or recede from one another they form jointly a binary (&c.) system, because changes of distance may and frequently do result only from a difference in the proper motions of the 2 stars. The motion to be binary must be elliptic in its nature, not rectilinear.

Fig. 15, which represents the binary star ξ Ursæ Majoris at the respective epochs of 1865, 1873, and 1883, may be taken as typical of the character of the changes exhibited from time to time by a great number of binary stars.

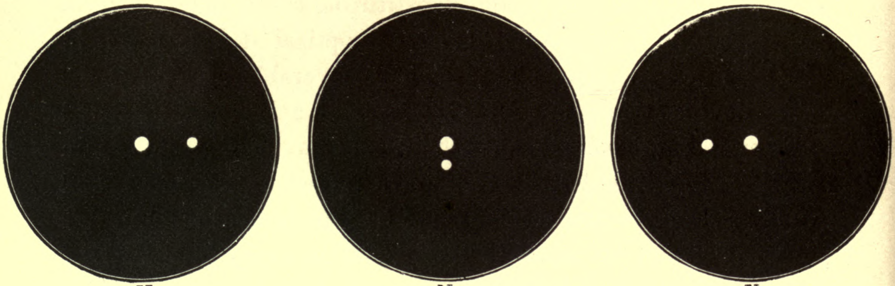
In a subsequent chapter information will be given concerning

[c] *Phil. Trans.*, vol. xciii. p. 339, 1803; see also vol. xciv. p. 353, 1804. It may be worth mentioning that Lambert (*Lettres Cosmologiques*) and Mitchell (*Phil. Trans.*, vol. lvii. p. 234, 1767) both conjectured the existence of binary stars. Lambert's book was *re-written* by M. Mérian and published in French at Berlin in 1784 under the title of *Système du Monde par M. Lambert:* a translation of this corrupted edition was made into English by J. Jacque, and published at London in 1800 under the title of *The System of the World.*

some of the more remarkable of these objects, together with the elements of their orbits determined on the principles of the Newtonian law of gravitation—a law which was first practically applied to this branch of sidereal astronomy by M. Savary in 1830, in the case of ξ Ursæ Majoris [d].

The work of cataloguing double stars, initiated by Sir W. Herschel, was followed up with great assiduity by W. Struve, whose large catalogue of 3112 stars—the *Mensuræ Micrometricæ*—was published at St. Petersburg in 1837. Other subsidiary catalogues were also published at different times by this observer. The system which he adopted was to divide all the double stars

Fig. 15.



ξ URSÆ MAJORIS.

measured by him into 8 classes, and each class into 2 sub-classes, according to the angular distance of the components. The 8 principal classes were as follows:—

	Dist. ″		Dist. ″
I.	less than 1	V.	between 8—12
II.	between 1—2	VI.	12—16
III.	2—4	VII.	16—24
IV.	4—8	VIII.	24—32

The arrangement of the sub-classes had regard to the magnitudes of the component stars. The 1st sub-class of every

[d] *Conn. des Temps,* 1830, p. 56. Four observations in position and distance are necessary for laying down the orbit of a binary star. Encke's method will be found in the *Berliner Astronomisches Jahrbuch,* 1832, p. 253, and Sir J. Herschel's in *Mem.* R.A.S., vol. v. p. 171, 1833. See also Arago's *Pop. Ast.*, Eng. ed., vol. i. p. 301.

principal class consisted of conspicuous doubles, or, as Struve called them, *duplices lucidæ;* the 2nd of less important doubles, or *duplices reliquæ.* The former comprised stars each component of which exceeded in brightness the $8\frac{1}{4}$ magnitude; the latter, stars between the magnitudes $8\frac{1}{4}$ and 12—which last was assumed to be the smallest visible in the telescope employed (the Dorpat refractor of 15 English inches aperture). Struve's system is arbitrary and inconvenient, for these reasons—that double stars which are also binaries (as many are) frequently pass from one class to another in the course of a few years, and likewise that the magnitudes are not comparable with those assessed on the common scale. Neither Struve's classification nor his scale of magnitudes have been generally adopted by subsequent observers. References to W. Struve's catalogue are generally indicated thus—Σ. Stars observed and catalogued by his son Otto Struve are frequently indicated thus—σ, or OΣ.

Of late years the subject of double stars has received much attention from Smyth, Dawes, Jacob, Main, Wilson, Seabroke, and Gledhill in England; from Secchi, Dunér, and Dembowski on the Continent; and from Burnham, O. Stone, A. Hall, and Pickering in America.

A comprehensive general catalogue of all the known double stars (embodying the numerous observations of recent years) is now a desideratum, but it is understood that Burnham has one in hand.

According to Smyth, of 653 stars in Struve's 8 orders there are probably only 48 which are optically double. Of the wider ones none have so changed in position as to enable any orbit to be determined, whence it is concluded that even where they have a physical connexion the period of revolution cannot be less than 20,000 years. This statement was made more than 40 years ago, and should perhaps now be qualified.

The following are suggested by Smyth as a few of the more remarkable optically-double stars, but it is obviously absurd to speak of a star as composed of 2 stars where the minor constituent is upwards of 100″ distant from its primary:—

	Mags.	Dist.
		″
Vega (α Lyræ)	1 —11 ...	48
Aldebaran (α Tauri)	1 —12 ...	114
Altair (α Aquilæ)	1½—10 ...	153
Pollux (β Geminorum) ...	2 —12 ...	206

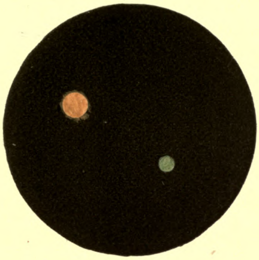
Many double stars exhibit the curious and beautiful phenomenon of complementary colours. In such instances the larger star is usually of a ruddy or orange hue, and the smaller one blue or green. When complementary colours are found in a double star the components of which are of very unequal size, we may attribute the circumstance mainly to the effect of contrast; yet it can hardly be doubted that in many cases colour truly exists. Single stars of a fiery red or deep orange are not uncommon, but isolated blue or green stars are very rare. Amongst the conspicuous stars β Libræ (green) appears to be the only instance. The following may be cited as good examples of coloured pairs:—

Name.	R.A. 1890.	Decl. 1890.	Mag. of Components.	Dist.	Colour of A.	Colour of B.
	h. m. s.	° ′		″		
η Cassiop. ...	0 42 26	+ 57 13·9	4 7½	5 (bin.)	Yellow ...	Purple.
α Piscium ...	1 56 21	+ 2 14·0	3 4	3	Pale Green	Blue (or var.).
γ Androm.	1 57 8	+ 41 48·1	3½ 5½	10	Orange ...	Green.
ι Cancri ...	8 40 3	+ 29 9·7	4½ 6¼	30	Orange ...	Blue.
ε Boötis......	14 40 11	+ 27 32·2	3 6	3	Pale orange	Sea green.
ζ Coronæ ...	15 35 14	+ 36 59·7	4 5	6	White......	Blue.
α Herculis...	17 9 38	+ 14 30·9	3 6	5	Orange ...	Emerald green.
β Cygni......	19 26 17	+ 27 43·7	3 7	34	Yellow ...	Sapphire blue.
σ Cassiop. ...	23 53 25	+ 55 8·5	5 7	3	Greenish...	Bright blue.

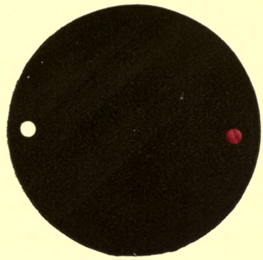
The following are some generalisations from Struve's catalogue[e]. Of 596 bright double stars there were:—

375 pairs of the same colour and intensity.
101 pairs of the same colour but different intensity.
120 pairs of totally different colours.

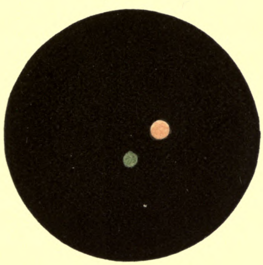
[e] Quoted in Smyth's *Cycle of Cel. Obj.*, vol. i. p. 301. See the original.



γ ANDROMEDÆ.

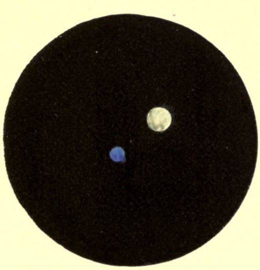


R LEPORIS.

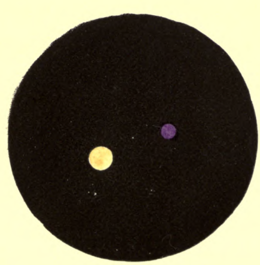


ϵ BOÖTIS.

β CYGNI.



σ CASSIOPEIÆ.



η CASSIOPEIÆ.

COLOURED STARS.

Amongst those of the same colour the white greatly predominated, and of 476 specimens of that species there were:—

295 pairs both white.
118 pairs yellowish or reddish.
63 pairs both bluish.

Webb thus commented on this analysis:—"The curious fact is here made evident that when the brighter star is not white, it approaches the less refrangible end of the spectrum, and the reverse: so that the very remarkable statement of J. Herschel that 'no green or blue star (of any decided hue) has, we believe, ever been noticed unassociated with a companion brighter than itself,' is shown to be, if not literally, yet substantially correct [f]."

The number of the reddish stars is double that of the bluish stars; and that of the white stars is 2½ times as great as the number of red ones. The combination of a blue companion with a coloured primary happens:—

53 times with a white principal star.
52 times with a light yellow.
52 times with a yellow or red.
16 times with a green.

Doberck has analysed [g] with great attention to details the colours of all the binary stars given in Struve's *Mensuræ Micrometricæ*. He considers that his tabulated results show at a glance that there are 2 kinds of revolving double stars:—(1) Those whose components are of identical colours; (2) Those whose components are of complementary colours. In both cases the principal star is white or yellow, white stars being most common in systems of the 1st kind. The chief component of a binary is never blue, but the companion is often blue, and the greater the distance the more probable is it that the companion will be blue. On the other hand, the components of close pairs are alike in colour. It agrees well with the foregoing that, as Struve has shown, the brightness is on the whole more different, the more different the colour is, because it is known that the inequality of the brightness of a pair of stars increases with the

[f] *Student*, vol. v. p. 488. Jan. 1871.
[g] *Ast. Nach.*, vol. xcv., No. 2278, Sept. 20, 1879.

distance. Doberck further shows that a physical connection is most probable where the components are of about the same magnitude, and that most binaries have for their chief component a star between the 7th and 8th magnitudes. Moreover, very few pairs of stars are physically connected where the distance is greater than $6\frac{1}{2}''$. It would be interesting to extend Doberck's analysis of Struve's stars to all the known binary stars in order to see whether his conclusions are of universal application.

Niesten has approached this question from another standpoint with the view of ascertaining whether the colours of binary stars depend in any way on the position in its orbit of the smaller companion. He drew up in 1879 a table of colours of 20 binary groups observed during a period of nearly a century, and the results of his inquiries were to this effect:—(1) In systems with well-marked orbital motion, and especially in those of short period, the two components have ordinarily the same yellow or white tints. (2) In systems, as to which we have colour observations sufficient to enable us to connect the colour with the position of the satellite in its orbit, the principal star is white or pale yellow, when the companion is at its periastron, whereas, in the other positions, it is yellow, gold-yellow, or orange. (3) The companion follows the principal star in its fluctuation of colour, and often surpasses that in colour as it withdraws from periastron. (4) The same similarity of tints in the two stars appears both in binary groups with rectilinear motion, and in those with orbital motion and long periods of revolution. (5) In perspective binary groups, the companion is almost always blue. This last observation is thought to point to a super-position of tint (as in the case of distant mountains looking blue). From these groups, the small star may be reasonably supposed much further distant than the large one; in fact, near the confines of the visible universe. May not this blue colour (it is asked) be due to a gaseous medium expanded in celestial space, acting on luminous rays which traverse it quite like our own atmosphere, of which it is perhaps merely the continuation?

Of isolated stars which are both large in size and noticeable in colour the following may be mentioned:—

White stars.—α Canis Majoris, α Leonis, β Leonis, α Piscis Australis, α Ursæ Minoris.
Red stars.—α Tauri, α Scorpii, α Orionis.
Blue stars.—α Aurigæ, β Orionis, γ Orionis, α Canis Minoris, α Virginis.
Green stars.—α Lyræ, α Aquilæ, α Cygni.
Yellow stars.—α Boötis.

The question of change in the colour of stars must perhaps be answered in the affirmative, though the examples are few and the evidence not very conclusive. Ptolemy and Seneca expressly declare that in their time Sirius was of a reddish hue, whereas now, as is well known, it is of a brilliant white. Capella which was formerly red is now blue. It would also seem that γ Leonis and γ Delphini have changed since they were first observed by Sir W. Herschel. He says[h] that they were perfectly white, whereas the larger components of each were seen by Smyth both to be yellow, and the smaller both green, but I am much inclined to view all such statements as these with distrust.

Admiral Smyth once published[i] a diagram of coloured discs to guide observers in assigning colours to stars. The diagram contained 4 shades of each of the following colours, viz.:—red, orange, yellow, green, blue, and purple—but it was of no practical use as an adjunct to the telescope: for one cannot compare a glittering and flashing point with a wafer-like circle of dead and opaque colour. But it might suggest the preparation of a series of similar discs in transparent coloured glass to be used with the aid of a lighted lamp behind them. Such a series of discs mounted in a frame might be available in making comparisons of colour. Struve was of opinion that his 9th was the smallest magnitude in which he could recognise colour, but Smyth considered that he could detect blue in stars smaller than that magnitude.

When very powerful telescopes are directed upon some stars which with smaller ones are only seen as single stars or doubles,

[h] Quoted in Smyth's *Cycle*, vol. i. p. 303. I have been unable to find the original.

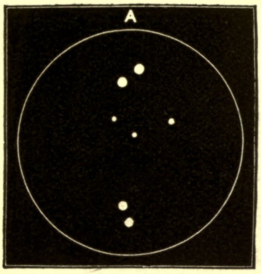
[i] In his *Sidereal Chromatics*, 8vo. Lond. 1864, p. 54. Reproduced in 1881 in my edition of Smyth's *Cycle of Celestial Objects*.

they will be found to consist of 3 or more stars grouped together: such are termed triples, quadruples, quintuples, or multiples, as the case may be. The following are examples, but some of the triples (*e.g.* γ Argûs) might with propriety be ranked as quadruples:—

Name.	R.A. 1890.	Decl. 1890.	Magnitudes.	Distance.
Triples.	h. m. s.	° ′		″ ″
ψ Cassiopeiæ	1 18 10	+67 33·3	4½ 9 11	29 2
γ Andromedæ	1 57 8	+41 48·1	3½ 5½ 6	10·3 0·4
3760 H Columbæ... ...	5 21 58	−35 26·7	7 7 11	7·3 20
11 Monocerotis	6 23 29	− 6 57·7	6½ 7 8	7·2 9·6
12 Lyncis	6 36 30	+59 33·1	6 6½ 7½	1·6 8·7
3928 H Puppis	7 1 34	−34 36·1	6½ 8½ 10	5·5 37
ζ Cancri...	8 5 54	+18 0·9	6 7 7½	0·8 5·3
γ Argûs...	8 6 8	−47 0·4	2 6 8	42 62
2837 B.A.C. Volantis...	8 20 9	−71 9·5	6 6½ 7	65
A Velorum	8 25 35	−47 33·6	6 9 10	4·4 20
1604 Σ Crateris	12 3 46	−11 14·0	7 9½ 8	11 40
γ Centauri	14 14 44	−57 57·0	6 8½ 11	9·6 35
51 Libræ	15 58 19	−11 4·1	4½ 5 7½	1·1 7·1
379 South, Sagittarii ...	17 55 40	−23 2·7	7 11 8	5 15
Quadruples.				
π^2 Canis Majoris ...	6 50 18	−20 15·9	6 9½ 9½ 10	45 52 125
5112 H Sagittarii ...	19 17 4	−18 12·0	8 8 8 12	23 20 25
178 P XX. Delphini...	20 25 56	+10 53·3	7 7½ 8 12	14 23 0·7
8^2 Lacertæ	22 30 58	+39 3·9	6½ 6½ 11 10	22 82 28
Quintuple.				
β Lyræ	18 46 1	+33 14·1	3-5 8 13 8½ 9	45 46 66 85
Multiples.				
σ Orionis	5 33 3	− 2 38·0	{4, 11, 8, 7, 8½, (D) 9, 8}	{12″, 12, 42, 211; D—9, 8½″, D—8.68″}
45 Leporis	5 34 25	−17 56·6	7, 8, 8, 8, 12, 13	[See *Cycle.*]
α Crucis	12 20 28	−62 29·3	{1½, 2, 5, 12, 14, 13}	{5, 90, 60, 100, 125}
ε Lyræ	18 40 41	+39 33·2	{5, 6½, 5, 5½, 9½, 13, 13}	
β Capricorni	20 13 42	−15 11·4	3½, 7	205

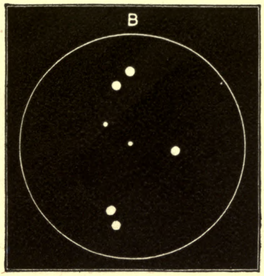
Several of the above are known to be binary &c. systems, and perhaps as time goes on and observers multiply we shall find that others will have to be ranked in the same category. For instance, respecting ε Lyræ, Prince notes not only a "considerable increase of brilliancy" in the largest of the trio of small stars which lie between the two principal pairs, but also points out that if Smyth's drawing and description are to be relied on, a change of position has certainly taken place between 1842 and 1873. "The central acolyte is more nearly midway between the 2 pairs than formerly, while the largest forms with them, very nearly, the apex of a triangle[k]." This object deserves careful scrutiny, for the position angle of both pairs is changing slowly

Fig. 22.



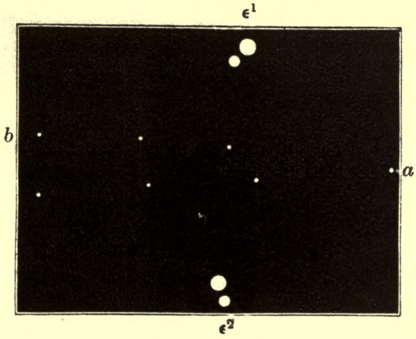
ε LYRÆ. (*Smyth*, 1842.)

Fig. 23.



ε LYRÆ. (*Prince*, 1873.)

Fig. 24.



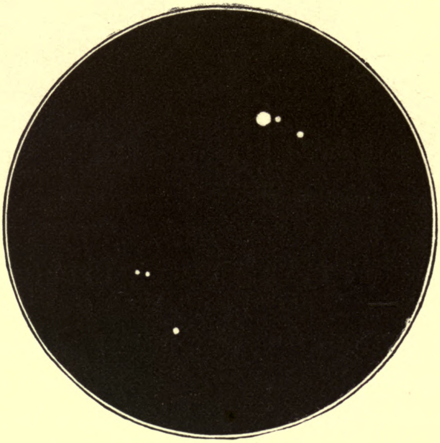
ε LYRÆ. (*A. Hall.*)

[k] *Month. Not.*, vol. xxxiv. p. 86. Dec. 1873.

in a retrograde direction. The largest star of the central trio is of magnitude 9½[1]; the other two of magnitude 13.

Fig. 25 represents a sextuple star of almost as great interest as ε Lyræ. It comprises, as will be seen, two triplets of stars, one of which consists of a 4th magnitude with two companions

Fig. 25.



THE MULTIPLE STAR σ ORIONIS.

of magnitudes 8 and 7; whilst the other triplet has as its chief star an 8¼ magnitude with a 9th magnitude near, and an 8th magnitude at a distance. There really are 10 stars altogether in the group, but the other members are very small and difficult.

[1] A. Hall in 1881 called it mag. 11, and said that he could see 6 others on the preceding side the smallest of which was of mag. 16. (*Observatory*, vol. iv. p. 281, Oct. 1881.)

CHAPTER III.

VARIABLE STARS.

Variable Stars.—o Ceti.—Algol.—δ Cephei.—β Lyræ.—R Coronæ Borealis.—η Argus.—Miscellaneous remarks.—List of prominent Variable Stars.—Variable Stars of the Algol Type.—U Ophiuchi.—Chandler's generalisations on the colours and periods of Variable Stars.—Statistics by Espin.—Temporary Stars.—Notices of Stars which have disappeared.—Are Temporary Stars and Variable Stars identical in character?

THERE are many stars which exhibit periodical changes of brilliancy: these are termed *Variable* stars. About 200 stars are now known to belong to this class, and many more still are put down as "suspected."

One of the most interesting, as also the first that was recognised, of these curious objects, is o Ceti, or *Mira* [sc. *stella*]. It appears about 12 times in 11 years; remains at its greatest brightness for about a fortnight, when it sometimes equals in brilliancy a star of the 2^{nd} magnitude; decreases during about 3 months, till it becomes totally invisible; remains so for about 5 months, and then gradually recovers its brilliancy during the remaining 3 months of its period. Its maximum brightness is not always the same, nor does it always increase or diminish by the same gradations; nor are the successive intervals of its maxima equal. The mean period is $331^{d}\ 8^{h}$, but it would appear from the researches of Argelander[a] that this is subject to a cyclical variation embracing 88 such periods, which has the effect of gradually lengthening and shortening alternately these periods

[a] *Ast. Nach.*, vol. xxvi. No. 624. Jan. 22, 1848.

to the extent of 25 days one way and the other. It is not improbable too that the irregularities of its maximum brilliancy are also periodical, that is to say, that at every 11th maximum the star's brightness is above the average. On Oct. 5, 1839 (the epoch of maximum for that year, according to Argelander), Mira was unusually bright, excelling α Ceti and equalling β Aurigæ. On the other hand, according to the testimony of Hevelius, between Oct. 1672 and Dec. 1676 it did not *appear at all*[b]. The average duration of the naked-eye visibility is about 18 weeks, but in 1859–60 Mira was observed with the naked eye during 21 weeks, whilst in 1868 the term was but 12 weeks.

I append a few details connected with the history of this star:—

On Aug. 13, 1596, David Fabricius noted a star in Cetus to be of the 3rd magnitude, and that in October of the same year[c] it had disappeared. Seven years later, or in 1603, Bayer affixed the letter *omicron* (*o*) to a star in Cetus placed exactly where the star of Fabricius had disappeared. He observed it to be of the 4th magnitude, but not comparing the former observations of Fabricius with his own he failed to make the discovery which was within his grasp.

In the beginning of Dec. 1638, Phocylides Holwarda of Franecker saw this star shining brighter than one of the 3rd magnitude. In the summer of the following year he was unable to find any trace of it, but on Oct. 7 he again perceived it; and to him may be assigned the honour of having first discovered the existence of a variable star.

In 1648 Hevelius commenced a careful series of observations, which were carried on till 1662, during which time he placed the certainty of the discovery beyond a doubt, and made a first approximation to a knowledge of the attendant circumstances[d]. In the following century, between the years 1779 and 1790,

[b] Lalande, *Astronomie*, Art. 794. But it has been suggested that this was because the maxima occurred during months when the constellation Cetus was lost in the Sun's rays.

[c] Kepler, *De Stellâ Novâ*, cap. xxiii. p. 115.

[d] *Historiola Miræ Stellæ*. Fol. Gedan, 1662.

Sir W. Herschel observed this star with his wonted diligence, and materially added to our knowledge of it[e]. In more recent times the name of Argelander may be singled out as specially associated with *o* Ceti.

Algol, or β Persei, is a variable star of short period, which from its Northern position may often be under the notice of observers in Great Britain. It is commonly of the 2^{nd} magnitude: from that it descends to the 4^{th} magnitude in a period of about $3\frac{1}{2}^{h}$, and at this it remains for about 20^{m}. Another period of $3\frac{1}{2}^{h}$ then brings the star up to the 2^{nd} magnitude, at which it remains for another period of $2^{d}\ 13^{h}$, when similar changes recur. Near the epoch of maximum and minimum the variations of brilliancy proceed slowly, but at the intermediate stages they are much more rapid, and therefore more noticeable. The exact period in which all these changes take place is $2^{d}\ 20^{h}\ 48^{m}\ 55^{s}$. Pickering suggests that the range of variability is less than that stated above, and that it is no more than about 1 magnitude.

The observations of Argelander, Heis, and Schmidt tend to show that the period of Algol is less than it was in former years, but that this diminution is not uniformly progressive, inasmuch as an augmentation has now set in; and it may be inferred that future and long-continued observations will result in the discovery that this change of period is itself periodical.

The variability of Algol was discovered by Montanari in 1669 and confirmed by Maraldi in 1694: its period was determined by Goodricke in 1782, who also may be said to have re-discovered its variability[f].

δ Cephei is another variable star which derives additional interest from the fact that its position in the heavens permits frequent observation of it in England. Its period is $5^{d}\ 8^{h}\ 47^{m}$, counting from minimum to minimum, and its range is from mag. $3\frac{1}{2}$ to mag. $4\frac{1}{2}$. The interval between the maximum and minimum is greater than that between the minimum and

[e] *Phil. Trans.*, vol. lxx. p. 338. 1780.

[f] The Saxon farmer Palitzch, noted for his early detection of Halley's comet in 1758, also investigated the period of Algol by means of original observations made by himself. (*Phil. Trans.*, vol. lxxiv. p. 4, 1784.)

maximum, the former being $3^d\ 19^h$, the latter only $1^d\ 14^h$. The variability of this star was discovered by Goodricke in 1784.

β Lyræ is a variable star, remarkable as having a double maximum and minimum within its simple period. Goodricke, the discoverer, assigned to it a period of about $6\frac{3}{8}^d$, but the more recent observations of Argelander show that the true period is double this; or, more exactly, $12^d\ 21^h\ 53^m$—thus set forth[g]: Starting from a maximum when the star is of mag. $3\frac{1}{4}$ it reaches the first minimum of mag. 4; then follows a second maximum, and after that a second minimum, but at this second period of least light the star is fainter than before, being only equal to a $4\frac{1}{2}$ mag. Argelander further ascertained that, as in the case of *o* Ceti, the period of β Lyræ is itself variable; that down to the year 1840 it was increasing, but that from that period it began to decrease, and was continuing to do so at the time the remark in question was made (1866). The annual amount of the increment gradually diminished till the stationary epoch, whence we may anticipate by analogy that now the decrement will gradually become more rapid.

The variable star R Coronæ Borealis is noticeable from the fact that on some occasions the fluctuations in brightness between the maximum and minimum epochs are so inconsiderable as to be scarcely perceptible, but that after some years of these almost insensible variations, the fluctuations become so great that at its minimum the star either descends to some such mag. as 13, or entirely disappears. The period of this star is commonly put at 323 days, but it cannot be said that that period is conclusively accepted. At its maximum its brilliancy is that of a star of the 6^{th} magnitude. Its variability was discovered by Pigott in 1795.

Perhaps the most remarkable variable star with which we are acquainted is η Argûs—an object unfortunately not visible in England. The following historical notes, down to 1850, were brought together by Humboldt[h].

[g] Argelander, *Ast. Nach.*, vol. xxvi. No. 624. Jan. 22, 1848.

[h] Quoted in Arago's *Pop. Ast.*, vol. i. p. 258, Eng. ed.

As early as the year 1677, Halley, on his return from St. Helena, frequently expressed a doubt respecting the constancy of the brightness of the stars in the constellation Argo; he had especially in his mind those belonging to the prow and the deck, the magnitudes of which had been indicated by Ptolemy. But the uncertainty of the ancient designations, the numerous variations of the manuscript of the *Almagest*, and especially the difficulty of obtaining exact evaluations of the brightness of the stars, did not permit him to transform his suspicions into a certainty. In 1677 he classed η Argûs among the stars of the 4^{th} magnitude; in 1751 La Caille found it to be of the 2^{nd} magnitude. Subsequently it resumed its original appearance, for Burchell, during his residence in South Africa from 1811 to 1815, noted it to be of mag. 4. From 1822 to 1826 it appeared to be of mag. 2 to Brisbane in New South Wales, and to Fallows at the Cape. In 1827 Burchell, then residing at St. Paul in Brazil, found it to be of mag. 1, and almost as bright as α Crucis. A year afterwards it had decreased to the 2^{nd} magnitude. To this class it still belonged on Feb. 29, 1828, when Burchell observed it at Goyaz, and it is under this magnitude that Johnson and Taylor have entered it in their catalogues, 1829–1833. When Sir J. Herschel was at the Cape between 1834 and 1837 he placed it constantly between mags. 2 and 1: but on Dec. 16 in the latter year, whilst scrutinising the stars lying around the great nebula in Argo, his attention was attracted towards a strange phenomenon—η Argûs, which he had so frequently observed on former occasions, had so rapidly increased in brightness as to equal α Centauri, surpassing every other star in the heavens except Canopus and Sirius. Its maximum brilliancy occurred on or about Jan. 2, 1838. Thenceforward it began to fade away; in April, however, it was still as bright as Aldebaran. This diminution went on till April 1843, though at no time did the star fall below the 1^{st} magnitude. In April a rapid augmentation set in, and according to the observations of Mackay at Calcutta and Maclear at the Cape, η Argûs surpassed Canopus and scarcely fell short of Sirius in brilliancy. Under date of Feb. 1850

Lieut. Gilliss, then in Chili, reported η Argûs to be of a reddish yellow colour, somewhat darker than that of Mars, and very nearly as bright as Canopus.

Since 1850 much has been done, especially by E. B. Powell and Tebbutt[i], towards elucidating the anomalous irregularities (as they were long deemed to be) in the light of η Argûs, and a diagram submitted in 1869 to the Royal Astronomical Society by Loomis[k] seems to make the matter fairly clear. On the whole we are justified in assuming that η Argûs varies from

Fig. 26.

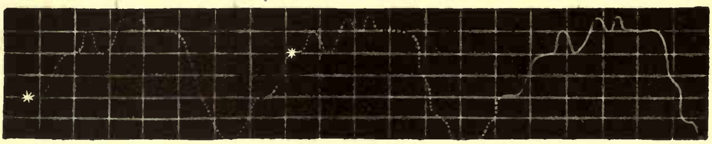


DIAGRAM REPRESENTING THE LIGHT-CURVE OF η ARGÛS. (*Loomis.*)

mag. 1 to mag. 6 or 7 during a period of about 70 years or more, though Schönfeld considers that it has no regular period at all. The maximum phase appears to be complicated, and to consist of three maxima which jointly occupy about 25 years of the 70, during which sub-period the oscillations are restricted to mags. 1 and 2, this sub-period falling as near as may be in the mid-interval between every 6th mag. minimum of the star.

Some remarkable circumstances connected with η Argûs and the nebula surrounding it will more appropriately be related in the next chapter.

Several explanations have been offered to account for the variability of stars, but all are unsatisfactory because the irregularities of the periods offer a bar to any hypothesis which supposes a regular series of changes. Boulliaud, in the case of o Ceti, ascribed its variability to its being a globe of irregular luminosity rotating on an axis, by which different portions of the differently illuminated surface were successively turned towards us[l].

Pigott suggested that an opaque body revolving round a

[i] *Month. Not.*, vol. xxvi. p. 83, Jan. 1866; and vol. xxviii. p. 266, October 1868.

[k] *Ibid.*, vol. xxix. p. 298, May 1869.

[l] *Ad Astronomos monita duo.* 4to. Paris, 1667.

variable star as its primary, whose light would be cut off from time to time after the manner of an eclipse of the Sun, would produce the phenomenon[m]; and this explanation, old as it is, has not yet been superseded by any better one.

The following are some of the more important and prominent periodic stars visible to the naked eye:—

Name.	R.A. 1890			Decl. 1890.		Period.	Changes of Magnitude.	
	h.	m.	s.	°	′	d.	From	to
β Persei	3	1	2	+40	31·9	2·86	2·2	3·7
δ Cephei	22	25	5	+57	51·1	5·36	3·7	4·8
η Aquilæ	19	46	52	+ 0	43·5	7·17	3·6	4·7
β Lyræ	18	46	1	+33	14·1	12·91	3½	4½
α Herculis	17	9	38	+14	30·9	88·5: irreg.	3·1	3·9
ο Ceti	2	13	47	− 3	28·7	330	2	0
R Hydræ	13	23	42	−22	42·7	436	4	10
η Argûs	10	40	47	−59	6·5	70 years ?	1	6

The following is a list of Variables which have been described as of the "Algol type" owing to the fact that their light variations take place in the course of a few hours, followed by a period of constant light. The number of stars of this type is very limited.

No.	Name.	R.A. 1890.			Decl. 1890.		Period.			Variation.
		h.	m.	s.	°	′	d.	h.	m.	
1	U Cephei...	0	52	34	+81	16·0	2	12	0	7·2 to 9·1—9·4
2	β Persei	3	1	1	+40	31·9	2	20	48	2·2 to 3·7
3	λ Tauri	3	54	35	+12	10·8	3	22	48	3·4 4·2
4	155 *Uran. Arg.* Can. Maj.	7	14	29	−16	11·3	1	3		6·2 6 8
5	S Cancri	8	37	39	+19	25·9	9	11	37	8·2 to 9·8—11·7
6	δ Libræ	14	55	5	− 8	4·9	2	7	51	4·9 to 6·1
7	U Coronæ	15	13	42	+32	3·1	3	10	51	7·6 to 8·8
8	U Ophiuchi	17	10	59	+ 1	19·9	0	20	7	6·0 to 6·7

U Ophiuchi is a variable which presents some features of interest in that it has the shortest known period of any variable

[m] *Phil. Trans.*, vol. lxxiii. p. 482, 1783.

star, and is of a magnitude capable of being dealt with by any telescope however small. Its period is $20^h\ 7^m\ 41^s$. It remains at its maximum (6) for 16 hours, and all its changes from maximum to minimum ($6\frac{3}{4}$) and back again to maximum are accomplished in about 4^h. This star is sometimes called Sawyer's Variable, from its period having been worked out by E. F. Sawyer in 1881, but its variability was suggested by Schjellerup as far back as 1863, and a variation of magnitude from 6 to 6·5 was observed by Davis at Cordoba in 1871.

Hind has called attention to the fact that variable stars, especially the smaller ones, are frequently of a ruddy colour. The same observer has noticed that when at their minimum they appear surrounded by a kind of fog. Arago remarked that if this latter opinion should turn out to be well founded it might give us a clue, none other than that the diminution of brilliancy is due to the interference of clouds which cut off a part of the stellar light [n]. It may here be noted as an undoubted fact that with respect to red variable stars as they lose light they gain colour and *vice versâ*, which circumstance favours the hypothesis that absorption of light is the cause of the phenomenon.

Chandler has endeavoured, and with a considerable measure of success, to connect together the colours and periods of variable stars. He has laid down the 3 following preliminary laws:—(1) Variable stars are generally red; (2) They increase in brightness more rapidly than they decrease; (3) The more red they are, the longer their periods [o]. Taking 112 variables whose colours and periods are recorded with fair certainty, Chandler found himself able to frame the following table:—

Periods in days.	White or yellow. per cent.	Red or reddish. per cent.
Under 100	52	48
100–200	22	78
200–300	26	74
300–400	8	92
Over 400	0	100

[n] *Pop. Ast.*, vol. i. p. 260, Eng. ed.
[o] Quoted in *Observatory*, vol. vii. p. 340, Nov. 1884.

In another form his *data* yield the following results:—

Colour of Star.	Average. d.
White	126
Yellow	124
Yellow-red	212
Red	288
Intense red	77

The progressive increase in the periods with the increase in the intensity of the colour cannot be fortuitous[p].

Espin has framed[q] some statistics concerning the distribution of variable stars in the heavens, and concerning their periods, which are so extremely interesting that a brief summary of them must be given in this place:—(1) Variable stars are to be found in a well-marked zone inclined 15° or 20° to the Equator; (2) This zone crosses the preceding side of the galactic circle N. of the Equator, and the following side S. of it; (3) In crossing the preceding side the zone is not many degrees broad, and is very clearly marked, but where it crosses the following side it is broken up into 2 streams; (4) The division into 2 streams occurs where the galaxy is also divided into 2 streams; (5) In this part the variable stars are intimately connected with the galaxy, often occurring in the gaps, and constantly on the edges of the gaps, but rarely in the centre of the star-sprays from the galaxy; where the zone crosses the preceding part of the galaxy it is marked sharply and clearly and seems unconnected with the galaxy; (6) It is noteworthy that with one or two exceptions all the temporary stars have appeared in the region where the galaxy and the variable star zone are both broken into 2 streams; (7) The stars which do not belong to the above-named zone are chiefly the bright and short-period variables; (8) If the stars strongly suspected to be variable are taken into account the foregoing conclusions become still more obvious.

Following up these results Espin has proceeded to consider whether any and what conclusions may be drawn from an

[p] *Science Observer*, July 1878.

[q] *Observatory*, vol. iv. p. 250, Sept. 1881; *Ib.*, vol. v. p. 77, March 1882; *Ib.*, vol. vi. p. 180, June 1883.

examination of the known variable stars grouped in periods. He found in 1882 that the variables then known readily fell into 2 classes, as follows:—

(1.) Period less than 70 days.

(2.) Period more than 135 days.

Further, that there were no stars with periods between 71 and 135 days; that no such gap occurs anywhere else between the shortest and the longest known periods respectively; and that the number of stars decreases rapidly on one side of the gap and increases on the other side thereof. Other considerations also point to a division into 2 classes. For instance, Chandler's results, given above, adapted to Espin's method of classification, yield the following figures:—

Period.	Total No.	White: yellow.	Red: reddish.	Per cent.
Less than 71 days	27	14	13	49
More than 135 days ...	84	11	74	88

It thus appears that white or yellow stars slightly predominate in the 1st class or short-period group; whilst they form but a small minority in the 2nd class or long-period group. Again—in the 1st class there are a large number of bright stars (15 out of 32 being above the 4th magnitude); whereas in the 2nd class there are but few bright stars (only 5 out of 87 being above the 4th magnitude).

The general conclusions derivable from Espin and Chandler's investigations are, that taking into account the attributes of period, colour and magnitude, the known variable stars may be divided into 2 principal classes:—

(1.) Period, less than 70 days; colour, white or red in tolerably even numbers; magnitude, large.

(2.) Period, more than 135 days; colour, mainly red; magnitude, small.

What has been said up to this point concerns variable stars as a whole, but it appears possible to draw some further conclusions from an examination of them class by class. For instance, tabulating the 32 stars in Espin's 1st class in periods of 10 days, we find that 16 out of the 32 have periods of less than 10 days.

Tabulating them according to the number of magnitudes through which they vary, we find that 26 vary one magnitude; 4 vary through 2 magnitudes; 2 vary through 3 magnitudes; so that the greater the extent of the variation the fewer the stars. The average period of the 26 stars which vary one magnitude is $18{\cdot}7^d$; of the 4 stars which vary 2 magnitudes, is $32{\cdot}7^d$; of the 2 stars which vary 3 magnitudes, is $48{\cdot}8^d$; so that increase of variation is attended by increase of period. Hence it follows that:—

(1.) If the variation is small, the period will probably be short.

(2.) If the star is a bright one, the period will probably be short.

Treating in a somewhat similar manner the stars in his 2nd class, Espin finds as follows with respect to the number of stars in relation to the period:—

Period. d.	No. of Stars.	Period. d.	No. of Stars.
135–170	7	320–370	21
170–220	9	370–420	15
220–270	10	420–470	7
270–320	15	470–520	3

Tabulating them according to the number of magnitudes through which they vary, we find:—

Vary in Mag.	No. of Stars.	Vary in Mag.	No. of Stars.
1	3	5	27
2	3	6	25
3	6	7	6
4	14	8 and 9	3

Hence it follows that:—

(1.) Up to a period of (say) 420 days the number of stars increases with the length of the period.

(2.) Up to a range of 6 magnitudes the number of stars increases with the variation in magnitude.

Espin has carried his statistics beyond this point, but, as it seems to me, on data not sufficient for trustworthy conclusions to be drawn. I will therefore only add that he thinks there are indications that there are a certain number of stars in the heavens which should be formed into a class by themselves by reason of the fact that their light is constant for long periods of time (years) in succession, then alters a magnitude or so, and after a very short space of time (weeks) returns to its normal value for another long period of time.

Somewhat similar in character to the variable stars are the "*temporary*" *stars*—stars which suddenly blaze out in the heavens and after a while fade away. The first on record was observed by Hipparchus. Pliny informs us that it was the appearance of this star which induced Hipparchus to construct his catalogue of stars, the first which was ever executed. This statement was by many regarded as a fiction, but E. Biot found that a new star in Scorpio is recorded in the Chinese chronicles under the date of 134 B.C., so that there is no longer any ground for rejecting Pliny's statement. It may be added that the date commonly assigned to Hipparchus's catalogue is 125 B.C.

Brilliant stars are said to have appeared in or near Cassiopeia in the years 945, 1264 [r], and 1572. The last was a very remarkable one, and a most elaborate and graphic account of it is given by Tycho Brahe [s], some extracts from which will be found in Humboldt's *Cosmos*. The substance of his description is as follows: The star lasted from November 1572 to March 1574, or 17 months. It was brighter than Sirius, and rivalled Venus. Its colour was successively white, yellow, red, and white again, and it remained stationary all the while in the position which it occupied when discovered. It has been suggested that the stars of 945, 1264 and 1572 are identical, being apparitions of a variable star of long period. There exists at this moment (as was pointed out by D'Arrest in 1864 [t]), within 1′ of the place assigned by Argelander to Tycho's star, a small star sensibly

[r] As to the star of 1264, Lynn has given good reasons for doubting whether there ever was such a star (*Observatory*, vol. vi. p. 126, April 1883); and the "star" of 945 rests upon no authenticated record. But in both years large comets were visible.

[s] *Progymnasmata*, lib. i.

[t] D'Arrest published a map of the neighbourhood. It will be found in *Oversigt over det Kgl. danske Videnskabernes Selskabs Forhandlinger og dets Medlemers Arbeider i Aaret* 1864, p. 1.

variable in its light, according to the observations of Hind and Plummer in 1873[u]. The star assumed by those observers to be Tycho's follows a 9th magnitude at a distance of $29{\cdot}6^s$, and $10' \, 4''$ to the S. This 9th magnitude may be found by noting that it follows 10 Cassiopeia (a star of magnitude 6) at a distance of $17^m \, 12^s$ and is $6{\cdot}4'$ to the N. of it. The following should be the position for 1890 of Tycho's star, according to Argelander:—

	h. m. s.		° ′
R.A.	0 18 40	Decl.	+63 32·3

In November 1876, presumably between the 20th and 24th (for general bad weather rendered the precise day uncertain), a remarkable outburst of stellar energy took place in Cygnus. Soon after sunset on November 24 Schmidt at Athens observed in this constellation a new star of the 3rd magnitude and of a yellow colour. Unfortunately much delay occurred in communicating the discovery of this star to the astronomers of Western Europe, and when its existence became generally known early in December it had sunk to the 5th magnitude. It continued to diminish day by day, and by the end of December was no brighter than a 7th magnitude star. It was of a decidedly orange-red tint. The position of this star (for 1890·0) is:—

	h. m. s.		° ′ ″
R.A.	21 37 24	Decl.	+42 20 26

Temporary stars of considerable brilliancy shone forth in 1604 and 1670. The former appeared in the constellation Ophiuchus, and became nearly as bright as Venus; it lasted 12 months or more[x]. The latter appeared in Cygnus, and attained the 3rd magnitude; it lasted altogether 2 years, but faded away and then blazed out again more than once before its final disappearance[y].

On April 28, 1848, a new star of the 5th magnitude was seen by Hind in Ophiuchus[z]. It rose to the 4th magnitude a few

[u] *Month. Not.*, vol. xxxiv. p. 168. Feb. 1874.

[x] Kepler, *De Stellâ novâ in pede Serpentarii.*

[y] *Phil. Trans.*, vol. v. p. 2087 *et seq.*, 1670; also vol. vi. p. 2197 *et seq.*, 1671.

[z] *Month. Not.*, vol. viii. p. 146. April 1848.

weeks later; subsequently its light diminished, and now it is usually of the 11^{th} or 12^{th} magnitude[a].

The remarkable star which blazed forth in the constellation Corona Borealis in May 1866 needs a brief mention here in order to make this chapter complete, although the star itself is treated now as a recognised variable (=T Coronæ), and is entered accordingly in the catalogues. This star, recorded by Argelander in 1855 as being of magnitude 9½, was seen by Birmingham at Tuam on May 12, 1866, as a star of magnitude 2. Combining the negative testimony of Schmidt of Athens with the positive testimony of Birmingham, it would seem that the star rose from the 4^{th} to the 2^{nd} magnitude in about 3 hours on the evening in question. It soon began to fade away, and by the end of May had fallen to magnitude 8. It continued below magnitude 9 all through the following summer, but rose to magnitude 7½ in September, and remained nearly stationary in brightness for the remainder of the year.

Sir J. Herschel remarked:—"It is worthy of especial notice, that all the stars of this kind on record, of which the places are distinctly indicated, have occurred, *without exception*, in or close upon the borders of the Milky Way, and that only within the *following* semicircle, the *preceding* having offered no example of the kind[b]."

Numerous instances are on record of stars formerly known which are now not to be found[c], and *vice versâ* of new stars appearing which were never before noticed. There once were stars to the number of 4 in Hercules, 1 in Cancer, 1 in Perseus, 1 in Pisces, 1 in Hydra, 1 in Orion, and 2 in Coma Berenices, which seem now to have disappeared. Several stars in the catalogue of Ptolemy do not appear in that of Ulugh-Beigh; 6 of these were near Piscis Australis, and as 4 were of the 3^{rd} magnitude, Baily concludes that they were visible in Ptolemy's

[a] Arago and other writers say that this star *disappeared*; but Hind has expressly stated this to be incorrect. *Month. Not.*, vol. xxi. p. 232. June 1861. It is now regularly included in catalogues of variable stars, and treated as such.

[b] *Outlines of Ast.*, p. 605.

[c] Sir W. Herschel, *Phil. Trans.*, vol. lxxiii. pp. 250–3. 1783.

time, but disappeared before the time of Ulugh-Beigh. Many discrepancies have, no doubt, arisen from mistaken entries, yet there are other instances in later times which it seems out of the question to explain in this way. Thus 55 Herculis, mag. 5, was observed by Sir W. Herschel in 1781 and 1782, but 9 years afterwards it could not be found, and has not been seen since. In May 1829 Sir J. Herschel missed one of De Zach's stars in Virgo. Montanari remarked, in 1670, as follows:—"There are now wanting in the heavens 2 stars of the 2nd magnitude, in the stern and yard of the Ship Argo. I and others observed them in the year 1664, upon the occasion of the comet that appeared that year. When they first disappeared, I know not; only I am sure that on April 10, 1668, there was not the least glimpse of them to be seen[d]."

Two suggestions may here be submitted:—(1) all the "temporary" stars on record, and (2) such of the "missing" stars as do not depend on errors of observation, would be found to be ordinary "variable" stars could their history be properly traced. Nevertheless Kirkwood considers the theory that temporary stars are long-period variables to be unsound, and that the suddenness of their apparition, the short duration of their brightness, and the great length of their supposed periods are all so many reasons for treating them as distinct from what are commonly known as "variable stars[e]."

[d] *Phil. Trans.*, vol. vi. p. 2202. 1671. [Translated.]
[e] *Amer. Acad., Art and Sciences,* 1884.

CHAPTER IV.

CLUSTERS AND NEBULÆ.

Arranged in three classes.—Five kinds of Nebulæ.—The Pleiades.—The Hyades.—Mentioned by Homer.—Præsepe.—Opinion of Aratus and Theophrastus.—Coma Berenices.—List of Clusters.—Annular Nebulæ.—Elliptic Nebulæ.—Spiral Nebulæ.—Planetary Nebulæ.—Nebulous Stars.—List of irregular Clusters.—Notes to the objects in the list.—The Nubeculæ major and minor.—List of Nebulæ in Sir J. Herschel's Catalogue of 1864.—*Historical statement relating to the observation of Nebulæ and Clusters.*

IF we examine the heavens on a clear evening when the Moon is not shining, we shall find here and there groups of stars which seem to be compressed together in such a manner as to present to the naked eye or under inadequate optical power a hazy cloud-like appearance; these are termed *clusters* and *nebulæ*, and may be conveniently classed as follows:—

1. Irregular groups, visible more or less to the naked eye.
2. Clusters resolvable into separate stars with the aid of a telescope.
3. Nebulæ, for the most part irresolvable with the telescopes which we at present possess.

The objects forming the 3rd class may in their turn be subdivided into—

i. Annular nebulæ.
ii. Elliptic nebulæ.
iii. Spiral nebulæ.
iv. Planetary nebulæ.
v. Nebulous stars.

Of the 1st class there are several examples to be found, with all of which the reader is probably more or less familiar. The cluster of the *Pleiades*, in Taurus, is doubtless the best known [a]. When examined *directly* few persons can see more than 6 stars, but by turning the eye *sideways*, more may be seen. Thus, Miss Airy has noted 12, and Möstlin, according to Kepler, 14. Between 50 and 60 stars, to say the least of it, are visible in a telescope. The following are some of the different estimations:—

Kepler	32	Hooke	78
La Hire	64	De Rheita	118

Fig. 27.

THE PLEIADES, IN TAURUS. NAKED-EYE VIEW. (*Miss Airy.*)

These totals have been greatly exceeded by subsequent observers, and indeed photography has registered fully 1400 stars in the Pleiades.

The most brilliant star in the group is *Alcyone*, or η Tauri, of the 3^{rd} magnitude; next in order come *Electra* and *Atlas*, of the 4^{th}; *Maia* and *Taygeta*, of the 5^{th}; *Pleione* and *Celeno*, which are

[a] The Pleiades and Hyades are among the few stars mentioned by Homer. (*Odyssey*, lib. v. ver. 270.) The engraving by Jeaurat is taken from *Hist. de l'Acad. Royale des Sciences*, 1779, p. 505; published in 1782. A good lithograph by Tempel will be found in *Month. Not.*, vol. xl. p. 622, 1880.

between the 6th and 7th; *Asterope*, between the 7th and 8th; and finally, a great number of smaller stars.

Fig. 28.

S

N

THE PLEIADES, IN TAURUS. TELESCOPIC VIEW. (*Jeaurat.*)

Fig. 29.

THE HYADES, IN TAURUS.

The *Hyades* is another loose group in Taurus, near Aldebaran, and somewhat similar in character is the cluster near λ Orionis, neither of them of much account as telescopic objects, the stars being too scattered to make a good field.

Præsepe, or the "Bee-hive," in Cancer, is one of the finest objects of this kind for a small telescope; it is an aggregation of little stars, which has long borne the name of a nebula, its components not being visible to the naked eye; indeed, before the invention of the telescope, it must have been almost the only

Fig. 30.

PRÆSEPE, IN CANCER.

recognised one. Aratus[b] and Theophrastus[c] tell us that its becoming dim and ultimately disappearing was regarded as an indication of rain.

The group forming the constellation *Coma Berenices* has fewer stars, but they are of larger size and more diffused. As Webb well remarks, "This is a gathering of small stars, which obviously at a sufficient distance would become a nebula to the naked eye."

[b] *Diosemeia*, ver. 160. See Lamb's translation, p. 70, where the passage is very prettily rendered into English verse.

[c] *De Signis Pluviarum*, p. 419. Heinsius's ed., Lugd. Batavor.

In reference to globular clusters and the hypothesis that they are formed of stars evenly distributed in space, Guillemin remarks: "But the increase of brightness from the border to the centre is often more rapid than the hypothesis of an equal distribution of the stars in the interior will sanction. It has been held therefore that besides the apparent or purely optical condensation, there exists a real condensation, which is produced doubtless by the influence of the central forces, resulting from the separate attractions of each of the suns which compose these systems[d]."

The following objects will serve as representatives of the 2^{nd} class[e]:—

No.	Name.	Dreyer.	H.'s Cat. of 1864.	R.A. 1890.			Decl. 1890.	
				h.	m.	s.	°	′
1	31 H VI Cassiopeiæ ..	663	392	1	38	39	+60	41·3
2	33 H VI Persei	869	512	2	11	20	+56	38·5
3	35 Geminorum	2168	1360	6	2	4	+24	21·2
4	3 M Canum Venat...	5272	3636	13	37	3	+28	55·3
5	5 M Libræ	5904	4083	15	12	57	+ 2	30·1
6	80 M Scorpii	6093	4173	16	10	26	−22	43·2
7	13 M Herculis	6205	4230	16	37	45	+36	39·9
8	92 M Herculis	6341	4294	17	13	46	+43	15·1
9	22 M Sagittarii	6656	4424	18	29	28	−23	59·4
10	11 M Antinoï	6705	4437	18	45	13	− 6	24·1
11	15 M Pegasi	7078	4670	21	24	38	+11	40·3
12	2 M Aquarii	7089	4678	21	27	44	− 1	19·1

No. 1 is a somewhat conspicuous object, that is to say, it is readily visible with a telescope of 2^{in} aperture.

No. 2 lies in immediate proximity to 34 H VI Persei, and the two objects are frequently taken together and spoken of as "the cluster in the sword-handle of Perseus." These two clusters have been well termed by Webb "gorgeous," and by Smyth were

[d] *The Heavens*, Eng. ed., p. 377.

[e] Most of the clusters and nebulæ engraved in this chapter but not separately mentioned will be found alluded to in the Catalogue of Celestial Objects in Chapter X (*post*).

described as "affording together one of the most brilliant telescopic objects in the heavens."

No. 4 (3 M Canum Venaticorum) was described by Smyth as "a brilliant and beautiful globular congregation of not less than 1000 small stars." There is a sensible concentration of stars near the centre of the cluster.

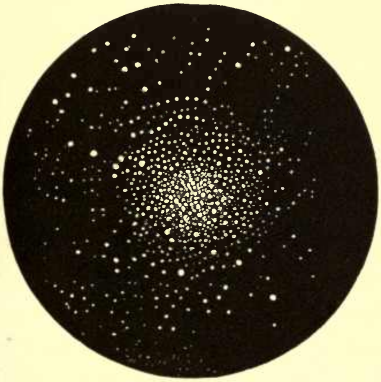
Fig. 31.

3 M CANUM VENATICORUM.
(*Smyth*)

No. 5 (5 M Libræ), in the words of Webb, is a "beautiful assemblage of minute stars greatly compressed in centre." Sir W. Herschel with his 40-ft. reflector made out about 200 stars; Sir J. Herschel notes that the stars range between mags. 11–15.

No. 6 (80 M Scorpii) much resembles a telescopic comet. Sir W. Herschel called it the richest and most condensed mass of stars in the firmament. Near its centre, or, as Webb suggested,

Fig. 32.



5 M LIBRÆ.
(*Sir J. Herschel.*)

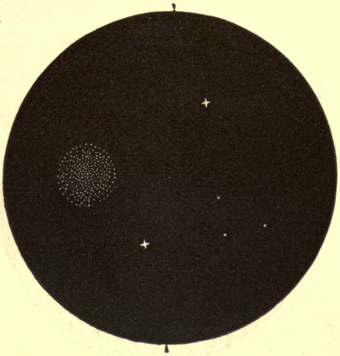
Fig. 33.

13 M HERCULIS.
(*Sir J. Herschel.*)

"between it and us," is a remarkable variable star, particulars of the sudden apparition of which in 1860 will be found elsewhere (see Chap. V., *post*).

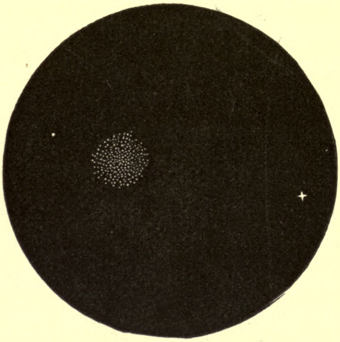
No. 7 (13 M Herculis) is commonly regarded as the finest of the globular clusters. Smyth called it "an extensive and magnificent mass of stars, with the most compressed part densely

Fig. 34.



80 M SCORPII.
(*Smyth.*)

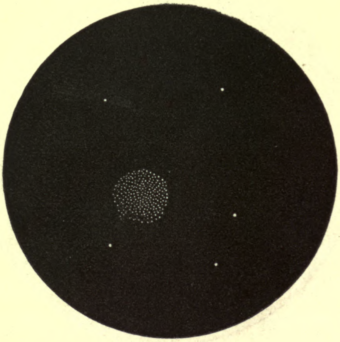
Fig. 35.



92 M HERCULIS.
(*Smyth.*)

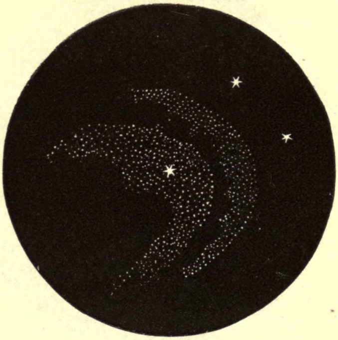
compacted and wedged together under unknown laws of aggregation,"—a very good description. Sir J. Herschel spoke of thousands of stars and "hairy-looking curvilinear branches,"

Fig. 36.



22 M SAGITTARII.
(*Smyth.*)

Fig. 37.



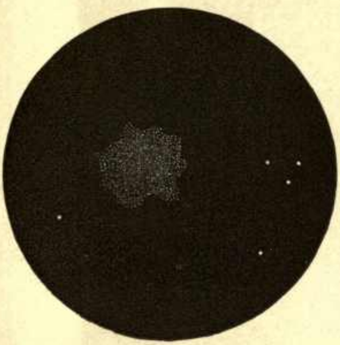
11 M ANTINOÏ.
(*Smyth.*)

which features the Earl of Rosse interpreted as indicative of a spiral tendency; he also perceived several dark rifts in the interior of the cluster. In 1887 Harrington at Ann Arbor was able to see Rosse's rifts not only with a 12-inch but with a 6-inch refractor [f]. Huggins finds the spectrum to be continuous. This cluster was discovered by Halley in 1714, and is visible in *one sense* with any telescope, however small.

No. 8 (92 M Herculis) is a fine globular cluster, inferior however to the preceding. It has a marked central condensation, and exhibits a continuous spectrum.

No. 9 (22 M Sagittarii) is a fine globular cluster, so situated that in England it is rarely possible to do justice to it. Webb remarked that this object is "interesting from the visibility of the components (the largest, 10 and 11 mags.), which makes it

Fig. 38.



15 M PEGASI. (*Smyth.*)

Fig. 39.

2 M AQUARII. (*Sir J. Herschel.*)

a valuable object for common telescopes, and a clue to the structure of more distant or difficult nebulæ."

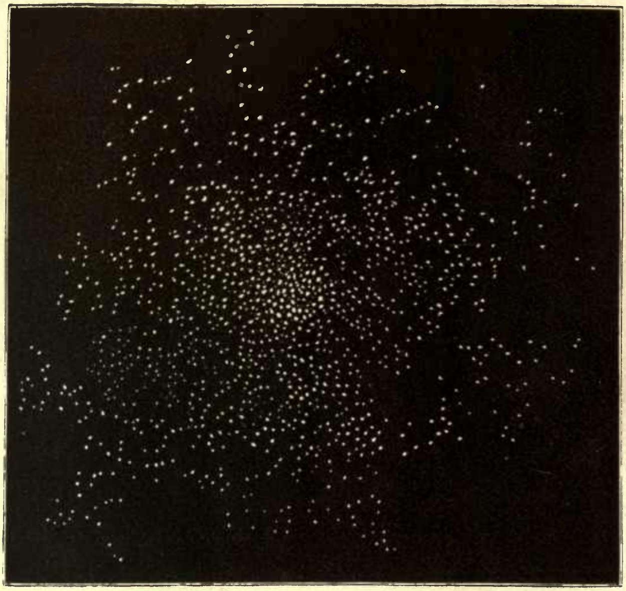
No. 10 (11 M Antinoï) is an interesting cluster of uncommon form. Smyth likened it to a flight of wild ducks—a simile more appropriate than many of those met with in astronomical writings, which it may be fairly said often abound in wordy exaggerations. Three stars of mag. 8 help to enhance the beauty of the field.

No. 11 (15 M Pegasi) is a moderately bright and resolvable cluster. Large apertures are required to make it worthy of much attention.

[f] *Ast. Journ.*, vol. vii. p. 157. Dec. 14, 1887.

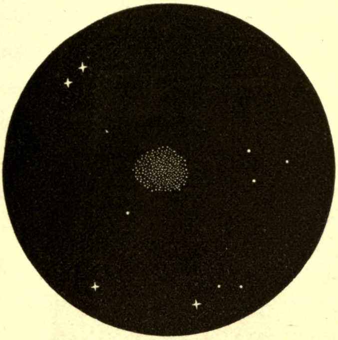
No. 12 (2 M Aquarii) is with small telescopes a round nebula exhibiting, in Webb's words, "a granulated appearance, the precursor of resolution." The truth of this remark will become more manifest if we compare Lord Rosse's figure with Sir J. Herschel's. Sir John compared this object to a heap of fine sand, and considers it to be composed of thousands of 15-mag. stars, a statement which is probably a little over-drawn.

Fig. 40.

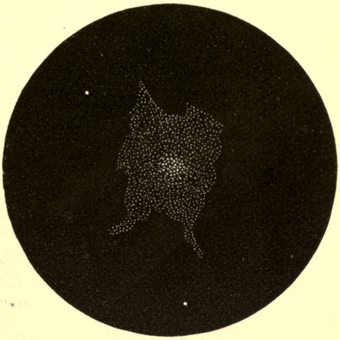


2 M AQUARII. (*Earl of Rosse.*)

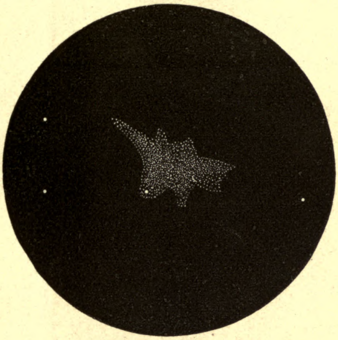
I now pass on to another order of objects which present themselves much less clearly to our eyes than the brilliant clusters enumerated above—the *nebulæ* properly so called. Some of them are resolvable in large telescopes, but the greater number defy the utmost efforts made to separate them into component stars, though probably most of them are stellar. They are usually faint misty objects, many of them not unlike comets or specks of luminous fog. It has been found convenient to subdivide them into five classes, which I shall now proceed to consider briefly.



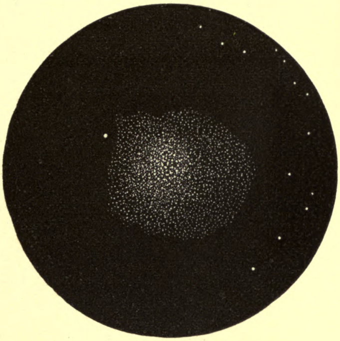
14 M OPHIUCHI.



30 M CAPRICORNI.

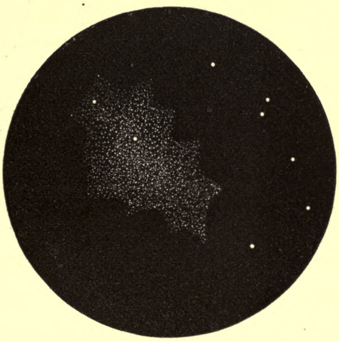


52 M CEPHEI.



56 M LYRÆ.

64 M COMÆ BERENICIS.



67 M CANCRI.

RESOLVABLE CLUSTERS.

(*Drawn by Smyth.*)

Of annular nebulæ the heavens afford only four examples. The most remarkable one occurs in Lyra, R.A. $18^h\ 49^m\ 28^s$, Decl. $+32°53{\cdot}6'$ (Messier's 57th: D 6720). It is situated about midway between the stars β and γ, and may be seen with a telescope of moderate power, a statement which can be made of no other annular nebula[g]. Sir J. Herschel, in his description of it, said: "It is small and particularly well defined, so as to have more the appearance of a flat oval solid ring than of a nebula. The axes of the ellipse are to each other in the proportion of about 4 to 5, and the opening occupies about half, or rather more than half, the diameter. The central vacuity is not quite dark, but is filled in with faint nebula like a gauze stretched over a hoop.

Fig. 47.

(*Sir J. Herschel.*)

Fig. 48.

(*Earl of Rosse.*)

THE ANNULAR NEBULA 57 M LYRÆ.

The powerful telescopes of Lord Rosse resolve this object into excessively minute stars, and show filaments of stars adhering to its edges[h]." Chacornac also, with a 2½-ft. reflector by Foucault, resolved this nebula into stars. Yet, in contradiction to these circumstantial details, Huggins claims that his spectroscope shows the whole to be gaseous—probably nitrogen.

The most recent account of this nebula is due to Holden. Using the great Lick Telescope he says:—" One's first idea is not so much that the aspect is unfamiliar, as that it is distinctly

[g] As the nebula appeared to me on Sept. 23, 1864, in an 8½-in. refractor, the difference between the luminosity of the central and marginal portions of the nebula was by no means considerable.

[h] *Outlines of Ast.*, p. 644. The last sentence of this extract seems not to be accurate.

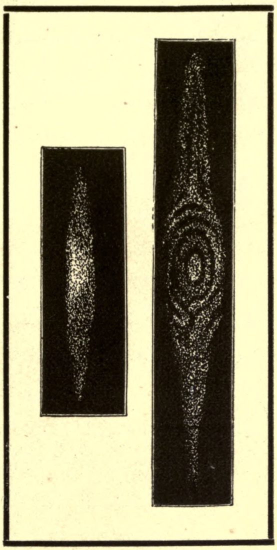
different, that its simple structure has suddenly become complex, and finally that the task of depicting it completely is practically impossible by the ordinary methods. . . . The N. end of the minor axis is much the best terminated. From the whole S. edge faint filaments of nebulosity radiate out. . . . The preceding

Fig. 49.

THE GREAT NEBULA IN ANDROMEDA.
(*G. P. Bond.*)

edge of the major axis is the best terminated. There are several bright patches in the nebulosity, especially at the end of the minor axis. . . . Neither the outer nor the inner boundary curves of the nebula are smooth ovals. Inside the ring it is at once seen that the space on the S. and preceding side is darker than the rest[1]."

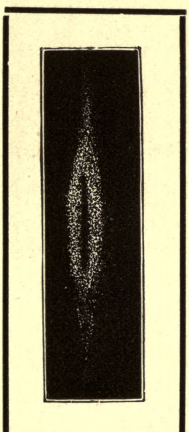
[1] *Month. Not.*, vol. xlviii. p. 385. 1888.



(*Sir J. Herschel.*) (*Earl of Rosse.*)

NEBULA, 65 M LEONIS.

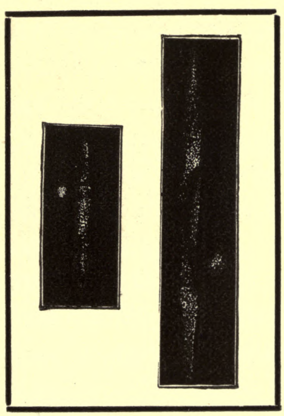
R.A. $11^h\ 12^m\ 40^s$, Decl. $+13^\circ\ 45{\cdot}0'$.



NEBULA, 4058 H DRACONIS.

R.A. $15^h\ 3^m\ 24^s$, Decl. $+56^\circ\ 11{\cdot}4'$.

(*Earl of Rosse.*)



(*Sir J. Herschel.*) (*Earl of Rosse.*)

NEBULA, 42 H V. COMÆ BERENICES.

R.A. $12^h\ 36^m\ 50^s$, Decl. $+33^\circ\ 8{\cdot}8'$.

VARIOUS NEBULÆ.

Other annular nebulæ will be found as follows:—

No.	Name.	Dreyer.	H.'s Cat. of 1864.	R.A. 1890.			Decl. 1890.	
				h.	m.	s.	°	′
1	4290 H Scorpii	6337	4290	17	14	43	−38	22·0
2	11 H IV Scorpii ...	6369	4302	17	22	39	−23	39·4
3	13 H IV Cygni ...	6894	4565	20	11	57	+30	8·7

Elliptic nebulæ of various degrees of eccentricity are not uncommon; the well-known "Great Nebula in Andromeda," R.A. $0^h\ 36^m\ 47^s$, Decl. $+40°\ 40{\cdot}1'$ (Messier's 31st: D 224), is an object of this kind. Its ellipticity is considerable; it is likewise very long, and has a bright central condensation sufficient to make it visible to the naked eye. A drawing by G. P. Bond portrays this nebula under an aspect differing much from that which it is commonly recognised as possessing. That observer traced it to a length of 4° and to a breadth of $2\frac{1}{2}°$, and was the first to draw attention to the two curious black streaks, or longitudinal vacuities, which run nearly parallel to the major axis of the oval on the South side. Telescopes of large size are required to show these and other details mentioned by the American observer in question[k]. No telescope has yet resolved this object, though several hundred stars (shown in the annexed engraving), have been counted within its limits. Huggins has noticed its spectrum to be continuous (though cut off at the red end), and therefore whatever it is, seemingly it is *not* gaseous. Mr. I. Roberts has recently obtained photographs of this object which seem to combine the features exhibited by Sir J. Herschel in the engraving appended to his *Outlines of Astronomy* with the rifts recorded by Bond.

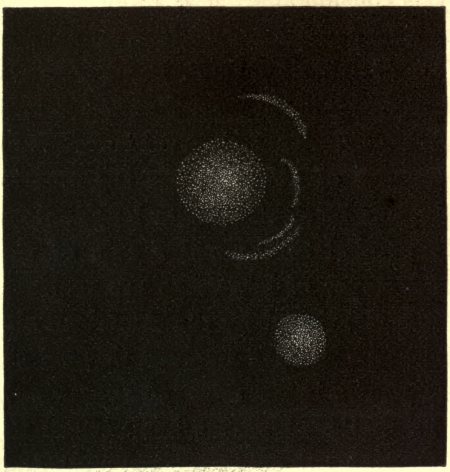
Several elliptic nebulæ are remarkable as having double stars at or near each of their foci: the nebula 4395 H Clypei Sobieskii, situated in R.A. $18^h\ 10^m\ 34^s$, and Decl. $-18°\ 54{\cdot}8'$, is an example.

[k] *Mem. Amer. Acad.*, New Ser., vol. iii. p. 80. 1848.

Other elliptic nebulæ will be found as follows:—

No.	Name.	Dreyer.	H.'s Cat. of 1864.	R.A. 1890.			Decl. 1890.	
				h.	m.	s.	°	′
1	1 ♅ V Ceti	253	138	0	42	13	−25	53·7
2	3706 H Centauri ...	5367	3706	13	51	8	−39	26·6
3	4419 H Draconis ...	6648	4419	18	25	12	+64	53·2

Fig. 55.



THE SPIRAL NEBULA 51 M CANUM VENATICORUM.
(*Smyth.*)

The discovery of *spiral* or *whirlpool* nebulæ is due to the late Earl of Rosse. The best known is in the constellation Canes Venatici, R.A. $13^h\ 25^m\ 13^s$, Decl. $+47° 45{\cdot}2'$ (Messier's 51^{st}: D 5194). To Sir J. Herschel it presented the appearance of a large and bright globular cluster, surrounded by a ring at a considerable distance from the globe, which varied very much in brightness in its different parts, and through about two-fifths of its circumference was subdivided as if into 2 laminæ, one of which appeared turned up towards the eye out of the plane of the rest. Near it (at about a radius of the ring distant) is a "small bright round nebula[1]." In Lord Rosse's telescope the aspect of this object is entirely altered. The ring passes into a distinct spiral coil of nebulous matter, and the outlying portion is seen to be connected with the main mass by a curved band, the whole showing indications of resolvability into

[1] *Outlines of Ast.*, p. 649.

stars. A small telescope utterly fails to grasp any of these features. All it can do is to exhibit a misty spot of light. Huggins finds the spectrum to be non-gaseous [m].

Fig. 56.

THE SPIRAL NEBULA 51 M CANUM VENATICORUM.
(*Sir J. Herschel.*)

Other spiral nebulæ will be found as follows:—

No.	Name.	Dreyer.	H.'s Cat. of 1864.	R.A. 1890. h.	m.	s.	Decl. 1890. °	'
1	33 M Trianguli	598	352	1	27	38	+30	6·8
2	57 H I. Leonis	2905	1863	9	25	57	+21	59·1
3	99 M Virginis	4254	2838	12	13	13	+15	6·9
4	55 H I. Pegasi [n]... ...	7479	4892	22	59	27	+11	43·9

[m] For other drawings of this see *Mem. R.A.S.* vol. xxxvi. Pl. VI. Fig. 27 [not 27a] (Lassell); *Scientific Trans. Roy. Dub. Soc.*, New Ser., vol. ii. Pl. IV. (Rosse). All these are said by Dreyer to be much better than the one given here.

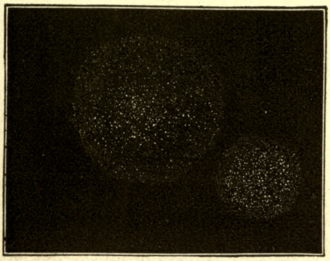
[n] The spiral (or annular) mass of nebula engraved in Fig. 62 *post* has been made by the engraver far too definite and bright.

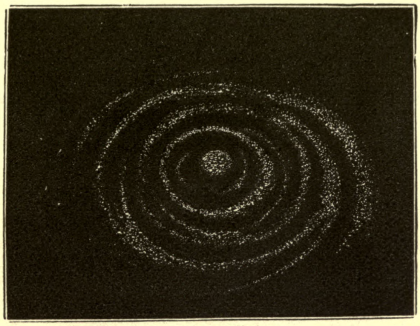
Planetary nebulæ received their name from Sir W. Herschel on account of their resembling in form the larger planets of our system. They are either circular or slightly elliptical; some have

Fig. 57.

THE SPIRAL NEBULA 51 M CANUM VENATICORUM.
(*Earl of Rosse.*)

well-defined outlines; in others the edges appear hazy; they are throughout uniformly bright, without any traces of nuclei. One of the most striking of this class is 97 M [D 3587] Ursæ Majoris, R.A. $11^h\ 8^m\ 19^s$, Decl. $+55°\ 36{\cdot}7'$, close to the star β of that con-



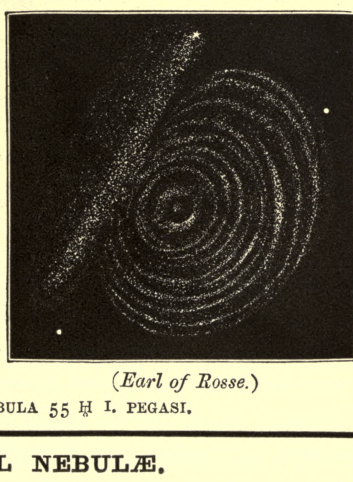


(*Sir J. Herschel.*) (*Earl of Rosse.*)

THE SPIRAL NEBULA 57 H I. LEONIS.

THE SPIRAL NEBULA 99 M VIRGINIS.

(*Earl of Rosse.*)



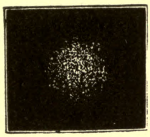
(*Sir J. Herschel.*) (*Earl of Rosse.*)

THE SPIRAL NEBULA 55 H I. PEGASI.

SPIRAL NEBULÆ.

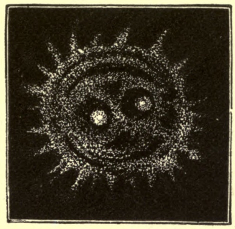
stellation, that is to say, 2° *sf*. It was discovered by Méchain in 1781, and is described as "a very singular object, circular and uniform, and after a long inspection looks like a condensed mass of attenuated light." Sir J. Herschel gave it a diameter of 2′ 40″

Fig. 63.



(*Sir J. Herschel.*)

Fig. 64.



(*Earl of Rosse*).

PLANETARY NEBULA, 97 M URSÆ MAJORIS.

The late Earl of Rosse detected perforations and a spiral tendency in it. To Huggins it yields a gaseous spectrum.

Other planetary nebulæ will be found as follows :—

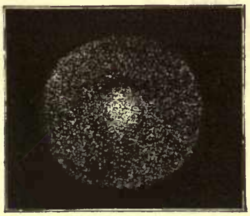
No.	Name.	Dreyer.	H.'s Cat. of 1864.	R.A. 1890. h.	m.	s.	Decl. 1890. °	′
1	26 ℍ IV. Eridani...	1535	826	4	9	10	−13	1·3
2	39 ℍ IV. Argûs ...	2438	1565	7	36	49	−14	29·1
3	1843 H Argûs (Car.)...	2867	1843	9	18	18	−57	50·6
4	27 ℍ IV. Hydræ ...	3242	2102	10	19	25	−18	5·1
5	2581 H Centauri ...	3918	2581	11	44	51	−56	34·1
6	297 ℍ II. Virginis ...	5247	3614	13	32	7	−17	19·3
7	4234 H Herculis ...	6210	4234	16	39	51	+24	0·0
8	50 ℍ IV. Herculis	6229	4244	16	43	56	+47	48·0
9	37 ℍ IV. Draconis	6543	4373	17	58	35	+66	38·0
10	743 ℍ III. Aquilæ...	6781	4487	19	13	5	+ 6	14·0
11	51 ℍ IV. Sagittarii	6818	4510	19	37	45	−14	24·8
12	73 ℍ IV. Cygni ...	6826	4514	19	41	56	+50	14·7
13	1 ℍ IV. Aquarii...	7009	4628	20	58	10	−11	47·7
14	18 ℍ IV. Androm.	7662	4964	23	20	35	+41	55·5

No. 1 was described by Lassell as the most interesting and extraordinary object which he had ever seen: an 11th-mag. star standing in the centre of a circular nebula, itself placed centrally upon a larger and fainter circle of hazy light. To Huggins it yields a non-gaseous spectrum, though deficient at the red end.

No. 2 is a faint object near 46 M Argûs, which Lassell and the late Earl of Rosse found to be annular rather than strictly "planetary."

No. 4 was described by Smyth as resembling Jupiter. Secchi's large refractor at Rome entirely altered the features of this object as seen with less powerful instruments. Spectrum, gaseous.

Fig. 65.



PLANETARY NEBULA, 297 H II. VIRGINIS. R.A. $13^h\ 32^m\ 7^s$, Decl. $-17°\ 19{\cdot}3'$. (*Sir J. Herschel.*)

No. 9 is large and bright of its class, according to Webb, and "much like a considerable star out of focus." Spectrum, gaseous. So found in 1864 by Huggins, and the first of his discoveries in this field. Some interesting conclusions have been arrived at by Holden, using the great Lick telescope. He says:—"It bears magnifying well, losing only its characteristic and remarkable ['light blue'] colour with the higher powers. The nebula is apparently composed of rings overlying each other, and it is difficult to resist the conviction that these are arranged in Space in the form of a true helix. Holden consequently proposes to term this a 'Helical Nebula[o]' the first of its class."

No. 11 has been found by Huggins to exhibit a gaseous spectrum.

No. 13 is a somewhat oval and fairly bright nebula. As in so many other like instances, the "planetary" features disappear in very large telescopes. It yields a gaseous spectrum Holden describes this as a "truly wonderful object. . . . The colour is pale blue. . . . The central oval is not bounded by a smooth curve. It looks like an elastic link which has been warped, so that the preceding one-quarter appears beyond the median plane (further away from the eye); the central one-half appears

[o] *Month. Not.*, vol. xlviii. p. 388, 1888.

on the hither side of the median plane (nearer the eye); and the following one-quarter, again, appears to be beyond the median plane. . . . The central ring lies upon an oval of much fainter nebulosity. This outer nebulosity is fairly uniform in brightness, except that there is a defalcation of light at its S. preceding edge, and one at its N. following edge. The latter is very remarkable as seen. A dark band lies just N. of the bright central ring, and one not quite so dark lies just S. of the same ring. The two satellites preceding and following nearly in the major axis of the nebula appear to be faintly connected with the main nebula[p]."

No. 14 is a small but bright object. Lassell noticed it to comprise a nucleus and 2 oval rings, out of which the late Earl of Rosse evolved a spiral structure. Huggins obtains a spectrum of 4 gaseous lines, the form of the nebula being annular.

Some peculiarities may be mentioned as connected with planetary nebulæ: three-fourths of those known are situated in the Southern hemisphere; they are mostly gaseous (if spectroscopy is to be relied on), and several are noticeably of a blue tinge. Among other peculiarities which characterise gaseous nebulæ it may be mentioned that they are nearly all in or close to the Milky Way. D'Arrest remarked in 1872, that of 12 undoubtedly gaseous nebulæ in the Northern hemisphere 10 are inside and only 2 outside the Milky Way as seen with the naked eye. In the Southern hemisphere, out of 20 nebulæ there are 15 inside and 5 outside the Milky Way; and of the 5 outsiders one is very close to it.

Nebulous stars are so called because they are surrounded by a faint nebulosity, usually of a circular form, and sometimes several minutes in diameter. Hind remarks that the nebulosity is, in some cases, well defined, but in other cases quite the reverse. He also says that "the stars thus attended have nothing in their appearance to distinguish them from others entirely destitute of such appendages; nor does the nebulous matter in which they are situated offer the slightest indications of resolvability into

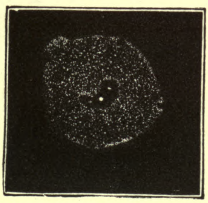
[p] *Month. Not.*, vol. xlviii. p. 391. 1888.

stars with any telescopes hitherto constructed." The following stars are instances of this kind:—

No.	Name.	Dreyer.	H.'s Cat. of 1864.	R.A. 1890.			Decl. 1890.	
				h.	m.	s.	°	′
1	ι Orionis	1980	1183	5	30	3	− 5	59·0
2	ε Orionis	1990	1193	5	30	38	− 1	16·4
3	45 H IV. Geminorum	2393	1532	7	22	41	+ 21	8·1

No. 1 is a triple star, A $3\frac{1}{2}$, B 8, and C 11, dist. 11·5″ and 49″, the whole being involved in a large nebulous *ring* 3′ in diameter.

Fig. 66.

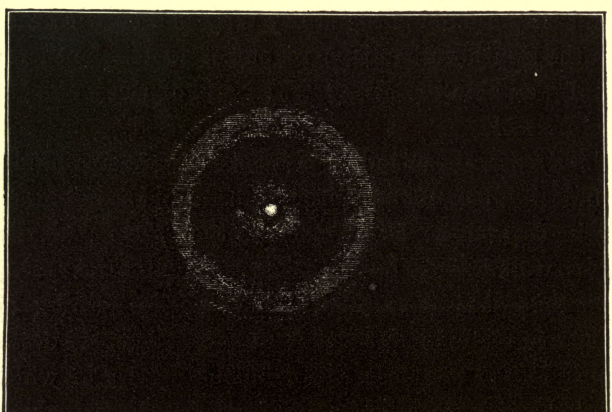


NEBULOUS STAR, ι ORIONIS.
(*Earl of Rosse.*)

No. 2 is a $2\frac{1}{2}$-mag. star, said to have been seen "involved in an immense nebulous atmosphere," but later observations by more than one observer throw doubts on the accuracy of this statement.

No. 3 is an 8th-mag. star, which, according to Sir J. Herschel, lies "exactly in the centre of an exactly round bright atmosphere 25″ in diameter."

Fig. 67.



NEBULOUS STAR, 45 H IV. GEMINORUM. (*Rev. H. C. Key.*)

The Rev. H. C. Key [q], who paid special attention to this object, described it as "a bright but somewhat nebulous star closely surrounded by a dark ring; this again by a luminous ring; then an interval much less luminous, and, finally, at some distance an exterior luminous ring,"—a description which accords well with the late Earl of Rosse's, derived from his much more powerful telescope.

Only with large telescopes can nebulous stars be scrutinised with any satisfactory result.

Besides the clusters and nebulæ belonging to the foregoing classes, there are others for the most part of irregular form and large dimensions, which it is convenient to class by themselves. Under this head may be included the following:—

No.	Name.	Dreyer.	H.'s Cat. of 1864.	R.A. 1890.			Decl. 1890.	
				h.	m.	s.	°	′
1	47 Toucani	104	52	0	19	9	−72	41·6
2	1 M Tauri	1952	1157	5	27	51	+21	56·6
3	42 M Orionis	1976	1179	5	29	52	−5	27·7
4	30 Doradûs	2070	1269	5	39	29	−69	9·4
5	η Argûs	3372	2197	10	40	47	−59	6·5
6	κ Crucis	4755	3275	12	47	7	−59	45·2
7	ω Centauri	5139	3531	13	20	10	−46	44·3
8	20 M Sagittarii	6514	4355	17	55	41	−23	1·8
9	8 M Sagittarii	6523	4361	17	57	8	−24	22·6
10	17 M Scuti Sobieskii	6618	4403	18	14	16	−16	14·9
11	27 M Vulpeculæ... ...	6853	4532	19	54	48	+22	25·0
12	4618 H Cygni	6995	4618	20	52	34	+30	33·9

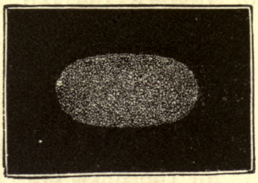
The remarks which follow in inverted commas are nearly all by Sir John Herschel, though an actual reference to that effect is not in every case given.

No. 1 (47 Toucani) was described by Sir J. Herschel as "a superb globular cluster, immediately preceding the *Nubecula Minor;* it is very visible to the naked eye, and one of the finest objects

[q] *Month. Not.*, vol. xxviii. p. 154. March 1868.

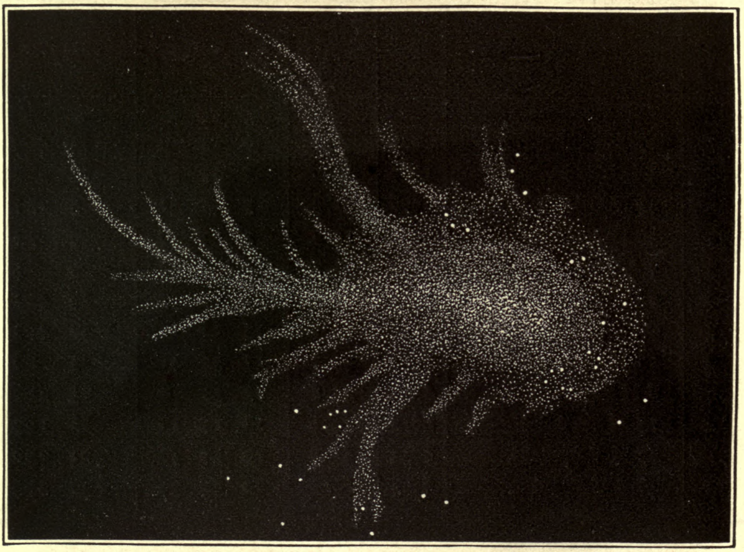
in the heavens. It consists of a very condensed spherical mass of stars, of a pale rose colour, concentrically enclosed in a much less condensed globe of white ones 15′ or 20′ in diameter." In his account of this cluster Sir John remarked that he could not

Fig. 68.



(*Sir J. Herschel.*)

Fig. 69

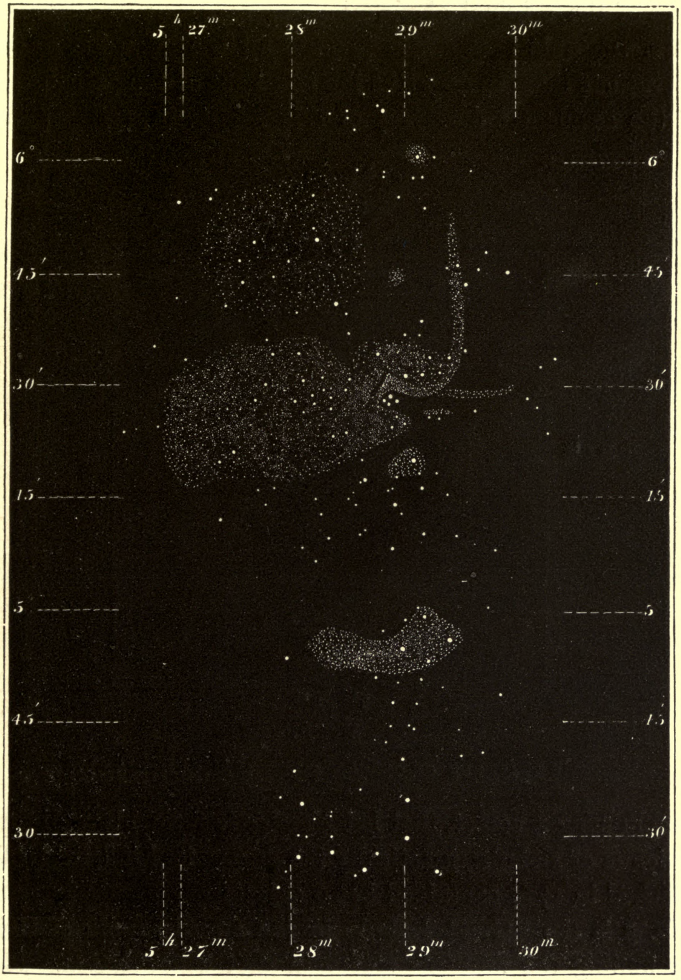


(*Earl of Rosse.*)

THE "CRAB" NEBULA IN TAURUS.

remember a single elliptical nebula which is resolvable, all the resolvable clusters being more or less circular in their outlines. "Between these 2 characters then (ellipticity of form and difficulty of resolution) there undoubtedly exists some physical connexion... It deserves also to be noticed that in very elliptic nebulæ which have a spherical centre (as in 65 M), a resolvable or mottled character often distinguishes the central portion, while the branches exhibit nothing of the kind[r]."

Fig. 70.



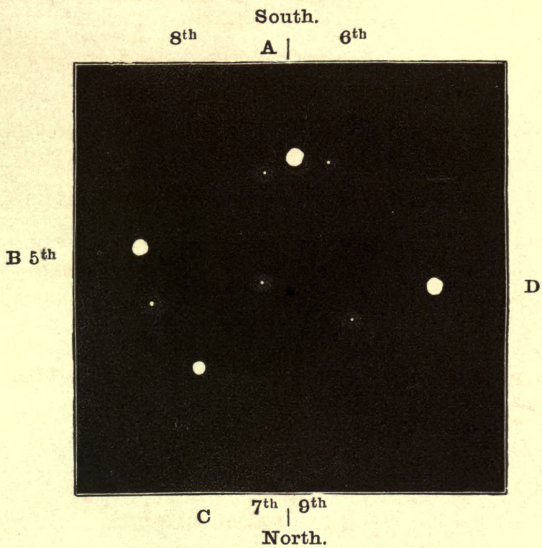
THE GREAT NEBULA IN ORION. (*Tempel.*)

No. 2 is frequently called the "Crab Nebula in Taurus." It has an elliptic outline in most instruments, but in Lord Rosse's

[r] *Results of Ast. Obs.*, p. 19. An exception to this rule is 1 M Tauri.

reflector "it is transformed into a closely-crowded cluster, with branches, streaming off from the oval boundary, like claws, so as to give it an appearance that in a measure justifies the name by which it is distinguished." This is Sir J. Herschel's paraphrase of the original observations of 1844, but by all accounts it is a veritable paraphrase because all the later Parsonstown observations seem to negative the existence of the "claws[s]." It was the accidental discovery of this nebula in 1758, when he

Fig. 71.



THE TRAPEZIUM OF ORION, January 1866. (*Huggins.*)

was following a comet, that led Messier to form his well-known Catalogue of Nebulæ, practically the first of its kind, for Halley's published in 1715 contained but 6 objects.

No. 3 is the "Great Nebula in the sword-handle of Orion," surrounding the multiple star θ in that constellation. It was mentioned by Cysatus of Lucerne as known to him in 1618, though often spoken of as discovered by Huyghens about the year 1656. "In its more prominent details may be traced some

[s] See *Trans. Roy. Dub. Soc.*, New Ser., vol. ii. p. 47.

slight resemblance to the wing of a bird. In the brightest portion are 4 conspicuous stars forming a trapezium. The nebulosity in the immediate vicinity of these stars is flocculent, and of a greenish white tinge; about half a degree northward of the trapezium are 2 stars involved in a bright branching nebula of singular form, and southward is the star ι Orionis, also situated in a nebula. Careful examination with powerful telescopes has traced out a continuity of nebulous light between the great nebula and both these objects, and there can be but little doubt that the nebulous region extends northwards as far as ϵ in the belt of Orion, which is involved in a strong nebulosity, as well as several smaller stars in the immediate neighbourhood." Secchi, in fact, says that the nebulous mass in Orion has, speaking roughly, a triangular outline with a base of about 4°, and a height of about $5\frac{1}{2}$°, reaching downwards from ζ, the apex (with a break, however, at σ), almost as far as υ[t]. The "Trapezium" of stars in this nebula deserves a few additional words on its own account. Four stars were long known. In 1826 W. Struve found a 5th, and four years later Sir J. Herschel a 6th. Since then other stars have been seen with more or less certainty, and Huggins puts up the total number to 9, as in the engraving on p. 86. Numerous observations[u] by different astronomers, at different dates, and with instruments of widely different size and character, are only explicable on the supposition that most of the smaller stars of the Trapezium are variable. The 4 brightest stars are respectively of mags. 6, 7, $7\frac{1}{2}$, and 8. All the rest are much smaller. Much controversy has taken place respecting the existence of stars in the Trapezium beyond the familiar 6, and Burnham and other American observers have plainly asserted that no more than 6 exist which can be seen in any telescope smaller than

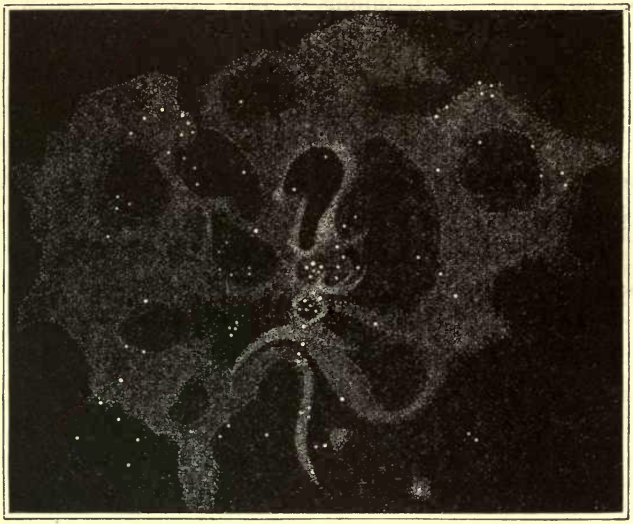
[t] See Struve, *Month. Not.*, vol. xvii. pp. 225–30, June 1857; W. C. Bond, *Mem. Amer. Acad.*, vol. iii. New Series, p. 87; Sir J. Herschel, *Results of Ast. Obs.*, pp. 25–32; *Outlines of Ast.*, p. 650; Secchi, *Month. Not.*, vol. xviii. p. 8, Nov. 1857; G. P. Bond, *ibid.*, vol. xxi. p. 203, May 1861; Liapounov, *ibid.*, vol. xxiii. p. 228, May 1863; *Washington Observations*, 1878, App. I., for various remarks on this nebula.

[u] See for some of these Huggins's paper on the subject in *Month. Not.*, vol. xxvi. p. 71. Jan. 1866.

the Lick 36-inch[1]. The discordant opinions may however be reconcileable on the supposition that all the interior stars are variable.

No. 4 (30 Doradûs) is a singular nebula, faintly visible to the naked eye, situated within the limits of the *Nubecula Major;* it was noticed by La Caille as resembling the nucleus of a comet, and is one of the most singular and extraordinary objects in the heavens.

Fig. 72.



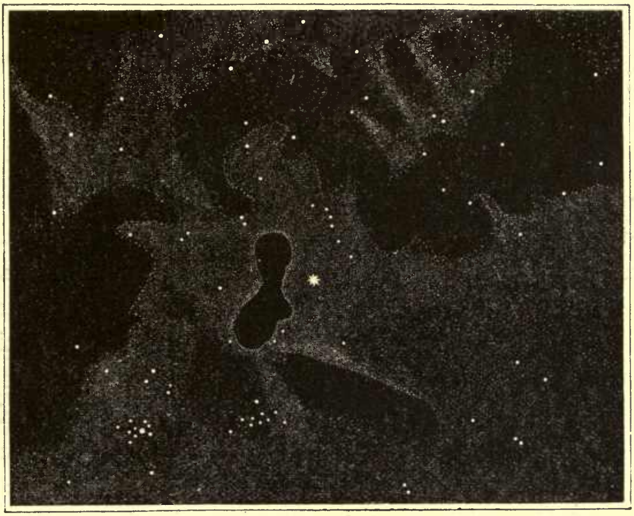
THE NEBULA 30 DORADÛS. (*Sir J. Herschel.*)

No. 5 is a very large nebula surrounding the star η Argûs, and occupying a space equal to about 5 times the area of the Moon. Sir J. Herschel, who carefully examined this object when he was at the Cape of Good Hope in 1833 and following years, said that "viewed with an 18-inch reflector no part of this strange object shows any sign of resolution into stars, nor in the brightest and most condensed portion, adjacent to the singular oval vacancy in the middle of the figure, is there any of that curdled appearance, or that tendency to break up into bright knots with intervening

[1] *Month. Not.*, vol. xlix. p. 352. April 1889.

darker portions, which characterise the nebula of Orion, and indicate its resolvability. . . . . It is not easy for language to convey a full impression of the beauty and sublimity of the spectacle which this nebula offers, as it enters the field of the telescope (fixed in R.A.) by the diurnal motion, ushered in as it is by so glorious and innumerable a procession of stars, to which it forms a sort of climax[y]." Some recent observations on a

Fig. 73.



THE NEBULA SURROUNDING η ARGÛS. (*Sir J. Herschel.*)

point of great importance concerning this nebula will be alluded to hereafter.

No. 6. The cluster surrounding κ Crucis was described by Sir J. Herschel as one of the most beautiful objects of its class: it consists of about 110 stars from the 7th magnitude downwards, 8 of the more conspicuous of them being coloured various shades of red, green, and blue. The accompanying plate is the result of observations made by Mr. H. C. Russell at Sydney, N. S. W., in March and April 1872. The lines on the edges of the en-

[y] Sir J. Herschel, *Outlines of Ast.*, p. 652; see also *Results of Ast. Obs.*, pp. 32–47.

graving represents scales of distance reckoned from the principal star. Mr. Russell remarks that "many of the stars have drifted" since the drawing by Sir J. Herschel was made, and he has seen 25 stars not noted by Herschel, although using a smaller telescope than the Cape one. "The colours of this cluster are very beautiful, and fully justify Herschel's remark that it looks like a 'superb piece of fancy jewellery[z].'"

No. 7 (ω Centauri) is visible to the naked eye, and resembles a tail-less comet: its brilliancy is about equal to that of a 4½-magnitude star, but, "viewed in a powerful telescope, it appears as a globe of fully 20′ in diameter, very gradually increasing in brightness to the centre, and composed of innumerable stars of the 13th and 15th magnitudes[a]."

No. 8 (20 M Sagittarii) is the chief member of an important group of nebulæ. "One of them [1991 h] is singularly trifid, consisting of 3 bright and irregularly formed nebulous masses, graduating away insensibly externally, but coming up to a great intensity of light at their interior edges, where they enclose and surround a sort of three-forked rift or vacant area, abruptly and uncouthly crooked, and quite void of nebulous light. A beautiful triple star is situated precisely on the edge of one of these nebulous masses, just where the interior vacancy forks out into two channels[b]."

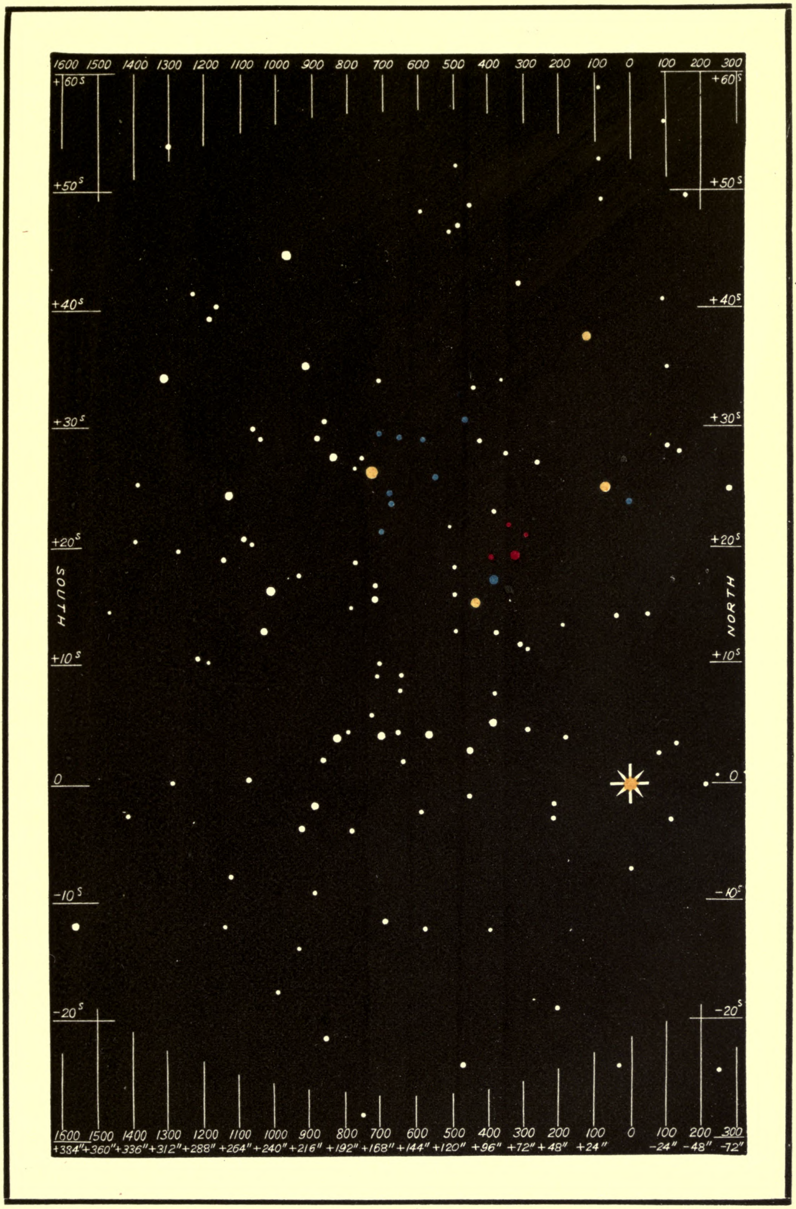
No. 9 (8 M Sagittarii). "A collection of nebulous folds and masses, surrounding and including a number of oval dark vacancies, and in one place coming up to so great a degree of brightness as to offer the appearance of an elongated nucleus. Superposed upon this nebula, and extending in one direction beyond its area, is a fine and rich cluster of scattered stars, which seem to have no connexion with it, as the nebula does not, as in the region of Orion, show any tendency to congregate about the stars[c]." Webb describes this as a "splendid galaxy object visible to naked eye."

[z] *Month. Not.*, vol. xxxiii. p. 66, Dec. 1872.

[a] Sir J. Herschel, *Outlines of Ast.*, p. 637; see also *Results of Ast. Obs.*, p. 21.

[b] Sir J. Herschel, *Outlines of Ast.*, p. 653.

[c] *Outlines of Ast.*, p. 654.



THE CLUSTER NEAR κ CRUCIS.

No. 10 is frequently but not very judiciously termed the "Horse-shoe nebula" from a certain peculiarity in its form: this name, however, can only be applied to the most prominent portion, for there is an important outlier; and when this is seen, and also the bright lens-like band which unites it with the principal mass, the whole object resembles a pair of capital Greek omegas connected at their bases. In ordinary telescopes the outline resembles that of a swan minus its legs! Huggins finds it to be gaseous.

Fig. 75.

THE NEBULA 17 M CLYPEI SOBIESKII.
(*Chambers.*)

Holden has investigated with much care and detail the history of this nebula between 1833 and 1875 as recorded in numerous drawings by Sir J. Herschel, Lamont, Mason, Lassell, Trouvelot and himself. As a final result he concludes that "the drawings, whether taken as a whole, or considered according to their relative importance, show that the 'Horse-shoe' has moved with reference to the stars [in the nebula], while the Messierian streak has not moved; and that, therefore, we have evidences of a change going on in the nebula. This may be a veritable change in the structure of the nebula itself, such as was suspected by Schröter, confirmed by O. Struve, and again confirmed by myself in the nebula of Orion; or it may be the bodily shifting of the whole nebula in space, in some plane inclined to the line of sight[d]."

No. 11 is a curious object near the 5th-magnitude star 14 Vulpeculæ; it is shaped like a double-headed shot, or dumb-bell, and is usually known as the "Dumb-bell" nebula. In a small telescope it appears like two roundish nebulosities, in contact

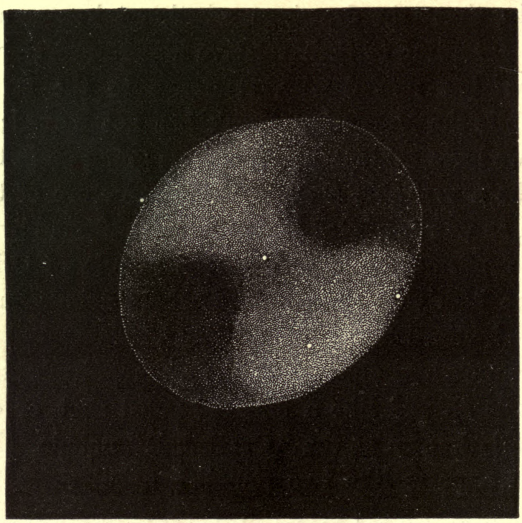
[d] *American Journ. Arts and Sc.*, 3rd Ser., vol. xii. p. 360. June 1876. Swift has given a sketch and some descriptive notes on this nebula which deserve to be looked up by the possessors of large telescopes. (*Sidereal Messenger*, vol. iv. p. 38. March 1885.)

the one with the other, or nearly so. Sir J. Herschel saw it

Fig. 76.

THE "DUMB-BELL" NEBULA IN VULPECULA. (*Smyth.*)

Fig. 77.



THE "DUMB-BELL" NEBULA IN VULPECULA. (*Sir J. Herschel.*)

with "an elliptical outline of faint light enclosing the two chief masses," but Lord Rosse's reflectors materially change the appearance of the object: his 3-ft. reflector destroys the regular elliptic outline seen by Sir J. Herschel, and his 6-ft. instru-

Fig. 78.

THE "DUMB-BELL" NEBULA IN VULPECULA.
(*Earl of Rosse:* 3-ft. Reflector.)

ment makes the general outline to resemble that of a chemical retort, and reveals many stars. The history of the successive stages in the observation of this nebula affords a striking comment on the "Nebular Hypothesis," which was so much under discussion a few years ago.

No. 12 (4618 H Cygni). "A most wonderful phenomenon. A very large space, 20′ or 30′ broad in P.D. and 1^m or 2^m in R.A., full of nebula and stars mixed. The nebula is decidedly attached to the stars, *and is as decidedly not stellar.* It forms irregular lacework marked out by stars, but some parts are decidedly nebulous, wherein no stars can be seen."

In the Southern hemisphere, and not far from the Pole, are the Magellanic clouds, or *Nubeculæ Major* and *Minor*, so called

Fig. 79.

THE "DUMB-BELL" NEBULA IN VULPECULA [e].
(*Earl of Rosse*: 6-ft. Reflector.)

from their cloud-like appearance. The former is situated in the constellation Dorado, and the latter in Toucan. They are of a somewhat oval shape, and are both visible to the naked eye when the Moon is not shining; but the smaller disappears in strong moon-light. Sir J. Herschel, when at the Cape, examined these remarkable objects with his large telescope, and described them as consisting of swarms of stars, clusters, and nebulæ of every description. The larger one covers an area of about 42 square degrees, and the smaller of 10 square degrees.

[e] This illustration (from *Phil. Trans.*, vol. cxl.) is described by Dreyer as "outrageous." On the other hand, he says that the illustration in *Phil. Trans.*, vol. cli. is "very good and agrees well with those of other observers."

The nebulæ are very far from being uniformly distributed in the heavens, but congregate especially in a zone crossing at right angles the Milky Way. They are exceedingly abundant in the constellation Virgo. Sir J. Herschel's Catalogue of 1864 contains 5079 of these objects, which are thus distributed through the different hours of R.A.:—

0 Hour	211 Neb.	XII Hour	686 Neb.
I "	278 "	XIII "	252 "
II "	161 "	XIV "	263 "
III "	163 "	XV "	114 "
IV "	198 "	XVI "	109 "
V "	352 "	XVII "	108 "
VI "	139 "	XVIII "	92 "
VII "	132 "	XIX "	79 "
VIII "	135 "	XX "	90 "
IX "	252 "	XXI "	120 "
X "	294 "	XXII "	142 "
XI "	421 "	XXIII "	163 "

On the distribution of the nebulæ[f], Guillemin remarks as follows:—

"This is very unequal in the Northern hemisphere, and in those parts of the Southern one visible in the Northern temperate zone. The greatest number is found in a zone which scarcely embraces the eighth part of the heavens. The constellations Leo, Ursa Major, Camelopardus, Draco, Boötes, Coma Berenices, and Canes Venatici, but principally Virgo, form this zone, which extends as far as the middle of Centaurus: it is known under the name of the nebulous region of Virgo. Nearly at the opposite pole of the sky, another agglomeration of nebulæ embraces Andromeda, Pegasus, and Pisces, and extends lower than the first-named constellation into the Southern heavens.

"It is noteworthy that the regions nearest the Milky Way are the poorest in nebulæ, whilst the two richest regions lie at the two poles of that great belt in which the stars are so numerous and condensed. The nebulæ are more uniformly spread over the zone which surrounds the South Pole; they are at the same

[f] Readers interested in this matter should study an elaborate paper by C. Abbe in *Month. Not.*, vol. xxvii. p. 257 (May 1867), followed by others by R. A. Proctor in *Month. Not.*, vol. xxix. p. 357 (Oct. 1869); and by S. Waters in *Month. Not.*, vol. xxxiii. p. 558 (Oct. 1873).

time much less numerous. On the other hand, there are two magnificent regions there, which alone contain nearly 400 nebulæ and star-clusters[g]."

In connection with the distribution of the nebulæ it may here be mentioned that almost all the nebulæ indicated by the spectroscope to be gaseous are situated either within or on the borders of the Milky Way, whilst in the regions near the poles of the Milky Way such nebulæ are wanting, though of other nebulæ there is no lack there. These facts may hereafter prove to be of great significance.

The first who paid much attention to clusters and nebulæ was the French astronomer Messier, who formed the well-known and important, though small Catalogue, the constituents of which are still distinguished by his initial—M. After him came Sir W. Herschel, who classified the nebulæ which he observed in the following way:—

I. "Bright nebulæ"—288 objects.
II. "Faint nebulæ"—909 objects.
III. "Very faint nebulæ"—984 objects.
IV. "Planetary nebulæ, stars with bars, milky chevelures, short rays, remarkable shapes," &c.—79 objects.
V. "Very large nebulæ"—52 objects.
VI. "Very compressed rich clusters"—42 objects.
VII. "Pretty much compressed clusters"—67 objects.
VIII. "Coarsely scattered clusters"—88 objects.
Grand total:—2509.

Objects catalogued by this observer are usually indicated by the symbol ♅, with the number of the class in Roman capitals; thus:—33 ♅ VI. Persei. References to Sir John Herschel's Catalogue of 1833, and his Cape extension of it, are indicated by the letter "h" with the number prefixed. For Sir John Herschel's combination Catalogue of 1864, "H" has been taken as the designating letter in this volume. A large and important reconstruction of that Catalogue was published by Dreyer in 1888[h], and there can be no doubt that this (which contains 7840 objects) will be the standard Catalogue for many years to come.

The other observers who must be cited as having devoted

[g] *The Heavens*, Eng. ed., p. 395.
[h] *Mem.* R.A.S., vol. xlix.

much attention to nebulæ and clusters are the late Earl of Rosse and Dreyer in Ireland, and MM. D'Arrest, Schönfeld, Schultz and Stéphan on the Continent. The late Earl of Rosse laid before the Royal Society, in 1861, a large and valuable Catalogue of 989 nebulæ observed by himself at Parsonstown[i]; and his son, the present Earl, has developed his father's efforts by observations since brought together in a valuable and important catalogue communicated in 1878 to the Royal Dublin Society[k]. Some further information respecting the work done of late years in this branch of sidereal astronomy may be gleaned from the list of Catalogues[l].

The following abbreviations relate to words which were made special use of by Sir J. Herschel in his Catalogues of Nebulæ, and as they have been adopted by various observers writing in various languages, a statement of Sir John's terminology will frequently be found useful[m]:—

ab	about.
alm	almost.
am	among.
app	appended.
att	attached.
B	bright.
b	brighter.
bet	between.
biN	bi-nuclear.
bn	brightest towards the North side.
bs	brightest towards the South side.
bp	brightest towards the preceding side.
bf	brightest towards the following side.
C	compressed.
c	considerably.
co	coarse, coarsely.
com	cometic.
cont	in contact.
cl	cluster.
D	double.
d	diameter.
diffic	difficult.
dif	diffused.
dist	distance, distant.
def	defined.
E	extended.
e	extremely.
ee	excessively.
er	easily resolveable.
exc	excentric.
F	faint.
f	following.
g	gradually.
gr	group.
inv	involved.
i	irregular.
iF	irregular Figure.
L	large.
l	long, or little.
M	in the middle.
m	much.
mm	mixed magnitudes.

[i] *Phil. Trans.*, vol. cli. p. 681.

[k] *Scientific Transactions, Roy. Dublin Soc.*, New Ser., vol. ii. 1880.

[l] See vol. ii. p. 500.

[m] This table has been taken from his *General Catalogue*, p. 11, but I have excluded a few words which are of limited applicability, and I have varied the order a little in some cases to facilitate reference. These designations were first given in Sir J. Herschel's 1833 Catalogue. (*Phil. Trans.*, vol. cxxiii. p. 359.)

mn	milky nebulosity.
N	nucleus, or to a nucleus.
neb	nebula.
nr	near.
n	North.
np	north preceding.
nf	north following.
P	poor.
p	pretty (before F, B, L, S, &c.); otherwise, it means preceding.
pg	pretty gradually.
pm	pretty much.
ps	pretty suddenly.
pos	angle of position.
R	round.
RR	exactly round.
Ri	rich.
r	resolvable, barely (mottled as if with stars).
rr	partially resolved—same stars visible.
rrr	well resolved—clearly seen to consist of stars.
S	small.
sm	smaller.
s	south, suddenly.
sp	south preceding.
sf	south following.
st	stars.
sc	scattered.
sev	several.
susp	suspected.
sh	shaped.
stell	stellar.
sw	sweep.
tri-N	tri-nuclear.
trap	trapezium.
v	very.
vv	very exceedingly.
☾	moon above the horizon.
☾☾	moon very bright.
*	star.
*10	a star of the 10th magnitude.
**	double star.
***	triple star.
!	a remarkable object.
!!	very much so.
!!!	a magnificent or otherwise exceedingly interesting object.
?	doubtful.
??	very doubtful either as to accuracy of place or reality of existence.
△	Dunlop; *or* forms a triangle with.
⊕	globular cluster.
○	planetary nebula.
⊙	annular nebula.
st. 9...	stars from the 9th (or other) magnitude downwards.
st. 9...13	stars from the 9th down to the 13th magnitude.

Sir J. Herschel adopted the following scales of brightness, size and form:—

1. Excessively faint	excessively small;	3″ to 4″ diam.
2. Very faint	very small	10″ to 12″ diam.
3. Faint	small	20″ to 30″ diam.
4. Considerably faint	considerably small	
5. Pretty faint	pretty small	50″ to 60″ diam.
6. Pretty bright	pretty large	
7. Considerably bright	considerably large	3′ to 4′ diam.
8. Bright	large	
9. Very bright	very large	8′ to 10′ diam.
10. Excessively bright	excessively large	20′ and upwards.

On this Dreyer remarks:—"In estimating clusters of well-separated and scattered stars a wider acceptation must be understood, so that, *e.g.* a cluster of 1′ in extent would be very small, and one of 15′ or 20′ large.

CHAPTER V.

VARIABLE NEBULÆ.

Variable Nebula in Taurus.—Observations by Hind.—Variable Nebula in Scorpio.—Observations by Pogson and others.—Notes of observations on the other Nebulæ suspected to be variable.—The controversy respecting the nebula surrounding η Argûs.

CURIOUS and interesting as are those stars which undergo periodical changes of brilliancy, it seemed at one time not unlikely that we should have to accept the idea that they do not stand alone, but that variations sometimes occur in the light of nebulæ more or less analogous in character to those already recognised in the case of numerous single stars. Subsequent consideration of the available evidence, however, leaves the matter in great doubt, and it cannot be said that any periodical changes have yet been proved in the case of nebulæ[a]. So much as is known on the subject will however now be set out.

The following is a summary of a communication by Hind. On Oct. 11, 1852, that observer discovered, at the Regent's Park Observatory, a small nebula about 1′ in diameter, with a central condensation of light. Its position (reduced to 1860) was R.A. $4^h\ 13^m\ 47^s$, and Decl. $+19°\ 11{\cdot}2'$, and therefore it was in the constellation Taurus, about $1\frac{1}{2}°$ distant from ϵ.

From 1852 to 1856 a star of the 10^{th} magnitude almost touched the *nf* edge of the nebula; this star was first noticed on the night of the discovery of the nebula, and from the fact that it had escaped observation on many previous occasions when

[a] See on this subject as a whole an important paper by Dreyer, *Month. Not.*, vol. xlvii. p. 412. May 1887.

the same locality had been under examination, Hind was induced to suspect its variability—a suspicion which eventually was shown to be well-founded, as the star afterwards dwindled down to the 12th mag. But the most singular thing remains to be told: namely, that on Oct. 3, 1861, D'Arrest, of Copenhagen, found that the *nebula* had *totally vanished.* This statement was not credited at the time on account of its apparent improbability, notwithstanding the known reputation of the observer who made it; and it was assumed, too hastily, that some error of observation had crept in, though D'Arrest's good faith was not at all questioned. Let it be noted, moreover, that a small nebula 4′ preceding Hind's was seen in 1868 by O. Struve, was verified by D'Arrest shortly afterwards, and has now disappeared.

On Jan. 26, 1862, Le Verrier turned the large equatorial of the Paris Observatory (of 12·4 inches aperture) on the place of the nebula; not a single trace, however, could be obtained of it either by Le Verrier or by his assistant, Chacornac, and on the following night Secchi, at Rome, was similarly unsuccessful; thus was confirmed beyond a doubt the statement of D'Arrest. Chacornac, whilst engaged in 1854 in forming a chart of the stars in the neighbourhood of the nebula, saw it, but in going over the locality again in 1858, with a much more powerful instrument, he did not see it, though the reason why he did not announce the disappearance is not known.

Hence Hind infers that the disappearance of the nebula took place either during 1856 or during the following year. He further remarks: "How the variability of a nebula and a star closely adjacent is to be explained, it is not easy to say in the actual state of our knowledge of the constitution of the sidereal universe. A dense but invisible body of immense extent interposing between the Earth and them might produce effects which would accord with those observed; yet it appears more natural to conclude that there is some intimate connexion between the star and the nebula upon which alternations of visibility and invisibility of the latter may depend. If it be allowable to suppose that a nebula can shine by light reflected from a star, then the waning of the latter might account for the apparent extinction of the former; but in this case it is hardly possible to conceive that the nebula can have a stellar constitution[b]."

On Dec. 29, 1861, the nebula was again seen in the 15-inch refractor at Pulkova, and by March 22, 1862, it had so far increased in brightness as to bear a faint illumination. But on Dec. 12, 1863, Hind and Talmage carefully looked for it with the telescope with which it was originally observed, and failed to establish any trace of its visibility. The telescope in question (Mr. Bishop's) has only half the aperture of the one at Pulkova.

It is satisfactory to know that the preceding instance does not altogether stand alone, but that something at least analogous is on record. In the autumn of 1860 Mr. N. Pogson, then assistant at the Hartwell Observatory, and now Director of the Madras Observatory, communicated to the Royal Astronomical Society a paper, of which the following is the substance.

The 80th object in Messier's Catalogue of Nebulæ, although described as a compressed cluster, had always presented to Pogson the appearance of a well-defined *nebula*, and as it was in the same field of view with R and S Scorpii, had frequently come under his notice. On May 28, 1860, when seeking for these two variables, neither of which was then visible, his attention was arrested by the startling fact, that a star of about the 7th mag. was in the place previously occupied by the nebula. The power used was 118 on the Hartwell equatorial; and so recently as May 9 (the last night on which R Scorpii was visible) Pogson saw the nebula, and is positive that it appeared exactly the same as usual, without anything stellar about it, the selfsame instrument and power being employed. On June 10, with a power of 66, the stellar appearance had nearly vanished, but the cluster still shone with unusual brilliancy, and with a marked central condensation. Pogson's remarkable observations

[b] Letter in the *Times*, Feb. 4, 1862. See a further communication in *Month. Not.*, vol. xxiv. p. 65, Jan. 1864, and D'Arrest's paper in *Ast. Nach.*, vol. lvii. No. 1366, June 26, 1862.

were fully confirmed by the independent testimony of E. Luther and Auwers[c]. The last-named observer first saw the star on May 21, 1860[d].

Pogson concludes with the following remarks:—"It is therefore incontestably proved, upon the evidence of three witnesses, that between May 9 and June 10 [1860] the cluster known as 80 Messier changed apparently from a pale cometary-looking object to a well-defined star, fully of the 7^{th} magnitude, and then returned to its usual and original appearance. It seems to me absurd to attribute this phenomenon to actual change in the cluster itself, but it is very strange if a new variable star, the third in the same field of view, should be situated between us and the centre of the cluster. Should such be the true explanation, the midway variable star must be similar in nature, but of greater range, than Mr. Hind's wonderful U Geminorum. The cluster should be closely watched[e]."

On June 1, 1869, Schönfeld thought he saw some trace of the star, but no further information is on record. I looked for it but failed to see it on July 29, 1885, with a 6-inch refractor.

On Sept. 1, 1859, H. P. Tuttle discovered a nebula in Draco (D. 6643, Position for 1890, R.A. $18^h\ 22^m\ 44^s$, Decl. $+74°\ 31{\cdot}2'$), which D'Arrest and others stated to be so bright as to make it inexplicable how it should have escaped the notice of Sir W. and Sir J. Herschel, if it had always been of uniform brilliancy. D'Arrest described this nebula as oval, $2'$ long and $1'\ 20''$ broad. Dreyer thinks that this nebula ought not to be included here, on the ground that its having escaped the notice of the Herschels proves very little, because neither of those 2 astronomers paid much attention to the North Polar regions of the heavens.

On Oct. 19, 1859, Tempel observed in Taurus an object which he took to be a new telescopic comet. The next evening, however, finding it still in the same position, he was able to determine that it was not a comet, but a nebula[f]. On Dec. 31, 1860, it

[c] *Ast. Nach.*, vol. liii. No. 1267. July 1860.

[d] *Ast. Nach.*, vol. cxiv. No. 2715. March 6, 1886.

[e] *Month. Not.*, vol. xxi. p. 32. Nov. 1860.

[f] *Ast. Nach.*, vol. liv. No. 1290. Jan. 10, 1861.

was seen again by Tempel and Pape, though with some difficulty. Auwers, who has also seen it, describes it as triangular in form, and 15′ in extent, but he thinks that it might have escaped notice owing to its proximity to a bright star—Merope, one of the Pleiades. Schiaparelli, at Milan, trying a new telescope on Feb. 25, 1875, saw this nebula very clearly, and was much surprised at its size. He noted it to extend from the star Merope, beyond Electra and as far as Celæno [g]. It may be added that Hind states that he has often suspected nebulosity about some of the smaller outlying stars of the Pleiades. The position of this nebula (which is 1435 D.) is R.A. $3^h\ 39^m\ 38^s$, and Decl. $+23°\ 25{\cdot}5'$ (1890). Its variability seems not clearly established.

On October 19, 1855, Chacornac discovered a nebula also in Taurus, which had not been previously observed. This object, which is D. 1988, Position for 1890, R.A. $5^h\ 30^m\ 51^s$, Decl. $+21°\ 6{\cdot}4'$, was so conspicuous that he felt some difficulty in understanding how it could have escaped earlier notice if it had always possessed the same brilliancy [h]. Dreyer however states, on the authority of Tempel, that this nebula is a myth; that is to say, that it arose from a false image of the star in Chacornac's telescope.

The foregoing observations may be said to have relation to objects of small size, but there are some slight grounds for the opinion that there is one example of a large and important nebula having undergone changes of form. The great nebula in Argo, when observed by Sir J. Herschel in 1838, contained within its area a vacuity of considerable size. The star η, then of the 1st magnitude, was situated in the most dense part of the nebula, and was completely encompassed by nebulous matter. In 1863, according to Abbott of Hobart-Town, the star, which had

[g] *Ast. Nach.*, vol. lxxxvi. No. 2045, July 10, 1875. A translation appears in *Ast. Reg.*, vol. xiii. p. 194, Aug. 1875. Further observations by Tempel, together with a lithograph, will be found in *Month. Not.*, vol. xl. p. 622, 1880. It is to be noted however that according to Tempel's sketch the nebula trends away to the S. quite in the opposite direction to Electra and Cæleno, and therefore Tempel is in conflict with Schiaparelli. Tempel however was a very careful artist.

[h] *Bulletin Météorologiqüe*, April 28, 1863.

dwindled down to the 6th magnitude (a matter already alluded to[i]), *was entirely free from nebulosity.* This observer also stated[k] that the outline of the vacuity was materially different from the representation given by Herschel. Mr. E. B. Powell, of Madras, confirmed these remarks generally, but also stated that the nebula as a whole had varied much in brilliancy during the time it had been under his notice[l].

Consequent on the publication of Abbott's several communications, Capt. J. Herschel in India and Dr. Gould at Cordoba in South America directed their attention to this nebula in 1868 and following years. Capt. Herschel's own observations were compared by himself[m], by Sir J. Herschel[n], by Sir G. B. Airy[o], and Mr. Lassell with Sir John Herschel's observations at the Cape in 1834, &c., and with Abbott's comments thereon, and the general opinion of astronomers may be gathered from the Report of the Council of the Royal Astronomical Society of 1872, where Dr. Gould's words are quoted with evident approval[p]. That observer had stated that he was strongly impressed "with the conviction that the alleged change is altogether imaginary," and astronomers are now agreed to pass an unfavourable opinion on Mr. Abbott's assertions[q]. The most recent detailed observations of this nebula are due to C. E. Peek, who carefully studied it in November and December, 1882, with a 6-inch refractor. He thus summarises his conclusions: "I am aware that recent observers have described and delineated it as completely changed since the days of Sir John Herschel; but so far as I was able to perceive, its details agree in a remarkable manner with his plate[r]."

[i] See p. 88, *ante*.

[k] *Month. Not.*, vol. xxi. p. 230, June 1861; vol. xxiv. p. 5, Nov. 1863; vol. xxv. p. 192, April 1865; vol. xxviii. p. 200, May 1868; and vol. xxxi. p. 226, June 1871. Sir J. Herschel's earliest comment on Abbott's statements will be found in vol. xxviii. p. 225, June 1868.

[l] *Month. Not.*, vol. xxiv. p. 171, May 1864.

[m] *Month. Not.*, vol. xxix. p. 82, Jan. 1869.

[n] *Month. Not.*, vol. xxix. p. 84, Jan. 1869; vol. xxxi. p. 228, June 1871.

[o] *Month. Not.*, vol. xxxi. p. 233, June 1871.

[p] *Month. Not.*, vol. xxxii. p. 178, Feb. 1872.

[q] See, for instance, a memorandum by Proctor in *Month. Not.*, vol. xxxii. p. 62, Dec. 1871.

[r] *Astronomical Observations*, 1882–85, by C. E. Peek. 4to. Lond. 1886.

CHAPTER VI.

THE MILKY WAY[a].

Its course amongst the stars described by Sir J. Herschel.—The "Coal Sack" in the Southern Hemisphere.—Remarks by Sir W. Herschel as to the prodigious number of stars in the Milky Way.—Computation by Sir J. Herschel of the total number of stars visible in an 18-inch reflector.—Terms applied to the Milky Way by the Greeks.—By the Romans.—By our ancestors.

FOREMOST amongst the clusters of stars which we see in the heavens stands the Milky Way, which has pre-eminently occupied the attention of philosophers from the earliest ages of antiquity.

The course of the Milky Way amongst the constellations is well sketched by Sir J. Herschel, whose description I shall give, with a few verbal alterations[b].

Neglecting occasional deviations, and following the line of its greatest brightness as well as its varying breadth and intensity will permit, its course conforms nearly to that of a great circle inclined at an angle of about 63° to the equinoctial, and cutting that circle in R.A. $6^h\ 47^m$, and $18^h\ 47^m$; so that its Northern and Southern poles respectively are situated in R.A. $12^h\ 47^m$, Decl. N. 27° and R.A. $0^h\ 47^m$, Decl. S. 27°. Throughout the region where it is so remarkably subdivided this great circle holds an intermediate situation between the two great streams; with a nearer approximation, however, to the brighter and continuous stream than to the fainter and interrupted one. If

[a] An extremely interesting article on the Milky Way by J. C. Houzeau will be found in the *Annuaire de l'Observatoire de Bruxelles,* 1880, p. 233. Mr. Böddicker, Lord Rosse's assistant at Parsonstown, presented to the Royal Astronomical Society in 1889 a very beautiful and elaborate series of drawings of the Milky Way which deserve notice.

[b] *Outlines of Ast.*, p. 569.

we trace its course in order of Right Ascension, we find it traversing the constellation Cassiopeia, its brighter part passing about 2° North of the star δ of that constellation, *i.e.* in about 62° of North Declination. Passing thence between γ and ϵ Cassiopeiæ, it sends off a branch to the south-preceding side, towards a Persei, very conspicuous as far as that star, prolonged faintly towards ϵ of the same constellation, and possibly traceable towards the Hyades and Pleiades as remote outliers. The main stream, however (which is here very faint), passes on through Auriga, over the 3 remarkable stars ϵ, ζ, η of that constellation preceding Capella (a Aurigæ), and called the Hædi, between the feet of Gemini and the horns of the Bull (where it intersects the ecliptic, nearly in the solstitial colure), and thence over the club of Orion to the neck of Monoceros, intersecting the equinoctial in R.A. $6^h\ 54^m$. Up to this point, from the offset in Perseus, its light is feeble and indefinite, but thenceforward it receives a gradual accession of brightness, and when it passes through the shoulder of Monoceros, and over the head of Canis Major, it presents a broad, moderately bright, very uniform, and, to the naked eye, slender stream up to the point where it enters the prow of the ship Argo, nearly in the Southern Tropic. Here it again subdivides (about the star *m* Puppis), sending off a narrow and winding branch on the preceding side as far as γ Argûs, where it terminates abruptly. The main stream pursues its southward course to the 33rd parallel of South Declination, where it diffuses itself broadly and again subdivides, opening out into a wide fan-like expanse, nearly 20° in breadth, formed of interlacing branches, all of which terminate abruptly, in a line drawn nearly through λ and γ Argûs.

At this place the continuity of the Milky Way is interrupted by a wide gap, and when it recommences on the opposite side it is by a somewhat similar fan-shaped assemblage of branches which converge upon the bright star η Argûs. Thence it crosses the hind feet of the Centaur, forming a curious and sharply-defined semi-circular concavity of small radius, and enters the Cross by a very bright neck or isthmus not more than 3° or 4°

in breadth—this is the narrowest portion of the Milky Way. After this it immediately expands into a broad and bright mass, enclosing the stars α and β Crucis, and β Centauri, and extending almost up to α of the latter constellation. In the midst of this bright mass, surrounded by it on all sides, and occupying about half its breadth, occurs a singular dark pear-shaped vacancy, so conspicuous and remarkable as to attract the notice of the most superficial gazer, and to have acquired, amongst the early Southern navigators, the uncouth but expressive appellation of the "Coal Sack." In this vacancy, which is about 8° in length and 5° in breadth, only one very small star visible to the naked eye occurs, though it is far from devoid of telescopic stars, so that its striking blackness is simply due to the effect of contrast with the brilliant ground with which it is on all sides surrounded. This is the place of the nearest approach of the Milky Way to the South Pole. Throughout all this region its brightness is very striking, and when compared with that of its more Northern course, already traced, conveys strongly the impression of greater proximity, and would almost lead to a belief that our situation as spectators is separated on all sides by a considerable interval from the dense body of stars composing the Galaxy, which in this view of the subject would come to be considered as a flat ring of immense and irregular breadth and thickness, within which we are eccentrically situated, nearer to the Southern than to the Northern part of its circuit.

At α Centauri the Milky Way again subdivides, sending off a great branch of nearly half its breadth, but which thins off rapidly at an angle of about 20° with its general direction towards the preceding side to η and *d* Lupi, beyond which it loses itself in a narrow and faint streamlet. The main stream passes on, increasing in breadth to γ Normæ, where it makes an abrupt elbow, and again subdivides into one principal and continuous stream of very irregular breadth and brightness on the following side, and a complicated system of interlaced streaks and masses on the preceding, which covers the tail of Scorpio, and terminates in a vast and faint effusion over the whole extensive region occupied by the preceding leg of Ophiuchus, extending Northwards to a parallel of 13° of South Declination, beyond which it cannot be traced, a wide interval of 14°, free from all appearance of nebulous light, separating it from the great branch on the North side of the equinoctial, of which it is usually represented as a continuation.

Returning to the point of separation of this great branch from the main stream, let us now pursue the course of the latter. Making an abrupt bend to the following side, it passes over the stars ι Aræ, θ and ι Scorpii, and γ Telescopii to γ Sagittarii, when it suddenly collects into a vivid oval mass about 6° in length and 4° in breadth, so excessively rich in stars that a very moderate calculation makes their number exceed 100,000. Northward of this mass this stream crosses the ecliptic in longitude about 276°, and proceeding along the bow of Sagittarius into Antinoüs, has its course rippled by 3 deep concavities, separated from each other by remarkable protuberances, of which the larger and brighter (situated between Flamsteed's stars 3 and 6 Aquilæ) forms the most conspicuous patch in the southern portion of the Milky Way visible in our latitudes.

Crossing the equinoctial at the 19th hour of Right Ascension, it next runs in an irregular, patchy, and winding stream through Aquila, Sagitta, and Vulpecula, up to Cygnus; at ϵ of which constellation its continuity is interrupted, and a very confused and irregular region commences, marked by a broad dark vacuity, not unlike the Southern "Coal Sack," occupying the space between ϵ, α, and γ Cygni, which serves as a kind of centre for the divergence of 3 great streams: one which I have already traced; a 2nd, the continuation of the 1st (across the interval) from α Cygni Northward, between Lacerta and the head of Cepheus to the point in Cassiopeia whence we set out; and a 3rd branching off from γ Cygni, very vivid and conspicuous, running off in a Southern direction through β Cygni and s Aquilæ, almost to the equinoctial, when it loses itself in a region thinly sprinkled with stars, where in some maps the modern constellation Taurus Poniatowskii is placed. This is the branch which, if continued across the equinoctial, might be supposed to unite with the great Southern effusion in Ophiuchus, already noticed. A considerable offset, or protuberant appendage, is also thrown off by the Northern stream from the head of Cepheus directly towards the Pole, occupying the greater part of the quartile formed by α, β, ι, and δ of that constellation.

It is impossible to give any idea of the enormous number of stars in the Milky Way, but Sir W. Herschel recorded some facts that will assist us. That observer stated that on one occasion he estimated that 116,000 stars passed through the field of his telescope in $\frac{1}{4}$ hour[c]; and again that on Aug. 22, 1792, he saw 258,000 stars pass in 41^{m}.[d] The surprising character of this result will be more adequately appreciated when compared with the number of stars that are visible to the naked eye. The common estimation gives between 3000 and 4000, though Struve augments the number to 6000 for persons of very acute vision[e].

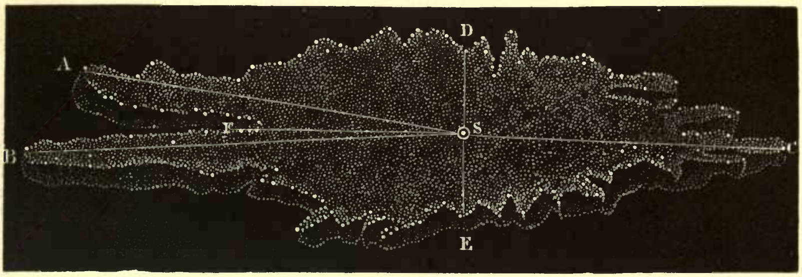
Sir John Herschel computed that the total number of stars visible in an 18-inch reflector cannot be less than $5\frac{1}{4}$ millions, and may probably be many more[f]. Struve's estimate for Sir W. Herschel's 20-ft. reflector is $20\frac{1}{2}$ millions.

A brief reference must here be made to what is commonly known as Sir W. Herschel's theory of the Milky Way. He conjectured that the stars were not indifferently scattered through the heavens, but were rather arranged in a certain definite stratum, comprised between 2 plane surfaces parallel to and near each other but prolonged to immense distances in every direction, the thickness of which stratum, as compared with its length and breadth, was inconsiderable; and that the Sun occupies a place somewhere about the middle of its thickness, and near the point where it subdivides into 2 principal streams,

c *Phil. Trans.*, vol. lxxv. p. 244. 1785.
d *Ibid.*, vol. lxxxv. p. 70. 1795.
e *Etudes d'Astronomie Stellaire*, p. 61.
f *Results of Astron. Obs.*, &c., p. 381. For more on this subject, see *Outlines of Ast.*

inclined to each other at a small angle. It is clear, then, that to an eye viewing the stratum from S, the apparent density of the stars would be least in the direction S D, or S E, and greatest in the direction S A, S B, S C, and this corresponds generally to the observed facts[g]. "Such is the view of the construction of the starry firmament taken by Sir William Herschel[h], whose powerful telescopes first effected a complete analysis of this wonderful zone, and demonstrated the fact of its consisting entirely of stars[i]."

Fig. 80.



HERSCHEL'S STRATUM THEORY.

Though we talk of the "starry" heavens, and especially associate the Milky Way with the idea of stars, yet it must be remembered that there exist in the Milky Way certain places which seemingly are absolutely devoid of stars. When Sir John Herschel was preparing for his well-known expedition to the Cape of Good Hope in 1833, his aunt Caroline Herschel wrote and requested him to pay particular attention to the tail of the

[g] Hind, in *Atlas of Astronomy.*

[h] Thomas Wright, of Durham, first started this idea in 1734 (see his *Original Theory or New Hypothesis of the Universe*, London, 1751). An analysis by Prof. De Morgan of this curious work will be found in the *Phil. Mag.*, 3rd ser., vol. xxxii. p. 241. April 1848.

[i] This paragraph is in substance taken from Sir John Herschel's *Outlines of Ast.*, p. 569, a source of information selected for the obvious reason that Sir John ought to have known better than any man what his father's views were; but Proctor has pointed out with some force that there are grounds for the opinion that this "Stratum Theory" of Sir W. Herschel (which dates back to about 1784) was in part abandoned in after years by its author. It is not a little strange that if this be the case no one should have found it out for nearly ¾ths of a century. Proctor relies especially on a passage in *Phil Trans.*, vol. ci. p. 269. 1811. (See *Month. Not.*, vol. xxxiii. p. 541. Oct. 1873.)

Scorpion, because Sir William Herschel had been much struck with the absence of stars there, and with the altogether abnormal disposition of the nebulous matter which exists there.

Sir John, writing to his aunt on June 6, 1834, replied that he had examined parts of the constellation Scorpio as requested, and that he had found many clusters of stars, and a nebula of remarkable shape. His aunt in thanking him said:—"It is not to clusters of stars that I was referring. One night your father, after a long and painful silence, cried out, *Hier ist wahrhaftig ein Loch im Himmel*, and after having dwelt a long time on it he left it not knowing what to make of it." On the strength of this statement Sir John Herschel seems to have returned to the subject, with the result that he found in the following positions patches of sky absolutely devoid of all stars:—

R.A.	Decl.
h. m.	° ′
16 15	−23 56
16 19	26 3
16 23	24 25
16 26	24 14
16 27	−24 0

Ultimately it would seem that he found no fewer than 49 such void spaces.

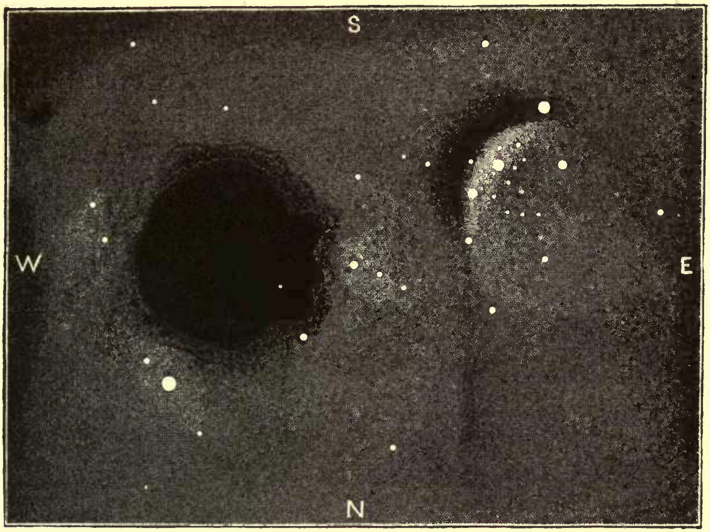
Figure 81 represents a black void in the heavens observed and described by Trouvelot in August, 1876. It is situated in the constellation Sagittarius, in R.A. $17^h\ 56^m$ and Decl. $-27°\ 51'$. This black hole is almost circular; on the north-west of it there are 4 stars, the brightest of which is orange-coloured. To the East of this hole there is another void space, in shape a narrow crescent, but this space is less black and less sharply defined than the former [k].

By the Greeks the Milky Way was termed the Γαλαξίας or Κύκλος γαλακτικός, and by the Romans the *Circulus lacteus* or *Orbis lacteus;* from our ancestors it received the names of "Jacob's Ladder," the "Way to St. James's," "Watling Street," &c. The diversity of the ancient names was equalled only by the diversity

[k] *L'Astronomie*, vol. iii. p. 421. Nov. 1884.

of opinions that prevailed as to what it was. Metrodorus considered it to be the original course of the Sun, but that it was abandoned by him after the bloody banquet of Thyestes; others, that it pointed out the place of Phaëthon's accident; whilst a 3rd class thought that it was caused by the ears of corn dropped by Isis in her flight from Typhon. Aristotle imagined it to be the result of gaseous exhalations from the Earth, which were

Fig. 81.



BLACK SPACE VOID OF STARS IN THE CONSTELLATION SAGITTARIUS.

set on fire in the sky. Theophrastus declared it to be the soldering together of two hemispheres; and finally, Diodorus conceived it to be a dense celestial fire, showing itself through the clefts of the starting and dividing semi-globes.

The speculations of Democritus[1] and Pythagoras were to the effect that the Galaxy was neither more nor less than a vast assemblage of stars. Ovid speaks of it as a high road "whose groundwork is of stars." Manilius uses similar language. In

[1] Plutarch, *De Placit.*, lib. iii. cap. I.

an English version of Manilius [m] his allusion to the Milky Way runs as follows:—

> "Or is the spacious bend serenely bright
> From little stars, which there their beams unite,
> And make one solid and continued light?"

It is singular that Ptolemy has in none of his writings expressed any opinion on it. Our own ancestors supported the star theory. In Milton we find mention of that—

> "broad and ample road,
> Whose dust is gold, and pavement, stars."

[m] *Astronomicon*, lib. i. cap. xv.

CHAPTER VII.

THE CONSTELLATIONS.

List of those formed by Ptolemy.—Subsequent Additions.—Remarks by Herschel, &c.—Catalogue of the Constellations, with the position of, and Stars in, each.

THE constellations have already been referred to generally: in this chapter they will be set out more particularly.

Ptolemy enumerates 48 constellations: 21 northern, 12 zodiacal, and 15 southern, as follows:—

Northern.

1. Ursa Minor.	The Little Bear.
2. Ursa Major.	The Great Bear.
3. Draco.	The Dragon.
4. Cepheus.	
5. Boötes, or *Arctophylax.*	The Bear Keeper.
6. Corona Borealis.	The Northern Crown.
7. Hercules, *Engonasin.*	Hercules kneeling.
8. Lyra.	The Harp.
9. Cygnus, *Gallina.*	The Swan.
10. Cassiopeia.	The Lady in her Chair.
11. Perseus.	
12. Auriga.	The Charioteer.
13. Ophiuchus (Serpentarius).	The Serpent Bearer.
14. Serpens.	The Serpent.
15. Sagitta.	The Arrow.
16. Aquila, *Vultur volans.*	The Eagle.
17. Delphinus.	The Dolphin.
18. Equuleus.	The Little Horse.
19. Pegasus, *Equus.*	The Winged Horse.
20. Andromeda.	The Chained Lady.
21. Triangulum.	The Triangle.

Zodiacal.

1. Aries.	The Ram.
2. Taurus.	The Bull.
3. Gemini.	The Twins.

4. Cancer.	The Crab.
5. Leo.	The Lion.
6. Virgo.	The Virgin.
7. Libra, *Chelæ.*	The Balance. *The Claws* [of Scorpio].
8. Scorpio.	The Scorpion.
9. Sagittarius.	The Archer.
10. Capricornus.	The Goat.
11. Aquarius.	The Water Bearer.
12. Pisces.	The Fishes.

Southern.

1. Cetus.	The Whale.
2. Orion.	
3. Eridanus, *Fluvius.*	Eridanus, The River.
4. Lepus.	The Hare.
5. Canis Major.	The Great Dog.
6. Canis Minor.	The Little Dog.
7. Argo Navis.	The Ship "Argo."
8. Hydra.	The Snake.
9. Crater.	The Cup.
10. Corvus.	The Crow.
11. Centaurus.	The Centaur.
12. Lupus.	The Wolf.
13. Ara.	The Altar.
14. Corona Australis.	The Southern Crown.
15. Piscis Australis.	The Southern Fish.

Tycho Brahe (d. 1601) added—

1. Coma Berenices.	The Hair of Berenice.
2. Antinous.	

(Both Northern Constellations.)

Bayer (*circa* 1603) added[a]—

1. Pavo.	The Peacock.
2. Toucan.	The American Goose.
3. Grus.	The Crane.
4. Phœnix.	The Phœnix.
5. Dorado, *Xiphias.*	The Sword Fish.
6. Piscis Volans.	The Flying Fish.
7. Hydrus.	The Water Snake.
8. Chamæleon.	The Chameleon.
9. Apis.	The Bee.
10. Avis Indica.	The Bird of Paradise.
11. Triangulum Australe.	The Southern Triangle.
12. Indus.	The Indian.

(All Southern.)

[a] Perhaps it would be more correct to say that Bayer "adopted" rather than "added," which might seem to imply original design on his part. With this, Lynn asserts, he must *not* be credited. (*Observatory,* vol. ix. p. 255, July 1886.)

Royer, in 1679, added [b]—

1.	Columba Noachi.	The Dove of Noah.
2.	Crux Australis.	The Southern Cross.
3.	Nubes Major.	The Great Cloud.
4.	Nubes Minor.	The Little Cloud.
5.	Lilium.	Fleur-de-Lys. The Lily.

(All Southern Constellations.)

Halley, about the same period, added—

1.	Robur Caroli.	Charles's Oak.

(A Southern Constellation.)

Flamsteed's maps also contain—

1.	Mons Mænalus.	The Mountain Mænalus.
2.	Cor Caroli.	Charles's Heart.

(Both Northern Constellations.)

Hevelius, in 1690, added—

1.	Camelopardus.	The Cameleopard.
2.	Canes Venatici, *Asterion et Chara.*	The Hunting Dogs.
3.	Vulpecula et Anser.	The Fox and the Goose.
4.	Lacerta.	The Lizard.
5.	Leo Minor.	The Little Lion.
6.	Lynx.	The Lynx.
7.	Scutum, or Clypeus, Sobieskii.	The Shield of Sobieski.
8.	Triangulum Minor.	The Little Triangle.
9.	Cerberus.	

(All Northern: and)

10.	Monoceros.	The Unicorn.
11.	Sextans Uraniæ.	The Sextant of Urania.

(Southern Constellations.)

La Caille, in 1752, added—

1.	Apparatus Sculptoris.	The Apparatus of the Sculptor.
2.	Fornax Chemica.	The Chemical Furnace.
3.	Horologium.	The Clock.
4.	Reticulus Rhomboidalis.	The Rhomboidal Net.
5.	Cæla Sculptoris.	The Sculptor's Tools.
6.	Equuleus Pictoris.	The Painter's Easel.
7.	Pyxis Nautica.	The Mariner's Compass.
8.	Antlia Pneumatica.	The Air Pump.
9.	Octans.	The Octant.
10.	Circinus.	The Compasses.
11.	Norma, *alias* Quadra Euclidis.	The Rule, *alias* Euclid's Square.
12.	Telescopium.	The Telescope.
13.	Microscopium.	The Microscope.
14.	Mons Mensæ.	The Table Mountain.

(All Southern Constellations.)

[b] Lynn has challenged the accuracy of this statement, asserting that the first 4 of these constellations were simply *borrowed* by Royer. (*Observatory*, vol. ix. p. 313, Sept. 1886.)

Le Monnier, in 1776, added—

1. Tarandus.	The Rein Deer.
2. Solitarius.	The Solitaire.

(The former in the Northern, the latter in the Southern hemisphere.)

In the same year Lalande placed Messier's name in the heavens, by forming a constellation in his honour, near Tarandus.

Poczobut, in 1777, added—

Taurus Poniatowskii.	The Bull of Poniatowski.

(Between Aquila and Ophiuchus.)

Hell formed in Eridanus—

Psalterium Georgianum.	George's Lute.

And, finally, in Bode's maps we meet with—

1. Honores Frederici.	The Honours of Frederick.
2. Sceptrum Brandenburgicum.	The Sceptre of Brandenburg.
3. Telescopium Herschelii.	Herschel's Telescope.
4. Globus Aërostaticus.	The Balloon.
5. Quadrans Muralis.	The Mural Quadrant.
6. Lochium Funis.	The Log Line.
7. Machina Electrica.	The Electrical Machine.
8. Officina Typographica.	The Printing Press.
9. Felis.	The Cat.

Making in all 109 constellations. This number by no means exhausts the list of those which have been proposed by different persons[c]. A writer in the *English Cyclopædia* very pertinently remarks: "In fact, half-a-century ago, no astronomer seemed comfortable in his position till he had ornamented some little cluster of stars of his own picking with a name of his own making."

Sir J. Herschel said: "The constellations seem to have been almost purposely named and delineated to cause as much confusion and inconvenience as possible. Innumerable snakes twine through long and contorted areas of the heavens, where no memory can follow them; bears, lions, and fishes, small and large, northern and southern, confuse all nomenclature," &c.

Many of the above smaller constellations are very properly rejected by modern uranographers, and in the list which follows

[c] There appear to be 2 Musca's: one so named by La Caille by way of substitution for Bayer's Apis; and the other formed by Bode out of stars near Aries.

in the next chapter only those asterisms will be found which are generally acknowledged in the present day, and even some of these were rejected by Argelander[d].

Argelander has given the following numbers as representing the stars of the magnitudes stated:—

1st mag.	=	20	4th mag.	=	425	7th mag.	=	13,000
2nd ,,	=	65	5th ,,	=	1100	8th ,,	=	40,000
3rd ,,	=	190	6th ,,	=	3200	9th ,,	=	142,000

Grant's figures for the first 6 magnitudes are:—

18, 68, 102, 428, 1100, and 2878.

According to Argelander the number of stars visible to the naked eye at Berlin is 3256. The number, of course, increases as we approach the equator, owing to the wider expanse of heavens opened up by the diurnal movement.

C. Von Littrow[e] for the Northern hemisphere has made an enumeration as follows:—

1st mag.	=	10	5th mag.	=	1001	9th mag.	=	237,131
2nd ,,	=	37	6th ,,	=	4386	Nebulous	=	62
3rd ,,	=	130	7th ,,	=	13,823	Variable	=	64
4th ,,	=	312	8th ,,	=	58,095			

[d] Proctor attempted a Reform of the Constellations on his own account, but his proposed modifications of existing names were far more barbarous than the originals which he condemned.

[e] *Ast. Nach.*, vol. lxxiii. No. 1741. Feb. 20, 1869.

CHAPTER VIII.

A USEFUL CATALOGUE OF NAKED EYE STARS.

THE information which now follows respecting the constellations is designed to serve but a single purpose; to facilitate their study and the identification of their stars by the naked eye. Materials for the guidance of observers working with the telescope must be sought in Chapters X to XIII (*post*).

The French and German names of the constellations are given because they will often be useful to readers consulting books in those languages, and those names are not always to be found correctly rendered in common Dictionaries.

The term "meridional centre of constellation" may be thus explained. Project a line through the given R.A., and another through the given Declination, and their point of intersection will fall on a central part of the constellation, a celestial globe or map being employed.

It frequently happens in dealing with astronomical matters of various kinds that it is necessary to mention particular stars either by their names or by the letters or numbers commonly employed to indicate them. The reader or the listener whose attention is thus called to a particular star will often find it difficult on the spur of the moment to hunt it up in a catalogue, or in works such as Smyth's *Cycle*. Accordingly he will often find it convenient to have at hand a catalogue of the principal stars arranged, not in the true scientific order of Right Ascension, but gathered together in groups according to their constellations. Hence the *raison d'être* of the present catalogue in the form given to it.

It is intended to exhibit all stars whatsoever down to the 5^{th} magnitude, with a certain number of the more important of those which are usually ranked as being between the 5^{th} and the 6^{th} magnitudes.

It fortunately happens that astronomers have now at command 2 or 3 very important works reducing into shape and order the question of star magnitudes in a way which has never before been attained. I am alluding more especially to Pickering's *Harvard Photometry* and Pritchard's *Uranometria Nova Oxoniensis* as regards the Northern hemisphere; and to Gould's *Uranometria Argentina* as regards the Southern hemisphere.

The 2 former works have already been mentioned as regards the principles upon which they are constructed[a]. It suffices for the purposes of the present chapter to be able to record the fact that they have been constructed on definite principles. This remark does not with perfect strictness apply to Dr. Gould's work, for that is based on the old-fashioned method of eye estimates and not on anything instrumental, which is a great misfortune, having regard to the scarcity of information respecting the stars of the Southern hemisphere. However, it is abundantly evident that very great care and trouble was expended on it, and the results, so far as eye estimates of star magnitudes are concerned, are worthy of a high degree of confidence. I wish that my praise of Dr. Gould's labours could extend beyond this, but that is impossible, for he has given to the world the results of the labours of himself and his staff in a form which combines the maximum of confusion with the minimum of convenience. It has already been pointed out in these pages[b] that the astronomers of the last century left the constellations of the Southern hemisphere in a condition of much ambiguity and confusion. Attention was called to this fact by Sir John Herschel after his return from the Cape in 1837. He propounded[c] a scheme of reform which was deemed at the time far too radical to be reasonable or necessary. But F. Baily took advantage of his opportunities to do something; in point of fact he accomplished a very large measure of reform in his capacity of Editor of the Catalogues of Lacaille and of La Lande and of

[a] See p. 12, *ante*. [b] See p. 17, *ante*. [c] *Cape Obs.* p. 305.

the compilation so widely known and appreciated as the *British Association Catalogue.* On these works Gould remarks in the following terms:—" The notation employed in these three works is essentially the same, and whatever may be thought of its merits, it has most assuredly tended to reduce the amount of discordance and to simplify the nomenclature, especially for the Southern stars. For, although it has been employed only to a very limited extent by the astronomers of other nations, a very large proportion of the practical astronomers in the Southern hemisphere has been supplied by England [d]."

It is passing strange that the man who could have written the foregoing remarks should have sought to perpetrate the extravagant changes in the settlement accepted by all his predecessors which Gould has done. The result is a series of anomalies and monstrosities in the boundaries of his Southern constellations and in the lettering of the stars therein wholly unparalleled in the annals of astronomy. The reader will not be surprised to hear that, holding these views, and hoping that Gould's mischievous innovations will not command the assent of astronomers generally, I have wholly disregarded them in this and the other Catalogues of this volume, in which nothing has been drawn from Cordoba sources except information applicable to the physical circumstances of particular stars examined by the Cordoba observers. This information, thus for the first time made accessible to the general reader in England, will no doubt be highly appreciated. Nor is it possible to praise too highly the value and importance of the *Harvard* results, albeit that the Harvard Catalogue is printed by no means in the most convenient form possible as regards the arrangement of the matter which appears in its pages.

Very much more convenient indeed is the form of the *Uranometria Oxoniensis,* but that work came into my hands too late for me to make as much use of it as I should have liked to have done.

I frequently found it a matter of considerable difficulty to pick out the Cordoba stars which I wanted to identify, and no

[d] Introduction to the *Uranometria Argentina,* p. 59.

wonder, having regard to what has gone before. The difficulty of finding any particular star was only equalled by the difficulty of finding any particular constellation, as will be readily understood from the fact that Gould states the "order" in which the constellations are arranged "is such that, beginning with Octans, which includes the south pole, they follow the order of the polar distances of their southern limits, proceeding spirally around the celestial sphere in the direction of Right Ascensions."

The inconvenience of this will be best understood by a reader who wishes to consult the Argentine volume, and has only 2 hours at his disposal for hunting up a dozen stars.

It does not appear necessary to offer any detailed remarks with respect to the construction of the present Catalogue. Flamsteed's Catalogue and the B. A. C. are the basis of it generally, whilst the lettering depends, with scarce a single exception, on the authority of Baily. The stars chosen, the magnitudes were then attached to them from the *Harvard Photometry* when the stars were to be found therein: after that recourse was had to the *Uranometria Argentina.* It was then found that those two works together included virtually the whole of the stars required, with only one or two exceptions.

The places are more or less those of *Harvard* for the Northern hemisphere, and of Stone's *Cape Catalogue* for the Southern hemisphere.

The constellations in their names conform to the lists already given[e].

The selection of the stars here given has been made on the following principle. The Catalogue was (as stated above) intended to include all stars down to the 5th magnitude. To make sure of this I included all stars ranked by the Harvard observers down to 5·2, or by the Cordoba observers down to 5·5. All other Harvard stars between 5·3 and 5·5 inclusive, and all remaining Bayer's stars down to 5·9 if lettered with Greek letters, and all other Cordoba stars between 5·6 and 5·9 inclusive, have been put together by constellations in paragraph form by

[e] See p. 114 *et seq.*, *ante.*

way of supplement to the Tables. But in a few cases, in order not to exclude stars which have long borne a Greek letter as their designation, the 5·9 limit has been disregarded, and accordingly a few stars marked as 6·0 or something less will be found here and there.

The various lists taken together should, if my work has been properly performed, embrace every star in the heavens down to the magnitude of 5·5; but owing to the extreme difficulty experienced in collating the Cordoba lists (for the reasons already given), I am not fully confident that the record is absolutely complete.

In the column headed "Magnitude," when there is only one entry its source will be indicated by the entry in col. 5; that is to say, a group of figures only in the 5th column are Harvard figures; but a group of figures with A prefixed are Cordoba figures from the *Uranometria Argentina.* But if there is a second entry in the "Magnitude" column, or within the same parenthesis in the Supplementary Lists, it is from the *Uranometria Nova Oxoniensis.* The estimates in that work are given to 2 places of decimals, but in transcribing the results I have been content to take the nearest first decimal, in excess or defect, as the case might be.

Inasmuch as the magnitudes of a very large number (perhaps of two-thirds) of the stars here given are photometric, whilst the remainder depend only on eye-estimates, it seemed expedient to take some steps to indicate which were which. It has been already pointed out in a previous paragraph that the Cordoba estimates can in the Tables be immediately discriminated from the Harvard and Oxford photometric values by reason of the fact that a capital A is everywhere prefixed to the reference numbers of the Cordoba stars. The question then arose, how to indicate the diverse origins of the magnitudes of the stars in the supplementary lists prepared to complete the muster roll of each constellation up to mag. 5½ or thereabouts (which was the task I proposed to myself) without inconveniently multiplying symbols or marks in the printing.

I think the distinctions will be discoverable without difficulty if the following facts are borne in mind. The *Harvard Photometry* extends from the N. Pole to Decl. $-30°$, and also embraces occasionally a star which is a degree or two more to the S. The *Uranometria Oxoniensis* also extends from the N. Pole beyond the the Equator, but terminates very exactly at Decl. $-10°$. The *Uranometria Argentina* extends from the S. Pole beyond the Equator up to Decl. $+10°$. It therefore overlaps Harvard to the extent of 40° and Oxford to the extent of 20°. But notwithstanding this overlap, I have made absolutely no use whatever of the Argentine figures except in their own proper territory (so to speak) of the Southern hemisphere through the 60° of Declination from $-30°$ to $-90°$. Within those limits *all* the values of magnitude (excepting, as above mentioned, a few Harvard stars lying between $-30°$ and $-34°$) are Argentine ones. It only remains then to be added that the position of a constellation, whether it be wholly N. or wholly S. of Decl. $-30°$, determines the authorship of its star magnitudes. Constellations which are cut by the 30° line of Declination are of course of mixed origin as regards their star magnitudes. Where any particular star bears a Greek or a Roman letter of designation, the reader must exercise a little discrimination of his own in deciding whether the magnitude assigned in this chapter is photometric or estimated; but when it is a question of a numbered star, there need be no uncertainty, because I have adopted the following rule: *No B. A. C. number is applied to a star whose magnitude is given estimated; no Lacaille or Brisbane number is given to a star whose magnitude is photometric.* I think it will be found, on a full examination, that to this rule no exception has in any case been made.

As to certain of the stars, some annotations are desirable in order to reconcile or to point out doubts and uncertainties which exist; but to have worked up the available materials exhaustively would have required more time and more space than was at my command. Many such annotations will be found in the 3 works already so often cited—the *Harvard Photometry*, the *Uranometria Oxoniensis*, and the *Uranometria Argentina*—and the reader desirous of pursuing the matter in detail must consult those works.

1. ANDROMEDA.

Fr. **Andromède**; *Germ.* **Andromeda.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation		0 40	+38
Approximate Boundaries, 1900.	Preceding	23 0	
	Following	2 25	
	North		+55
	South		+20

Andromeda is one of the largest and most important constellations in the Northern hemisphere.

It comprises the following conspicuous stars :—

	Mag.		Mag.
α (Alpheratz) ...	2·1	ν	3·7
β (Mirach)	2·2	ο	3·8
γ (Almaac)	2·2	μ	3·9
δ	3·4		

It includes also 30 stars between mags. 4—5·2, and is rich in telescopic objects of interest and importance.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	ο	1	8023	4073	22 56·4	+41 41	3·8 : 3·7
2	...	2	8028	4076	22 57·1	+42 7	5·1 : 5·2
3	...	3	8036	4079	22 58·8	+49 24	4·9 : 4·9
4	...	7	8082	4104	23 7·1	+48 45	4·7 : 4·9
5	...	8	8114	4120	23 12·2	+48 22	4·9 : 5·0
6	λ	16	8224	4174	23 31·7	+45 48	4·0 : 3·7
7	ι	17	8229	4176	23 32·3	+42 36	4·3 : 4·5
8	κ	19	8237	4183	23 34·5	+43 40	4·4 : 4·3
9	ψ	20	8261	4197	23 40·1	+45 45	5·0 : 5·0
10	α	21	4	5	0 2·2	+28 26	2·1 : 2·0
11	...	22	16	13	0 4·1	+45 24	4·9 : 5·0
12	θ	24	52	40	0 10·8	+38 1	4·3 : 4·4
13	σ	25	58	42	0 12·0	+36 7	4·6 : 4·4
14	π	29	155	83	0 30·5	+33 4	4·4 : 4·2
15	ε	30	164	90	0 32·2	+28 40	4·6 : 4·3

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
16	δ	31	166	92	0 32·9	+30 12	3·4 : 3·2
17	ζ	34	215	119	0 41·0	+23 37	4·4 : 4·1
18	ν	35	227	127	0 43·2	+40 26	4·4 : 4·6
19	μ	37	259	148	0 50·1	+37 51	3·9 : 4·0
20	η	38	264	150	0 50·8	+22 47	4·6 : 4·4
21	φ	42	330	182	1 2·5	+46 36	4·3 : 4·4
22	β	43	334	185	1 3·0	+34 59	2·2 : 2·2
23	ξ	46	404	214	1 15·3	+44 54	4·9 : 5·2
24	ω	48	432	228	1 20·5	+44 47	4·8 : 4·9
25	A	49	441	234	1 22·9	+46 23	5·2 : 5·4
26	...	50	480	248	1 29·7	+40 48	4·2 : 4·2
27	υ	51	487	251	1 30·6	+48 1	3·7 : 3·8
28	χ	52	492	254	1 32·6	+43 46	5·1 : 5·2
29	τ	53	502	259	1 33·6	+39 58	4·9 : 5·0
30	...	...	510	261	1 34·5	+42 1	5·2 : 5·4
31	...	54	522	269	1 36·1	+50 5	4·2 : 4·3
32	γ	57	628	324	1 56·5	+41 45	2·2 : 2·1
33	...	58	649	334	2 1·3	+37 18	4·8 : 5·1
34	...	...	100	59	0 21·8	+43 44	5·2 : 5·4
35	b	60	676	349	2 5·8	+43 40	5·1 : 5·1
36	c	62	706	364	2 11·5	+46 49	5·2 : 5·4
37	...	65	735	381	2 17·7	+49 44	4·9 : 5·1

Fl. 11 (5·3); Fl. 14 (5·3); Fl. 15 (5·5); Fl. 18 (5·3); ρ (5·3); Fl. 28 (5·3); B.A.C. 152 (5·4); Fl. 36 (5·4); Fl. 41 (5·3); Fl. 47 (5·5); Fl. 64 (5·5).

2. ANTLIA PNEUMATICA.

Fr. La Machine Pneumatique; *Germ.* Die Luftpumpe.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation		10 0	−35
Approximate Boundaries, 1900.	Preceding	9 25	
	Following	11 20	
	North		−25
	South		−40

This is a small constellation destitute of conspicuous stars, the largest, α, being only of mag. 4·5. There are only 2 others which are brighter than mag. 5·2. It lies immediately to the N. of Argo, to which constellation its stars are sometimes regarded as belonging.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	Magnitude. Oxford.
					h. m.	° ′		
1	ϵ	...	3244	A 2	9 24·3	— 35 25	5·0	
2	θ	...	3332	1746	9 38·9	— 27 13	4·9	
3	α	...	3578	1842	10 21·7	— 30 27	4·5	

η (5·6); Lac. 4234 (5·8); Lac. 4278 (5·7); δ (6·0); Lac. 4358 (5·9); Lac. 4415 (5·9); Lac. 4483 (5·8); Lac. 4527 (5·1); Lac. 4580 (5·8).

3. APUS.

Fr. **L'oiseau de Paradis**; *Germ.* **Der Paradiesvogel.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	15 30	−76
Approximate Boundaries, 1900.	Preceding	13 0	
	Following	17 30	
	North		−70
	South		−84

Apus is a small southern constellation with only one star (α) as bright as mag. 3·9, though it has 7 of mags. 4—5½.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	Magnitude. Oxford.
					h. m.	° ′		
1	θ	...	4660	A 4	13 53·7	— 76 13	5½	
2	η	...	4692	A 6	14 3·3	— 80 26	5·3	
3	ϵ	...	4712	A 9	14 8·1	— 79 33	5·5	
4	α	...	4833	A 14	14 33·0	— 78 32	4·0	
5	δ	...	5339	A 40–1	16 2·5	— 78 23	4·6	
6	γ	...	5439	A 44	16 15·0	— 78 38	3·9	
7	β	...	5510	A 47	16 26·0	— 77 16	4·5	
8	ζ	...	5810	A 60	17 9·5	— 67 39	5·4	

κ^1 (5·8); κ^2 (5·9); δ^1 (5·2); δ^2 (5·5); ι (5·8).

4. AQUARIUS.

Fr. **Le Verseau;** *Germ.* **Der Wassermann.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	22 20	13
Approximate Boundaries, 1900.	Preceding	20 35	
	Following	23 50	
	North		+ 1
	South		− 25

The two brightest stars, β and α, are only of mags. 3·1 and 3·2 respectively, but of stars between 4—5·2 mags. there are an unusual number (30), and many interesting telescopic objects. The principal stars are the following:—

	Mag.		Mag.
β	3·1	c^2	3·6
α	3·2	ϵ	3·8
δ	3·4	ζ	3·8

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	ϵ	2	7196	3647	20 41·2	— 9 56	3·8
2	...	3	7201	3649	20 41·4	— 5 28	4·6 : 4·8
3	μ	6	7239	3666	20 46·2	— 9 26	4·8 : 4·9
4	ν	13	7344	3723	21 3·1	— 11 51	4·6
5	β	22	7478	3795	21 25·2	— 6 6	3·1 : 3·1
6	ξ	23	7514	3811	21 31·4	— 8 24	4·8 : 4·7
7	o	31	7672	3889	21 57·1	— 2 44	4·7 : 4·6
8	...	32	7685	3896	21 58·6	— 1 29	5·2 : 5·6
9	α	34	7688	3899	21 59·6	— 0 54	3·2 : 3·0
10	ι	33	7691	3901	22 0·0	— 14 27	4·3
11	θ	43	7773	3940	22 10·5	— 8 23	4·3 : 4·4
12	γ	48	7795	3950	22 15·5	— 1 59	4·1 : 4·0
13	π	52	7814	3960	22 19·1	+ 0 46	4·6 : 4·8
14	ζ	55	7832	3970–1	22 22·7	— 0 38	$3{\cdot}8\begin{Bmatrix}4{\cdot}7\\4{\cdot}5\end{Bmatrix}3{\cdot}7$
15	σ	57	7840	3978	22 24·2	— 11 18	4·8

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
16	v	59	7864	3991	22 28·1	— 21 19	5·2
17	η	62	7868	3994	22 29·2	— 0 44	4·2 : 4·1
18	g	66	7922	4018	22 37·1	— 19 28	4·8
19	τ^2	71	7954	4031	22 43·2	— 14 14	4·1
20	λ	73	7970	4040	22 46·4	— 8 13	3·8 : 3·8
21	δ	76	7980	4047	22 48·3	— 16 28	3·4
22	c^1	86	8047	4083	23 0·2	— 24 23	4·8
23	c^2	88	8062	4093	23 3·1	— 21 49	3·6
24	c^3	89	8069	4096	23 3·5	— 23 6	4·9
25	ϕ	90	8085	4106	23 8·1	— 6 41	4·2 : 4·3
26	ψ^1	91	8095	4109	23 9·6	— 9 44	4·5
27	χ	92	8102	4113	23 10·7	— 8 22	5·2 : 5·5
28	ψ^2	93	8109	4119	23 11·7	— 9 50	4·5
29	ψ^3	95	8116	4124	23 12·7	— 10 16	5·1
30	...	94	8117	4125	23 12·8	— 14 7	5·2
31	b^1	98	8144	4139	23 16·7	— 20 45	4·1
32	b^2	99	8161	4145	23 19·7	— 21 18	4·4
33	b^4	101	8202	4157	23 27·0	— 21 34	4·7
34	ω^1	102	8232	4178	23 33·6	— 14 53	5·2
35	A^2	104	8242	4187	23 35·5	— 18 29	4·8
36	ω^2	105	8246	4190	23 36·5	— 15 12	4·7

Fl. 1 (5·4); Fl. 5 (5·5); Fl. 18 (5·4); *d* (5·4); *e* (5·4); Fl. 41 (5·5); ρ (5·4); Fl. 47 (5·4); *k* (5·5); Fl. 38 (5·5); Fl. 68 (5·5); *h* (5·4); Fl. 97 (5·3); H.P. 4189 (5·5); i^1 (5·3); i^2 (5·4); Fl. 108 (5·3).

5. AQUILA, [with ANTINOUS].

Fr. **L'Aigle;** *Germ.* **Der Adler mit dem Antinous.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	19 30	+ 2
Approximate Boundaries, 1900.	Preceding	18 40	
	Following	20 25	
	North		+ 16
	South		— 12

Aquila is but a small constellation; it is, however, rich in large stars and double stars. The conspicuous stars are:—

	Mag.		Mag.
α (Altair)	1·0	δ	3·5
γ	2·8	λ	3·6
ζ	3·1	η	3·9
θ	3·4		

There are 21 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	4	6379	3158	18 32·8	+ 1 56	5·1 : 5·0
2	...	...	...	3227	18 52·9	+17 12	5·2 : 5·0
3	...	11	6483	3229	18 53·6	+13 28	5·2 : 5·2
4	ε	13	6487	3231	18 54·2	+14 54	4·1 : 3·8
5	...	12	6492	3240	18 55·3	— 5 54	4·0 : 4·0
6	ζ	17	6528	3259	18 59·9	+13 41	3·1 : 3·1
7	λ	16	6526	3260	18 59·9	— 5 4	3·6 : 3·3
8	...	18	6543	3264	19 1·3	+10 53	5·1 : 5·0
9	...	21	6572	3284	19 7·7	+ 2 5	5·2 : 5·2
10	ω	25	6595	3305	19 12·2	+11 23	5·1 : 5·3
11	*f*	26	6614	3315	19 14·1	— 5 38	5·2 : 5·2
12	δ	30	6646	3343	19 19·4	+ 2 53	3·5 : 3·4
13	ν	32	6653	3349	19 20·4	+ 0 6	4·8 : 5·1
14	*e*	36	6679	3360	19 24·4	— 3 2	5·2 : 5·2
15	μ	38	6701	3368	19 28·2	+ 7 8	4·7 : 5·1
16	κ	39	6713	3380	19 30·4	— 7 18	4·9 : 5·0
17	ι	41	6715	3381	19 30·5	— 1 33	4·3 : 4·5
18	σ	44	6729	3394	19 33·3	+ 5 8	5·0 : 4·9
19	γ	50	6772	3418	19 40·6	+10 19	2·8 : 2·8
20	α	53	6802	3429	19 44·9	+ 8 33	1·0 : 1·0
21	ο	54	6805	3432	19 45·3	+10 7	5·2 : 5·1
22	η	55	6811	3436	19 46·4	+ 0 42	3·9 : 4·2
23	ξ	59	6825	3444	19 48·5	+ 8 9	4·9 : 4·9
24	β	60	6833	3450	19 49·4	+ 6 6	4·0 : 3·7
25	θ	65	6934	3514	20 5·1	— 1 11	3·4 : 3·3

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
26	ρ	67	6952	3523	20 8·7	+ 14 50	5·1 : 5·1
27	...	69	7058	3580	20 23·4	− 3 17	5·2 : 5·2
28	...	71	7122	3608	20 32·1	− 1 31	4·4 : 4·6

g (5·5); Fl. 19 (5·3); Fl. 20 (5·3); H.P. 3293 (5·5); Fl. 22 (5·4); H.P. 3298 (5·4); Fl. 23 (5·4); A (5·4); *b* (5·3); Fl. 37 (5·3); Fl. 45 (5·5); χ (5·4); υ (5·8); π (5·7); Fl. 57 (5·3); φ (5·4); τ (5·6); B.A.C. 7014 (5·4); Fl. 70 (5·3).

6. ARA.

Fr. **L'Autel;** *Germ.* **Der Altar.**

			R.A. h. m.	Decl. °
Meridional Centre of Constellation		... ...	16 50	−55
Approximate Boundaries, 1900.	Preceding	... ...	16 10	
	Following	... ...	18 0	
	North	... ...		−46
	South	... ...		−66

Ara is a constellation small in size, but nevertheless possessed of a number of important stars. The chief of these are:—

	Mag.		Mag.
β	2·8	δ	3·7
α	2·9	η	3·8
ζ	3·2	θ	3·9
γ	3·6		

Of stars between 4—5½ mags. there is but 1, a remarkable disproportion.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	η	...	5609	A 13	16 39·4	− 58 49	3·8
2	ζ	...	5683	A 23	16 48·7	− 55 48	3·2
3	ε¹	...	5697	A 25	16 50·0	− 52 59	4·2
4	γ	...	5850	A 50	17 15·3	− 56 16	3·6
5	β	...	5852	A 51	17 15·3	− 55 25	2·8

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
6	δ	...	5877	A 60	17 20·3	—60 35	3·7
7	α	...	5899	A 62	17 22·6	—49 47	2·9
8	θ	...	6105	A 84	17 57·3	—50 6	3·9

Lac. 6824 (5·8); Lac. 6912 (5·6); ϵ^2 (5·9); ι (5·8); κ^1 (5·8); σ (5·5); π (5·8); λ (5·6); μ (5·7).

7. ARGO.

Fr. **Le Navire Argo**; *Germ.* **Das Schiff Argo.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	8 0	—40
Approximate Boundaries, 1900.	Preceding	6 20	
	Following	11 0	
	North		— 9
	South		—70

The constellation Argo in consequence of its great size has been by common consent divided into four divisions, respectively called Carina, Malus, Puppis and Vela, to which some add a fifth, Pyxis Nautica, a part of Malus. But for star-gazing purposes it is preferable to regard the constellation as one whole. The conspicuous stars are:—

	Mag.		Mag.
α (Canopus) ...	0·4	ρ	2·9
β	2·0	γ	3·0
ε	2·1	τ	3·2
δ	2·2	υ	3·3
ι	2·5	ξ	3·4
ζ	2·5	ν	3·5
λ	2·5	σ	3·5
κ	2·7	ω	3·6
π	2·7	χ	3·7
θ	2·9	ψ	3·7
μ	2·9	φ	3 9

These will be found scattered all over the constellation. The first-named, Canopus, is the second brightest star in the heavens, being but slightly inferior to Sirius, which it precedes by only 18^m in R.A. The Milky Way runs through the main part of Argo.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	α	...	2096	A 7 C.	6 21·3	—52 38	0·4
2	ν	...	2188	A 20 P.	6 34·1	—43 4	3·5
3	τ	...	2256	A 39 P.	6 47·0	—50 28	3·2
4	π	...	2414	A 82 P.	7 12·9	—36 53	2·7
5	σ	...	2482	A 99 P.	7 25·4	—43 4	3·5
6	ξ	7	2602	1474	7 44·3	—24 34	3·4
7	χ	...	2665	A 65 C.	7 53·7	—52 39	3·7
8	ζ	...	2710	A 248 P.	7 59·4	—39 40	2·5
9	ρ	15	2728	1515	8 2·4	—23 58	2·9
10	γ	...	2755	A 9 V.	8 5·8	—46 59	3·0
11	ε	...	2832	A 89 C.	8 20·1	—59 7	2·1
12	ο	...	2950	A 56 V.	8 36·9	—52 29	4·0
13	δ	...	2979	A 65 V.	8 41·4	—54 16	2·2
14	λ	...	3126	A 100 V.	9 3·6	—42 57	2·5
15	β	...	3177	A 123 C.	9 11·9	—69 14	2·0
16	ι	...	3186	A 127 C.	9 13·9	—58 46	2·5
17	κ	...	3213	A 129 V.	9 18·4	—54 30	2·7
18	ψ	...	3257	A 140 V.	9 26·0	—39 57	3·7
19	υ	...	3365	A 160 C.	9 44·1	—64 31	3·3
20	φ	...	3410	A 171 V.	9 52·7	—54 0	3·9
21	ω	...	3516	A 185 C.	10 10·9	—69 26	3·6
22	θ	...	3686	A 223 C.	10 38·7	—63 46	2·9
23	η	...	3695	A 231 C.	10 40·4	—59 3	Var.
24	μ	...	3702	A 229 V.	10 41·6	—48 47	2·9

(i.) Carina.

		R.A.	Decl.
		h. m.	°
Meridional Centre of the sub-division	...	8 40	−62
Approximate Boundaries, 1900.	Preceding	6 20	
	Following	11 0	
	North		−53
	South		−70

The bright stars appropriated to Carina are:—

	Mag.		Mag.
q	3·3	*a*	3·8
p	3·6	*l*	$3\frac{3}{4}$ var.

There are 30 stars between 4—$5\frac{1}{2}$ mags.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R. A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	...	2176	A 11	6 32·3	—52 52	4·8
2	B	...	2259	A 18	6 47·2	—53 29	4·8
3	Q	...	2524	A 50	7 32·7	—52 16	5·5
4	...	...	2694	A 73	7 57·5	—60 15	5·5
5	D¹	...	2713	A 77	7 58·8	—63 14	5·2
6	B²	...	2770	A 82	8 7·0	—60 56	5·3
7	*e*	...	2921	A 96	8 32·5	—57 35	5·4
8	*d*	...	2962	A 99	8 38·0	—59 19	4·7
9	*f*	...	2998	A 103	8 43·6	—56 19	5·1
10	C	...	3064	A 108	8 52·3	—60 11	4·0
11	*b*¹	...	3073	A 109	8 54·0	—58 46	5·4
12	E	...	3134	A 115	9 4·6	—70 3	5·2
13	G	...	3136	A 116	9 4·8	—72 8	4·8
14	*a*	...	3149	A 117	9 7·8	—59 29	3·8
15	*i*	...	3152	A 119	9 8·6	—61 50	4·3
16	*g*	...	3179	A 125	9 12·8	—57 2	4·5
17	*k*	...	3212	A 132	9 18·0	—61 53	5·5
18	*h*	...	3289	A 147	9 29·0	—58 42	4·9
19	*m*	...	3320	A 150	9 36·0	—60 47	5·1
20	*l*	...	3353	A 157	9 41·9	—61 57	$3\frac{3}{4}$ Var.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
21	*q*	...	3526	A 187	10 13·1	−60 44	3·3
22	L	...	3564	A 191	10 19·4	−66 17	5·4
23	I	...	3585	A 193	10 22·0	−73 25	4·3
24	*s*	...	3594	A 196	10 23·5	−58 8	4·6
25	K	...	3617	A 202	10 27·3	−71 22	5·0
26	*p*	...	3619	A 203	10 27·8	−61 4	3·6
27	*r*	...	3635	A 208	10 30·9	−56 56	5·3
28	t^1	...	3642	A 210	10 31·8	−58 56	5·5
29	t^2	...	3655	A 213	10 34·2	−58 34	5·2
30	...	...	3688	A 224	10 39·0	−59 56	5·2
31	*u*	...	3740	A 246	10 48·6	−58 13	4·1
32	z^1	...	3805	A 257	11 1·6	−61 46	5·3
33	*x*	...	3818	A 260	11 3·5	−58 19	4·6
34	*y*	...	3835	A 263	11 7·5	−59 39	5·2

Lac. 2601 (5·8); Lac. 2642 (5·7); Lac. 2783 (5·9); Lac. 2829 (5·7); Lac. 3046 (5·9); Lac. 3275 (5·7); b^2 (5·7); Lac. 3846 (5·7); H (5·9); 2871 Brisb. (5·7); M (5·7); Lac. 4367 (5·6); Lac. 4375 (5·7); Lac. 4440 (5·7); Lac. 4455 (5·6); Lac. 4475 (5·8); Lac. 4657 (5·7).

(ii.) **Malus, with Pyxis Nautica.**

		R.A. h. m.	Decl. °
Meridional Centre of sub-division	... ...	9 0	−30
Approximate Boundaries, 1900.	Preceding	8 20	
	Following	9 20	
	North		−21
	South		−38

Some of the stars usually allotted to Malus were by Lacaille formed into a small sub-constellation by themselves and designated Pyxis Nautica, the Mariner's Compass, but this has not been so generally accepted as all Lacaille's other designations. The only bright star appropriated to Malus is *a* of mag. 3·6. There are 9 stars between 4—5½ mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	*g*	...	2916	1590	8 32·7	— 25 50	5·0
2	...	...	...	1593	8 33·9	— 22 16	5·1
3	*f*	...	2932	1595	8 34·7	— 29 8	4·9
4	*b*	...	2935	A 22 Pyx.	8 35·4	— 34 53	4·4
5	*a*	...	2964	1604	8 39·2	— 32 45	3·6
6	*c*	...	3010	1621	8 45·4	— 27 16	4·3
7	*d*	...	3051	1633	8 50·4	— 27 13	4·8
8	...	...	3121	1663	9 2·8	— 25 22	4·8
9	*h*	...	3195	1690	9 16·2	— 25 27	4·9
10	...	...	3207	1693	9 18·0	— 28 19	4·9

B.A.C. 2868 (5·4); Lac. 3549 (5·8); B.A.C. 3130 (5·4).

(iii.) **Puppis.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of sub-division	... ...	7 40	−32
Approximate Boundaries, 1900.	Preceding	6 20	
	Following	8 20	
	North		−11
	South		−50

The only bright star appropriated to Puppis is *c* of mag. 3·6. There are 52 stars between 4—5½ mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	...	1933	A 66 Col.	5 55·5	— 42 49	4·0
2	Z	...	2137	A 16	6 26·8	— 50 9	5·5
3	V	...	2193	A 21	6 35·5	— 48 6	5·3
4	*x*	...	2231	A 31	6 43·3	— 37 48	5·3
5	X	...	...	A 38	6 46·5	— 46 29	5·4
6	...	...	2289	A 47	6 53·0	— 48 33	5·5
7	*t*	...	2295	A 49	6 54·0	— 33 57	5·4
8	C	...	2327	A 59	7 0·3	— 42 10	5·5
9	H	...	2332	A 61	7 0·8	— 49 24	5·3
10	A	...	2355	A 67	7 4·8	— 39 28	5·3

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
11	I	...	2389	A 71	7 9·1	−46 34	4·8
12	L¹	...	2392	A 72	7 9·7	−44 50	5·3
13	...	..	2404	A 78	7 11·3	−48 3	5·0
14	...	...	2422	A 83	7 14·0	−36 30	5·3
15	...	...	2425	A 84	7 14·4	−36 31	5·4
16	...	...	...	1416	7 24·8	−22 46	4·8
17	...	...	2484	1420	7 26·0	−30 43	4·8
18	...	...	...	1429	7 28·3	−14 16	5·0
19	...	...	...	1431	7 29·0	−22 2	4·5
20	n^1	...	2497	1432	7 29·3	−23 13	5·2
21	*p*	...	2508	1433	7 30·6	−28 6	4·4
22	*f*	...	2523	A 127	7 32·9	−34 42	4·8
23	*m*	...	2525	1443	7 33·3	−25 6	4·3
24	k^1	...	2530	1445	7 33·9	−26 32	4·6
25	k^2	...	2531	1446	7 33·9	−26 32	4·6
26	...	...	2538	1447	7 34·9	−14 59	5·2
27	d^1	...	2543	A 143	7 35·2	−38 1	5·4
28	...	1	2560	1461	7 38·7	−28 7	5·0
29	...	3	2562	1462	7 39·0	−28 40	4·2
30	...	4	2573	1469	7 40·4	−14 16	5·2
31	*c*	...	2580	A 175	7 41·0	−37 41	3·6
32	*o*	...	2594	1472	7 43·1	−25 38	4·7
33	Q	...	2611	A 196	7 44·8	−46 46	5·1
34	P	...	2620	A 199	7 45·6	−46 4	4·3
35	...	9	2622	1482	7 46·2	−13 35	5·5
36	*a*	...	2634	A 213	7 48·1	−40 16	4·0
37	*b*	...	2635	A 214	7 48·4	−38 33	4·9
38	...	...	2642	A 216	7 49·7	−49 18	5·0
39	R	...	2644	A 218	7 49·8	−47 47	4·5
40	...	11	2652	1492	7 51·7	−22 33	4·3
41	...	...	2655	1496	7 52·9	−30 1	4·8
42	...	12	2662	1500	7 53·9	−22 59	5·2
43	...	...	2666	1501	7 54·5	−18 4	4·6

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
44	...	...	...	A 233	7 54·8	−48 55	5·0
45	...	...	2723	1514	8 2·0	−20 12	5·0
46	...	16	2736	1518	8 3·7	−18 54	4·2
47	...	19	2750	1524	8 5·6	−12 34	4·6
48	h^1	...	2762	A 267	8 7·0	−39 15	4·8
49	...	20	2769	1529	8 7·8	−15 26	5·1
50	*r*	...	2774	A 274	8 8·0	−35 42	5·3
51	...	...	2777	A 276–7	8 9·5	−35 58·0	5·4
52	h^2	...	2780	A 279	8 9·8	−39 59	4·8
53	*q*	...	2795	A 289	8 14·1	−36 16	4·7

Lac. 3163 (5·7); Lac. 2137 (5·8); G (5·9); Lac. 2608 (5·8); Lac. 2673 (5·6); E (5·7); Lac. 2714 (5·6); F (5·8); *s* (5·4, H.P. 1396); Lac. 2773 (5·8); Lac. 2793 (5·6); H.P. 1410 (5·4); *y* (5·9); B.A.C. 2565 (5·4); W (5·7); Lac. 2950 (5·6); Lac. 2945 (5·7); Fl. 5 (5·4); Lac. 2991 (5·9); Lac. 3003 (5·9); Lac. 3035 (5·7); N (5·7); O (5·6); Lac. 3103 (5·9); Lac. 3131 (5·8); Lac. 3197 (5·3); H.P. 1542 (5·4); *w* (5·7); H.P. 1555 (5·5); B.A.C. 2827 (5·5).

(iv.) Vela.

			R.A. h. m.	Decl. °
Meridional Centre of sub-division		... ...	9 30	−45
Approximate Boundaries, 1900.	Preceding	... ...	8 0	
	Following	... ...	11 0	
	North	... ...		−38
	South	... ...		−57

The only bright star appropriated to Vela is N, of mag. 3·2. There are 27 stars between 4—5½ mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	...	2642	A 216 P.	7 49·7	−49 18	5·0
2	...	...	2670	A 233 P.	7 54·8	−48 55	5·0
3	B	...	2823	A 26	8 18·8	−48 6	5·4
4	...	...	2866	A 34	8 25·4	−44 19	5·5
5	*e*	...	2926	A 48	8 33·4	−42 34	4·6

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	Magnitude. Oxford.
					h. m.	° ′		
6	*b*	...	2947	A 53	8 36·7	−46 13	4·1	
7	...	...	2955	A 58	8 37·3	−46 53	5·2	
8	*d*	...	2973	A 64	8 40·1	−42 13	4·4	
9	*a*	...	2981	A 66	8 42·0	−45 36	4·1	
10	H	...	3066	A 88	8 52·7	−52 15	5·4	
11	...	...	3081	A 91	8 55·6	−40 47	5·2	
12	*c*	...	3110	A 97	9 0·0	−46 37	4·6	
13	*l*	...	3163	A 115	9 10·9	−38 4	5·5	
14	k^2	...	3165	A 117	9 10·9	−36 54	5·1	
15	N	...	3269	A 144	9 27·6	−56 30	3·2	
16	L	...	3280	A 146	9 30·0	−50 43	5·5	
17	M	...	3300	A 148	9 32·6	−48 49	4·9	
18	*m*	...	3382	A 163	9 47·2	−45 59	4·8	
19	Q	...	3472	A 186	10 4·4	−51 13	5·3	
20	*q*	...	3509	A 191	10 9·7	−41 32	4·0	
21	V	...	3536	A 201	10 15·1	−54 25	5·4	
22	T	...	3546	A 203	10 16·4	−55 26	5·0	
23	*r*	...	3552	A 204	10 17·2	−41 3	5·3	
24	P	...	3589	A 195 C.	10 23·0	−57 1	5·4	
25	*s*	...	3613	A 216–7	10 26·8	−44 27	5·4	
26	*p*	...	3644	A 222	10 32·2	−47 36	4·1	
27	X	...	3658	A 225	10 34·5	−54 58	4·8	
28	*i*	...	3772	A 239	10 54·6	−41 34	4·5	

Lac. 3180 (5·9); Lac. 3187 (5·9); Lac. 3228 (5·8); Lac. 3337 (5·7); F (5·7); C (5·6); Lac. 3486 (5·9); Lac. 3492 (5·9); D (5·8); *g* (5·7); *f* (5·6); Lac. 3596 (5·8); Lac. 3635 (5·9); Lac. 3667 (5·9); Lac. 3723 (5·6); *z* (5·9); Lac. 3764 (5·6); Lac. 3765 (5·8); Lac. 3786 (5·8); I (5·8); Lac. 3894 (5·9); 3917 (5·6); O (5·8); *u* (5·6); Gilliss 1186 (5·7); Lac. 4206 (5·8); Lac. 4336 (5·6); *t* (5·6); Lac. 4648 (5·8).

8. ARIES.

Fr. Le Bélier; *Germ.* Der Widder.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	2 30	+ 20
Approximate Boundaries, 1900.	Preceding	1 40	
	Following	3 20	
	North		+ 30
	South		+ 10

In the head of Aries there are 3 stars which serve to indicate the position of the constellation, but otherwise it offers to the naked eye nothing to attract notice. These 3 stars are:—

		Mag.
α	... ...	2·0
β	... ...	2·8
γ	... ...	4·1

41 Arietis is of mag. 3·8, and besides γ there are 13 stars between 4—5·2 mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude Harv. or Arg.	:	Magnitude Oxford.
					h. m.	° ′			
1	γ^1	5	572	291	1 46·9	+ 18 42	5·0	:	4·1
2	γ^2	5	573	292	1 46·9	+ 18 42	5·1		
3	β	6	577	295	1 48·0	+ 20 13	2·8	:	2·7
4	ι	8	592	299	1 50·8	+ 17 14	5·2	:	5·2
5	λ	9	593	303	1 51·1	+ 23 1	4·9	:	4·9
6	κ	12	644	332	1 59·8	+ 22 5	5·2	:	5·3
7	α	13	648	333	2 0·4	+ 22 54	2·0	:	2·1
8	...	14	657	337	2 2·6	+ 25 23	5·1	:	5·0
9	...	35	831	432	2 36·4	+ 27 12	4·7	:	4·5
10	...	38	844	435	2 38·4	+ 11 57	5·2	:	5·4
11	...	39	861	439	2 40·8	+ 28 45	4·6	:	5·1
12	...	41	872	445	2 42·9	+ 26 46	3·8	:	3·6
13	ε	48	921	472	2 52·4	+ 20 52	4·6	:	4·2
14	δ	57	986	505	3 4·8	+ 19 16	4·5	:	4·5
15	ζ	58	999	515	3 8·0	+ 20 56	4·9	:	4·8

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
16	...	...	1025	528	3 13·1	+28 37	4·7 : 4·8
17	τ^1	61	1034	535	3 14·3	+20 43	5·2 : 5·4
18	τ^2	63	1045	542	3 15·8	+20 19	5·2 : 5·4

η (5·4); θ (5·6); ξ (5·4); ν (5·4); Fl. 33 (5·4); μ (5·8); o (5·8); σ (5·5); ρ (5·5); Fl. 55 (5·5); Fl. 56 (5·5).

9. AURIGA.

Fr. **Le Cocher;** *Germ.* **Der Fuhrmann.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	6 0	+42
Approximate Boundaries, 1900.	Preceding	4 40	
	Following	7 20	
	North		+57
	South		+27

Auriga is a constellation of large extent and with one star in particular, Capella, which in the absence of all others would suffice to make the constellation conspicuous. The chief stars are:—

	Mag.		Mag.
α (Capella) ...	0·2	ϵ	3·2
β	2·1	η	3·3
θ	2·7	δ	3·8
ι	2·7		

There are 28 stars between 4—5·2 mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	1	1476	835	4 41·8	+37 17	5·2 : 5·3
2	...	2	1492	844	4 44·6	+36 31	5·0 : 5·0
3	ι	3	1520	862	4 49·2	+32 58	2·7 : 2·9
4	...	4	1530	873	4 51·1	+37 42	5·1 : 5·3
5	ϵ	7	1540	877	4 53·4	+43 39	3·2 : 3·6
6	ζ	8	1541	879	4 54·1	+40 54	4·0 : 3·8
7	...	9	1554	891	4 57·3	+51 26	4·9 : 5·1

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
8	η	10	1558	896	4 58·1	+ 41 4	3·3 : 3·5
9	μ	11	1602	922	5 5·2	+ 38 20	4·9 : 5·1
10	...	14	1614	930	5 7·6	+ 32 33	5·2 : 5·3
11	α	13	1613	932	5 7·8	+ 45 52	0·2 : 0·1
12	...	16	1627	942	5 10·3	+ 33 15	5·0 : 5·0
13	λ	15	1631	944	5 10·7	+ 40 0	5·0 : 5·0
14	...	19	1636	949	5 12·1	+ 33 50	5·1 : 5·4
15	ρ	20	1645	954	5 13·4	+ 41 41	5·1 : 5·4
16	σ	21	1663	965	5 16·5	+ 37 16	5·2 : 5·4
17	χ	25	1723	1001	5 24·6	+ 32 6	5·0 : 5·1
18	τ	29	1830	1063	5 40·9	+ 39 8	4·6 : 4·8
19	υ	31	1844	1072	5 43·0	+ 37 16	5·2 : 5·1
20	ν	32	1845	1073	5 43·2	+ 39 7	4·2 : 4·2
21	ξ	30	1854	1079	5 44·8	+ 55 41	5·0 : 5·0
22	δ	33	1885	1093	5 49·6	+ 54 16	3·3 : 4·0
23	β	34	1895	1100	5 50·7	+ 44 57	2·1 : 1·9
24	π	35	1897	1102	5 51·0	+ 45 56	4·5 : 4·7
25	θ	37	1900	1104	5 51·5	+ 37 12	2·7 : 3·0
26	κ	44	2001	1161	6 7·7	+ 29 32	4·5 : 4·8
27	ψ^1	46	2044	1193	6 15·7	+ 49 21	5·0 : 5·2
28	...	48	2082	1211	6 20·9	+ 30 34	5·2 : 5·5
29	...	49	2133	2239	6 27·7	+ 28 7	4·9 : 4·9
30	ψ^3	52	2156	1245	6 30·5	+ 40 0	5·1 : 5·3
31	ψ^2	50	2159	1247	6 30·8	+ 42 36	5·2 : 5·1
32	ψ^4	55	2182	1255	6 34·4	+ 44 39	5·2 : 5·2
33	ψ^7	58	2223	1287	6 42·3	+ 41 56	5·0 : 5·1
34	ψ^{10}	16	2261	1310	6 48·9	+ 45 17	4·7 : 5·0
35	...	63	2338	1348	7 3·4	+ 39 31	5·2 : 5·0

H.P. 843 (5·5); B.A.C. 1632 (5·3); H.P. 947 (5·3); H.P. 958 (5·5); φ (5·3); ο (5·4); Fl. 36 (5·5); Fl. 40 (5·3); Fl. 45 (5·5); Fl. 53 (5·5); ψ^5 (5·4); ψ^6 (5·3); H.P. 1274 (5·3); ψ^8 (5·4); ψ^9 (5·9); Fl. 65 (5·3); Fl. 66 (5·3).

10. BOÖTES.

Fr. Le Bouvier; *Germ.* Bootes.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	14 35	+30
Approximate Boundaries, 1900.	Preceding	13 40	
	Following	15 20	
	North		+55
	South		+ 6

Boötes is one of the largest and most important of the Northern constellations, and possesses in Arcturus one of the most brilliant, perhaps the most brilliant, of the Northern stars, its rivals being Capella (α Aurigæ) and Vega (α Lyræ). Its chief stars are :—

	Mag.		Mag.
α (Arcturus) ...	0·0	δ	3·5
ϵ	2·6	β	3·6
η	2·9	ρ	3·6
γ	3·1	ζ	3·8

There are 28 stars between 4—5·2 mags.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	τ	4	4597	2333	13 41·6	+ 18 3	4·5 : 4·6
2	υ	5	4615	2343	13 43·7	+ 16 24	4·1 : 3·9
3	*e*	6	4618	2344	13 44·0	+ 21 52	5·0 : 4·9
4	η	8	4648	2360	13 49·0	+ 19 0	2·9 : 2·7
5	...	9	4656	2365	13 51·1	+ 28 5	5·1 : 5·0
6	*d*	12	4706	2385	14 4·9	+ 25 40	4·8 : 4·8
7	...	15	4724	2394	14 9·0	+ 10 40	5·2 : 5·4
8	κ	17	4726	2395	14 9·2	+ 52 21	4·4 : 4·5
9	α	16	4729	2400	14 10·2	+ 19 48	0·0 : 0·3
10	λ	19	4741	2403	14 11·8	+ 46 38	4·3 : 4·2
11	ι	21	4742	2404	14 11·9	+ 51 55	4·8 : 4·6
12	A	...	4747	2409	14 13·0	+ 36 4	4·8 : 5·0
13	...	18	4751	2411	14 13·5	+ 13 34	5·2 : 5·2
14	...	20	4753	2413	14 14·1	+ 16 51	4·9 : 4·6
15	...	...	4766	2420	14 17·5	+ 9 0	5·0 : 5·3

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford
					h. m.	° '	
16	...	...	4773	2423	14 18·2	+ 6 22	5·0 : 5·2
17	θ	23	4789	2426	14 21·0	+ 52 24	4·2 : 4·0
18	ρ	25	4808	2433	14 26·7	+ 30 54	3·6 : 3·6
19	γ	27	4812	2436	14 27·2	+ 38 50	3·1 : 3·2
20	σ	28	4823	2442	14 29·5	+ 30 16	4·5 : 4·6
21	π	29	4847	2449	14 35·1	+ 16 56	4·6 : 4·6
22	ζ	30	4849	2452–3	14 35·4	+ 14 15	3·8 {4·8 / 4·4} 3·9
23	...	31	4850	2454	14 35·8	+ 8 41	5·0 : 5·0
24	...	34	4864	2459	14 38·2	+ 27 3	4·9 : 4·8
25	ο	35	4873	2466	14 39·7	+ 17 29	4·8 : 4·6
26	ε	36	4876	2467	14 39·8	+ 27 35	2·6 : 2·5
27	ξ	37	4905	2489	14 45·9	+ 19 36	4·6 : 4·6
28	ω	41	4953	2513	14 56·9	+ 25 29	4·9 : 4·7
29	β	42	4958	2515	14 57·4	+ 40 52	3·6 : 3·6
30	ψ	43	4969	2520	14 59·3	+ 27 25	4·5 : 4·4
31	i	44	4974	2521	14 59·8	+ 48 7	4·9 : 4·6
32	c	45	4981	2527	15 2·0	+ 25 20	5·0 : 5·1
33	δ	49	5036	2541	15 10·7	+ 33 46	3·5 : 3·4
34	μ	51	5084	2561	15 20·0	+ 27 48	4·4 : 4·5
35	ν^1	52	5122	2583	15 26·6	+ 41 14	5·1 : 4·6
36	ν^2	53	5130	2584	15 27·5	+ 41 18	5·0 : 5·0

Fl. 10 (5·3); B.A.C. 4699 (5·5); Fl. 13 (5·5); Fl. 14 (5·5); *f* (5·4); Fl. 33 (5·3); Fl. 39 (5·5); B.A.C. 4906 (5·5); Fl. 40 (5·4); χ (5·3); φ (5·4).

11. CÆLA SCULPTORIS [CÆLUM].

Fr. **Les Burins**; *Germ.* **Der Grabstichel.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	4 40	−42
Approximate Boundaries, 1900.	Preceding	4 20	
	Following	5 10	
	North		−30
	South		−50

Cæla Sculptoris, more generally known as Cælum (a graving tool), is a small Southern constellation the brightest star of which, (α), is only of mag. 4·6, γ being 4·7; and there are 2 others brighter than $5\frac{1}{2}$.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	δ	...	1413	A 7	4 27·2	−45 13	5·0
2	α	...	1458	A 9	4 36·7	−42 6	4·6
3	β	...	1464	A 10	4 37·8	−37 23	5·1
4	γ'	...	1573	A 28	5 0·1	−35 39	4·7

No stars within the limits 5·5 to 5·9.

12. CAMELOPARDUS.

Fr. La Girafe; *Germ.* Die Giraffe.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation		5 40	+70
Approximate Boundaries, 1900.	Preceding	3 0	
	Following	8 0	
	North		+85
	South		+53

Camelopardus is a long straggling constellation with a large number of medium stars (mags. ±4), but no conspicuous ones; the 2 brightest of all (B.A.C. 1058, and β) only attaining to mag. 4·2. Altogether there are 22 stars between 4—5·2 mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	...	1001	516	3 9·5	+65 13	4·8 : 4·7
2	...	...	1058	551	3 19·4	+59 31	4·2 : 4·5
3	...	...	1062	553	3 20·3	+58 28	4·8 : 4·7
4	...	...	1065	557	3 20·9	+55 2	5·0 : 5·1
5	...	...	1111	583	3 31·8	+62 50	5·2 : 5·2
6	...	...	1133	596	3 35·6	+62 58	5·0 : 5·2
7	γ	...	1137	607	3 37·7	+70 58	4·6 : 4·5

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
8	...	...	1144	612	3 38·5	+65 9	4·6 : 4·7
9	...	...	1203	639	3 46·8	+62 43	4·8 : 5·0
10	...	...	1204	641	3 46·9	+60 45	5·1 : 5·2
11	...	...	1237	659	3 54·6	+58 49	4·9 : 5·1
12	...	...	1293	711	4 7·4	+53 18	5·2 : 5·1
13	α	9	1474	836	4 42·1	+66 8	4·4 : 4·5
14	...	7	1504	856	4 47·7	+53 34	4·5 : 4·7
15	β	10	1536	876	4 52·7	+60 16	4·2 : 4·3
16	...	11	1546	885	4 55·7	+58 48	5·1 : 5·2
17	...	...	1565	913	5 2·8	+79 5	5·1 : 5·1
18	...	31	1849	1078	5 44·2	+59 52	5·2 : 5·5
19	...	...	1980	1155	6 5·6	+69 22	4·7 : 4·6
20	...	42	2198	1270	6 38·4	+67 42	4·9 : 4·9
21	...	43	2209	1279	6 40·8	+69 1	5·1 : 5·0
22	...	...	2210	1288	6 42·6	+77 8	4·6 : 4·7

H.P. 598 (5·3); B.A.C. 1300 (5·5); Fl. 1 (5·5); Fl. 2 (5·5); Fl. 3 (5·4); Fl. 4 (5·4); B.A.C. 1549 (5·5); Fl. 16 (5·3); Fl. 37 (5·3); Fl. 36 (5·3); Fl. 40 (5·5); B.A.C. 2095 (5·5); B.A.C. 2326 (5·3); B.A.C. 2590 (5·3); Fl. 55 (5·5); B.A.C. 3528 (5·3).

13. CANCER.

Fr. **Cancre or L'Écrevisse**; *Germ.* **Der Krebs.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	8 30	+20
Approximate Boundaries, 1900.	Preceding	7 50	
	Following	9 20	
	North		+35
	South		+9

Cancer has no more conspicuous star than β of mag. 3·8, but the cluster Præsepe (M 44) will serve to indicate this asterism to the naked-eye observer. There are 14 stars between 4—5·2 mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	6	2672	1505	7 56·0	+28 8	5·0 : 5·1
2	...	8	2690	1507	7 58·4	+13 28	5·1 : 5·1
3	μ	10	2714	1511	8 0·7	+21 56	5·2 : 5·5
4	ζ	16	2744	1521	8 5·3	+18 1	4·7 : 4·9
5	β	17	2778	1533	8 10·0	+ 9 33	3·8 : 3·7
6	χ	18	2786	1536	8 12·8	+27 37	5·1 : 5·2
7	...	...	2822	1553	8 19·5	+ 7 57	5·1 : 5·4
8	γ	43	2937	1597	8 36·3	+21 55	4·8 : 4·9
9	δ	47	2953	1602	8 37·9	+18 36	4·3 : 4·3
10	ι	48	2965	1605	8 39·4	+29 12	4·2 : 4·2
11	ρ^2	58	3026	1626	8 48·5	+28 23	5·2 : 5·3
12	o	62	3047	1634	8 50·6	+15 47	5·2 : 5·5
13	α	65	3055	1639	8 51·9	+12 19	4·3 : 4·4
14	κ	76	3111	1659	9 1·3	+11 9	5·0 : 5·2
15	ξ	77	3117	1661	9 2·5	+22 31	5·2 : 5·2

ω (5·9); ψ (5·8); λ (5·7); ϕ^1 (5·9); ϕ^2 (5·5); θ (5·8); η (5·5); υ^2 (5·9); υ^3 (5·8); ϵ (Præsepe); σ^1 (5·7); σ^2=Fl. 57 (5·5); Fl. 59 (5·5); ν (5·6); τ (5·4); π (5·6).

14. CANES VENATICI.

Fr. **Les Lévriers;** *Germ.* **Die Jagdhunde.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	13 0	+40
Approximate Boundaries, 1900.	Preceding	12 0	
	Following	14 5	
	North		+54
	South		+30

This constellation has but one conspicuous star, α, called also Cor Caroli, of mag. 3. It was this star which, with a few near it, Halley desired to form into a separate constellation to commemorate King Charles II., and even now celestial atlases and globes will sometimes be met with in which this star is placed in the centre of a heart surmounted by a crown. There are 10 stars between 4—5·2 mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	...	4128	2082	12 10·5	+33 44	5·1 : 5·1
2	...	5	4180	2102	12 18·2	+52 12	5·0 : 5·2
3	β	8	4235	2133	12 28·0	+42 1	4·3 : 4·5
4	α	12	4346	2195	12 50·4	+38 58	3·0 : 3·3
5	...	...	4433	2237	13 8·3	+40 47	5·0 : 5·0
6	...	20	4451	2248	13 12·2	+41 12	4·7 : 4·7
7	...	21	4456	2253	13 13·1	+50 19	5·2 : 5·0
8	...	...	4536	2297	13 29·4	+37 48	5·0 : 5·0
9	...	24	4538	2299	13 29·6	+49 38	4·8 : 5·0
10	...	25	4552	2304	13 32·1	+36 54	5·0 : 5·1
11	...	...	4632	2352	13 46·5	+35 2	4·9 : 5·2

Fl. 6 (5·3); B.A.C. 4233 (5·3); Fl. 14 (5·3); B.A.C. 4600 (5·5).

15. CANIS MAJOR.

Fr. **Le Grand Chien;** *Germ.* **Der Grosse Hund.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	6 40	−24
Approximate Boundaries, 1900.	Preceding	6 10	
	Following	7 15	
	North		−10
	South		−35

Canis Major is quite a small constellation as regards its area, but it contains a large number of conspicuous stars, including the brightest of all the stars, Sirius. The following are the important stars:—

	Mag.		Mag.
α (Sirius)	−1·4	ζ	3·0
ε	1·5	o²	3·0
δ	1·8	22	3·5
β	2·0	28	3·7
η	2·4	κ	3·9

Besides these, Canis Major contains 31 stars of mags. 4—5·2, and therefore may be ranked as decidedly a bright constellation.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	Magnitude. Oxford.
					h. m.	° ′		
1	...	...	...	1177	6 10·2	— 13 40	4·8	
2	...	...	...	1183	6 12·4	— 16 46	5·1	
3	...	...	...	1186	6 13·2	— 19 55	5·1	
4	ζ	1	2051	1195	6 15·7	— 30 1	3·0	
5	β	2	2061	1201	6 17·4	— 17 54	2·0	
6	...	3	2066	1203	6 17·7	— 33 22	4·1	
7	λ	...	2109	1222	6 23·7	— 32 30	4·1	
8	ξ^1	4	2132	1235	6 26·9	— 23 19	4·2	
9	ξ^2	5	2160	1242	6 30·0	— 22 52	4·4	
10	ν^2	7	2171	1251	6 31·5	— 19 9	4·2	
11	ν^3	8	2174	1253	6 32·6	— 18 8	4·7	
12	...	...	...	1254	6 33·8	— 14 2	5·0	
13	α	9	2213	1275	6 39·9	— 16 33	— 1·4	+ 1·9
14	...	10	2214	1276	6 39·9	— 30 57	5·2	
15	...	11	2221	1283	6 41·4	— 14 18	4·9	
16	κ	13	2246	1300	6 45·4	— 32 22	3·9	
17	...	...	2252	A37Pup.	6 46·5	— 34 14	5·4	
18	...	15	2263	1308	6 48·4	— 20 5	4·4	
19	θ	14	2264	1309	6 48·1	— 11 53	4·2	
20	o^1	16	2267	1312	6 49·2	— 24 2	4·0	
21	...	19	2272	1315	6 50·4	— 19 59	4·4	
22	μ	18	2273	1316	6 50·6	— 13 53	5·2	
23	...	...	...	1317	6 50·7	— 22 47	5·2	
24	ι	20	2274	1318	6 50·8	— 16 54	4·5	
25	...	...	2281	1320	6 52·6	— 24 29	5·2	
26	ε	21	2293	1325	6 53·9	— 28 48	1·5	
27	...	22	2309	1333	6 56·9	— 27 46	3·5	
28	o^2	24	2318	1337	6 58·0	— 23 40	3·0	
29	γ	23	2319	1340	6 58·3	— 15 27	4·1	
30	...	...	...	1345	7 1·1	— 11 6	5·1	
31	δ	25	2345	1350	7 3·5	— 26 12	1·8	
32	...	27	2388	1368	7 9·4	— 26 9	4·5	
33	...	28	2391	1370	7 9·9	— 26 34	3·7	
34	...	...	...	1372	7 10·8	— 15 23	5·2	
35	...	...	...	1374	7 11·6	— 23 6	4·7	

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
36	...	...	2405	1375	7 11·8	— 27 40	4·9
37	...	29	2417	1380	7 13·7	— 24 20	4·8
38	...	30	2418	1381	7 13·7	— 24 44	4·3
39	...	...	...	1391	7 17·0	— 18 47	4·9
40	...	...	2454	1398	7 19·2	— 15 58	4·9
41	η	31	2458	1399	7 19·4	— 29 4	2·4

H.P. 1190 (5·4); H.P. 1226 (5·3); Lac. 2334 (5·8); Lac. 2341 (5·9); B.A.C. 2162 (5·3); Lac. 2374 (5·7); H.P. 1278 (5·3); H.P. 1282 (5·5); H.P. 1291 (5·3); H.P. 1306 (5·5); B.A.C. 2291 (5·4); H.P. 1358 (5·4); H.P. 1383 (5·4).

16. CANIS MINOR.

Fr. **Le Petit Chien;** *Germ.* **Der Kleine Hund.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	7 30	+ 6
Approximate Boundaries, 1900.	Preceding	7 0	
	Following	8 0	
	North		+ 12
	South		+ 1

Canis Minor will always be readily found by reason of its conspicuous leader Procyon, of mag. 0·5 of the Harvard scale, the Oxford value being substantially the same. The only other important star is β of mag. 3·1, but there are 6 other stars between 4—5·2 mags., which is a high average for so small an asterism.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	ϵ	2	2451	1397	7 19·1	+ 9 31	5·0 : 5·1
2	β	3	2462	1403	7 20·6	+ 8 32	3·1 : 3·1
3	γ	4	2468	1406	7 21·6	+ 9 10	4·6 : 4·8
4	...	6	2473	1413	7 23·1	+ 12 15	5·0 : 4·9
5	δ^1	7	2480	1419	7 25·9	+ 2 10	5·1 : 5·0
6	α	10	2522	1442	7 33·0	+ 5 32	0·5 : 0·5
7	ζ	13	2612	1476	7 45·5	+ 2 4	5·0 : 5·0
8	...	13	2673	1504	7 56·0	+ 2 40	4·9 : 4·4

Fl. 1 (5·4); η (5·3); δ^2 (5·6); Fl. 11 (5·5); Fl. 14 (5·3).

17. CAPRICORNUS.

Fr. **Le Capricorne;** *Germ.* **Der Steinbock.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	20 50	– 20
Approximate Boundaries, 1900.	Preceding	20 0	
	Following	21 45	
	North		– 9
	South		– 28

Capricornus is a constellation which has not much to attract the naked eye. Its chief stars are:—

	Mag.		Mag.
δ	3·0	ζ	3·8
β	3·4	γ	3·8
a^2	3·8		

together with 16 stars between 4—5·2 mags.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	a^1	5	6972	3537	20 11·0	— 12 53	4·5
2	a^2	6	6974	3538	20 11·4	— 12 55	3·8
3	ν	8	6991	3552	20 14·0	— 13 8	4·7
4	β	9	6995	3554	20 14·3	— 15 10	3·4
5	π	10	7031	3574	20 20·5	— 18 36	5·2
6	ρ	11	7042	3575	20 22·0	— 18 12	5·0
7	ψ	16	7177	3638	20 39·0	— 25 42	4·3
8	ω	18	7227	3661	20 44·7	— 27 22	4·4
9	η	22	7305	3706	25 57·6	— 20 20	5·2
10	θ	23	7322	3712	20 59·2	— 17 43	4·3
11	A	24	7328	3715	21 0·1	— 25 29	4·6
12	ι	32	7407	3756	21 15·6	— 17 21	4·4
13	ζ	34	7445	3779	21 19·9	— 22 56	3·8
14	b	36	7460	3783	21 21·8	— 22 20	4·5
15	ε	39	7506	3809	21 30·4	— 20 0	4·5
16	γ	40	7525	3818	21 33·4	— 17 12	3·8
17	...	41	7539	3822	21 35·2	— 23 48	5·2

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
18	κ	43	7543	3824	21 36·0	— 19 24	4·7
19	c	46	7563	3838	21 38·6	— 9 38	5·2
20	δ	49	7580	3848	21 40·4	— 16 40	3·0
21	μ	51	7618	3864	21 46·8	— 14 7	5·2

σ (5·6); ο (5·6); τ (5·3); υ (5·3); χ (5·3); φ (5·3); Fl. 29 (5·5); Fl. 30 (5·4); Fl. 42 (5·3); λ (5·4).

18. CASSIOPEIA.

Fr. Cassiopée; *Germ.* Cassiopeia.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	1 0	+ 60
Approximate Boundaries, 1900.	Preceding	23 0	
	Following	3 10	
	North		+ 77
	South		+ 46

Cassiopeia is a constellation of great extent and of great telescopic interest, owing to the fact that a rich part of the Milky Way runs through it, but the interest of its naked-eye stars chiefly resides in its well-known W group. The chief stars of the constellation are:—

	Mag.		Mag.
α	2·2	η	3·6
γ	2·3	ε	3·6
β	2·4	ζ	3·7
δ	2·8		

and there are 31 stars between 4—5·2 mags.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	1	8054	4086	23 1·5	+ 58 47	5·0 : 5·2
2	...	4	8162	4144	23 19·5	+ 61 37	5·2 : 5·5
3	...	...	8188	4153	23 24·5	+ 57 53	4·8 : 4·9
4	τ	5	8268	4201	23 41·2	+ 57 59	5·2 : 5·1
5	ρ	7	8310	4224	23 48·4	+ 56 50	4·6 : 4·8
6	σ	8	8330	4237	23 53·0	+ 55 5	5·0 : 5·0
7	β	11	7	9	0 2·8	+ 58 29	2·4 : 2·3

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
.					h. m.	° ′	
8	λ	14	121	69	0 25·1	+53 50	4·8 : 4·9
9	κ	15	126	71	0 26·2	+62 16	4·2 : 4·3
10	...	...	146	77	0 29·5	+53 30	5·0 : 5·5
11	ζ	17	153	82	0 30·3	+53 14	3·7 : 3·7
12	α	18	169	94	0 33·7	+55 53	2·2 : 2·4
13	ξ	19	180	100	0 35·5	+49 51	4·8 : 5·2
14	π	20	189	102	0 36·8	+46 22	5·0 : 5·0
15	ο	22	198	107	0 38·0	+47 38	4·6 : 4·8
16	η	24	218	120	0 41·8	+57 11	3·6 : 3·4
17	ν	25	219	121	0 42·0	+50 19	5·0 : 4·9
18	...	...	239	136	0 45·9	+60 27	4·9 : 5·1
19	v^1	26	244	139	0 47·9	+58 19	5·1 : 5·1
20	...	...	245	...	0 48·3	+48 2	5
21	γ	27	253	142	0 49·5	+60 4	2·3 : 2·2
22	v^2	28	254	143	0 49·5	+50 31	4·9 : 4·9
23	μ	30	314	175	1 0·4	+54 20	5·2 : 5·4
24	θ	33	339	189	1 3·0	+54 31	4·4 : 4·7
25	φ	34	391	208	1 12·6	+57 36	5·2 : 5·1
26	ψ	36	412	218	1 17·5	+67 30	4·8 : 5·0
27	δ	37	416	219	1 18·0	+59 37	2·8 : 2·9
28	χ	39	456	241	1 26·1	+58 37	4·9 : 5·0
29	...	42	499	260	1 33·8	+70 0	5·1 : 5·2
30	ε	45	564	287	1 45·8	+63 5	3·6 : 3·5
31	ω	46	568	290	1 46·8	+68 5	5·1 : 4·9
32	...	...	588	300	1 50·9	+64 2	5·2 : 5·4
33	...	48	595	304	1 52·1	+70 19	4·6 : 4·8
34	...	50	600	306	1 53·2	+71 50	4·1 : 4·4
35	ι	...	744	384	2 19·2	+66 52	4·6 : 4·4
36	...	...	955	493	2 58·9	+73 56	4·7 : 4·8
37	...	...	1001	516	3 9·5	+65 13	4·8
38	...	...	1211	650	3 50·0	+80 22	5·2

Fl. 2 (5·4); B.A.C. 8083 (5·5); Fl. 6 (5·5); B.A.C. 8322 (5·5); Fl. 10 (5·5); B.A.C. 79 (5·4); Fl. 12 (5·4); B.A.C. 197 (5·5); B.A.C. 201 (5·4); Fl. 23 (5·3); B.A.C. 228 (5·4); B.A.C. 255 (5·5); Fl. 31 (5·3); B.A.C. 335 (5·4); Fl. 32 (5·5); Fl. 40 (5·5); Fl. 43 (5·5); Fl. 44 (5·5); Fl. 47 (5·4); Fl. 49 (5·3); Fl. 53 (5·5); B.A.C. 777 (5·3).

19. CENTAURUS.

Fr. Le Centaur; *Germ.* Der Centaur.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	13 20	−47
Approximate Boundaries, 1900.	Preceding	10 45	
	Following	14 40	
	North		−33
	South		−62

Centaurus is a large and important Southern constellation, rich in bright stars, the whole of which are unfortunately invisible in England. The prominent stars are:—

	Mag.		Mag.
α^2	1·0	δ	2·8
β	1·2	ι	3·0
θ	1·7	κ	3·3
γ	2·4	λ	3·4
η	2·5	μ	3·4
ϵ	2·6	α^1	$3\frac{1}{2}$
ζ	2·7	ν	3·7

and there are 42 stars between 4—$5\frac{1}{2}$ mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	π	...	3866	A 24	11 15·6	−53 50	4·3
2	...	...	3907	A 34	11 22·8	−42 0	5·4
3	...	Lac. 4774	...	A 37	11 26·2	−58 46	5·2
4	...	Lac. 4775	...	A 38	11 26·3	−58 51	5·5
5	...	...	3935	A 42	11 28·8	−53 34	5·2
6	...	Brisb. 3663	3938	A 45	11 30·1	−46 58	5·5
7	λ	...	3941	A 46	11 30·3	−62 21	3·4
8	...	...	3986	A 65	11 40·7	−60 30	4·7
9	...	...	3988	A 66	11 40·8	−39 50	5·4
10	...	...	4000	A 69	11 43·8	−63 7	4·9
11	...	...	4007	A 71	11 45·1	−44 30	5·0
12	δ	...	4087	A 94	12 2·1	−50 3	2·8
13	ρ	...	4103	A 101	12 5·4	−51 42	4·5
14	κ^1	...	4174	A 113	12 17·3	−34 44	5·5
15	σ	...	4197	A 121	12 21·6	−49 34	4·3

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
16	τ	...	4251	A 131	12 31·1	−47 53	4·4
17	...	...	4262	A 132	12 33·4	−39 20	5·2
18	γ	...	4264	A 134	12 34·9	−48 18	2·4
19	...	...	4272	A 136	12 35·9	−48 9	5·4
20	...	...	4309	A 143	12 44·2	−33 20	5·3
21	...	...	4317	A 149	12 46·3	−48 17	5·0
22	...	...	4321	A 150	12 46·8	−39 32	4·4
23	...	...	4325	{A 52 Cruc.}	12 47·6	−56 32	4·4
24	...	...	4377	A 171	12 59·3	−47 49	5·3
25	ξ^2	...	4379	A 173	12 59·9	−49 16	4·8
26	...	...	4412	A 183	13 4·8	−59 16	5·4
27	...	...	4417	A 185	13 5·3	−37 10	5·3
28	ι	...	4458	A 204	13 13·9	−36 5	3·0
29	...	...	4463	A 208	13 14·9	−60 21	5·2
30	...	...	4507	A 227	13 24·1	−38 47	4·5
31	ϵ	...	4549	A 245	13 32·3	−52 51	2·6
32	i	1	4579	A 265	13 38·9	−32 26	4·5
33	...	...	4580	A 266	13 39·1	−50 50	5·2
34	ν	...	4601	A 272	13 42·3	−41 5	3·7
35	μ	...	4602	A 273	13 42·4	−41 53	3·4
36	g	2	4603	A 274	13 42·5	−33 51	4·6
37	k	3	4623	A 280	13 44·9	−32 24	4·7
38	h	4	4629	2349	13 46·3	−31 20	4·7
39	ζ	...	4638	A 289	13 48·0	−46 42	2·7
40	ϕ	...	4653	A 296	13 51·0	−41 32	4·1
41	v^1	...	4654	A 297	13 51·3	−44 13	4·2
42	v^2	...	4668	A 303	13 54·2	−45 1	5·0
43	β	...	4669	A 304	13 55·4	−59 48	1·2
44	χ	...	4681	A 311	13 58·7	−40 36	4·8
45	θ	5	4686	2379	13 59·6	−35 47	1·7
46	...	...	4695	A 321	14 1·9	−52 51	5·4
47	...	...	4735	A 336	14 11·9	−55 49	5·0
48	ψ	...	4745	A 338	14 13·3	−37 20	4·4
49	...	...	4759	A 342	14 15·7	−38 58	4·9
50	η	...	4811	A 356	14 27·9	−41 38	2·5

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
51	α^1	...	4831	A 363	14 31·4	— 60 20	$3\frac{1}{2}$
52	α^2	...	4832	A 364	14 31·5	— 60 20	1·0
53	...	...	4842	A 368	14 34·5	— 37 16	4·2
54	...	...	4852	A 371	14 36·3	— 34 39	4·3
55	...	...	4858	A 372	14 37·6	— 34 40	5·4
56	κ	...	4928	A 386	14 51·4	— 41 37	3·3

Lac. 4603 (5·5); Lac. 4649 (5·8); Lac. 4747 (5·7); Lac. 4785 (5·7); Lac. 4816 (5·9); Lac. 4815 (5·9); Lac. 4856 (5·7); Lac. 4868 (5·8); Lac. 4878 (5·9); Lac. 4992 (5·7); Lac. 5029 (5·8); Lac. 5037 (5·9); Lac. 5069 (5·8); Lac. 5092 (5·8); Lac. 5142 (5·8); Lac. 5150 (5·7); Lac. 5164 (5·9); Lac. 5211 (5·7); Lac. 5331 (5·8); ξ^1 (5·8); Lac. 5422 (5·7); Lac. 5437 (5·9); B.A.C. 4437 (5·5); Lac. 5531 (5·9); ω (4); Lac. 5552 (5·8); Lac. 5632 (5·7); Lac. 5676 (5·8); Lac. 5700 (5·9); Lac. 5733 (5·7); Lac. 5850 (5·6); Lac. 5875 (5·9); Lac. 5893 (5·6); Lac. 6146 (5·8).

20. CEPHEUS.

Fr. Céphée; *Germ.* Cepheus.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	22 0	+ 70
Approximate Boundaries, 1900.	Preceding	20 20	
	Following	24 0	
	North		+ 85
	South		+ 55

Cepheus is a large and straggling constellation reaching nearly to the North Pole and without any very conspicuous stars. The chief are:—

	Mag.		Mag.
α (Alderamin) ...	2·6	η	3·6
β	3·4	ι	3·6
γ	3·4	μ	3·9
ζ	3·5		

and there are 20 stars between 4—5·2 mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	...	6867	3468	19 53·6	+58 32	5·2
2	κ	1	7005	3545	20 12·9	+77 21	4·4 : 4·5
3	θ	2	7098	3594	20 27·6	+62 35	4·3 : 4·2
4	...	...	7215	3653	20 42·4	+57 9	4·6 : 4·7
5	η	3	7222	3656	20 42·8	+61 22	3·6 : 3·5
6	α	5	7416	3757	21 15·7	+62 5	2·6 : 2·6
7	β	8	7493	3798	21 27·1	+70 2	3·4 : 3·4
8	...	9	7542	3819	21 34·7	+61 32	4·8 : 5·0
9	μ	...	7582	3845	21 40·0	+58 14	3·9 : 4·5
10	...	11	7588	3847	21 40·2	+70 46	4·8 : 4·9
11	ν	10	7595	3855	21 42·0	+60 34	4·5 : 4·8
12	...	...	7658	3879	21 53·2	+63 3	5·2 : 5·4
13	...	16	7686	3892	21 57·5	+72 36	5·2 : 5·4
14	ξ	17	7700	3903	22 0·3	+64 3	4·4 : 4·7
15	...	19	7708	3909	22 1·5	+61 42	5·2 : 5·4
16	ζ	21	7749	3923	22 6·7	+57 37	3·5 : 3·4
17	...	24	7758	3925	22 7·5	+71 45	5·0 : 4·7
18	ε	23	7778	3942	22 10·6	+56 27	4·2 : 4·7
19	δ	27	7848	3981	22 24·7	+57 48	4·0 : 4·2
20	...	30	7902	4009	22 34·4	+62 58	5·2 : 5·4
21	ι	32	7967	4037	22 45·4	+65 34	3·6 : 3·6
22	...	...	7990	4045	22 47·9	+82 31	4·8 : 5·0
23	...	...	8026	4071	22 55·3	+83 42	5·0 : 5·2
24	π	33	8074	4098	23 4·1	+74 44	4·5 : 4·7
25	ο	34	8124	4127	23 13·8	+67 28	4·9 : 5·2
26	γ	35	8238	4182	23 34·4	+76 58	3·4 : 3·5
27	...	...	8273	4204	23 42·2	+67 8	5·1 : 5·2

B.A.C. 225 (5·5); B.A.C. 979 (5·5); B.A.C. 1247 (5·4); B.A.C. 1448 (5·3); B.A.C. 2157 (5·3); Fl. 4 (5·5); B.A.C. 7377 (5·5); Fl. 6 (5·3); Fl. 7 (5·4); B.A.C. 7495 (5·4); B.A.C. 7545 (5·5); Fl. 14 (5·5); Fl. 18 (5·4); Fl. 20 (5·4); B.A.C. 7754 (5·4); λ (5·3); B.A.C. 7760 (5·5); B.A.C. 7759 (5·4); Fl. 28 (5·4); ρ (5·4); Fl. 31 (5·3); B.A.C. 7961 (5·4); B.A.C. 8039 (5·4); B.A.C. 8106 (5·5).

21. CETUS.

Fr. **La Baleine;** *Germ.* **Der Wallfisch.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	1 45	−12
Approximate Boundaries, 1900.	Preceding	23 50	
	Following	3 20	
	North		+10
	South		−25

Cetus is a very large constellation as regards its area, but not one of any great interest either from a naked-eye or telescopic point of view. The chief stars are:—

	Mag.		Mag.
β	2·1	γ	3·6
α (Menkar) ...	2·7	θ	3·8
ι	3·6	ζ	3·8
η	3·6	υ	3·8
τ	3·6		

Allusion must here be made to the celebrated variable *o* Ceti, commonly called Mira, because at its maximum it generally reaches the 3rd or even the 2nd mag.

Besides the foregoing there are 27 stars between 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	2	8358	4252	23 57·6	−18 0	4·6 : 4·3
2	...	3	8361	4255	23 58·4	−11 11	5·2
3	...	6	21	17	0 5·2	−16 8	4·9 : 4·6
4	...	...	...	21	0 6·1	−18 37	5·2
5	...	7	33	30	0 8·5	−10 36	4·6 : 4·3
6	ι	8	62	45	0 13·3	− 9 29	3·6 : 3·7
7	...	...	115	68	0 24·4	−24 27	5·2
8	β	16	196	103	0 37·6	−18 39	2·1 : 2·4
9	ϕ^1	17	200	109	0 38·1	−11 16	4·9
10	...	...	203	111	0 38·8	−22 40	5·2

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
11	...	20	242	138	0 46·9	− 1 48	5·0 : 5·2
12	η	31	332	183	1 2·6	− 10 49	3·6 : 3·5
13	...	37	372	203	1 8·4	− 8 34	5·0 : 5·2
14	θ	45	420	220	1 18·0	− 8 48	3·8 : 3·4
15	...	48	449	236	1 23·8	− 22 15	5·1
16	τ	52	536	271	1 38·5	− 16 34	3·6 : 3·1
17	χ	53	559	282	1 43·7	− 11 17	4·8 : 4·7
18	ζ	55	565	286	1 45·5	− 10 56	3·8 : 3·5
19	...	56	594	302	1 51·0	− 23 7	5·2
20	υ	59	618	315	1 54·3	− 21 40	3·8 : 3·6
21	...	...	627	322	1 55·9	− 30 35	5·2
22	ξ¹	65	684	352	2 6·6	+ 8 17	4·4 : 4·5
23	ο	68	720	370	2 13·3	− 3 31	Var.
24	ρ	72	754	385	2 20·2	− 12 50	4·9
25	ξ²	73	760	389	2 21·8	+ 7 56	4·4 : 4·7
26	σ	76	781	400	2 26·4	− 15 46	4·7
27	...	...	790	404	2 28·6	− 28 46	4·8
28	ν	78	794	409	2 29·6	+ 5 5	4·9 : 4·9
29	δ	82	811	418	2 33·3	− 0 11	4·1 : 4·2
30	ε	83	815	420	2 33·8	− 12 23	5·0 : 4·5
31	γ	86	837	433	2 37·1	+ 2 44	3·6 : 3·4
32	π	89	847	436	2 38·4	− 14 22	4·3 : 4·0
33	μ	87	845	437	2 38·5	+ 9 36	4·4 : 4·2
34	λ	91	929	477	2 53·3	+ 8 26	4·6 : 4·9
35	α	92	949	482	2 56·0	+ 3 37	2·7 : 2·4
36	...	94	994	510	3 6·6	− 1 39	5·0 : 5·3
37	κ¹	96	1028	529	3 13·1	+ 2 56	5·0 : 5·1

H.P. 29 (5·4); B.A.C. 35 (5·4); Fl. 13 (5·3); H.P. 124 (5·5); ϕ^2 (5·3); ϕ^3 (5·6); ϕ^4 (5·8); Fl. 28 (5·4); Fl. 46 (5·3); Fl. 49 (5·5); Fl. 50 (5·5); H.P. 270 (5·4); Fl. 60 (5·4); Fl. 67 (5·5); H.P. 377 (5·5); H.P. 386 (5·5); B.A.C. 776 (5·5); Fl. 97 (5·5).

22. CHAMÆLEON.

Fr. Caméléon; *Germ.* Das Chamäleon.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	10 40	−78
Approximate Boundaries, 1900.	Preceding	8 0	
	Following	13 0	
	North		−73
	South		−83

Chamæleon is a small and unimportant constellation not far from the South Pole which has no star brighter than α of mag. 4·2. It contains however 6 other stars nearly as bright, that is to say between 4·4—5½ mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	: Oxford.
					h. m.	° ′		
1	α	...	2849	A 4	8 21·6	−76 32	4·2	
2	θ	...	2870	A 5	8 24·2	−77 6	4·7	
3	ζ	...	3334	A 14	9 37·4	−80 24	5·5	
4	γ	...	3660	A 23	10 34·1	−77 59	4·4	
5	δ^2	...	3724	A 26	10 44·6	−79 54	4·9	
6	ε	...	4048	A 37	11 53·7	−77 33	4·9	
7	β	...	4131	A 40	12 11·3	−78 39	4·6	

η (5·6); ι (5·8); κ (5·6).

23. CIRCINUS.

Fr. Le Compas; *Germ.* Der Zirkel.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	14 50	−63
Approximate Boundaries, 1900.	Preceding	14 10	
	Following	15 20	
	North		−55
	South		−68

Circinus is a very small constellation with one fairly bright star α of mag. 3·5, and 3 others between 4—5½ mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	α	...	4835	A 17	14 32·8	−64 27	3·5
2	ε	...	5007	A 43	15 7·5	−63 9	5·5
3	β	...	5011	A 44	15 8·1	−58 21	4·7
4	γ	...	5044	A 47	15 13·8	−58 53	5·2

Lac. 6119 (5·9); θ (5·8); η (5·9); δ (5·6).

24. COLUMBA NOACHI.

Fr. La Colombe; *Germ.* Die Taube.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	5 40	−34
Approximate Boundaries, 1900.	Preceding	5 0	
	Following	6 20	
	North		−27
	South		−43

Columba is a small constellation to the south of Lepus, partly visible in England, and possessing the following stars of importance:—

	Mag.
α	2·7
β	2 9
ε	3·8

together with 9 between 4—5½ mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	ο	...	1650	A 11	5 13·9	−35 1	5·1
2	ε	...	1739	1011	5 27·0	−35 34	3·8
3	...	...	1787	1042	5 33·1	−28 46	5·2
4	α	...	1802	1048	5 35·3	−34 8	2·7
5	μ	...	1841	...	5 41·5	−32 21	5·4
6	β	...	1878	1088	5 46·7	−35 48	2·9
7	λ	...	1891	A 57	5 48·8	−33 49	5·2
8	ξ	...	1906	A 61	5 51·3	−37 8	5·4
9	γ	...	1922	1110	5 53·3	−35 17	4·1
10	...	...	1946	1125	5 58·4	−26 17	5·0

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
11	θ	...	1982	A 79	6 3·4	− 37 14	5·3
12	κ	...	2034	A 84	6 12·3	− 35 6	4·8

Lac. 1868 (5·9); Lac. 1895 (5·8); Lac. 1941 (5·7); Lac. 1936 (5·9); Lac. 1964 (5·7); Lac. 2067 (5·8); σ (5·6); Lac. 2124 (5·8); Lac. 2130 (5·9); π^2 (5·8); Lac. 2217 (5·8).

25. COMA BERENICES.

Fr. **La Chevelure de Bérénice;** *Germ.* **Das Haupthaar der Berenice.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	12 40	+ 27
Approximate Boundaries, 1900.	Preceding	11 50	
	Following	13 30	
	North		+ 32
	South		+ 14

Coma Berenices is a small constellation exhibiting a considerable number of medium-sized stars distributed over its whole area at something approaching equi-distant intervals. The brightest is β of mag. 4·4, but besides that there are 17 stars as bright as or brighter than 5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	6	4125	2079	12 9·9	+ 15 34	5·1 : 5·1
2	...	7	4127	2081	12 10·3	+ 24 37	5·2 : 5·4
3	...	11	4156	2094	12 14·7	+ 18 27	4·9 : 4·7
4	...	12	4169	2098	12 16·5	+ 26 31	4·8 : 4·6
5	...	13	4181	2103	12 18·3	+ 26 46	5·1 : 5·5
6	...	14	4191	2109	12 20·4	+ 27 54	5·1 : 5·1
7	γ	15	4195	2110	12 21·0	+ 28 54	4·7 : 4·5
8	...	16	4196	2111	12 21·0	+ 27 29	5·1 : 5·4
9	...	17	4207	2117	12 22·9	+ 26 35	5·2 : 5·1
10	...	23	4240	2136	12 28·9	+ 23 17	4·9 : 4·9

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
11	...	24	4242	2137	12 29·1	+ 19 2	5·0 : 4·8
12	...	31	4315	2181	12 45·9	+ 28 12	5·0 : 5·1
13	...	35	4328	2184	12 47·4	+ 21 54	5·1 : 5·0
14	...	36	4351	2201	12 53·0	+ 18 4	5·0 : 5·2
15	...	37	4360	2204	12 54·5	+ 31 26	5·1 : 5·0
16	...	41	4390	2218	13 1·4	+ 28 16	4·9 : 5·0
17	α	42	4406	2226–7	13 4·2	+ 18 10	4·4 {5·1 / 5·1} 4·4
18	β	43	4421	2232	13 6·3	+ 28 29	4·4 : 4·2

Fl. 18 (5·5); Fl. 21 (5·5); Fl. 26 (5·4); Fl. 27 (5·3).

26. CORONA AUSTRALIS.

Fr. **La Couronne Australe;** *Germ.* **Die Südliche Krone.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	18 30	−41
Approximate Boundaries, 1900.	Preceding	17 55	
	Following	19 5	
	North		−36
	South		−45

Corona Australis is sometimes designated by foreign astronomers Corona Austrinus, but Australis is undoubtedly to be preferred. The brightest star is β of mag. 4·1: next follows α, which is 4·2. Six of the naked-eye stars, including the 2 just mentioned, near the following border are disposed in a curved line which Gore speaks of as a good example of a "star stream." Altogether there are 8 stars above the magnitude of 5½.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	θ	...	6296	A 15	18 25·0	— 42 24	5·1
2	...	...	6378	A 24	18 39·3	— 40 31	5·5
3	ε	...	6458	A 34	18 50·6	— 37 15	5·5
4	ζ	...	6484	A 39	18 54·6	— 42 15	5·2
5	γ	...	6511	A 41	18 58·3	— 37 14	4·6

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
6	δ	...	6523	A 43	14 0·0	—40 41	5·0
7	α	...	6535	A 44	19 1·3	—38 5	4·2
8	β	...	6541	A 46	19 1·8	—39 32	4·1

Lac. 7550 (5·6); Lac. 7621 (5·9); Lac. 7671 (5·6); Lac. 7680 (5·7); Lac. 7748 (5·6); κ (5·4); Lac. 77?0 (5·8); λ (5·4); Lac. 7829 (5¾); η^1 (5·7); Lac. 7909 (5·8); Lac. 7916 (5·7).

27. CORONA BOREALIS.

Fr. La Couronne Boréale; *Germ.* Die Nördliche Krone.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation		15 40	+30
Approximate Boundaries, 1900.	Preceding	15 10	
	Following	16 20	
	North		+40
	South		+21

Corona Borealis is a constellation respecting which Webb remarked that it resembles "more than usual the object whose name it bears." The brightest stars are the following:—

	Mag.
α	2·4
β	3·8

and there are 13 other stars between 4—5·2 mags.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	η	2	5075	2559	15 18·2	+30 43	5·0 : 5·0
2	β	3	5098	2572	15 22·9	+29 31	3·8 : 3·8
3	θ	4	5131	2588	15 28·1	+31 46	4·3 : 4·2
4	α	5	5143	2594	15 29·6	+27 7	2·4 : 2·2
5	ζ	7	5178	2614-5	15 34·9	+37 2	4·8 {6·1 / 5·2} 4·7
6	γ	8	5192	2625	15 37·7	+26 41	4·2 : 3·9
7	δ	10	5244	2643	15 44·6	+26 26	4·6 : 4·9
8	κ	11	5259	2652	15 46·7	+36 2	4·7 : 5·0
9	ε	13	5302	2673	15 52·6	+27 14	4·1 : 4·2
10	ρ	15	5319	2685	15 56·5	+33 40	5·2 : 5·1

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
11	ι	14	5321	2686	15 56·7	+ 30 11	5·1 : 5·0
12	τ	16	5385	2710	16 4·6	+ 36 47	5·2 : 5·1
13	ξ	19	5473	2750	16 17·4	+ 31 10	4·5 : 4·6
14	ν	20	5479	2751	16 17·8	+ 35 5	5·1 : 5·1
15	ν^2	21	5480	2752	16 18·0	+ 33 59	5 0 : 5·1

λ (5·6); μ (5·4); o (5·7); π (5·6); σ (5·3); υ (5·8).

28. CORVUS.

Fr. **Le Corbeau;** *Germ.* **Der Rabe.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	12 30	– 18
Approximate Boundaries, 1900.	Preceding	11 55	
	Following	13 0	
	North		– 11
	South		– 25

Corvus, though a small constellation, contains an unusual proportion of bright stars, several of which are suspected of variability. The principal stars are:—

	Mag.		Mag.
γ	2·8	ϵ	3·1
β	2·8	δ	3·1

These form a trapezium. The star lettered α is now only of mag. 4·3, which seems remarkable, and it is difficult to believe that Bayer could have allotted that letter to that star if it had been in 1603 as small as it now is. Besides the foregoing stars there are 3 others as bright as 5·2 mag.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	α	1	4090	2060	12 2·2	— 24 3	4·3
2	ϵ	2	4097	2063	12 4·0	— 21 57	3·1
3	...	3	4101	2066	12 4·9	— 22 56	5 2
4	γ	4	4124	2078	12 9 6	— 16 53	2·8
5	δ	7	4211	2120	12 23·7	— 15 51	3·1

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
6	η	8	4226	2128	12 25·9	— 15 32	4·4
7	β	9	4234	2134	12 28·1	— 22 44	2·8

ζ (5·5); B.A.C. 4157 (5·4); H.P. 2154 (5·3).

29. CRATER.

Fr. La Coupe; *Germ.* Der Becher.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	11 20	−15
Approximate Boundaries, 1900.	Preceding	10 45	
	Following	12 0	
	North		− 5
	South		−23

Crater is by some catalogue-makers treated as part of Hydra, but its individuality as a separate asterism is now admitted by the best authorities. The following are its principal stars:—

		Mag.
19	... ...	3·8
δ	... ...	3·9

and there are 13 stars ranging between 4—5·2 mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	b^3	6	3733	1905	10 47·6	— 19 30	5·2
2	α	7	3766	1918	10 53·9	— 17 40	4·1
3	χ^1	9	3793	1932	10 59·6	— 26 39	5·2
4	β	11	3826	1946	11 5·8	— 22 10	4·4
5	δ	12	3859	1963	11 13·3	— 14 8	3·9
6	λ	13	3874	1968	11 17·4	— 18 7	5·0
7	ε	14	3881	1971	11 18·6	— 10 12	5·0
8	γ	15	3883	1973	11 18·9	— 17 1	4·2
9	...	17	3922	1991	11 26·3	— 28 36	5·0
10	...	19	3928	1994	11 27·1	— 31 12	3·8

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
11	θ	21	3943	2002	11 30·6	— 9 8	4·7
12	ζ	27	3978	2016	11 38·7	— 17 41	4·9
13	...	28	4015	2035	11 46·8	— 33 14	4·2
14	η	30	4035	2044	11 49·9	— 16 29	5·0
15	...	31	4053	2052	11 54·7	— 18 59	5·1

κ (5·8); ι (5·6); b^1 (5·4); Fl. 10 (5·4); Fl. 18 (5·4); Fl. 26 (5·4); H.P. 2050 (5·5).

30. CRUX.

Fr. **La Croix du Sud**; *Germ.* **Das Kreuz.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	12 20	—60
Approximate Boundaries, 1900.	Preceding	11 45	
	Following	12 50	
	North		—56
	South		—64

The Southern Cross, as it is generally designated, is a constellation small in size, but always spoken of with much enthusiasm by those who have seen it. The chief stars are :—

	Mag.		Mag.
α	1·3	γ	2·0
β	1·7	δ	3·4

These form the cross. There are also 5 stars ranging between mags. 4—5·2.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	θ^1	...	4061	A 6	11 56·9	— 62 38	4·7
2	θ^2	...	4067	A 7	11 58·1	— 62 29	5·3
3	η	...	4078	A 10	12 0·6	— 63 57	4·7
4	δ	...	4120	A 18	12 8·8	— 58 5	3·4
5	ζ	...	4133	A 19	12 11·9	— 63 20	4·6

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
6	ε	...	4158	A 22	12 14·9	− 59 44	4·0
7	α	...	4187	A 26	12 19·9	− 62 26	1·3
8	γ	...	4215	A 34	12 24·5	− 56 26	2·0
9	...	...	4284	A 45	12 39·5	− 55 49	5·4
10	β	...	4289	A 46	12 40·7	− 59 2	1·7
11	...	...	4325, 7	A 52–3	12 47·5	− 56 31	4·1

Brisb 4073 (5·9) ; ι (5·7) ; λ (5·6).

31. CYGNUS.

Fr. Le Cygne ; *Germ.* Der Schwan.

				R.A.	Decl.
				h. m.	°
Meridional Centre of Constellation		...	...	20 30	+ 40
Approximate Boundaries, 1900.	Preceding	... ...	...	19 10	
	Following	... ...	...	21 50	
	North	... ...	...		+ 60
	South	... ...	...		+ 29

Cygnus is a large and important constellation from whatever standpoint it may be regarded. Not only are the naked-eye stars very numerous, but its telescopic objects of interest, especially its red stars, are also numerous and interesting. This seems partly due to the fact that a rich part of the "Milky Way" occupies a large portion of the constellation. Its important stars are :—

	Mag.		Mag.
α (Deneb) ...	1·5	ξ	3·7
γ	2·3	o¹	3·8
ε	2·7	κ	3·9
δ	3·0	ι	3·9
β (Albireo) ...	3·1	τ	3·9
ζ	3·5		

and there are no fewer than 50 stars between 4—5·2 mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	: Oxford.
					h. m.	° ′		
1	κ	1	6623	3316	19 14·3	+ 53 9	3·9	: 3·8
2	...	2	6648	3342	19 19·4	+ 29 33	4·9	: 5·1
3	...	4	6667	3352	19 21·8	+ 36 5	5·1	: 5·1
4	β^1	6	6690	3362	19 25·9	+ 27 43	3·1	: 3·0
5	β^2	...	6691	3363	19 25·9	+ 27 43	5·2	: 4·8
6	ι	10	6697	3365	19 26·7	+ 51 28	3·9	: 4·0
7	...	8	6698	3366	19 27·4	+ 34 12	4·8	: 4·7
8	...	...	6718	3382	10 30·8	+ 42 8	5·2	: 5·4
9	...	...	6731	3392	19 32·9	+ 44 26	5·2	: 5·4
10	θ	13	6734	3393	19 33·2	+ 49 57	4·6	: 4·9
11	ϕ	12	6740	3397	19 34·6	+ 29 53	4·9	: 5·1
12	...	...	6754	3407	19 37·2	+ 45 14	5·1	: 5·3
13	...	15	6771	3417	19 40·0	+ 37 4	5·0	: 5·4
14	δ	18	6779	3419	19 41·2	+ 44 50	3·0	: 2·8
15	χ	17	6784	3420	19 41·6	+ 33 27	5·0	: 5·3
16	*d*	20	6824	3440	19 47·6	+ 52 41	5·0	: 5·3
17	...	23	6847	3455	19 50·8	+ 57 12	5·1	: 5·3
18	...	22	6849	3458	19 51·6	+ 38 10	4·7	: 5·1
19	η	21	6851	3460	19 51·8	+ 34 46	4·0	: 4·1
20	ψ	24	6856	3463	19 52·5	+ 52 7	4·8	: 4·8
21	...	25	6875	3479	19 55·5	+ 36 43	5·2	: 5·5
22	*e*	26	6895	3486	19 58·0	+ 49 46	5·2	: 5·3
23	b^2	28	6937	3513	20 5·0	+ 36 29	4·8	: 5·0
24	o^{1a}	30	6962	3527	20 9·5	+ 46 7	4·9	: 4·7
25	o^{1b}	31	6965	3528	20 9·9	+ 46 23	3·8	: 4·2
26	b^3	29	6967	3529	20 10·1	+ 36 27	5·0	: 5·0
27	...	33	6976	3532	20 10·6	+ 56 12	4·4	: 4·5
28	...	32	6983	3541	20 11·8	+ 47 21	4·1	: 4·5
29	P	34	6990	3547	20 13·4	+ 37 39	4·9	
30	...	35	6998	3551	20 14·0	+ 34 37	5·2	: 5·3
31	γ	37	7022	3564	20 17·9	+ 39 52	2·3	: 2·2
32	...	39	7029	3569	20 19·1	+ 31 48	4·6	: 4·8
33	...	41	7067	3583	20 24·5	+ 29 58	4·1	: 4·3

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
34	ω^2	45	7085	3587	20 26·3	+48 33	5·0 : 5·0
35	...	47	7103	3599	20 29·3	+34 51	4·8 : 5·0
36	a	50	7171	3631	20 37·3	+44 51	1·5 : 1·3
37	...	52	7194	3643	20 40·7	+30 17	4·3 : 4·5
38	ϵ	53	7204	3648	20 41·4	+33 31	2·7 : 2·4
39	T	...	...	3654	20 42·4	+33 56	5·2
40	λ	54	7213	3655	20 42·7	+36 3	4·6 : 4·9
41	...	55	7233	3662	20 44·9	+45 40	5·0 : 5·4
42	...	56	7241	3665	20 45·9	+43 36	5·0 : 5·2
43	...	57	7253	3673	20 49·0	+43 56	4·6 : 4·8
44	ν	58	7277	3687	20 52·7	+40 42	4·1 : 4·2
45	f^1	59	7301	3701	20 55·7	+47 3	4·6 : 4·7
46	...	60	7306	3705	20 57·0	+45 41	5·2 : 5·3
47	ξ	62	7333	3716	21 0·6	+43 27	3·7 : 4·0
48	...	61	7336–7	3717–8	21 1·5	+38 10	5·1 : 5·0
49	f^2	63	7345	3721	21 2·5	+47 10	5·1 : 5·3
50	ζ	64	7368	3732	21 7·8	+29 44	3·5 : 3·1
51	τ	65	7385	3741	21 10·0	+37 32	3·9 : 3·6
52	σ	67	7398	3745	21 12·7	+38 53	4·3 : 4·5
53	v	66	7399	3747	21 13·0	+34 24	4·4 : 4·3
54	A	68	7402	3750	22 14·1	+43 26	5·0 : 5·0
55	...	70	7462	3784	21 22·4	+36 36	5·1 : 5·1
56	ρ	73	7503	3807	21 29·5	+45 4	4·2 : 4·1
57	...	72	7505	3808	21 29·9	+38 0	5·0 : 5·2
58	...	74	7521	3814	21 32·1	+39 52	5·1 : 5·2
59	π^1	80	7560	3833	21 37·8	+50 38	4·9 : 4·9
60	μ	78	7568	3840	21 38·8	+28 12	4·4 : 4·5
61	π^2	81	7598	3856	21 42·4	+48 45	4·4 : 4·8

Fl. 9 (5·4); Fl. 14 (5·3); c (5·5); Fl. 19 (5·5); B.A.C. 6817 (5·5); H.P. 3471 (5·4); H.P. 3497 (5·5); b^1 (5·5); B.A.C. 6986 (5·5); Fl. 40 (5·5); ω^1 (5·6); ω^3 (5·6); B.A.C. 7174 (5·5); Fl. 51 (5·4); H.P. 3657 (5·5); B.A.C. 7294 (5·5); H.P. 3724 (5·5); B.A.C. 7111 (5·4); B.A.C. 7455 (5·5); H.P. 3786 (5·3); g (5·3); Fl. 75 (5·3); Fl. 77 (5·3); B.A.C. 7565 (5·5); Fl. 79 (5·5); B.A.C. 7631 (5·5).

32. DELPHINUS.

Fr. Le Dauphin ; *Germ.* Der Delphin.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	20 35	+ 12
Approximate Boundaries, 1900.	Preceding	20 15	
	Following	21 10	
	North		+ 20
	South		+ 3

Delphinus is a small and compact constellation of no great interest to the naked-eye observer. The principal star is β of mag. 3·7, and there are 7 stars ranging from 4—5·2 mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	ε	2	7088	3592	20 27·5	+ 10 54	4·1 : 3·6
2	η	3	7094	3597	20 28·3	+ 12 38	5·2 : 5·3
3	ζ	4	7107	3600	20 29·7	+ 14 16	4·7 : 4·8
4	β	6	7121	3605	20 31·9	+ 14 11	3·7 : 3·5
5	κ	7	7141	3620	20 33·3	+ 9 40	5·1 : 5·1
6	α	9	7149	3624	20 34·1	+ 15 29	4·0 : 3·9
7	δ	11	7173	3635	20 37·9	+ 14 39	4·6 : 4·6
8	γ^1	12	7199	3645	20 40·1	+ 15 42	5·6 } 4·2 { 4·0
9	γ^2	...	7200	3646	20 40·1	+ 15 42	4·6 } 4·2 { 5·0

ι (5·3) ; Fl. 13 (5·5) ; Fl. 17 (5·4) ; Fl. 16 (5·4).

33. DORADO.

Fr. Dorade ; *Germ.* Dorado.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	5 0	−60
Approximate Boundaries, 1900.	Preceding	3 45	
	Following	6 30	
	North		−49
	South		−70

The chief stars in this constellation are :—

	Mag.
α	3·1
β	3·9

and there are 7 stars ranging from 4—5·2 mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	γ	...	1331	A 3	4 12·9	−51 47	4·4
2	α	...	1438	A 8	4 31·3	−55 18	3·1
3	ζ	...	1600	A 20	5 3·4	−57 38	4·8
4	θ	...	1659	A 22	5 13·9	−67 19	5·1
5	β	...	1791	A 29	5 32·6	−62 34	3·9
6	δ	...	1868	A 33	5 44·5	−65 46	4·5
7	ϵ	...	1905	A 34	5 50·0	−66 55	4·9
8	...	...	1926	A 36	5 53·2	−63 7	5·1
9	ν	...	2025	A 39	6 9·5	−68 49	5·2
10	η^2	...	2031	A 40	6 11·0	−65 33	5·5

κ (5·6); Lac. 1772 (5·7); λ (5·6); Lac. 1949 (5·9); π^2 (5·9).

34. DRACO.

Fr. Le Dragon; *Germ.* Der Drache.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation		16 0	+60
Approximate Boundaries, 1900.	Preceding	9 0	
	Following	20 20	
	North		+82
	South		+50

Draco is one of the most difficult constellations in the heavens to deal with from a topographical point of view, because of its great length and of its being always within the circle of perpetual apparition to an observer in British latitudes. It extends through nearly 12 hours of R.A., and the study of its constituent stars is rendered doubly difficult to an observer in England by reason of the fact that it passes the meridian in the zenith. Its chief stars are:—

	Mag.		Mag.
γ	2·4	α	3·6
η	2·8	χ	3·7
β	3·0	κ	3·8
δ	3·2	ξ	3·9
ζ	3·3	ϵ	3·9
ι	3·4		

There are no fewer than 41 stars ranging from 4—5·2 mags.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	...	3199	1695	9 19·8	+ 81 51	4·6 : 4·4
2	...	...	3593	1851	10 24·9	+ 76 20	5·1 : 4·9
3	λ	1	3914	1988	11 24·3	+ 70 0	4·1 : 3·8
4	...	...	4112	2070	12 6·6	+ 78 17	5·1 : 5·1
5	κ	5	4239	2135	12 28·4	+ 70 27	3·8 : 3·7
6	...	6	4246	2141	12 29·7	+ 70 42	5·1
7	i	10	4646	2356	13 47·9	+ 65 19	4·7 : 4·8
8	a	11	4696	2381	14 1·1	+ 64 57	3·6 : 3·6
9	...	...	4949	2510	14 55·7	+ 66 25	4·8
10	...	...	4992	2529	15 2·9	+ 55 1	5·2 : 5·3
11	ι	12	5097	2569	15 21·8	+ 59 23	3·4 : 3·2
12	...	...	5249	2644	15 44·8	+ 62 58	5·2
13	...	...	5313	2680	15 54·9	+ 55 5	5·0 : 5·2
14	θ	13	5348	2696	15 59·6	+ 58 53	4·2 : 3·9
15	η	14	5512	2766	16 22·4	+ 61 47	2·8 : 2·8
16	A	15	5545	2781	16 28·2	+ 69 2	5·0 : 4·9
17	...	17	5575	2794–5	16 33·4	+ 53 10	5·2 : 5·2
18	g	18	5628	2813	16 40·1	+ 64 49	5·0 : 5·0
19	...	...	5643	2820	16 43·0	+ 57 0	4·9 : 4·9
20	h^1	19	5740	2843	16 55·4	+ 65 19	4·7 : 4·9
21	μ	21	5785	2865	17 2·8	+ 54 38	5·2 : 5·0
22	ζ	22	5823	2878	17 8·4	+ 65 52	3·3 : 3·3
23	β	23	5937	2937	17 27·7	+ 52 23	3·0 : 3·0
24	ν^1	24	5950	2945	17 29·8	+ 55 16	4·9 : 4·7
25	ν^2	25	5951	2946	17 29·9	+ 55 15	4·8 : 4·7
26	ω	28	6006	2964	17 37·7	+ 68 49	4·9 : 4·8
27	ψ^1	31	6047	2985	17 41·1	+ 72 12	4·5 : 4·8
28	...	30	6052	2989	17 46·2	+ 50 50	5·2 : 5·2
29	ξ	32	6079	3003	17 51·5	+ 56 54	3·9 : 3·9
30	γ	33	6091	3009	17 53·8	+ 51 30	2·4 : 2·4
31	...	35	6114	3019	17 54·8	+ 76 59	5·1 : 5·1
32	...	40–1	6206,8	3071–2	18 9·0	+ 79 58	5·2 {5·8 : 5·7 / 6·2 : 6·0}
33	...	36	6224	3081	18 13·2	+ 64 21	5·0 : 5·0
34	...	...	6255	3106	18 18·5	+ 49 4	5·1 : 5·1
35	b	39	6289	3116	18 22·2	+ 58 44	4·8 : 4·8

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
36	ϕ	43	6297	3120	18 22·5	+ 71 16	4·2 : 4·2
37	χ	44	6302	3122	18 23·2	+ 72 41	3·7 : 3·9
38	...	42	6316	3126	18 25·6	+ 65 29	5·0 : 5·1
39	*d*	45	6348	3136	18 30·5	+ 56 57	4·8 : 4·9
40	*c*	46	6395	3166	18 40·3	+ 55 25	5·2 : 5·3
41	*o*	47	6463	3206	18 49·4	+ 59 14	4·6 : 4·7
42	...	...	6470	3214	18 50·3	+ 50 34	4·9 : 5·1
43	υ	52	6510	3242	18 55·9	+ 71 8	4·8 : 5·0
44	...	53	6583	3289	19 9·4	+ 56 39	5·2 : 5·2
45	δ	57	6612	3307	19 12·5	+ 67 27	3·2 : 3·0
46	...	59	6625	3313	19 13·5	+ 76 21	4·9 : 5·2
47	τ	60	6650	3328	19 17·9	+ 73 8	4·5 : 4·6
48	π	58	6662	3345	19 20·1	+ 65 29	4·6 : 4·8
49	σ	61	6735	3389	19 32·6	+ 69 27	4·7 : 4·8
50	ϵ	63	6836	3447	19 48·6	+ 69 58	3·9 : 3·7
51	ρ	67	6926	3506	20 2·3	+ 67 32	4·6 : 4·5
52	...	73	7156	3614	20 33·1	+ 74 33	5·1 : 5·4

Fl. 2 (5·5); Fl. 3 (5·5); Fl. 4 (5·3); Fl. 8 (5·3); B.A.C. 5404 (5·4); B.A.C. 5459 (5·4); B.A.C. 5514 (5·4); B.A.C. 5599 (5·5); B.A.C. 5840 (5·5); *f* (5·3); Fl. 26 (5·3); B.A.C. 6350 (5·4); H.P. 3153 (5·5); B.A.C. 6469 (5·4); H.P. 3249 (5·4); Fl. 51 (5·4); Fl. 54 (5·3); *e* (5·4); B.A.C. 7299 (5·4); Fl. 78 (5·4).

35. EQUULEUS.

Fr. **Le Petit Cheval;** *Germ.* **Das Füllen.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	21 10	+ 6
Approximate Boundaries, 1900.	Preceding	20 45	
	Following	21 30	
	North		+ 11
	South		+ 1

Equuleus is a small constellation of which the brightest star is α, of mag. 4·1. There are 3 other stars between that and mag. 5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	γ	5	7350	3726	21 4·5	+ 9 39	4·8 : 4·4
2	δ	7	7372	3735	21 8·7	+ 9 31	4·6 : 4·5
3	α	8	7380	3739	21 9·8	+ 4 45	4·1 : 3·9
4	β	10	7421	3765	21 16·9	+ 6 18	4·9 : 5·0

Fl. 1 (5·4).

36. ERIDANUS.

Fr. **L'Eridan;** *Germ.* **Der Fluss Eridanus.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	3 50	−30
Approximate Boundaries, 1900.	Preceding	1 30	
	Following	5 0	
	North		− 0
	South		−57

Eridanus is a very long straggling constellation, of which a large part is invisible in England, reaching as it does from the Equator to 60° of S. Declination; and it is the southern part of the constellation which contains the brightest stars. The chief stars are:—

	Mag.		Mag.
α (Achernar) ...	1·0	ϵ	3·7
θ	2·6	δ	3·7
β	2·9	12	3·8
γ	3·0	v^7	3·8
v^4	3·3	τ^4	3·8
ϕ	3·5	53	3·9

There are also 44 stars ranging from 4—5·2 mags.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	α	...	507	A 2	1 33·3	− 57 51	1·0
2	q^2	...	550	A 6	1 41·5	− 54 8	5·4
3	χ	...	596	A 7	1 51·3	− 52 12	3·9
4	ϕ	...	717	A 14	2 12·0	− 52 4	3·5
5	κ	...	763	A 16	2 22·6	− 48 14	4·2

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
6	...	...	828	A 18	2 35·2	−43 24	5·0
7	ι	...	832	A 19	2 35·9	−40 22	4·2
8	τ^1	1	856	438	2 39·5	−19 5	4·7
9	τ^2	2	887	453	2 45·6	−21 30	4·8
10	...	...	...	463	2 50·6	− 4 12	5·2 : 5·2
11	η	3	910	464	2 50·6	− 9 23	4·0 : 3·9
12	...	...	...	474	2 52·7	− 3 16	5·0 : 5·4
13	θ	...	937	A 48	2 53·7	−40 47	2·6
14	τ^3	11	954	487	2 57·1	−24 6	4·1
15	...	12	997	512	3 7·0	−29 28	3·8
16	ζ	13	1013	519	3 10·0	− 9 16	4·8 : 4·8
17	...	15	1031	530	3 13·1	−22 57	5·0
18	τ^4	16	1037	533	3 14·2	−22 12	3·8
19	...	...	1044	A 82	3 15·1	−43 32	4·4
20	...	17	1090	571	3 24·7	− 5 29	4·8 : 4·7
21	ϵ	18	1100	576	3 27·3	− 9 52	3·7 : 3·4
22	τ^5	19	1104	579	3 28·5	−22 2	4·2
23	...	...	1125	A 110	3 32·8	−40 40	4·8
24	δ	23	1148	604	3 37·5	−10 10	3·7
25	...	...	1150	605	3 37·5	−32 19	4·8
26	...	24	1153	611	3 38·4	− 1 33	5·1 : 5·4
27	υ^1	...	1159	A 124	3 38·4	−37 41	4·8
28	π	26	1168	619	3 40·5	−12 29	4·4
29	τ^6	27	1181	623	3 41·7	−23 36	4·3
30	τ^7	28	1191	627	3 42·5	−24 15	4·8
31	...	...	1199	A 135	3 44·2	−37 59	4·5
32	υ^2	...	1201	A 138	3 45·0	−36 34	4·1
33	...	32	1216	664–5	3 48·3	− 3 19	$4{\cdot}8\begin{cases}6{\cdot}5\\5{\cdot}1\end{cases}\begin{cases}6{\cdot}4\\4{\cdot}8\end{cases}$
34	τ^8	33	1217	646	3 48·6	−24 58	4·7
35	υ^3	...	1220	A 151	3 49·1	−35 5	5·3
36	γ	34	1234	653	3 52·4	−13 51	3·0
37	τ^9	36	1243	660	3 54·8	−24 21	4·6
38	...	35	1245	662	3 55·5	− 1 53	5·2 : 5·1
39	o^1	38	1290	701	4 6·0	− 7 9	4·1 : 4·1
40	A	39	1303	714	4 8·7	−10 33	4·9

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
41	o^2	40	1309	721	4 9·7	— 7 50	4·5 : 4·5
42	v^4	41	1333	740	4 13·4	—34 6	3·3
43	v^5	43	1372	766	4 19·6	—34 18	4·0
44	...	45	1403	787	4 25·7	— 0 18	4·9 : 5·1
45	v^6	50	1422	796	4 28·8	—30 1	4·4
46	ν	48	1429	799	4 30·3	— 3 36	4·1 : 4·0
47	v^7	52	1433	802	4 30·9	—30 49	3·8
48	...	53	1441	812	4 32·7	—14 32	3·9
49	...	...	1443	813	4 33·3	—12 21	4·9
50	...	54	1451	821	4 35·2	—19 59	4·5
51	μ	57	1469	830	4 39·5	— 3 29	4·3 : 4·1
52	...	60	1498	846	4 44·8	—16 25	5·2
53	ω	61	1507	854	4 47·0	— 5 39	4·2 : 4·3
54	...	64	1545	883	4 54·4	—12 43	4·9
55	ψ	65	1552	884	4 55·6	— 7 21	4·7 : 4·8
56	...	66	1579	906	5 0·8	— 4 49	5·2
57	β	67	1588	910	5 2·0	— 5 15	2·9 : 2·8
58	λ	69	1597	917	5 3·4	— 8 55	4·4 : 4·3

Lac. 495 (5·6); q^1 (5·9); B.A.C. 883 (5·3); Fl. 4 (5·4); Fl. 5 (5·4); B.A.C. 940 (5·4); ρ^2 (5·4); ρ^3 (5·4); Fl. 20 (5·3); Lac. 1163 (5·8); Fl. 22 (5·4); Fl. 30 (5·4); H.P. 664 (5·5); B.A.C. 1273 (5·5); H.P. 695 (5·4); H.P. 749 (5·3); ξ (5·3); H.P. 782 (5·3); Fl. 49 (5·4); *c* (5·3); B.A.C. 1446 (5·5); *b* (5·4); H.P. 878 (5·4); Fl. 68 (5·4).

37. FORNAX CHEMICA.

Fr. Le Fourneau Chimique; *Germ.* Der Chemische Ofen.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	2 25	−33
Approximate Boundaries, 1900.	Preceding	1 40	
	Following	3 25	
	North		−24
	South		−40

Fornax Chemica, generally known as Fornax, has for its brightest star B. A. C. 643, the mag. of which is 4·6. There are also 4 other stars between that and mag. 5·2.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	...	627	A 12	1 55·9	— 30 34	5·5
2	...	...	643	A 331	1 59·1	— 29 52	4·6
3	μ	...	688	355	2 7·6	— 31 17	5·2
4	κ	...	737	380	2 17·0	— 24 21	5·4
5	...	...	765	A 28	2 23·0	— 34 21	5·1
6	...	...	790	A 34	2 28·6	— 28 45	4·9
7	β	...	879	448	2 44·1	— 32 55	4·7

Lac. 798 (5·7); Lac. 805 (5·9); Lac. 811 (5·7); Lac. 892 (5·6); Lac. 899 (5·4); Lac. 947 (5·9); Lac. 1108 (5·6).

38. GEMINI.

Fr. Les Gémeaux; *Germ.* Die Zwillinge.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	7 0	+ 24
Approximate Boundaries, 1900.	Preceding	5 50	
	Following	7 50	
	North		+ 35
	South		+ 11

Gemini has two well-known stars Castor and Pollux as leaders, together with several others of lesser magnitude, which help to identify the constellation. Its chief stars are:—

	Mag.		Mag.
β (Pollux) ...	1·1	η	3·5
α (Castor) ...	1·6	λ	3·6
γ	2·0	δ	3·6
μ	3·2	κ	3·6
ϵ	3·2	θ	3·7
ξ	3·4		

There are also 22 stars ranging from 4—5·2 mags. Therefore, considering its comparatively small area, Gemini may be regarded as a rather bright constellation.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	1	1938	1121	5 56·8	+23 16	4·3 : 4·5
2	η	7	2002	1160	6 7·6	+22 32	3·5 : 3·6
3	μ	13	2047	1194	6 15·7	+22 35	3·2 : 3·4
4	ν	18	2090	1216	6 21·8	+20 17	4·0 : 4·3
5	γ	24	2163	1249	6 30·8	+16 31	2·0 : 2·1
6	...	26	2191	1260	6 35·4	+17 46	5·0 : 5·2
7	ε	27	2194	1263	6 36·6	+25 15	3·2 : 3·3
8	...	30	2199	1266	6 37·2	+13 21	4·6 : 5·2
9	ξ	31	2206	1272	6 38·6	+13 2	3·4 : 3·8
10	d	36	2233	1293	6 44·4	+21 55	5·2 : 5·3
11	θ	34	2237	1295	6 44·9	+34 6	3·7 : 3·6
12	e	38	2255	1305	6 47·9	+13 20	4·8 : 4·9
13	ζ	43	2305	1334	6 57·0	+20 45	4·0 : 4·0
14	...	...	2306	1335	6 57·0	+11 7	5·2 : 5·2
15	τ	46	2340	1349	7 3·5	+30 26	4·6 : 4·7
16	λ	54	2398	1373	7 11·2	+16 45	3·6 : 3·7
17	δ	55	2410	1377	7 13·0	+22 12	3·6 : 3·5
18	...	56	2423	1384	7 14·9	+20 39	5·0 : 5·1
19	A	57	2431	1387	7 16·2	+25 17	5·0 : 5·2
20	ι	60	2442	1394	7 18·3	+28 2	4·0 : 4·0
21	ρ	62	2464	1405	7 21·4	+32 1	4·2 : 4·4
22	b^1	64	2467	1409	7 21·9	+28 23	5·1 : 5·1
23	b^2	65	2469	1412	7 22·4	+28 10	5·1 : 5·0
24	...	68	2486	1421	7 26·8	+16 5	5·0 : 5·2
25	a^2	66	2485	1423–4	7 27·0	+32 9	$1·6\left\{\begin{matrix}2·0\\2·8\end{matrix}\right\}1·5$
26	υ	69	2493	1430	7 28·5	+27 10	4·2 : 4·4
27	ο	71	2509	1436	7 31·3	+34 52	4·7 : 5·0
28	f	74	2519	1440	7 32·6	+17 58	5·2 : 5·2
29	σ	75	2540	1453	7 35·8	+29 10	4·1 : 4·1
30	κ	77	2551	1457	7 37·2	+24 41	3·6 : 3·6
31	β	78	2555	1459	7 38·0	+28 19	1·1 : 1·4
32	g	81	2558	1463	7 39·2	+18 48	5·1 : 5·3
33	φ	83	2617	1481	7 46·2	+27 5	4·9 : 5·0

Fl. 28 (5·4); Fl. 33 (5·4); ω (5·3); Fl. 47 (5·5); Fl. 51 (5·4); Fl. 63 (5·3); B.A.C. 2489 (5·4); c (5·3); π (5·4); Fl. 85 (5·3).

39. GRUS.

Fr. La Grue; *Germ.* Der Kranich.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	22 20	−47
Approximate Boundaries, 1900.	Preceding	21 20	
	Following	23 30	
	North		−37
	South		−57

Grus, though a small constellation, contains a considerable number of important stars, the chief of which are as follows :—

	Mag.		Mag.
α	1·9	ε	3·5
β	2·2	ι	3·9
γ	3·0		

There are 9 stars between mags. 4—5½. Most of the conspicuous stars of Grus, exceping α, are arranged in a gently curved line.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880. h. m.	Decl. 1880. ° ′	Magnitude. Harv. or Arg. : Oxford.
1	γ	...	7613	A 18	21 46·7	−37 58	3·0
2	λ	...	7684	A 27	21 58·9	−40 7	4·7
3	α	...	7692	A 28	22 0·6	−47 33	1·9
4	μ^1	...	7756	A 35	22 8·4	−41 56	5·0
5	μ^2	...	7763	A 36	22 9·2	−42 13	5·4
6	δ^1	...	7828	A 42	22 22·1	−44 7	4·2
7	δ^2	...	7830	A 43	22 22·6	−44 22	4·4
8	β	...	7904	A 57	22 35·6	−47 32	2·2
9	ρ	...	7916	A 59	22 36·5	−42 2	5·2
10	η	...	7925	A 61	22 38·3	−54 8	5·1
11	ε	...	7946	A 68	22 41·3	−51 57	3·5
12	ζ	...	8008	A 77	22 53·8	−53 24	4·0
13	θ	...	8043	A 84	23 0·1	−44 10	4·2
14	ι	...	8067	A 90	23 3·6	−45 54	3·9

Lac. 8912 (5·8); Lac. 8964 (5·8); Lac. 8976 (5·8); Lac. 9076 (5·7); π (5·9); Lac. 9136 (5·6); Lac. 9229 (5·9); Lac. 9275 (5·8); Lac. 9328 (5·9); Lac. 9353 (5·6); Lac. 9369 (5·7); Lac. 9367 (5·9); φ (5·8); Lac. 9457 (5·9); Lac. 9470 (5·7).

40. HERCULES.

Fr. Hercule; *Germ.* Hercules.

		R.A. h. m.	Decl.
Meridional Centre of Constellation	... ...	17 10	+ 27
Approximate Boundaries, 1900.	Preceding	15 55	
	Following	18 55	
	North		+ 51
	South		+ 4

Hercules is a large and important constellation, distinguished alike by its naked-eye and its telescopic objects. The chief stars are:—

	Mag.		Mag.
β	2·8	η	3·7
ζ	3·1	γ	3·8
α	3·2	τ	3·9
δ	3·3	ι	3·9
π	3·4	ξ	3·9
μ	3·5	Fl. 109	3·9

There are 37 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	χ	1	5271	2658	15 48·6	+ 42 47	4·5 : 4·5
2	υ	6	5338	2694	15 59·1	+ 46 22	4·7 : 4·6
3	κ¹	7	5367	2706	16 2·7	+ 17 22	5·1 : 5·0
4	φ	11	5388	2713	16 5·0	+ 45 15	4·2 : 4·1
5	τ	22	5463	2745	16 16·1	+ 46 36	3·9 : 3·6
6	γ	20	5466	2747	16 16·6	+ 19 26	3·8 : 3·6
7	ω	24	5490	2757	16 19·9	+ 14 19	4·7 : 4·7
8	g	30	5523	2772	16 24·7	+ 42 9	5·1 : 5·1
9	β	27	5525	2774	16 25·1	+ 21 45	2·8 : 2·7
10	s	...	5527	2776	16 25·4	+ 20 45	4·7 : 4·9
11	h	29	5532	2780	16 27·0	+ 11 45	5·0 : 5·2
12	σ	35	5552	2787	16 30·2	+ 42 42	4·2 : 4·1
13	...	42	5596	2802	16 35·5	+ 49 20	5·2 : 4·9

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	: Oxford.
					h. m.	° ′		
14	ζ	40	5604	2807	16 36·8	+31 49	3·1	2·6
15	η	44	5617	2810	16 38·8	+39 9	3·7	3·6
16	...	52	5667	2826	16 45·7	+46 12	5·0	5·0
17	...	51	5677	2830	16 46·8	+24 52	5·2	5·0
18	ε	58	5731	2844	16 55·7	+31 6	4·0	3·8
19	...	[32]	5749	2849	16 57·6	+14 18	5·1	5·3
20	...	60	5765	2859	16 59·8	+12 54	4·9	4·9
21	...	...	...	2872	17 5·7	+40 56	5·1	
22	α	64	5821	2879	17 9·2	+14 32	3·2	3·0
23	δ	65	5828	2880	17 10·1	+24 59	3·3	3·2
24	π	67	5834	2885	17 10·9	+36 57	3·4	3·6
25	u	68	5842	2890	17 12·9	+33 14	4·9	5·1
26	e	68	5847	2893	17 13·5	+37 25	4·9	4·5
27	...	...	5856	2900	17 15·0	+18 11	5·1	5·0
28	ρ	75	5886	2914–5	17 19·6	+37 16	4·1 {5·3, 4·5}	4·3
29	λ	76	5922	2933	17 25·9	+26 12	4·3	4·7
30	ι	85	5990	2959	17 36·1	+46 4	3·9	4·1
31	μ	86	6021	2976	17 41·8	+27 48	3·5	3·5
32	θ	91	6082	3004	17 52·1	+37 16	4·0	3·7
33	ξ	92	6084	3007	17 53·1	+29 16	3·9	4·0
34	ν	94	6087	3010	17 53·9	+30 12	4·6	4·6
35	...	93	6094	3018	17 54·7	+16 46	4·5	4·5
36	...	95	6106	3026–7	17 56·4	+21 37	4·6	4·4
37	...	96	6110	3033	17 57·3	+20 50	5·1	5·2
38	o	103	6150	3048	18 2·9	+28 45	4·0	3·7
39	...	100	6151–2	3049–50	18 3·0	+26 5	5·2 {5·9, 6·1}	{6·0, 6·1}
40	...	102	6157	3051	18 3·6	+20 49	4·5	4·3
41	...	101	6159	3053	18 3·7	+20 3	5·2	5·3
42	...	...	6162	3055	18 4·0	+43 27	5·1	5·0
43	A	104	6178	3065	18 7·4	+31 22	4·9	5·1
44	...	106	6231	3091	18 15·2	+21 55	4·8	5·0
45	t	107	6238	3097	18 16·3	+28 49	5·0	5·2

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
46	...	109	6251	3107	18 18·6	+ 21 43	3·9 : 4·2
47	...	110	6387	3171	18 40·5	+ 20 26	4·2 : 4·0
48	...	111	6397	3178	18 41·7	+ 18 3	4·5 : 4·2
49	...	113	6453	3209	28 49·7	+ 22 30	4·6 : 4·8

Fl. 2 (5·5); *r* (5·3); B.A.C. 5460 (5·5); Fl. 25 (5·5); *n* (5·5); H.P. 2782 (5·3); *i* (5·5); *l* (5·5); *k* (5·4); Fl. 53 (5·4); Fl. 54 (5·5); *d* (5·3); *c* (5·5); Fl. 66 (5·5); H.P. 2902 (5·4); Fl. 70 (5·3); *w* (5·4); B.A.C. 5900 (5·4); *y* (5·5); Fl. 87 (5·4); *f* (5·3); Fl. 98 (5·4); *b* (5·4); B.A.C. 6245 (5·5); Fl. 112 (5·5).

41. HOROLOGIUM.

Fr. L'Horloge; *Germ.* Die Pendeluhr.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	3 20	−52
Approximate Boundaries, 1900.	Preceding	2 0	
	Following	4 20	
	North		−42
	South		−65

Horologium has one conspicuous star, *α*, of mag. 3·8, and 4 stars of mags. 4—5½.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	ζ	...	839	A 14	2 36·9	— 55 4	5·5
2	...	...	956	A 32	2 56·5	— 64 33	5·2
3	...	...	972	A 33	3 0·8	— 60 12	5·3
4	δ	...	1299	A 63	4 6·8	— 42 18	5·3
5	α	...	1315	A 66	4 10·0	— 42 35	3·8

λ (5·8); η (5·6); Lac. 859 (5·6); R. 87 (5·7); Lac. 1144 (5·9); Lac. 1424 (5·8).

42. HYDRA.

Fr. Hydre; *Germ.* Die Wasserschlange.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	11 0	−12
Approximate Boundaries, 1900.	Preceding	8 10	
	Following	4 50	
	North		+10
	South		−35

Hydra is a long and straggling constellation, extending through more than 6^h of R.A. in a direction nearly E. and W. The following are its chief stars, and of these one only is at all prominent:—

	Mag.		Mag.
α (Alphard) ...	2·0	π	3·5
ζ	3·3	ε	3·6
ν	3·3	θ	3·9
γ	3·4	λ	3·9

There are 32 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	δ	4	2901	1588	8 31·3	+ 6 7	4·1 : 4·2
2	σ	5	2911	1589	8 32·5	+ 3 46	4·4 : 4·4
3	...	6	2929	1594	8 34·3	−12 3	5·2
4	...	9	2940	1596	8 36·2	−15 31	5·0
5	η	7	2945	1599	8 37·0	+ 3 50	4·2 : 4·4
6	ε	11	2971	1608	8 40·4	+ 6 52	3·6 : 3·5
7	...	12	2975	1610	8 40·7	−13 6	4·4
8	...	...	2976	1611	8 41·2	− 1 27	5·1 : 5·1
9	ρ	13	2978	1613	8 42·1	+ 6 17	4·3 : 4·7
10	...	14	2987	1614	8 43·3	− 3 0	5·1 : 5·1
11	ζ	16	3032	1629	8 49·1	+ 6 24	3·3 : 3·4
12	θ	22	3146	1676	9 8·1	+ 2 49	3·9 : 4·0
13	...	26	3184	1687	9 14·0	−11 28	4·9
14	...	27	3188	1688	9 14·6	− 9 3	4·9 : 5·0
15	α	30	3223	1698	9 21·7	− 8 8	2·0 : 2·2

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. :	Oxford.
					h. m.	° ′		
16	...	...	...	1700	9 21·8	— 21 49	5·0	
17	τ^1	31	3237	1704	9 23·1	— 2 15	4·9 :	5·0
18	τ^2	32	3253	1714	9 25·9	— 0 39	4·6 :	4·8
19	...	...	...	1720	9 27·7	— 20 36	5·2	
20	ι	35	3303	1734	9 33·9	— 0 36	4·2 :	4·4
21	κ	38	3311	1739	9 34·6	— 13 47	4·9	
22	...	...	...	1741	9 35·8	— 23 4	4·6	
23	...	...	...	1743	9 36·8	— 23 23	4·9	
24	υ^1	39	3372	1759	9 45·7	— 14 17	4·3	
25	...	...	3391	1768	9 48·8	— 25 22	5·1	
26	υ^2	40	3444	1789	9 59·3	— 12 29	4·7	
27	λ	41	3473	1800	10 4·7	— 11 46	3·9	
28	μ	42	3568	1837	10 20·3	— 16 13	4·1	
29	...	...	3638	1870	10 31·6	— 26 47	5·2	
30	ϕ^3	...	3646	1875	10 32·7	— 16 15	5·2	
31	ν	...	3715	1893	10 43·7	— 15 34	3·3	
32	ψ	45	4395	2222	13 2·6	— 22 29	5·1	
33	γ	46	4450	2249	13 12·4	— 22 32	3·4	
34	...	47	4657	2366	13 51·8	— 24 23	5·1	
35	π	49	4685	2378	13 59·6	— 26 6	3·5	
36	...	50	4708	2387	14 5·9	— 26 42	5·2	
37	...	51	4763	2417	14 16·2	— 27 12	4·9	
38	...	52	4784	2427	14 21·1	— 28 57	5·0	
39	...	54	4865	2463	14 39·1	— 24 56	5·0	
40	...	58	4891	2477	14 43·2	— 27 27	5·0	

Fl. 15 (5·5); ω (5·6); Fl. 19 (5·5); Fl. 23 (5·4); Fl. 24 (5 5); B.A.C. 3226 (5·3); H.P. 1769 (5·3); B.A.C. 3471 (5·3); B.A.C. 3521 (5·5); Fl. 44 (5·4); B.A.C. 3637 (5·4); Lac. 4739 (5·7); B.A.C. 4253 (5·5); B.A.C. 4767 (5·4).

43. HYDRUS.

Fr. **L' Hydre Mâle;** *Germ.* **Die kleine Wasserschlange.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	2 40	−72
Approximate Boundaries, 1900.	Preceding	0 20	
	Following	4 40	
	North		−60
	South		−81

This constellation is by young astronomers sometimes confused with Hydra, but the two are quite distinct. The following are the principal stars :—

	Mag.
β	2·7
α	2·9
γ	3·2

There are 5 stars of mags. 4—5½.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	Magnitude. Oxford.
					h. m.	° ′		
1	β	...	88	A 5	0 19·4	−77 56	2·7	
2	η^2	...	603	A 21	1 51·9	−68 14	4·9	
3	α	...	623	A 24	1 55·0	−62 9	2·9	
4	δ	...	756	A 38	2 19·6	−69 12	4·1	
5	ε	...	849	A 44	2 37·7	−68 47	4·2	
6	ζ	...	882	A 47	2 43·7	−68 7	5·2	
7	ν	...	928	A 50	2 51·3	−75 33	5·1	
8	γ	...	1230	A 62	3 49·2	−74 36	3·2	

λ (5·6); π^1 (5·9); π^2 (5·9); μ (5·6); θ (5·8); ι (5·9).

44. INDUS.

Fr. **L'Indien;** *Germ.* **Der Indianer.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	21 20	−58
Approximate Boundaries, 1900.	Preceding	20 0	
	Following	22 0	
	North		−45
	South		−75

Indus is a small and straggling Southern constellation, with not much to distinguish it: ϵ is remarkable for its great proper motion. The chief stars are:—

	Mag.
α	3·1
β	3·7

There are 6 stars of mags. 4—5½.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	α	...	7096	A 1	20 29·1	−47 43	3·1
2	η	...	7154	A 2	20 35·2	−52 20	4·7
3	ζ	...	7192	A 4	20 41·2	−46 40	5·3
4	β	...	7228	A 6	20 45·4	−58 54	3·7
5	θ	...	7388	A 25	21 11·3	−53 57	4·6
6	γ	...	7423	A 34	21 17·7	−55 13	5 var.
7	δ	...	7633	A 60	21 49·7	−55 34	4·8
8	ϵ	...	7656	A 64	21 54·2	−57 16	5·2

ν^1 (5·6); ι (5·6); μ (5·8); o (5·7); (ϵ 5·2); ν^2 Lac. 9082 (5·7); Lac. 9117 (5·9); Lac. 9337 (5·8).

45. LACERTA.

Fr. **Le Lézard;** *Germ.* **Die Eidechse.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation		22 25	+43
Approximate Boundaries, 1900.	Preceding	21 55	
	Following	22 55	
	North		+55
	South		+35

Lacerta is a small Northern constellation, with little to distinguish it. Its largest star, α, is only of mag. 3·9, but there are no less than 15 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	...	7765	3935	22 8·7	+39 7	4·6 : 4·9
2	...	1	7777	3944	22 10·7	+39 9	4·1 : 4·6
3	...	2	7800	3953	22 16·1	+45 56	4·8 : 4·6

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv or Arg. : Oxford.
					h. m.	° ′	
4	β	3	7815	3959	22 18·9	+ 51 38	4·5 : 4·5
5	...	4	7820	3962	22 19·7	+ 48 52	4·6 : 4·9
6	...	5	7845	3980	22 24·6	+ 47 6	4·6 : 4·5
7	...	6	7850	3985	22 25·3	+ 42 30	4·6 : 4·7
8	α	7	7855	3987	22 26·4	+ 49 40	3·9 : 4·1
9	...	9	7888	4001	22 32·5	+ 50 56	4·8 : 4·9
10	...	10	7901	4005	22 33·9	+ 38 26	5·0 : 5·2
11	...	11	7906	4011	22 35·3	+ 43 39	4·7 : 4·8
12	...	12	7915	4014	22 36·1	+ 39 37	5·1 : 5·3
13	...	13	7932	4022	22 38·7	+ 41 11	5·1 : 5·1
14	...	15	7972	4042	22 46·7	+ 42 39	5·1 : 5·3
15	...	...	7995	4058	22 51·2	+ 49 6	5·2 : 5·2
16	...	...	7999	4060	22 51·8	+ 48 2	5·1 : 5·3

B.A.C. 7705 (5·3); B.A.C. 7746 (5·4); Fl. 8 (5·3).

46. LEO.

Fr. Le Lion; *Germ.* Der Löwe.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	10 30	+ 15
Approximate Boundaries, 1900.	Preceding	9 20	
	Following	11 55	
	North		+ 30
	South		+ 4

In Leo we have an important and interesting constellation, one prominent feature of which, the group of stars forming "The Sickle," is known to most star-gazers. The chief stars are :—

	Mag.		Mag.
α (Regulus) ...	1·4	θ	3·5
γ	2·2	η	3·6
β (Denebola) ...	2·2	ζ	3·6
δ	2·8	ο	3·8
ε	3·1		

There are 23 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	:	Oxford.
					h. m.	° ′			
1	κ	1	3204	1692	9 17·7	+ 26 42	4·6	:	4·7
2	λ	4	3246	1710	9 24·9	+ 23 30	4·4	:	4·5
3	ξ	5	3250	1711	9 25·5	+ 11 50	5·2	:	5·2
4	ο	14	3312	1740	9 34·8	+ 10 26	3·8	:	3·7
5	ε	17	3331	1747	9 39·1	+ 24 20	3·1	:	3·4
6	μ	24	3371	1760	9 45·9	+ 26 34	4·1	:	3·9
7	π	29	3415	1782	9 53·9	+ 8 37	5·0	:	5·2
8	η	30	3453	1793	10 0·8	+ 17 21	3·6	:	3·5
9	A	31	3457	1795	10 1·5	+ 10 35	4·6	:	4·9
10	α	32	3459	1797	10 2·0	+ 12 33	1·4	:	1·2
11	ζ	36	3508	1811-2	10 10·0	+ 24 1	3·6 {5·8, 3·8}		3·4
12	...	40	3522	1821	10 13·3	+ 20 5	5·0		
13	γ	41	3523	1823-4	10 13·4	+ 20 27	2·2 {2·5, 3·7}		2·1
14	ρ	47	3609	1859	10 26·5	+ 9 56	4·0	:	4·0
15	...	48	3621	1863	10 28·5	+ 7 34	5·2	:	5·0
16	...	54	3742	1908	10 49·1	+ 25 23	4·3	:	4·5
17	d	58	3768	1921	10 54·4	+ 4 16	5·0	:	5·0
18	c	59	3769	1922	10 54·5	+ 6 44	5·1	:	5·1
19	p^1	61	3775	1924	10 55·7	+ 1 50	5·0	:	5·1
20	b	60	3776	1925	10 55·9	+ 20 49	4·5	:	4·6
21	χ	63	3788	1931	10 58·8	+ 7 59	4·7	:	5·0
22	δ	68	3834	1949	11 7·7	+ 21 11	2·8	:	2·5
23	θ	70	3838	1951	11 7·9	+ 16 5	3·5	:	3·4
24	...	72	3842	1952	11 8·8	+ 23 45	4·9	:	5·0
25	φ	74	3848	1956	11 10·6	+ 3 0	4·5	:	4·3
26	σ	77	3862	1965	11 15·0	+ 6 41	4·1	:	4·1
27	ι	78	3877	1969	11 17·7	+ 11 12	4·0	:	4·2
28	τ	84	3900	1978	11 21·8	+ 3 31	5·1	:	5·2
29	e	87	3916	1987	11 24·2	— 2 20	5·0	:	5·1
30	υ	91	3946	2003	11 30·8	— 0 10	4·5	:	4·3
31	...	93	3990	2022	11 41·8	+ 20 53	4·6	:	4·4
32	β	94	3995	2025	11 42·9	+ 15 15	2·2	:	2·1

ω (5·6); *h* (5·4); ψ (5·7); *g* (5·3); ν (5·3); *l* (5·3); p^5 (5·5); *n* (5·5); Fl. 75 (5·4); Fl. 79 (5·4); Fl. 81 (5·5); Fl. 92 (5·5); ο (5·4).

47. LEO MINOR.

Fr. Le Petit Lion; *Germ.* Der kleine Löwe.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	10 20	+33
Approximate Boundaries, 1900.	Preceding	9 20	
	Following	11 0	
	North		+44
	South		+23

Leo Minor lies to the N. of Leo Major. Its brightest star is Fl. 46 of mag. 3·9. There are 7 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880. h. m.	Decl. 1880. ° ′	Magnitude. Harv. or Arg. : Oxford.
1	...	10	3261	1717	9 26·9	+36 56	4·7 : 4·6
2	...	19	3399	1771	9 50·3	+41 38	5·2 : 5·2
3	...	21	3446	1792	10 0·4	+35 50	4·6 : 4·4
4	...	30	3560	1834	10 19·0	+34 25	5·1 : 4·8
5	β	31	3572	1840	10 20·9	+37 19	4·4 : 4·2
6	...	37	3640	1872	10 32·0	+32 36	4·8 : 4·9
7	...	41	3671	1884	10 36·9	+23 49	5·1 : 5·1
8	...	46	3728	1902	10 46·6	+34 52	3·9 : 4·0

Fl. 8 (5·5); Fl. 11 (5·5); Fl. 15 (5·3); Fl. 23 (5·4); Fl. 34 (5·5); Fl. 42 (5·4).

48. LEPUS.

Fr. Le Lièvre; *Germ.* Der Hase.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	5 25	−20
Approximate Boundaries, 1900.	Preceding	4 55	
	Following	6 5	
	North		−9
	South		−27

Lepus is a small constellation immediately south of Orion, with the following conspicuous stars:—

	Mag.		Mag.
α	2·7	ζ	3·7
β	3·0	η	3·7
ε	3·3	γ	3·8
μ	3·3		

There are 12 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	...	1553	889	4 56·2	— 20 14	5·0
2	...	...	1559	892	4 57·3	— 26 27	5·0
3	ε	2	1575	901	5 0·4	— 22 32	3·3
4	ι	3	1608	927	5 6·7	— 12 1	4·7
5	μ	5	1616	929	5 7·5	— 16 21	3·3
6	κ	4	1617	931	5 7·6	— 13 5	4·6
7	...	...	1634	943	5 10·6	— 27 5	4·7
8	λ	6	1653	959	5 14·1	— 13 18	4·3
9	ν	7	1654	960	5 14·4	— 12 26	5·2
10	...	...	...	963	5 15·3	— 21 21	4·6
11	...	8	1679	972	5 18·0	— 14 2	5·1
12	β	9	1715	994	5 23·1	— 20 51	3·0
13	α	11	1741	1014	5 27·4	— 17 55	2·7
14	γ	13	1823	1057	5 39·5	— 22 29	3·8
15	ζ	14	1840	1065	5 41·5	— 14 51	3·7
16	δ	15	1871	1086	5 46·2	— 20 53	4·0
17	η	16	1901	1101	5 50·9	— 14 11	3·7
18	...	17	955	1130	5 59·6	— 16 29	4·9
19	θ	18	1959	1134	6 0·7	— 14 55	4·6

H.P. 897 (5·5); B.A.C. 967 (5·3); Fl. 10 (5·4); B.A.C. 1965 (5·4); Fl. 19 (5·5); H.P. 1143 (5·5).

49. LIBRA.

Fr. **La Balance**; *Germ.* **Die Wage.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation		15 10	−14
Approximate Boundaries, 1900.	Preceding	14 20	
	Following	16 0	
	North		− 1
	South		−30

Libra is situated so low down towards the Southern horizon as regards England that it is not always easy to get hold of it, especially as it is a summer constellation. The chief stars are:—

	Mag.		Mag.
β	2·7	Fl. 39	3·9
α	3·0	Fl. 40	3·9
Fl. 20	3·2		

There are 13 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	α	9	4895	2480	14 44·2	−15 32	3·0
2	...	11	4898	2483	14 44·8	− 1 48	5·2
3	...	16	4927	2499	14 50·9	− 3 51	4·5
4	δ	19	4939	2506	14 54·6	− 8 2	4·9
5	...	20	4950	2514	14 57·1	−24 48	3·2
6	ι¹	24	4995	2531	15 5·4	−19 20	4·9
7	β	27	5034	2539	15 10·6	− 8 56	2·7
8	ε	31	5074	2557	15 17·7	− 9 53	5·2
9	...	37	5125	2586	15 29·6	− 9 39	4·9
10	...	...	5129	2587	15 27·9	− 8 47	5·0
11	γ	38	5134	2589	15 28·8	−14 23	4·0
12	...	39	5138	2595	15 29·7	−27 44	3·9
13	...	40	5151	2601	15 31·3	−29 23	3 9
14	...	42	5166	2610	15 33·3	−23 26	5·2
15	κ	43	5176	2618	15 35·0	−19 17	5·0
16	λ	45	5251	2650	15 46·4	−19 48	5·0
17	θ	46	5257	2655	15 47·0	−16 23	4·3
18	...	48	5290	2670	15 51·5	−13 56	4·8

μ (5·4); Fl. 8 (5·3); ξ (5·8); ν (5·4); B.A.C. 5109 (5·4); ζ (5·4); Fl. 36 (5·3) η (5·5); H.P. 2708 (5·5).

50. LUPUS.

Fr. Le Loup; *Germ.* Der Wolf.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation		15 0	−40
Approximate Boundaries, 1900.	Preceding	14 0	
	Following	16 0	
	North		−29
	South		−55

Lupus is a Southern constellation, practically invisible in England, but with a large number of conspicuous stars, of which an unusual proportion are doubles. Its chief stars are:—

	Mag.		Mag.
α	2·6	δ	3·7
β	2·8	ε	3·7
γ	3·2	η	3·7
ζ	3·6	ι	3·8
ϕ^1	3·6		

There are 23 stars of mags. 4—5½.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	ι	...	4734	A 1	14 11·7	—45 30	3·8
2	τ^1	...	4768	A 9	14 18·4	—44 41	5·3
3	τ	...	4770	A 10	14 18·5	—44 50	4·9
4	σ	...	4801	A 15	14 24·5	—49 56	5·2
5	ρ	...	4821	A 20	14 29·8	—48 54	4·5
6	α	...	4839	A 27	14 34·0	—46 52	2·6
7	ο	...	4892	A 35	14 43·8	—43 5	5·0
8	β	...	4924	A 41	14 50·7	—42 39	2·8
9	π	...	4948	A 47	14 57·0	—46 35	4·3
10	λ	...	4973	A 57	15 0·8	—44 49	4·8
11	κ	...	4986	A 62	15 3·6	—48 17	4·1
12	ζ	...	4989	A 64	15 3·7	—51 38	3·6
13	...	...	4994	A 66	15 4·8	—44 2	5·5
14	...	1	5009	A 69	15 7·3	—31 4	5·5
15	...	2	5032	2540	15 10·0	—29 42	4·7
16	μ	...	5028	A 75	15 10·2	—47 26	5·0
17	δ	...	5046	A 83	15 13·5	—40 13	3·7
18	ϕ^1	...	5054	A 88	15 14·2	—35 50	3·6
19	ε	...	5056	A 91	15 14·6	—44 16	3·7
20	ϕ^2	...	5060	A 92	15 15·5	—36 26	5·1
21	...	...	5069	A 97	15 17·5	—38 18	5·1
22	γ	...	5118	A 113	15 27·2	—40 46	3·2
23	...	...	5123	A 114	15 27·6	—44 33	5·1
24	ι	...	5139	A 117	15 30·0	—42 10	4·7
25	ψ^1	3	5160	2605	15 32·1	—34 1	4·6

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
26	...	...	5165	A 121	15 33·0	−44 16	5·2
27	ψ^2	4	5173	A 125	15 35·0	−34 19	5·1
28	χ	5	5227	2637	15 43·3	−33 16	4·0
29	ξ	...	5268	2659	15 49·2	−33 37	4·5
30	...	...	5282	A 144	15 51·3	−41 23	5·5
31	η	...	5292	A 146	15 52·2	−38 3	3·7
32	θ	...	5331	A 157	15 58·7	−36 28	4·9

Lac. 5891 (5·7); Lac. 5950 (5·9); Lac. 6070 (5·8); Lac. 6124 (5·7); Lac. 6198 (5·8); Lac. 6209 (5·7); Lac. 6280 (5·8); Lac. 6322 (5·8); Lac. 6356 (5·9); Lac. 6380 (5·9); Lac. 6486 (5·8); Lac. 6514 (5·9, ? Var.); Lac. 6644 (5·6).

51. LYNX.

Fr. Le Lynx; *Germ.* Der Luchs.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	7 50	+45
Approximate Boundaries, 1900.	Preceding	6 10	
	Following	9 30	
	North		+63
	South		+34

The stars in Lynx are rather troublesome to find and identify, there being but two prominent ones, namely :—

	Mag.
α	3·4
Fl. 38	3·8

But there are as many as 15 of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	2	2007	1168	6 9·1	+59 3	4·3 : 4·7
2	...	12	2187	1261	6 35·7	+59 33	4·7 : 4·8
3	...	15	2248	1302	6 46·9	+58 35	4·5 : 4·7
4	...	...	2379	1367	7 9·4	+49 41	4·8 : 4·9
5	...	19	2407	1378	7 13·1	+55 30	5·2 : 5·2

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
6	...	21	2441	1392	7 17·7	+49 27	4·6 : 4·9
7	...	24	2516	1441	7 32·8	+58 59	4·9 : 5·1
8	...	50 Camel.	2532	1448	7 35·0	+50 42	5·2 : 5·5
9	...	27	2697	1509	7 59·4	+51 51	4·8 : 5·0
10	...	31	2793	1539	8 14·6	+43 35	4·4 : 4·6
11	...	35	2989	1616	8 43·9	+44 11	5·2 : 5·4
12	...	10 Ursæ	3059	1641	8 52·9	+42 16	4·2 : 4·1
13	...	...	3097	1653	8 58·9	+38 56	4·7 : 4·7
14	...	36	3131	1671	9 6·0	+43 43	5·2 : 5·1
15	...	38	3162	1681	9 11·4	+37 19	3·8 : 3·9
16	α	40	3178	1685	9 13·8	+34 54	3·4 : 3·2
17	...	...	3265	1719	9 27·7	+40 9	5·0 : 4·9

Fl. 1 (5·4); Fl. 5 (5·5); H.P. 1198 (5·4); Fl. 13 (5·4); Fl. 14 (5·4); Fl. 18 (5·3); H.P. 1401 (5·5); Fl. 22 (5·4); H.P. 1460 (5·5); Fl. 29 (5·4); Fl. 42 (5·3); Fl. 43 (5·5).

52. LYRA.

Fr. La Lyre; *Germ.* Die Leier.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation		18 45	+36
Approximate Boundaries, 1900.	Preceding	18 5	
	Following	19 20	
	North		+48
	South		+25

Lyra is, as regards its area, relatively a small constellation, but it is marked by the very brilliant star Vega and by a great variety of interesting telescopic objects. Its chief stars are:—

	Mag.
α (Vega)	0·2
γ	3·2
β	3·6

There are 15 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	κ	1	6235	3093	18 15·7	+36 1	4·4 : 4·5
2	μ	2	6268	3110	18 20·3	+39 27	4·9 : 5·1
3	α	3	6355	3147	18 32·9	+38 40	0·2 : 0·8
4	ϵ^1	4	6390	3167	18 40·4	+39 33	4·6 : 4·4
5	ϵ^2	5	6391	3169	18 40·4	+39 29	4·6 : 4·7
6	ζ^1	6	6392	3172	18 40·6	+37 29	4·3 : 4·5
7	...	...	...	3177	18 41·2	+26 32	4·9 : 5·0
8	ν	9	6427	3192	18 45·4	+32 25	5·1 : 5·3
9	β	10	6429	3193	18 45·7	+33 13	3·6
10	δ^2	12	6466	3210	18 50·3	+36 45	4·5 : 4·7
11	R var.	13	6475	3224	18 51·7	+43 47	4·4 : 4·6
12	γ	14	6491	3232	18 54·5	+32 32	3·2 : 3·2
13	λ	15	6497	3241	18 55·5	+31 59	5·1 : 5·2
14	...	16	6520	3254	18 58·0	+46 47	5·0 : 5·2
15	...	17	6553	3271	19 2·9	+32 18	4·9 : 5·1
16	ι	18	6556	3272	19 3·0	+35 55	5·2 : 5·3
17	η	20	6581	3291	19 9·7	+38 56	4·5 : 4·7
18	θ	21	6599	3304	19 12·2	+37 55	4·3 : 4·6

H.P. 3132 (5·4); H.P. 3146 (5·3); H.P. 3160 (5·5); δ^1 (5·3); B.A.C. 6473 (5·4); B.A.C. 6480 (5·3); H.P. 3236 (5·3); H.P. 3246 (5·5); B.A.C. 6547 (5·5).

53. MONS MENSA.

Fr. La Montagne de la Table; *Germ.* Der Tafelberg.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	5 40	−77
Approximate Boundaries, 1900.	Preceding	3 10	
	Following	8 0	
	North		−70
	South		−85

Mons Mensæ, the "Table Mountain," is usually called Mensa. Its brightest star is only of mag. 5·3; the next is of mag. 5·5, and even by descending as low as mag. 5·8 we can only make up 7 more stars.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	: Oxford.
					h. m.	° ′		
1	...	...	1969	A 32	5 58·4	— 79 22	5·3	
2	α	...	2053	A 33	6 13·8	— 74 42	5·5	

δ (5·8); Lac. 639 (5·7); Lac. 1654 (5·6); β (5·7); Lac. 1921 (5·8); Lac. 2027 (5·6); Lac. 2097 (5·9); Lac. 2138 (5·8); ζ (5·8); Lac. 2758 (5·6).

54. MICROSCOPIUM.

Fr. **Le Microscope;** *Germ.* **Das Microscop.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	21 0	−37
Approximate Boundaries, 1900.	Preceding	20 20	
	Following	21 25	
	North		−30
	South		−45

Microscopium is a small constellation, the brightest star of which, θ^1, is only of mag. 4·8.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	: Oxford.
					h. m.	° ′		
1	ι	...	7186	A 26	20 40·3	— 44 25	5·4	
2	α	...	7207	A 27	20 42·5	— 34 14	5·1	
3	ζ	...	7292	A 44	20 55·3	— 39 5	5·5	
4	θ^1	...	7397	A 65	21 13·0	— 41 18	4·8	

Lac. 8517 (5·8); Lac. 8545 (5·8); Lac. 8582 (5·9); Lac. 8606 (5·7); Lac. 8719 (5·7); Lac. 8809 (5·9); Lac. 8833 (5·7).

55. MONOCEROS.

Fr. **La Licorne;** *Germ.* **Das Einhorn.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	7 0	− 3
Approximate Boundaries, 1900.	Preceding	5 55	
	Following	8 30	
	North		+12
	South		−13

Monoceros is a constellation with little to attract the naked eye, but it is rich from a telescopic point of view, owing to its position in the Milky Way. Its chief stars are :—

	Mag.
Fl. 11	3·9
Fl. 30	3·9

There are 25 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	2	1920	1111	5 53·4	− 9 34	5·1 : 5·1
2	...	3	1936	1117	5 56·2	− 10 36	4·8
3	...	...	1994	1157	6 6·0	− 6 32	5·0 : 4·9
4	...	5	2015	1170	6 9·0	− 6 15	4·0 : 4·4
5	...	7	2040	1188	6 13·9	− 7 46	5·1 : 5·2
6	...	...	...	1189	6 14·0	− 2 53	5·1 : 5·0
7	...	8	2059	1200	6 17·4	+ 4 39	4·4 : 4·9
8	...	10	2094	1217	6 22·0	− 4 41	5·0 : 4·8
9	...	11	2105	1220–1	6 23·0	− 6 57	3·9 {4·7, 5·2} 4·3
10	...	...	...	1224	6 25·1	+ 11 38	4·9 : 4·9
11	...	13	2126	1231	6 26·4	+ 7 26	4·3 : 4·8
12	...	...	...	1238	6 27·6	− 1 7	5·0 : 4·7
13	...	...	...	1246	6 30·7	− 5 7	5·2 : 5·6
14	S	15	2185	1256	6 34·4	+ 10 1	4·6 : 4·6
15	...	17	2216	1280	6 40·8	+ 8 10	5·0 : 5·0
16	...	18	2222	1284	6 41·6	+ 2 33	4·8 : 4·9
17	...	...	...	1307	6 48·3	− 8 58	5·2
18	...	19	2307	1336	6 57·0	− 4 4	4·8 : 4·8
19	...	20	2348	1354	7 4·3	− 4 3	5·1 : 4·9
20	...	22	2358	1359	7 5·7	− 0 18	4·6 : 4·5
21	...	25	2513	1437	7 31·3	− 3 50	5·1 : 4·9
22	γ	26	2542	1452	7 35·6	− 9 16	4·2 : 4·4
23	...	27	2660	1498	7 53·7	− 3 21	5·1 : 5·2
24	...	28	2668	1503	7 55·1	− 1 3	4·9 : 4·8
25	...	29	2725	1516	8 2·6	− 2 38	4·5 : 5·3

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
26	...	30	2825	1554	8 19·7	— 3 31	3·9 : 3·6
27	...	31	2954	1600	8 37·8	— 6 48	4·8 : 4·6

H.P. 1196 (5·3); H.P. 1204 (5·5); H.P. 1262 (5·4); H.P. 1286 (5·3); H.P. 1330 (5·4); B.A.C. 2373 (5·5); H.P. 1527 (5·3).

56. MUSCA AUSTRALIS.

Fr. **La Mouche Australe;** *Germ.* **Die südliche Fliege.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	12 30	−68
Approximate Boundaries, 1900.	Preceding	11 20	
	Following	13 40	
	North		−63
	South		−74

Musca Australis is a small Southern constellation marked by several rather conspicuous stars spread about. The chief are:—

	Mag.		Mag.
α	2·9	δ	3·7
β	3·4	B.A.C. 3984 ...	3·8

There are 7 stars of mags. 4—5½.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	..	...	3984	A 15	11 40·0	— 66 4	3·8
2	...	...	3993	A 16	11 42·5	— 66 8	5·3
3	...	...	4011	A 18	11 46·0	— 64 32	5·4
4	ε	...	4129	A 35	12 11·1	— 67 17	4·7
5	γ	...	4224	A 44	12 25·3	— 71 28	4·0
6	α	...	4245	A 45	12 30·0	— 68 28	2·9
7	β	...	4280	A 51	12 38·9	— 67 27	3·4
8	δ	...	4353	A 54	12 54·1	— 70 54	3·7
9	η	...	4426	A 59	13 7·1	— 67 15	5·3
10	...	...	4434	A 62	13 9·1	— 66 8	5·5
11	...	...	4469	{A 214 Cent.}	13 16·0	— 63 54	5·2

Lac. 4907 (5·6); ζ^2 (5·8); θ (5·9); ι^1 (5·6).

57. NORMA.

Fr. L'Équerre; *Germ.* Das Winkelmass.

			R.A. h. m.	Decl. °
Meridional Centre of Constellation		... ...	16 0	−49
Approximate Boundaries, 1900.	Preceding	... ...	15 0	
	Following	... ...	16 30	
	North	... ...		−40
	South	... ...		−59

Norma is a small and unimportant Southern constellation, the brightest star of which, γ^2, is only of mag. 4·6. There are 7 other stars between that and mag. $5\frac{1}{2}$.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880. h. m.	Decl. 1880. ° ′	Magnitude. Harv. or Arg. : Oxford.
1	ι^1	...	5301	A 28	15 53·8	−57 26	5·4
2	η	...	5305	A 30	15 54·4	−48 53	5·2
3	δ	...	5323	A 33	15 58·0	−44 51	4·9
4	κ	...	5373	A 40	16 4·0	−54 19	5·5
5	θ	...	5390	A 42	16 6·5	−47 3	5·4
6	γ^1	...	5404	A 46	16 8·0	−49 45	5·4
7	γ^2	...	5425	A 49	16 10·9	−49 52	4·6
8	μ	...	5521	A 60	16 25·5	−43 47	5·5

Lac. 6437 (5·8); λ (5·7); Lac. 6790 (5·9); Lac. 6841 (5·9).

58. OCTANS.

Fr. L'Octant; *Germ.* Der Oktant.

			R.A. h. m.	Decl. °
Meridional Centre of Constellation		... ...	Polar	
Approximate Boundaries, 1900.	Preceding	... ...	Polar	
	Following	... ...	Polar	
	North	... ...		−73
	South	... ...		−90

Octans includes the South Pole, but that Pole is marked by no conspicuous star, the nearest being σ of mag. 5·8. The brightest star in the constellation is ν of mag. 3·8. There are only 4 other stars as bright as mag. $5\frac{1}{2}$.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	δ	...	4705	A 19	14 7·8	−83 7	4·7
2	σ	...	5959	A 34	18 24·5	−89 17	5·8
3	ν	...	7481	A 60	21 28·0	−77 55	3·8
4	β	...	7886	A 75	22 33·7	−82 1	4·4
5	γ^1	...	8290	A 86	23 45·0	−82 41	5·5
6	θ	...	8342	A 88	23 55·4	−77 43	5·4

γ^3 (5·6); ζ (5·7); κ (5·7); Brisb. 5046 (5·9); Lac. 6006 (5·9); ρ (5·9); Lac. 7001 (5·8); Lac. 7559 (5·8); α (5·6); λ (5·7); ε (5·6); Lac. 9022 (5·9).

59. OPHIUCHUS.

Fr. Le Serpentaire ; *Germ.* Der Schlangenträger.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	17 10	− 4
Approximate Boundaries, 1900.	Preceding	16 5	
	Following	18 40	
	North		+ 16
	South		− 30

Ophiuchus is a constellation much mixed up with Hercules, and it is not always easy to distinguish their respective boundaries. The following are the chief stars:—

	Mag.		Mag.
α	2·2	κ	3·4
η	2·6	θ	3·4
δ	2·8	ν	3·5
ζ	2·8	γ	3·8
β	2·9	Fl. 72	3·8
ε	3·4		

There are no fewer than 30 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	δ	1	5414	2726	16 8·1	− 3 23	2·8 : 2·6
2	ε	2	5437	2736	16 12·0	− 4 24	3·4 : 3·3
3	ψ	4	5467	2748	16 17·1	−19 45	4·6
4	ρ	5	5477	2755	16 18·4	−23 10	4·8
5	χ	7	5489	2758	16 20·1	−18 11	5·0

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	:	Oxford.
					h. m.	° ′			
6	υ	3	5495	2762	16 21·3	− 8 6	4·6	:	4·6
7	φ	8	5516	2771	16 24·3	− 16 21	4·4		
8	λ	10	5520	2773	16 24·9	+ 2 15	4·0	:	3·8
9	ω	9	5519	2775	16 25·0	− 21 12	4·7		
10	ζ	13	5548	2788	16 30·6	− 10 19	2·8	:	2·8
11	...	...	5579	2797	16 34·7	− 17 30	5·2		
12	...	20	5637	2821	16 43·2	− 10 34	4·7		
13	ι	25	5692	2832	16 48·3	+ 10 22	4·4	:	4·2
14	κ	27	5708	2838	16 52·0	+ 9 34	3·4	:	3·2
15	...	30	5724	2842	16 54·7	− 4 2	5·0	:	5·0
16	η	35	5781	2868	17 3·5	− 15 34	2·6	:	2·4
17	A^1	36	5808	2877	17 7·5	− 26 25	4·7		
18	...	41	5830	2882	17 10·5	− 0 18	5·0	:	5·1
19	...	39	5827	2884	17 10·7	− 24 9	5·2		
20	ξ	40	5844	2895	17 13·8	− 20 59	4·5		
21	θ	42	5851	2899	17 14·7	− 24 53	3·4	:	2·8
22	b	44	5876	2909	17 19·1	− 24 4	4·5		
23	d	45	5881	2916	17 19·7	− 29 45	4·4		
24	...	...	5890	2918	17 20·3	− 4 59	4·6	:	4·7
25	σ	49	5893	2921	17 20·6	+ 4 15	4·4	:	4·4
26	...	...	5903	2925	17 22·7	+ 0 27	5·2	:	5·3
27	c^2	51	5907	2927	17 24·1	− 23 52	4·9		
28	α	55	5941	2944	17 29·4	+ 12 39	2·2	:	2·2
29	μ	57	5953	2949	17 31·3	− 8 2	4·7	:	4·7
30	...	58	5987	2960	17 36·3	− 21 37	5·0		
31	β	59	5996	2962	17 37·6	+ 4 37	2·9	:	2·9
32	γ	62	6020	2979	17 41·9	+ 2 45	3·8	:	3·8
33	ν	64	6078	3005	17 52·4	− 9 45	3·5	:	3·5
34	...	66	6089	3014	17 54·3	+ 4 23	4·8	;	4·7
35	...	67	6092	3017	17 54·7	+ 2 56	4·0	:	4·3
36	...	68	6101	3023	17 55·7	+ 1 18	4·4	:	4·7
37	τ	69	6104	3028-9	17 56·6	− 8 11	4·9	:	5·1

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
38	...	70	6123	3037	17 59·4	+ 2 32	4·1 : 4·3
39	...	71	6142	3044	18 1·6	+ 8 43	4·8 : 4·9
40	...	72	6143	3045	18 1·7	+ 9 33	3·8 : 3·9
41	...	74	6227	3089	18 15·0	+ 3 20	5·0 : 5·1

B.A.C. 5494 (5·4); Fl. 21 (5·5); Fl. 37 (5·5); B.A.C. 5910 (5·4); H.P. 2940 (5·5); H.P. 3138 (5·5); H.P. 3139 (5·3).

60. ORION.

Fr. Orion; *Germ.* Orion.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	5 20	+ 3
Approximate Boundaries, 1900.	Preceding	4 35	
	Following	6 10	
	North		+ 21
	South		− 12

Orion, though not in area the largest, is without doubt the most brilliant and most interesting of all the constellations, distinguished alike for its naked-eye stars and for its telescopic objects. The chief stars are:—

	Mag.		Mag.
β (Rigel)	0·3	ι	3·0
α (Betelgeuze) ...	0·9	π^1	3·3
ε	1·8	η	3·5
γ (Bellatrix) ...	1·9	λ	3·5
ζ	1·9	τ	3·6
κ	2·2	σ	3·7
δ (Mintaka) ...	2·4	π^5	3·9

There are no fewer than 44 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	π^1	1	1486	840	4 43·3	+ 6 45	3·3 : 3·6
2	π^2	2	1491	841	4 44·1	+ 8 42	4·4 : 4·9
3	π^3	3	1495	845	4 44·8	+ 5 24	4·0 : 4·0
4	π^5	8	1514	857	4 48·0	+ 2 15	3·9 : 4·1
5	*g*	6	1515	858	4 48·2	+ 11 14	5·2 : 5·0

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	:	Oxford.
					h. m.	° ′			
6	π^4	7	1516	859	4 48·3	+ 9 59	4·8	:	5·0
7	o^2	9	1525	865	4 49·6	+13 19	4·3	:	4·5
8	π^6	10	1538	875	4 52·3	+ 1 33	4·7	:	4·7
9	...	11	1557	894	4 57·7	+15 14	4·7	:	4·7
10	...	15	1591	914	5 2·8	+15 27	4·8	:	4·8
11	ρ	17	1611	928	5 7·0	+ 2 43	4·5	:	4·4
12	β	19	1623	936	5 8·8	− 8 20	0·3	+	1·0
13	τ	20	1638	948	5 11·8	− 6 59	3·6	:	3·9
14	o	22	1660	964	5 15·6	− 0 30	4·6	:	4·8
15	*m*	23	1665	966	5 16·5	+ 3 26	5·0	:	5·2
16	*e*	29	1680	973	5 18·2	− 7 55	4·3	:	4·2
17	*p*	27	1682	974	5 18·4	− 1 0	5·2	:	5·2
18	η	28	1684	975	5 18·4	− 2 31	3·5	:	3·7
19	ψ^1	25	1685	977	5 18·5	+ 1 44	4·6	:	4·6
20	γ	24	1687	979	5 18·7	+ 6 14	1·9	:	1·8
21	ψ^2	30	1700	988	5 20·6	+ 2 59	4·7	:	4·6
22	...	31	1717	997	5 23·6	− 1 11	4·9	:	5·0
23	A	32	1722	1000	5 24·4	+ 5 51	4·3	:	4·4
24	δ	34	1730	1005	5 25·9	− 0 23	2·4	:	2·0
25	v	36	1731	1007	5 26·1	− 7 23	4·7	:	5·2
26	...	...	...	1010	5 26·7	− 1 41	5·2	:	5·2
27	ϕ^1	37	1748	1017	5 28·2	+ 9 24	4·4	:	4·5
28	λ	39	1749	1019	5 28·5	+ 9 51	3·5	:	3·5
29	...	...	1752	1021	5 29·2	− 6 5	4·5		
30	θ^1	41	1758	1023	5 29·4	− 5 28	4·4	:	4·6
31	θ^2	43	1760	1024	5 29·5	− 5 30	4·9	:	5·1
32	*c*	42	1759	1025	5 29·5	− 4 55	4·6	:	5·4
33	ι	44	1762	1027	5 29·6	− 5 59	3·0	:	3·2
34	ϵ	46	1765	1029	5 30·1	− 1 17	1·8	:	1·8
35	ϕ^2	40	1766	1030	5 30·3	+ 9 13	4·4	:	4·7
36	σ	48	1780	1039	5 32·7	− 2 40	3·7	:	3·9
37	ω	47	1782	1040	5 32·9	+ 4 3	4·5	:	4·3
38	*d*	49	1785	1041	5 33·1	− 7 17	5·0	:	5·2
39	ζ	50	1794	1045–6	5 34·7	− 2 0	$1·9\begin{Bmatrix}2·0\\4·2\end{Bmatrix}$		1·8
40	...	...	...	1047	5 34·8	− 1 11	5·1	:	5·3

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
41	κ	53	1843	1068	5 42·1	− 9 43	2·2 : 2·4
42	...	56	1869	1085	5 46·2	+ 1 49	5·0 : 5·1
43	χ^1	54	1876	1089	5 47·3	+20 16	4·6 : 5·1
44	α	58	1883	1091	5 48·7	+ 7 23	0·9 + 0·0
45	...	60	1913	1109	5 52·7	+ 0 32	5·2 : 5·1
46	...	...	...	1114	5 54·1	− 3 5	4·7 : 5·0
47	μ	61	1928	1116	5 55·8	+ 9 39	4·3 : 4·7
48	χ^3	64	1934	1119	5 56·4	+19 42	5·1 : 5·0
49	χ^4	62	1939	1122	5 56·8	+20 9	4·8 : 4·9
50	...	...	...	1124	5 58·4	− 6 42	5·0 : 5·3
51	ν	67	1958	1132	6 0·7	+14 47	4·4 : 4·4
52	...	...	...	1133	6 0·7	− 4 11	5·2 : 5·3
53	f^1	69	1989	1152	6 5·1	+16 9	5·0 : 5·2
54	ξ	70	1990	1153	6 5·1	+14 14	4·2 : 4·4
55	...	71	2004	1162	6 7·8	+19 12	5·1 : 5·3
56	k^2	74	2017	1174	6 9·7	+12 19	5·1 : 5·3
57	*l*	75	2022	1178	6 10·5	+ 9 59	5·2 : 5·3
58	...	77	2086	1214	6 21·1	+ 0 22	5·2 : 5·0

B.A.C. 1460 (5·3); o^1 (5·4); *i* (5·4); *h* (5·3); B.A.C. 1601 (5·3); Fl. 21 (5·4); n^1 (5·5); n^2 (5·3); H.P. 1018 (5·5); *c* (5·0); *b* (5·3); Fl. 52 (5·3); Fl. 55 (5·3); H.P. 1142 (5·5); f^2 (5·4); Fl. 73 (5·4).

61. PAVO.

Fr. Le Paon; *Germ.* Der Pfau.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	19 10	−65
Approximate Boundaries, 1900.	Preceding	17 20	
	Following	21 20	
	North		−56
	South		−74

Pavo is a Southern constellation, the chief stars of which are the following:—

	Mag.		Mag.
α	2·1	δ	3·5
β	3·3	η	3·8

There are 17 stars of mags. 4—5½.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	η	...	5963	A 2	17 34·0	— 64 40	3·8
2	π	...	6100	A 16	17 57·0	— 63 40	4·6
3	...	...	6198	A 26	18 12·9	— 61 32	4·4
4	ν	...	6253	A 33	18 20·2	— 62 21	4·8
5	ζ	...	6315	A 35	18 29·0	— 71 32	4·2
6	...	...	6352	A 39	18 33·7	— 64 59	5·3
7	λ	...	6383	A 45	18 41·1	— 62 20	4·3
8	κ	...	6405	A 46	18 44·6	— 67 23	4 var.
9	ω	...	6436	A 51	18 47·9	— 60 21	5·4
10	...	...	6766	A 74	19 40·5	— 59 29	5·5
11	ϵ	...	6801	A 78	19 46·7	— 73 13	4·0
12	...	...	6807	A 80	19 47·0	— 59 13	5·5
13	δ	...	6873	A 88	19 56·9	— 66 29	3·5
14	...	...	6885	{A 78 Telesc.}	19 58·2	— 53 13	5·5
15	α	...	7004	A 99	20 16·2	— 57 7	2·1
16	ϕ^1	...	7066	A 104	20 25·6	— 60 59	4·9
17	ρ	...	7082	A 107	20 27·5	— 61 56	4·9
18	ϕ^2	...	7099	A 109	20 30·1	— 60 56	5·5
19	β	...	7129	A 111	20 34·1	— 66 38	3·3
20	o	...	7331	A 123	21 2·0	— 70 36	5·5
21	γ	...	7409	A 128	21 18·5	— 65 55	4·5

Brisb. 6303 (5·8); Lac. 7944 (5·7); Lac. 7980 (5·8); Lac. 7997 (5·6); Lac. 8156 (5·7); Lac. 8226 (5·9); μ^1 (5·9); μ^2 (5·6); Lac. 8269 (5·7); v (5·6 Var); σ (5·7); Lac. 8550 (5·9); Lac. 8625 (5·9); Lac. 8782 (5·9).

62. PEGASUS.

Fr. Pégase; *Germ.* Der Pegasus.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	22 30	+ 17
Approximate Boundaries, 1900.	Preceding	21 10	
	Following	0 10	
	North		+ 35
	South		+ 1

The "Square of Pegasus," though one star in Andromeda (α, which is also sometimes known as δ Pegasi) helps to form it, is a group well known to all star-gazers. The chief stars are:—

	Mag.		Mag.
ϵ	2·4	η	3·1
α (Markab) ...	2·6	ζ	3·6
β (Scheat) ...	2·6	μ	3·7
γ (Algenib) ...	3·0	θ	3·8

There are 30 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	1	7418	3761	21 16·5	+ 19 18	4·3 : 4·3
2	...	2	7474	3792	21 24·5	+ 23 6	4·3 : 4·5
3	...	5	7520	3813	21 32·1	+ 18 47	5·2
4	ϵ	8	7561	3836	21 38·3	+ 9 20	2·4 : 2·4
5	...	9	7567	3842	21 38·8	+ 16 48	4·4 : 4·4
6	κ	10	7571	3843	21 39·2	+ 25 4	4·2 : 4·2
7	...	14	7607	3861	21 44·5	+ 29 37	5·0 : 5·2
8	...	16	7627	3867	21 47·6	+ 25 22	5·0 : 5·2
9	ν	22	7689	3898	21 59·6	+ 4 28	4·8 : 4·8
10	ι	24	7706	3907	22 1·4	+ 24 46	4·0 : 4·2
11	θ	26	7723	3913	22 4·2	+ 5 36	3·8 : 3·5
12	π^2	29	7731	3917	22 4·7	+ 32 35	4·4 : 4·0
13	...	30	7788	3948	22 14·4	+ 5 11	5·2 : 5·0
14	...	31	7796	3951	22 15·6	+ 11 36	5·1 : 5·1
15	...	32	7798	3952	22 15·8	+ 27 44	4·9 : 5·1
16	...	35	7827	3965	22 21·8	+ 4 6	5·0 : 5·0
17	ζ	42	7908	4013	22 35·5	+ 10 12	3·6 : 3·3
18	o	43	7914	4015	22 36·1	+ 28 40	4·9 : 5·1
19	η	44	7923	4020	22 37·4	+ 29 35	3·1 : 2·9
20	ξ	46	7943	4024	22 40·7	+ 11 33	4·2 : 4·2
21	λ	47	7945	4026	22 40·9	+ 22 56	4·2 : 4·0
22	μ	48	7958	4034	22 44·2	+ 23 58	3·7 : 3·6
23	ρ	50	7988	4051	22 49·2	+ 8 11	5·0 : 5·0
24	β	53	8032	4078	22 58·0	+ 27 26	2·6 : 2·5
25	α	54	8034	4080	22 58·8	+ 14 34	2·6 : 2·3

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
26	...	55	8051	4084	23 1·0	+ 8 46	4·6 : 4·7
27	...	56	8052	4085	23 1·3	+ 24 49	4·9 : 4·7
28	...	59	8078	4102	23 5·7	+ 8 4	5·1 : 5·3
29	τ	62	8131	4132	23 14·7	+ 23 5	4·7 : 4·7
30	...	66	8149	4140	23 17·0	+ 11 39	5·2 : 5·4
31	υ	68	8160	4143	23 19·4	+ 22 45	4·6 : 4·6
32	q	70	8182	4151	23 23·1	+ 12 6	4·6 : 5·0
33	...	72	8206	4162	23 28·0	+ 30 40	5·2 : 5·4
34	...	78	8256	4194	23 38·0	+ 28 42	4·9 : 5·0
35	φ	81	8299	4217	23 46·4	+ 18 27	5·2 : 5·4
36	ψ	84	8324	4233	23 51·6	+ 24 28	4·6 : 4·7
37	γ	88	26	23	0 7·0	+ 14 31	3·0 : 2·5
38	χ	89	32	28	0 8·4	+ 19 33	4·9 : 4·9

Fl. 7 (5·5); Fl. 12 (5·4); Fl. 13 (5·3); Fl. 17 (5·5); Fl. 23 (5·5); B.A.C. 7753 (5·4); Fl. 37 (5·3); Fl. 38 (5·5); σ (5·3); Fl. 58 (5·3); Fl. 64 (5·4); Fl. 67 (5·5); Fl. 71 (5·4); Fl. 75 (5·4); Fl. 77 (5·4); Fl. 82 (5·3).

63. PERSEUS.

Fr. Persée; *Germ.* Perseus.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	3 20	+ 42
Approximate Boundaries, 1900.	Preceding	1 30	
	Following	4 40	
	North		+ 58
	South		+ 30

Perseus is a very brilliant constellation in consequence of its embracing a very rich portion of the Milky Way. Its chief stars are:—

	Mag.		Mag.
α (Mirfac) ...	1·9	ζ	3·1
β (Algol)	2·3	δ	3·2
ε	3·0	ρ	3·7
γ	3·1	η	3·9

There are 38 stars of mags. 4—5·2. Algol is a well-known short-period variable, which is now treated as the type of a class of Variables.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	*g*	4	614	314	1 54·4	+53 55	4·9 : 5·1
2	*i*	9	721	373	2 14·0	+55 18	5·2 : 5·5
3	...	12	821	427	2 34·8	+39 41	4·9 : 5·0
4	θ	13	827	429	2 36·0	+48 43	4·2 : 4·3
5	η	15	863	443	2 41·9	+55 24	3·9 : 4·1
6	...	16	871	446	2 43·0	+37 49	4·4 : 4·8
7	...	17	877	449	2 44·2	+34 34	4·8 : 4·9
8	τ	18	885	454	2 45·8	+52 16	4·0 : 4·1
9	...	21	904	461	2 50·0	+31 26	5·2 : 5·4
10	π	22	912	465	2 51·1	+39 11	4·7 : 4·9
11	...	24	915	468	2 51·7	+34 42	5·0 : 5·3
12	...	...	918	470	2 52·4	+51 54	5·1 : 5·2
13	γ	23	947	483	2 56·1	+53 2	3·1 : 3·1
14	...	...	948	484	2 56·5	+56 14	5·0 : 5·0
15	ρ	25	953	489	2 57·5	+38 22	3·7 : 4·2
16	ι	...	962	495	3 0·4	+49 9	4·1 : 4·4
17	β	26	963	496	3 0·4	+40 30	2·3 : 2·4
18	κ	27	967	498	3 1·4	+44 24	4·0 : 4·1
19	ω	28	981	503	3 3·6	+39 9	4·7 : 4·9
20	...	...	995	513	3 7·6	+50 29	5·2 : 5·2
21	...	29	1007	521	3 10·1	+49 47	5·3 : 5·4
22	...	31	1011	522	3 10·7	+49 40	5·0 : 5·1
23	...	...	1017	524	3 11·3	+33 46	4·8 : 4·9
24	*l*	32	1026	532	3 13·5	+42 54	4·8 : 5·0
25	...	...	1035	537	3 14·7	+48 47	5·2
26	α	33	1043	541	3 15·8	+49 26	1·9 : 1·9
27	...	...	1059	552	3 19·6	+48 39	5·0 : 5·0
28	...	34	1066	555	3 20·8	+49 7	4·8 : 5·0
29	σ	35	1071	560	3 22·1	+47 35	4·4 : 4·7
30	ψ	37	1099	578	3 28·0	+47 48	4·2 : 4·5
31	δ	39	1129	591	3 34·4	+47 24	3·2 : 3·1
32	*o*	40	1132	594	3 34·8	+33 34	5·0 : 5·0

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
33	o	38	1138	600	3 36·8	+31 54	4·0 : 4·4
34	ν	41	1139	602	3 37·0	+42 12	4·0 : 4·1
35	n	42	1175	626	3 42·1	+32 43	5·2 : 5·4
36	ζ	44	1207	638	3 46·6	+31 34	3·1 : 3·1
37	ε	45	1219	649	3 49·8	+39 40	3·0 : 3·1
38	ξ	46	1228	652	3 51·2	+35 27	4·1 : 4·3
39	λ	47	1254	671	3 57·7	+50 1	4·5 : 4·4
40	c	48	1266	682	4 0·0	+47 24	4·3 : 4·3
41	μ	51	1287	702	4 6·1	+48 6	4·2 : 4·2
42	f	52	1291	707	4 6·7	+40 11	4·9 : 4·8
43	b^1	...	1301	719	4 9·2	+50 0	4·6 : 4·8
44	...	54	1322	733	4 12·6	+34 17	5·1 : 5·3
45	d	53	1323	735	4 13·0	+46 13	4·9 : 4·9
46	e	58	1414	793	4 28·4	+41 1	4·4 : 4·6

Fl. 1 (5·5); Fl. 2 (5·4); Fl. 6 (5·4); χ (neb.); Fl. 20 (5·4); H.P. 514 (5·5); Fl. 30 (5·4); H.P. 556 (5·5); Fl. 36 (5·4); B.A.C. 1210 (5·4); A. (5·5); H.P. 647 (5·5); B.A.C. 1314 (5·4); B.A.C. 1364 (5·4); Fl. 59 (5·3).

64. PHŒNIX.

Fr. **Phénix;** *Germ.* **Der Phönix.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	1 0	−48
Approximate Boundaries, 1900.	Preceding	23 20	
	Following	2 15	
	North		−38
	South		−59

Phœnix is a Southern constellation, with the following as its chief stars:—

	Mag.		Mag.
α	2·4	ε	3·8
β	3·3	κ	3·9
γ	3·4		

There are 13 stars of mags. 4—5½.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	Magnitude. Oxford.
					h. m.	° ′		
1	ι	...	8210	A 9	23 28·6	−43 17	4·4	
2	σ	...	8264	A 19	23 40·9	−50 53	5·2	
3	π	...	8329	A 29	23 52·7	−53 25	5·2	
4	ε	...	11	A 39	0 3·3	−46 24	3·8	
5	κ	...	93	A 46	0 20·3	−44 21	3·9	
6	α	...	94	A 48	0 20·4	−42 58	2·4	
7	λ	...	124	A 54	0 25·6	−49 28	4·6	
8	μ	...	183	A 64	0 35·6	−46 44	4·7	
9	η	...	199	A 68	0 37·9	−58 8	4·5	
10	β	...	317	A 85	1 0·7	−47 22	3·3	
11	υ	...	331	A 88	1 2·3	−42 7	5·4	
12	ζ	...	340	A 89	1 3·3	−55 54	4·2	
13	ν	...	380	A 93	1 9·8	−46 10	5·3	
14	γ	...	447	A 106	1 23·2	−43 56	3·4	
15	δ	...	461	A 109	1 26·3	−49 42	4·0	
16	...	...	582	A 126	1 48·8	−46 53	4·8	
17	φ	...	585	A 127	1 49·4	−43 5	5·5	
18	...	...	604	A 128	1 52·4	−47 58	5·1	

Lac. 9689 (5·8); Lac. 9721 (5·7); Lac. 99 (5·9); Lac. 110 (5·7); Lac. 137 (5·7); Lac. 143 (5·6); Lac. 180 (5·9); ρ (5·6); Lac. 277 (5·6); Lac. 289 (5·9); Lac. 392 (5·8); Lac. 520 (5·8); Lac. 599 (5·9); χ (5·6).

65. EQUULEUS PICTORIS.

Fr. Le Chevalet du Peintre; *Germ.* Die Malerstaffelei.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	5 30	−52
Approximate Boundaries, 1900.	Preceding	4 40	
	Following	6 40	
	North		−42
	South		−65

This constellation is now generally known as Pictor. Its 2 principal stars are the following:—

	Mag.
α	3·5
β	3·9

There are besides 6 stars of mags. 4—5½.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	λ	...	1473	A 4	4 39·7	−50 42	5·5
2	...	...	1521	A 7	4 48·2	−53 39	5·4
3	η^1	...	1569	A 10	4 59·6	−49 19	5·5
4	η^2	...	1589	A 11	5 1·8	−49 45	5·3
5	β	...	1861	A 32	5 44·4	−51 6	3·9
6	γ	...	1884	A 35	5 47·6	−56 11	4·7
7	...	...	2013	A 48	6 7·9	−54 56	5·2
8	α	...	2260	A 66	6 47·0	−61 49	3·5

ζ (5·8); Lac. 1888 (5·7); Lac. 2003 (5·8); Lac. 2052 (5·6); Lac. 2087 (5·8); Brisb. 1172 (5·7).

66. PISCES.

Fr. Les Poissons; *Germ.* Die Fische.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	0 20	+10
Approximate Boundaries, 1900.	Preceding	22 45	
	Following	1 40	
	North		+32
	South		−6

Pisces is an eminently dull constellation to the naked eye, for it possesses no conspicuous stars whatever. The 2 brightest are :—

		Mag.
η	... ...	3·7
γ	... ...	3·8

But there are no fewer than 28 stars of mags. 4—5·2.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	β	4	8031	4077	22 57·8	+ 3 10	4·6 : 4·4
2	γ	6	8105	4114	23 11·0	+ 2 38	3·8 : 3·6
3	b	7	8127	4130	23 14·3	+ 4 43	5·1 : 5·0
4	κ	8	8169	4146	23 20·8	+ 0 36	5·0 : 5·2
5	θ	10	8177	4149	23 21·9	+ 5 43	4·4 : 4·2

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	:	Oxford.
					h. m.	° ′			
6	ι	17	8233	4180	23 33·8	+ 4 59	4·3	:	4·2
7	λ	18	8243	4188	23 35·9	+ 1 7	4·7	:	4·9
8	...	19	8262	4198	23 40·2	+ 2 49	5·2	:	5·2
9	...	27	8328	4235	23 52·5	− 4 13	5·0	:	5·3
10	ω	28	8331	4238	23 53·2	+ 6 12	4·2	:	4·2
11	...	29	8346	4245	23 55·7	− 3 42	5·1	:	5·3
12	...	30	8349	4247	23 55·8	− 6 41	4·6	:	4·5
13	...	33	8368	4259	23 59·2	− 6 23	4·6	:	4·8
14	δ	63	222	125	0 42·5	+ 6 56	4·6	:	4·3
15	ε	71	288	162	0 56·7	+ 7 15	4·5	:	4·2
16	ψ^1	74	307–8	169, 170	0 59·3	+ 20 50	5·0	:	{5·1 5·3
17	g	82	345	195	1 4·7	+ 30 47	5·1	:	4·9
18	χ	84	348	196	1 5·0	+ 20 24	4·9	:	4·9
19	τ	83	349	197	1 5·1	+ 29 27	4·7	:	4·2
20	φ	85	365	198	1 7·3	+ 23 56	4·6	:	4·8
21	ζ	86	368–9	199, 200	1 7·5	+ 6 57	5·0	:	4·9
22	f	89	388	207	1 11·6	+ 2 59	5·1	:	5·3
23	υ	90	395	209	1 12·9	+ 26 38	4·7	:	4·5
24	ρ	93	427	226	1 19·8	+ 18 33	5·2	:	5·3
25	μ	98	448	237	1 23·9	+ 5 31	5·2	:	5·4
26	η	99	453	239	1 25·1	+ 14 44	3·7	:	3·7
27	ν	106	518	265	1 35·2	+ 4 53	4·7	:	4·7
28	ο	110	537	272	1 39·1	+ 8 33	4·4	:	4·3
29	ξ	111	574	294	1 47·3	+ 2 36	4·7	:	4·7
30	α	113	625	320	1 55·9	+ 2 11	4·0	:	{3·7 4·7

A. (5·5); Fl. 34 (5·4); Fl. 47 (5·4); Fl. 52 (5·5); Fl. 55 (5·5); Fl. 64 (5·3); σ (5·6); ψ^2 (5·7); ψ^3 (5·6); π (5·6); Fl. 107 (5·4).

67. PISCIS AUSTRALIS.

Fr. Le Poisson Austral; *Germ.* Der Südliche Fisch.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	21 40	−32
Approximate Boundaries, 1900.	Preceding	20 50	
	Following	23 0	
	North		−26
	South		−37

This is sometimes termed Piscis Austrinus, but the designation "Australis" is to be preferred. It has only 1 conspicuous star:—

	Mag.
α (Fomalhaut)	1·3

There are 9 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	1	7280	{A. 39 Mic.}	20 53·9	−32 43	5·0
2	...	4	7386	3742	21 10·7	−32 40	4·8
3	ι	9	7557	3834	21 37·8	−33 34	4·2
4	θ	10	7583	3850	21 40·7	−31 27	5·0
5	μ	14	7701	3908	22 1·4	−33 34	4·5
6	β	17	7842	3983	22 24·7	−32 58	4·3
7	ε	18	7898	4007	22 34·0	−27 40	4·1
8	γ	22	7966	4038	22 45·9	−33 31	4·3
9	δ	23	7987	4052	22 49·3	−33 11	4·4
10	α	24	7992	4057	22 51·0	−30 16	1·3
11	...	...	8025	A 72	22 56·8	−35 23	5·3

η (5·5); Lac. 9030 (5·4); Lac. 9036 (5·7); Fl. 15 (3·3); Lac. 9063 (5·9); λ (5·6); Lac. 9197 (5·9); Lac. 9321 (5·9); Lac. 9333 (5·9).

68. RETICULUM RHOMBOIDALIS.

Fr. **Le Réticule;** *Germ.* **Das rhomboidische Netz.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	3 50	−63
Approximate Boundaries, 1900.	Preceding	3 10	
	Following	4 50	
	North		−55
	South		−69

This small constellation has as its chief stars the following:—

	Mag.
α	3·3
β	3·9

There are 5 stars of mags. 4—5½.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	...	1103	A 6	3 27·3	−63 21	5·0
2	β	...	1197	A 14	3 42·4	−65 11	3·9
3	δ	...	1259	A 18	3 56·9	−61 45	4·7
4	γ	...	1270	A 22	3 59·2	−62 29	4·7
5	ι	...	1271	A 23	3 59·4	−61 25	5·1
6	α	...	1336	A 25	4 12·9	−62 47	3·3
7	ε	...	1344	A 27	4 14·4	−59 36	4·6

ζ^2 (5·7); η (5·8).

69. SAGITTA.

Fr. **La Flèche;** *Germ.* **Der Pfeil.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation		19 50	+18
Approximate Boundaries, 1900.	Preceding	19 0	
	Following	20 20	
	North		+21
	South		+15

Sagitta, though a small and unimportant constellation, is nevertheless as ancient as the time of Ptolemy. Its principal stars are:—

	Mag.
γ	3·6
δ	3·7

There are 4 stars of mags. 4—5·2.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	α	5	6739	3399	19 34·7	+17 44	4·3 : 4·4
2	β	6	6744	3402	19 37·7	+17 12	4·4 : 4·6
3	δ	7	6783	3421	19 42·1	+18 14	3·7 : 3·8
4	ζ	8	6794	3424	19 43·7	+18 51	5·0 : 4·8
5	γ	12	6858	3466	19 53·4	+19 10	3·6 : 3·7
6	...	14	6890	3487	19 58·0	+15 42	5·2 : 5·5

ε (5·6); Fl. 10 (5·5); Fl. 11 (5·3); Fl. 13 (5·5); η (5·4).

70. SAGITTARIUS.

Fr. Le Sagittaire; *Germ.* Der Schütze.

			R.A.	Decl.
			h. m.	°
Meridional Centre of Constellation		... ...	19 0	−25
Approximate Boundaries, 1900.	Preceding	... ...	17 30	
	Following	... ...	20 20	
	North	... ...		−12
	South	... ...		−45

Sagittarius is a more important constellation than most dwellers in England are aware of, and the Milky Way materially adds to its attractiveness. The chief stars are:—

	Mag.		Mag.
ϵ	2·1	π	3·1
σ	2·3	ϕ	3·3
δ	2·8	ξ^2	3·5
ζ	2·9	τ	3·5
γ^2	3·0	β^1	3·8
η	3·0	o	3·9
λ	3·1	ρ^1	3·9

There are also 34 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	Magnitude. Oxford.
					h. m.	° ′		
1	...	3	6008	2972	17 40·0	−27 47	4·9	
2	...	...	6016	A 170 Scorp.	17 41·3	−31 39	5·5	
3	...	...	6074	A 14	17 51·4	−30 14	5·4	
4	...	4	6077	3006	17 52·5	−23 48	4·6	
5	γ^1	...	6107	3035	17 57·4	−29 35	4·9	
6	γ^2	10	6115	3036	17 58·1	−30 25	3·0	
7	...	...	6127	3039	18 0·5	−28 28	4·7	
8	μ	13	6168	3062	18 6·6	−21 5	4·1	
9	η	...	6186	3074	18 9·5	−36 48	3·0	
10	...	...	6194	3076	18 10·5	−27 5	4·7	
11	δ	19	6209	3084	18 13·3	−29 53	2·8	
12	ϵ	20	6233	3095	18 16·2	−34 26	2·1	

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude Harv. or Arg.	: Oxford.
					h. m.	° ′		
13	...	21	6247	3105	18 18·2	— 20 36	4·9	
14	λ	22	6263	3111	18 20·6	— 25 29	3·1	
15	...	...	6279	3119	18 22·4	— 14 39	4·7	
16	...	...	6294	3124	18 24·4	— 18 29	5·2	
17	φ	27	6371	3157	18 38·2	— 27 7	3·3	
18	ν^1	32	6434	3196	18 46·9	— 22 53	5·0	
19	...	...	...	3198	18 47·8	— 15 45	5·1	
20	σ	34	6440	3199	18 47·8	— 26 27	2·3	
21	ν	35	6441	3200	18 47·9	— 22 49	5·2	
22	ξ^1	36	6454	3213	18 50·2	— 20 49	5·0	
23	ξ^2	37	6461	3218	18 50·6	— 21 16	3·5	
24	ζ	38	6489	3237	18 55·0	— 30 3	2·9	
25	ο	39	6507	3252	18 57·5	— 21 55	3·9	
26	τ	40	6521	3258	18 59·5	— 27 51	3·5	
27	π	41	6548	3270	19 2·6	— 21 13	3·1	
28	ψ	42	6575	3287	19 8·2	— 25 28	5·2	
29	*d*	43	6584	3296	19 10·6	— 19 10	4·9	
30	β^1	...	6608	A 168	19 14·0	— 44 41	3·8	
31	β^2	...	6610	A 172	19 14·5	— 45 2	4·4	
32	ρ^1	44	6619	3319	19 14·7	— 18 4	3·9	
33	υ	46	6621	3321	19 14·8	— 16 11	4·7	
34	α	...	6622	A 177	19 15·6	— 40 51	4·0	
35	χ	47	6633	3331	19 18·0	— 24 44	5·1	
36	...	...	6689	{A 64 Telesc.}	19 26·3	— 48 21	5·4	
37	h^2	52	6706	3373	19 29·4	— 25 9	4·6	
38	e^2	55	6742	3403	19 35·7	— 16 24	5·0	
39	*f*	56	6760	3414	19 39·4	— 20 3	5·1	
40	ι	...	6812	A 241	19 47·0	— 42 11	4·3	
41	ω	58	6823	3446	19 48·5	— 26 37	5·0	
42	*b*	59	6832	3451	19 49·6	— 27 29	4·7	
43	*g*	61	6840	3456	19 51·1	— 15 49	5·0	

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
44	A	60	6842	3459	19 51·6	— 26 31	5·0
45	...	...	6843	3461	19 51·9	— 35 36	4·2
46	c	62	6870	3477	19 55·3	— 28 3	4·7
47	...	...	6872	A 268	19 55·5	— 38 16	5·0
48	...	...	6877	3484	19 56·7	— 32 23	5·1

Fl. 7 (5·4); B.A.C. 6161 (5·3); Lac. 7746 (5·8); Lac. 7761 (5·6); Lac. 7830 (5·2); Fl. 29 (5·5); H.P. 3226 (5·3); B.A.C. 6499 (5·5); B.A.C. 6536 (5·5); Lac. 8037 (5·9); Fl. 50 (5·5); B.A.C. 6746 (5·5); Lac. 8239 (5·6); Lac. 8285 (5·9); Lac. 8296 (5·9); Lac. 8362 (5·7); Lac. 8415 (5·5); Lac. 8417 (5·6).

71. SCORPIO.

Fr. **Le Scorpion;** *Germ.* **Der Scorpion.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	16 20	— 26
Approximate Boundaries, 1900.	Preceding	15 30	
	Following	17 55	
	North		— 7
	South		— 45

Scorpio is also a much richer and more important constellation than many persons imagine. Besides its leading star Antares there are no fewer than 15 of its stars brighter than mag. 3·9. These are:—

	Mag.		Mag.
α (Antares) ...	1·1	τ	2·9
λ	1·7	σ	3·0
θ	2·1	π	3·1
ε	2·2	ι^1	3·3
δ	2·5	μ^1	3·6
κ	2·6	ζ^2	3·6
υ	2·8	η	3·6
β^1	2·9	μ^2	3·9

On the other hand, its stars of mags. 4—5·2 are disproportionately few, for there are only 16 of them.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	b	1	5232	2640	15 43·8	— 25 23	4·8
2	A	2	5250	2651	15 46·4	— 24 58	4·7
3	ρ	5	5272	2662	15 49·5	— 28 52	4·0
4	π	6	5289	2671	15 51·6	— 25 46	3·1
5	δ	7	5303	2674	15 53·2	— 22 17	2·5
6	ξ	51	5324	2688–9	15 57·7	— 11 12	4·1 {5·0, 4·7}
7	β¹	8	5329	2690–1	15 58·5	— 19 29	2·9 {5·2, 3·0}
8	ω¹	9	5337	2698	15 59·8	— 29 21	4·1
9	ω²	10	5242	2700	16 0·4	— 20 33	4·6
10	...	...	5374	2709	16 3·6	— 20 6	5·1
11	c²	13	5381	2711	16 4·9	— 27 37	4·7
12	ν	14	5382	2714	16 5·0	— 19 9	4·2
13	ψ	15	5386	2715	16 5·4	— 9 45	4·8
14	...	...	5429	2732	16 10·9	— 28 19	5·0
15	...	19	5445	2737	16 13·4	— 23 53	4·7
16	σ	20	5447	2738	16 13·9	— 25 18	3·0
17	α	21	5498	2764	16 22·1	— 26 10	1·1 : 1·1
18	...	22	5501	2769	16 22·9	— 24 51	4·6
19	...	...	5508	A 72	16 23·5	— 34 27	4·6
20	τ	23	5539	2783	16 28·4	— 27 58	2·9
21	...	...	5538	A 76	16 28·5	— 35 1	4·4
22	ε	26	5632	2818	16 42·4	— 34 5	2·2
23	μ¹	...	5638	A 98	16 43·8	— 37 50	3·6
24	μ²	...	5640	A 99	16 44·2	— 37 49	3·9
25	ζ²	...	5661	A 104	16 46·1	— 42 9	3·6
26	...	...	5735	A 120	16 56·9	— 33 57	5·5
27	η	...	5778	A 126	17 3·6	— 43 5	3·6
28	υ	34	5901	2924	17 22·6	— 37 12	2·8
29	λ	35	5915	2932	17 25·5	— 37 1	1·7
30	...	...	5932	A 159	17 28·3	— 38 32	4·7
31	θ	...	5935	A 160	17 28·7	— 42 55	2·1
32	κ	...	5970	A 165	17 34·2	— 38 58	2·6

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
33	ι^1	...	6004	A 169	17 39·2	−40 5	3·3
34	...	...	6055	A 181	17 48·0	−44 19	5·4
35	...	...	6061	A 183	17 49·3	−41 41	5·3

B.A.C. 5254 (5·4); Fl. 4 (5·5); B.A.C. 5286 (5·4); B.A.C. 5314 (5·4); Fl. 12 (5·5); Fl. 16 (5·5); B.A.C. 5435 (5·4); χ (5·6); Lac. 6810 (5·8); Lac. 6816 (5·7); B.A.C. 5464 (5·4); Lac. 6854 (5·9); Lac. 6859 (4·6); Lac. 6949 (5·9); Lac. 7000 (5·9); Lac. 7016 (5·8); Lac. 7089 (5·7); B.A.C. 5718 (5·3); Lac. 7147 (5·7); Lac. 7159 (5·9); Lac. 7179 (5·8); Lac. 7202 (5·9); Lac. 7247 (5·8); Brisb. 6125 (5·8); ι^2 (5·6).

72. APPARATUS SCULPTORIS (SCULPTOR).

Fr. **L'Atelier du Sculpteur;** *Germ.* **Die Bildhauerwerkstätte.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation		0 30	−35
Approximate Boundaries, 1900.	Preceding	23 0	
	Following	1 40	
	North		−27
	South		−42

The constellation Apparatus Sculptoris is now universally called "Sculptor," the tools being discarded and their owner raised to the place of dignity.

The brightest star, *a*, is only of mag. 4·1. There are 10 stars between that and the $5\frac{1}{2}$ limit.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	γ	...	8113	4121	23 12·3	−33 11	4·6
2	β	...	8201	A 16	23 26·5	−38 19	4·8
3	μ	...	8236	A 23	23 34·3	−32 44	5·5
4	δ	...	8275	4205	23 42·7	−28 48	4·6
5	ζ	...	8352	4248	23 56·2	−30 23	5·0
6	...	...	10	11	0 3·2	−28 39	5·2
7	...	...	23	18	0 5·5	−28 28	5·5
8	θ	...	24	A 53	0 5·6	−35 48	5·4

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
9	ι	...	72	50	0 15·5	—29 39	5·5
10	...	...	103	62	0 22·0	—33 40	4·8
11	α	...	272	158	0 52·8	—30 0	4·1
12	ε	...	541	274	1 40·0	—25 39	5·2

Lac. 9675 (5·8); Lac. 9735 (5·7); Lac. 22 (5·9); Lac. 125 (5·8); λ^2 (5·8); σ (5·6); Lac. 447 (5·8); Lac. 462 (5·9); Lac. 500 (5·6); Lac. 501 (5·9).

73. SCUTUM SOBIESKII.

Fr. **L'Écu de Sobieski**; *Germ.* **Der Sobieskische Schild.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	18 30	—10
Approximate Boundaries, 1900.	Preceding	18 0	
	Following	18 55	
	North		— 3
	South		—15

This constellation is sometimes called Clypeus Sobieskii, but Scutum simply is now its more usual designation. Its brightest star is B.A.C. 6325, of mag. 4. There are 5 other stars between that and mag. 5·2. Nos. 2—6, below, are assigned to Aquila in B.A.C.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	...	...	3102	18 17·1	— 9 0	5·0 : 5·1
2	...	...	6325	3134	18 28·7	— 8 20	4·0 : 4·2
3	...	2	6361	3151	18 35·7	— 9 10	4·8 : 5·0
4	...	3	6367	3154	18 37·0	— 8 25	5·1 : 5·2
5	...	6	6388	3174	18 40·8	— 4 53	4·4 : 4·5
6	...	9	6464	3219	18 50·7	— 6 0	5·1 : 5·6

B.A.C. 6324 (5·3).

74. SERPENS.

Fr. **Le Serpent;** *Germ.* **Die Schlange.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	15 35	+ 8
Approximate Boundaries, 1900.	Preceding	15 0	
	Following	16 15	
	North		+ 23
	South		− 4

Serpens is a long rambling constellation much mixed up with Ophiuchus, whence the name Serpentarius (= serpent-bearer) sometimes applied to Ophiuchus. The chief stars are :—

	Mag.		Mag.
α	2·7	ε	3·7
η	3·4	ξ	3·7
μ	3·5	β	3·8

There are 19 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880. h. m.	Decl. 1880. ° ′	Magnitude. Harv. or Arg. : Oxford.
1	...	5	5047	2544	15 13·2	+ 2 13	5·1 : 5·1
2	...	10	5095	2571	15 22·6	+ 2 16	5·1 : 5·2
3	δ	13	5135	2590	15 29·1	+ 10 57	4·0 : 3·8
4	χ	20	5185	2620	15 36·1	+ 13 14	5·1 : 5·0
5	ι	21	5187	2621	15 36·2	+ 20 3	4·6 : 4·6
6	α	24	5196	2627	15 38·4	+ 6 48	2·7 : 2·7
7	β	28	5216	2632	15 40·6	+ 15 48	3·8 : 3·5
8	λ	27	5214	2633	15 40·6	+ 7 44	4·4 : 4·7
9	κ	35	5234	2636	15 43·3	+ 18 31	4·2 : 3·9
10	μ	32	5230	2638	15 43·4	− 3 4	3·5 : 3·3
11	ω	34	5238	2641	15 44·2	+ 2 33	5·2 : 5·0
12	ε	37	5245	2645	15 44·8	+ 4 50	3·7 : 3·6
13	b	36	5246	2646	15 45·0	− 2 44	5·2 : 5·3
14	ρ	38	5252	2649	15 46·0	+ 21 20	4·8 : 5·0
15	γ	41	5284	2666	15 50·9	+ 16 3	4·0 : 3·8

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
16	π	44	5322	2687	15 57·1	+23 8	5·0 : 4·5
17	σ	50	5456	2744	16 16·0	+ 1 19	4·8 : 4·9
18	ν	53	5845	2897	17 14·1	−12 43	4·4 : 4·3
19	ξ	55	5949	2947	17 30·7	−15 19	3·7 : 3·3
20	o	56	5976	2956	17 34·7	−12 49	4·4 : 4·3
21	ζ	57	6085	3013	17 54·2	− 3 41	4·5 : 4·5
22	η	58	6229	3090	18 15·1	− 2 56	3·4 : 3·6
23	d	59	6269	3112	18 21·1	+ 0 8	5·2 : 5·5
24	θ^1	63	6460	3215	18 50·2	+ 4 3	4·7 : 3·9
25	θ^2	...	6462	3216	18 50·3	+ 4 3	5·1 : 4·2

Fl. 3 (5·4); Fl. 4 (5·4); Fl. 6 (5·5); τ^1 (5·5); Fl. 16 (5·3); A^2 (5·4); Fl. 30 (5·5); ϕ (5·4); *c* (5·5); ψ (5·6); τ^8 (5·7); *υ* (5·7).

75. SEXTANS.

Fr. **Le Sextant**; *Germ.* **Der Sextant.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	10 10	− 1
Approximate Boundaries, 1900.	Preceding	9 30	
	Following	10 40	
	North		+ 8
	South		− 9

Sextans is an insignificant constellation, of which no star is brighter than mag. 4·5, and only 4 others are above the 5·2 limit.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	1	3286	1726	9 30·9	+ 7 22	5·0 : 5·1
2	...	2	3295	1732	9 32·2	+ 5 11	4·8 : 4·6
3	...	15	3458	1796	10 1·8	+ 0 13	4·5 : 4·9
4	...	29	3590	1846	10 23·4	− 2 8	5·2 : 5·1
5	...	30	3597	1850	10 24·2	− 0 1	4·9 : 5·0

Fl. 8 (5·3); Fl. 22 (5·4).

76. TAURUS.

Fr. Le Taureau ; *Germ.* Der Stier.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	4 30	+ 18
Approximate Boundaries, 1900.	Preceding	3 15	
	Following	5 45	
	North		+ 30
	South		+ 0

Taurus is a large and interesting constellation, comprising naked-eye and telescopic objects in great variety. The former include the 2 historically celebrated groups of the Pleiades and Hyades, and the beautiful star Aldebaran. The principal stars are:—

	Mag.		Mag.
α (Aldebaran) ...	1·0	ο	3·8
β	1·9	ξ	3·8
η	3·0	Fl. 17	3·8
ζ	3·0	Fl. 27	3·8
λ	3·6	γ	3·9
θ^2	3·6	θ^1	3·9
ε	3·7		

There are no fewer than 46 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	ο	1	1057	550	3 18·4	+ 8 36	3·8 : 3·6
2	ξ	2	1068	554	3 20·7	+ 9 19	3·8 : 3·7
3	s	4	1084	563	3 23·8	+ 10 56	5·1 : 5·3
4	f	5	1087	567	3 24·2	+ 12 31	4·3 : 4·1
5	...	10	1112	581	3 30·8	+ 0 1	4·4 : 4·5
6	...	17	1147	608	3 37·8	+ 23 44	3·8 : 4·0
7	...	19	1151	610	3 38·1	+ 24 5	4·4 : 4·5
8	...	20	1154	613	3 38·7	+ 24 0	4·0 : 4·0
9	...	23	1161	615	3 39·2	+ 23 34	4·2
10	η	25	1166	618	3 40·4	+ 23 44	3·0 : 3·1

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
11	e	30	1174	622	3 41·7	+10 46	5·1 : 5·1
12	...	27	1176	625	3 42·0	+23 41	3·8 : 4·0
13	λ	35	1241	657	3 54·0	+12 9	3·6 : 3·4
14	ν	38	1251	665	3 56·8	+ 5 39	4·0 : 4·1
15	A¹	37	1257	670	3 57·6	+21 45	4·4 : 4·8
16	ψ	42	1265	680	3 59·6	+28 41	5·2 : 5·3
17	...	47	1298	712	4 7·4	+ 8 58	5·0 : 5·1
18	...	...	...	713	4 8·1	+ 9 42	5·0 : 5·3
19	μ	49	1304	716	4 9·0	+ 8 36	4·3 : 4·3
20	ω²	50	1311	722	4 10·2	+20 17	4·6 : 5·1
21	φ	52	1326	736	4 13·0	+27 4	5·1 : 5·2
22	γ	54	1328	737	4 13·0	+15 20	3·9 : 3·5
23	...	58	1332	742	4 13·8	+14 48	5·1
24	δ¹	61	1346	750	4 16·0	+17 15	4·0 : 3·9
25	δ²	64	1356	756	4 17·2	+17 10	4·7 : 5·0
26	r	66	1357	757	4 17·3	+ 9 11	5·1 : 5·2
27	κ	65	1362	760	4 18·2	+22 2	4·6 : 4·6
28	δ³	68	1365	763	4 18·6	+17 39	4·2 : 4·5
29	υ¹	69	1367	764	4 19·1	+22 32	5·3 : 4·6
30	...	71	1369	765	4 19·5	+15 20	4·6 : 5·0
31	π	73	1370	768	4 19·8	+14 26	4·9 : 5·1
32	ε	74	1376	773	4 21·6	+18 55	3·7 : 3·7
33	θ¹	77	1380	775	4 21·7	+15 42	3·9 : 4·1
34	θ²	78	1381	776	4 21·8	+15 36	3·6 : 3·6
35	b	79	1384	777	4 22·1	+12 47	5·2 : 5·1
36	...	...	1391	783	4 23·7	+15 56	4·9 : 5·1
37	ρ	86	1409	789	4 26·7	+14 35	4·8 : 5·0
38	a	87	1420	797	4 29·0	+16 16	1·0 : 1·1
39	d	88	1421	798	4 29·1	+ 9 55	4·6 : 4·5
40	c¹	90	1434	805	4 31·5	+12 16	4·3 : 4·6
41	σ¹	91	1436	807	4 32·3	+15 33	5·1 : 5·3
42	σ²	92	1437	808	4 32·4	+15 42	4·8 : 5·1
43	τ	94	1449	819	4 35·0	+22 44	4·4 : 4·6
44	i	97	1493	842	4 44·3	+18 39	5·1 : 5·2
45	ι	102	1551	888	4 55·9	+21 25	4·7 : 4·9

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg. : Oxford.
					h. m.	° ′	
46	*m*	104	1568	900	5 0·3	+18 30	5·1 : 5·3
47	*n*	109	1637	950	5 12·1	+21 59	5·2 : 5·4
48	...	111	1671	970	5 17·4	+17 17	5·2 : 5·3
49	β	112	1681	978	5 18·7	+28 30	1·9 : 1·8
50	*o*	114	1695	987	5 20·4	+21 50	4·8 : 5·1
51	...	119	1726	1003	5 25·2	+18 30	4·6 : 4·6
52	ζ	123	1767	1032	5 30·5	+21 4	3·0 : 3·0
53	...	125	1778	1037	5 32·3	+25 50	4·9 : 5·1
54	...	126	1792	1044	5 34·4	+16 29	4·9 : 5·1
55	...	133	1834	1064	5 40·9	+13 52	5·2 : 5·3
56	...	132	1837	1067	5 41·7	+24 33	5·1 : 5·3
57	...	134	1846	1071	5 42·8	+12 37	4·8 : 5·0
58	...	136	1863	1084	5 45·8	+27 36	4·5 : 4·7
59	...	139	1896	1099	5 50·6	+25 56	5·1 : 5·0

t (5·5); Fl. 13 (5·4); B.A.C. 1192 (5·5); Fl. 40 (5·3); H.P. 672 (5·5); Fl. 41 (5·4); Fl. 46 (5·3); Fl. 51 (5·4); Fl. 53 (5·5); Fl. 56 (5·4); χ (5·5); Fl. 67 (5·5); Fl. 72 (5·4); Fl. 75 (5·3); Fl. 81 (5·5); Fl. 83 (5·4); H.P. 810 (5·5); Fl. 93 (5·3); *l* (5·4); Fl. 103 (5·5); Fl. 115 (5·4); Fl. 116 (5·5); Fl. 118 (5·4); B.A.C. 1728 (5·5); Fl. 120 (5·3); Fl. 121 (5·4); Fl. 122 (5·4); Fl. 130 (5·5).

77. TELESCOPIUM.

Fr. **Le Télescope**; *Germ.* **Das Teleskop.**

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	18 40	−52
Approximate Boundaries, 1900.	Preceding	17 40	
	Following	19 30	
	North		−46
	South		−60

Telescopium is a small Southern constellation, the brightest star of which is α of mag. 3·5. There are 5 other stars between that and mag. $5\frac{1}{2}$.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	: Oxford.
					h. m.	° ′		
1	ε	...	6140	A 3	18 2·3	—45 58	5·2	
2	α	...	6240	A 13	18 18·1	—46 2	3·5	
3	ζ	...	6250	A 14	18 19·6	—49 8	4·5	
4	λ	...	6443	A 41	18 48·8	—53 5	5·2	
5	...	...	6592	A 55	19 13·1	—54 38	5·4	
6	ν	...	6751	A 67	19 38·2	—56 38	5·5	

Lac. 7608 (5·7); δ^1 (5·7); δ^2 (5·7); κ (5·7); Lac. 7872 (5·9); ρ (5·7); Lac. 8091 (5·9).

78. TOUCAN.

Fr. Le Toucan; *Germ.* Der Tucan.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	23 45	—68
Approximate Boundaries, 1900.	Preceding	22 0	
	Following	1 30	
	North		—57
	South		—76

This constellation comprises only one bright star, α, of mag. 2·8, together with 11 stars of mags. 4—5½.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.	Oxford.
					h. m.	° ′		
1	α	...	7767	A 2	22 10·3	— 60 51	2·8	
2	δ	...	7808	A 6	22 18·8	— 65 35	4·8	
3	ν	...	7841	A 8	22 24·9	— 62 36	5·5	
4	γ	...	8098	A 26	23 10·4	— 58 54	4·0	
5	η	...	8323	A 43	23 51·3	— 64 58	5·3	
6	ε	...	8334	A 44	23 53·7	— 66 15	4·3	
7	ζ	...	64	A 49	0 13·8	— 65 34	4·1	
8	β^1	...	127	A 52	0 26·0	— 63 37	4·3	
9	β^2	...	128	A 53	0 26·1	— 63 38	4·7	
10	...	...	134	A 54	0 27·2	— 63 42	5·5	

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
11	λ^2	...	266	A 70	0 50·5	− 70 10	5·5
12	κ	...	392	A 78	1 11·7	− 69 31	5·1

Lac. 9112 (5·7); Lac. 9412 (5·7); Lac. 9463 (5·7); Lac. 9474 (5·7); Lac. 9483 (5·8); Lac. 9710 (5·9); π (5·7); ρ (5·7); ι (5·6).

79. TRIANGULUM.

Fr. **Le Triangle**; *Germ.* **Das Dreieck.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation		2 0	+ 32
Approximate Boundaries, 1900.	Preceding	1 30	
	Following	2 30	
	North		+ 37
	South		+ 26

Triangulum is one of the ancient constellations, notwithstanding its small size. Its principal stars are:—

	Mag.
β	3·1
α	3·6

There are 3 stars between mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	α	2	569	289	1 46·3	+ 29 0	3·6 : 3·5
2	β	4	656	336	2 2·4	+ 34 25	3·1 : 3·1
3	...	7	691	356	2 8·8	+ 32 49	5·2 : 5·3
4	δ	8	697	360	2 9·9	+ 33 42	5·0 : 5·2
5	γ	9	698	361	2 10·2	+ 33 17	4·2 : 4·3

B.A.C. 516 (5·4); ϵ (5·4); Fl. 6 (5·3); Fl. 10 (5·3); Fl. 12 (5·5); Fl. 14 (5·3); H.P. 398 (5·5).

80. TRIANGULUM AUSTRALE.

Fr. Le Triangle Austral; Das Südliche Dreieck.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation		15 40	−65
Approximate Boundaries, 1900.	Preceding	14 40	
	Following	16 40	
	North		−59
	South		−72

The Southern Triangle is, like its Northern namesake, a small constellation, but it contains several bright stars:—

	Mag.
α	2·2
γ	3·1
β	3·1

There are also 2 stars of mags. 4·3 and 4·6 respectively, but all the others are below $5\frac{1}{2}$.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	γ	...	5005	A 5	15 7·7	−68 16	3·1
2	ε	...	5103	A 11	15 25·8	−65 55	4·6
3	β	...	5233	A 17	15 54·6	−63 3	3·1
4	δ	...	5375	A 25	16 4·5	−63 23	4·3
5	α	...	5578	A 42	16 36·0	−68 48	2·2

κ (5·7); ζ (5·6); ι (5·8); Lac. 6809 (5·9); Lac. 6906 (5·6).

81. URSA MAJOR.

Fr. La Grande Ourse; *Germ.* Der Grosse Bär.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation		11 0	+58
Approximate Boundaries, 1900.	Preceding	8 0	
	Following	14 0	
	North		+75
	South		+30

Ursa Major, though certainly not on the whole so rich or so beautiful a constellation as Orion, is probably more generally known to all classes by reason of its perpetual visibility in England. Its chief stars are:—

	Mag.		Mag.
ε (Alioth)	1·8	θ	3·2
α (Dubhe)	2·0	ο	3·4
η (Alkaid or Benetnasch)	2·0	δ	3·4
ζ (Mizar)	2·4	λ	3·6
β	2·6	κ	3·7
γ	2·6	h	3·7
μ	3·1	ξ	3·8
ψ	3·1	ν	3·8
ι	3·1	χ	3·9

There are 27 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	ο	1	2819	1558	8 20·3	+61 8	3·4 : 3·4
2	π^2	4	2884	1584	8 29·7	+64 46	4·8 : 4·7
3	ι	9	3048	1636	8 51·0	+48 31	3·2 : 3·2
4	ρ	8	3049	1638	8 51·7	+68 6	5·0 : 5·0
5	κ	12	3075	1645	8 55·4	+47 48	3·7 : 3·6
6	σ	13	3099	1655	8 59·8	+67 37	4·8 : 5·0
7	f	15	3106	1656	9 0·4	+52 5	4·4 : 4·7
8	τ	14	3108	1658	9 1·0	+64 0	4·8 : 4·9
9	c	16	3125	1669	9 4·9	+61 55	5·2 : 5·1
10	e	18	3140	1675	9 7·6	+54 31	4·9 : 5·0
11	h	23	3221	1701	9 22·1	+63 35	3·7 : 3·7
12	d	24	3232	1706	9 23·9	+70 21	4·6 : 4·9
13	θ	25	3242	1709	9 24·8	+52 13	3·2 : 3·1
14	...	26	3256	1715	9 26·6	+52 36	4·6 : 4·7
15	υ	29	3346	1753	9 42·5	+59 36	4·0 : 3·9
16	φ	30	3358	1756	9 44·0	+54 38	4·4 : 4·7
17	λ	33	3505	1810	10 9·9	+43 31	3·6 : 3·5
18	μ	34	3533	1827	10 15·2	+42 6	3·1 : 3·1
19	...	...	3531	1829	10 15·5	+66 11	5·0 : 5·0
20	...	36	3580	1844	10 23·0	+56 36	4·9 : 5·0

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
21	...	...	3607	1857	10 26·2	+ 41 3	5·1 : 5·1
22	...	37	3612	1861	10 27·4	+ 57 42	5·2 : 5·4
23	...	38	3647	1877	10 33·8	+ 66 20	5·0 : 5·0
24	...	...	3652	1878	10 34·5	+ 69 42	5·2 : 5·0
25	ω	45	3729	1903	10 47·1	+ 43 50	4·9 : 4·9
26	...	46	3741	1907	10 49·1	+ 34 9	5·2
27	...	47	3757	1913	10 52·8	+ 41 4	5·2 : 5·2
28	β	48	3767	1923	10 54·6	+ 57 1	2·6 : 2·2
29	α	50	3777	1926	10 56·3	+ 62 24	2·0 : 1·9
30	ψ	52	3812	1941	11 2·9	+ 45 9	3·1 : 3·2
31	ξ	53	3851	1959–60	11 11·8	+ 32 18	$3{\cdot}8\begin{Bmatrix}4{\cdot}8\\4{\cdot}3\end{Bmatrix}3{\cdot}7$
32	ν	54	3852	1961	11 12·0	+ 33 45	3·8 : 3·5
33	...	55	3856	1962	11 12·6	+ 38 51	4·8 : 4·9
34	...	56	3868	1967	11 16·3	+ 44 9	5·1 : 5·3
35	...	57	3905	1980	11 22·6	+ 40 0	5·2 : 5·1
36	χ	63	3981	2018	11 39·7	+ 48 27	3·9 : 3·8
37	γ	64	4017	2036	11 47·5	+ 54 22	2·6 : 2·3
38	...	67	4057	2054	11 56·0	+ 43 43	5·1 : 5·1
39	δ	69	4123	2077	12 9·5	+ 57 42	3·4 : 3·4
40	ε	77	4335	2191	12 48·7	+ 56 37	1·8 : 1·8
41	...	78	4366	2207	12 55·6	+ 57 1	4·8 : 5·0
42	ζ	79	4484	2264–5	13 19·1	+ 55 33	$2{\cdot}4\begin{Bmatrix}2{\cdot}6\\4{\cdot}2\end{Bmatrix}5{\cdot}1$
43	g	80	4493	2267	13 20·4	+ 55 37	4·2 : 4·0
44	...	83	4568	2315	13 36·2	+ 55 17	4·8 : 5·1
45	η	85	4607	2338	13 42·8	+ 49 55	2·0 : 1·8

A (5·3); σ^1 (5·3); B.A.C. 3150 (5·5); Fl. 27 (5·5); Fl. 31 (5·3); B.A.C. 3665 (5·3); Fl. 44 (5·4); Fl. 49 (5·4); Fl. 59 (5·5); B.A.C. 3985 (5·3); B.A.C. 4510 (5·4); Fl. 81 (5·5); Fl. 82 (5·3); Fl. 86 (5·5); B.A.C. 5058 (5·5).

*** The star numbered above as 26 (Fl. 46) is assigned by B.A.C. to Leo Minor, but as it is numbered in Baily's edition of Flamsteed in Ursa Major I have thought it best to do the same.

82. URSA MINOR.

Fr. **La petite Ourse ;** *Germ.* **Der Kleine Bär.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	15 40	+78
Approximate Boundaries, 1900.	Preceding	13 0	
	Following	18 0	
	North		+90
	South		+65

Ursa Minor is often regarded as a sort of counterpart of Ursa Major, but the resemblance is rather far-fetched. The real importance of this constellation arises from the fact that the North Pole and the Pole Star are within its boundaries. Its chief stars are:—

	Mag.
β (Kochab)	2·1
α (Polaris)	2·2
γ	3·2

There are 11 stars of mags. 4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880. h. m.	Decl. 1880. ° ′	Magnitude. Harv. or Arg.	: Oxford.
1	...	2	262	155	0 52·6	+85 37	4·5	
2	α	1	360	213	1 14·6	+88 40	2·2	: 2·0
3	...	...	4339	2188	12 48·1	+84 4	5·0 (3, 4)	
4	...	...	4342	2189	12 48·3	+84 4		
5	...	4	4733	2396	14 9·3	+78 7	4·9	: 5·0
6	...	5	4822	2437	14 27·8	+76 14	4·3	: 4·7
7	β	7	4936	2500	14 51·1	+74 39	2·1	: 2·2
8	...	11	5079	2555	15 17·2	+72 15	5·1	
9	γ	13	5094	2566	15 20·9	+72 16	3·2	: 3·0
10	θ	15	5191	2616	15 35·0	+77 45	5·3	: 5·0
11	ζ	16	5285	2657	15 48·4	+78 10	4·5	: 4·6
12	η	21	5511	2759	16 21·0	+76 2	5·0	: 5·1
13	ε	22	5780	2851	16 58·3	+82 14	4·5	: 4·5
14	δ	23	6281	3077	18 11·0	+86 37	4·3	: 4·5

B.A.C. 4732 (5·3) ; Fl. 11 (5·3) ; Fl. 19 (5·5) ; B.A.C. 5592 (5·5).

83. VIRGO.

Fr. La Vierge ; *Germ.* Die Jungfrau.

		R.A.	Decl.
		h. m.	°
Meridional Centre of Constellation	... ...	13 20	− 2
Approximate Boundaries, 1900.	Preceding	11 35	
	Following	15 0	
	North		+15
	South		−20

Virgo is a constellation marked by a fair number of bright stars, including one very bright one (Spica), but astronomically Virgo is chiefly noted for its large number of nebulæ. The chief stars are:—

	Mag.		Mag.
α (Spica)	1·2	β	3·7
γ	2·8	δ	3·7
ε (Vindemiatrix) ...	3·0	Fl. 109	3·7
ζ	3·5	μ	3·9

There are 30 stars of mags. 4·4—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	ξ	2	3979	2017	11 39·1	+ 8 55	4·9 : 5·2
2	ν	3	3982	2019	11 39·7	+ 7 12	4·2 : 4·3
3	A¹	4	3989	2023	11 41·8	+ 8 55	5·2 : 5·3
4	β	5	4002	2028	11 44·4	+ 2 27	3·7 : 3·4
5	b	7	4049	2049	11 53·8	+ 4 20	5·2 : 5·4
6	π	8	4052	2051	11 54·7	+ 7 17	4·4 : 4·6
7	o	9	4072	2057	11 59·1	+ 9 24	4·3 : 4·3
8	η	15	4145	2088	12 13·8	0 0	4·0 : 3·8
9	c	16	4151	2090	12 14·3	+ 3 59	5·2 : 5·3
10	χ	26	4257	2150	12 33·1	− 7 20	4·7 : 4·7
11	γ	29	4268	2155–6	12 35·6	− 0 47	2·8 {3·5 / 3·5} 2·7
12	ρ	30	4271	2157	12 35·8	+10 54	5·1 : 4·9
13	ψ	40	4330	2186	12 48·1	− 8 53	5·0 : 5·1
14	δ	43	4340	2193	12 49·6	+ 4 3	3·7 : 3·5
15	ε	47	4367	2208	12 56·2	+11 36	3·0 : 3·0

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
16	*g*	49	4391	2219	13 1·6	−10 6	5·2
17	θ	51	4401	2224	13 3·7	− 4 54	4·4 : 4·5
18	...	53	4418	2231	13 5·7	−15 33	5·1
19	*e*	59	4440	2244	13 10·8	+10 5	5·1 : 5·2
20	σ	60	4446	2246	13 11·5	+ 6 6	5·0 : 5·1
21	...	61	4449	2247	13 12·1	−17 38	4·8
22	α	67	4480	2263	13 18·9	−10 32	1·2 +0·04
23	...	70	4499	2271	13 22·6	+14 27	5·2 : 5·0
24	l^2	74	4516	2283	13 25·8	− 5 38	4·9 : 5·0
25	...	78	4529	2292	13 28·1	+ 4 16	4·9 : 5·1
26	ζ	79	4532	2294	13 28·6	+ 0 1	3·5 : 3·4
27	...	89	4608	2341	13 43·3	−17 32	5·2
28	τ	93	4672	2373	13 55·6	+ 2 7	4·4 : 4·3
29	...	...	4700	2384	14 4·3	−15 44	5·2
30	...	...	4713	2388	14 6·2	+ 2 58	5·0 : 5·4
31	κ	98	4716	2390	14 6·5	− 9 43	4·3 : 4·1
32	ι	99	4727	2398	14 9·7	− 5 26	4·2 : 3·9
33	λ	100	4743	2408	14 12·6	−12 49	4·6 : 4·7
34	v^1	102	4748	2410	14 13·4	− 1 42	5·2 : 5·0
35	φ	105	4792	2428	14 22·0	− 1 41	4·9 : 4·9
36	μ	107	4855	2457	14 36·7	− 5 8	3·9 : 3·9
37	...	109	4878	2468	14 40·2	+ 2 24	3·7 : 4·0
38	...	110	4951	2512	14 56·8	+ 2 34	4·6 : 5·0

ω (5·5); d^2 (5·4); Fl. 57 (5·4); Fl. 63 (5·5); *i* (5·5); *h* (5·5); *m* (5·3); *r* (5·3); B.A.C. 4722 (5·5).

84. PISCIS VOLANS (VOLANS).

Fr. Le Poisson Volant; *Germ.* Der Fliegende Fisch.

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	8 40	−69
Approximate Boundaries, 1900.	Preceding	6 40	
	Following	9 0	
	North		−63
	South		−75

The proper name of this constellation is the first of those given above, but as there are already two other constellations of Fish it has been found convenient to indicate this asterism by the single name "Volans." Its chief stars are:—

		Mag.
γ	... ...	3·8
β	... ...	3·9

There are 5 stars of mags. 4—5½.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	γ	...	2400	A 8	7 9·8	−70 18	3·8
2	δ	...	2447	A 10	7 16·9	−67 44	4·1
3	ζ	...	2607	A 16	7 43·3	−72 20	4·3
4	ϵ	...	2773	A 22	8 7·6	−68 16	4·5
5	...	...	2835	A 25	8 20·1	−71 7	5·2
6	β	...	2863	A 29	8 24·4	−65 44	3·9
7	α	...	3114	A 46	9 0·6	−65 55	4·2

ι (5·6); Lac. 2646 (5·7); Lac. 3313 (5·7); Lac. 3357 (5·7); η (5·7); θ (5·6); Lac. 3609 (5·9).

85. VULPECULA ET ANSER.

Fr. **Le petit Renard avec L'oie**; *Germ.* **Das Füchschen mit der Gans.**

		R.A. h. m.	Decl. °
Meridional Centre of Constellation	... ...	20 10	+25
Approximate Boundaries, 1900.	Preceding	19 0	
	Following	21 20	
	North		+29
	South		+20

As a fox and a goose were formerly considered 2 things which naturally went together, so Vulpecula had an Anser joined to it, but the Anser has fallen into disuse. The brightest star is α, of mag. 4·4, and there are in this constellation no fewer than 14 other stars ranging between mags. 4·7—5·2.

No.	Letter.	Flamsteed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	° ′	
1	...	1	6589	3300	19 11·1	+ 21 11	4·7 : 4·8
3	...	3	6637	3329	19 17·9	+ 26 2	5·0 : 5·0
3	...	4	6654	3347	19 20·2	+ 19 34	5·2 : 5·0
4	α	6	6674	3357-8	19 23·7	+ 24 25	4·4 : 4·6
5	...	9	6709	3372	19 29·3	+ 19 31	5·0 : 5·1
6	...	12	6810	3433	19 45·9	+ 22 18	5·0 : 5·5
7	...	13	6827	3443	19 48·4	+ 23 46	4·7 : 5·0
8	...	15	6879	3481	19 56·2	+ 27 26	4·9 : 5·0
9	...	...	6966	3530	20 10·2	+ 25 14	4·8 : 5·1
10	...	23	6973	3534	20 10·8	+ 27 27	4·8 : 4·7
11	...	29	7140	3616	20 33·2	+ 20 47	4·8 : 4·7
12	...	28	7143	3619	20 33·3	+ 23 42	5·1 : 5·3
13	...	30	7188	3640	20 39·7	+ 24 51	5·1 : 5·0
14	...	31	7246	3668	20 47·0	+ 26 38	4·7 : 4·6
15	...	32	7256	3676	20 49·5	+ 27 36	5·1 : 5·3

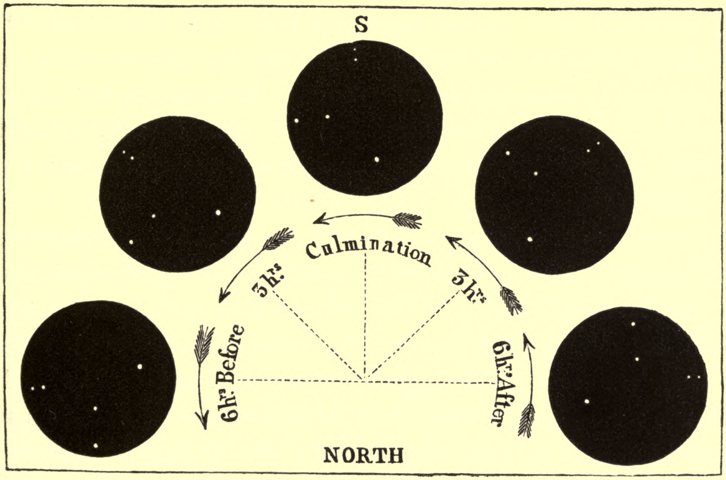
Fl. 5 (5·4); Fl. 10 (5·4); Fl. 16 (5·4); Fl. 17 (5·3); Fl. 18 (5·5); Fl. 21 (5·3); Fl. 22 (5·5); Fl. 24 (5·5); Fl. 25 (5·4); Fl. 35 (5·4).

CHAPTER IX.

ON FINDING THE STARS[a].

ARMED with the time and a telescope, the amateur astronomer may take the field, and make observations of interest and utility, if he proceed on a deliberate *festina lente* principle. He has only to recollect that one good observation

Fig. 82.



APPARENT CHANGES IN A GROUP OF STARS IN THE COURSE OF 12 HOURS BETWEEN RISING AND SETTING.

is worth more than fifty bad ones, and "hasten slowly" to obtain it.

It will be necessary for a beginner to accustom himself to the

[a] Revised and expanded from Smyth's *Cycle of Celestial Objects*, vol. i. p. 404, et seq.

varying positions which the constellations occupy between their risings and settings, and this can only be correctly followed by a telescope turning on a polar axis. In fixed instruments, such as circles or transits, which are restricted to the meridian, the course of a celestial object across the field of vision, under an astronomical eye-piece, will be from the right horizontally to the left. But in extra-meridian or universal instruments, it will vary as regards its line of position with the horizon at each degree of its advance towards culmination, and from thence to its setting. In the preceding diagram, the arrows show the direction in which the bodies pass the telescope, and the dark circles represent the field of vision for every 3 hours after the group rises, till it goes down.

Here it is evident that, however the position of the group of stars alters to the eye and the senses, its line of position, as seen from a station at the centre with an equatorial instrument, will be the same at whatever time and point it is looked at. The observer need hardly be reminded that the foregoing diagram refers to an instrument which is turned towards the S.: when it is pointed to the polar regions, each movement becomes reversed in the field, as to the culminations and passages of the circumpolar stars.

The principal stars may be easily recognised by allineations; but an introductory view will facilitate the application of the rules. The beginner should commence with such stars as never set in our climate, and he may then refer the situations of others to their positions with respect to these. A moonlight night, if not too strongly illuminated, will be the best for him to learn some standard points, because only the principal stars show themselves, and determine the figure of the asterism; and he will find that the winter affords the best nights, both from their length, and the absence of twilight. The observer will have made himself acquainted with the Great and Little Bears, some of the principal points in the Zodiac, Orion, the Pleiades, and the more remarkable groups, as a key to the others. His meridian line, however rude, will show him the *southing*, or passing of every object over that meridian, and from thence he will readily advance upon the vicinity; an operation in which good celestial maps or globes will largely assist. But in resorting to such aid, it must not be forgotten that by virtue of the apparent rotation of the heavens, the stars, though preserving their mutual distances and relations, turn with that motion: the ideal lines which join them therefore receive variable directions, which may appear to differ from those on the maps, being sometimes horizontal, sometimes inclined, and sometimes vertical, after the manner represented by the small group passed round in the diagram on p. 237. This difficulty, however, need only be alluded to, since it is so readily overcome as to offer no real impediment to allineation; and though the tyro must not expect to become familiar with all the component stars of a constellation at once, he will soon unravel the apparent confusion, and know the *lucida* of each asterism, together with several of its principal components.

The Great Bear is the most conspicuous of those constellations which never set in our latitudes; the tail and hind quarters consist of 7 brilliant stars, 4 of which (α, β, γ, δ) are likened to a wain, the other 3 (ϵ, ζ, η) being fancifully called the horses; or the 7 taken together make "The Plough." The hind-wheels, or the two farthest (β, α) from the horses, are designated the Pointers, because they direct the eye upon the Pole-star (α Ursæ Minoris), at the tip of the Little Bear's tail; and further on to the constellations Cepheus and Cassiopeia, which are situated in the Milky Way, where it is nearest to the pole[b]. Cassiopeia consists of several well-known stars, which are likened, according as viewed, to the letter M or W in form. The two northernmost wheels of the wain (δ, α Ursæ Majoris) point to the very bright star Capella, in Auriga, which is also circumpolar in our latitudes.

Descending diagonally along the Milky Way from Cassiopeia

[b] The following information respecting the distances of the stars of the Great Bear is given by way of providing an approximate scale of distances for general use. The nearest "Pointer" (α) is $28\frac{3}{4}°$ from the Pole; from α to β is $5°$; from β to γ is $8°$; from γ to δ is $4\frac{1}{2}°$; from δ to ϵ is $5\frac{1}{2}°$; from ϵ to ζ is $4\frac{1}{2}°$; from ζ to η is $7°$.

towards Capella, we come to Mirfak, in Perseus (α), and a little further from the pole we find Algol (β Persei), the variable star in Medusa's head: if we pass across the Milky Way in the opposite direction, we arrive at Deneb, the *lucida* of Cygnus (α); and beyond the Swan, a little out of the Milky Way, is Vega, the bright star in the Lyre (α). The Dragon consists of a very lengthy chain of stars sweeping partly around the Little Bear; and in the space bounded by Cassiopeia, Cygnus, and Draco, is the constellation Cepheus.

Near Algenib (γ Pegasi), and pointing directly towards it, are two conspicuous stars of Andromeda (α, β), and a third (γ) is a little beyond them. Andromeda will be readily known by the connection of the *lucida* in her head (α), with the large trapezium of Pegasus (α, β, γ).

An imaginary line projected through the Great Bear and Capella passes to the Pleiades (η Tauri, &c.), and then turning at a right angle towards the Milky Way reaches Aldebaran (α Tauri), the Bull's Eye, and the shoulders (α, γ) of Orion, who is known by his brilliant belt, consisting of three stars (δ, ϵ, ζ) placed in the middle of a quadrangle. Aldebaran is a star of a reddish tint, and the most prominent of the Hyades, a cluster resembling the letter V, not far from the Pleiades. Aldebaran, the Pleiades, and Algol (β Persei), make the upper, while Menkab (α Ceti), in the Whale's jaw, with Aries, form the lower points of a W. The head of Aries is denoted by two principal stars (α, β), one of them having a smaller attendant.

A fancied line drawn from Polaris (α Ursæ Minoris), and led midway between the Great Bear and Capella (α Aurigæ), passes to Castor (α Geminorum) and Pollux (β Geminorum), two well-known stars in the heads of the Twins; and to the south of Gemini it meets Procyon (α Canis Minoris), the *lucida* of the Lesser Dog. From thence, by bending the line across the Milky Way, and carrying it as far again, it reaches Sirius (α Canis Majoris), in the Greater Dog's mouth, and passes on to the conspicuous star which is the α of Columba Noachi.

Algol (β Persei) and the Twins point at Regulus (α Leonis), the Lion's heart, which is situated at one end of an arc, with Denebola (β Leonis), the tuft of the Lion's tail, at the other end. South-preceding Regulus (α Leonis) is Cor Hydræ (α), and the space between them is occupied by the Sextant of Hevelius. The Pole-star and the middle horse of the wain (ζ) direct us to Spica, the *lucida* of Virgo (α), considerably distant, and at the horizon leads us into Centaurus. The Pole-star and the first horse (η Ursæ Majoris) conduct us nearly upon Arcturus, in Boötes (α), by which fine star, Spica (α Virginis), and Regulus (α Leonis), a splendid triangle is formed. Following at a distance to the southward is Antares (α Scorpii), the Scorpion's heart, constituting with Arcturus (α Boötis) and Spica (α Virginis) another large triangle, within which are the two bright stars of Libra (α and β).

The Northern Crown is nearly in a line between Wega (α Lyræ) and Arcturus (α Boötis); and the heads of Hercules and Ophiuchus are between Lyra and Scorpio. In the Milky Way, below the part nearest to Lyra, and on a line drawn from Arcturus (α Boötis) through the head of Hercules, is Altair, in the Eagle (α Aquilæ), making with Wega and Deneb (β Leonis) a conspicuous triangle. Closely following Aquila is a remarkable group of stars called Delphinus.

The last and brightest (α) of the three principal stars in Andromeda makes, with three of Pegasus (α, β, γ), the large square or trapezium already mentioned; of which one of the sides (formed by β and α) points to Fomalhaut (α Piscis Australis), situated at a considerable distance in the mouth of the Southern Fish, between the tails of Cetus and Capricornus.

The line of the ecliptic may, with considerable accuracy, be traced by the eye, when it becomes familiar with the stars here enumerated. Not far from the Pleiades are the Hyades with Aldebaran (α Tauri), a little S. of the ecliptic. To the N.W. of Aldebaran, at some distance, is the chief star of Aries (α); while to the N.E. of that star are Castor and Pollux (α and β Geminorum). Regulus (α Leonis) is on the line of the ecliptic; and Spica (α Virginis) is but a little S. of it. The ecliptic thus known, the zodiacal constellations are easily distinguished, in their order from W. to E. Thus Aries lies immediately between Andromeda on the N. and Cetus on the S., the three reaching nearly from the horizon to the zenith; Taurus will be recognised by the Pleiades, Aldebaran (α), and the Hyades; Gemini by Castor and Pollux (α and β); Cancer, the highest of the signs, by the Præsepe looming through its desert wastes; Leo, from the stars Regulus (α) and Denebola (β); Virgo, by Spica (α), to the S. of Coma Berenices; Libra in mid-distance between Corona Borealis and the Pole; Scorpio, by the reddish star Antares (α), and its three other very conspicuous stars (β, δ, π); Sagittarius, as being the lowest of all the signs; Capricornus, S. of the Dolphin; Aquarius, under the neck of Pegasus; and Pisces between Pegasus, Andromeda, and Cetus. As more will presently be said respecting these signs, it may suffice here to present the Latin hexameters, which were constructed to enable beginners to retain their names:—

Sunt Aries, Taurus, Gemini, Cancer, Leo, Virgo,
Libraque, Scorpius, Arcitenens, Caper, Amphora, Pisces.

Or in the downright English memory-verses:—

The *Ram*, the *Bull*, the heavenly *Twins*,
And, next the *Crab*, the *Lion* shines.
The *Virgin*, and the *Scales*;
The *Scorpion*, *Archer*, and *Sea-goat*,
The *Man* that holds the water-pot,
And *Fish* with glitt'ring tails.

All the stars which are situated in the same horary circle will obviously pass the meridian at the same time, from the horizon through the zenith to the pole. In proportion to their proximity to the equator, the larger will be the circle described by the star, and the smaller as they near the pole; consequently, as the stars move over equal portions of circles in equal times, whatever be the diameters of the circles, the motion of those near the equator is apparently very rapid, and that of the polar ones as slow. Thus the changes of the whole are in simultaneous concert; and the Table on pp. 244–5 exhibits the aspect of the heavens on the first day of every month, at midnight, throughout the year. The *exact* risings and settings of the constellations cannot, of course, always be observed, owing to terrestrial obstacles, which may block the horizon, but the noting them will mark the spot where they may be first looked for. The *Risings* are taken along the horizon, from the N. round by E. to the S.; the *Culminations* from the N. horizon, over the pole and zenith, and thence down to the S.; and the *Settings* are brought from the N. round by W. to the S. Polaris, though not always precisely on the meridian, is included in every month, as a standard mark and pointer.

With the Tables on pp. 244–5 may be used the following Table, which indicates that the tabular entries for midnight on the 1st day of the several months given in the 1st column stand good also for the different hours and different months exhibited in the next 6 columns.

Tabular entries for midnight on the 1st day of	Corresponding Months and Hours when the same Entries are available.					
	6 p.m.	8 p.m.	10 p.m.	2 a.m.	4 a.m.	6 a.m.
January...	...	March ...	February	December	November	October.
February	...	April	March ...	January...	December	November.
March ...	...	May	April	February	January...	December.
April	...	June	May	March ...	February	January.
May	...	July	June	April	March ...	February.
June	September	August ...	July	May	April	March.
July	October ...	September	August ...	June	May	April.
August ...	November	October ...	September	July	June	...
September	December	November	October ...	August ...	July	...
October ...	January...	December	November	September	August ...	...
November	February	January...	December	October ...	September	...
December	March ...	February	January...	November	October ...	...

THE CONSTELLATIONS ON THE 1ST DAY OF EVERY MONTH, AT MIDNIGHT (FOR THE S. OF ENGLAND).

Mo.	Rising.	Culminating.	Setting.
JANUARY.	Hercules, *the legs.*	Draco, *the body.*	Cygnus, *the neck.*
	Corona Borealis.	POLARIS.	Pegasus, *the hoofs.*
	Boötes, *the knees.*	Camelopardus, *the head.*	Pegasus, *northern wing.*
	Virgo, *the shoulders.*	Lynx, *the head and neck.*	Pisces, *the ribbon.*
	Crater, *the middle.*	Gemini, *the legs.*	Cetus, *the body.*
	Pyxis Nautica.	Monoceros, *neck and chest.*	Eridanus, *middle reach.*
	Argo Navis, *the mast.*	Canis Major, *the head.*	Columba.
FEBRUARY.	Lyra.	Cygnus. *the tail.*	Pisces, *the northern fish.*
	Hercules, *the shoulders.*	Cepheus, *the knee.*	Aries, *the fore legs.*
	Serpens, *the head.*	POLARIS.	Cetus, *the head.*
	Virgo, *the feet.*	Ursa Major, *the head and fore legs.*	Eridanus, *north reach.*
	Corvus, *the feet.*	Lynx, *the tail.*	Lepus, *the fore legs.*
	Hydra, *the lower fold.*	Cancer, *the claws.*	Canis Major, *the hind legs.*
	Antlia Pneumatica.	Hydra, *the head.*	Argo Navis, *the compass.*
MARCH.	Cygnus, *the following wing.*	Lacerta, *over the back.*	Andromeda, *the body.*
	Lyra.	Cepheus, *preceding arm.*	Triangulum.
	Hercules, *the head.*	POLARIS.	Taurus, *the neck.*
	Ophiuchus, *the head.*	Ursa Maj., α and β, *the hind legs.*	Orion, *the sword.*
	Serpens, *the middle.*	Leo, *the flank.*	Canis Major, *the head.*
	Libra, *both dishes.*	Crater, *preceding edge.*	Pyxis Nautica.
	Hydra, *the tail.*	Hydra, *the body.*	
APRIL.	Lacerta.	Andromeda, *the body.*	Andromeda, *the feet.*
	Vulpecula et Anser.	Cassiopeia, *the waist.*	Perseus, *Medusa's head.*
	Sagitta.	POLARIS.	Taurus, *the horns.*
	Aquila, *the tail.*	Ursa Major, *the tail.*	Orion, *the head.*
	Ophiuchus, *the knees.*	Canes Venatici, *the fore legs.*	Monoceros, *head and chest.*
	Scorpio, *the head.*	Virgo, *the waist.*	Pyxis Nautica.
	Centaurus, *the head.*	Corvus, *the tail.*	Antlia Pneumatica.
MAY.	Andromeda, *the feet.*	Perseus, *the head.*	Auriga, *the legs.*
	Pegasus, *the fore legs.*	Cassiopeia, *the feet.*	Gemini, *the legs.*
	Equuleus, *the nose.*	POLARIS.	Cancer, *the southern legs.*
	Delphinus, *the body.*	Draco, *the tail.*	Hydra, *the heart.*
	Antinous.	Boötes, *the body.*	Crater, *the base.*
	Scorpio, *the tail.*	Libra, *preceding lanx.*	Corvus, *the body.*
	Lupus, *the head.*	Centaurus, *the hand.*	Centaurus, *the head.*
JUNE.	Perseus, *Medusa's head.*	Auriga, *the kids.*	Gemini, *the heads.*
	Triangulum.	Camelopardus, *the chest.*	Cancer, *the body.*
	Pisces, *the northern fish.*	POLARIS.	Leo, *the fore legs.*
	Pegasus, *the wing.*	Draco, *the body.*	Sextans.
	Aquarius, *the shoulders.*	Hercules, *the back.*	Corvus, *the wings.*
	Capricornus, *the head.*	Ophiuchus, *preceding thigh.*	Hydra, *the tail.*
	Sagittarius, *the body.*	Scorpio, *the tail.*	Lupus, *the head.*

Mo.	Rising.	Culminating.	Setting.
JULY.	Auriga, *the waist.* Perseus, *the feet.* Aries, *the head.* Pisces, *the tails.* Aquarius, *the legs.* Sagittarius, *the hips.*	Lynx, *the head.* Camelopardus, *head and neck.* POLARIS. Draco, *two folds.* Lyra. Scutum Sobieskii. Sagittarius, *the head.*	Lynx, *the hind legs.* Leo minor, *the legs.* Leo, *the rump.* Virgo, *the shoulders.* Libra, *the preceding lanx.* Scorpio, *the body.*
AUGUST.	Lynx, *the body.* Gemini, *Castor's arm.* Auriga, *the knees.* Taurus, *the head.* Cetus, *mouth and body.* Piscis Australis, *the head.* Microscopium.	Ursa Major, *the head.* POLARIS. Cepheus, *the sceptre.* Cygnus, *α, the body.* Vulpecula, *the flank.* Delphinus, *the body.* Capricornus, *the neck.*	Leo minor, *the head.* Coma Berenices. Boötes, *the feet.* Libra, *the following lanx.* Ophiuchus, *the legs.* Sagittarius, *the waist.*
SEPTEMBER.	Leo Minor, *the head.* Lynx, *the hind legs.* Gemini, *the bodies.* Orion, *the shoulders.* Eridanus, *upper reach.* Cetus, *the legs.* Sculptor.	Ursa Major, *the body.* Draco, *tip of the tail.* POLARIS. Cepheus, *head and body.* Pegasus, *the chest.* Aquarius, *the stream.* Piscis Australis, *the head.*	Canes Venatici, *Chara's chest.* Boötes, *the knees.* Serpens, *the head.* Ophiuchus, *the waist.* Scutum Sobieskii. Sagittarius, *the robe.* Piscis Australis, *the tail.*
OCTOBER.	Leo Minor, *the fore body.* Cancer, *the body.* Canis Minor, *the head.* Monoceros, *the neck.* Orion, *the following leg.* Lepus, *the head.* Fornax Chemica.	Ursa Major, *the tail.* Draco, *the tail.* POLARIS. Cassiopeia, *the head.* Andromeda, *the breast.* Pisces, *the ribbon.* Cetus, *the tail.*	Boötes, *the shoulders.* Corona Borealis. Hercules, *the shoulders.* Ophiuchus, *the head.* Capricornus, *the head.* Piscis Australis, *the head.*
NOVEMBER.	Canes Venatici, *Chara's chest.* Leo, *the fore body.* Hydra, *the head.* Monoceros, *the flank.* Canis Major, *the head.* Lepus, *the body.* Eridanus, *middle stream.*	Draco, *the last quoil.* Ursa Minor, *the head.* POLARIS. Perseus, *the head and shoulder.* Aries, *the body.* Cetus, *the mouth.* Fornax Chemica.	Hercules, the legs. Vulpecula. Sagitta. Aquila, *head and body.* Equuleus. Aquarius, *the legs.* Sculptor.
DECEMBER.	Boötes, *the head.* Coma Berenices. Leo, *the hind legs.* Sextans. Hydra, *the heart.* Argo Navis, *the mast.* Canis Major, *the hind legs.*	Draco, *the middle.* Ursa Minor, *the haunch.* POLARIS. Camelopardus, *the body.* Taurus, *the head.* Eridanus, *the northern reach.* Eridanus, *the southern reach.*	Lyra. Cygnus, *the head.* Vulpecula, *the hind legs.* Pegasus, *the head.* Pisces, *the preceding fish.* Cetus, *the tail.* Fornax Chemica.

Those who are possessed of an Astronomical Catalogue may readily find the mean apparent time of any individual star passing the meridian on any given day of the year, by adding the number placed against the date, in the following Table (p. 247), to the Right Ascension of the star taken from the catalogue. This depends, as the reader will perceive, on the star's distance to the East of the Sun at the required time; and as the Table shows the Sun's Eastern distance from the first point of Aries, the culmination of every object is of course easily found by the proposed addition. If the Sun be more than 24 hours, the latter number must be subtracted from it. From the sum thus obtained—to be roundly exact—subtract 1^{m}, 2^{m}, or 3^{m}, according as it exceeds 6, 12, or 18 hours, or approaches closely upon them: by this ready means the time of culmination is found, counting from the noon of the given day. This Table will be sufficiently exact for mere star-gazing purposes till the end of the 19th century.

As it may assist a first attempt to give an example or two, we will show the culmination of Sirius on the 11th of January 1890, of Arcturus on the 11th of March, and of Vega on the 30th of May, for the same year:—

I.

	h.	m.	s.
Sirius	6	40	17
Tabular No.	4	29	
	11	9	17

II.

	h.	m.	s.
Arcturus	14	10	38
Tabular No.	0	35	
	14	45	38

III.

	h.	m.	s.
Vega	18	33	12
Tabular No.	19	32	
	38	5	12
$-24^{h}=$	14	5	12

Days.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
1	5 14	3 1	1 12	23 18	21 27	19 24	17 20	15 15	13 19	11 31	9 35	7 31
2	5 9	2 57	1 8	23 15	21 23	19 20	17 16	15 11	13 15	11 27	9 31	7 27
3	5 4	2 53	1 4	23 11	21 19	19 16	17 12	15 7	13 12	11 24	9 27	7 22
4	5 0	2 49	1 1	23 7	21 16	19 12	17 8	15 4	13 8	11 20	9 23	7 18
5	4 56	2 45	0 57	23 4	21 12	19 8	17 4	15 0	13 5	11 17	9 19	7 14
6	4 51	2 41	0 53	23 0	21 8	19 4	16 59	14 56	13 1	11 13	9 15	7 9
7	4 47	2 37	0 49	22 56	21 4	19 0	16 55	14 52	12 57	11 9	9 11	7 5
8	4 42	2 33	0 46	22 53	21 0	18 56	16 51	14 48	12 54	11 6	9 7	7 1
9	4 38	2 29	0 42	22 49	20 56	18 51	16 47	14 44	12 50	11 2	9 3	6 56
10	4 34	2 25	0 38	22 45	20 52	18 47	16 43	14 41	12 47	10 58	8 59	6 52
11	4 29	2 21	0 35	22 42	20 48	18 43	16 39	14 37	12 43	10 55	8 55	6 47
12	4 25	2 17	0 31	22 38	20 44	18 39	16 35	14 33	12 39	10 51	8 51	6 43
13	4 21	2 13	0 27	22 34	20 41	18 35	16 31	14 29	12 36	10 47	8 47	6 39
14	4 16	2 9	0 24	22 31	20 37	18 31	16 27	14 26	12 32	10 43	8 43	6 34
15	4 12	2 5	0 20	22 27	20 33	18 27	16 23	14 22	12 29	10 40	8 39	6 30
16	4 8	2 1	0 16	22 23	20 29	18 22	16 19	14 18	12 25	10 36	8 35	6 25
17	4 4	1 57	0 13	22 20	20 25	18 18	16 15	14 14	12 21	10 32	8 30	6 21
18	3 59	1 54	0 9	22 16	20 21	18 14	16 11	14 11	12 18	10 28	8 26	6 16
19	3 55	1 50	0 6	22 12	20 17	18 10	16 7	14 7	12 14	10 25	8 22	6 12
20	3 51	1 46	0 2	22 8	20 13	18 6	16 3	14 3	12 11	10 21	8 18	6 8
21	3 47	1 42	23 58	22 5	20 9	18 2	15 59	13 59	12 7	10 17	8 14	6 3
22	3 42	1 38	23 55	22 1	20 5	17 57	15 55	13 56	12 3	10 13	8 9	5 59
23	3 38	1 34	23 51	21 57	20 1	17 53	15 51	13 52	12 0	10 10	8 5	5 54
24	3 34	1 31	23 47	21 53	19 57	17 49	15 47	13 48	11 56	10 6	8 1	5 50
25	3 30	1 27	23 44	21 50	19 53	17 45	15 43	13 45	11 53	10 2	7 57	5 45
26	3 26	1 23	23 40	21 46	19 49	17 41	15 39	13 41	11 49	9 58	7 53	5 41
27	3 21	1 19	23 36	21 42	19 45	17 37	15 35	13 37	11 45	9 54	7 48	5 36
28	3 17	1 16	23 33	21 38	19 41	17 32	15 31	13 34	11 42	9 50	7 44	5 32
29	3 13	1 14	23 29	21 35	19 37	17 28	15 27	13 30	11 38	9 47	7 40	5 28
30	3 9	...	23 25	21 31	19 32	17 24	15 23	13 26	11 35	9 43	7 35	5 23
31	3 5	...	23 22	...	19 28	...	15 19	13 23	...	9 39	...	5 19

To the mere star-gazer the following Table (see pp. 248–9) of the approximate apparent times of the meridian passages of the principal fixed stars, with the point in the horizon of their rising and setting, and the duration of their visibility, on the 1st day of each month, may be acceptable. The stars are selected to form a net over the whole of the N. hemisphere. This Table is computed for 1892.

Stars.			Jan.	Feb.	Mar.	Apr.	May.	June.	July.
Constellation.	Names.	Mag.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
α Andromedæ ...	*Alpheratz*	1	5 23	3 22	1 28	23 22	21 24	19 22	17 24
γ Pegasi	*Algenib* ...	2½	5 29	3 27	1 33	23 27	21 29	19 27	17 29
α Cassiopeiæ ...	*Schedir* ...	3	5 55	3 53	1 59	23 53	21 55	19 53	17 55
β Ceti...	*Diphda* ...	2½	5 59	3 57	2 3	23 57	21 59	19 57	17 59
α Ursæ Minoris...	*Polaris* ...	2½	6 40	4 38	2 44	0 38	22 40	20 38	18 40
α Arietis	*Hamal* ...	3	7 22	5 20	3 26	1 20	23 22	21 20	19 22
α Ceti	*Menkab* ...	2½	8 15	6 13	4 19	2 13	0 15	22 13	20 15
α Persei	*Mirfak* ...	2½	8 38	6 36	4 42	2 36	0 38	22 36	20 38
α Tauri	*Aldebaran*	1	9 51	7 49	5 55	3 49	1 51	23 49	21 51
α Aurigæ	*Capella* ...	1	10 30	8 28	6 34	4 28	2 30	0 28	22 30
β Orionis	*Rigel* ...	1	10 30	8 28	6 34	4 28	2 30	0 28	22 30
β Tauri	*Nath* ...	2	10 40	8 38	6 44	4 38	2 40	0 38	22 40
α Orionis	*Betelgeuze*	1	11 4	9 2	7 8	5 2	3 4	1 2	23 4
α Canis Majoris...	*Sirius* ...	1	12 1	9 59	8 5	5 59	4 1	1 59	0 1
ε Canis Majoris ...	*Adara* ...	2½	12 15	10 13	8 19	6 13	4 15	2 13	0 15
α Canis Minoris...	*Procyon* ...	1½	12 55	10 53	8 59	6 53	4 55	2 53	0 55
β Geminorum ...	*Pollux* ...	2	13 0	10 58	9 4	6 58	5 0	2 58	1 0
α Hydræ	*Alphard* ...	2	14 43	12 41	10 47	8 41	6 43	4 41	2 43
α Leonis	*Regulus* ...	1	15 24	13 22	11 28	9 22	7 24	5 22	3 24
α Ursæ Majoris...	*Dubhe* ...	1½	16 18	14 16	12 22	10 16	8 18	6 16	4 18
β Leonis	*Denebola* ...	2½	17 5	15 3	13 9	11 3	9 5	7 3	5 5
γ Ursæ Majoris...	*Phecda* ...	2	17 9	15 7	13 13	11 7	9 9	7 7	5 9
α Canum Venat....	*Cor Caroli*	2½	18 12	16 10	14 16	12 10	10 12	8 10	6 12
α Virginis	*Spica* ...	1	18 41	16 39	14 45	12 39	10 41	8 39	6 41
η Ursæ Majoris ...	*Benetnasch*	2½	19 4	17 2	15 8	13 2	11 4	9 2	7 4
α Boötis	*Arcturus*	1	19 32	17 30	15 36	13 30	11 32	9 30	7 32
α Coronæ Borealis	*Alphecca* ...	2	20 51	18 49	16 55	14 49	12 51	10 49	8 51
α Serpentis... ...	*Unukalhay*	2½	21 0	18 58	17 4	14 58	13 0	10 58	9 0
β¹ Scorpii	*Acrab* ...	2	21 20	19 18	17 24	15 18	13 20	11 18	9 20
α Scorpii	*Antares* ...	1	21 44	19 42	17 48	15 42	13 44	11 42	9 44
β Draconis	*Alwaid* ...	2	22 49	20 47	18 53	16 47	14 49	12 47	10 49
α Ophiuchi	*Rasalague*	2	22 51	20 49	18 55	16 49	14 51	12 49	10 51
γ Draconis	*Etamin* ...	2	23 15	21 13	19 19	17 13	15 15	13 13	11 15
α Lyræ	*Vega* ...	1	23 54	21 52	19 58	17 52	15 54	13 52	11 54
α Aquilæ	*Altair* ...	1½	1 7	23 5	21 11	19 5	17 7	15 5	13 7
α Cygni	*Deneb* ...	1	1 59	23 57	22 3	19 57	17 59	15 57	13 59
α Cephei	*Alderamin*	3	2 37	0 35	22 41	20 35	18 37	16 35	14 37
ε Pegasi	*Enif* ...	2½	3 0	0 58	23 4	20 58	19 0	16 58	15 0
α Piscis Australis	*Fomalhaut*	1	4 13	2 11	0 17	22 11	20 13	18 11	16 13
α Pegasi	*Markab* ...	2	4 20	2 18	0 24	22 18	20 20	18 18	16 20

STARS.	Aug.	Sept.	Oct.	Nov.	Dec.	Point of Rising.	Hours to mer.	Point of Setting.
Constellation.	h. m.	h. m.	h. m.	h. m.	h. m.			
α Andromedæ ...	15 22	13 20	11 22	9 20	7 23	N. E. ½ N.	8¾	W. N. ½ N.
γ Pegasi	15 27	13 25	11 27	9 25	7 28	E. N. E.	7¼	W. N. W.
α Cassiopeiæ ...	15 53	13 51	11 53	9 51	7 54		*Circumpolar.*	
β Ceti	15 57	13 55	11 57	9 55	7 58	E. S. E. ¾ S.	4	W. S. W. ¾ S.
α Ursæ Minoris ...	16 38	14 36	12 38	10 36	8 39		*Circumpolar.*	
α Arietis	17 20	15 18	13 20	11 18	9 21	N. E. by E.	8¼	N. W. by W.
α Ceti	18 13	16 11	14 13	12 11	10 14	E. ½ N.	6¼	W. ½ N.
α Persei	18 36	16 34	14 36	12 34	10 37		*Circumpolar.*	
α Tauri	19 49	17 47	15 49	13 47	11 50	E. N. E.	7½	W. N. W.
α Aurigæ	20 28	18 26	16 28	14 26	12 29		*Circumpolar.*	
β Orionis	20 28	18 26	16 28	14 26	12 29	E. by S. ½ S.	5¼	W. by S. ½ S.
β Tauri	20 38	18 36	16 38	14 36	12 39	N. E. ¼ N.	8¾	N. W. ¼ N.
α Orionis	21 2	19 0	17 2	15 0	13 3	E. by N.	6½	W. by N.
α Canis Majoris ...	21 59	19 57	17 59	15 57	14 0	E. S. E. ½ S.	4½	W. S. W. ½ S.
ε Canis Majoris ...	22 13	20 11	18 13	16 11	14 14	S. E. ¾ S.	3	S. W. ¾ S.
α Canis Minoris ...	22 53	20 51	18 53	16 51	14 54	E. ¾ N.	6½	W. ¾ N.
β Geminorum ...	22 58	20 56	18 58	16 56	14 59	N. E. ½ N.	9	N. W. ½ N.
α Hydræ	0 41	22 39	20 41	18 39	16 42	E. by S. ¼ S.	5½	W. by S. ¼ S.
α Leonis	1 22	23 20	21 22	19 20	17 23	E. N. E.	7¼	W. N. W.
α Ursæ Majoris ...	2 16	0 14	22 16	20 14	18 17		*Circumpolar.*	
β Leonis	3 3	1 1	23 3	21 1	19 4	E. N. E. ¼ N.	7½	W. N. W. ¼ N.
γ Ursæ Majoris ...	3 7	1 5	23 7	21 5	19 8		*Circumpolar.*	
12 Canum Venat.	4 10	2 8	0 10	22 8	20 11		*Circumpolar.*	
α Virginis	4 39	2 37	0 39	22 37	20 40	E. by S. ½ S.	5	W. by S. ½ S.
η Ursæ Majoris ...	5 2	3 0	1 2	23 0	21 3		*Circumpolar.*	
α Boötis	5 30	3 28	1 30	23 28	21 31	N. E by E.	7¾	N. W. by W.
α Coronæ Borealis	6 49	4 47	2 49	0 47	22 50	N. E. ½ N.	8½	N. W. ½ N.
α Serpentis	6 58	4 56	2 58	0 56	22 59	E. by N.	6½	W. by N.
β¹ Scorpii	7 18	5 16	3 18	1 16	23 19	S. E. by E.	4¼	S. W. by W.
α Scorpii	7 42	5 40	3 42	1 40	23 43	S. E.	3½	S. W.
β Draconis	8 47	6 45	4 47	2 45	0 48		*Circumpolar.*	
α Ophiuchi	8 49	6 47	4 49	2 47	0 50	E. N. E.	7¼	W N. W.
γ Draconis	9 13	7 11	5 13	3 11	1 14		*Circumpolar.*	
α Lyræ	9 52	7 50	5 52	3 50	1 53		*Circumpolar.*	
α Aquilæ	11 5	9 3	7 5	5 3	3 6	E. by N. ¼ N.	6¾	W. by N. ¼ N.
α Cygni	11 57	9 55	7 57	5 55	3 58		*Circumpolar.*	
α Cephei	12 35	10 33	8 35	6 33	4 36		*Circumpolar.*	
ε Pegasi	12 58	10 56	8 58	6 56	4 59	E. by N. ¼ N.	6¾	W. by N. ¼ N.
α Piscis Australis	14 11	12 9	10 11	8 9	6 12	S. E. by S.	2½	S. W. by S.
α Pegasi	14 18	12 16	10 18	8 16	6 19	E. N. E.	7¼	W. N. W.

The foregoing Table, as already stated, shows the culminating times of the stars on the first day of each month; and this will be sufficient for the mere general reconnoitre of the heavens, which an amateur may take previous to making a settled gaze with his instrument. To find the time of passage for any intervening day, subtract the portion of time corresponding to the stated day of the month, in the following Table of Corrections.

Days.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
2	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4
3	0 9	0 8	0 7	0 7	0 8	0 8	0 8	0 8	0 7	0 7	0 8	0 9
4	0 13	0 12	0 11	0 11	0 11	0 12	0 12	0 12	0 11	0 11	0 12	0 13
5	0 18	0 16	0 15	0 15	0 15	0 16	0 16	0 15	0 14	0 15	0 16	0 17
6	0 22	0 20	0 19	0 18	0 19	0 21	0 21	0 19	0 18	0 18	0 20	0 22
7	0 26	0 24	0 22	0 22	0 23	0 25	0 25	0 23	0 22	0 22	0 24	0 26
8	0 30	0 28	0 26	0 26	0 27	0 29	0 29	0 27	0 25	0 25	0 28	0 30
9	0 35	0 32	0 30	0 29	0 30	0 33	0 33	0 31	0 29	0 29	0 32	0 35
10	0 39	0 36	0 33	0 33	0 35	0 37	0 37	0 35	0 32	0 33	0 36	0 39
11	0 43	0 40	0 37	0 36	0 39	0 41	0 41	0 38	0 36	0 37	0 40	0 44
12	0 48	0 44	0 41	0 40	0 42	0 45	0 45	0 42	0 40	0 40	0 44	0 48
13	0 52	0 48	0 44	0 44	0 46	0 49	0 49	0 46	0 43	0 44	0 48	0 52
14	0 56	0 52	0 48	0 48	0 50	0 54	0 53	0 50	0 47	0 48	0 52	0 57
15	1 1	0 56	0 52	0 51	0 54	0 58	0 57	0 53	0 50	0 51	0 56	1 1
16	1 5	1 0	0 55	0 55	0 58	1 2	1 1	0 57	0 54	0 55	1 0	1 6
17	1 9	1 3	0 59	0 59	1 2	1 6	1 5	1 1	0 58	0 59	1 4	1 10
18	1 13	1 7	1 2	1 2	1 6	1 10	1 9	1 5	1 1	1 3	1 9	1 15
19	1 18	1 11	1 6	1 6	1 10	1 14	1 13	1 8	1 5	1 6	1 13	1 19
20	1 22	1 15	1 10	1 10	1 14	1 19	1 17	1 12	1 8	1 10	1 17	1 24
21	1 26	1 19	1 14	1 13	1 18	1 23	1 21	1 16	1 12	1 14	1 21	1 28
22	1 31	1 23	1 17	1 17	1 22	1 27	1 25	1 19	1 16	1 18	1 25	1 32
23	1 35	1 26	1 21	1 21	1 26	1 31	1 29	1 23	1 19	1 21	1 30	1 37
24	1 39	1 30	1 24	1 25	1 30	1 35	1 33	1 27	1 23	1 25	1 34	1 41
25	1 43	1 34	1 28	1 28	1 34	1 39	1 37	1 31	1 26	1 29	1 38	1 46
26	1 47	1 38	1 32	1 32	1 38	1 44	1 41	1 34	1 30	1 33	1 42	1 50
27	1 51	1 42	1 35	1 36	1 42	1 48	1 45	1 38	1 34	1 37	1 47	1 55
28	1 56	1 45	1 39	1 40	1 46	1 52	1 49	1 42	1 37	1 41	1 51	1 59
29	2 0	1 48	1 43	1 44	1 50	1 56	1 53	1 45	1 41	1 44	1 55	2 3
30	2 4	...	1 46	1 47	1 55	2 0	1 57	1 49	1 44	1 48	1 59	2 8
31	2 8	...	1 50	...	1 59	...	2 1	1 52	...	1 52	...	2 12

The following Table will be found to exhibit in a very condensed form the positions of a few of the leading constellations visible in England at different times of the year:—

January ...	Draco	Lyra	Serpens ...	Sagittarius.
February ...	Cepheus... ...	Cygnus	Delphinus ...	Capricornus.
March	Cassiopeia ...	Pegasus... ...	Aquarius.	
April	Cassiopeia ...	Andromeda ...	Pisces	Cetus.
May	Perseus	Aries	Cetus	Eridanus.
June	Perseus	Taurus	Orion.	
July	Lynx	Gemini	Canis Major.	
August	Ursa Major ...	Cancer	Hydra.	
September ...	Ursa Major ...	Hydra	Leo.	
October	Ursa Major ...	ComaBerenices	Virgo.	
November ...	Boötes	Corona	Libra.	
December ...	Draco	Hercules ...	Ophiuchus ...	Scorpio.

To use this Table; count as many months forward on the Table as half the number of hours that have elapsed since noon. This will give the constellations exactly on the 1st day of each month, and it will not be difficult to make the requisite allowance for the intermediate days. Thus, for 8 P.M. on the 1st January, count 4 (being half of 8) months forward, and opposite May we shall find Perseus, Aries, Cetus, and Eridanus, which constellations will be due S. at the time in question on Jan. 1. The constellations named below these will be visible to the *West* of the meridian, and those above them to the *East* thereof.

Amateurs will find a Planisphere very useful for identifying the constellations visible on any given night of the year. There are various forms of Planisphere in circulation. One of the most comprehensive is Grosse's[b]. This consists of a sheet of cardboard mounted on a frame 22^{in} by 19^{in}, having a circle 9^{in} in diameter cut out of the centre. Immediately behind this circular area, a circular map of the constellations visible in England is placed which can be made to rotate by means of a button, and so bring into view in succession the various con-

[b] Sold by the author, 14 Weymouth Street, Manchester.

stellations which come to the meridian at the different seasons of the year. The outer edge of this rotating card is divided into 365 equal parts representing the days of the year. The blank spaces on the principal card are occupied with various useful memoranda connected with the constellations and the principal stars therein.

Smaller in size and more convenient in shape is Philip's "Planisphere[c]." This (which is made in two forms, for the Northern and Southern heavens respectively) shows the stars white on an indigo background. The printing is clear and good, and the moving parts and corners being made in black leather the whole affair is calculated to stand a considerable amount of knocking about and rough usage.

One of the newest and most original planispheres is the "Oxford Planisphere" devised by the Rev. Professor Pritchard. It is a rectangular chart forming a cylindrical projection of the heavens from the horizon of Greenwich to its zenith. All the brighter stars visible at Greenwich are given; *i.e.* from the 1[s] to the 4[th] magnitudes. A few other stars of individual interest are also projected, and a few nebulæ of importance; these have Messier's designations attached to them. The equator runs horizontally through the map; on it are marked the Right Ascensions from O hours to XXIV. The circles of Declination are drawn for every 10 degrees and are all parallel to the equator; the hour circles also are projected in parallel straight lines at right angles to the equator, and are drawn at intervals of 1 hour, being subdivided on the equator into 6 divisions, representing 10 minutes each. The ecliptic is projected as a dotted curve, with the positions of the Sun engraved on it for the first day of each month; and its position on intermediate days can be estimated proportionally. After this description the rotating circular chart will speak for itself. The stars above the line marked "Non-Setting Line, Greenwich," never set in that latitude. The Galaxy or Milky Way is the space bounded by faint dotted lines, and its northern pole is

[c] Sold by Philip & Son, 32 Fleet Street, London.

marked G.P. in the Constellation Coma. The construction of this chart has this advantage, that it serves equally well for all the "Constellation Seasons." The stars forming each particular constellation are here linked together by faint lines. Any allineations of stars on the chart represent the equivalent allineations of the same stars in the skies. Hence if any strongly-marked constellations or configurations of stars, such as Orion, "the great square of Pegasus," Cygnus, Cassiopeia, Ursa Major, etc., are once mastered, the star-gazer can then make allineations for himself on the map, and transfer them successfully to the heavens. Thus he can hardly avoid "finding the stars."

CHAPTER X.

A CATALOGUE OF CELESTIAL OBJECTS.

THIS catalogue furnishes observers in any part of the world with a series of objects available for achromatic telescopes of about 3^{in} aperture and 4^{ft} focal length. With few exceptions, those objects which are visible in England have been examined by myself (many of them with an instrument of this size); the remainder have been selected by me chiefly from Sir J. Herschel's *Cape Observations*. Speaking generally, double stars are characteristic of the Northern heavens; remarkable clusters and nebulæ, of the Southern; nearly all the celebrated aggregations of stars being situated South of the celestial equator, whilst important doubles are rather scarce there. The marks are to this effect:—2 stars (**) indicate objects of very special size, brilliancy, or interest; one star (*) denotes objects of less importance but still deserving of special attention.

PART I.—DOUBLE, TRIPLE, AND MULTIPLE STARS.

As a general rule, no stars are inserted which are less than 2″ or more than 45″ apart. Also, as a general rule, no principal star is included which is less than the $6\frac{1}{2}$ magnitude, and no secondary one which is less than the $7\frac{1}{2}$; but in some special cases these limitations have been disregarded, as for instance in regions where objects are sparsely scattered and an adequate number fulfilling the requsite conditions could not be had. Many stars, double when examined with small telescopes, appear triple or quadruple in larger ones: reckoned under the latter head they would be inappropriate in this list, but not so, regarded in the more elementary form. The magnitudes are chiefly from Smyth and Webb; the distances from many sources. The epochs are in all cases the most recent that were accessible, but many binaries vary considerably in their distance in the course of even a few years. It will be remembered that in double-star nomenclature, A denotes the largest star, and B, C, &c. the smaller ones in succession.

No.	Star.	R.A. 1890.	Decl. 1890.	Mags.	Distance and Notes.
		h. m. s.	° ′		″
1	β Toucani	0 26 30	−63 34·0	both 5	28
*2	π Andromedæ	0 31 0	+33 6·8	4½ and 9	35
**3	η Cassiopeiæ	0 42 26	+57 13·9	4 and 7½	5·1 (1883). Binary.
*4	65 Piscium	0 43 58	+27 6·7	6 and 6	4·3
5	— Cassiopeiæ	0 47 44	+56 9·7	7¾, 8½, 11	1·5″ 4″, multiple.
**6	ψ^1 Piscium	0 59 47	+20 53·0	both 5½	29·4
*7	α Ursæ Minoris ...	1 18 14	+88 43·3	2½ and 9½	18·4
8	6 Eridani	1 35 37	−56 45·2	both 6½	6·3 (1880). Binary.
**9	γ Arietis	1 47 29	+18 45·3	4½ and 5	8·3″
*10	λ Arietis	1 51 47	+23 3·6	5½ and 8	37
**11	α Piscium	1 56 21	+ 2 14·0	5 and 6	3·0
**12	γ Andromedæ	1 57 8	+41 48·1	3½ and 5½	10·5; B also double.
*13	59 Andromedæ ...	2 4 12	+38 31·2	6½ and 7	16
*14	ι Trianguli	2 5 59	+29 47·2	5½ and 7	3·8
*15	ι Cassiopeiæ	2 20 0	+66 54·4	4½, 7, and 9	2·1 and 7·5
16	112 P. II. Fornacis ...	2 29 1	−28 42·7	5½ and 8	11
*17	30 Arietis	2 30 37	+24 10·2	6 and 7	38
*18	12 Persei	2 35 18	+39 43·7	6 and 7½	23
**19	γ Ceti	2 37 36	+ 2 33·5	3 and 7	2·7
**20	η Persei	2 42 40	+55 26·3	5 and 8½	28
*21	220 P. II. Persei ...	2 53 2	+51 54·9	6 and 8	12
22	θ Eridani	2 54 5	−40 44·8	5 and 6	8·5
23	12 Eridani	3 7 23	−29 26·0	3½ and 8	2·6
24	*f* Eridani	3 44 33	−37 57·8	5 and 5½	8·5
*25	32 Eridani	3 48 46	− 3 16·8	5 and 7	6·7
*26	ε Persei	3 50 28	+39 41·5	3½ and 9	8·4
*27	χ Tauri	4 15 53	+25 22·2	6 and 8	19·2
*28	τ Tauri	4 35 38	+22 44·8	5 and 8	63
29	ι Pictoris	4 48 28	−53 39·0	5½ and 6½	12·3
*30	14 Aurigæ	5 8 14	+32 33·6	5 and 7½	14·6
**31	β Orionis	5 9 15	− 8 19·9	1 and 9	9·5
*32	170 σ Leporis	5 14 27	−18 38·0	7 and 7½	39
*33	23 Orionis	5 17 3	+ 3 26·3	5 and 7	31
*34	118 Tauri	5 22 30	+25 3·6	7 and 7½	5·1
*35	δ Orionis	5 26 23	− 0 22·9	2 and 7	53

No.	Star.	R.A. 1890.	Decl. 1890.	Mags.	Distance and Notes.
		h. m. s.	° ′		″
**36	λ Orionis	5 29 5	+ 9 51·5	4 and 6	4·3
**37	ι Orionis	5 30 3	− 5 59·0	$3\frac{1}{2}$, 8, 11	11·2 and 49
**38	σ Orionis	5 33 3	− 2 38·0	4, 8, and 7	12 and 42; multiple star.
**39	ζ Orionis	5 35 12	− 2 0·2	3, $6\frac{1}{2}$, 10	2·6, 57
*40	41 Aurigæ	6 3 10	+ 48 44 0	6 and 7	7·8
**41	11 Monocerotis ...	6 23 29	− 6 57·7	$6\frac{1}{2}$, 7, and 8	7·2, 9·6 (BC = 2·5)
**42	V Puppis	6 35 41	− 48 7·8	$5\frac{1}{2}$ and $7\frac{1}{2}$	13
43	12 Lyncis	6 36 30	+ 59 33·1	6, $6\frac{1}{2}$, $7\frac{1}{2}$	1·6 and 8·7
*44	958 Σ Lyncis	6 39 1	+ 55 49·8	both 6	5·1
*45	38 Geminorum... ...	6 48 26	+ 13 19·1	$5\frac{1}{2}$ and 8	6·3
*46	301 P. VI. Lyncis ...	6 56 55	+ 52 55·4	6 and $6\frac{1}{2}$	3·2
47	2640 Lac. Carinæ ...	7 1 33	− 59 0·6	$6\frac{1}{2}$ and $7\frac{1}{2}$	2·4
48	γ Piscis Volantis ...	7 9 40	− 70 19·2	5 and 7	13
*49	19 Lyncis	7 13 53	+ 55 28·6	7, 8, and 8	14 and 215
**50	α Geminorum	7 27 35	+ 32 7·8	3 and $3\frac{1}{2}$	5·6
*51	175 P. VII. Puppis...	7 34 18	− 26 33·1	both $6\frac{1}{2}$	9·8
*52	2 Puppis	7 40 26	− 14 25·4	7 and $7\frac{1}{2}$	17
*53	ζ Cancri	8 5 54	+ 18 0·9	6, 7, and $7\frac{1}{2}$	1·0 and 5·7 (1886)
54	γ Argûs	8 6 8	− 47 0·4	2 and 6	42
*55	ϕ^2 Cancri	8 20 8	+ 27 17·7	6 and $6\frac{1}{2}$	4·7
*56	108 P. VIII. Hydræ	8 30 1	+ 7 0·5	6 and 7	10·5
**57	124 P. VIII. Cancri	8 33 32	+ 19 56·0	7, $7\frac{1}{2}$, $6\frac{1}{2}$	45 and 93
58	b^1 Carinæ	8 54 17	− 58 48·39	6 and 7	40
**59	38 Lyncis	9 12 0	+ 37 16·3	4 and $7\frac{1}{2}$	2·9
**60	γ Leonis	10 13 54	+ 20 23·8	2 and 4	3·6
61	*s* Velorum	10 27 14	− 44 30·2	both $6\frac{1}{2}$	14
*62	1474 Σ Hydræ	10 42 12	− 11 40·9	7, 9, and $8\frac{1}{2}$	71 and 6·7
*63	54 Leonis	10 49 39	+ 25 20·2	$4\frac{1}{2}$ and 7	6·4
*64	ξ Ursæ Majoris ...	11 12 20	+ 32 9·5	4 and $5\frac{1}{2}$	2·0 (1886)
*65	ι Leonis	11 18 11	+ 11 8·4	4 and $7\frac{1}{2}$	2·6
66	17 Crateris	11 26 49	− 28 39·6	$5\frac{1}{2}$ and 7	8·7
*67	90 Leonis	11 28 59	+ 17 24·4	6, $7\frac{1}{2}$, $9\frac{1}{2}$	3·5 and 63
*68	65 Ursæ Majoris ...	11 49 23	+ 47 5·4	7, $9\frac{1}{2}$, and 7	3·8 and 63
*69	2 Comæ Berenices ...	11 58 39	+ 22 4·5	6 and $7\frac{1}{2}$	3·6
70	15 P. XII. Centauri	12 8 13	− 45 6·7	$5\frac{1}{2}$ and 7	4

No.	Star.	R.A. 1890.	Decl. 1890.	Mags.	Distance and Notes.
		h. m. s.	° ′		″
71	32 P. XII. Virginis	12 12 30	− 3 20·5	both $7\frac{1}{2}$	20
72	α Crucis	12 20 28	−62 29·3	$1\frac{1}{2}$, 2, and 5	5, 90 [quintuple]
**73	17 Comæ Berenices ...	12 23 25	+26 30·4	$4\frac{1}{2}$ and 6	145: for low power.
74	δ Corvi	12 24 11	−15 54·1	3 and $8\frac{1}{2}$	23
75	γ Crucis	12 25 2	−56 29·6	2 and 5	120
*76	24 Comæ Berenices ...	12 29 36	+18 58·9	$5\frac{1}{2}$ and 7	20
77	γ Virginis	12 36 5	− 0 50·8	both 4	5·3 (1885)
*78	232 P. XII. Camelop.	12 48 16	+84 0·7	6 and $6\frac{1}{2}$	22
**79	α Canum Venat. ...	12 50 53	+38 54·7	$2\frac{1}{2}$ and $6\frac{1}{2}$	20
*80	54 Virginis	13 7 33	−18 14·5	7 and $7\frac{1}{2}$	5·3
**81	ζ Ursæ Majoris ...	13 19 29	+55 30·1	3 and 5	14·4; Alcor, mag. 5, is distant $11\frac{3}{4}$′.
*82	*f* Hydræ	13 30 42	−25 56·0	6 and 7	10
*83	3 (*k*) Centauri	13 45 28	−32 26·5	6 and $7\frac{1}{2}$	8
**84	ι Boötis	14 12 17	+51 52·5	$4\frac{1}{2}$ and 8	38
85	5893 Lac. Centauri ...	14 14 44	−57 57·0	6, $8\frac{1}{2}$, 11	9·6 and 35
*86	69 P. XIV. Boötis ...	14 17 58	+ 8 56·9	6 and $7\frac{1}{2}$	6·2
87	α Centauri	14 32 7	−60 22·7	1 and 2	14·0 (1885)
**88	π Boötis	14 35 33	+16 53·5	$3\frac{1}{2}$ and 6	5·9
*89	54 Hydræ	14 39 39	−24 58·4	$5\frac{1}{2}$ and $7\frac{1}{2}$	9·0
**90	ε Boötis	14 40 11	+27 32·2	3 and 7	2·7; colours fine.
*91	39 Boötis	14 45 57	+49 10·3	6 and $6\frac{1}{2}$	3·6
*92	ξ Boötis	14 46 18	+19 33·6	$3\frac{1}{2}$ and $6\frac{1}{2}$	3·3 (1887)
*93	212 P. XIV. Libræ ...	14 50 55	−20 53·2	6 and 8	15
*94	44 Boötis	15 0 11	+48 5·0	5 and 6	4·7
95	κ Lupi	15 4 16	−48 19·3	$5\frac{1}{2}$ and 7	27
96	μ Lupi	15 10 52	−47 28·0	5, 6, and 8	2·1 and 20
*97	μ Boötis	15 20 21	+37 45·8	4 and 8	108; B also double (0·7″: 1887).
**98	δ Serpentis	15 29 33	+10 54·5	3 and 5	3·4
*99	ζ Coronæ	15 35 14	+36 59·7	5 and 6	6·2
100	ξ Lupi	15 49 52	−33 38·9	6 and $6\frac{1}{2}$	11
**101	ξ Scorpii	15 58 19	−11 4·1	$4\frac{1}{2}$ and $7\frac{1}{2}$	7·1; A also double (1·1″).
**102	β Scorpii	15 59 2	−19 30·2	2 and $5\frac{1}{2}$	13·6; A also double (0·9″).
*103	κ Herculis	16 3 6	+17 20·6	$5\frac{1}{2}$ and 7	30
*104	ν Scorpii	16 5 36	−19 10·3	4 and 7	40; both stars double; 0·7″, 2·0″.
105	36 P. XVI. Scorpii ...	16 12 35	−30 38·4	7 and $7\frac{1}{2}$	27

No.	Star.	R.A. 1890.	Decl. 1890.	Mags.	Distance and Notes.
		h. m. s.	° ′		″
*106	σ Scorpii	16 14 30	−25 16·8	4 and 9½	20
**107	ρ Ophiuchi	16 18 59	−23 11·5	5 and 7½	3·4; two stars near make a trio.
**108	17 Draconis	16 33 37	+53 8·8	6, 6½, and 6	3·7 and 90
*109	μ Draconis	17 3 3	+54 37·1	4 and 4½	2·6
*110	36 (A) Ophiuchi ...	17 8 34	−26 25·3	4½ and 6½	4·6
**111	α Herculis...	17 9 38	+14 30·9	3½ and 5½	4·7
*112	39 Ophiuchi	17 11 18	−24 9·9	5½ and 7½	10·8
**113	ρ Herculis...	17 19 53	+37 14·9	4 and 5½	3·9
**114	ν Draconis	17 30 0	+55 15·5	both 5	62
*115	ψ¹ Draconis	17 43 54	+72 12·5	5½ and 6	31
116	67 Ophiuchi	17 55 8	+ 2 56·2	4 and 8	55
*117	95 Herculis	17 56 50	+21 35·8	5½ and 6	6·1
*118	70 Ophiuchi	17 59 53	+ 2 32·5	4 and 6	2·0 (1886)
**119	100 Herculis	18 3 24	+26 4·8	both 7	14·1
**120	40 Draconis	18 8 16	+79 59·0	5½ and 6	20
121	κ Coronæ Australis...	18 25 47	−38 47·8	6½ and 7½	22
**122	ε Lyræ	18 40 41	+39 33·2	5, 6½, 5, 5½	3·4 and 2·5; distance A C 207.
**123	ζ Lyræ	18 40 59	+37 29·4	5 and 5½	44
**124	β Lyræ	18 46 1	+33 14·1	3–5 (var.), 8, 8½, and 9	46, 60, and 71
*125	θ Serpentis	18 50 45	+ 4 3·4	4½ and 5	21·7
*126	γ Coronæ Australis...	18 59 0	−37 12·9	both 6	1 ±
127	15 Aquilæ...	18 59 9	− 4 11·7	6 and 7½	35
128	β¹ Sagittarii	19 14 44	−44 40·1	4½ and 8	29
**129	β Cygni	19 26 17	+27 43·7	3 and 7	34
*130	16 Cygni	19 38 54	+50 16·2	6½ and 7	37
*131	57 Aquilæ...	19 48 40	− 8 30·8	6½ and 7	36
132	320 P.XIX.Vulpeculæ	19 48 31	+20 3·0	both 7	42
133	θ Sagittæ	20 5 5	+20 35·2	7, 9, and 8	11 and 75
*134	26 P. XX. Antinoï...	20 6 38	+ 0 32·3	6½ and 7	3·5
*135	o² Cygni	20 10 10	+46 24·5	4, 7½, 5½	107 and 338
*136	α² Capricorni	20 11 57	−12 53·1	3 and 4	376 [use a very low power].
*137	κ Cephei	20 12 35	+77 22·7	4½ and 8½	7·2
*138	β² Capricorni	20 14 50	−15 7·8	3½ and 7	205
*139	o² Capricorni	20 23 36	−18 56·7	6 and 7	21
*140	γ Delphini	20 41 33	+15 43·9	4 and 6½	11·3

No.	Star.	R.A. 1890.	Decl. 1890.	Mags.	Distance and Notes.
		h. m. s.	° ′		″
141	8550 Lac. Pavonis ...	20 42 26	−62 50·1	both $6\frac{1}{2}$	3·2
*142	ε Equulei	20 53 35	+ 3 52·5	$5\frac{1}{2}$ and $7\frac{1}{2}$	10·6; A also double (1·0″).
*143	λ (2) Equulei	20 56 47	+ 6 44·8	6 and $6\frac{1}{2}$	2·8
*144	61 Cygni	21 1 57	+38 12·5	$5\frac{1}{2}$ and 6	20 (1884)
145	1 Pegasi	21 17 0	+19 20·0	4 and 9	37
**146	β Cephei	21 27 14	+70 4·6	3 and 8	13·3
**147	248 P. XXI. Cephei	21 35 33	+56 59·5	6, $8\frac{1}{2}$, $8\frac{1}{2}$	11·7 and 20
*148	μ Cygni	21 39 12	+28 15·0	5, 6, and $7\frac{1}{2}$	3·9 and 208
*149	ξ Cephei	22 0 35	+64 5·4	5 and 7	6·6
*150	11 P. XXII. Cephei	22 4 52	+58 45·3	6 and $6\frac{1}{2}$	21; B also double (0·6″).
*151	33 Pegasi	22 18 21	+20 17·5	$6\frac{1}{2}$, 10, & 8	1·9 and 63
*152	53 Aquarii	22 20 34	−17 18·0	both $6\frac{1}{2}$	7·8
*153	ζ Aquarii	22 23 9	− 0 35·0	4 and $4\frac{1}{2}$	3·2 (1879)
*154	δ Cephei	22 25 5	+57 51·1	$4\frac{1}{2}$ and 7	40. A is var.
*155	8^2 Lacertæ	22 30 58	+39 3·9	$6\frac{1}{2}$, $6\frac{1}{2}$, 11, 10	Two nearest, 23
*156	γ Piscis Australis ...	22 46 25	−33 27·5	5 and 9	3·5
157	9367 B.A.C. Gruis ...	23 0 53	−51 16·8	$6\frac{1}{2}$ and 7	8
*158	107 Aquarii	23 40 18	−19 17·5	6 and $7\frac{1}{2}$	5·8
*159	σ Cassiopeiæ	23 53 25	+55 8·5	6 and 8	2·9

PART II.—CLUSTERS AND NEBULÆ.

Many clusters and nebulæ are *visible* with small telescopes, which cannot in any satisfactory way be examined by such instruments. The largest and brightest only have been selected for insertion in this list; and it may as well be stated at the outset, that many of them will be found disappointing with apertures below 5 inches. Abundant light and (generally) low magnifiers are essential requisites for the satisfactory examination of all kinds of clusters and nebulæ.

In the column of Synonyms—

D refers to Dreyer's new great Catalogue of 1888.
M „ Messier's Catalogue.
H „ Sir John Herschel's General Catalogue of 1864.
H „ Sir William Herschel's Catalogues.
h „ Sir John Herschel's old Catalogue of 1833.
S „ Smyth's *Bedford Catalogue* (1st ed.).
S & C „ Smyth and Chambers's *Cycle*.

The notes are partly selected and partly original, but those who are accustomed to observe clusters and nebulæ will be well aware how different are the impressions conveyed by the same objects to different observers using telescopes of different capabilities.

CATALOGUE OF CLUSTERS

No.	Name or Constellation.	D	M	H	ℌ	h	S	S&C	R.A. 1890. h. m. s.	Decl. 1890. ° ′
**1	47 Toucani ...	104	...	52	... ...	2322	...	17	0 19 9	−72 41·6
**2	Andromeda ...	224	31	116	... ...	50	24	35	0 36 47	+40 40·1
3	Cetus	253	...	138	1 v.	61	30	41	0 42 13	−25 53·7
4	Nubecula Minor	292	...	165	... ...	2356	...	...	0 48 41	−73 58·7
5	Toucan	362	...	193	... ...	2375	...	...	0 58 31	−71 26·2
6	Cassiopeia	581	103	341	... ...	126	55	78	1 25 56	+60 7·1
*7	Triangulum ...	598	33	352	17 v.	131	57	80	1 27 38	+30 6·8
**8	Perseus	869	...	512	33 vi.	207	92	133	2 11 20	+56 38·5
*9	Perseus	1039	34	584	... ...	248	106	152	2 34 57	+42 15·7
10	Eridanus	1365	...	731	... ...	2552	...	...	3 29 26	−36 30·4
**11	η Tauri	..	...	...	... ...	...	142	218	3 40 56	+23 45·9
**12	γ Tauri	...	...	...	... ...	...	159	241	4 13 31	+15 21·7
13	Columba	1851	...	1061	... ...	2777	...	...	5 10 29	−40 10·2
14	Auriga	1912	38	1119	... ...	...	204	329	5 22 2	+35 44·1
15	Nubecula Major	...	...	...	... ...	...	...	...	5 24 6	−69 34·1
*16	Taurus	1952	1	1157	... ...	357	212	341	5 27 51	+21 56·6
17	Auriga	1960	36	1166	... ...	358	214	343	5 29 2	+34 4·2
18	Dorado	1978	...	1181	... ...	2878	...	...	5 28 32	−66 19·0
**19	Orion	1976	42	1179	... ...	360	216	348	5 29 52	− 5 27·7
**20	Orion	1981	...	1184	... ...	362	217	350	5 30 4	− 4 25·4
**21	30 Doradûs ...	2070	...	1269	... ...	2941	...	367	5 39 29	−69 9·4
*22	Auriga	2099	37	1295	... ...	369	230	376	5 45 2	+32 31·3
*23	Gemini	2168	35	1360	... ...	377	236	388	6 2 4	+24 26·2
24	Orion	2169	...	1361	24 viii.	379	238	391	6 3 15	+13 58·5
*25	Canis Major ...	2287	41	1454	... ...	411	265	437	6 42 13	−20 37·8
26	Monoceros ...	2323	50	1483	... ...	425	276	451	6 57 41	− 8 10·7
*27	Puppis	2422	...	1551	38 viii.	459	296	488	7 31 33	−14 14·3
28	Puppis	2437	46	1564	... ...	463	302	496	7 36 47	−14 27·3
29	Puppis	2477	...	1593	... ...	3103	...	509	7 48 23	−38 15·7
30	Argo Navis ...	2516	...	1619	... ...	3111	...	...	7 56 31	−60 34·1

AND NEBULÆ.

No.	Description.
1	Superb globular cluster, 15′ to 20′ in diameter. Central stars pale rose colour; outer ones white.
2	The great nebula; an elongated ellipse 2° long.
3	One of the finest, though faint, elliptic nebulæ, 30′ long, 5′ wide ±: some small stars involved.
4	Visible to the naked eye.
5	A highly condensed cluster, 4′ in diameter.
6	A fine field.
7	Large roundish faint oval nebula, 40′ in diameter ±; resolvable into stars.
8	The magnificent double cluster in the sword-handle of Perseus: stars 7 to 14 mag.
9	A fine group of rather large stars.
10	An oval and possibly spiral nebula.
11	The Pleiades.
12	The Hyades: a scattered group of rather large stars.
13	Bright globular cluster, 3′ in diameter.
14	Cruciform cluster. In same field, 30′ S., is 39 Ḥ vii. In a rich neighbourhood.
15	Visible to the naked eye.
16	The "Crab" nebula. Large elliptical nebula, resolvable into stars.
17	A neat cluster of 9 to 11 mag. stars, near M 38, with double star in field, dist. 12″. Mags. 8 and 9.
18	Large and bright oval nebula.
19	The great nebula in Orion, with multiple star involved. The most magnificent of the nebulæ.
20	A brilliant field, 1° N. of θ.
21	Very large and irregular nebula.
22	Compact cluster of small stars.
23	Fine large cluster of 9 to 16 mag. stars. In same field to the N. is a neat cluster of small stars, 17 Ḥ vi.
24	Loose cluster in the form of a trapezium, containing a pair of mags. 7½ and 8½, 2·4″ apart. 1° S. of ν.
25	Large scattered cluster, 4° below Sirius.
26	Cluster; rather more than ⅓ from Sirius to Procyon.
27	Bright neat cluster, with double star, 8″ dist. A bright orange star precedes.
28	Large loose cluster of small stars, 8 to 13 mag., with faint planetary nebula involved.
29	Superb cluster, 20′ in diameter.
30	Cluster of 200 or more stars, visible to the naked eye.

No.	Name or Constellation.	Synonym in various Catalogues.							R.A. 1890.	Decl. 1890.
		D	M	H	Ḩ	h	S	S & C	h. m. s.	° ′
31	Puppis	2547	...	1636	... ...	3117	...	527	8 7 25	−48 56·3
32	Monoceros	2548	...	1637	22 vi.	496	318	531	8 8 8	− 5 28·0
**33	Cancer	2632	44	1681	... ...	517	331	547	8 33 55	+20 19·4
34	Cancer	2682	67	1712	... ...	531	339	558	8 45 10	+12 12·7
35	Carinæ	2932	...	1881	... ...	3179	...	606	9 31 13	−46 26·9
*36	Ursa Major ...	3031	81	1949	... ...	649	369	617	9 46 23	+69 38·8
37	Ursa Major ...	3034	82	1950	79 iv.	...	369	617	9 46 27	+70 20·8
38	Carina	3114	...	2007	... ...	3224	...	623	9 59 8	−59 35·4
**39	Sextans	3115	...	2008	163 i.	668	373	624	9 59 45	− 7 11·3
40	Hydra...	3242	...	2102	27 iv.	3248	378	643	10 19 25	−18 5·1
**41	η Argûs	3372	...	2197	... ...	3295	...	658	10 40 47	−59 6·5
42	Centaurus	3532	...	2308	... ...	3315	...	684	11 1 50	−58 4·7
*43	Ursa Major ...	3587	97	2343	... ...	838	402	692	11 8 19	+55 36·7
*44	Ursa Major ...	4258	...	2841	43 v.	1175	441	796	12 13 33	+47 54·5
*45	Coma Berenices...	4382	85	2946	... ...	1242	...	815	12 19 49	+18 47·9
*46	Virgo	4472	49	3021	... ...	1294	447	825	12 24 8	+ 8 36·3
*47	Virgo	4501	88	3049	... ...	1312	448	831	12 26 26	+15 1·9
48	Coma Berenices...	4631	...	3165	42 v.	1397	...	853	12 36 50	+33 8·8
*49	Canes Venatici ...	4736	94	3258	... ...	1456	459	867	12 45 43	+41 43·3
*50	κ Crucis	4755	...	3275	... ...	3435	...	870	12 47 7	−59 45·2
*51	Coma Berenices...	4826	64	3321	... ...	1486	467	879	12 51 19	+22 16·9
*52	Coma Berenices...	5024	53	3453	... ...	1558	474	897	13 7 30	+18 45·3
*53	Canes Venatici ...	5055	63	3474	... ...	1570	476	901	13 10 53	+42 36·7
**54	ω Centauri	5139	...	3531	... ...	3504	...	908	13 20 10	−46 44·3
**55	Canes Venatici ...	5194	51	3572	... ...	1622	484	913	13 25 13	+47 45·2
**56	Canes Venatici ...	5272	3	3636	... ...	1663	492	928	13 37 3	+28 55·3
**57	Libra	5904	5	4083	... ...	1916	538	1023	15 12 57	+ 2 30·1
*58	Scorpio	6093	80	4173	... ...	3624	564	1080	16 10 26	−22 43·2
**59	Scorpio	6121	4	4183	... ...	...	569	1089	16 16 53	−26 14·8
**60	Hercules	6205	13	4230	... ...	1968	585	1115	16 37 45	+36 39·9
*61	Hercules	6210	...	4234	... ...	1970	587	1118	16 39 51	+24 0·0
**62	Ophiuchus	6218	12	4238	... ...	1971	590	1121	16 41 31	− 1 45·9
*63	Ophiuchus	6254	10	4256	... ...	1972	595	1136	16 51 22	− 3 56·8
*64	Scorpio	6266	62	4261	... ...	3661	596	1139	16 54 14	−29 55·4
*65	Ophiuchus	6273	19	4264	... ...	1975	597	1141	16 55 48	−26 6·9

No.	Description.
31	Large loose cluster, fully 20′ in diameter.
32	Loose bright cluster of stars, 9 to 13 mag.; double star in centre 4″ dist.
33	The fine cluster "Præsepe."
34	Large cluster of small stars, 10 to 15 mag.
35	Large rich cluster, upwards of 1° in diameter.
36	Bright elliptical nebula, 15′ long, 6′ wide ±. In same field is M 82.
37	Long narrow nebula, a bright ray, 7′ long, 1′ wide ±. In same field is M 81.
38	Large loose cluster.
39	Long narrow nebula, 5′ long, 40″ wide ±; a flashing stellar nucleus.
40	Very bright planetary nebula, 32″ diameter; bluish.
41	A very large and remarkable nebula.
42	Large scattered cluster.
43	Large planetary nebula, 3½′ to 4′ diameter.
44	Large bright elongated nebula, with stellar nucleus.
45	Round nebula; with attentive gaze, perhaps bi-nuclear; rather faint.
46	Round nebula, which becomes suddenly much brighter in the centre.
47	Large elliptical nebula, rather faint.
48	Very elongated nebula, rather faint, 15′ long ±, with a star close to its edge in the centre of its length.
49	Bright, large, round nebula; resolvable. Much brighter in centre.
50	Rich loose cluster, containing many coloured stars.
51	Very large, bright, elliptical nebula, with stellar nucleus.
52	Very large, very fine, globular cluster of 12-mag. stars; 3′ diameter; very compressed.
53	Large oval nebula; rather faint, with small brightish nucleus.
54	Fine globular cluster.
55	Remarkably singular double neb., the larger 6′ diam. ±, and ring-shaped. Spiral neb.
56	Very superb globular cluster of 11-mag. stars, very condensed; brighter than, but not so large as 13 M.
57	Very bright superb globular cluster of stars, 11 to 15 mags.; very compressed.
58	Globular cluster of 14-mag. stars (*Herschel*): a round bright nebula in ordinary telescopes.
59	Rather loose cluster, compressed in centre, but dim. Precedes α Scorpii by about 1½°.
60	Large superb globular cluster of stars, 11 to 20 mags. One of the finest of its class.
61	Small bright planetary nebula, 8″ diameter. Cobalt-blue colour.
62	Fine globular cluster of small stars, 10 mag., much compressed.
63	Fine large globular cluster of small stars, 10 to 15 mags., much compressed.
64	Large bright globular cluster of very small stars, 14 to 16 mags.
65	Bright globular cluster of very small stars, 16 mag., very compressed.

No.	Name or Constellation.	Synonym in various Catalogues.							R.A. 1890.	Decl. 1890.
		D	M	H	Ḩ	h	S	S & C	h. m. s.	° ′
*66	Ophiuchus	6333	9	4287	... ...	1979	609	1163	17 12 37	−18 24·2
**67	Hercules	6341	92	4294	... ...	...	611	1165	17 13 46	+43 15·1
68	Ara	6397	...	4311	... ...	3692	...	1185	17 31 43	−53 36·3
*69	Ophiuchus	6402	14	4315	... ...	1983	621	1184	17 31 50	− 3 11·2
*70	Ophiuchus	...	...	...	... ...	...	...	...	17 39 35	+ 5 45·2
*71	Ophiuchus	6494	23	4346	... ...	1990	626	1203	17 50 28	−18 58·9
*72	Sagittarius	6514	20	4355	{10, 11, 12 v. 41 v.}	1991	...	1210	17 55 41	−23 1·8
*73	Sagittarius	6523	8	4361	... ...	3722	...	1214	17 57 8	−24 22·6
*74	Draco	6543	...	4373	37 iv.	...	635	1217	17 58 35	+66 38·0
**75	Scutum Sobieskii	6603	24	4397	... ...	2004	642	1238	18 11 44	−18 26·8
*76	Scutum Sobieskii	6611	16	4400	... ...	2006	643	1239	18 12 34	−13 49·7
*77	Scutum Sobieskii	6613	18	4401	... ...	2007	644	1240	18 13 30	−17 10·8
**78	Scutum Sobieskii	6618	17	4403	... ...	2008	645	1242	18 14 16	−16 14·9
**79	Sagittarius	6656	22	4424	... ...	2015	654	1257	18 29 28	−23 59·4
**80	Antinous	6705	11	4437	... ...	2019	664	1280	18 45 13	− 6 24·1
**81	Lyra	6720	57	4447	... ...	2023	669	1287	18 49 28	+32 53·6
*82	Lyra	6779	56	4485	... ...	2036	688	1321	19 12 16	+29 59·3
*83	Sagittarius	6838	71	4520	... ...	2056	725	1372	19 48 49	+18 29·6
**84	Vulpecula	6853	27	4532	... ...	2060	729	1377	19 54 48	+22 25·0
85	Capricornus ...	6981	72	4608	... ...	2090	766	1446	20 47 24	−12 56·6
86	Aquarius	7009	...	4628	1 iv.	2098	774	1459	20 58 10	−11 47·7
**87	Pegasus	7078	15	4670	... ...	2120	785	1484	21 24 38	+11 40·3
**88	Aquarius	7089	2	4678	... ...	2125	787	1489	21 27 44	− 1 19·1
*89	Capricornus ...	7099	30	4687	... ...	2128	791	1493	21 34 7	−23 39·0
*90	Lacerta	7243	...	4773	75 viii.	2155	807	1526	22 11 57	+49 19·9
*91	Cepheus	7654	52	4957	... ...	2238	837	1575	23 19 21	+60 59·5
**92	Andromeda ...	7662	...	4964	18 iv.	2241	...	1577	23 20 35	+41 55·5
**93	Cassiopeia	7789	...	5031	30 vi.	2284	847	...	23 51 35	+56 6·2

No.	Description.
66	Bright globular cluster of small stars, 14 mag., 2′ diameter ±.
67	Magnificent globular cluster of small stars, condensed in centre.
68	Globular cluster.
69	Fine large globular cluster of small stars, 15 to 16 mags., 4′ diameter ±.
70	Large group of bright stars, closely *nf* β Ophiuchi. B. A. C. 6012.
71	Interesting group of small stars.
72	An open cluster of stars, superposed upon a singular trifid nebulous mass. Requires a large telescope.
73	Irregular cluster with nebula adjoining. A pretty low-power field.
74	Brilliant small planetary nebula, cobalt-blue colour; stellar nucleus; flashing light; very singular. Gaseous (?). Really requires a large aperture.
75	Globular cluster of small stars, 15 mag., in a superb field of stars.
76	A loose cluster with nebulous background.
77	Very rich field.
78	The "Horse-shoe" nebula. In ordinary telescopes more the shape of a swan.
79	Fine large globular cluster of stars, 11 to 15 mags.
80	Exceedingly beautiful aggregation of small stars of about 11 mag.
81	The annular nebula in Lyra, midway between β and γ.
82	In a fine field; a globular cluster of small stars, 11 to 14 mags., 3′ diameter.
83	Cluster of small stars, 11 to 16 mags., 3′ diameter ±.
84	The "Dumb-bell" nebula; oval in shape; major axis 9′ long, minor axis 5′ ±.
85	Large mass of very small stars, 3′ diameter. A globular cluster.
86	Small bright planetary nebula, stellar nucleus, blue colour. Similar to No. 74.
87	Fine globular cluster of very small stars, 5′ diameter ±, much compressed in centre.
88	Fine globular cluster of very small stars, 5′ diameter ±.
89	Globular cluster of small stars, 12 to 16 mags., 2′ diameter ±, rather faint.
90	A magnificent field of stars.
91	An irregular cluster of stars, 9 to 13 mags., of no great interest.
92	A very bright planetary neb., 12″ diam. ±; cobalt-blue colour; flashing light. Gaseous (?).
93	A superb cluster of small stars and star dust, 11 to 18 mags.

PART III.—MISCELLANEOUS OBJECTS.

The following list contains objects which are not within the scope of the two foregoing sections; to wit, coloured and variable stars of large or considerable magnitude, and, in the case of variables, of short periods:—

No.	Name.	R.A. 1890. h. m. s.	Decl. 1890. ° ′	Mag.	Notes.
1	— Piscium	1 10 4	+25 11·2	7	Fiery red *.
2	R Sculptoris	1 21 54	−33 7·3	6	Beautiful orange-red *.
3	31 Birm. Cassiopeiæ ...	1 47 44	+69 39·8	8	Fiery red *.
4	*o* Ceti	2 13 47	− 3 28·6	var.	Max. 2; generally invisible at minimum. Period 330ᵈ. Fiery red at max.
5	41 Birm. Persei... ...	2 14 15	+56 38.2	9	Fiery red *. In a grand field.
*6	α Ceti	2 56 31	+ 3 39·5	$2\frac{1}{2}$	Fine orange *, with a blue neighbour in the field to the N.
*7	β Persei	3 1 2	+40 31·9	var.	Max. 2; min. 4; period, $2^d\ 20\frac{3}{4}^h$.
8	65 Birm. Camelopardi	3 32 21	+62 17·4	7	Pale crimson *.
9	W. B. IV. 585 Eridani	4 29 8	− 9 10·3	6	Fiery red *.
10	82 Birm. Aurigæ ...	4 38 7	+32 42·8	$8\frac{3}{4}$	Pale crimson *: large orange * *p*.
**11	85 Birm. Aurigæ ...	4 44 37	+28 20·2	8	Unmistakeably crimson *.
12	5 Orionis	4 47 38	+ 2 19·5	$5\frac{1}{2}$	Deep orange *. "Probably var."
**13	R Leporis	4 54 36	−14 58·2	var.	Max. 6; min. 9; period 438ᵈ; an intense crimson *.
14	899 H. P. Orionis ...	4 59 43	+ 1 1·5	7	Intense fiery red *.
15	— Leporis	5 6 38	−12 1·2	$7\frac{1}{2}$	Deep red *.
16	10149 Lal. Aurigæ ...	5 20 7	+29 49·5	8	Almost pale ruby *.
17	Arg. + 7: 929 Orionis	5 27 16	+ 7 3·6	$7\frac{3}{4}$	Very red *.
18	124 Birm. Pictoris ...	5 40 8	−46 30·5	8	Vivid red *.
19	U Orionis	5 49 17	+20 9·6	$6\frac{1}{2}$	Fiery red *. Period ±365ᵈ.
20	5 Lyncis	6 17 12	+58 28·7	$5\frac{1}{2}$	Fiery red *. In a striking group.
*21	144 Birm. Geminorum	6 19 11	+14 46·8	7	Reddish yellow *.
22	— Canis Majoris ...	6 19 16	−26 59·6	8	Pale crimson *.
**23	2139 B. A. C. Aurigæ	6 28 59	+38 32·0	6	Deep fiery red *.
24	μ Canis Majoris... ...	6 51 3	−13 54·0	$5\frac{1}{4}$	Fiery red *.
25	165 Birm. Monocerotis	7 1 36	− 7 23·3	8	Crimson *.

No.	Name.	R.A. 1890.	Decl. 1890.	Mag.	Notes.
		h. m. s.	° ′		
26	14776 Lal. Puppis ...	7 28 44	−14 17·0	5	Fiery red *. Brilliant field *p*.
27	16320 Lal. Hydræ ...	8 14 21	+ 3 6·6	8½	Very red *.
28	17576 Lal. Cancri ...	8 49 11	+17 39·0	7	Pale crimson *.
29	3121 B. A. C. Argûs ...	9 3 13	−25 24·6	4¾	Deep red *.
**30	R Leonis	9 41 39	+11 56·5	var.	Max. 5; min. 10; period, 312ᵈ: pale crimson *.
31	2874 Brisb. Antliæ ...	10 7 5	−34 46·7	7	Scarlet *.
32	3630 B. A. C. Antliæ...	10 30 20	−38 59·9	6½	"Orange, almost scarlet *."
33	3637 B. A. C. Hydræ	10 32 7	−12 48·7	6	Fiery red *. "Var."
*34	20918 Lal. Hydræ ...	10 46 16	−20 37·9	7	"Copper red *: most magnificent."
35	R Crateris	10 55 8	−17 44·0	var.	Red *; follows α 42½ˢ and 1′ S. Max. 8; min. 9.
**36	277 Birm. Virginis ...	12 19 37	+ 1 22·7	8¼	Good crimson *. "Var."
37	4287B.A.C.Can.Venat.	12 39 57	+46 2·4	5½	"Deep orange brown *."
38	291 Birm. Crucis ...	12 40 58	−59 5·6	8½	Intense blood-red *; in the field with β Crucis, a white *.
39	298 Birm. Draconis ...	12 52 5	+66 35·3	7	Pale crimson *.
*40	328 Birm. Boötis ...	14 19 14	+26 12·2	7½	Vivid red *.
**41	β Libræ	15 11 5	− 8 58·6	2½	Beautiful pale-green *.
42	347 Birm. Apodis ...	15 14 3	−75 32·0	7	"Very high red *."
43	39 Libræ	15 30 21	−27 46·2	4	Decided red *.
**44	α Scorpii	16 22 39	−26 11·2	1	Fiery-red *: double dist. 3″.
**45	410 Birm. Ophiuchi ...	17 23 14	−19 23·1	8	Very decided red *.
46	W.B. XVII. 912 Ophi.	17 46 57	+ 1 20·4	6½	Fiery red *. Fine field.
*47	422 Birm. Ophiuchi ...	17 52 39	+ 2 44·0	7½	Reddish *. "? Var."
**48	Arg. + 36: 3168 Lyræ	18 28 30	+36 54·5	8	Decided crimson *. "? Var."
49	464 Birm. Scuti... ...	18 43 57	− 8 1·9	8	Rich fiery red *. "? Var."
50	35611 Lal. Aquilæ ...	18 58 32	− 5 50·9	7½	Very fine fiery red *. "? Var."
51	4 Vulpeculæ	19 20 38	+19 35·0	5¼	Orange *: fine field.
52	Arg. + 45: 2906 Cygni	19 25 21	+45 48·9	8	Pale crimson *. "? Var."
53	6702 B.A.C. Draconis	19 25 30	+76 21·1	6½	Strong fiery red *. "? Var."
54	36981 Lal. Sagittarii...	19 28 0	−16 36·8	7	Deep red *. ? Var. in colour.
*55	6769 B.A.C. Cygni ...	19 40 16	+40 26·6	6	Fiery red *.
56	χ Cygni	19 46 20	+32 38·2	var.	Max. 4; min. 0; period, 406ᵈ. Fiery red when approaching max.
57	η Aquilæ	19 46 52	+ 0 43·4	var.	Max. 3·6; min. 4·7; period, 7·17ᵈ.
*58	526 Birm. Sagittarii...	20 0 12	−27 32·5	7	Deep red *.

No.	Name.	R.A. 1890.	Decl. 1890.	Mag.	Notes.
		h m. s.	° ′		
*59	545 Birm. Capricorni...	20 10 40	−21 38·3	$7\frac{1}{2}$	Decided red *.
60	U Cygni	20 16 12	+47 32·9	var.	Max. 7; min. 11<; period, 461[d]. Very red *: in striking contrast with a blue * *nf.*
61	61 P. XXI. Cephei ...	21 9 59	+59 38·6	$7\frac{1}{2}$	Remarkable fiery red *. "? Var."
62	8745 Lac. Indi.... ...	21 14 19	−70 11·7	6	Ruby-orange *.
63	589 Birm. Cygni ...	21 37 23	+35 0·4	7	Unmistakeable fiery red *.
**64	592 Birm. Cygni ...	21 38 43	+37 30·7	8	Deep fiery red *.
**65	μ Cephei	21 40 8	+58 16·5	var.	Max. 4; min. 6; period, 5 or 6 years: "very fine deep garnet."
**66	42431 Lal. Aquarii ...	21 40 50	− 2 43·4	$6\frac{1}{2}$	Decided red *.
*67	Arg. + 65: 1691 Cephei	21 54 22	+65 37·6	$6\frac{1}{2}$	Fiery red *. Blue * $6\frac{1}{2}$ mag. near, *p.*
68	δ Cephei	22 25 5	+57 51·1	var.	Max. $3\frac{1}{4}$; min. $4\frac{1}{2}$; period, 5·36[d]. Orange * with blue *comes.*
69	Arg. + 57: 2562 Cephei	22 30 23	+57 36·1	$7\frac{1}{2}$	Fiery red *.
70	8 Andromedæ	23 12 38	+48 24·9	5	Fiery red *.
71	19 Piscium...	23 40 45	+ 2 52·5	$5\frac{1}{4}$	Decided red *. "? Var."
**72	R Cassiopeiæ	23 52 49	+50 46·5	var.	Max. 5; min. 12; period, 430[d]. Vivid red *.
**73	6259 Rad. Cassiopeiæ	23 55 39	+59 44·5	8	Very fiery red *. 9[th] mag. blue * near.
*74	30 Piscium...	23 56 19	− 6 37·5	$4\frac{1}{2}$	Fiery red *.

CHAPTER XI.

A CATALOGUE OF VARIABLE STARS.

PART I.—KNOWN VARIABLES.

IN the *Astronomical Register*, vol. ii. p. 194, August 1864, I published a Catalogue of Variable Stars, based upon the latest information then accessible; that Catalogue was copied into various publications, English and foreign, and a revised and enlarged version of it was published in *Month. Not.*, vol. xxv. p. 208, May 1865. The present Catalogue may be considered an extension of the latter.

As regards the Catalogue itself, the headings of the columns are sufficiently explicit, and it is only necessary to state that the symbol < signifies that the star's minimum magnitude fell below that given, but how much is unknown.

Various stars suspected to be variable have been formed into a sub-class by themselves.

Argelander's very crude and unsatisfactory nomenclature[a] has been followed, but at no very distant period it will have to give place to something more artistic.

I have to thank Mr. J. Baxendell and Mr. G. Knott for much important assistance in revising this Catalogue up to date.

In revising the Catalogue for the present edition of this work the following sources of information are amongst those which have been made use of:—

1874. SCHÖNFELD, *Zweiter Catalog der Veränderlichen Sterne.* 8vo. Mannheim.
1884. GORE, J. E., *Catalogue of Known Variable Stars.* (*Proceedings Roy. Irish Acad.*, 2nd Ser., vol. iv. p. 149.)
1885. GORE, J. E., *Catalogue of Suspected Variable Stars.* (*Proceedings Roy. Irish Acad.*, 2nd Ser., vol. iv. p. 267.)
1888. GORE, J. E., *Revised Catalogue of Variable Stars.* (*Proceedings Roy. Irish Acad.*, 3rd Ser., vol. i. p. 97.)
1888. CHANDLER, S. C., *Catalogue of Variable Stars.* (*Astronomical Journal*, vol. viii. p. 81. Sept. 6, 1888.
1889. PICKERING, E. C., *Index to Observations of Variable Stars.* (*Annals of Harvard College Observatory*, vol. xviii. part VIII. p. 244.)

[a] *Ast. Nach.*, vol. xl. No. 959. May 3, 1855.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude. From	to	Discoverer.	
		h. m. s.	° ′	Days.	From	to		
1	T Ceti	0 16 12	−20 40·3	65 ?	5	7	Chandler	1881
2	T Cassiopeiæ ...	0 17 17	+55 10·9	441	6½	12	Krüger	1870
3	R Andromedæ	0 18 13	+37 58·0	411	5½	13<	Argelander	1858
4	S Ceti	0 18 27	− 9 56·3	323	7	12½<	Borrelly	1872
5	B Cassiopeiæ ...	0 18 41	+63 32·2	...		...	Tycho Brahe	1572
6	T Piscium ...	0 26 17	+13 59·6	Irreg.	9½	11	R. Luther	1855
7	Nova Androm.	0 36 43	+40 39·9	...	7	14<	I. W. Ward	1885
8	V Cassiopeiæ ...	0 40 13	+47 39·3	260 ±	7½ ?	14 ?	Espin	1887
9	U Cephei ...	0 52 32	+81 16·9	2·49 +	7	9½	Ceraski	1880
10	S Cassiopeiæ ...	1 11 35	+72 2·0	607	6¾	13½<	Argelander	1861
11	S Piscium ...	1 11 48	+ 8 21·1	406	8	13<	Hind	1851
12	U Piscium ...	1 17 8	+12 17·4	330	10	14<	Peters	1880
13	R Sculptoris ...	1 21 54	−33 6·8	207 ?	5¾	7¾	Gould	1872 ?
14	R Piscium ...	1 24 58	+ 2 18·8	345	7	13<	Hind	1850
15	S Arietis... ...	1 58 44	+11 59·9	290	9	14 ?	C.H.F.Peters	1865
16	R Arietis ...	2 9 52	+24 32·7	187	7½	13½	Argelander	1857
17	T Persei	2 11 28	+58 26·5	Irreg.	8	9½	Safarik	1882
18	*o* Ceti	2 13 47	− 3 28·7	331	1¾	10<	D. Fabricius	1596
19	S Persei	2 14 57	+58 5·0	346	8	12½	Krüger	1873
20	R Ceti	2 20 26	− 0 40·4	167	7½	13½	Argelander	1866

1. A star of the same type as the long-known variable R Scuti.

2. Increase of light less rapid than the decrease. At times a very red star. An 8^{th} mag. star follows 10^s and 0·5′ to the N.

3. At max. the star's light fluctuates but little for 2 or 3 weeks.

4. Schönfeld finds the increase quicker than the decrease.

5. This is Tycho's celebrated star as placed by Hind. An 11^{th} mag. star thought to show signs of variability is still there. (See *Cycle*, p. 679.)

7. This is the temporary star which suddenly appeared in August 1885 in the great nebula in Andromeda (31 Messier).

8. Chandler calls this U Cassiopeiæ.

9. This is a very remarkable star. It remains at its maximum for the greater part of its period, the decrease and increase being together accomplished in the short space of 6^h. Sometimes it varies a whole magnitude in one hour.

10. Light increases more quickly than it decreases. A 9½ mag. star follows 20^s and 2′ to the S.

13. "One of the most brilliantly-coloured stars in the heavens." (*Gould.*)

14. Light increases more quickly than it decreases. There is an 11^{th} mag. star *nf.*

15. Observers differ as to the period.

16. Period well determined. From max. to min. the interval is 99^d; and from min. to max. 88^d.

18. Described in detail in Chap. III. (*ante*).

19. There is a 10^{th} mag. star *nf.*

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude. From	to	Discoverer.	
		h. m. s.	° ′	Days.	From	to		
21	U Ceti	2 28 25	−13 37·8	233	$6\frac{3}{4}$	$10\frac{1}{2}$	Sawyer	1885
22	T Arietis ...	2 42 11	+17 3·2	323	8	$9\frac{1}{2}$	Auwers	1870
23	ρ Persei	2 58 7	+38 24·9	33? or irreg.	$3\frac{1}{2}$	$4\frac{1}{4}$	Schmidt	1854
24	β Persei	3 1 1	+40 31·9	2·86	$2\frac{1}{4}$	4	Montanari	1669
25	R Persei... ...	3 23 3	+35 17·7	212	$7\frac{3}{4}$	$13\frac{1}{2}$ or <	Schönfeld	1861
26	λ Tauri	3 54 35	+12 10·8	3·95 or 3·38	$3\frac{1}{2}$	$4\frac{1}{4}$	Baxendell	1848
27	T Tauri	4 15 35	+19 16·5	Irreg.	$9\frac{1}{4}$	$13\frac{1}{2}$?	Hind	1861
28	W Tauri... ...	4 21 45	+15 51·4	275 ±	8	13	Espin	1886
29	R Tauri	4 22 17	+ 9 55·0	325	$7\frac{1}{2}$	$13\frac{1}{2}$	Hind	1849
30	S Tauri	4 23 11	+ 9 42·2	378	$9\frac{1}{2}$	$13\frac{1}{2}$<	Oudemans	1855
31	R Reticuli ...	4 32 23	−63 15·4	281	7	13<	C. Ragoonatha Chary	1867
32	R Doradûs ...	4 35 28	−62 17·6	...	$5\frac{1}{2}$	$6\frac{3}{4}$	Thome (Gould)	1874?
33	V Tauri	4 45 40	+17 21·1	169	$8\frac{1}{2}$	$13\frac{1}{2}$<	Auwers	1871
34	R Orionis ...	4 52 59	+ 7 57·7	379	$8\frac{3}{4}$	13<	Hind	1848
35	ε Aurigæ ...	4 54 2	+43 39·7	Irreg.	3	$4\frac{1}{2}$?	Fritsch	1821
36	R Leporis ...	4 54 36	−14 58·2	436	6	$8\frac{1}{2}$?	Schmidt	1855
37	R Aurigæ ...	5 8 25	+53 27·7	460	$6\frac{1}{2}$	13	Argelander	1862
38	S Aurigæ ...	5 19 52	+34 4·2	400? or irreg.	$9\frac{1}{4}$	14<	Dunér	1881
39	S Orionis ...	5 23 34	− 4 47·0	413 ±	$8\frac{1}{2}$	13<	Webb	1870
40	δ Orionis... ...	5 26 23	− 0 22·9	Irreg.	$2\frac{1}{4}$	$2\frac{3}{4}$	Sir J. Herschel	1834

23. Period irregular.
24. Described in detail in Chap. III. (*ante*).
25. Sometimes at its min. this star remains almost without change for 2 months.
26. The fluctuations of light are for the most part accomplished in about 10^h.
27. In immediate proximity, to the *nf*, of D'Arrest's var. neb. (See Chap. V. *ante.*)
30. Only for about 70^d of its period is this star brighter than 12^{th} mag.
32. "Excessively red."—(*Gould.*)
33. A $12\frac{1}{2}$ mag. star follows.
34. The decrease of light is less rapid than the increase.
35. Schönfeld thinks that there is no regular period and that the variation is often for a long period imperceptible.
36. This is Hind's celebrated "crimson star." It well deserves all that has been said of it. (See *Cycle*, No. 281.)
37. A red star. About 114^d before max. the light remains unchanged at 9^{th} mag. for about 48^d. The increase from $8\frac{1}{2}$ mag. lasts 40^d, and the decrease 62^d.
38. A very red star.
39. Very red. Webb says:—"Centre of little triplet, 11, 11·5 in large triangle; sweep $6\frac{1}{3}^m$ W. from minute pair 10′ N. of 42."
40. Schönfeld finds no regular period, but Auwers suggests 16^d, with min. nearly in middle interval of 2 max.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.		Discoverer.	
		h. m. s.	° ′	Days.	From	to		
41	T Orionis ...	5 30 26	− 5 32·8	...	$9\frac{3}{4}$	13	Bond	1863
42	α Orionis ...	5 49 13	+ 7 23·1	Irreg.	1	$1\frac{1}{2}$	Sir J. Herschel	1840
43	U Orionis ...	5 49 17	+ 20 9·4	365 ±	6	12<	Gore	1885
44	η Geminorum	6 8 13	+ 22 32·3	140 ± ?	3	4	Schmidt	1865
45	V Monocerotis	6 17 10	− 2 8·3	334	7	$10\frac{1}{2}$<	Schönfeld	1883
46	T Monocerotis	6 19 17	+ 7 8·7	26.8	$5\frac{3}{4}$	$8\frac{1}{4}$	Davis	1871
47	R Monocerotis	6 33 10	+ 8 50·0	Irreg.	$9\frac{1}{2}$	13< ?	Schmidt	1861
48	S (15) Monoc.	6 34 58	+ 9 59·7	3·4 ?	5	$5\frac{1}{2}$	Winnecke	1867
49	R Lyncis ...	6 52 13	+ 55 29·2	380	8	13<	Krüger	1874
50	ζ Geminorum	6 57 35	+ 20 43·9	10·16	$3\frac{3}{4}$	$4\frac{1}{2}$	Schmidt	1847
51	R Geminorum	7 0 43	+ 22 52·4	371	$6\frac{1}{2}$	$13\frac{1}{2}$<	Hind	1848
52	R Canis Minoris	7 2 40	+ 10 11·9	337	7	10	Argelander	1855
53	L^2 Puppis ...	7 10 12	−44 27·7	136	$3\frac{1}{2}$	$6\frac{1}{4}$	Gould	1872
54	R Canis Majoris	7 14 29	−16 11·1	1·13	6	$6\frac{3}{4}$	Sawyer	1887
55	V Geminorum	7 16 59	+ 13 18·1	276	$8\frac{1}{4}$	14	Baxendell	1880

41. In the Great Nebula of Orion.

42. In spite of Sir J. Herschel having been confirmed in 1852 by Fletcher, there seems great doubt about the variability of this star. J. F. J. Schmidt's testimony is emphatically in the negative.

43. A fine red star.

44. At max. the fluctuations appear to be irregular, but at min. fairly gradual. This has been found by Burnham to be double, the companion being of mag. 9 at a distance of about 1″.

46. Schönfeld suggests that the coincidence of the period with the lunar month influences the observations made on the star. Colour golden yellow. The max. occurs 8^d after the min.

47. Schönfeld thinks that no regular period exists, and that the magnitude at min. is uncertain. Close to the neb. 2 Ħ IV. (See *Ast. Nach.*, vol. lv. No. 1302, April 6, 1861.)

48. Period uncertain. The principal star in the cluster 5 Ħ VIII. (See *Cycle*, No. 424.) Has a companion at 139·2° : 75·7″, which is stated to be also variable.

49. A red star.

50. Light decreases somewhat more quickly than it increases. Pickering suggests that the star presents to us a surface of revolution, one side being about $\frac{4}{5}$ the brightness of the other.

51. Light curve very irregular. Stated by Hind and also by Pogson to be remarkably variable in colour. Most interesting bright lines spectrum at maximum, according to Secchi.

53. At epoch of max. the fluctuations of light are rapid; at min. comparatively slow. A very red star.

54. A star of the Algol type.

55. Increase and decrease of brightness nearly equal. An $11\frac{1}{2}$ mag. star *sf.*

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.		Discoverer.	
		h. m. s.	° ′	Days.	From	to		
56	U Monocerotis	7 25 32	− 9 32·8	31 ? or 45 ?	6	8	Gould	1873
57	S Canis Min....	7 26 44	+ 8 33·2	332	$7\frac{1}{4}$	$13\frac{1}{2}$	Hind	1856
58	T Canis Min....	7 27 53	+11 58·7	322	9	$13\frac{1}{2}<$	Schönfeld	1865
59	U Canis Min.	7 35 22	+ 8 38·2	425	8	13	Baxendell	1879
60	S Geminorum	7 36 26	+23 42·7	294	$8\frac{1}{4}$	$13\frac{1}{2}<$	Hind	1848
61	T Geminorum	7 42 42	+24 0·5	288	8	$13\frac{1}{2}<$	Hind	1848
62	S Puppis... ...	7 43 32	−47 50·5	...	$7\frac{1}{4}$	9	Gould	1872 ?
63	U Geminorum	7 48 34	+22 17·5	Irreg., 86 ?	9	$14<$	Hind	1855
64	U Puppis ...	7 55 40	−12 33·7	310	$8\frac{1}{2}$	$14<$	Pickering	1881
65	R Cancri ...	8 10 30	+12 3·8	354	6	$11\frac{3}{4}<$	Schwerd	1829
66	V Cancri ...	8 15 27	+17 38·2	272	7	$12<$	Auwers	1870
67	U Cancri ...	8 29 28	+19 16·5	306	$8\frac{1}{4}$	$14<$	Chacornac	1853
68	S Cancri... ...	8 37 39	+19 25·9	9·48	8	$11\frac{1}{2}$	Hind	1848
69	S Hydræ ...	8 47 49	+ 3 29·1	256	$7\frac{1}{2}$	$13\frac{1}{2}$	Hind	1848
70	T Hydræ ...	8 50 19	− 8 43·1	289	$6\frac{1}{2}$	$13<$	Hind	1851

56. Gould suggests a period of 46^d; Espin of 31^d.

57. At maximum the light fluctuates very little for a week. A yellowish red star.

58. Below 13 mag. during a large part of its period. There is a $12\frac{3}{4}$ mag. star *sp*, and a $12\frac{1}{4}$ mag. star *sf*.

59. A double-period variable.

60. The fluctuations of light are rapid, especially between min. and max.

61. Schönfeld says that the average period is sometimes as much as $13{\cdot}7^d$ out. The progressive increase in the light between min. and max. is often checked at mag. $9\frac{1}{2}$.

63. The period of this star is subject to great variations. Schönfeld thinks that the period may range between 70^d and 150^d. The visibility at max. usually lasts either 10^d or 20^d, there being two distinct types of maxima. At the max. of November 1858, Baxendell found that the star "had a somewhat hazy or nebulous appearance." The star rises at times 3 magnitudes in 24^h; the fall is much less rapid.

65. Schönfeld thinks that the period is increasing. Light increases more quickly than it decreases. There is a 10^{th} mag. star *sf*.

66. A yellowish red star. There is an 11^{th} mag. star *f* on the parallel, and a $10\frac{1}{2}$ mag. star *sf*.

67. For a month before and after max. the increase and decrease of light are nearly equal.

68. A star of the Algol type. The decrease lasts $8\frac{1}{2}^h$, and the increase 13^h. The progressive increase in the light between min. and max. is in a marked degree retarded at $9\frac{1}{2}$ mag. An 11^{th} mag. star *p*, nearly on the parallel.

69. A reddish yellow star.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude. From	to	Discoverer.	
		h. m. s.	° ′	Days.	From	to		
71	T Cancri ...	8 50 23	+20 16·1	483	8	10½	Hind	1850
72	R Carinæ ...	9 29 28	−62 18·1	312	4¼	10	Gould	1871
73	R Leonis Min.	9 38 59	+35 1·2	373	6	12½<	Schönfeld	1863
74	R Leonis ...	9 41 39	+11 56·5	314	5	11½	Koch	1782
75	*l* Carinæ... ...	9 42 13	−62 0·1	31·0	3¾	5¼	Gould	1871
76	V Leonis ...	9 53 57	+21 47·2	280?	8½	13½<	Becker	1882
77	R Antliæ ...	10 5 2	−37 11·5	...	6½	8<	Gould	1872
78	S Carinæ ...	10 5 51	−61 0·7	several mos.	6¼	9	Gould	1871
79	U Leonis ...	10 18 10	+14 33·6	...	9½	13½<	Peters	1876
80	U Hydræ ...	10 32 7	−12 48·8	195	4¼	6½	Gould	1871
81	R Ursæ Majoris	10 36 51	+69 21·2	302	6	13½	Pogson	1853
82	η Argûs	10 40 47	−59 6·5	70 yr. ± ?	1	7½	Burchell	1827
83	V Hydræ ...	10 46 17	−20 40·0	575 ±	6	9<	Gould	1874?
84	W Leonis ...	10 47 49	+14 18·0	395	9?	14<	Peters	1880
85	T Carinæ ...	10 50 53	−59 56·0	...	6	7	Thome	1872
86	R Crateris ...	10 55 8	−17 44·0	160?	8	9<	Winnecke	1861
87	S Leonis... ...	11 5 10	+ 6 3·7	188?	9	13<	Chacornac	1856
88	T Leonis... ...	11 32 48	+ 3 58·9	...	10?	14<	C.H.F.Peters	1862
89	X Virginis ...	11 56 13	+ 9 41·1	...	7	12	C.H.F.Peters	1871
90	R Comæ... ...	11 58 37	+19 23·8	363	7½	13½<	Schönfeld	1856

71. A very red star.
72. A red star; or, as Sir J. Herschel has it, "between scarlet and carmine red." Gould's averages make the period about 320^d.
73. Light increases more quickly than it decreases. The increase from mag. 9 to max. occupies from 40^d to 80^d. A red star.
74. One of the best known long period variables. "A fine rich ruby star." (MS. Jan. 20, 1865.)
78. A reddish star.
80. "Intensely orange red."—(*Gould.*)
81. Increase of light to max. takes 3 months less time than the decrease to min. In 1876 it rose from mag. 13 to max. in 28^d, but it occupied 112^d in passing from max. to invisibility.
82. For a full account of this see Chap. V. (*ante*).
83. An intensely red star.
86. Usually a very red star. Schönfeld suggests a period of 160^d. Follows *a* Crateris 43^s, and 1·2′ to the S. A 10th mag. star *p*, and there is a 9th mag. star *sf*.
88. Not seen by Schönfeld since 1866, excepting perhaps in Feb. 1874.
89. Seen by Schönfeld March 1873 and Feb. 1874, but not since. A 12th mag. star *f*. 2^s.
90. Owing to the near coincidence of the period of this star with the solar year it has since 1875 been unfavourably situated for observation. There is an 8th mag. star *np*.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.		Discoverer.	
		h. m. s.	° ′	Days.	From	to		
91	T Virginis ...	12 8 58	− 5 25·3	337	8	13½<	Boguslawski	1849
92	R Corvi	12 13 56	−18 38·4	317	6¾	11½<	Karlinski	1867
93	Z Virginis ...	12 28 13	− 3 49·0	210±	8	14	Henry	1874
94	β Corvi	12 28 36	−22 47·3	...	2½	3¼	Smyth	?
95	T Ursæ Majoris	12 31 23	+60 5·6	257	6¼	13½	Argelander	1860
96	R Virginis ...	12 32 55	+ 7 35·7	146	6½	11<	Harding	1809
97	R Muscæ ...	12 35 22	−68 48·2	0·9	6½	7½	Gould	1871
98	S Ursæ Majoris	12 39 7	+61 41·7	231	7	13	Pogson	1853
99	U Virginis ...	12 45 31	+ 6 9·1	207	7½	13	Harding	1831
100	W Virginis ...	13 20 21	− 2 48·2	17·27	8¾	10½	Schönfeld	1856
101	V Virginis ...	13 22 7	− 2 36·0	251	8	13<	Goldschmidt	1857
102	R Hydræ ...	13 23 42	−22 42·7	430±	4	10<	J. P. Maraldi	1704
103	S Virginis ...	13 27 16	− 6 37·7	374	5½	13	Hind	1852
104	Y Virginis ...	13 28 50	−12 39·0	...	5	8 ?	Schmidt	1866
105	R Canum Venat.	13 44 14	+40 5·3	...	7¼	13½ ?	Espin	1888
106	RR Virginis ...	13 59 3	− 8 40·2	383	11	14<	Peters	1880

91. "A very red star."—(*Schönfeld.*)

92. Light increases more quickly than it decreases. There are two 8th mag. stars and a 10th mag. star, near.

93. Chandler calls this Y Virginis, rejecting (but unreasonably as I think) the star below, to which Gould applied the letter Y.

94. Gould and Gore both confirm Smyth as to the variability of this star.

95. Latter portion of rise to maximum is, at times, extremely rapid (Baxendell, jun.).

96. Both the epochs of maxima and the epochs of minima seem not to recur at strictly regular intervals. The light curve also exhibits irregularities.

97. Gould's period is more exactly 21h 20m. The max. follows the min. by 9h.

98. The light curve is irregular. Shortly before maximum the increase of light undergoes a marked retardation, and shortly before maximum the decrease is similarly checked. Pogson notes that the increase and the decrease of light take place in intervals of time more equal than is usual with variable stars.

99. Near the epoch of max. the light curve is very irregular. There is a 10th mag. star *np*.

101. The increase from 10th mag. to max. occupies 35d, with marked fluctuations: the decrease to the same mag. 51d, much more uniform. A yellowish red star.

102. The period has undoubtedly diminished. In 1708 it was 500d; in 1785 it was 487d; in 1870, 437d; and it is still diminishing at the rate of 9h for each period according to Gould. A red star.

103. The period seems to be diminishing. The min. has been found to occur about 119d before the max. Very red at max. Stated to be subject to marked changes of colour.

104. This is one of Burnham's close doubles. Pos. 80°; dist. 0·48″; epoch, 1879·4. The components were found by him nearly equal in magnitude.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.		Discoverer.	
		h. m. s.	° ′	Days.	From	to		
107	Z (*bis*) Virginis	14 4 25	−12 46·9	303	9	14<	Palisa	1880
108	R Centauri ...	14 8 39	−59 24·0	Probably long & irreg.	6	10	Gould	1871
109	T Boötis... ...	14 8 57	+19 34·9	...	$9\frac{3}{4}$	14<	Baxendell	1860
110	X Boötis... ...	14 18 58	+16 49·0	121	9	$10\frac{1}{4}$	Baxendell	1859
111	S Boötis	14 19 10	+54 18·6	272	$7\frac{3}{4}$	$13\frac{1}{2}$<	Argelander	1860
112	V Boötis... ...	14 25 18	+39 21·0	267	7	$9\frac{1}{2}$	Dunér	1884
113	R Camelopardi	14 25 55	+84 19·8	269	$7\frac{3}{4}$	$13\frac{1}{2}$	Hencke	1858
114	R Boötis... ...	14 32 20	+27 13·0	224	6	13?	Argelander	1858
115	V Libræ	14 34 14	−17 10·9	...	9	$12\frac{1}{2}$	Schönfeld	1882
116	W Boötis ...	14 38 35	+26 59·8	Long and irreg.	5	6	Schmidt	1867
117	U Boötis ...	14 49 14	+18 8·4	174	9	$13\frac{1}{2}$	Baxendell	1880
118	δ Libræ ...	14 55 5	− 8 4·9	2·32	5	6	Schmidt	1859
119	T Libræ ...	15 4 27	−19 35·8	723	10	14<	Palisa	1878
120	Y Libræ ...	15 5 52	− 5 35·6	...	$8\frac{1}{2}$	?	Bauschinger	1887
121	R Triang. Aust.	15 9 56	−66 5·5	3·4	$6\frac{1}{2}$	8	Gould	1871
122	U Coronæ ...	15 13 42	+32 3·1	3·45	$7\frac{1}{2}$	9	Winnecke	1869
123	S Libræ ...	15 15 4	−19 59·4	192	8	13<	Borrelly	1872
124	S Serpentis ...	15 16 30	+14 42.5	365	$7\frac{1}{2}$	$12\frac{1}{2}$?	Harding	1828
125	S Coronæ ...	15 16 54	+31 45·8	360·5	6	13	Hencke	1860

107. Chandler calls this simply Z. See note *ante* on Z Virginis (No. 93).

108. The light curve is very irregular, and the period uncertain. Gould suggests 525^d with 2 intermediate maxima. ? R.A. 22^s too little if star = 323 Birmingham. A red star.

109. Not seen since 1860. Evidently one of the so-called temporary stars.

110. Increase of brightness takes more than twice as long as the decrease; but light curve is very irregular.

111. Period fairly certain. Light curve irregular.

113. Fluctuations of light irregular.

114. Schmidt made the period 229^d.

118. A variable of the Algol type. The fluctuations of light occupy about 12^h, of which $5\frac{1}{2}^h$ represents the decrease and $6\frac{1}{2}^h$ the increase.

122. A variable of the Algol type. The fluctuations of light occupy about $9\frac{3}{4}^h$, of which $4\frac{1}{2}^h$ represents the decrease and $5\frac{1}{4}^h$ the increase.

123. Peters suggests a period of only 98^d. There is a 13^{th} mag. star *np*, and a 12^{th} mag. star *nf*.

124. The period is uncertain or irregular. The min. occurs nearer to the following max. than to the preceding one. There is an 11^{th} mag. star *np*, and a $12\frac{3}{4}$ mag. star *nf*. "A very red star."—(*Schönfeld.*)

125. Increase of light rapid, decrease slow.—(*Sawyer.*) Baxendell gives increase 126^d and decrease 234^d. Period irregular, owing to varying position of "head" on maximum portion of light curve.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.		Discoverer.
		h. m. s.	° ′	Days.	From	to	
126	T (*bis*) Libræ...	15 29 50	−20 48·0	302 ?	11 ?	14<	C.H.F.Peters 1878
127	U Libræ ...	15 31 40	−15 48·6	380 ?	11	14<	C.H.F.Peters 1878
128	{Ö-Arg. 14782 Libræ}	15 35 38	−20 49·5	228	9	14<	C.H.F.Peters 1878
129	R Coronæ ...	15 44 3	+28 29·6	irreg.	5¾	13	Pigott 1795
130	V Coronæ ...	15 45 36	+39 54·1	357	7¼	12	Dunér 1878
131	R Serpentis ...	15 45 38	+15 28·0	358	5½	13<	Harding 1826
132	R Lupi	15 46 20	−35 58·2	...	9	12<	Gould 1884
133	R Libræ... ...	15 47 23	−15 54·4	723	9	13½<	Pogson 1858
134	T Coronæ ...	15 54 53	+26 14·0	...	2	9½	Birmingham 1866
135	R Herculis ...	16 1 17	+18 40·0	319	8	13½<	Argelander 1855
136	W Scorpii ...	16 2 4	−21 13·9	405 ?	11	13	C.H.F.Peters 1876
137	V Scorpii ...	16 5 20	−19 51·0	224	10	14½	J. Palisa 1877
138	T Scorpii ...	16 10 29	−22 42·2	...	7	13<	Auwers 1860
139	R Scorpii ...	16 11 5	−22 40·3	225	9	14<	Chacornac 1853
140	S Scorpii . .	16 11 6	−22 37·2	177	9	13<	Chacornac 1854
141	W Ophiuchi ...	16 15 29	− 7 26·2	328 ?	9	13½<	Schönfeld 1881
142	U Scorpii ...	16 16 8	−17 37·5	...	9 ?	13½<	Pogson 1863

126. The true period may be the half of 310ᵈ. Chandler calls this X Libræ.
127. The true period may be the half of 380ᵈ. Chandler calls this W Libræ.
128. Chandler calls this U Libræ.
129. The fluctuations of light are very irregular, and all sorts of periods have been suggested. Sometimes it remains unchanged in light for a period as long as a year.
130. A red star.
131. The period is certainly irregular.
133. This star has not been much observed owing to the short duration of its max. phase. Schönfeld thinks that the period of 723ᵈ given in the table may be a multiple of the true period.
134. This is Birmingham's *Nova* of 1866, of which a more particular account is given in Chap. III. (*ante*). Regarded as a variable it has been suspected by Schmidt and Schönfeld to undergo regular fluctuations of light in 94ᵈ.
135. The period seems to be increasing.
136. Chandler calls this X Scorpii.
137. Chandler calls this W Scorpii.
138. This is Pogson's Nova of 1860, of which a more particular account is given in Chap. V. (*ante*).
139. This is close to the cluster 80 M. The light curve is said by Schönfeld to be very variable.
140. This is 3¼′ distant from R Scorpii. There is a 9½ mag. star *sf.*
142. This has not been seen since 1863. It diminished from mag. 9 to mag. 12, between May 20 and 28. Its precise place has not been well ascertained.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.		Discoverer.	
		h. m. s.	° ′	Days.	From	to		
143	V Ophiuchi ...	16 20 36	−12 10·4	307 ±	7	10½	Dunér	1881
144	U Herculis ...	16 20 56	+19 8·6	411	6½	13	Heucke	1860
145	*g* (30) Herculis	16 25 2	+42 7·5	40 to 125	4¾	6¼	Baxendell	1857
146	T Ophiuchi ...	16 27 26	−15 53·8	359 ?	10	13<	Pogson	1860
147	S Ophiuchi ...	16 27 55	−16 55·7	234	8¼	13½<	Pogson	1854
148	V Herculis ...	16 31 19	+37 33·7	289	8	14	Dunér	1880
149	R Ursæ Min....	16 31 26	+72 30·0	180 ?	8½	10½	Pickering	1881
150	R Draconis ...	16 32 21	+66 59·3	245	7	13<	Geelmuyden	1876
151	S Herculis ...	16 46 53	+15 7·5	309	6	13<	Schönfeld	1856
152	*Nova* Ophiuchi	16 53 20	−12 43·5	...	4½	13½<	Hind	1848
153	V Herculis ...	16 54 16	+35 13·9	257 or 324	9	12	Baxendell	1880
154	R Ophiuchi ...	17 1 27	−15 56.6	302	7½	13½<	Pogson	1853
155	α Herculis ...	17 9 38	+14 30·9	irreg.	3	4	W. Herschel	1759
156	U Ophiuchi ...	17 10 56	+ 1 19·9	20^h	6	6¾	Sawyer	1881
157	*u* (68) Herculis	17 13 15	+33 13·0	38½	4½	5½	Schmidt	1869 ?

143. A very red star.
144. A highly yellowish-red star.
145. Schönfeld calls this star *g* Herculis. The fluctuations of light are very irregular, but 70 or 80 days seems to be something like the mean value.
146. The observations of this star are few, and its real period uncertain.
147. The light curve is very variable. The increase and decrease of light 14^d before and after max. is nearly equal; afterwards the decrease proceeds more slowly than the increase.
148. The period is probably long; 2 years or more. This star is said by Webb to be white at max. and ruddy at min. Chandler calls this W Herculis.
150. There is a 9^{th} mag. star closely *sf.*
151. A very red star. A retardation in the increase of light usually occurs 1 or 2^m before max. After max. the decrease is rapid. There is an 11^{th} mag. star *sf*, and a 6^{th} mag. star *nf.* The last is 49 Fl. Herculis.
152. This is Hind's well-known star of 1848, as to which see Chap. III. (*ante*). It is still visible as a 12^{th} mag. star, having diminished year by year, especially 1856-1874.
155. The irregularities in the light of this star are so great that such diverse periods as 7^d, 26^d, 103^d, 111^d, and 185^d have been assigned.
156. A variable of the Algol type, having, moreover, the shortest known period, namely, $20^h\ 7^m\ 41^s$. It remains at its normal max. for 16^h, and accomplishes all its changes in 4^h.
157. Numerous irregularities appear in the light curve, especially at min. Schmidt found the extremes of variation to be, occasionally, greater than those given above, even mag. 4 on the one hand and mag. 6 on the other. Has a 10^{th} mag. companion 4″ distant.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.		Discoverer.	
		h. m. s.	° ′	Days.	From	to		
158	*Nova* Serpentarii	17 24 3	−21 23·2	...	...		D. Fabricius	1604
159	— Aræ	17 31 5	−45 24·8	...	5	11	Tebbutt	1877
160	X (3) Sagittarii	17 40 37	−27 47·3	7·01	4	6	Schmidt	1866
161	W (γ^1) Sagitt.	17 58 0	−29 35·0	7·59	5	6½	Schmidt	1866
162	T Herculis ...	18 4 57	+31 0·2	165	7	13½	Argelander	1857
163	Y Sagittarii ...	18 14 54	−18 54·5	5·77	5½	6½	Sawyer	1886
164	T Serpentis ...	18 23 27	+ 6 13·6	342	9	14 ?	Baxendell	1860
165	V Sagittarii ...	18 24 57	−18 20·5	...	7	9½	Quirling	1865
166	U Sagittarii ...	18 25 24	−19 12·3	6.74	7	9	Schmidt	1866
167	X Ophiuchi ...	18 33 6	+ 8 44·0	300 ±	6.8	9 ?	Espin	1886
168	T Aquilæ ...	18 40 26	+ 8 38·1	4^m ±	8¾	10	Winnecke	1860
169	R Scuti Sob. ...	18 41 37	− 5 49·3	71	4¾	9	Pigott	1795
170	κ Pavonis ...	18 45 36	−67 22·2	9	4	5½	Thome	1872
171	β Lyræ	18 46 1	+33 14·1	12·91	3½	4½	Goodricke	1784
172	R (13) Lyræ ...	18 51 59	+43 48·0	46	4	4¾	Baxendell	1855
173	S Coronæ Aust.	18 53 44	−37 6·1	6·2	9½	13	Schmidt	1866
174	R Coronæ Aust.	18 54 30	−37 6·0	31 ?	10	13<	Schmidt	1866

158. This is Kepler's celebrated star of 1604, as to which see Chap. III. (*ante*). The place here given is that deduced by Schönfeld from Fabricius's observations, but its exactness cannot be guaranteed. Chacornac and Winnecke have seen very close to this place a star which if we compare their account would seem to be variable, and may therefore be Kepler's star shorn of its brilliancy. About 6′ following the calculated place of the Nova there is a 9th mag. star, followed by 2 fainter stars which form with it a rough isosceles triangle.

161. Period and light curve somewhat irregular.

162. There is an 11th mag. star *np.*

164. This star is *sp* the cluster 72 ℌ VIII. The light increases from 10th mag. to max. in 51d, and decreases again to the same point in the curve in 54d. There is a 10th mag. star *f*, and a little *n*.

165. Schönfeld finds small change of light since 1870, and no signs of its being periodical.

166. There is an 8½ mag. star *nf.*

168. Schönfeld can determine no regular period.

169. The minima are bright and faint alternately, according to both Schmidt and Schönfeld.

170. The min. is always later than midway between 2 max.

171. This star has 2 maxima of 3·4 mag.; and 2 minima, one being 3·9 mag. and the other 4·5 mag.

174. Period uncertain. This star seems to have some connection with a nebula close by, which according to Schmidt may also be variable.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.		Discoverer.	
		h. m. s.	° ′	Days.	From	to		
175	T Coronæ Aust.	18 54 34	−37 6·2	...	10	13	Schmidt	1876
176	R Aquilæ ...	19 1 5	+ 8 3·9	345	6½	11½	Argelander	1856
177	T Sagittarii ...	19 9 53	−17 9·7	384	7½	12<	Pogson	1863
178	R Sagittarii ...	19 10 15	−19 30·0	270	7	13<	Pogson	1858
179	S Sagittarii ...	19 13 0	−19 13·5	230	9¾	13½<	Pogson	1860
180	T Sagittæ ...	19 16 47	+17 27·0	...	8½	9½	Espin	1885
181	U Aquilæ ...	19 23 26	− 7 16·1	7·0	6¼	7¼	Sawyer	1886
182	h^1(51) Sagittarii	19 29 21	−24 57·6	...	5¼	6¾	Gould	
183	R Cygni ...	19 33 52	+49 57·0	426	6	14<	Pogson	1852
184	*Nova* (11) Vulpeculæ	19 43 9	+27 3·0	...	3		Anthelm	1670
185	S Vulpeculæ ...	19 43 54	+27 0·9	67·8	8½	10	Rogerson	1837
186	χ Cygni	19 46 20	+32 38·3	406	4	13½<	G. Kirch	1686
187	η Aquilæ ...	19 46 52	+ 0 43·4	7·17	3¼	4¾	Pigott	1784
188	S (10) Sagittæ	19 51 0	+16 20·6	8·38	5½	6½	Gore	1885
189	Z Cygni	19 58 20	+49 44·2	...	7	14	Espin	1887
190	S Cygni	20 3 12	+57 40·1	323	8¾	13½<	Argelander	1860

176. The light curve is very irregular, especially at the max., and during the first 2 months of the decrease. The changes from mag. 9 to mag. 7 previous to a max. often take place with great rapidity. A red star. There is a 9½ mag. star *sp*, and a 10½ mag. star *np*.

177. A red star.

178. There is an 11¼ mag. star *sp*, and a 10¾ mag. star *np*.

183. A red star. According to Pogson the max. follows the min. by 155^d. There is a 10^{th} mag. star *n* and a little *f*. The var. lies closely *sf*. θ Cygni.

184. This is Anthelm's temporary star of 1670, as to which see Chap. III. (*ante*). The place here given is that deduced by Schönfeld from the observations of Hevelius and Picard. Hind's place is -5^s in R.A. and −½′ in δ. A star suspected to be variable within a narrow range has been seen within 1′ of arc of Schönfeld's place, but there is nothing to identify it with Anthelm's star. The next object, S Vulpeculæ, is certainly a distinct star.

185. The rise from min. to max. occupies less than one-half of the period.

186. This is Stone's designation, to distinguish the star from 17 Flamsteed Cygni which precedes and which Flamsteed by error termed χ, misunderstanding Bayer's intentions, as it would seem. The period appears to be itself variable. The max. follows the min. by 185^d. At some maxima the star is barely visible to the naked eye. A red star.

187. The period seems variable to the extent sometimes of 6^h.

188. Owing to its proximity to a good comparison star, 11 Sagittæ, the variation, though small, is very evident. Duration of increase = 3^d; of decrease $5{\cdot}38^d$.

189. A red star. Period as yet undetermined. Light curve probably interesting.

190. There is a 9^{th} mag. star *nf*.

No.	Star.	R.A. 1890.			Decl. 1890.		Period.	Change of Magnitude.		Discoverer.	
		h.	m.	s.	°	′	Days.	From	to		
191	R Capricorni ...	20	5	8	−14	35·7	347	$8\frac{3}{4}$	$13\frac{1}{2}$	Hind	1848
192	S Aquilæ ...	20	6	33	+15	17·4	147	$8\frac{1}{2}$	$11\frac{3}{4}$	Baxendell	1863
193	Y Sagittarii ...	20	8	1	−22	18·8	364?	11?	14?	C.H.F.Peters	1872?
194	R Sagittæ ...	20	9	3	+16	23·7	71	$8\frac{1}{4}$	$10\frac{1}{2}$	Baxendell	1859
195	R Delphini ...	20	9	37	+ 8	45·4	284	$7\frac{1}{2}$	13	Schönfeld	1859
196	R Cephei ...	20	7	36	+88	48·3	$1^y \pm$	5	11	Pogson	1856
197	P (34) Cygni ...	20	13	43	+37	41·4	...	3	?	Janson	1600
198	U Cygni	20	16	12	+47	32·9	461	7	$11\frac{1}{2}$	Knott	1871
199	S Capricorni ...	20	35	16	−19	23·2	...	9	11	Hind	1854
200	V Cygni	20	37	45	+47	44·9	448	$6\frac{3}{4}$	$13\frac{1}{2}$	Birmingham	1881
201	S Delphini ...	20	38	0	+16	41·6	277	8	12	Baxendell	1860
202	X Cygni	20	39	6	+35	11·3	15·6	$6\frac{1}{2}$	$7\frac{3}{4}$	Chandler	1886
203	T Delphini ...	20	40	16	+15	59·9	332	8	$13\frac{1}{2}<$	Baxendell	1863
204	U Delphini ...	20	40	25	+17	41·5	111 ± ?	$6\frac{1}{4}$	$7\frac{1}{2}$?	Espin	1884
205	U Capricorni...	20	42	3	−15	11·1	203	10	$13\frac{1}{2}<$	Pogson	1857
206	T Cygni	20	42	48	+33	58·3	365?	5	6	Schmidt	1864

191. The period is sometimes irregular to the extent of as much as 30^d.

192. Light curve variable. Period has undergone remarkable changes. There is a 9^{th} mag. star *sf*.

193. Is called W Capricorni by Chandler.

194. This star has two maxima and two minima in each period. The two minima have been reversed.

195. No min. seems to have been observed. There is a 12^{th} mag. star *sp*.

196. The annual Precession in R.A. of this star is about −42 *seconds of time.* This star is 24 Cephei of Hevelius.

197. This is the *Nova* of 1600, as to which see Chap. III. (*ante*). It has undergone numerous unquestionable changes of magnitude, but no attempts to assign a period have been successful.

198. A very red star, with variation, probably cyclical, in min. mag. There is an 8^{th} mag. blue star *nf*, which Birmingham believed to be slightly variable.

200. Forms with 3 other stars the S. end of an irregular cross. A deep red star. A secondary max. follows the principal one 2^m or 3^m. Remains at min. mag. about 4^m.

201. A red star. Period and fluctuations of light irregular. There is an 8^{th} mag. star *np*.

202. Bright and faint minima, but not regularly alternating. The increase occupies 4^d; the decrease 10^d, with a pause about the middle of the latter.

203. The light increases from 10^{th} mag. to max. generally in 28^d, and decreases again to the same point in the curve in 49^d. A yellowish-red star. There is an 11^{th} mag. star *np*, and a 10^{th} mag. star *nf*.

206. Period about 1^y, but in some years the variation is scarcely noticeable.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.	Discoverer.
		h. m. s.	° ′	Days.	From to	
207	T Aquarii ...	20 44 8	− 5 33·2	203	$6\frac{3}{4}$ 13	Goldschmidt 1861
208	T Vulpeculæ ...	20 46 49	+ 27 50·0	4^d 10^h	$5\frac{1}{2}$ $6\frac{1}{2}$	Sawyer 1885
209	Y Cygni	20 47 39	+ 34 14·7	1^d 12^h	7 8	Chandler 1886
210	R Vulpeculæ ...	20 59 30	+ 23 23·2	137 ±	$7\frac{1}{2}$ $13\frac{1}{2}$	Argelander 1858
211	W Capricorni...	21 1 12	− 24 21·7	310 ?	9 14 ?	C.H.F.Peters 1867
212	X Capricorni ...	21 2 15	− 21 47·5	210 ?	$11\frac{1}{2}$? 14<	C.H.F.Peters 1872
213	T Cephei ...	21 8 5	+ 68 2·6	383 ?	$5\frac{1}{2}$ 10	Ceraski 1878
214	T Capricorni ...	21 15 57	− 15 37·5	269	9 14<	Hind 1854
215	W Cygni... ...	21 31 53	+ 44 53·1	126 ?	$5\frac{3}{4}$ $7\frac{1}{4}$	Gore 1885
216	S Cephei... ...	21 36 36	+ 78 7·7	485	$7\frac{1}{2}$ $11\frac{1}{2}$	Hencke 1858
217	*Nova* Cygni ...	21 37 23	+ 42 20·4	...	3 $13\frac{1}{2}$	Schmidt 1876
218	μ Cephei... ...	21 40 8	+ 58 16·5	irreg.	$3\frac{3}{4}$ 6	Sir W. Herschel 1782
219	U Aquarii ...	21 57 20	− 17 9·4	200-300	10 ? 14 ?	Peters 1881
220	T Pegasi... ...	22 3 31	+ 12 0·0	373	$8\frac{1}{2}$ 13<	Hind 1863
221	R Piscis Aust.	22 11 45	− 30 9·1	...	$5\frac{1}{2}$? 11< ?	Gould 1884
222	δ Cephei	22 25 5	+ 57 51·1	5·37	$3\frac{3}{4}$ 5	Goodricke 1784
223	R Indi	22 28 10	− 67 51·3	...	8 11<	Gould 1884
224	R Lacertæ ...	22 38 22	+ 41 47·6	315	$8\frac{1}{2}$ $13\frac{1}{2}$	Deichmüller 1883
225	S Aquarii ...	22 51 13	− 20 55·8	279	$7\frac{3}{4}$ $12\frac{1}{2}$<	Argelander 1853

207. Though Goldschmidt in 1861 from his own observations announced this as a variable, it is so marked in the XX[th] Berlin Star Chart (by Hencke) published previously.

208. The increase occupies 1^d; the decrease $3\frac{1}{4}^d$.

210. There is a $9\frac{1}{2}$ mag. star *nf*.

211. Chandler calls this V Capricorni.

213. A red star.

214. There is a 9[th] mag. star *np*.

216. An intensely red star. Winnecke finds that the max. follows the min. by about 240^d.

217. This is Schmidt's *Nova* discovered on Nov. 24, 1876 shining as a 3[rd] mag. star. For further particulars see Chap. III. (*ante*). It has now disappeared.

218. This is Sir W. Herschel's well-known "Garnet star." Period very uncertain; at any rate much less than "5 or 6 years" as sometimes stated: perhaps 14 months is not far from the truth.

220. This star seems to remain a long time at the 11[th] mag., especially when approaching a max.

222. The period otherwise expressed is 5^d 8^h 48^m. The interval from max. to min. is 3^d 19^h, but from min. to max. only 1^d 14^h. The fluctuation of light seems to receive a check from 16^h to 24^h after max.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.		Discoverer.	
		h. m. s.	° ′	Days.	From	to		
226	β Pegasi... ...	22 58 25	+27 29·0	40±, irreg.	2	$2\frac{3}{4}$	Schmidt	1847
227	R Pegasi ...	23 1 7	+ 9 57·0	382	7	$13\frac{1}{2}$<	Hind	1848
228	S Pegasi... ...	23 14 59	+ 8 19·1	318	7	13<	Marth	1864?
229	R Aquarii ...	23 38 8	−15 53·8	388	$5\frac{3}{4}$	11?	Harding	1811
230	19 Piscium ...	23 40 46	+ 2 52·6	165±	$4\frac{3}{4}$	$6\frac{1}{4}$	Espin	1884
231	R Phœnicis ...	23 50 45	−50 24·1	...	$8\frac{1}{2}$	11<	Gould	1885
232	T Ceti	23 52 16	− 9 34·4	273?	$9\frac{3}{4}$	14?	C.H.F.Peters	1879
233	R Cassiopeiæ...	23 52 49	+50 46·4	429	$4\frac{3}{4}$	13<	Pogson	1853
234	U Cassiopeiæ...	23 55 39	+59 44·5	...	6	9	Birmingham	1877
104*a*	— Hydræ ...	13 42 49	−27 49·2	±1 year	7	8	Sawyer	1889

226. The period is indeterminate; Schmidt said sometimes 36^d; sometimes 43^d. Argelander suggested 41^d, but Schönfeld considers it altogether irregular between the limits of 30^d and 50^d.

227. It does not seem possible to reconcile the recent with the earlier observations as regards the period.

229. Some uncertainty in the period may perhaps be explained by the supposition that the star has a secondary as well as a primary max. A red star.

230. A deep orange star.

232. Chandler calls this V Ceti.

233. At times a very red star. Schönfeld considers that the period is certainly diminishing. There is an 11^{th} mag. star closely *np*.

104*a*. Colour "quite red."

PART II.—STARS PROBABLY VARIABLE.

No attempt has been made to render this list exhaustive, for the simple reason that there are hundreds of stars believed with more or less probability to be subject to fluctuations of light.

The last edition of this work contained but 35 stars ranked as suspected variables. I have however increased that number considerably in the present edition by the aid of the valuable catalogues compiled by Mr. J. E. Gore[a]. But as Mr. Gore's first list comprises 773 objects, it is evident that I have passed over a very great many. In making the present selection I have been guided in the main by the following considerations:—

(1) That the star should be one usually visible to the naked eye.

(2) That the suspicion of variability should depend on the observations of at least 2 observers of known experience.

Besides the 2 foregoing conditions, a slight preference has been shown to stars which are (*a*) situate in the Northern hemisphere, or (*b*) which are red or orange in colour.

From these explanations the reader will have no great difficulty in understanding that the list as here framed is intended to suggest to amateur astronomers a branch of research in which they can render useful service to science, and the fact that such a large proportion of the stars here given belong to the Southern hemisphere is significant of the amount of work remaining to be done there. For practical hints on the conduct of variable star observations, see vol. ii. p. 283 (*ante*).

The magnitudes given in the 5th column, and the resulting range, are only to be deemed approximate.

[a] These are referred to at p. 271 *ante*. And some particulars of about 350 stars contained in the *Harvard Photometry* which may be regarded, on evidence more or less conclusive, to be variable stars, will be found in *Annals of Harvard College Observatory*, vol. xiv. Part II. p. 431.

No.	Star.	R.A. 1890.	Decl. 1890.	Probable changes of Magnitude.		Authority : Remarks.
		h. m. s.	° ′			
1	γ Pegasi	0 7 34	+14 34·3	$2\frac{1}{2}$	3	Schwab. Period $27\frac{1}{2}^d$?
2	— Ceti	0 18 12	−10 14·2	7	10	Borrelly.
3	Arg.+81°18Ceph.	0 40 58	+81 22·0	{through $\frac{1}{2}$ a mag.}		Pickering; Knott.
4	2598 Lal. Ceti...	1 20 16	− 4 31·9	$6\frac{1}{2}$	$7\frac{1}{2}$	Gould.
5	112 Piscium ...	1 54 26	+ 2 34·3	6	$6\frac{1}{2}$	Schmidt.
6	61 Ceti	1 58 10	− 0 52·1	6	7	Sir W. Herschel.
7	ν Fornacis ...	1 59 33	−29 49·5	5	6	Gould.
8	{937 Lac. Horologii}	2 49 56	−63 21·5	6	$6\frac{3}{4}$	Gould. "Strikingly red."
9	*z* Eridani	3 26 18	−41 44·4	4	$6\frac{1}{2}$	Houzeau, 1875.
10	7172 Lal. Tauri	3 47 17	+ 7 26·9	$6\frac{3}{4}$	8	Gould.
11	γ Eridani... ...	3 52 53	−13 49·3	$2\frac{1}{2}$	$3\frac{1}{2}$	Secchi.
12	48 Tauri	4 9 30	+15 7·7	6	7	Schmidt.
13	U Tauri	4 15 24	+19 33·3	9	$10\frac{1}{2}$	Baxendell. A double, 3″.
14	54 Eridani ...	4 35 38	−19 53·0	$4\frac{1}{2}$	5	Gould.
15	π^1 Orionis... ...	4 43 51	+ 6 46·1	$3\frac{1}{2}$	5	Gould. Period $54\frac{1}{2}^d$ (Gage).
16	5 Orionis	4 47 38	+ 2 19·5	$5\frac{1}{2}$	$6\frac{1}{2}$	Gould. Red star.
17	R Eridani... ...	4 50 21	−16 35·6	5·4	6	Gould.
18	S (64) Eridani...	4 54 49	−12 42·0	4·8	5·7	Gould.
19	{16 Birm. Add. Leporis}	5 6 38	−12 1·2	$5\frac{1}{2}$	$7\frac{1}{2}$	Burton. Very red star.
20	31 Orionis ...	5 23 59	− 1 10·8	$4\frac{3}{4}$	6	Gould. Very red.
21	— Tauri	5 28 16	+21 52·1	$8\frac{1}{2}$	$11\frac{1}{2}$	Schmidt.
22	T (*bis*) Orionis...	5 29 8	+10 10·2	5·7	6·7	Thome (Gould).
23	10527Lal.Orionis	5 29 38	− 6 5·0	$5\frac{1}{2}$	$7\frac{1}{2}$	Falb and Gould. *sp* ι Orionis.
24	2145 Lac.Pictoris	6 1 55	−48 26·9	6	7	Tebbutt. A close double, $2\frac{1}{2}$″.
25	11884Lal.Orionis	6 8 54	+13 53·0	6	$6\frac{1}{2}$	Gould.
26	12104Lal.Orionis	6 14 27	− 2 53·9	$5\frac{1}{2}$	6	Gould.
27	{2470 Lac. Canis Majoris}	6 45 42	−27 12·4	6	8	Gould.
28	σ Canis Majoris	6 57 20	−27 46·6	5	$4\frac{1}{2}$	Gould. Very red star.
29	27 Canis Majoris	7 9 46	−26 9·8	5	6	Gore.
30	2761 Lac. Puppis	7 16 18	−47 1·0	6 ?	$8\frac{1}{2}$	Gould; Stone.
31	{W. B. (2) VII. 669 Monoc.}	7 23 45	− 1 40·7	$4\frac{1}{2}$	9	Olbers, 1824.

No.	Star.	R.A. 1890.	Decl. 1890.	Probable changes of Magnitude.		Authority : Remarks.
		h. m. s.	° ′			
32	14970 Lal. Canis Minoris	7 35 48	+ 3 52·9	6	7	Gould. Period several years ?
33	R Puppis	7 36 36	−31 24·3	6½	7½	Gould.
34	T Puppis	7 44 23	−40 22·6	6½	7¼	Gould.
35	22 P. VIII. Puppis	8 7 42	−42 39·5	5	5¾	Gould.
36	β Volantis ...	8 24 32	−65 46·2	4	5	Gould.
37	3344 Lac. Argûs	8 24 50	−26 57·9	6	8	Gould.
38	R Pyxidis Nauticæ	8 48 20	−36 7·8	6½	7½	Gould.
39	Arg. + 11°: 1954 Cancri	8 52 17	+11 15·5	7·7	8·6	Baxendell.
40	κ Pyxidis Nauticæ	9 3 13	−25 24·7	4	5	Gould. Orange star.
41	26 P. IX. Velorum	9 9 6	−38 9·7	6	7	Gould.
42	N Velorum ...	9 27 53	−56 32·9	3½	4½	Gould. Period 4½d ? Colour var. ?
43	R Velorum ...	10 2 0	−51 39·1	6½	7½	Thome.
44	q Carinæ	10 13 24	−60 47·0	4	5	Gould. Red star.
45	r Velorum ...	10 17 36	−41 5·8	5	6	Gould. Red star.
46	I Carinæ	10 22 12	−73 28·3	4	5	Gould.
47	t^1 Carinæ	10 32 13	−58 59·5	5½	6½	Gould.
48	4422 Lac. Carinæ	10 37 5	−59 6·1	5	7	Thome.
49	256 P. X. Crateris	11 3 25	−27 29·0	5	6	Gilliss. Short period ?
50	η Crateris	11 50 24	−16 32·3	4½	6½	Houzeau, 1875.
51	b (7) Virginis ...	11 54 18	+ 4 16·1	4	6	Flammarion ?
52	5013 Lac. Hydræ	12 0 27	−35 4·9	6	6½	Gould.
53	ε Corvi	12 4 27	−22 0·5	3	4	Gould.
54	δ Ursæ Majoris	12 9 58	+57 36·8	2½	4	Pigott.
55	γ Corvi	12 10 9	−16 55·9	2½	3	Gould.
56	η Virginis ...	12 14 16	− 0 3·3	3	4	Gould.
57	277 Birm. Virginis	12 19 37	+ 1 22·8	6½	8½	Birmingham and Espin.
58	δ Corvi	12 24 11	−15 54·2	2¾	3½	Gould.
59	23793 Lal. Can. Venaticorum	12 39 57	+46 2·5	4½	6	Schmidt and Espin. Orange star.
60	63 Virginis ...	13 17 8	−17 9·5	5	6	Gould.
61	83 Ursæ Majoris	13 36 33	+55 14·4	4	5	Birmingham. Orange star.
62	g (2) Centauri ...	13 43 4	−33 54·0	4½	5	Gould.

No.	Star.	R.A. 1890.	Decl. 1890.	Probable changes of Magnitude.		Authority : Remarks.
		h. m. s.	° ′			
63	η Ursæ Majoris	13 43 12	+49 51·7	2	0	Espin, &c.
64	υ Boötis	13 44 11	+16 20·6	4	4½	Schmidt. Reddish star.
65	θ Apodis	13 54 38	−76 15·9	5½	6½	Gould. Red star.
66	26325 Lal. Boötis	14 18 53	+ 8 35·2	6	7½	Birmingham.
67	6077 Lac. Apodis	14 45 22	−76 12·8	5½	6	Gould. Red star.
68	β Ursæ Minoris	14 51 2	+74 36·3	2¼	2¾	Sir J. Herschel; Espin. Period 10½ᵈ?
69	T Triang. Aust.	14 59 30	−68 17·7	7	7½	Gould. Period 1ᵈ.
70	6320 Lac. Lupi	15 14 5	−44 32·4	6¾	7½	Taylor; Gould.
71	6439 Lupi ...	15 29 17	−32 43·5	6½	7	Gould.
72	τ¹ Serpentis ...	15 31 22	+15 28·0	6	8	Birmingham. Red star.
73	28607 Lal. Libræ	15 37 11	−10 34·2	7	8¾	Weiss, 1879.
74	6514 Lac. Lupi	15 39 42	−34 20·2	5½	6½	Gould.
75	6578 Lac. Trianguli Aust.	15 51 18	−63 27·7	6¾	7½	Gould.
76	379 Birm. Ophiuchi	16 20 37	−12 10·1	7½	9	Birmingham. Red star.
77	X Scorpii	16 22 49	−19 15·2	...		C. H. F. Peters, 1880.
78	111 P. XVI. Scorpii	16 29 7	−35 1·7	4¼	5	Gould.
79	391 Birm. Ophiuchi	16 45 33	− 5 59·3	9	0	Birmingham.
80	7057 Lac. Aræ	16 51 55	−56 23·2	6½	7¼	Gould.
81	30 Ophiuchi ...	16 55 15	− 4 3·5	5	6	Gould. Orange star.
82	μ Draconis ...	17 3 3	+54 37·1	4	5	S. J. Johnson.
83	ι Apodis	17 9 50	−70 0·3	5	6	Gould.
84	e (69) Herculis	17 13 51	+37 24·3	5	6	H. T. Vivian, 1870. Period 21ᵈ?
85	418 Birm. Serpentis	17 38 28	−18 36·4	7½	0	Birmingham.
86	z (88) Herculis	17 47 12	+48 25·4	5½	7	Peirce.
87	420 Birm. Ophiuchi	17 48 38	+ 1 47·3	7½	0	Birmingham.
88	γ Sagittarii ...	17 58 44	−30 25·3	3	3½	Gould. Period long?
89	7681 Lac. Sagittarii	18 14 45	−24 57·8	6	7	Gould.
90	29 Sagittarii ...	18 43 8	−20 27·0	5	6	Gould.
91	35611 Lal. Aquilæ	18 58 32	− 5 50·8	7	8	Schmidt; Espin. Red star.
92	8122 Yarnall Sagitt.	19 0 42	−18 54·4	6	7	Gould.
93	β Cygni	19 26 17	+27 43·7	3	4	Klein. Years?
94	μ Aquilæ	19 28 42	+ 7 8·8	4	5	Gould.
95	ε Draconis ...	19 48 32	+69 59·2	3¾	4¾	Double: dist. 2·8″. B also var.

No.	Star.	R.A. 1890.			Decl. 1890.		Probable changes of Magnitude.		Authority: Remarks.
		h.	m.	s.	°	′			
96	535 B.	20	6	7	+47	31·4	$7\frac{1}{2}$	$9\frac{1}{2}$	Espin, 1886? Red star.
97	Arg. + 35°,4002 Cygni	20	6	14	+35	37·0	$8\frac{1}{2}$	10	Espin, 1886. Red star.
98	541 B. Cygni ...	20	9	23	+38	23·5	$6\frac{1}{2}$	8	Espin, 1887. Red star.
99	38839 Lal. Capric.	20	10	40	−21	39·3	$6\frac{1}{2}$	$8\frac{1}{2}$	Secchi. "Ruby" star.
100	558 Birm. Delph.	20	20	27	+9	42·0	6	0	Birmingham. Orange star.
101	Arg. + 39°,4208 Cygni	20	24	50	+39	36·7	8	9	Espin, 1885. Red star.
102	ρ Pavonis	20	28	21	−61	54·4	$4\frac{1}{2}$	$5\frac{1}{4}$	Gould.
103	υ Pavonis ...	20	31	51	−67	8·9	5	6	Gould.
104	RR Cygni ...	20	42	16	+44	28·1	8?	$9\frac{1}{2}$?	Espin, 1888.
105	13 Delphini ...	20	42	21	+5	36·2	6	$6\frac{1}{2}$	Schmidt. Period short.
106	14 Delphini ...	20	44	25	+7	27·2	$5\frac{1}{2}$	7	Schmidt.
107	63 Cygni	21	2	47	+47	12·3	$4\frac{1}{2}$	6	Espin, 1882.
108	8721 Lac. Pavonis	21	8	53	−65	8·3	$5\frac{1}{2}$	6	Gould.
109	8768 Lac. Indi	21	13	44	−50	23·9	6	$7\frac{1}{4}$	Gould.
110	γ Indi	21	18	23	−55	8·1	6	$6\frac{1}{2}$	Gould.
111	β Cephei	21	27	14	+70	4·6	3	$3\frac{1}{2}$	Period 383^d? Double star, dist. 13″.
112	ε Pegasi	21	38	47	+9	22·2	2	$2\frac{1}{2}$	Schwab. Period $25\frac{3}{4}$^d?
113	596 Birm. Aquarii	21	40	50	−2	43·4	6	$7\frac{1}{2}$	Birmingham. Period, years?
114	U Aquarii ...	21	57	18	−17	10·0	10?	14?	Peters, 1881.
115	9036 Lac. Pis. Aust.	22	3	30	−34	33·3	$5\frac{3}{4}$	7	Gould. Reddish star.
116	39 Aquarii ...	22	6	29	−14	44·1	6	$6\frac{1}{2}$	Gould.
117	ζ Piscis Aust. ...	22	24	47	−26	38·1	5	$6\frac{1}{2}$	Schmidt. Period long.
118	η Pegasi	22	37	50	+29	38·7	3	$3\frac{1}{4}$	Christie.
119	ι Cephei	22	45	45	+65	37·4	$3\frac{3}{4}$		Schmidt. Period 369^d?
120	7995 B. A. C. Lacertæ	22	51	39	+49	9·1	$4\frac{1}{2}$	$5\frac{1}{2}$	Pierce.
121	303 B Aquarii ...	23	11	55	−12	18·8	6	7	Schmidt.
122	22743 O. Arg. Aquar.	23	12	41	−19	26·6	7	8	Schulhof.
123	8 Andromedæ ...	23	12	37	+48	24·8	$5\frac{1}{2}$	6	Gore, 1876. Red star.
124	ψ^3 Aquarii ...	23	13	14	−10	12·7	4	5	Schönfeld. Period long?
125	ι Andromedæ ...	23	32	44	+42	39·5	$4\frac{1}{2}$	5?	Gore.
126	3 Ceti	23	58	52	−11	7·3	5	6	Gould.

CHAPTER XII.

A CATALOGUE OF "RED" STARS[a].

THE following Catalogue is the outcome of many hundreds of observations, extending over (more particularly) a period of about 20 years (1870-89). Between 1870 and 1881 the telescope employed was a 4-inch Refractor by Cooke, but the observations made since 1884 were made with a 6-inch Refractor by Grubb, almost always charged with an eye-piece of very low power, having a field of $1\frac{1}{4}°$.

The existing Catalogues of red stars from which contributions have been levied are the following: but I have not limited myself to these, having considered the claims of all stars termed "red" wheresoever mentioned:—

1804. LALANDE, J. DE, *Tables des Étoiles Rouges.*
(*Connaissances des Temps*, An. xv. p. 378.)
1822. DE ZACH, Baron, *Étoiles Rouges.*
(*Corresp. Ast.*, vol. vii. p. 298.)
1847. HERSCHEL, Sir J., *Ruby-coloured, or very Intense Red Stars.*
(*Cape Observations*, p. 448.)
1866. SCHJELLERUP, H. C., *Catalog der rothen, isolirten Sterne.*
(*Ast. Nach.*, vol. lxvii. No. 1591, June 18, 1866; Addenda, vol. lxviii. No. 1613, October 30, 1866.
1872. SCHMIDT, J. F. J., *Verzeichniss rothgelber Sterne.*
(*Ast. Nach.*, vol. lxxx. No. 1902, September 5, 1872.)
1874. SCHJELLERUP, H. C., *Zweiter Catalog der rothen, isolirten Sterne.*
(*Vierteljahrsschrift der Astronomischen Gesellschaft*, vol. ix.)
1876. BURNHAM, S. W., *Catalogue of Red Double Stars.*
(*Month. Not.*, vol. xxxvi. p. 331, 1876.)
1877. BIRMINGHAM, J., *Observations and Catalogue of Red Stars.*
(*Trans. Roy. Irish Acad.*, vol. xxvi. p. 249, 1877.)
1877. FEARNLEY, *Des Etoiles colorées.*
(*Ast. Nach.*, vol. lxxxix. No. 2121, March 27, 1877.)

[a] Revised and condensed from a catalogue published in *Month. Not.*, vol. xlvii. p. 348, April 1887.

1879. Lindemann, E., *Verzeichniss von 42 neuen rothen Sternen.* (*Bulletin de l'Acad. de St.-Pétersbourg*, vol. xxv. p. 155.)

1882. Dreyer, J. L. E., *Mean places of 321 Red Stars.* (*Dunsink Observations*, Part IV. p. 35.)

1882. Lindemann, E., *Zweites Verzeichniss neuer rother Sternen.* (*Bulletin de l'Acad. de St.-Pétersbourg*, vol. xxviii. p. 278.)

1885. Espin, Rev. T. E., *Some New Red Stars.* (*Journal of Liverpool Ast. Soc.*, vol. iii. p. 82, March 1885.)

1886. Espin, Rev. T. E., *Some New Red and Orange-red Stars.* (*Month. Not. R.A.S.*, vol. xlvi. p. 293, March 1886.)

This Catalogue makes no pretension to being exhaustive; it must not be regarded as more than it professes to be, namely, a working list of the best of the red stars, almost always excluding known variables, many of which are notoriously red in colour. My reason for excluding known variables was this: their inclusion would have been a trap to observers using this list for the purpose for which alone it is designed, namely, to facilitate the study of any red stars which are always within reach of their instruments (regard being had to the season of the year and the latitude of the place of observation).

And in another sense this Catalogue is not exhaustive; it only includes stars of decided colour and not less than 8½ magnitude. It may be that my eyes are not so sensitive to red hues as many other eyes are, but I certainly have often considered that many of my predecessors in the observation of red stars have greatly exaggerated the colours they have ascribed to particular objects. Taking the so-called "red" stars all round, my opinion is that a more generally accurate generic term for them would be "orange" stars, and that very few indeed rise to real "red," and that less than a dozen can be truly termed "carmine" or "ruby." These remarks seem requisite by way of caution in order to guard inexperienced observer from being disappointed when they come to examine for themselves stars described by Sir W. Herschel, Sir J. Herschel, Schmidt, and others, as "red" or "very red." There can be no doubt that these observers saw many stars to possess a redder tinge than they have since been found to exhibit. This may have been in the case of the Herschels some effect of their metallic mirrors, or of their eye-sight, or may have been due to both causes combined; and, speaking generally, it may be said that the vast majority of the stars here catalogued are "orange" more than anything else. I would for this purpose define as "orange" the colour exhibited by the gilding inside articles of silver plate newly gilt.

A few, and only a few, explanations are requisite as to the principles on which the Catalogue has been constructed. In column 1, one asterisk indicates objects of particular interest; 2 or 3 asterisks, objects of special and remarkable interest. Column 2 gives the progressive numbers, if any, from Birmingham's catalogue. The places in columns 4 and 5 have been taken from the best authorities available, brought up to 1890. I have freely consulted the Catalogues of Stone and Yarnall, and the Armagh Catalogue, and the two Radcliffe Catalogues, besides Birmingham's and the Dunsink Catalogue of 1882. The places of such of the stars as are to be found in the *Nautical Almanac* for 1890, or the *American Ephemeris* for 1889, are taken from those works respectively. Espin's places are as given by him, but brought up from 1885 to 1890. As, however, he only quotes the *Durchmusterung* to the nearest minute of Right Ascension and Declination, my 1890 places of his stars will be less exact than in the case of all the other stars. The magnitudes in column 6 are in all cases from Pickering's *Harvard Photometry*, where the star was to be found in that important and interesting record; one of the most valuable contributions to practical astronomy that has appeared for many years. The magnitudes of many of the remaining stars have been determined by Mr. C. G. Brodie by Dawes's method. In the column headed "Colour; Remarks" the information given within inverted commas has been generally taken from published sources, although the authority is not in all cases mentioned. All other details not in inverted commas reproduce the results of my own original work. The stars originally examined by myself amounted to 589, out of a total of 719, being virtually nearly all those visible in England; and it is out of those 719 (with perhaps half a dozen added) that I have chosen the 500 stars which make up this working List.

It would not be difficult to offer many interesting and suggestive reflections as the result of a prolonged study of the red stars; but one would soon be apt to drift away into speculations, which, however attractive to some minds, would not only be mere speculations, but would relate to matters quite beyond the domain of astronomy proper. I will therefore here only record the well-known facts that many of the stars certainly variable are red, and that many of the red stars have, since they were first noted as such, been found to be variable. The instances that could be cited in support of these statements are very numerous, and it is quite impossible for the coincidence between the redness of the colour and the variability of the light of several hundred stars to be accidental. What it means I do not presume to suggest. Amongst observers who have paid much attention to the colours of stars a foremost place must be given to the late Mr. J. Birmingham, of Tuam, whose labours in the matter of red stars added much to our knowledge of stellar colours. It was he who remarked that "a space of the heavens, including the Milky Way, between Aquila, Lyra, and Cygnus, seems so peculiarly favoured by red and orange stars that it might not inaptly be called "the red region," or "the red region of Cygnus;" and, although the chances of finding a star of any stated colour must, of course, be greater among the countless multitudes of the Milky Way than elsewhere, still its other portions visible in this latitude show no such special richness in red stars.

One other remark of Birmingham's will be useful in this place: "The red stars seem as liable to change of tint as to change of magnitude; and, although modifications of colour may have been remarked without any striking change of size, still I have observed that as a red variable increases it grows paler, and that it reddens deeper towards the minimum. Schmidt has made the same observation, and it well accords with the fact that all the very red stars are telescopic, and none of them visible to the naked eye. This is noteworthy, and seems difficult of explanation; but the cause, as I would suggest, may be found in the quality of light received from the object. As we do not see the stars by their discs, but by the amount of their light, according to apparent magnitude, it seems evident that the very red stars, shining with only a part of the components of white light, must appear less bright than the white stars, and seem therefore generally small. According to this view, it might be assumed that the few naked-eye reddish stars would appear larger if white; so that Aldebaran, Betelgeuse, &c., if of that colour, might be rivals of Sirius. The redness of a star has given rise to the singular conceit that it shows a cooling down, or, as we might say, an approach to a final snuffing out of the luminary; but one might think that the fact of periodic variation of tint in many of the red stars ought to go far in disproving this proposition."

The reason why stars below the 9th magnitude are not included is that, where one is dealing with a star which is near the *minimum visibile* of a telescope, estimations of colour are apt to become very imaginary in many cases. I say this without any desire to impute bad faith to an observer who might talk about "magnitude 13, colour red;" but the chromatic notions of such a person must be received with a certain amount of distrust. I do not believe that it is, as a rule, possible to assign colour to stars of the 12th or lesser magnitudes, except a very large telescope indeed happens to be employed in viewing them.

The question has often been discussed as to how far flat surface diagrams of colour are of any use as standards of comparison for coloured stars. On the whole it may be said that their usefulness is doubtful. I have often thought of trying whether a series of transparent discs of coloured glass, arranged in gradations of colour, and mounted in a frame sufficiently portable to be held in the hand by the observer whilst his eye is looking through the telescope, might not be used for comparisons of star colours. Probably the chief difficulty would be the obtaining of a sufficiently pure white light wherewith to illuminate the discs. If this were got over by the use of electricity or otherwise, such an apparatus might be effective and trustworthy, whilst it need not be very expensive nor very cumbersome.

Number. G. F. C.	Birm.	Dun-sink, Schj.	Star.	R. A. 1890. h. m. s.	Decl. 1890. ° ′	Mag.	Colour; Remarks.
1	3	...	ι Ceti ...	0 13 49	− 9 26·0	$3\frac{1}{2}$	Pale orange.
*2	4	3	— Andromedæ	0 14 5	+44 5·9	8	Fine fiery red.
3	...	...	— Cassiopeiæ	0 29 9	+67 19·2	$6\frac{3}{4}$	Pale red.
4	...	...	— Cassiopeiæ	0 31 21	+67 2·2	$7\frac{1}{4}$	Reddish.
**5	8	...	δ Andromedæ	0 33 26	+30 15·6	$3\frac{1}{4}$	Orange.
6	...	...	— Cassiopeiæ	0 44 25	+61 10·8	$6\frac{1}{4}$	Fiery orange.
7	...	...	— Cassiopeiæ	0 46 18	+69 21·9	$7\frac{1}{2}$	Orange.
8	17	...	β Andromedæ	1 3 34	+35 2·2	$2\frac{1}{4}$	Red.
***9	18	7	— Piscium	1 10 4	+25 11·2	7	Fiery red.
10	23	10a	— Cassiopeiæ	1 20 3	+65 30·4	7	Pale red.
11	24	...	R Sculptoris	1 21 55	−33 7·3	6	"Orange red" (J. Herschel). "Brilliant scarlet" (Gould).
12	...	...	36 Espin Persei	1 26 1	+57 49·7	6	Orange.
13	28	...	α Eridani	1 33 36	−57 47·7	1	"Red."
**14	29	...	ν Piscium	1 35 42	+ 4 55·8	5	Orange.
***15	31	14	— Cassiopeiæ	1 47 44	+69 39·8	8	Fiery red.
16	...	...	— Ceti	1 54 59	+ 9 9·2	6	Reddish.
***17	34	...	γ Andromedæ	1 57 8	+41 48·1	$2\frac{1}{4}$	Orange with a blue companion at 10″ distance.
**18	35	...	α Arietis	2 0 58	+22 56·5	2	Orange.
19	37	...	60 Andromedæ	2 6 19	+43 42·9	5	Orange.
20	40	19	ο Ceti	2 13 47	− 3 28·7	Var.	Fiery red when approaching max.
21	41	20	— Persei	2 14 15	+56 38·2	9	Fiery red; about midway between the clusters 33 and 34 H VI. In a grand field.
22	...	...	65 Andromedæ	2 18 17	+49 46·7	5	Good orange.
23	45	...	Arg. + 65° : 280 Cassiopeiæ	2 28 37	+65 15·9	6	Deep orange.
24	...	...	15 Trianguli	2 29 6	+34 12·5	Var 5–8	Reddish orange. Blue star near.
25	46	22	— Andromedæ	2 30 26	+56 35·6	8	Pale red.
26	47	23	855 Weisse Trianguli	2 37 24	+31 54·2	$7\frac{1}{2}$	Red; neb. h 257 *p* (D'Arrest). "Pale orange" (Dunsink).
27	49	...	η Persei	2 42 40	+55 26·3	4	Orange.
28	51	...	— Cassiopeiæ	2 47 19	+63 53·0	$6\frac{1}{2}$	Deep orange.

Number.			Star.	R.A. 1890.	Decl. 1890.	Mag.	Colour ; Remarks.
G. F. C.	Birm.	Dun-sink, Schj.		h. m. s.	° ′		
*29	52	...	α Ceti	2 56 31	+ 3 39·5	$2\frac{3}{4}$	Decided orange. "Orange red" (Robinson).
30	57	...	— Persei	3 4 49	+47 18·6	7	Pale red ; 2 small red stars in the field *sf.*
31	59	...	1014 B. A. C. Horologii	3 9 46	−57 44·0	7	"Red."
32	58	...	6048 Lal. Eridani	3 10 11	− 9 10·6	7	Reddish ; *p* ζ Erid. 18ˢ, and 4′ to the N.
33	60	26	W. B. III. 152 Eridani	3 10 55	− 6 7·9	7	Reddish orange.
34	...	...	o Tauri	3 18 53	+ 8 38·5	$3\frac{1}{2}$	Orange. "Red" (*Uran. Arg.*).
35	61	...	Arg. + 54° : 685 Camelopardi	3 21 49	+54 59·5	$7\frac{1}{2}$	Pale Red.
36	62	...	σ Persei	3 22 49	+47 36·9	$4\frac{1}{2}$	Pale orange ; contrasts well with white stars near.
37	...	...	Arg. + 79° : 110 Camelopardi	3 32 20	+79 58·4	$7\frac{3}{4}$	Red.
*38	65	27 a	— Camelopardi	3 32 21	+62 17·4	7	Pale crimson. "? Var."
39	68	30	6921 Lal. Eridani	3 38 28	− 9 57·3	8	Reddish. Evidently Var. 7–8 (G.F.C.).
40	69	...	121 P. III. Camelopardi	3 39 17	+65 10·9	6	Deep Orange. Mag. 4·75 (*Uran. Oxon.*).
41	70	30 a	π Eridani	3 40 56	−12 26·8	5	Reddish orange.
42	...	...	Arg. + 24° : 570 Tauri	3 41 29	+ 24 38·9	7	Reddish orange.
43	71	31	1204 B. A. C. Camelopardi	3 47 43	+60 47·1	6	Pale orange.
44	...	...	γ Hydræ	3 48 57	−74 34·5	$3\frac{1}{2}$	"Deep yellow" (Williams).
45	72	32	7272 Lal. Eridani	3 49 53	−15 13·8	7	Reddish orange; a larger star of the same colour *p* a little *s*.
46	...	...	γ¹ Eridani	3 52 53	−13 49·3	3	Reddish orange. "Reddish" (Robinson).
47	...	...	Arg. + 61° : 667 Camelopardi	3 56 20	+61 29·6	$7\frac{1}{2}$	Decided Red.
48	...	...	γ Reticuli	3 59 17	−62 28·0	5	"Deep yellow" (Williams).
49	...	...	Arg. + 32° : 743 Persei	4 5 59	+32 14·8	7	Fiery orange.
50	74	34	1342 B. A. C. Tauri	4 15 54	+20 33·6	$6\frac{1}{2}$	Fiery orange.
51	...	...	Arg. + 34° : 874 Persei	4 17 4	+34 59·4	7	Red.
52	...	...	45 Eridani	4 26 15	− 0 17·0	5	Deep orange. "Red" (*Uran. Arg.*).

Number. G. F. C.	Birm.	Dun-sink, Schj.	Star.	R. A. 1890. h. m. s.	Decl. 1890. ° ′	Mag.	Colour; Remarks.
53	79	38	8623 Lal. Eridani	4 28 10	−11 1·1	6½	Reddish.
*54	...	...	47 Eridani	4 28 53	− 8 27·5	5½	Reddish orange.
55	...	...	W.B. IV. 585 Eridani	4 29 8	− 9 10·3	6	Fiery red. "Red" (*Uran. Arg.*).
**56	81	...	*a* Tauri	4 29 36	+16 17·2	1	Deep reddish orange.
57	82	40	— Aurigæ	4 38 7	+32 42·8	8¾	Pale crimson; a larger orange star *p.*
*58	83	41	1457 B.A.C. Camelopardi.	4 39 48	+67 58·4	7	Fiery red.
*59	85	43	— Aurigæ	4 44 37	+28 20·2	8	Unmistakably crimson.
60	87	44	o^1 Orionis	4 46 19	+14 4·2	5½	Reddish orange.
*61	88	45	5 Orionis	4 47 38	+ 2 19·5	5¾	Deep orange. "Probably var."
62	89	46	236 P. IV. Orionis	4 48 51	+ 7 36·0	6	Deep golden yellow. "Orange red" (Brodie).
63	91	...	6 Aurigæ	4 52 49	+39 29·3	6½	Red.
64	...	...	3 Espin Aurigæ	4 53 3	+40 4·6	7½	Fiery red.
**65	94	49	R Leporis	4 54 36	−14 58·2	Var.	Decided crimson.
66	93	48 a	ζ Aurigæ	4 54 47	+40 54·8	4	Fine deep orange. "Slightly orange" (*Uran. Oxon.*).
67	95	50	276 P. IV. Orionis	4 56 11	+ 0 33·7	6	Pale orange. "? Var."
68	96	51	899 H.P. Orionis	4 59 43	+ 1 1·5	7	Intense fiery red.
69	97	...	ε Leporis	5 0 48	−22 31·1	3¼	Reddish orange. "? Var."
*70	...	...	— Leporis	5 6 38	−12 1·2	7½	Deep red.
71	102	...	Arg. − 0°: 890 Orionis	5 9 1	− 0 41·2	7	Pale orange.
72	...	...	5 Espin Aurigæ	5 10 59	+40 20·6	7	Reddish orange.
*73	...	...	Arg. + 40°: 1245 Aurigæ	5 11 12	+40 58·7	7½	Red.
74	...	...	50 Espin Aurigæ	5 11 49	+35 40·3	8½	Fiery red.
75	...	...	W.B. V. 266 Aurigæ	5 12 51	+41 0·3	5¼	Orange. "Slightly red" (*Uran. Oxon.*).
*76	...	...	53 Espin Orionis	5 19 50	−10 26·9	6	Reddish orange.
*77	...	...	52 Espin Orionis	5 20 7	+29 49·5	8	Almost pale ruby.

Number. G. F. C.	Birm.	Dun-sink, Schj.	Star.	R.A. 1890. h. m. s.	Decl. 1890. ° ′	Mag.	Colour ; Remarks.
78	...	...	— Aurigæ	5 20 38	+35 13·3	7	Good orange. In cl. 39 H VII.
79	...	...	6 Espin Aurigæ	5 22 39	+40 25·5	7½	Orange.
80	109	57b	S Orionis	5 23 34	− 4 47·0	Var.	Reddish. In centre of small equilat. triangle of 3 stars.
81	110	58	31 Orionis	5 24 8	− 1 10·8	5–6	Deep orange. "Var."
82	111	59	119 Tauri	5 25 47	+18 30·7	4½	Pale red. "Good orange" (Brodie).
83	...	...	7 Espin Aurigæ	5 26 31	+41 2·3	7½	Reddish.
84	...	...	54 Espin Aurigæ	5 26 31	+32 40·0	7	Reddish orange; blue star 6½ mag. near.
*85	...	...	156 Espin Orionis	5 27 16	+ 7 3·6	7¾	Very red.
86	...	...	10483 Lal. Orionis	5 28 29	− 1 32·4	7	Fiery red.
87	113	...	ϕ^2 Orionis	5 30 51	+ 9 14·1	4½	Orange.
88	114	60	— Orionis	5 30 58	+10 58·0	6½	Reddish orange.
*89	...	...	124 Tauri	5 32 34	+23 15·5	7½	Quadruple star ; A red.
90	...	...	β Doradûs	5 33 26	−62 33·7	3½	"Reddish yellow" (Williams).
91	...	...	157 Espin Aurigæ	5 33 37	+31 51·4	6½	Fiery red.
*92	...	...	Arg. + 31° : 1058 Aurigæ	5 34 59	+31 49·1	8½	Fiery red.
93	119	...	51 (*b*) Orionis	5 36 48	+ 1 25·3	5¼	Orange. "Slightly red" (*Uran. Oxon.*).
94	120	64	— Tauri	5 38 30	+24 22·3	8	"Full red" (*Dunsink*).
95	...	...	55 Espin Aurigæ	5 38 41	+50 2·5	7	Reddish orange.
96	...	...	— Aurigæ	5 39 5	+30 39·4	7	Good red.
97	121	64a	— Geminorum	5 39 6	+20 38·9	7½	Good red. "Deep orange red" (Brodie). "? Var."
98	124	...	— Pictoris	5 40 8	−46 30·5	8	"Vivid red" (J. Herschel).
99	...	...	57 Espin Aurigæ	5 44 18	+32 5·8	6½	Fiery red. Near neb. 37 M.
100	...	...	11061 Lal. Orionis	5 44 22	+ 4 23·9	6	Deep orange. "Red" (*Uran. Arg.*).
101	...	...	56 Orionis	5 46 44	+ 1 49·7	5	Reddish orange. "Red" (*Uran. Arg.*).
102	127	...	α Orionis	5 49 13	+ 7 23·1	1	Reddish orange.

Number. G. F. C.	Birm.	Dun-sink, Schj.	Star.	R.A. 1890.	Decl. 1890.	Mag.	Colour; Remarks.
				h. m. s.	° ′		
103	...	...	Gore's *Nova* Orionis	5 49 17	+ 20 9·6	$6\frac{1}{2}$	Fiery red. "Very red" (Robinson).
104	129	...	δ Aurigæ	5 50 28	+ 54 16·7	$3\frac{3}{4}$	Pale orange.
105	130	67	π Aurigæ	5 51 45	+ 45 55·5	$4\frac{1}{2}$	Reddish orange. "Pale orange" (Brodie).
106	...	...	13 Espin Aurigæ	6 0 5	− 5 51·0	$7\frac{1}{2}$	Reddish orange.
*107	135	72	11684 Lal. Geminorum	6 4 3	+ 26 2·2	$7\frac{1}{2}$	Good red.
108	...	...	14 Espin Aurigæ	6 4 56	+ 32 43·3	6	Reddish.
109	136	...	Arg. + 21°: 1146 Geminorum	6 5 14	+ 21 53·6	7	Pale red.
110	137	...	Arg. + 22°: 1220 Geminorum	6 5 39	+ 22 55·8	7	Red.
111	...	...	15 Espin Aurigæ	6 6 48	+ 33 16·3	7	Reddish orange.
112	141	...	Arg. + 39°: 1576 Aurigæ	6 9 3	+ 39 30·6	$7\frac{1}{2}$	Pale red. "? Var."
113	...	...	16 Espin Aurigæ	6 9 52	+ 39 53·7	7	Reddish.
114	...	...	18 Espin Aurigæ	6 10 6	+ 39 30.6	7	Deep red.
115	...	...	62 Espin Aurigæ	6 10 14	+ 33 14·8	9	Very red.
116	...	...	2029 B.A.C. Geminorum	6 12 42	+ 23 19·1	7	Pale orange. "Magnificent spectrum."
117	...	...	1183 H.P. Canis Majoris	6 12 48	− 16 46·3	5	Red.
118	...	...	12104 Lal. Orionis	6 14 29	− 2 53·2	5	Deep orange. "? Var." "Yellowish red" (Wickham).
119	...	...	Σ 895	6 14 55	+ 5 48·0		Fairly red.
120	...	...	160 Espin Aurigæ	6 15 24	+ 47 43·0	$8\frac{1}{2}$	"Red and probably var." (Espin).
121	...	...	12169 Lal. Canis Majoris	6 15 57	− 11 45·8	7	Fiery red. "Red" (Robinson
122	143	...	μ Geminorum	6 16 18	+ 22 34·1	$3\frac{1}{4}$	Reddish orange.
123	...	...	5 Lyncis	6 17 12	+ 58 28·7	$5\frac{1}{2}$	Fiery red. In a striking group.
124	...	...	3 Canis Majoris	6 18 5	− 33 22·8	4	"Rich orange yellow" (Tupman).
*125	144	74	— Geminorum	6 19 11	+ 14 46·8	7	Full deep orange. "? Var." "Yellowish" (Brodie).

Number.			Star.	R.A. 1890.	Decl. 1890.	Mag.	Colour; Remarks.
G. F. C.	Birm.	Dun-sink, Schj.		h. m. s.	° ′		
126	145	...	— Canis Majoris	6 19 16	−26 59·6	8	Pale crimson. "Intense ruby" (J. Herschel). "Orange red" (Brodie).
127	...	...	12359 Lal. Monocerotis	6 21 31	− 4 23·7	7	Deep orange.
128	...	...	12524 Lal. Canis Majoris	6 25 25	−19 8·1	$6\frac{1}{2}$	Orange.
129	...	...	12545 Lal. Monocerotis	6 26 50	− 8 5·2	$5\frac{1}{2}$	Reddish orange. "Red" (*Uran. Arg.*).
130	...	...	20 Espin Monocerotis	6 28 19	− 2 59·8	$7\frac{1}{2}$	Orange. Position approximate.
**131	148	78	2139 B.A.C. Aurigæ	6 28 59	+38 32·0	6	Deep fiery red.
132	...	...	21 Espin Aurigæ	6 31 2	+39 29·5	$6\frac{1}{2}$	Reddish orange.
133	...	...	ν^2 Canis Majoris	6 31 53	−19 9·7	4	Orange. "Red" (Robinson).
134	150	...	2196 B.A.C. Puppis	6 35 57	−52 50·0	6	"De color rojizo" (Moesta).
135	...	...	22 Espin Aurigæ	6 36 33	+40 44·2	7	Double: A 8, pale orange; B 10, blue; dist. 30″.
136	151	79b	12907 Lal. Monocerotis	6 36 41	− 9 3·5	$5\frac{1}{2}$	Orange.
137	...	...	23 Espin Geminorum	6 38 36	+24 46·5	$7\frac{1}{2}$	Fiery orange.
138	153	81	— Canis Majoris	6 41 14	−20 39·5	8	Pale red; near centre of cl. 41 M.
*139	...	...	13100 Lal. Monocerotis	6 42 22	− 8 52·4	$5\frac{1}{2}$	Reddish orange.
140	...	...	Arg. +61°: 915 Lyncis	6 43 10	+61 9·5	8	Red.
141	154	...	51 Cephei (Hev.)	6 48 46	+87 13·1	$5\frac{1}{4}$	Full orange.
142	156	...	θ Canis Majoris	6 49 5	−11 54·1	$4\frac{1}{4}$	Reddish orange.
143	157	...	o^1 Canis Majoris	6 49 34	−24 2·7	4	Deep orange.
144	158	...	μ Canis Majoris	6 51 3	−13 54·0	$5\frac{1}{4}$	Fiery red.
145	...	...	Arg. −8°: 1650 Monocerotis	6 52 49	− 8 52·6	7	Orange red.
146	161	...	2289 B. A. C. Puppis	6 53 20	−48 34·0	$5\frac{1}{2}$	"De color rojizo" (Moesta).
147	160	83	1245 Groom. Camelopardi	6 53 24	+70 53·4	$6\frac{1}{2}$	Pale red. Another star of same colour, mag. and decl. in the field.

Number.			Star.	R. A. 1890.	Decl. 1890.	Mag.	Colour; Remarks.
G. F. C.	Birm.	Dun-sink, Schj.		h. m. s.	° ′		
148	...	...	13627 Lal. Monocerotis	6 56 32	− 5 33·7	$5\frac{1}{2}$	Good orange. "? Var."
149	...	...	— Monocerotis	6 56 45	− 5 33·0	7	Pale orange.
150	162	...	22 Canis Majoris	6 57 20	−27 46·6	$3\frac{1}{2}$	Fiery red. "Reddish" (Brodie). "? Var."
151	163	86	— Monocerotis	6 57 29	− 8 17·7	8	Red. In cl. 50 M. "Reddish" (Brodie).
**152	165	88	— Monocerotis	7 1 36	− 7 23·3	8	Crimson.
*153	167	88 b	R Canis Minoris	7 2 40	+10 11·9	7–10	Red. "Var."
*154	166	89	— Canis Majoris	7 2 55	−11 45·6	$7\frac{1}{2}$	Decided red. A 9th mag. *np*.
155	...	...	2337 B. A. C. —Geminorum	7 3 43	+13 44·3	$6\frac{1}{2}$	Deep orange.
156	168	88 a	Camelopardi	7 7 56	+82 37·3	$5\frac{1}{4}$	Reddish orange.
157	170	91	14038 Lal. Geminorum	7 8 59	+22 9·4	7	Orange, or pale red.
158	...	...	L² Puppis	7 10 10	−44 27·7	5	"Red and var." (*Uran. Arg.*).
159	...	...	65 Espin Canis Majoris	7 12 0	−23 7·0	$6\frac{1}{2}$	Wide pair. A $6\frac{1}{2}$, orange; B 7, blue. "A probably var." (Espin).
160	...	...	14184 Lal. Monocertis	7 12 9	− 6 28·7	$6\frac{1}{2}$	Reddish orange.
161	171	...	π Puppis	7 13 15	−36 54·0	3	"Beautiful orange" (Gore). "Very rich yellow" (Tupman).
162	...	...	66 Aurigæ	7 16 31	+40 53·1	$5\frac{1}{2}$	Orange.
163	175	94	— Canis Majoris	7 18 28	−25 32·4	7	Red.
164	...	...	η Canis Majoris	7 19 44	−29 5·3	$2\frac{1}{2}$	Perhaps purplish. "? Purple" (Tupman). "Pale red" (Smyth).
165	...	...	171 Espin Lyncis	7 20 10	+46 11·4	8	Fiery red.
166	178	...	14599 Lal. Monocerotis	7 24 4	−10 5·9	6	Reddish orange. "? Var."
167	179	...	σ Argûs	7 25 44	−43 4·9	5	"Red" (Schmidt).
*168	...	...	14776 Lal. Puppis	7 28 44	−14 17·0	5	Fiery red. Precedes a brilliant field.
169	181	...	υ Geminorum	7 29 9	+27 8·7	$4\frac{1}{4}$	Orange.
170	...	...	25 Espin Lyncis	7 29 38	+40 15·8	7	Reddish. The *p* star of a curious curve of 5 stars.
171	182	...	1444 H.P. Geminorum	7 34 20	+23 17·3	6	Fiery red.

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172	...	...	14952 Lal. Puppis	7 34 26	−16 35·5	6	Pale red.
173	...	...	26 Espin Canis Minoris	7 34 55	+ 4 19·4	7	Reddish orange. Position approximate. ? R.A. too great by 30ˢ; and Decl. too little by 5′.
174	...	...	γ Monocerotis	7 36 0	− 9 17·7	4¼	Orange. "Reddish" (Robinson).
175	183	96	σ Geminorum	7 36 26	+29 9·0	4½	Pale orange; an 8th mag. red star *sp* 39ˢ.
176	186	97b	15018 Lal. Monocerotis	7 37 4	−10 37·2	8	Pale red.
177	187	...	Arg. +5°: 1759 Canis Min.	7 37 33	+ 5 12·3	7	Pale red.
178	189	...	*c* Puppis	7 41 20	−37 42·1	4½	"Orange" (J. Herschel). The chief star in neb. h 3099.
179	...	...	28 Espin Lyncis	7 42 43	+40 2·9	7	Good red.
180	...	...	176 Espin Canis Minoris	7 42 51	+ 5 42·0	9	Good red. ? Mag.
181	...	...	ξ Argûs	7 44 40	−24 35·0	3½	Good orange.
182	196	...	2704 B.A.C. Lyncis	8 1 2	+58 34·7	6	Orange.
*183	...	...	β Cancri	8 10 33	+ 9 31·4	4	Reddish orange.
184	...	...	16320 Lal. Hydræ	8 14 21	+ 3 6·6	8½	Very red. "Vividly red" (Bellamy).
185	201	...	2820 B.A.C. Puppis	8 19 13	−37 55·9	6	"De color rojizo" (Moesta).
186	...	...	ε Argûs	8 20 15	−59 9·3	2½	"Yellow; orange" (Tupman).
187	...	...	72 P. VIII. Puppis	8 20 18	−23 41·4	5½	Orange. "Orange" (Tupman).
188	205	...	17091 Lal. Hydræ	8 34 11	−19 21·1	6½	Red.
189	...	...	3449 Lac. Mali	8 35 5	−28 41·5	7	"Orange" (Gore). ? Place.
*190	211	115	17576 Lal. Cancri	8 49 11	+17 39·0	7	Pale crimson. "Rich orange red" (Brodie).
191	212	...	60 Cancri	8 49 56	+12 2·8	6–8	Reddish orange. "Probably var."
192	213	116	17624 Lal. Hydræ	8 49 21	−10 57·5	7½	Pale red: a blue star with a companion follows.
193	...	...	σ^1 Ursæ Majoris	8 58 48	+67 19·1	5¼	Deep orange.

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				h. m. s.	° ′		
194	...	...	ω Hydræ	9 0 11	+ 5 31·8	5½	Deep orange. "Red" (*Uran. Arg.*).
195	217	119	3121 B.A.C. Mali (κ Pyxis)	9 3 13	−25 24·6	4¾	Deep red.
196	...	...	λ Argûs	9 3 57	−42 59·3	2½	"Orange" (Tupman). "Blood red" (Pope).
197	218	120	Arg. + 31°: 1946 Cancri	9 4 0	+31 24·7	6½	Fiery red. "Pale orange" (Brodie). "? Var."
198	219	...	π^2 Cancri	9 9 10	+15 24·0	5¾	Pale orange. The *p* star of a curious group of 4.
199	...	...	*g* Carinæ	9 13 5	−57 4·9	4½	"Deep orange red" (Tupman).
200	220	...	α (40) Lyncis	9 14 21	+34 51·4	3½	Reddish orange; a small blue star, *nf*, 12ˢ.
201	221	...	Arg. + 0°: 2499 Hydræ	9 14 58	+ 0 38·2	7	Reddish.
202	...	...	18688 Lal. Hydræ	9 24 8	+20 16·0	6½	Red.
203	...	...	— Ursæ Majoris	9 25 11	+67 46·5	7	Orange. ?var. in colour. Decl. approximate.
204	224	...	λ Leonis	9 25 27	+23 27·3	4½	Reddish orange. "Slightly red" (*Uran. Oxon.*).
205	...	...	N Velorum	9 27 53	−56 32·9	3¾	"Very rich yellow" (Tupman).
206	226	...	ι Hydræ	9 34 14	− 0 38·7	4¼	Orange.
207	...	...	ε Leonis	9 39 36	+24 16·8	3	Pale orange.
208	...	...	*l* Carinæ	9 41 13	−62 0·0	4½	"Yellow; orange" (Tupman).
**209	228	123	R Leonis	9 41 39	+11 56·5	5–10	Pale crimson. "Var."
*210	229	124	Ö-A. (2) 10163 Hydræ	9 45 59	−22 30·2	7	Good red. "Distinctly red" (Bellamy).
211	...	...	66 Espin Ursæ Majoris	9 49 0	+54 47·0	7	Dark orange. = 2412 Rad.
212	230	...	— Velorum	9 50 57	−41 4·0	7½	"Scarlet" (J. Herschel).
213	...	...	29 Espin Leonis	9 51 46	+ 8 53·3	7	Reddish orange.
214	231	...	π Leonis	9 54 24	+ 8 34·3	5	Reddish orange.
215	...	...	19580 Lal. Sextantis	9 55 25	− 2 39·5	7	Reddish.
216	...	...	19620 Lal. Hydræ	9 56 38	−23 16·5	7	Reddish.

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217	...	...	19687 Lal. Sextantis	9 57 25	− 5 5·0	7	Reddish.
218	233	...	A (31) Leonis	10 2 4	+ 10 32·3	4½	Deep orange.
219	234	127	18 Sextantis	10 5 29	− 7 52·4	5¾	Reddish orange. "? Var."
220	235	...	2874 Brisb. Antliæ	10 7 5	− 34 46·7	7	"Scarlet" (J. Herschel).
221	...	...	30 Espin Ursæ Majoris	10 10 50	+ 42 0·9	6½	Fiery orange. "? Var."
222	...	...	*q* Carinæ	10 13 24	− 60 47·0	4	"Orange red" (Tupman).
223	...	...	V Velorum	10 15 29	− 54 28·6	5	"Red" (Tupman).
224	238	...	*μ* Ursæ Majoris	10 15 47	+ 42 4·2	3	Orange.
225	239	...	*μ* Hydræ	10 20 46	− 16 16·5	4	Reddish orange.
226	...	...	*s* Carinæ	10 23 50	− 58 10·6	4¼	"Yellow; orange" (Tupman).
227	...	...	4367 Lac. Carinæ	10 28 28	− 72 39·3	5½	"Deep orange" (Tupman).
228	240	...	3630 B. A. C. Antliæ	10 30 20	− 38 59·9	6½	"Orange; almost scarlet" (J. Herschel).
229	241	...	*r* Carinæ	10 31 22	− 56 59·3	5½	"De color rojizo" (Moesta). "Orange red" (Tupman).
**230	242	132	3637 B. A. C. Hydræ	10 32 7	− 12 48·7	5½	Fiery red. "Var. beyond question" (Gould).
231	...	...	t^2 Carinæ	10 34 34	− 58 36·6	5	"Deep orange red" (Tupman).
232	...	...	— Ursæ Majoris	10 37 26	+ 67 9·3	6	Good pale red.
233	...	...	4435 Lac. Carinæ	10 38 25	− 58 38·4	6	"Red" (Brisbane).
234	245	...	4446 Lac. Carinæ	10 39 21	− 59 59·4	6	"Red" (Brisbane). "Deep orange red" (Tupman).
235	247	...	*η* Argûs	10 40 47	− 59 6·5	6	"Orange" (Tupman). "Var."
236	...	...	*μ* Argûs	10 42 2	− 48 50·3	3	"Very red" (Tupman).
237	248	136	20918 Lal. Hydræ	10 46 16	− 20 37·9	7	Pale crimson. "Very red" (Robinson). "Copper red. Most magnificent" (*Dunsink*).
238	...	...	*u* Carinæ	10 49 1	− 58 16·1	4½	"Bright orange red" (Tupman).
239	...	...	— Leonis	10 50 0	+ 22 58·0	7	Orange. "Reddish yellow" (F. Brodie). Pos. approx.

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240	...	...	31 Espin Leonis	10 52 45	+20 13·4	7	Reddish.
241	...	...	α Crateris	10 54 27	−17 42·9	4½	Orange. "Red" (Robinson).
242	250	138	R Crateris	10 55 8	−17 44·0	8–9	Red. "Var." In the field with α Crateris.
243	254	...	ψ Ursæ Majoris	11 3 29	+45 5·8	3	Reddish.
244	...	...	x Carinæ	11 3 53	−58 22·7	4¾	"Deep orange red" (Tupman).
**245	259	141	ν Ursæ Majoris	11 12 32	+33 41·7	3¾	Deep golden yellow.
246	...	...	δ Crateris	11 13 50	−14 11·0	3½	Reddish yellow. "Orange red" (Robinson).
247	261	...	e (87) Leonis	11 24 42	− 2 23·7	5	Orange.
248	262	...	λ Draconis	11 24 52	+69 56·3	4	Orange.
249	...	...	υ Leonis	11 31 19	− 0 13·0	4½	Reddish yellow.
250	...	...	ω Virginis	11 32 47	+ 8 44·5	5½	Pale Orange. "Red" (*Uran. Arg.*).
251	...	...	22104 Lal. Crateris	11 34 16	−16 1·5	6	Reddish.
252	...	...	4899 Lac. Muscæ	11 42 57	−66 12·9	5	"Red" (Tupman).
253	269	...	203 P. XI. Virginis	11 52 30	+ 4 6·5	8	? Brighter than mag. 8. ? another star near is 203 P.
254	270	...	1845 Groom. Ursæ Minoris	11 54 35	+81 28·1	6	Reddish.
255	...	...	5032 Lac. Crucis	12 2 40	−60 14·1	6	"Red" (Stone).
*256	272	...	ε Corvi	12 4 28	−22 0·5	3	Reddish orange. "Reddish" (Robinson). "? Var."
257	...	...	ε Muscæ	12 11 38	−67 20·9	5	"Orange red" (Tupman).
258	...	...	ε Crucis	12 15 26	−59 47·6	4	"Orange" (Tupman).
**259	277	145	— Virginis	12 19 37	+ 1 22·7	8¼	Good crimson. "? Var."
260	...	...	71 Ursæ Majoris	12 19 48	+57 23·3	5½	Good orange.
*261	279	...	γ Comæ Berenices	12 21 27	+28 52·9	4¾	Deep golden yellow.
262	281	148	— Virginis	12 24 44	+ 5 1·5	8½	Deep red.
263	282	...	γ Crucis	12 25 3	−56 29·6	2	"Clear orange yellow" (Gould).
264	...	...	4 Draconis	12 25 19	+69 48·4	5¼	Reddish orange.

Number. G.F.C	Birm.	Dun-sink, Schj.	Star.	R.A. 1890. h. m. s.	Decl. 1890. ° ′	Mag.	Colour; Remarks.
265	...	...	23649 Lal. Virginis	12 33 49	− 5 29·7	6½	Reddish.
266	...	...	5250 Lac. Centauri	12 36 30	−48 12·5	...	"Intensely red" (*Uran. Arg.*).
*267	290	152	4287 B.A.C. Can. Venat.	12 39 57	+46 2·4	5½	Red. "Good orange" (Brodie). "Probably var."
268	291	...	— Crucis	12 40 58	−59 5·6	8½	"Most intense blood red" (J. Herschel).
269	295	...	κ Crucis	12 47 7	−59 45·2	7	In neb. h 3435; "central and largest star red."
270	...	...	ψ Virginis	12 48 38	− 8 56·4	5	Reddish orange. "Red" (*Uran. Arg.*).
271	298	155b	— Draconis	12 52 5	+66 35·3	7	Pale crimson. "Deep orange" (*Dunsink*).
272	299	156	24148 Lal. Comæ Berenices	12 52 40	+18 21·6	8	Red. "Red tinge" (Brodie).
273	300	...	36 Comæ Berenices	12 53 30	+18 0·1	5	Reddish yellow. "Perhaps var."
274	...	...	5460 Lac. Centauri	13 10 8	−44 7·4	7	"Red" (Stone).
275	303	158	γ Hydræ	13 12 56	−22 35·4	3½	Pale orange. "Red" (Brodie). "Perhaps var."
276	306	159	*i* Virginis	13 20 54	−12 8·1	5½	Reddish. "Yellowish red" (Brodie).
277	309	...	l^2 (74) Virginis	13 26 14	− 5 41·1	5	Orange. "Red" (*Uran. Arg.*).
278	311	...	W.B. (2) XIII. 596 Comæ Ber.	13 31 48	+25 10·2	6	Orange tinge.
279	...	...	25213 Lal. Virginis	13 34 2	−15 53·3	6½	Reddish.
280	312	...	83 Ursæ Majoris	13 36 34	+55 14·3	4¾	Golden. "? Var."
281	313	...	7561 Stone Hydræ	13 42 49	−27 49·0	6½	Red. "Splendid red." ? no such star here. ? Var. Double mags. 7, 10, Pos. 110° 77′. β. *Mem. R.A.S.* xlvii. 280.
282	...	...	25462 Lal. Virginis	13 44 11	−20 19·4	7	Reddish.
283	314	162	υ Boötis	13 44 11	+16 20·6	4	Orange "Probably var."
284	316	163	3105 Rad. Canum Venat.	13 48 29	+40 52·8	7	Orange.
285	318	...	π Hydræ	14 0 6	−26 9·0	3½	Deep orange.

Number. G. F. C.	Birm.	Dun-sink, Schj.	Star.	R.A. 1890. h. m. s.	Decl. 1890. ° ′	Mag.	Colour; Remarks.
286	...	...	θ Centauri	14 0 13	−35 49·6	2	"Pale orange?" (Tupman),
287	319	...	— Centauri	14 1 19	−59 12·2	8	"Double: both stars brick red" (J. Herschel).
288	320	...	13 Böotis	14 4 10	+49 58·6	5½	Orange.
289	321	...	4700 B.A.C. Virginis	14 4 51	−15 47·0	5¼	Rich orange.
290	322	...	κ Virginis	14 7 1	− 9 45·7	4¼	Orange. "Orange red" (Robinson).
291	323	...	—Centauri	14 9 0	−59 24·0	7½	"Ruby or high orange" (J. Herschel).
292	324	167b	4 Ursæ Minoris	14 9 17	+78 3·9	5	Orange.
293	325	167a	4732 B.A.C. Ursæ Minoris	14 10 2	+69 57·0	5¼	Pale orange.
**294	326	...	α Böotis	14 10 39	+19 45·3	1	Golden yellow.
295	...	...	Arg. +30°: 2513 Böotis	14 17 23	+29 52·9	6½	Reddish. "Orange red" (Espin).
*296	327	168	4775 B.A.C. Böotis	14 18 53	+ 8 35·2	7	Deep orange. "Yellowish red" (Brodie). "? Col. var."
297	328	169	26342 Lal. Böotis	14 19 14	+26 12·2	8	Pale red. "Ruby red" (Brodie). "? Var."
298	...	...	106 Virginis	14 22 53	− 6 24·3	6	Red.
299	330	171	ρ Böotis	14 27 5	+30 51·2	3½	Orange. "Reddish" (Brodie). Yellow (*Dunsink*).
300	335	...	α Centauri	14 32 7	−60 22·5	1	"Red." "Rich yellow" (Tupman).
301	337	173d	34 Böotis	14 38 35	+26 59·8	5	Orange.
*302	339	...	ε Böotis	14 40 11	+27 32·3	2½	Golden yellow.
303	340	...	58 Hydræ	14 43 50	−27 30·0	5	Red.
**304	341	...	β Ursæ Minoris	14 51 2	+74 36·3	2	Deep Golden yellow. "? Var."
305	...	...	— Libræ	14 51 42	−11 59·4	7½	Red.
*306	342	...	4949 B.A.C. Ursæ Minoris	14 55 50	+66 22.2	4¾	Orange.
*307	343	...	20 Libræ	14 57 38	−24 50·9	3½	Orange red. "Reddish" (Bellamy). "Red (Robinson). "Not red" (*Washburn Obs.*)
308	344	...	ν^1 Libræ	15 0 29	−15 49·7	5½	Reddish orange.
309	...	...	4984 B.A.C. Libræ	15 3 26	−23 33·9	7½	Good red.

Number.			Star.	R.A. 1890.	Decl. 1890.	Mag.	Colour; Remarks.
G. F. C.	Birm.	Dun-sink, Schj.		h. m. s.	° ′		
310	345	...	4976 B.A.C. Triang. Aust.	15 3 46	−69 39·8	6	"Almost scarlet" (J. Herschel). 'Red" (Stone).
311	346	...	δ Lupi	15 11 8	−29 44·6	5	Red.
312	347	...	— Apodis	15 14 3	−75 32·0	7	"Very high red" (J. Herschel).
313	...	...	ϕ^1 Lupi	15 14 49	−35 51·7	3½	"Very red" (Gould). "Reddish yellow" (Williams).
314	351	...	11 Ursæ Minoris	15 17 12	+72 13·4	5	Reddish.
315	...	...	ε Trianguli Australis	15 26 39	−65 56·7	4½	"Orange" (Tupman).
316	355	...	39 Libræ	15 30 21	−27 46·2	4	Decided red. "Not red" (*Washburn Obs.*).
317	...	...	68 Espin Coronæ Borealis	15 33 31	+24 52·8	7	Orange.
*318	357	...	θ Ursæ Minoris	15 34 41	+77 42·9	5¼	Orange.
319	...	...	κ Libræ	15 35 36	−19 19·3	5	Reddish orange.
320	358	...	κ Serpentis	15 43 47	+18 28·9	4	Orange.
*321	363	...	ρ Serpentis	15 46 25	+21 18·6	4¾	Pale orange.
322	365	...	θ Libræ	15 47 33	−16 24·5	4¼	Pale Orange.
323	...	...	28997 Lal. Libræ	15 50 57	−15 43·0	6¾	Red. "Reddish" (Robinson).
324	367	...	Arg. +47°: 2291 Coronæ Bor.	15 59 25	+47 32·3	7	Reddish orange.
325	...	...	6661 Lac. Normæ	15 59 42	−52 46·9	6¾	"Red" (Stone).
326	...	...	5347 B.A.C. Scorpii	16 1 25	−26 1·9	5¾	Good red.
327	369	185	W.B. (2) XV. 1569 Herculis	16 2 37	+22 7·0	6½	Reddish yellow. "Straw colour" (*Washburn Obs.*). "Pale yellowish red" (Brodie).
328	...	...	— Scorpii	16 3 3	−26 9·6	7½	Red. ? mag and colour.
329	370	...	47 Serpentis	16 3 10	+ 8 50·2	5¾	Decidedly reddish.
330	...	...	Arg. +9°: 3151 Serpentis	16 3 19	+ 8 55·2	7½	Orange.
**331	373	...	δ Ophiuchi	16 8 35	− 3 24·6	2¾	Reddish orange. "Orange red" (Robinson).
332	374	...	— Normæ	16 10 6	−45 32·0	8½	"Ruby red" (J. Herschel).
**333	376	...	ν^1 Coronæ Borealis	16 18 13	+34 4·5	5	Orange.

Number. G. F. C.	Birm.	Dun-sink, Schj.	Star.	R.A. 1890.	Decl. 1890.	Mag.	Colour; Remarks.
				h. m. s.	° ′		
**334	377	...	ν^2 Coronæ Borealis	16 18 21	+33 57·4	5	Orange. ν^1 is nearly the same in colour.
**335	381	...	α Scorpii	16 22 40	−26 11·2	1	Fiery red: double, dist. 3″.
336	383	...	β Herculis	16 25 30	+21 43·8	2¾	Golden. There is a red star ¾° *nf.* mag. 7.
337	...	...	69 Espin Herculis	16 27 0	+35 27·6	6½	Reddish orange. = 30129 Lal.
338	384	...	111 P. XVI. Scorpii	16 29 8	−35 1·7	5½	"Red."
339	385	...	— Scorpii	16 33 34	−32 9·7	8	"Deep red, like a drop of blood" (J. Herschel).
340	...	...	α Trianguli Australis	16 37 1	−68 49·5	2¼	"Orange; yellow" (Tupman).
341	...	...	η Aræ	16 40 17	−58 50·6	4	"Orange" (Tupman).
342	...	...	ε Scorpii	16 43 3	−34 5·5	2¼	"Orange; yellow" (Tupman).
343	...	...	ζ^2 Scorpii	16 46 50	−42 10·3	3	"Deep orange yellow" (Williams).
344	..	...	ζ Aræ	16 49 31	−55 48·9	4	"Bright orange" (Tupman.)
345	399	...	30 Ophiuchi	16 55 16	− 4 3·5	5	Reddish orange. "Probably var."
**346	402	...	α^1 Herculis	17 9 38	+14 31·0	3½	Deep orange. "Reddish" (Robinson). "Var."
347	...	...	— Ophiuchi	17 9 59	−15 5·3	7½	Fiery red.
348	404	...	π Herculis	17 11 13	+36 56·1	3½	Fiery orange. "? Var."
349	407	...	— Ophiuchi	17 14 14	+ 2 16·2	7	Red.
350	...	...	73 Espin Herculis	17 15 50	+17 9·9	7½	Red. ? Decl. too great.
351	...	...	β Aræ	17 16 9	−55 25·6	3	"Deep bright orange" (Tupman).
352	408	...	43 Ophiuchi	17 16 26	−28 2·3	5½	Reddish.
353	...	...	δ Aræ	17 21 10	−60 35·4	3	"Pale orange" (Tupman.
354	409	...	— Scorpii	17 22 49	−35 33·1	9	"Very deep red" (J. Herschel).
**355	410	202	— Ophiuchi	17 23 14	−19 23·1	8	Very decided red. "Ruby star" (J. Herschel). "Deep red, nearly crimson" (Brodie).
356	418	205	Serpentis	17 38 28	−18 36·4	8–9	Very little colour. "Very deep red" (*Dunsink*). "Probably var. in colour and mag."

Number.			Star.	R.A. 1890.	Decl. 1890.	Mag.	Colour ; Remarks.
G. F. C.	Birm.	Dun-sink, Schj.		h. m. s.	° ′		
357	....	...	76 Espin Herculis	17 42 58	+36 7·4	$6\frac{1}{2}$	Reddish orange.
358	...	...	77 Espin Herculis	17 44 4	+36 35·6	$6\frac{1}{2}$	Reddish orange.
359	...	...	79 Espin Ophiuchi	17 46 27	+ 1 8·1	7	Red. ? 886 Weisse.
360	...	...	80 Espin Ophiuchi	17 46 57	+ 1 20·4	$6\frac{1}{2}$	Fiery red. Fine field.
361	422	207	— Ophiuchi	17 52 32	+ 2 44·0	7	Reddish. "? Var."
**362	423	...	γ Draconis	17 54 3	+51 30·1	$2\frac{1}{2}$	Fiery orange.
363	425	...	γ^2 Sagittarii	17 58 44	−30 25·4	3	Reddish orange. "? Var."
364	...	...	7634 Lac. Sagittarii	18 8 3	−29 51·3	$7\frac{1}{2}$	"Reddish" (*Washburn Obs.*).
365	...	...	81 Espin Herculis	18 12 55	+17 55·5	7	Red.
366	433	...	Arg. + 23°: 3299 Herculis	18 13 32	+23 14·3	7	Orange.
367	434	...	δ Sagittarii	18 13 57	−29 52·5	$2\frac{3}{4}$	Orange red.
*368	437	211 a	33896 Lal. Herculis	18 16 57	+25 0·2	$7\frac{1}{2}$	Rich orange. "No red star here" (*Washburn Obs.*). "No colour" (*Dunsink*). ? R.A. too great by $1^m\ 28^s$; Decl. too great by 35′.
369	439	...	21 Sagittarii	18 18 46	−20 36·1	5	Red.
370	441	...	λ Sagittarii	18 21 11	−25 28·9	3	Orange.
**371	446	213	6306 B.A.C. Sagittarii	18 26 27	−14 56·7	$5\frac{3}{4}$	Fiery red. "Golden yellow" (Brodie). "Reddish" (Bellamy). "Not red" (*Dunsink*).
**372	448	...	Arg. + 36°: 3168 Lyræ	18 28 30	+36 54·5	8	Decided crimson. "? Var."
*373	449	...	1 Aquilæ	18 29 13	− 8 18·9	4	Orange.
374	...	...	82 Espin Lyræ	18 30 23	+38 21·1	7	Red.
375	452	...	6341 B.A.C. Herculis	18 30 57	+23 30·0	$5\frac{3}{4}$	Orange.
376	457	...	34746 Lal. Aquilæ	18 38 22	− 6 38·9	7	Reddish.
**377	464	219	—Scuti Sobieskii	18 43 57	− 8 1·9	8	Rich fiery red. "? Var." "Orange" (Brodie).

Number. G. F. C.	Birm.	Dun-sink, Schj.	Star.	R.A. 1890.	Decl. 1890.	Mag.	Colour ; Remarks.
				h. m. s.	° ′		
*378	466	...	ν^1 Sagittarii	18 47 32	−22 52·8	5	Red.
379	470	...	δ^2 Lyræ	18 50 39	+36 45·5	4½	Fiery orange. Good field.
380	...	...	9 Aquilæ	18 51 10	− 5 59·3	5	Orange "red" (*Uran. Arg.*).
*381	471	...	ξ^2 Sagittarii	18 51 9	−21 15·1	3½	Orange.
382	472	...	W.B. (2) XVIII. 1528 Herculis	18 51 15	+17 58·3	5¾	Pale orange.
*383	475	222	— Aquilæ	18 52 31	+14 12·6	9	"Deep fiery red" (*Dunsink*). Probably var. (G. F. C.)
384	...	...	87 Espin Lyræ	18 53 16	+36 19·3	7	Orange.
385	476	...	Arg. + 38° : 3362 Lyræ	18 53 23	+38 39·2	7½	Pale orange.
**386	478	...	12 Aquilæ	18 55 47	− 5 53·5	4	Orange. "? Var."
387	479	...	λ Lyræ	18 55 51	+31 59·4	5¼	Orange. "? Var."
388	480	222a	35562 Lal. Aquilæ	18 57 4	+ 8 12·8	6½	Orange.
389	482	222b	35624 Lal. Aquilæ	18 58 15	+ 8 7·9	8	Decided yellow : Good orange. "White" *Dunsink*). ? Colour var.
**390	483	222c	35611 Lal. Aquilæ	18 58 32	− 5 50.9	7½	Very fine fiery red. "? Var." "Decided red" (Brodie). "Deep red" (Wickham). "Copper red" (*Dunsink*).
391	485	...	τ Sagittarii	19 0 5	−27 49·6	3½	Reddish orange.
392	487	225	35928 Lal. Vulpeculæ	19 4 2	+24 0·3	7	Red.
393	...	...	89 Espin Lyræ	19 4 28	+38 58·7	7	Orange. = 78 Weisse.
394	490	...	Arg. + 18° : 4011 Sagittæ	19 10 42	+18 19·8	7	Orange.
395	492	...	— Lyræ	19 14 49	+27 3·2	9	Red. "? Var." Mag. 7½ ?
**396	...	...	4 Vulpeculæ	19 20 38	+19 35·0	5¼	Orange ; fine field. Includes 2 other orange stars.
*397	...	...	94 Espin Cygni	19 21 44	+50 1·0	7	Fiery red.
398	498	...	Arg. + 1° : 4004 Aquilæ	19 22 17	+ 1 57·2	8	Reddish. "? Var."
399	499	...	Arg. + 2° : 3904 Aquilæ	19 24 39	+ 2 40·6	6½	Reddish orange.
400	500	227	e (36) Aquilæ	19 24 54	− 3 1·1	5¼	Reddish orange. "Light orange" (Brodie). "Yellow" (*Dunsink*).

Number. G. F. C.	Birm.	Dun-sink, Schj.	Star.	R.A. 1890. h. m. s.	Decl. 1890. ° ′	Mag.	Colour; Remarks.
401	...	...	179 Espin Cygni	19 25 21	+45 48·9	8	Pale crimson. "Very red; ? Var." Espin).
**402	502	...	6702 B.A.C. Draconis	19 25 30	+76 21·1	6½	Strong fiery red. "? Var." "Reddish Orange" (Brodie).
**403	503	...	β Cygni	19 26 17	+27 43·7	3	Yellow, with a 7th mag. *comes* blue. Dist. 34″. "? Var."
404	504	...	Arg. +4°: 4152 Aquilæ	19 27 43	+ 4 47·6	7	Reddish orange.
*405	505	228	36981 Lal. Sagittarii	19 28 0	−16 36·6	7½	Orange. "Good ruby" J. Herschel). "Intense red" (*Dunsink*, 1875). "Fiery red" (Gore, 1876). "Red; deeper at times" (Bellamy). ?Var. in colour; no trace of ruby (G.F.C.). Crimson (G.F.C.).
406	506	...	Arg. +5°: 4190 Aquilæ	19 28 23	+ 5 13·5	7	Orange.
407	511	...	Arg. +12°: 4060 Aquilæ	19 39 29	+12 58·0	7	Reddish. Most southerly of 3 stars in a row.
*408	...	...	101 Espin Cygni	19 40 16	+40 26·6	6	Fiery red.
409	512	...	γ Aquilæ	19 41 2	+10 20·7	2¾	Brilliant orange. "Reddish yellow" (Robinson).
410	518	232	χ Cygni	19 46 20	+32 38·2	Var. 4–0	Fiery red, when approaching max.
411	519	...	19 Cygni	19 46 39	+38 26·1	5½	Full orange.
412	...	...	109 Espin Sagittæ	19 55 8	+17 18·3	7½	Orange; there is a red 9th mag. *nf.*
413	522	...	c Sagittarii	19 55 53	−28 1·0	4¾	Reddish orange.
414	...	...	38428 Lal. Cygni	19 59 41	+38 0·6	...	Reddish.
415	526	...	Ö-Arg. (2) 20234 Sagittarii	20 0 12	−27 32·5	7	Deep red. "Ruby" (J. Herschel). "Deep orange red" (Brodie).
416	530	...	Arg. +16°: 4153 Sagittæ	20 3 8	+16 21·4	6½	Orange.
*417	538	...	66 Aquilæ	20 7 33	− 1 20·3	5¾	Orange.
418	541	...	Arg. +38°: 3957 Cygni	20 9 24	+38 23·7	8	Decided red.
*419	545	238	Ö Arg. (2) 20363 Capricorni	20 10 40	−21 38·3	7½	Decided red. "Perhaps the finest of my ruby stars" (J. Herschel.) "Deep ruby; fine colour" (Brodie). "Bright ruby" (Bellamy).
420	546	...	23 Vulpeculæ	20 11 13	+27 28·6	4¾	Full orange.

Number.			Star.	R.A. 1890.	Decl. 1890.	Mag.	Colour; Remarks.
G.F.C.	Birm.	Dun-sink, Schj.		h. m. s.	° ′		
421	549	...	o^2 (32) Cygni	20 12 5	+47 22·6	4½	Pale orange.
422	551	...	6986 B.A.C. Cygni	20 12 59	+40 1·3	5½	Reddish orange.
423	553	239a	U Cygni	20 16 12	+47 32·9	7–11	Very red. "Remarkable ruby." "Var." In striking contrast with a blue star *nf.*
424	...	...	115 Espin Cygni	20 17 37	+53 14·2	7	Reddish.
425	556	...	— Aquilæ	20 19 10	+ 0 11.8	10	Reddish. ? Var. Mag. 8½, Aug. 9, 1885.
426	557	...	39 Cygni	20 19 28	+31 50·1	4½	Orange.
427	558	241	39304 Lal. Delphini	20 20 27	+ 9 42·0	7	Orange. "Probably var."
428	559	...	— Capricorni	20 21 12	−28 37·4	8	Decided red. "Fine ruby" (J. Herschel).
*429	...	...	117 Espin Delphini	20 24 2	+15 53·8	8½	Good red. There is a blue 8th Mag. S.
430	...	...	Arg. + 39°: 4208 Cygni	20 24 50	+39 36·7	9	Fiery red. "Colour very fine" (Espin).
431	563	...	47 Cygni	20 29 37	+34 52·4	4¾	Orange.
*432	566	...	Arg. + 17°: 4370 Delphini	20 32 54	+17 52·7	7	Full orange.
433	569	...	Arg. + 17°: 4401 Delphini	20 40 25	+17 41·5	7	Reddish. "Probably var."
434	...	...	119 Espin Cygni	20 43 4	+45 38·7	8½	Pale ruby.
435	...	...	121 Espin Cygni	20 46 8	+50 22·0	7½	Red.
436	...	...	122 Espin Cygni	20 47 20	+49 42·6	7	Deep orange.
437	572	...	Arg. + 32°: 3980 Cygni	20 49 26	+33 0·0	5¾	Orange.
438	...	...	3 Equulei	20 59 6	+ 5 3·9	5¾	Red. "Red" (*Uran. Arg.*).
439	575	...	A Capricorni	21 0 42	−25 26·7	4½	Deep orange.
440	...	...	124 Espin Cygni	21 6 40	+47 12·4	7½	Orange; a blue 7¼ mag. to the N.
*441	579	247	61 P. XXI. Cephei	21 9 59	+59 38·6	7½	Remarkable fiery red. "? Var."
442	580	...	8745 Lac. Indi	21 14 19	−70 11·7	6	"Red, inclining to orange" (J. Herschel).
443	...	...	125 Espin Cygni	21 14 58	+49 36·1	7	Fiery red.
*444	582	248b	— Cygni	21 18 16	+41 55·5	9	Deep red. A reddish star follows 15^s, and 20″ *s.*

Number. G. F. C.	Birm.	Dun-sink, Schj.	Star.	R. A. 1890.	Decl. 1890.	Mag.	Colour; Remarks.
				h. m. s.	° ′		
445	...	...	184 Espin Cygni	21 19 5	+ 40 28·1	$7\frac{1}{2}$	Red.
*446	583	...	2 Pegasi	21 24 58	+ 23 9·4	$4\frac{3}{4}$	Bright orange.
447	585	...	Arg. + 45° : 3584 Cygni	21 29 9	+ 45 21·9	7	Reddish orange.
448	587	...	Arg. + 44° : 3877 Cygni	21 31 53	+ 44 53·1	7	Reddish orange.
449	589	249 a	889 Bess. Cygni	21 37 23	+ 35 0·4	7	Unmistakable fiery red.
450	590	...	— Cygni	21 37 24	+ 42 20·4	7	Strong reddish tinge. "Schmidt's *Nova* of 1876."
**451	591	...	ε Pegasi	21 38 47	+ 9 22·2	$2\frac{1}{2}$	Full orange. "Probably var."
**452	592	251	923 Bess. Cygni	21 38 43	+ 37 30·7	8	Deep fiery red or pale crimson. "Good red" (Brodie).
**453	594	253	μ Cephei	21 40 8	+ 58 16·5	4–6	Intense reddish orange. "Light orange" (Brodie)
**454	596	254	42431 Lal. Aquarii	21 40 50	− 2 43·4	$6\frac{1}{2}$	Decided red. "? Var." "Fine red" (*Dunsink*).
*455	599	...	7658 B. A. C. Cephei	21 53 33	+ 63 5·7	$5\frac{1}{4}$	Fiery orange.
*456	...	...	133 Espin Cephei	21 54 22	+ 65 37·6	$6\frac{1}{2}$	Fiery red. Blue star $6\frac{1}{2}$ mag. near, *p*.
*457	600	258	— Pegasi	21 58 59	+ 27 49·1	$7\frac{1}{2}$	Fiery red. "Orange tinge" (Brodie). "? Var."
458	601	...	18 Cephei	22 0 39	+ 62 33·8	$5\frac{1}{2}$	Reddish orange.
459	602	...	20 Cephei	22 1 40	+ 62 14·9	$5\frac{1}{2}$	Orange.
460	...	...	134 Espin Lacertæ	22 6 30	+ 39 9·9	$7\frac{1}{4}$	Reddish.
461	604	...	ζ Cephei	22 7 3	+ 57 39·5	$3\frac{1}{2}$	Pale orange.
462	606	...	7766 B. A. C. Cephei	22 8 56	+ 62 43·5	6	Reddish orange.
463	607	260	7765 B. A. C. Lacertæ	22 9 9	+ 39 10·0	$4\frac{1}{2}$	Orange.
464	609	261	43501 Lal. Pegasi	22 11 56	+ 4 35·8	$7\frac{3}{4}$	Dull pale red. "Tinge of red" (Brodie).
465	610	262	7813 B. A. C. Cephei	22 18 59	+ 55 24·4	7	Good red.
466	...	...	36 Pegasi	22 23 39	+ 8 34·1	6	Reddish orange. "Red" (*Uran. Arg.*).
467	612	...	5 Lacertæ	22 24 57	+ 47 8·7	$4\frac{1}{2}$	Reddish orange.

Number. G. F. C.	Birm.	Dun-sink, Schj.	Star.	R.A. 1890. h. m. s.	Decl. 1890. ° ′	Mag.	Colour; Remarks.
468	613	262a	δ Cephei	22 25 5	+57 51·1	$3\frac{1}{2}$–$4\frac{1}{2}$	Orange; with blue companion in good contrast. "Var."
469	...	...	136 Espin Cephei	22 30 23	+57 36·1	$7\frac{1}{2}$	Fiery red.
470	...	...	Arg. + 57°: 2568 Cephei	22 32 16	+57 51·4	$7\frac{1}{4}$	Red. "Var. 7–8" (Espin).
471	615	...	Arg. + 56°: 2821 Cephei	22 34 18	+56 13·6	$5\frac{1}{2}$	Reddish.
472	616	...	11 Lacertæ	22 35 40	+43 42·1	$4\frac{3}{4}$	Reddish orange.
473	617	...	β Gruis	22 36 6	−47 27·7	3	"Reddish." "Orange" (Williams).
*474	620	...	τ^2 Aquarii	22 44 47	−14 10·4	4	Orange. "? Var."
475	622	...	15 Lacertæ	22 47 5	+42 43·7	5	Reddish orange.
476	...	...	138 Espin Lacertæ	22 52 25	+42 25·1	7	Orange.
477	625	263	267 P. XXII. Aquarii	22 53 8	−25 45·0	6	Reddish. "Pale red" (Brodie).
**478	627	264a	β Pegasi	22 58 25	+27 29·0	$2\frac{1}{2}$	Rich golden.
**479	629	266	55 Pegasi	23 1 27	+ 8 48·8	$4\frac{1}{2}$	Orange.
480	630	266a	57 Pegasi	23 3 59	+ 8 4·8	$5\frac{1}{2}$	Reddish orange.
481	631	...	631 B Aquarii	23 8 2	−13 59·5	7	Reddish. "Double, A 7; B 10; dist. 1·40″."
482	632	...	φ Aquarii	23 8 37	− 6 38·3	$4\frac{1}{4}$	Deep orange.
483	633	...	ψ^1 Aquarii	23 10 5	− 9 41·1	$4\frac{1}{2}$	Orange.
484	634	...	χ Aquarii	23 11 9	− 8 19·4	$5\frac{1}{4}$	Orange.
**485	635	267	8 Andromedæ	23 12 38	+48 24·9	5	Fiery red. "Orange red" (Brodie).
486	637	268	262 Bess. Pegasi	23 14 44	+22 29·4	7	Orange. "Var."
487	642	272	46112 Lal. Pegasi	23 27 0	+23 14·3	7	Pale orange.
488	643	272a	71 Pegasi	23 27 57	+21 53·5	$5\frac{1}{2}$	Deep orange.
489	644	...	λ Andromedæ	23 32 10	+45 51·7	4	Orange.
490	645	...	77 Pegasi	23 37 46	+ 9 43·2	$5\frac{1}{2}$	Deep orange.
491	647	...	78 Pegasi	23 38 27	+28 45·1	5	Pale orange.
**492	648	273	19 Piscium	23 40 45	+ 2 52·5	$5\frac{1}{4}$	Decided red. "Probably var."
493	651	276	4154 Groom. Cephei	23 47 2	+74 55·8	$6\frac{1}{4}$	Reddish orange.
494	653	...	235 P. XXIII. Pegasi	23 51 5	+22 2·1	6	Reddish. "Slightly red" (*Uran. Oxon.*).

Number.			Star.	R. A. 1890.	Decl. 1890.	Mag.	Colour ; Remarks.
G. F. C.	Birm.	Dun-sink, Schj.		h. m. s.	° ′		
495	654	...	9659 Lac. Sculptoris	23 51 28	−27 14·2	6½	Reddish.
**496	655	...	ψ Pegasi	23 52 9	+24 31·9	4½	Reddish yellow,
**497	656	278	R Cassiopeiæ	23 52 49	+50 46·5	5–12	Very red. "Vivid red" (Brodie). "Var."
**498	658	280	6259 Rad. Cassiopeiæ	23 55 39	+59 44·5	8	Very fiery red. A 9th mag. blue star near.
*499	...	...	30 Piscium	23 56 19	− 6 37·5	4½	Fiery red. "Red" (*Uran. Arg.*).
500	...	...	33 Piscium	23 59 42	− 6 19·4	4¾	Orange. "Red" (*Uran. Arg.*).

CHAPTER XIII.

A CATALOGUE OF KNOWN AND SUSPECTED BINARY STARS.

THE materials for this Catalogue have been selected from the latest and most trustworthy sources available, and no pains have been spared to make it fairly complete; but data for the compilation of such a list as this, even in an elementary form, are rather scarce, though less so than formerly.

The signs + and − in the last two columns indicate, it need hardly be said, that the position angle or the distance is increasing or diminishing as the case may be. A note of interrogation (?) denotes probability without certainty, but ± ? means that it is wholly impossible, owing to the discordances in the measures, to pronounce an opinion one way or the other.

The "Struve" numbers, which are within brackets, refer to O. Struve's Catalogue.

The measures given in the last 2 columns are as a rule all as recent as 1880–6, the new and valuable results of Engelmann and Perrotin[a] having been utilised as much as possible.

[a] For the titles of these and of other Catalogues of Double Stars, see Vol. II. p. 495.

PART I.—KNOWN BINARY STARS.

No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+	Mag.	Position.	Distance.
			h. m. s.	° ′			°	″
1	8372 B.A.C. Cassiop.	3062	0 0 28	+57 49·2	80·5	7 8	303+	1·57+
2	316 B Cephei ...	2	0 3 13	+79 6·0	80·5	6½ 7	single—	single—?
3	1007 h Andromedæ	[2]	0 7 57	+26 23·0	83·8	7 8½	38—	0·71+?
4	318 B Cephei ...	13	0 9 57	+76 20·0	80·6	7 7½	97—	0·75±?
5	λ Cassiopeiæ... ...	[12]	0 25 41	+53 54·9	80·6	6 6½	144+	0·47±?
6	η Cassiopeiæ... ...	60	0 42 26	+57 13·9	82·8	4 7½	165+	5·1 —
7	66 Piscium	[20]	0 48 45	+18 35·6	80·7	6 7	8—	0·41±?
8	36 Andromedæ ...	73	0 49 4	+23 2·0	85·2	6 7	2+	1·3 +
9	251 P.O. Piscium...	80	0 53 45	− 0 11·4	85·2	8 9	315+	20·5 +
10	42 Ceti	113	1 14 11	− 1 5·2	77·0	6 8	348+	1·3 ±?
11	123 P.I. Piscium...	138	1 30 17	+ 7 5·0	86·9	6½ 8	216+	1·3 —?
12	*p* (6) Eridani ...	...	1 35 37	−56 45·2	80·4	6½ 6½	234±?	6·3 +
13	586 B.A.C. Piscium	186	1 50 12	+ 1 18·2	78·8	7 7½	169+?	0·31—
14	α Piscium	202	1 56 21	+ 2 14·0	83·8	3 4	323—	2·9 —
15	γ^2 Andromedæ ...	[38]	1 57 8	+41 48·1	83·8	5 6¼	103—	0·40—?
16	259 B Andromedæ	228	2 6 59	+46 56·1	83·5	7 8	348+	0·31—
17	257 Σ Persei ...	257	2 16 37	+61 3·2	74·2	7 8	181—?	0·46±?
18	*i* Cassiopeiæ AB....	262	2 20 0	+66 54·4	86·0	4½ 7	176—	4·9 +
19	278 Σ Cassiopeiæ ...	278	2 29 18	+68 15·0	70·4	8 8½	76±?	0·56+?
20	114 B. Arietis ...	305	2 41 15	+18 54·5	82·9	7 8	318—	3·0 +
21	ε Arietis	333	2 52 55	+20 54·0	83·8	5 6½	198+	1·21+
22	367 Σ Ceti	367	3 8 23	+ 0 19·8	78·9	8 8	246—	0·63—
23	7 Tauri AB. ...	412	3 27 55	+24 5·7	84·0	6 6½	224—	0·39—
24	98 P. III. Eridani	422	3 31 8	+ 0 13·9	84·4	6 8	244+	6·2 +
25	49 Hev. Cephei ...	460	3 51 31	+80 24·3	83·2	5½ 6½	35+	0·9 ±?
26	511 Σ Camelopardi	511	4 8 41	+58 30·7	83·0	6 7	284—	0·46±?
27	55 Tauri	[79]	4 13 36	+16 15·5	79·0	6 7	58+	0·44±?
28	230 B Tauri	535	4 17 12	+11 6·9	84·0	7 8	337—	1·8 —?
29	2 Camelopardi ...	566	4 31 13	+53 15·4	82·9	5½ 7½	291—	1·8 ±?
30	577 Σ Aurigæ ...	577	4 34 50	+37 18·6	85·1	7½ 8	73—	1·4 ±?

No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+	Mag.		Position.	Distance.
			h. m. s.	° ′				°	″
31	*i* Orionis	[98]	5 1 54	+ 8 21	84·2	6	7	202	0·99
32	118 Tauri	716	5 22 30	+25 3·6	82·1	6	7	199+	5·1 ±?
33	A (32) Orionis ...	728	5 24 54	+ 5 52·0	82·9	5	7	192−	0·34−
34	380 B Tauri	742	5 29 50	+21 55·9	83·6	7	$7\frac{1}{2}$	257+	3·4 ±?
35	932 Σ Geminorum	932	6 28 5	+14 49·9	83·8	8	$8\frac{1}{2}$	327	2·3
36	12 Lyncis AB	948	6 36 30	+59 33·1	82·7	5	6	128−	1·7 +
	„ AC				82·2	5	7	126+	8·3 −?
37	α Canis Majoris ...	...	6 40 18	−16 33·7	86·2	1	9	30−	7·4 −?
38	15 Lyncis	[159]	6 47 45	+58 34·3	83·2	5	6	0−	0·7 +
39	ε (38) Geminorum	982	6 48 26	+13 19·1	82·9	5	8	163−	6·2 +
40	1037 Σ Geminorum	1037	7 5 58	+27 24·7	84·1	7	$7\frac{1}{2}$	310−	1·2 −?
41	α Geminorum ...	1110	7 27 35	+32 7·8	86·3	2	3	232−	5·7 +
42	1157 Σ Monocerotis	1157	7 49 1	− 2 29·9	82·2	8	$8\frac{1}{4}$	250	1·4
43	85 B Lyncis	1187	8 2 33	+32 34·9	84·1	7	$7\frac{1}{2}$	47−	2·0 +
44	ζ Cancri AB	1196	8 5 54	+18 0·9	86·3	6	7	56−	1·08+
	„ AC				84·2	6	$7\frac{1}{2}$	125−	5·7 +?
45	1216 Σ Hydræ ...	1216	8 15 46	− 1 14·9	79·2	7	$7\frac{1}{2}$	160+	0·37−?
46	ε Hydræ	1273	8 40 57	+ 6 49·3	82·9	4	$8\frac{1}{2}$	226+	3·4 ±?
47	ι Ursæ Majoris ...	...	8 51 41	+48 28·4	83·4	$3\frac{1}{2}$	11	356+	9·5 −
48	σ² Ursæ Majoris ...	1306	9 0 44	+67 35·0	82·8	5	8	238−	2·6 −
49	3121 Σ Cancri ...	3121	9 11 19	+29 4·4	80·3	7	$7\frac{1}{4}$	199+	0·5 ±?
50	157 B Lyncis ...	1338	9 14 7	+38 39·1	82·3	$7\frac{1}{2}$	8	153+	1·8 +
51	ω Leonis	1356	9 22 34	+ 9 32·2	86·3	6	7	92+	0·7 +
52	30 B Leonis Minoris	1374	9 34 33	+39 27·1	84·1	7	8	282+	3 2 −
53	161 P. IX. Sextantis	1377	9 37 45	+ 3 7·9	71·1	8	10	141+	3·5 −?
54	φ Ursæ Majoris ...	[208]	9 44 38	+54 34·6	82·2	5	$5\frac{1}{4}$	139	0·2
55	8 Sextantis	...	9 47 4	− 7 34·6	...	6	$6\frac{1}{2}$	...	...
56	23 P. X. Leonis ...	[215]	10 10 17	+18 17·4	85·9	7	7	219−	1·0 +
57	γ Leonis AB... ...	1424	10 13 54	+20 23·8	85·1	2	4	113+	3·4 +
58	145 B Leonis ...	1426	10 14 47	+ 6 59·2	83·5	$7\frac{1}{2}$	8	276+	0·9 +
59	1457 Σ Sextantis ...	1457	10 32 59	+ 6 18·5	84·1	$7\frac{1}{2}$	$8\frac{1}{2}$	314+	1·3 +
60	ξ Ursæ Majoris ...	1523	11 12 20	+32 9·5	86·3	4	$5\frac{1}{2}$	237−	2·0 +

No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+.	Mag.		Position.	Distance.
			h. m. s.	° ′				°	″
61	ι Leonis	1536	11 18 11	+11 8·4	84·2	4	8	64 −	2·6 +
62	126 South Ursæ Maj.	[234]	11 24 51	+41 54·2	80·3	7	7½	178 + ?	0·18 +
63	235 Σ Ursæ Majoris	[235]	11 26 3	+61 41·2	82·6	6	7¼	64 +	1·2 +
64	191 B Virginis ...	1647	12 24 57	+10 20·0	85·3	7½	8	217 +	1·4 +
65	γ Centauri	...	12 35 28	−48 21·5	80·4	4	4	1	1·4
66	γ Virginis	1670	12 36 5	− 0 50·8	84·9	3½	3½	336 −	5·3 +
67	1678 Σ Comæ Berenices	1678	12 39 58	+14 58·2	80·3	6½	7¼	200 −	32·4 +
68	35 Comæ Berenices	1687	12 47 53	+21 50·6	85·3	5	8	65 +	1·1 − ?
69	α Comæ Berenices	1728	13 4 39	+18 6·6	82·9	5	5	192 +	0·56 + ?
70	127 P. XIII Virginis	1757	13 28 40	+ 0 14·9	82·4	8	9	69 +	2·3 +
71	25 Canum Venat....	1768	13 32 34	+36 51·5	85·3	6	7	329 −	0·89 +
72	84 Virginis	1777	13 37 33	+ 4 5·8	86·4	6	8	231 ± ?	3·4 ± ?
73	1785 Σ Boötis ...	1785	13 44 6	+27 31·9	80 4	7½	8	215 +	2·1 −
74	1819 Σ Virginis ...	1819	14 9 48	+ 3 39·0	85·4	8	8	11 −	1·4 +
75	1830 Σ Boötis ...	1830	14 12 11	+57 11·1	85·4	8½	9	286 +	6·1 +
76	70 P. XIV Libræ...	1837	14 18 46	−11 10·1	79·4	7	8½	311 −	1·5 − ?
77	α Centauri	...	14 32 7	−60 22·7	85·5	1	2	200	14·0
78	π Boötis	1864	14 35 33	+16 53·5	80·4	3½	6	102 +	5·9 −
79	1876 Σ Libræ ...	1876	14 40 33	− 6 55·5	78·9	8	8	72	1·4
80	ε Boötis...	1877	14 40 11	+27 32·2	85·4	3	6	328 +	2·8 −
81	ξ Boötis...	1888	14 46 18	+19 33·6	86·6	4½	6½	259 −	3·3 −
82	288 OΣ Boötis ...	[288]	14 48 14	+16 10·0	84·4	6	7	195 −	1·4 +
83	i (44) Boötis... ...	1909	15 0 11	+48 5·0	85·6	5	6	241 +	5·0 +
84	1 B Coronæ Bor. ...	1932	15 13 37	+27 13·6	80·4	6	6½	302 +	0·90 −
85	η Coronæ Bor. ...	1937	15 18 39	+30 41·4	86·6	5	6	179 +	0·57 +
86	μ^2 Boötis	1938	15 20 22	+37 44·0	86·8	7	8	106 −	0·70 +
87	δ Serpentis	1954	15 29 33	+10 54·5	86·5	3	5	190 −	3·5 +
88	298 OΣ Boötis ...	[298]	15 31 3	+40 10·8	86·7	7	8	105 +	0·29 +
89	γ Coronæ Bor. ...	1967	15 38 7	+26 38·7	86·7	4	6½	160 −	0·93 +
90	ξ Scorpii (51 Libræ)	1998	15 58 19	−11 4·1	83·6	4½	5	194 +	1·14 +
91	49 Serpentis	2021	16 8 10	+13 49·8	84·5	7	7½	329 +	3·9 +
92	2026 Σ Herculis ...	2026	16 9 24	+ 7 38·5	71·5	8½	9½	325 ± ?	1·4 ± ?
93	σ Coronæ Bor. ...	2032	16 10 34	+34 8·2	85·7	6	6½	207 +	4·1 +

No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800 +.	Mag.		Position.	Distance.
			h. m. s.	° ′				°	″
94	λ Ophiuchi	2055	16 25 22	+ 2 13·6	86.6	4	6	44 +	1·57 +
95	ζ Herculis	2084	16 37 8	+ 31 48·2	86·7	3	7	90 −	1·78 +
96	21 Ophiuchi	[315]	16 45 50	+ 1 24·4	84·4	6	8	162 −	0·86 −
97	2106 Σ Ophiuchi ...	2106	16 45 52	+ 9 35·9	84·5	6	8	311 −	0·59 − ?
98	167 B Herculis ...	2107	16 47 29	+ 28 50·7	85·5	7	$8\frac{1}{2}$	236 +	0·78 ± ?
99	270 P. XVI. Ophiuchi	2114	16 57 41	+ 8 36·7	84·5	$6\frac{1}{2}$	$7\frac{1}{2}$	157 +	1·27 ± ?
100	210 B Herculis ...	2120	17 0 24	+ 28 14·5	87·8	6	9	247 −	5·9 +
101	μ Draconis	2130	17 3 3	+ 54 37·1	83·4	4	$4\frac{1}{2}$	343 −	2·4 −
102	36 Ophiuchi	...	17 8 34	− 26 25 3	79·9	$4\frac{1}{2}$	$6\frac{1}{2}$	...	
103	δ Herculis	3127	17 10 31	+ 24 58·3	83·5	4	$8\frac{1}{2}$	184 +	17·0 −
104	ρ Herculis	2161	17 19 53	+ 37 14·9	83·6	4	5	311 +	3·9 +
105	221 B Ophiuchi ...	2173	17 24 44	− 0 58·3	84·5	6	7	17 + ?	0·39 − ?
106	μ^1 Herculis BC ...	2220	17 42 10	+ 27 47·7	80·4	10	11	246 +	0·96 +
107	338 OΣ Herculis ...	[338]	17 46 58	+ 15 20·7	84·5	$6\frac{1}{2}$	$6\frac{3}{4}$	19 −	0·8 + ?
108	τ Ophiuchi	2262	17 57 5	− 8 10·7	86·6	5	6	256 +	1·8 +
109	70 Ophiuchi	2272	17 59 53	+ 2 32·5	86·6	4	6	13 −	2·0 −
110	ϵ^1 Lyræ	2382	18 40 41	+ 39 33·2	86·8	5	6	15 −	3·3 − ?
111	ϵ^2 Lyræ	2383	18 40 41	+ 39 29·0	86·8	5	5	134 −	2·4 ± ?
112	2402 Σ Serpentis ...	2402	18 43 33	+ 10 32·6	84·5	8	$8\frac{1}{2}$	204 +	1·08 +
113	274 P. XVIII. Aquil. BC	2434	18 57 5	− 0 51·9	80·6	9	$10\frac{1}{2}$	63 −	1·46 −
114	γ Coronæ Aust. ...	...	18 59 0	− 37 12·9	83·6	6	6	37 ± ?	1·62 ± ?
115	2455 Σ Vulpec. ...	2455	19 2 12	+ 22 0·1	83·6	$7\frac{1}{2}$	$9\frac{1}{2}$	95 −	3·4 ± ?
116	108 P. XIX. Draconis	2509	19 15 47	+ 63 0·5	79·7	$6\frac{1}{2}$	8	342 − ?	0·94 + ?
117	δ Cygni	2579	19 41 31	+ 44 51·7	85·9	3	8	319 −	1·84 − ?
118	400 OΣ Cygni ...	[400]	20 6 29	+ 43 38·3	74·5	$7\frac{1}{2}$	$8\frac{1}{2}$	107 −	round.
119	2696 Σ Delphini ...	2696	20 28 3	+ 5 3·9	86·7	8	$8\frac{1}{2}$	309	0·8
120	β Delphini	β 151	20 32 23	+ 14 12·8	83·5	4	5	182 +	0·23 ± ?
121	λ Cygni	[413]	20 43 7	+ 36 5·1	83·5	5	6	80 −	0·65 ± ?
122	4 Aquarii	2729	20 45 35	− 6 2·3	79·7	6	7	167 +	0·56 + ?
123	ε Equulei AB ...	2737	20 53 35	+ 3 52·5	86·2	6	6	284 −	0·97 + ?
124	61^1 Cygni	2758	21 1 57	+ 38 12·5	83·8	5	6	119 +	20·4 +
125	2760 Σ Cygni ...	2760	21 2 17	+ 33 41·1	86·7	7	8	225 ± ?	8·0 −

No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+.	Mag.	Position.	Distance.
			h. m. s.	° ′			°	″
126	δ Equulei AB ...	[535]	21 9 7	+ 9 33·9	86·9	4 4¼	203 −	0·47 −
127	2778 Σ Aquarii ...	2778	21 9 59	− 1 41·4	80·7	8 9	271 +	19·9 −
128	20 B Pegasi	2799	21 23 31	+ 10 36·5	86·7	7 7	306 −	1·4 ±?
129	29 B Pegasi	2804	21 27 52	+ 20 13·6	83·7	7½ 8	328 +	2·8 +?
130	μ Cygni	2822	21 39 12	+ 28 15·0	85·6	4 5	119 +	3·2 −
131	ξ Cephei	2863	22 0 35	+ 64 5·4	85·7	5 6	284 −	6·5 +
132	ζ Aquarii	2909	22 23 9	− 0 35·0	83·6	4 4½	330 −	3·2 −
133	2934 Σ Pegasi ...	2934	22 36 32	+ 20 51·6	84·2	7½ 9	157 −	1·1 −
134	π Cephei	[489]	23 4 23	+ 74 47·6	80·5	5 10	25 +	1·10 −
135	o Cephei	3001	23 14 4	+ 67 30·5	83·3	5 8	191 +	2·8 +
136	69P.XXIII.Aquarii	3008	23 18 4	− 9 3·8	80·9	8 8½	255 −	4·6 −
137	85 Pegasi	...	23 56 23	+ 26 30·3	81·5	6 12	311 +	0·58 −

PART II.—SUSPECTED BINARY STARS.

This list must be regarded as being just a little more than what the above title would indicate, for it includes various pairs which are in motion in a rectilinear direction, and also some objects of which no recent measures seem to exist, or, at any rate, to have been published. In other words, taken as a whole, it may be said to be intended to suggest to astronomers work which needs to be done.

The arrangement of the columns is the same as in Part I., and the introductory remarks made there apply, as a rule, here.

No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+.	Mag.	Position.	Distance.
			h. m. s.	° ′			°	″
1	4 OΣ Andromedæ	[4]	0 10 57	+35 51·0	80·5	7 8	163 −	0·4 −
2	1968 h Ceti	...	0 22 4	−17 1·1	80·7	7 10	73 + ?	7·0 −
3	44 Σ Andromedæ...	44	0 32 27	+40 22·9	85·8	8½ 9	264 + ?	9·4 +
4	φ Andromedæ ...	[515]	1 3 5	+46 39·5	83·8	4 6½	260 −	0·25 ± ?
5	ζ Piscium	100	1 7 59	+ 6 43·7	84·0	6 8	63	23·5
6	ψ Cassiopeiæ BC ...	117	1 18 10	+67 33·3	72·6	9 11	253	2·7 − ?
7	100 Piscium	136	1 29 1	+11 59·8	65·4	7 8	78	15·8
8	162 Σ Androm. AB	162	1 42 25	+47 21·2	83·8	6½ 7½	217 −	1·8 − ?
9	γ Arietis	180	1 47 29	+18 45·3	83·8	4½ 5	358 +	8·4 −
10	10 Arietis	208	1 57 23	+25 24·3	83·8	6 8½	50 +	1·04 −
11	234 Σ Cassiopeiæ...	234	2 9 16	+60 51·1	71·2	8 8½	220 −	0·6 −
12	40 OΣ Trianguli ...	[40]	2 14 59	+37 59·8	83·9	7½ 8	51 −	0·5 ± ?
13	285 Σ Trianguli ...	285	2 32 1	+32 57·0	83·8	7 7½	171	1·8
14	43 OΣ Arietis ...	[43]	2 34 14	+26 8·8	83·9	7 9	52 −	0·9 +
15	84 Ceti	295	2 35 35	− 1 9·8	64·9	6 12	325 −	4·6 ± ?
16	θ Persei AB	296	2 36 41	+48 45·8	80·1	4 10	299 +	16·5 ±
17	γ Ceti	299	2 37 36	+ 2 33·5	83·9	3 6	289 +	2·9 ± ?
18	85 B Persei	314	2 45 2	+52 32·2	80·0	7½ 8	302 +	1·4 ± ?
19	326 Σ Arietis ...	326	2 49 6	+26 26·0	83·9	7 9	217 ± ?	8·2 −
20	360 Σ Persei... ...	360	3 5 10	+36 48·1	83·9	7½ 8	139 −	1·9 +

No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+	Mag.	Position.	Distance.
			h. m. s.	° ′			°	″
21	1 P. III. Cassiopeiæ	[52]	3 7 56	+65 15·0	74·1	6½ 7	139−	elong. ±
22	367 Σ Ceti	367	3 8 23	+ 0 19·8	77·0	8 8	245−	0·5 −
23	53 OΣ Persei ...	[53]	3 10 31	+38 13·7	83·9	7 8	252−	0·6 ±?
24	400 Σ Camelopardi	400	3 26 20	+59 39·6	79·5	7½ 8½	301+	0·7 −
25	672 h Eridani ...	407	3 24 47	−11 30·3	79·0	8 9	48+	2·2 −?
26	476 Σ Persei	476	3 54 15	+38 21·7	80·4	7½ 8½	285+	19·9 +
27	493 Σ Tauri	493	4 0 53	+ 5 24·2	80·0	8 8¼	92−	1·4 −
28	497 Σ Tauri	497	4 2 35	+ 8 9·0	78·9	8 9	232−	13·3 −
29	40 Eridani BC ...	518	4 10 12	− 7 46·7	83·0	9 11	119−	3·0 −
30	520 Σ Tauri	520	4 11 41	+22 32·9	83·9	8 8¼	109+	0·8 ±
31	547 Σ Eridani ...	547	4 20 21	− 1 38·3	81·8	9 12	15+	2·4 −
32	80 Tauri	554	4 23 51	+15 23·9	79·0	6 8½	7−	0·5 −
33	4 B Aurigæ	572	4 31 41	+26 43·8	84·0	6½ 6½	203−	3·5 ±?
34	589 Σ Orionis ...	589	4 38 59	+ 5 5·2	63·7	8 8	303−	4·4 ±
35	258 P. IV. Orionis	622	4 52 23	+ 1 30·3	80·0	8½ 9	354−	2·4 ±?
36	619 Σ Aurigæ ...	619	4 52 52	+50 6·1	71·6	8 8	115+	5·0 −
37	288 P. IV. Orionis	[95]	4 58 9	+ 9 38·6	84·0	7 7	336−?	0·8 +
38	269 P. IV. Camelop.	634	5 4 26	+79 6·1	78·3	5½ 9	2+	20·2 −
39	676 Σ Camelopardi	676	5 13 53	+64 38·5	72·6	7½ 8½	274−	1·0 +
40	677 Σ Camelopardi	677	5 14 26	+63 16·4	74·1	7½ 8	261−	1·7 ±?
41	749 Σ Tauri	749	5 30 16	+26 51·5	83·7	7½ 8	177±?	1·0 +
42	β 89 Orionis	...	5 51	− 1	79·6	8 9	1+	0·7 ±?
43	112 OΣ Aurigæ ...	[112]	5 32 20	+37 53·8	85·0	7 7	74−	0·7 −
44	ζ Orionis	774	5 35 12	− 2 0·2	83·0	3 6½	155+	2·6 ±?
45	3115 Σ Camelopardi	3115	5 38 0	+62 44·2	83·5	7 8	23−	1·5 ±?
46	52 Orionis	795	5 42 6	+ 6 25·0	77·1	6 6½	203±?	1·4 +
47	840 Σ Orionis BC...	840	6 0 22	+10 46·0	79·0	8½ 9	174−	0·7 ?
48	4 Lyncis...	881	6 12 17	+59 25·1	83·8	6 7½	101+	0·9 ±?
49	143 OΣ Geminorum	[143]	6 24 52	+17 1·2	84·0	7 10	101−	8·1 +
50	149 OΣ Geminorum	[149]	6 29 35	+27 22·8	84·1	6 9	296−	0·5 ±
51	15 Monocerotis ...	950	6 34 55	+ 9 59·8	82·6	6¼ 9	211±?	3·0 +?
52	156 OΣ Geminorum	[156]	6 40 57	+18 19·7	84·0	6½ 7	310−	0·6 +?

No.	Name of Star.	Σ.	R.A. 1890.	Dec^l. 1890.	Epoch 1800+.	Mag.		Position.	Distance.
			h. m. s.	° ′				°	″
53	14 Lyncis	963	6 43 23	+59 37·6	82·8	6	6	66 +	c·5 —
54	52 P.VII. Can. Min.	[170]	7 11 36	+ 9 30·1	83·4	7	7	113 —	1·5 +?
55	δ Geminorum ...	1066	7 13 33	+22 11·3	83·3	3½	9	205 +	7·0 ±?
56	1074 Σ Monocerotis	1074	7 14 52	+ 0 36·8	78·5	7¾	8	135 +	0·6 +
57	1081 Σ Geminorum	1081	7 17 36	+21 40·6	77·2	7½	8½	223 +	1·4 ±?
58	1093 Σ Lyncis ...	1093	7 21 55	+50 12.4	78·8	8	8	130 +	0·07 —?
59	1104 Σ Puppis ...	1104	7 24 22	−14 45·1	82·8	7	9	320 +	2·7 ±?
60	175 OΣ Geminorum	[175]	7 28 9	+31 10·8	84·0	6	6½	332 ±	0·7 +
61	170P.VII.Can.Min.	1126	7 34 17	+ 5 29·1	84·4	7	8	138 —	1·4 +?
62	177 OΣ Lyncis ...	[177]	7 34 42	+37 42·3	84·0	7	8	127 —	0·6 +?
63	κ Geminorum ...	[179]	7 37 48	+24 39·7	84·0	4	8½	235 +	6·5 ±?
64	182 OΣ Can. Min.	[182]	7 46 56	+ 3 40·3	85·1	7	7¼	34 —	1·1 ±?
65	187 OΣ Cancri ...	[187]	7 57 12	+33 21·5	84·2	6½	7½	277 —	0·3 ±?
66	13 P. VIII. Cancri	1202	8 7 32	+11 11·0	83·5	7½	10	321 —	2·5 +?
67	υ¹ Cancri	1224	8 20 7	+24 53·8	80·2	7	7½	42 +	5·8 —?
68	ι² Cancri	1291	8 47 32	+30 59·8	84·1	6	6½	328 —	1·4 ±?
69	ι Ursæ Majoris ...	[196]	8 51 41	+48 28·4	83·4	3½	11	356 +	9·5 —
70	σ² Ursæ Majoris ...	1306	9 0 44	+67 35·0	82·8	5½	9½	238 —	2·6 —?
71	1316 Σ Hydræ AB	1316	9 2 25	− 6 41·1	73·2	7	11½	139 +	6·7 ±?
72	38 Lyncis	1334	9 12 0	+37 16·3	84·1	4	7	236 —	2·9 ±?
73	201 OΣ Leonis ...	[201]	9 17 25	+28 22·0	85·1	7½	9	222 —	1·3 ±?
74	21 Ursæ Majoris ...	1346	9 17 51	+54 29·3	74·2	8	9	312 +	5·3 —
75	116 B Hydræ ...	1348	9 18 41	+ 6 49·9	84·1	7	7½	327 —	1·7 +
76	1355 Σ Hydræ ...	1355	9 21 30	+ 6 42·8	84·1	7	7¼	333 +	2·6 —?
77	1423 Σ Leonis ...	1423	10 13 10	+21 7·2	6[illegible]·2	8½	9	76 —	1·2 ±?
78	49 Leonis	1450	10 29 16	+ 9 13·1	84·1	6	8½	157 —	2·3 ±?
79	128 P. X. Leonis ...	[224]	10 33 56	+ 9 24·5	84·2	7	9	326 —	0·5 +
80	227 OΣ Leonis ...	[227]	10 35 53	+11 18·4	84 2	7	8	341 +	0·6 +?
81	1472 Σ Leonis ...	1472	10 41 11	+13 33·2	85·8	7½	8½	38 ±?	36·9 +
82	2290 OΣ Ursæ Maj.	[229]	10 43 40	+41 41·2	84·2	6½	7	330 —	0·8 +
83	158 Russell Carinæ	...	10 45	−58 38	80·2	7	8	258 +	1·1 +
84	54 Leonis	1487	10 49 39	+25 20·2	84·2	5	7½	105 +	6·3 —?
85	1500 Σ Leonis ...	1500	10 54 25	− 2 53·1	85·8	7½	8	312 —	1·5 +

No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+.	Mag.	Position.	Distance.
			h. m. s.	° ′			°	″
86	229 P. X. Leonis...	1504	10 58 19	+ 4 13·8	84·2	7½ 7½	285 +	1·2 ±?
87	9 P. XI. Leonis ...	1517	11 7 56	+ 20 44·0	84·2	7½ 7½	100 −	0·5 −
88	339 B Leonis ...	1527	11 13 14	+ 14 52·4	84·2	7 8½	14 +	3·6 −?
89	4737 Lac. Carinæ...	...	11 18 36	− 64 21·3	71·4	6 7	292 +?	2·5 +?
90	57 Ursæ Majoris ...	1543	11 23 9	+ 39 56·5	84·2	5 8	4 −	5·6 +?
91	88 Leonis	1547	11 26 5	+ 14 58·8	84·2	6½ 8½	323 +	15·5 +
92	90 Leonis	1552	11 28 59	+ 17 24·4	84·2	6¼ 7½	209 −?	3·1 −
93	111 P.XI.Ursæ Maj.	1555	11 30 30	+ 28 23·5	84·2	6 6½	346 +	0·6 −
94	241 OΣ Ursæ Majoris	[241]	11 50 25	+ 36 2·0	84·2	6½ 8½	125 +	1·5 ±?
95	187 Russell Crucis	...	12 4	− 60 21	80·4	9 10	209 −	3·8 −
96	1606 Σ Can. Venat.	1606	12 5 14	+ 40 30·0	84·2	6 7	338 −	1·2 +?
97	68 B. Comæ Berenices	1639	12 18 55	+ 26 12·0	84·1	6½ 8	245 −	0·3 −?
98	245 OΣ Comæ Beren.	[245]	12 12 0	+ 29 32·0	84·2	6 10	278 +	8·3 ±?
99	1643 Σ Comæ Beren.	1643	12 21 43	+ 27 39·0	73·2	8 8¼	50 −	1·8 ±?
100	191 B Virginis ...	1647	12 24 59	+ 10 20·0	85·3	7½ 8	217 +	1·4 +
101	1663 Σ Comæ Beren.	1663	12 31 42	+ 21 48·0	85·3	7½ 9	107 −	0·7 −
102	209 Russell Centauri	...	13 0	− 59 14	80·4	8 8	25 −	0·7 +
103	261 OΣ Canum Venat.	[261]	13 6 49	+ 32 39·8	84·3	7 7¼	348 −	1·4 +
104	1734 Σ Virginis ...	1734	13 15 6	+ 3 31·0	85·3	7 8	191 −	1·0 ±?
105	266 OΣ Virginis ...	[266]	13 23 2	+ 16 18·2	84·3	7 8	339 +	1·6 +
106	1 Boötis...	1772	13 35 25	+ 20 30·6	86·3	6 9	142 −	4·8 ±?
107	1781 Σ Virginis ...	1781	13 40 36	+ 5 39·8	85·9	7 8	264 +	1·1 −
108	τ Boötis...	[270]	13 42 4	+ 17 59·8	84·3	5 11	353 +	9·0 −
109	238 P. XIII. Virginis	1788	13 49 12	− 7 31·1	85·4	7 8½	72 +	2·5 −
110	274 OΣ Boötis ...	[274]	14 1 56	+ 35 17·6	84·3	7 9	66 +	14·1 −
111	1808 Σ Boötis ...	1808	14 5 11	+ 27 7·8	85·4	8 9	73 +	2·7 ±?
112	277 OΣ Boötis ...	[277]	14 7 32	+ 29 13·9	84·3	7¾ 8	354 +	0·5 +
113	1820 Σ Boötis ...	1820	14 9 25	+ 55 50·0	85·	8 8½	67 +	2·1 −
114	121 B Boötis ...	1825	14 11 27	+ 20 38·1	85·3	7 9	176 −	3·9 −?
115	1863 Σ Boötis ...	1863	14 34 21	+ 52 3·2	83·7	7 7	98 −	0·6 ±?
116	ζ Boötis...	1865	14 35 53	+ 14 12·1	86·4	3½ 4	113 −	0·5 −
117	260 B Boötis ...	1867	14 36 4	+ 31 46·3	75·9	8 8½	16 −	1·3 −?

No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+.	Mag.	Position.	Distance.
			h. m. s.	° ′			°	″
118	1883 Σ Boötis ...	1883	14 43 26	+ 6 24·7	85·4	7 7½	76 −	0·6 −
119	39 Boötis	1890	14 45 57	+49 10·3	85·4	5½ 6½	43 − ?	3·4 −
120	1893 Σ Boötis ...	1893	14 51 6	+29 55·2	79·3	8 8½	247 −	19·9 −
121	289 OΣ Boötis ...	[289]	14 51 21	+32 43·2	84·3	6 10	113 −	4·7 + ?
122	18 Libræ	1894	14 52 57	−10 42·0	83·2	7 10	39 −	19·8 +
123	342 B Boötis ...	1901	14 56 23	+31 48·5	79·3	7½ 9	199 −	27·1 −
124	279 P. XIV. Boötis	1910	15 2 14	+ 9 38·9	86·5	7 7	210 +	4·3 − ?
125	1934 Σ Boötis ...	1934	15 13 32	+44 11·6	85·9	8 8	31 −	6·7 +
126	1941 Σ Coronæ Bor.	1941	15 21 2	+27 1·0	80·3	8 8	227 − ?	1·3 − ?
127	1944 Σ Serpentis ...	1944	15 22 17	+ 6 29·1	85·4	7 8	331 −	1·3 ± ?
128	296 OΣ Boötis ...	[296]	15 22 31	+44 24·2	84·4	7 8½	212 −	1·7 − ?
129	1957 Σ Serpentis ...	1957	15 30 41	+13 16·9	76·4	8 9	156 −	1·5 ± ?
130	1985 Σ Serpentis ...	1985	15 50 13	− 1 50·0	85·4	6½ 8½	334 +	5·9 +
131	1993 Σ Serpentis ...	1993	15 54 48	+17 41	86·5	8 8	38 ±	30·0 −
132	2006 Σ Draconis A B.	2006	15 58 12	+59 14·8	79·2	8 9	193 −	1·7 +
133	{ν Scorpii AB. (= β 120)}	...	16 5 36	−19 10·3	80·6	4 7	10 +	0·7 ± ?
134	306 OΣ Coronæ Bor.	[306]	16 7 39	+34 41·4	84·3	7 9	42 −	0·38 − ?
135	2022 Σ Coronæ Bor.	2022	16 8 18	+26 57·4	85·4	6 9	135 +	2·6 − ?
136	α Scorpii A a ...	...	16 22 39	−26 11·2	79·5	1 7	271 −	3·0 − ?
137	2049 Σ Coronæ Bor.	2049	16 23 23	+26 13·7	84·5	6½ 7½	210—	1·2 ± ?
138	2080 Σ Herculis ...	2080	16 34 47	+38 32·7	79·2	8 12	25 −	3·5 −
139	313 OΣ Herculis ...	[313]	16 28 55	+40 20·1	83·5	7 8	151 −	1·0 +
140	3107 Σ Ophiuchi ...	3107	16 53 17	+ 4 6·0	78·9	8½ 8½	100 −	1·33 −
141	20 Draconis	2118	16 55 52	+65 12·4	83·4	7 7½	round −	round ± ?
142	α Herculis	2140	17 9 38	+14 30·1	84·5	3½ 5½	114 −	4·7 ± ?
143	ρ Herculis	2161	17 19 53	+37 14·3	84·5	4½ 5½	311 +	3·9 ± ?
144	281 B Herculis ...	2165	17 21 58	+29 32·5	79·7	7½ 8½	53	7·6
145	135 P. XVII. Ophiuc.	[331]	17 26 38	+ 2 54·9	84·4	7 8½	337 +	1·1 +
146	2199 Σ Draconis ...	2199	17 36 35	+55 48·9	83·8	7 8	98 −	1·9 ± ?
147	2218 Σ Draconis ...	2218	17 39 36	+63 43·2	74·5	7 8½	350 +	2·1 ± !
148	μ Herculis	2220 BC	17 42 10	+27 47·7	83·9	10 11	80 +	0·6 —
149	260 P. XVII. ...	[337]	17 45 18	+ 7 16·5	84·6	7 8	292 −	0·5 + ?
150	401 B Herculis ...	2277	18 0 16	+48 28·0	66·7	6½ 9	119 +	27·1 ± ?

No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+.	Mag.	Position.	Distance.
			h. m. s.	° ′			°	″
151	5027 h Telescopii ...	...	18 4 39	−54 25	81·7	9 10	91 +	11·4 −
152	73 Ophiuchi	2281	18 4 6	+ 3 58·4	83·0	5 7	249 −	1·08 −?
153	2283 Ophiuchi ...	2283	18 4 12	+ 6 8·1	86·5	7 8	84	1·0
154	417 B Herculis ...	2289	18 5 14	+16 27·3	83·6	6 7	233 −	1·5 +
155	15 B Scuti Sob. ...	2303	18 14 6	− 8 1·9	79·0	7 10	222 +	2·6 −?
156	452 B Herculis ...	2315	18 20 35	+27 19·6	83·9	7 8	244 −	0·26 −
157	354 OΣ Serpentis ...	[354]	18 26 40	+ 6 42·0	84·5	7 8	166 +	0·9 ±?
158	55 Tauri Poniat. ...	2342	18 30 11	+ 4 53·5	76·6	6 9	9 −	28·7 +
159	358 OΣ Herculis ...	[358]	18 30 59	+16 54·5	83·9	7 7	198 −	1·8 +
160	2360 Σ Herculis ...	2360	18 34 37	+20 49·8	84·5	7 8	0 −	2·5
161	2369 Σ Aquilæ ...	2369	18 38 24	+ 2 31·1	84·5	7½ 8	93 −?	1·1
162	2384 Σ Draconis ...	2384	18 38 53	+67 1·3		8 9		
163	o Draconis	2420	18 49 34	+59 15·3	83·4	5 9	337 −	31·4 +?
164	2422 Herculis ...	2422	18 52 39	+25 57·3	85·5	7½ 7½	96 −	0·8 ±?
165	11 Aquilæ	2424	18 54 2	+13 28·8	83·2	7 10	260 +	17·0 −
166	2437 Σ Sagittæ ...	2437	18 57 4	+19 0·7	75·6	7½ 7½	70	1·0
167	287P.XVIII.Draco.	2438	18 55 40	+58 4·4	79·5	7 8	single−	single
168	2454 Σ Lyræ... ...	2454	19 1 53	+30 16·1	83·4	7½ 8½	243 +	0·8 ±?
169	17 Lyræ...	2461	19 3 16	+32 19·7	84·6	6 10	317 −	3·8 ±?
170	6 B Cygni	2486	19 9 16	+49 37·9	79·9	6½ 7	220 −	9·8 −
171	371 OΣ Lyræ ...	[371]	19 11 32	+27 14·9	84·6	6½ 7	156 +	0·8 ±
172	108P.XIX.Draconis	2509	19 15 47	+63 0·5	84·5	8 9	337 −	1·1 +
173	128 P. XIX. Anseris	2521	19 21 40	+19 40·4	64·6	6 10	41 −	23·7 ±?
174	22 B Cygni	2525	19 22 4	+27 5·8	83·2	7 7¼	227 −	0·23 −
175	375 OΣ Sagittæ ...	[375]	19 29 43	+17 52·4	86·5	7½ 8½	145 +	0·7 ±?
176	185 P. XIX. Antinoï	2541	19 30 46	−10 40·5	86·7	8 10	332 −	4 0 +?
177	2544 Σ Aquilæ AB	2544	19 31 48	+ 8 3·6	76·3	7 9½	210 −	1·4 −
178	2556 Σ Vulpeculæ	2556	19 35 43	+21 59·8	83·5	7 7	155 −	0·4 −?
179	2576 Σ Cygni ...	2576	19 41 23	+33 21·4	86·7	8 8	121 −	3·0 −
180	17 Cygni	2580	19 42 15	+33 28·8	83·6	5 9	71 −	25·8 +?
181	307 P. XIX. Aquilæ	2590	19 47 1	+10 4·1	70·6	7 11	309 +	13·4 +
182	ε Draconis	2603	19 48 32	+69 59·2	78·8	5½ 9½	1 +	2·8 ±?

No.	Name of Star.	Σ.	R.A. 1890. h. m. s.	Decl. 1890. ° ′	Epoch 1800+.	Mag.		Position. °	Distance. ″
183	191 B Aquilæ ...	2597	19 49 25	− 7 0·9	80·7	7½	8	88 ±?	1·2 −?
184	116 B Cygni ...	2607	19 54 13	+41 57·5	79·6	8	9	311 −	0·36 −
185	393 OΣ Cygni ...	[393]	19 54 23	+44 5·4	86·5	7	8	226 +?	20·6 −
186	16 Vulpeculæ ...	[395]	19 57 20	+24 37·6	86·5	6	6	96 +	c·7 +
187	396 P. XIX. Capric.	2625	20 0 38	−13 14·5	66·3	8	12	12	12·8
188	2640 Σ Draconis ...	2640	20 3 21	+63 34·2	83·5	6	10	21 −	5·2 −
189	θ Sagittæ AB ,, AC	2637	20 5 5	+20 35·2	83·9 83·9	7 7	9 8	326 −? 225 −?	11·5 ±? 76·4 +
190	178 P. XX. Delphini BC	2690	20 25 56	+10 53·4	83·4	7½	7½	31 −	0·4 −
191	94 Vulpeculæ ...	2695	20 27 16	+25 25·9	84·2	6½	8½	81 +	1·4 +
192	κ Delphini	[533]	20 33 46	+ 9 42·2	81·4		12	324 −	11·2 +
193	2708 Σ Cygni ...	2708	20 34 30	+38 15·4	83·8	7	8½	333 −	23·5 +
194	2725 Σ Delphini ...	2725	20 41 4	+15 30·2	86·7	7	8	2 −	5·2 +?
195	418 OΣ Cygni ...	[418]	20 50 18	+32 17·4	83·7	7	7	109 −	1·0 +
196	ε Equulei	2737	20 53 35	+ 3 52·5	84·5	5	6	286 −	1·2 +
197	429 P. XX. Cygni	2741	20 54 58	+50 2·0	79·7	6	7½	31 −	1·9 −
198	λ Equulei	2742	20 56 47	+ 6 44·8	86·2	6	6½	222 −	2·8 ±?
199	2744 Σ Aquarii ...	2744	20 57 29	+ 1 5·9	86·7	6½	7½	170 −	1·6 ±?
200	2746 Σ Cygni ...	2746	20 57 36	+38 49·9	83·6	7½	8½	290 +	1·0 ±?
201	431 OΣ Cygni ...	[431]	21 7 22	+40 49·5	86·7	7½	7¾	120 +	3·1 ±?
202	50 P. XXI. Cygni	[432]	21 10 5	+40 41·6	83·6	7	7¼	127 −	1·4 ±?
203	τ Cygni	...	21 10 23	+37 34·2	79·5	5½	8	148 −	c·9 −
204	437 OΣ Cygni ...	[437]	21 16 11	+31 59·0	83·7	6	7	49 −	1·5 +?
205	2790 Σ Cephei ...	2790	21 16 13	+58 9·1	64·5	6	10	45	4·4
206	29 B Pegasi	2804	21 27 54	+20 13·6	83·7	7½	8	328 +	2·8 ±?
207	448 OΣ Cygni ...	[448]	21 36 7	+28 50·1	86·1	8	8½	235 −	0·8 ±
208	2825 Aquarii ...	2825	21 41 17	+ 0 20·3	86·7	8	8½	114 +	1·2 ±?
209	2847 Σ Aquarii ...	2847	21 52 24	− 4 1·2	86·7	7½	8	305 +	1·1 −
210	41 Aquarii	...	22 8 14	−21 37·3	77·7	6	8½	116 −	5·1 ±?
211	33 P. XXII. Pegasi	2877	22 9 1	+16 38·9	83·4	7	10	354 +	10·4 +
212	33 Pegasi AB ...	2900	22 18 21	+20 17·4	83·9	6	9	179 −	2·0 −
213	37 Pegasi	2912	22 24 24	+ 3 52·5	85·5	6	7½	131 +	c·3 ±?
214	2928 Σ Aquarii ...	2928	22 33 41	−13 10·5	77·7	8	8¼	316 −	4·4 −
215	200 P. XXII. Aquarii	2935	22 37 17	− 8 53·2	66·0	7	8½	311 −	2·5 −

No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+.	Mag.	Position.	Distance.
			h. m. s.	° ′			°	″
216	209P.XXII.Aquarii	2939	22 39 34	−10 13·4	66·4	8 11	62	10·8
217	τ^1 Aquarii	2943	22 41 52	−14 38·2	77·8	6 9	115+	28·3 −
218	{219 P. XXII. Aquar. AB / ,, AC}	2944	22 42 10	− 4 47·8	{79·4 / 81·9}	7 7¼ / 7 8	255 / 138+	3·5 / 48·3 −
219	241 B Cephei ...	2950	22 47 4	+61 7·0	83·7	6 7½	311−	2·2 +?
220	52 Pegasi	[483]	22 53 41	+11 8·1	83·7	5 10	211+	1·0 +
221	{2976ΣPisciumAB / ,, AC}	2976	23 2 8	+ 6 0·3	{83·4 / 84·0}	8 10 / 8 9	263+ / 189+	7·8 ±? / 16·8 +
222	306 P.XXII.Pegasi	2978	23 2 12	+32 13·8	78·8	7 8½	144−	8·5 −?
223	3006 Σ Pegasi ...	3006	23 15 52	+34 50·6	64·9	8½ 9	173−	4·9 ±?
224	3009 Σ Piscium ...	3009	23 18 40	+ 3 6·7	65·2	7½ 9½	230	6·9
225	3046 Σ Ceti	3046	23 50 46	−10 7·0	77·7	8 8¼	243+	3·0 +
226	37 Andromedæ ...	3050	23 53 53	+33 7·0	83·7	6 6	26+	3·0 −
227	3056 Σ Andromedæ	3056	23 59 1	+33 39·0	83·7	7 7	151−	0·7 ±?

CHAPTER XIV.

A CATALOGUE OF NEW STARS.

IN compiling the Catalogue of Uncalculated Comets (Book IV, *ante*), I found myself much embarrassed in consequence of the Chinese chroniclers having intermingled with their comets proper a number of objects specifically termed by them "new stars." In some cases it was tolerably clear from internal evidence that these "new stars" were veritable comets, but in others it was impossible to express a confident opinion. Some of these uncertain objects were added to the cometary list, and others were wholly passed over, without any definite rule being conformed to. This manifestly involved serious drawbacks, and on reflection, conceiving that it would be convenient to astronomers to possess a comprehensive catalogue of all recorded temporary stars, I determined to detach from the comets all objects which certainly were not comets and unite them with all objects which certainly were stars. The two lists, that is to say, this one and that in Book IV. Ch. VII. (*ante*), between them comprise, it is supposed, every comet of which an unequivocal record has been handed down to us. I cannot, however, assert that this list is equally exhaustive in regard to the temporary stars. Let it be understood, therefore, that whilst the Comet Catalogue probably contains no stars, this, most likely, does contain some comets.

I have not included objects which are commonly, and on sufficient authority, dealt with as Variable Stars and usually included in Variable Star Lists; such will be found elsewhere.

The references cited as "Biot" are to E. Biot's lists published in the *Connaissance des Temps* for 1846. The better known temporary stars are not dealt with at length, as they are described elsewhere in this volume. For the sake of completeness, however, it was necessary to mention them here.

133 B.C. In June or July an extraordinary star appeared near β, π, ρ *Scorpii.*—(Biot; Williams, *Comets*, p. 6.) Perhaps identical with the comet of 134; or this may have been the temporary star which attracted the attention of Hipparchus and led to the formation of his Catalogue.

76 B.C. In September—October an extraordinary star appeared between a and δ *Ursæ Majoris.*—(Biot; Williams, *Comets*, p. 7.)

101 A.D. On Dec. 30 a small yellowish-blue star appeared in the group a, γ, η, σ, κ *Leonis* (Biot); as no mention is made of any change of position it may have been merely a temporary star.—(Hind, *Companion to the Almanac*, 1859, p. 12.)

107. On Sept. 13 a strange star appeared to the S.W. of δ, ϵ, η *Canis Majoris.*—(Biot.)

123. In December—January an extraordinary star was seen in the region near a *Herculis* and a *Ophiuchi.*—(Biot.)

173. On Dec. 10 a star appeared between a and β *Centauri*, and remained visible 7 or 8 months; it was like a large bamboo mat, and displayed five different colours.—(Biot.) Williams dates this object for Dec. 7, 185.—(*Comets*, p. 16.)

290. In May a strange star was observed within the Circumpolar regions.—Ma-tuoan-lin; Williams, *Comets*, p. 26.)

304. In May—June a strange star was seen in the sidereal division of a *Tauri.*—(Biot; Williams, *Comets*, p. 27.)

369. From the 2nd to the 7th Moon an extraordinary star was visible in the Western boundary of the circle of perpetual apparition. The 2nd Moon commenced about March 25, and the 7th about August 20.—(Biot; Williams, *Comets*, p. 29.)

386. Between April and July a strange star was seen in the sidereal division of λ, μ, ψ *Sagittarii.*—(Biot; Gaubil; Williams, *Comets*, p. 29.)

393. Between March and October a strange star appeared in the sidereal division of μ^2 *Scorpii* or in R.A. $\pm$ 17^h.—(Biot.) Williams places this object in R.A. $\pm$ $9\frac{1}{2}^h$.—(*Comets*, p. 30.)

561. On Oct. 8 an extraordinary star was seen in the sidereal division of a *Crateris.*—(Biot; Williams, *Comets*, p. 36.)

577. Pontanus (*Hist. Gelr.* iii) dates the appearance of a comet in the year that the son of Chilperic died, consequently in 577. Pingré thinks that it is the object recorded by Gregory of Tours as having appeared in the middle of the Moon on Nov. 11, during the celebration of the vigils of St. Martin, and probably a meteor.—(*Comét.* i. 323).

827 (?). The year is very doubtful. The Arabian astronomers, Haly and Ben Mohammed Albumazar, observed at Bagdad a star in *Scorpio* for 4 months. It was as bright as the Moon in its quarters.

829. In November an extraordinary star was seen in ζ, θ, o, π *Canis Minoris.*—(Biot; Williams, *Comets*, p. 46.)

945. A new star was seen near *Cassiopeia.*—(Cyprianus Leovitius, *Judicium de Novâ Stellâ* cited in Tycho Brahe's *De Novâ Stellâ, anni* 1572.) [There is no contemporary authority for this statement, and its authenticity seems open to great doubt, unless, as is very likely, the allusion is to the comet of 945.]

1011. On Feb. 8 an extraordinary star was seen near $\sigma, \tau, \zeta, \psi$ *Sagittarii.*—(Biot.)

1012. From May to August (it would seem) a star was visible in *Aries.* It was of astonishing size and dazzled the eye. It varied in size, and sometimes it was not seen at all. It lasted 3 months.—(Hepidannus, *Annales.*)

1054. On July 4 an extraordinary star appeared to the S.E. of ζ *Tauri.* It disappeared at the end of the year.—(Biot.)

1139. In this year an extraordinary star appeared in the division of κ *Virginis.*—(Biot.)

1174 ±. An immense star shone by night and by day in the W. It was surrounded by numerous others all bright red in colour.—(Boethius, *Hist. Scot.* xiii.) No doubt a meteor.—(Pingré.)

1203. Between July 28 and August 6 an extraordinary star was seen in the S.E. in the division μ^2 *Scorpii.* The colour was bluish-white resembling that of *Saturn.*—(Biot.)

1245. A bright star appeared in *Capricornus* for 2 months. It was comparable to *Venus,* but was red like *Mars.*—(Albertus Stadensis; Klein, *Handbuch der Fixsternhimmel,* p. 102.)

1264. A new star was seen in the vicinity of *Cepheus* and *Cassiopeia.*—(Leovitius.) Klein considers that this and the preceding are identical, but the comments on Leovitius made, *ante,* under the year 945, seem to apply to this record also.

1572. In Nov. 1572 a new star became visible in *Cassiopeia*; it lasted till March 1574. [See p. 54, *ante.*]

1584. On July 1 a star appeared in the sidereal division of π *Scorpii.*—(Biot; Williams, *Comets,* p. 93.)

1604. A new star appeared in *Ophiuchus*; at one time it was as bright as *Venus.* It was first seen on October 10, 1604, and last seen about the middle of October 1605. Its known duration was therefore about 12 months; but inasmuch as it was lost in consequence of coming into conjunction with the Sun its real duration might have been 14 or 15 months. At any rate in March 1606 it had become invisible. [See p. 55, *ante.*]

1612. A new star appeared in *Aquila.*—(Riccioli, *Quelle Fromordi Meteorologica,* lib. iii. cap. 2, art. 7; Klein, *Handbuch,* vol. ii. p. 105.) Klein insinuates that this is identical with a new star dated by the Chinese for 1609.

1621. On May 12 a reddish star was seen in the E.—(Williams, *Comets,* p. 94.)

1848, 1866, 1876. New stars appeared in each of these years, but as they are described at length elsewhere, no further reference to them need be made here. [See pp. 55, 56, *ante.*]

1885. On or about August 31 a new star burst forth in the great nebula in *Andromeda.* At its maximum brilliancy it was about mag. 6.—(*Observatory,* vol. viii. pp. 321, 330, &c. Oct. 1885.)

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