

T H E S T A R S,

IN

S I X M A P S,

ON THE

GNOMONIC PROJECTION.

UNDER THE SUPERINTENDENCE

OF

THE SOCIETY

FOR THE

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E X P L A N A T I O N.

THE following Maps are laid down according to the Gnomonic Projection: they are projected on the map *in perspective*; that is, as they would be, if it were possible, at a given moment, by a Camera Lucida. Every system of projection is liable to some difficulties; for Celestial Maps, the one which has been adopted unites perhaps the greatest advantages. The distinguishing feature of it is, that those stars which are in the same great circle in the heavens, and therefore appear to be in the same straight line, are still in the same straight line in the map, which gives great facility in finding any particular star. So, also, in the geographical maps published by the Society on the same projection, the shortest distance between any two points is found at once by joining them with a straight line; this is not the case in any other projection, except, and only sensibly, on a very small portion of the surface of the globe. In Nos. 1, 2, 3, and 4, the distance of a star from the centre of the map, measured in the direction of the equator is equal to the tangent of the difference of the star's right ascension and the right ascension of the centre of the map: and the distance of a star from the centre of the map, measured in a direction perpendicular to the equator, is equal to the tangent of the star's declination, divided by the cosine of the difference of the star's right ascension, and the right ascension of the centre of the map. In these, the parallels of declination are portions of hyperbolas. In Nos. 5 and 6 the distance of a star from the centre of the map is equal to the cotangent of the star's declination. From these expressions, a projection was made of the circles of right ascension and declination, for every degree of right ascension and declination: and the stars were laid down by Mr. W. Newton from the catalogue of the Astronomical Society, taking all the stars in that catalogue up to the sixth magnitude, exclusive. These are nearly all that can be seen by the naked eye, and it has been thought best to exclude stars of less magnitude, in order to avoid confusion.

The magnitudes of the catalogue of the Astronomical Society, which are those of Piazzi, and are the most to be depended upon, have been adhered to. The magnitudes are indicated by the number of petals of the asterisk; a star of the first magnitude has eight petals, a star of the second magnitude seven petals, and so on. Some of the stars are known to vary in magnitude; these have over them the letters Var. They are thirteen in number, up to the present time, and are taken from a list in the *Bulletin des Sciences Mathématiques*, 1827, p. 170, which is extracted from a paper on the subject by M. G. H. Westphal.

The Nebulæ are laid down from a catalogue reduced to the year 1822 by Mr. Mosley, from that given by Messier in the *Connaissance des Temps* for 1786, and from the catalogue given by Lacaille, in the same volume, of the Nebulæ observed by him in the southern hemisphere. The former have Messier's number underneath, those of Lacaille have no reference. Many of these Nebulæ resemble a comet in appearance, from which they can hardly be distinguished, except by the absence of any proper motion; some of them, with the most powerful telescopes, appear only as a patch of faint light; many, on the other hand, are resolvable into a multitude of small stars. The *Planetary Nebulæ* discovered by Mr. Struve have also been inserted. See *Catalogus novus Stellarum duplicium et multiplicium*, p. 88. Mr. Struve says, that these Nebulæ, when viewed with his large telescope,

present a uniform planetary disc, while to the finder they appear only as stars of the 7th or 8th magnitude, and they deserve to be reckoned amongst the most interesting objects in the heavens. One of these (No. 6) has since been discovered by Sir James South, with his 19 feet achromatic.

The Milky Way was laid down from Wollaston's catalogue, as far as that catalogue gives its boundary, that is, to about 30° south declination; beyond that we know no good authority for its limits*. Lacaille says (in the *Mémoires de l'Académie des Sciences*, 1755, p. 199) that, in the constellation of the Southern Cross, there is a space of about 3° diameter completely surrounded by the Milky Way, which on that account appears dark, and is one of the most remarkable phenomena in the southern hemisphere. This circumstance does not seem to have been attended to in any celestial globes or maps.

When a star has a Greek letter in the catalogue, this letter is placed against it in the map; when the star has no Greek letter, the number which stands in the second column is used; and in some few cases, when neither of these references exists, the italic letter which corresponds to the star in the catalogue is resorted to. Some stars are without either of these references. The double stars have two dots following the reference, as α : Andromedæ.

The Arabic names which are found on celestial maps and globes are generally corruptions of the words for which they are intended; but as many of the stars have been long known by these names, it has been thought better to retain them. The reader is referred for further information on this subject to a paper in the *Philosophical Magazine* for November, 1830, or to Hyde's Commentary on the Tables of Ulugh Beigh, from which that paper is principally taken.

The lines of longitude and latitude have been laid down; these will be found useful in showing the effect of the precession of the equinoxes upon the place of any star in right ascension and declination. The *triangle* at foot gives the *precession* in longitude for 50,100,359 years, supposing the *base* to equal five degrees measured on the small circle of longitude on which the star is situated. The motion of the star due to precession is of course in the small circle of longitude, and from right to left. The months and days of the year which are placed on the border indicate the stars which pass the meridian on those days at midnight nearly; thus *Alpherat* (Map, No. 1) passes the meridian at midnight about September 20, and at ten o'clock P.M. about October 21. This, of course, is only to be considered as a rough approximation.

Before the practice was introduced by Bayer, of denoting the stars by Greek letters, they were known by their situation in the *constellation*, which is always accurately described in the older catalogues, as in those of Ptolemy and Ulugh Beigh. Flamsteed paid particular attention to this circumstance in his *Celestial Atlas*: it has therefore been thought best to adhere closely to his figures, which have been copied for these Maps by Mr. W. B. Clarke.

Flamsteed tells us†, 'that having, about the year 1700, completed 'the calculation of the places of the fixed stars, he set himself to form

* Since this was written, our attention has been called, by an article in the *Philosophical Magazine*, to some drawings of the Milky Way in the southern hemisphere by M. Dunlop, in the *Philosophical Transactions* for 1828.

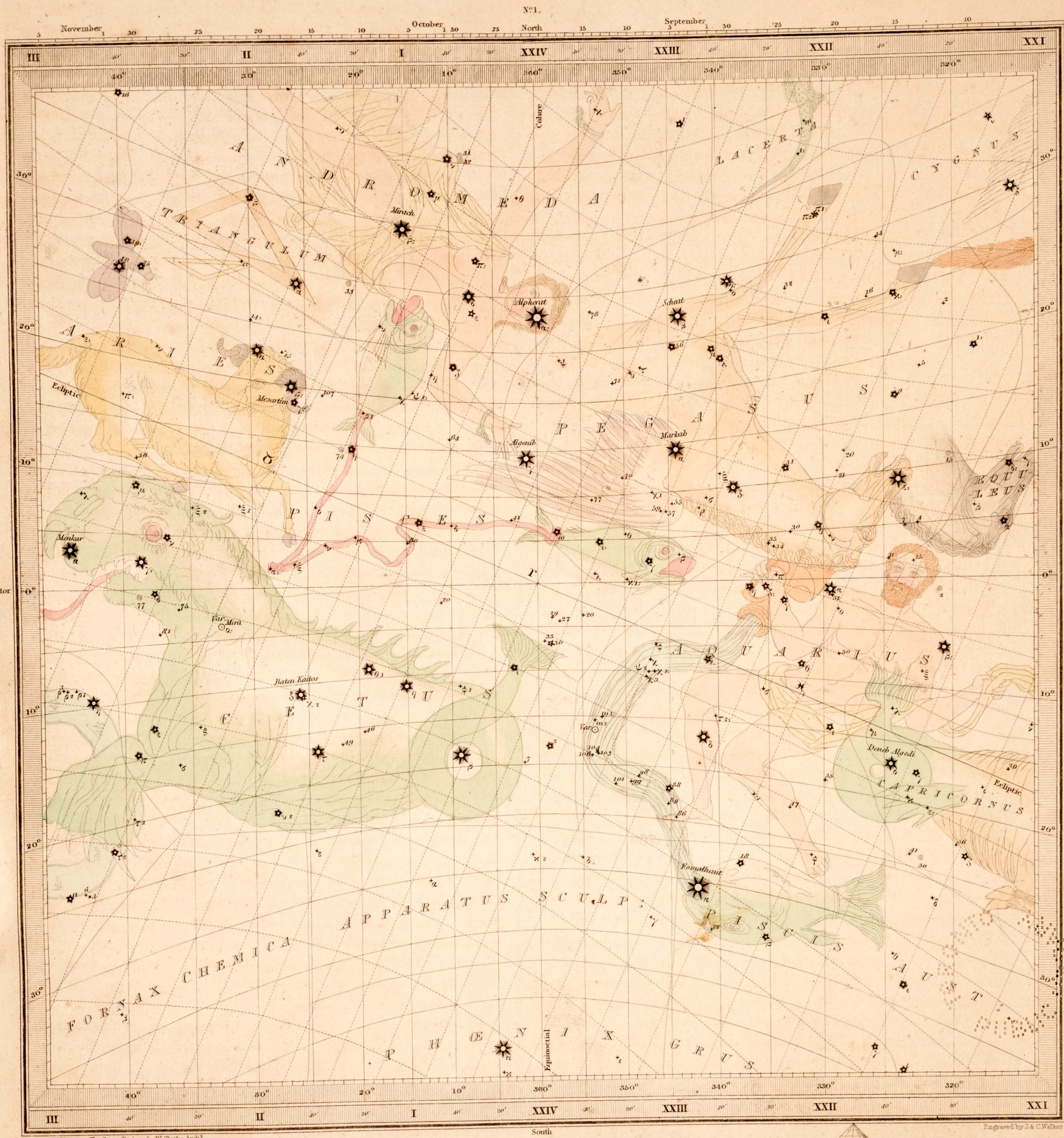
† *Historiæ Cœlestis*, vol. iii. p. 160.

maps of the constellations, in which he found it necessary wholly to depart from Bayer, of whom Hevelius himself complained, but without mentioning any particulars; and this led him into a strict inquiry to find out who those Astronomers were that first constructed maps of the constellations, and especially by whom the stars were reduced into those forms into which they are disposed in Ptolemy's catalogue (of which there is no account given that can be relied on); for, from what Ptolemy himself relates in the 4th chapter of his 7th Book of his *Almagest*, it is evident that those images or figures were older than Hipparchus's time, where he says, "That we employ not the same figures of the constellations that those before us did, as neither did they of those before them, but frequently make use of others that more truly represent the forms for which they are drawn;" for instance, those stars which Hipparchus places on the Virgin's shoulder, we place on her side, because their distances from the head appear too great for the distance from the head to the shoulder, in his sign of Virgo; and thereby making those stars to be on the sides, the figure will be agreeable and proper, which it would not if those stars were placed upon the shoulders. The Chaldean observations were made in the 82nd year, *κατὰ Χαλδαίους*, corresponding with the 519th year of Nabonassar, or 229 years before Christ, wherein mention is made of the stars in the southern shoulder of the Virgin, or the northernmost in the front of the Scorpion, in an Appulse of Mars to that star, which Appulse was observed in the 476th year of Nabonassar, or 271 years before Christ. Tymocharis and Aristillus are still ancients than the Chaldeans, who lived about 300 years before Christ, and observed the Appulses of the Moon to the fixed stars about 295 years before Christ, or year of the world 3709, and again in the 283rd year before Christ, or year of the world 3721; at which time it is plain, from what Ptolemy says, that the ancients had figures or maps of the constellations, with the stars' places designed on them. Aratus, the poet (who wrote of the rising and setting of the stars, and flourished about the 125th Olympiad, or about 276 years before Christ), was, if not contemporary, yet but little later than Tymocharis and Aristillus, and certainly older than the Chaldean observers of the Appulses, from whose poem it is confirmed that the Greeks had figures of the constellations; but from whom they had derived them, or how they came by them, is nowhere to be learnt. From the aforementioned place in Ptolemy it is evident that, by those before him, he meant Hipparchus and his followers, and by those older than the Chaldean or Greek astronomers, who flourished before Hipparchus's time, he meant those astronomers who first of all made observations of the Appulses of the planets to the fixed stars; from the translation of which we have an account of an observation in the northernmost star in the front of Scorpion made in the 476th year of Nabonassar, or 276 years before Christ; and likewise of another, in the southernmost shoulder of Virgo, made in the 519th year of Nabonassar, or 229 years before Christ. But Tymocharis and Aristillus, whose observations are also transmitted to us by Ptolemy, mention stars of many other constellations: whereby it is evident that they had formed figures of them in their time, about 300 years before our Saviour; which is all the account we have from Ptolemy. From Ptolemy's time to ours, the names that he made use of have been continued by the ingenious and learned men of all nations. The Arabians always used his forms and names of the constellations; the old Latin catalogues of the fixed stars use the same; Copernicus's catalogue (the first we have in good Latin), and Tycho Brahe's, use the same; so do the catalogues published in the German, Italian, Spanish, Portuguese, French, and English languages. All the observations of the ancients and moderns make use of Ptolemy's forms of the con-

stellations and names of the stars, so that there is a necessity of adhering to them, that we may not render the old observations unintelligible by altering or departing from them. Tycho Brahe died in the year 1601, two years after Bayer published his *Uranometria*, wherein he gives us maps of all the constellations; his figures are tolerable, and the stars rightly laid down according to their places in Tycho's catalogue, and many other small stars are added which it hath not. These, it is probable, he inserted upon his own bare view, by comparing them with the fixed stars inserted in his maps from Tycho's catalogue, whose nomenclature is the same; but having drawn all his human figures, except Bootes, Andromeda, and Virgo, with their backs towards us, those stars which all before him place in the right shoulders, sides, hands, legs, or feet, fall in the left, and the contrary in his figures; with which, therefore, whosoever goes about to examine the ancient observations, or the catalogues of the fixed stars printed or published in any language, will find himself much perplexed if he be not beforehand apprised of this. The reason probably of Bayer's fault was, that finding the word *εν ωτω* and *εν μεταφρενω* often in Ptolemy's catalogue, and consulting the Greek Lexicons for the sense of them, he found constantly *ωτος* rendered by *dorsum*, and *μεταφρενον* by *interscapilium*, and therefore concluded that *interscapilium* was the space betwixt the shoulderblades on the back; and whenever he met with either of these words in the description of any constellation, except Virgo and Andromeda, he drew it with the back towards us, whereby he makes all those stars that Ptolemy (and the ancients, and all since then to himself) placed in right shoulders, arms, sides, legs, and feet, &c. of their forms or figures, to stand on their left, whereby he renders the oldest observations false, or nonsense. To remedy this fault, when he mentions any eminent fixed stars to be in *dextro humero*, or *dextra tibia*, he adds *alias in sinistra*, &c.; which, indeed, seems to excuse the fault, but being done but seldom, will perplex those that make use of his maps, and render them useless. Had Bayer but drawn the map of Sagittary, or any other of the human forms, so that the stars placed in the right hands, shoulders, sides, and feet of Ptolemy's catalogue might stand on the same in his figures, he would have seen that they would all have their faces towards us, and thereby would have learned that, in Ptolemy's Greek, the *ωτος* signifies the *crates corporis*, or the ribs, and that the *μεταφρενον*, the space betwixt the shoulders, not only on the back, but also on the fore part of the body or upper part of the breast, and there would then have been no incongruity between his figures and the ancients' descriptions; for not only Ptolemy but Homer himself uses those words in a more comprehensive sense than the Lexicons commonly allow. Nevertheless, in most of the maps of the fixed stars that have been engraved since those of Bayer, the forms are taken from him, and have the same faults with his. . . . He caused the charts to be prepared, and the stars laid down in their proper places; after which the images were drawn on them according to the descriptions given in Ptolemy's catalogue (which have been used by all after him without variation, till Bayer formed them anew and spoiled them), that thereby the ancient figures of the constellations that were made use of by Ptolemy and his predecessors might be restored, and no longer spoiled by innovators.

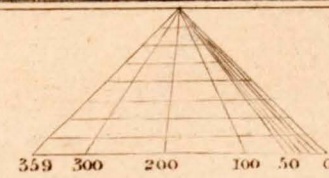
The preceding notice, which contains nearly all that is known with respect to the constellations, has been inserted at length from the Preface to Flamsteed's *Atlas Cœlestis*, because, as the same figures have been taken, it applies equally to these Maps.

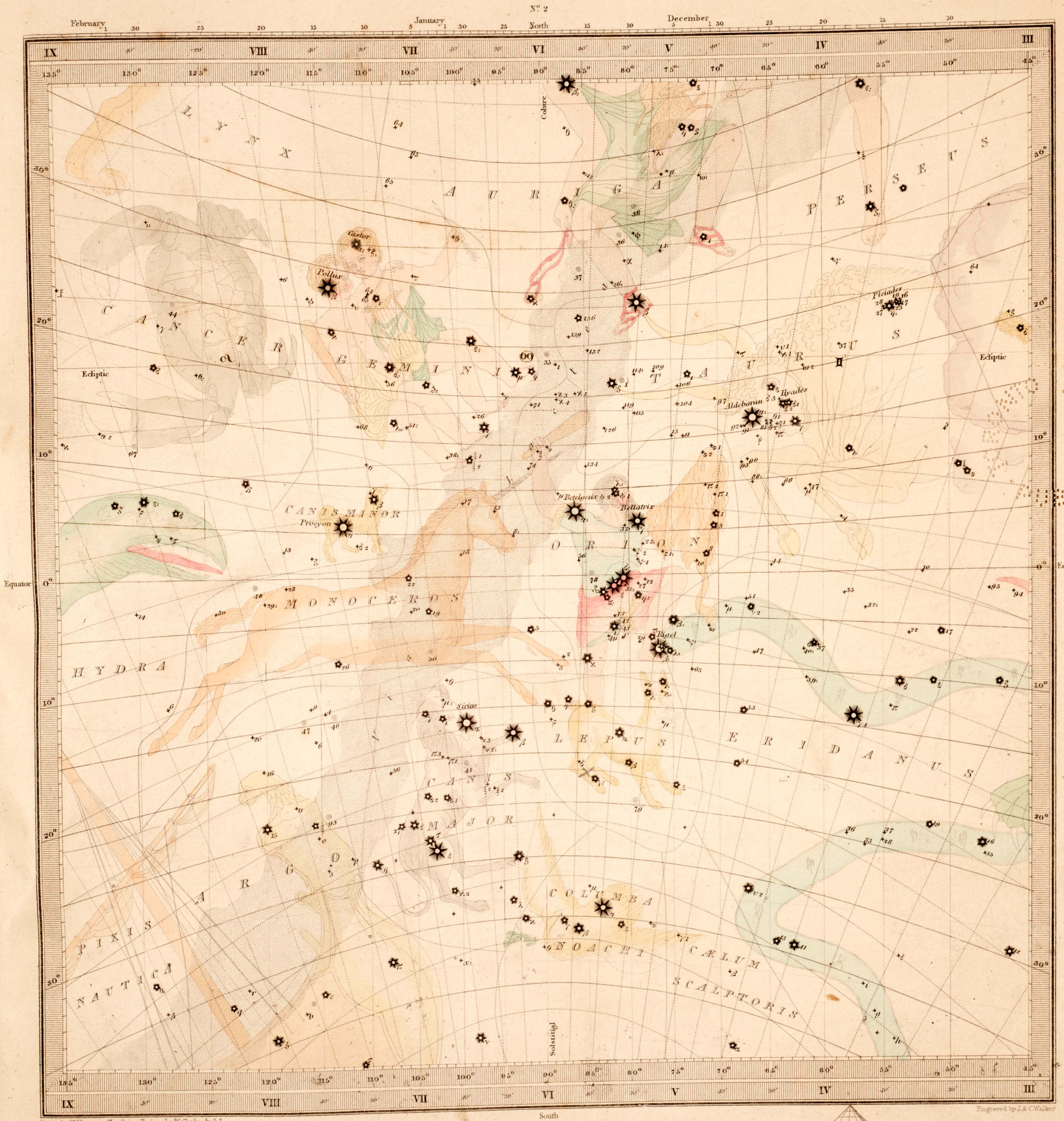
The authorities from which all the information contained in these Maps has been derived are stated, in order to facilitate the detection of any errors;—if any should be detected, the Society will feel much obliged by their being communicated to Mr. COATES.



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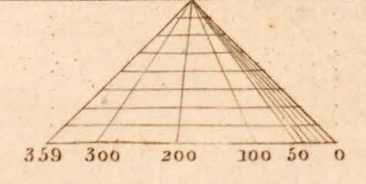
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- ★ 3rd
- ★ 4th
- ★ 5th
- ☉ Nebula
- Variable

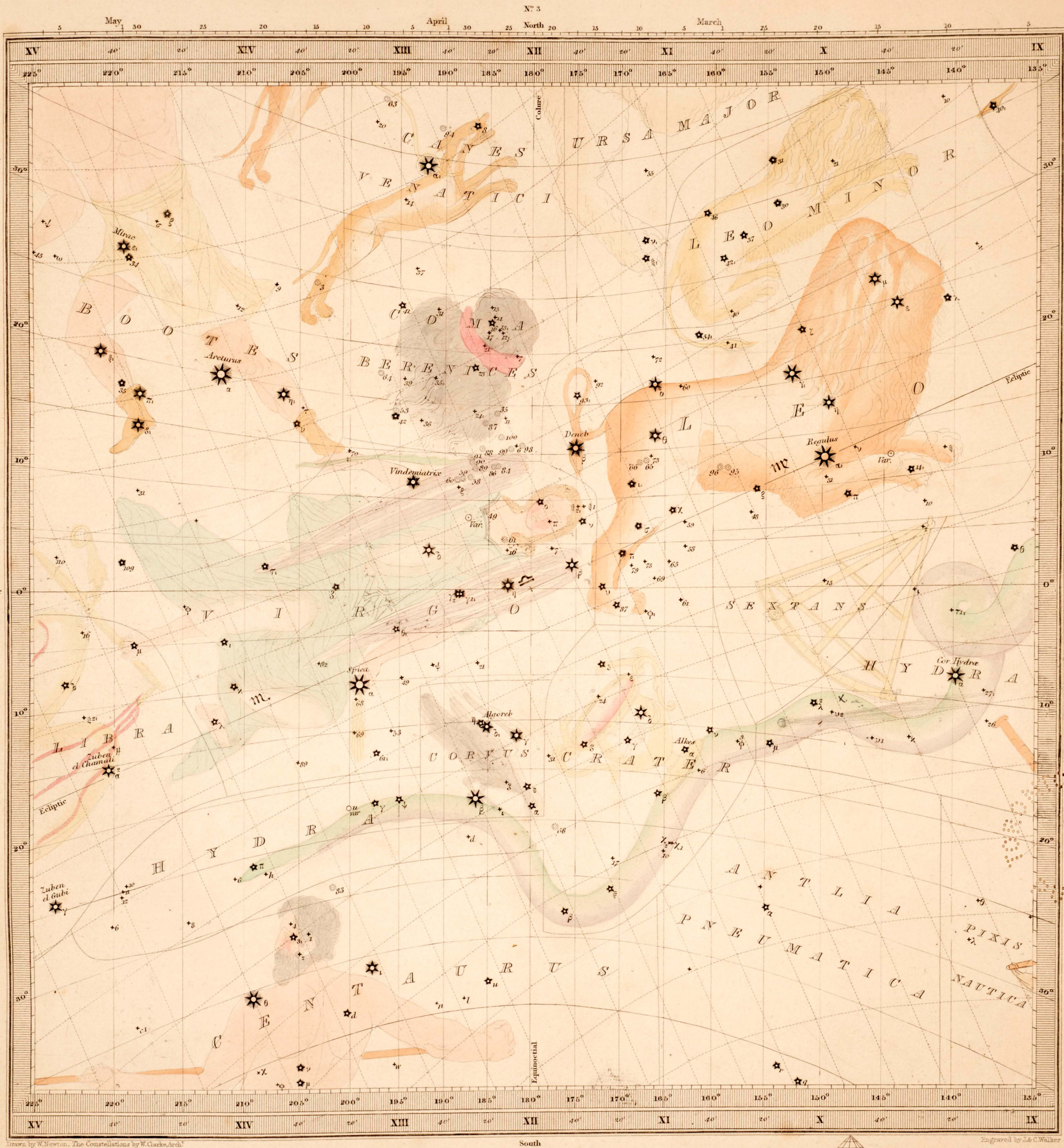
+ tail of comet
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Drawn by W. Newton. The Constellations by W. Clarke, Arch^d

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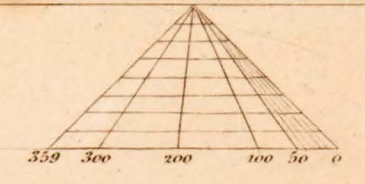


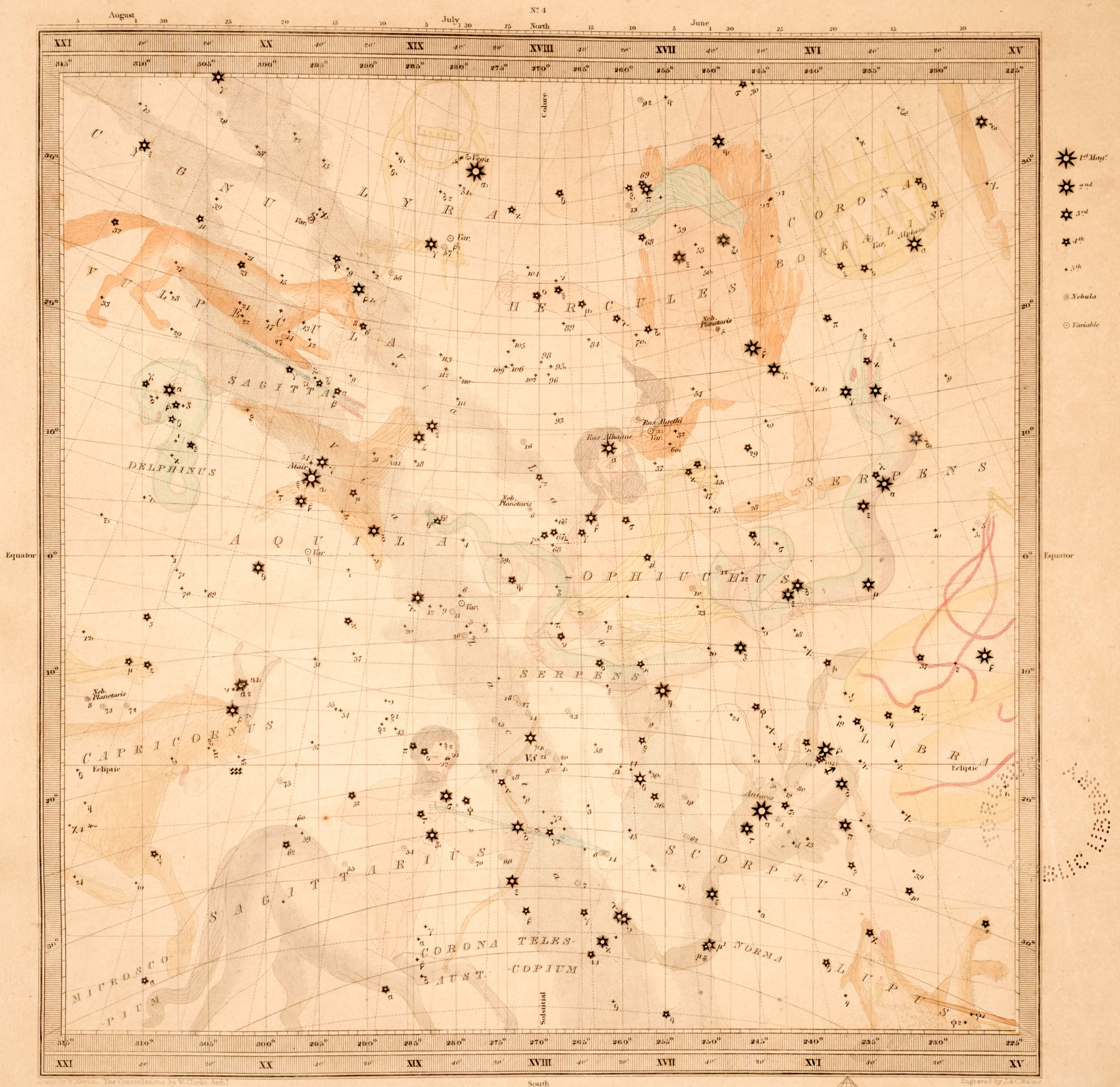


- ★ 1st Mag^t
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Correct
Oct 10 1882

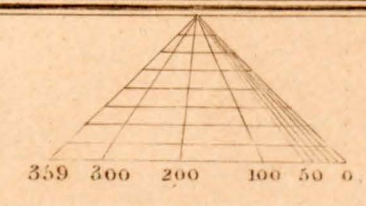
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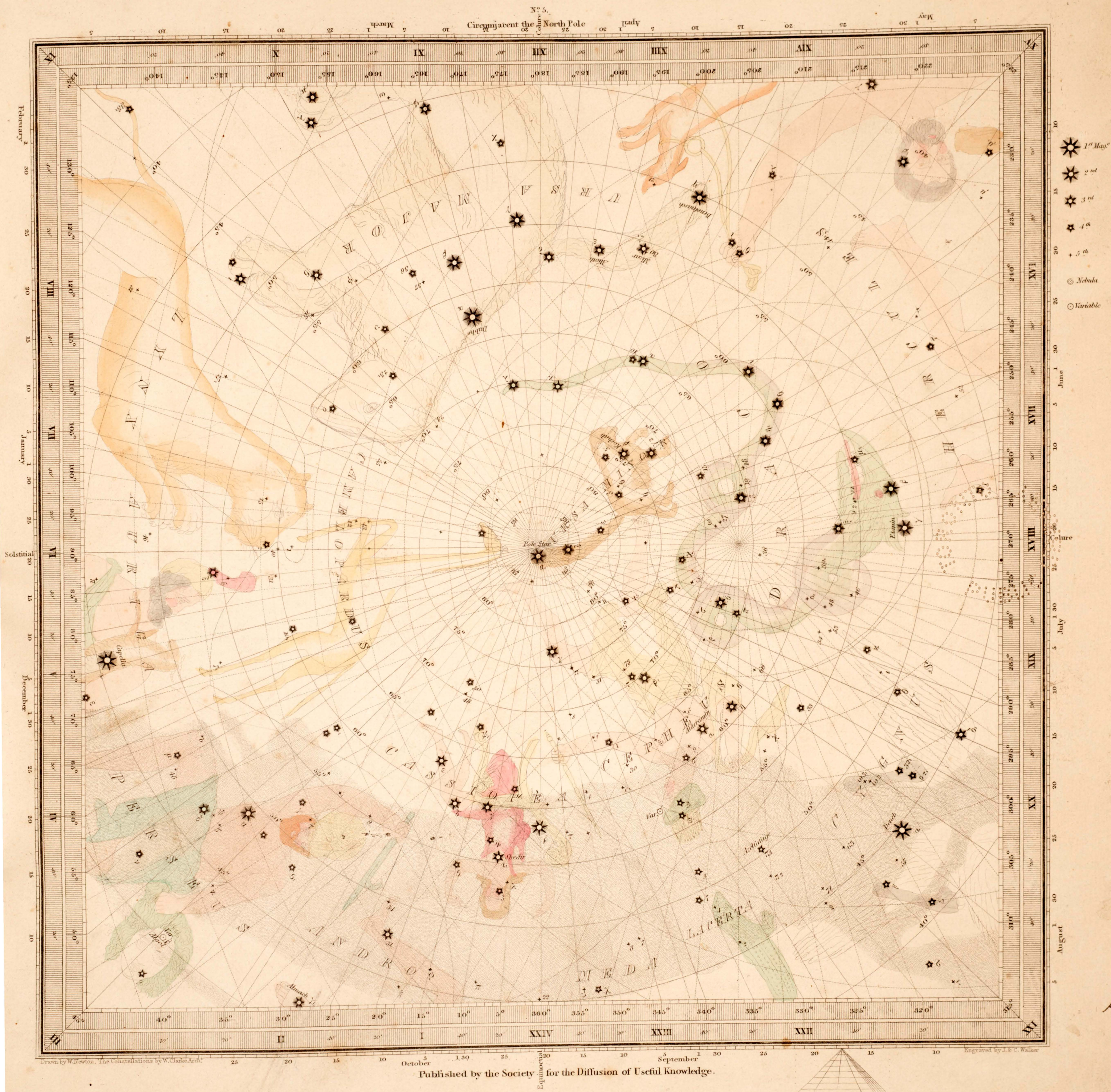




- ★ 1st Mag.
- ★ 2nd
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- ☉ Nebula
- Variable

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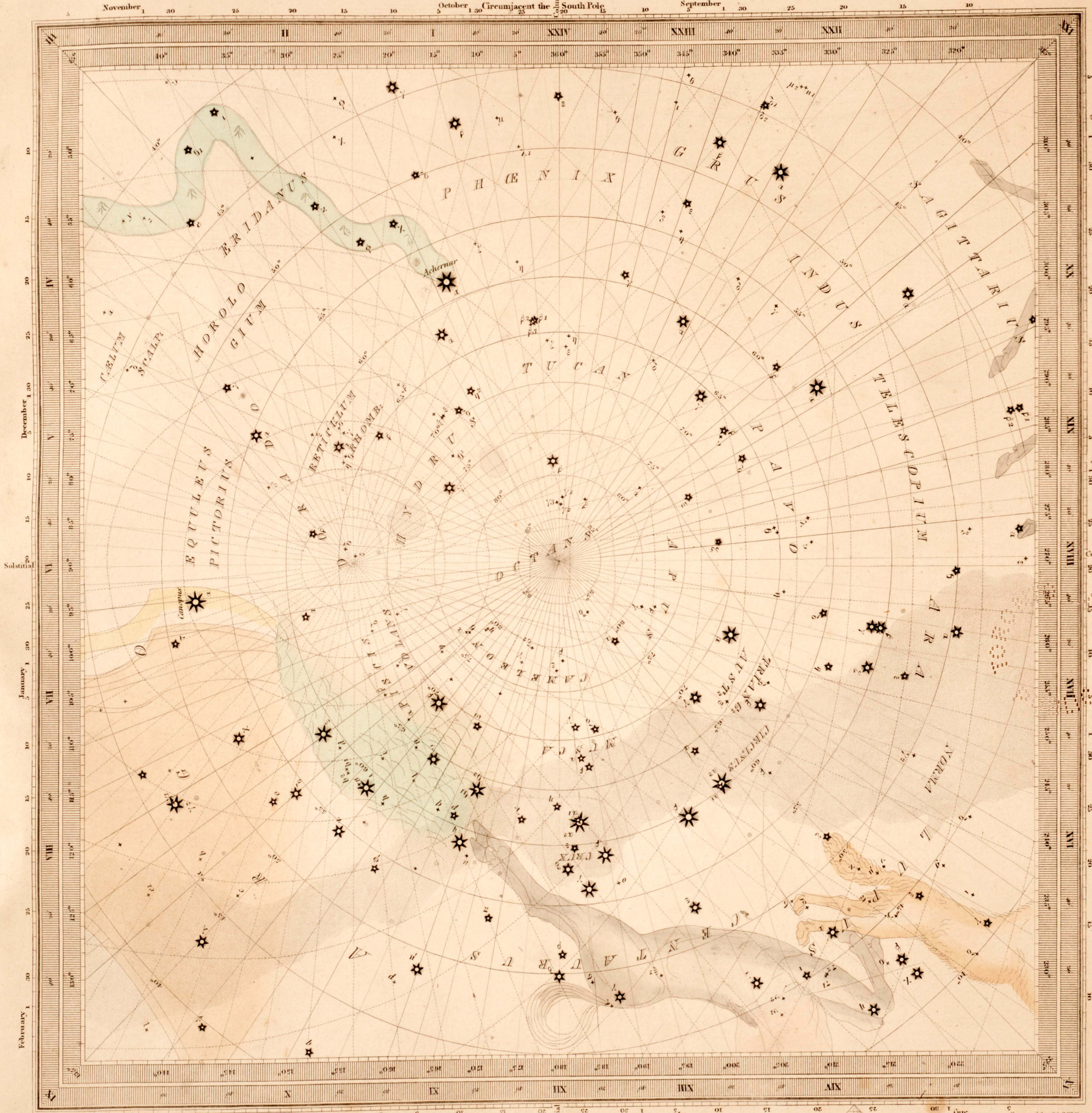
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October 1 30 25 20 15 10

Circumjacent the South Pole

September 1 30 25 20 15 10

10



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