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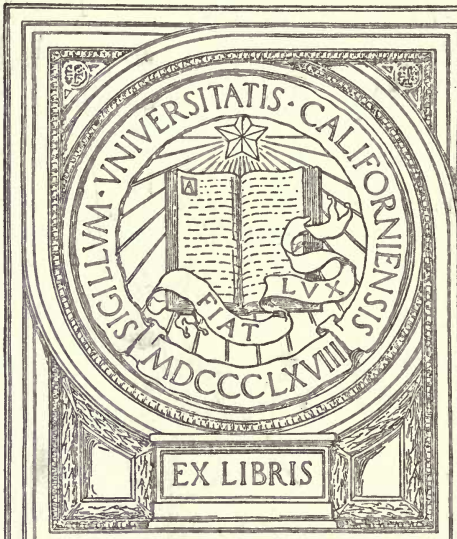
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By William Tyler Olcott

A Field Book of the Stars

In Starland with a Three-Inch Telescope

A FIELD BOOK OF THE STARS

BY

WILLIAM TYLER OLCOTT

WITH FIFTY DIAGRAMS



G. P. PUTNAM'S SONS
NEW YORK AND LONDON
The Knickerbocker Press

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WILLIAM TYLER OLCOTT

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INTRODUCTION.

CONSIDERING the ease with which a knowledge of the constellations can be acquired, it seems a remarkable fact that so few are conversant with these time-honored configurations of the heavens. Aside from a knowledge of "the Dipper" and "the Pleiades," the constellations to the vast majority, are utterly unknown.

To facilitate and popularize if possible this fascinating recreation of star-gazing the author has designed this field-book. It is limited in scope solely to that purpose, and all matter of a technical or theoretical nature has been omitted.

The endeavor has been to include in these pages only such matter as the reader can observe with the naked eye, or an opera-glass. Simplicity and brevity have been aimed at, the main idea being that whatever is bulky or verbose is a hindrance rather than a help when actually engaged in the observation of the heavens.

The constellations embraced in this manual are only those visible from the average latitude of the New England and Middle States, and owe their place in the particular season in which they are found to the fact that in that season they are favorably situated for observation.

With this brief explanatory note of the purpose and design of the book, the author proceeds to outline the scheme of study.

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SCHEME OF STUDY.

THE table of contents shows the scheme of study to be pursued, and to facilitate the work it is desirable that the student follow the therein circumscribed order.

A knowledge on the part of the reader of Ursa Major, or "the Dipper" as it is commonly called, and "the Pleiades," the well-known group in Taurus, is presupposed by the author.

With this knowledge as a basis, the student is enabled in any season to take up the study of the constellations. By following out the order dictated, he will in a few nights of observation be enabled to identify the various configurations making up the several constellations that are set apart for study in that particular season.

A large plate, showing the appearance of the heavens at a designated time on the first night of the quarter, is inserted before each season's work. This should be consulted by the student before he makes an observation, in order that he may obtain a comprehensive idea of the relative position of the constellations, and also know in what part of the heavens to locate the constellation which he wishes to identify.

A knowledge of one constellation enables the student

to determine the position of the next in order. In this work, the identification of each constellation depends on a knowledge of what precedes, always bearing in mind the fact that each season starts as a new and distinct part to be taken by itself, and has no bearing on that which comes before.

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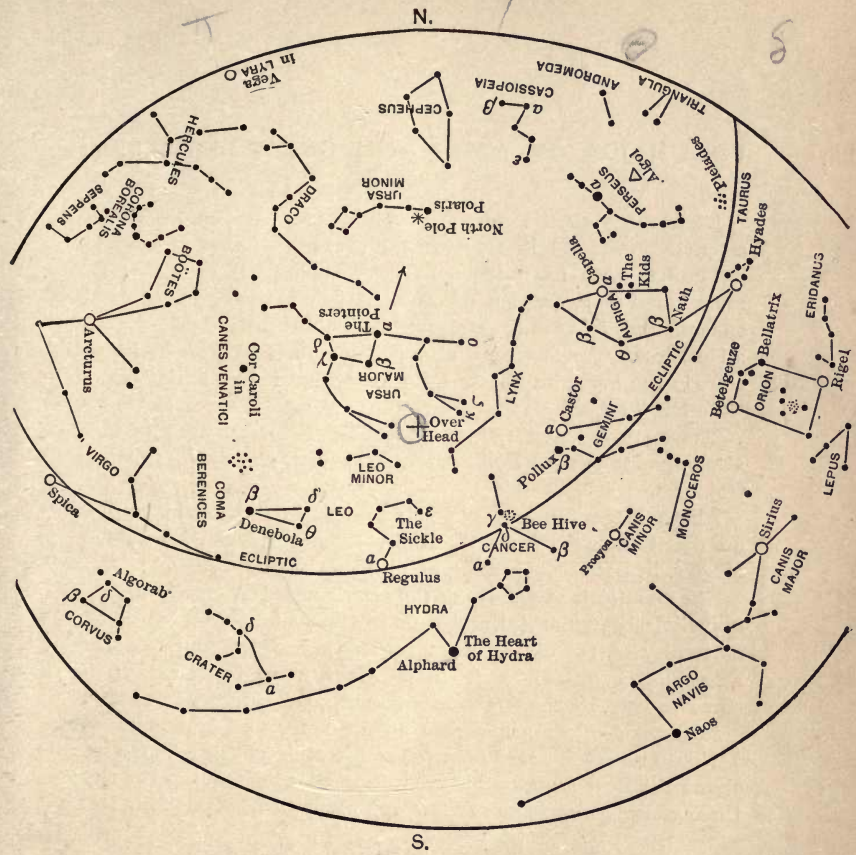
THE diagrams, it will be observed, are grouped under the seasons, and they indicate the positions of the constellations as they appear at 9 o'clock P.M. in mid-season.

To facilitate finding and observing the constellations, the student should face in the direction indicated in the text. This applies to all constellations excepting those near the zenith.

The four large plates are so arranged that the observer is supposed to be looking at the southern skies. By turning the plate about from left to right, the eastern, northern, and western skies are shown successively.

THE CONSTELLATIONS OF SPRING.



○ *Stars of the first magnitude.*

△ *Variable stars..*

⁘ *Nebula.*

Map showing the principal stars visible from Lat. 40° N. at 9 o'clock April 1st.

URSA MAJOR (er'sa mā'-jor)—THE GREAT BEAR. (Face North.)

LOCATION.—Ursa Major is probably the best known of the constellations, and in this work I presuppose that the reader is familiar with its position in the heavens. It is one of the most noted and conspicuous constellations in the northern hemisphere, and is readily and unmistakably distinguished from all others by means of a remarkable cluster of seven bright stars in the northern heavens, forming what is familiarly termed "the Dipper."

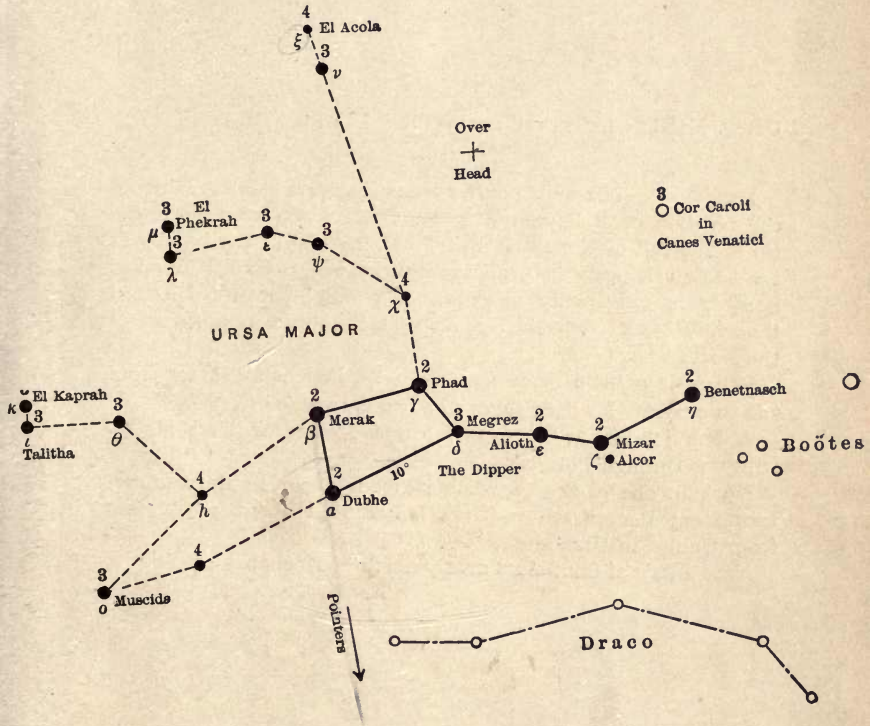
The stars (α) and (β) are called the pointers, because they always point toward Polaris, the Pole Star, $28\frac{3}{4}$ degrees distant from (α).

Alioth is very nearly opposite Shedir in Cassiopeia, and at an equal distance from the Pole. The same can be said of Megres, in Ursa Major, and Caph, in Cassiopeia.

The star (o) is at the tip of the Bear's nose. A clearly defined semicircle begins at (o) and ends in the pair (ι) and (κ) at the extremity of the Bear's right fore paw. This group of stars resembles a sickle. Note little Alcor close to Mizar. This star was used by the Arabs as a test of good eyesight.

Mizar and Alcor are known as the horse and his rider.

Note also a faint star near (α) in direction of (β). This plate shows the Bear lying on his back, his feet projected up the sky; three conspicuous pairs of stars represent three of his four feet.


El Acola
Over
Head
Cor Caroli
in
Canes Venatici
El
Phekrah
URSA MAJOR
Phad
Benetnasch
El Kaprah
Merak
Megrez
Alioth
Mizar
Alcor
Talitha
Dubhe
The Dipper
Boötes
Muscida
Pointers
Draco

URSA MINOR (er'-sa mi'-nor)—THE LITTLE BEAR. (Face North.)

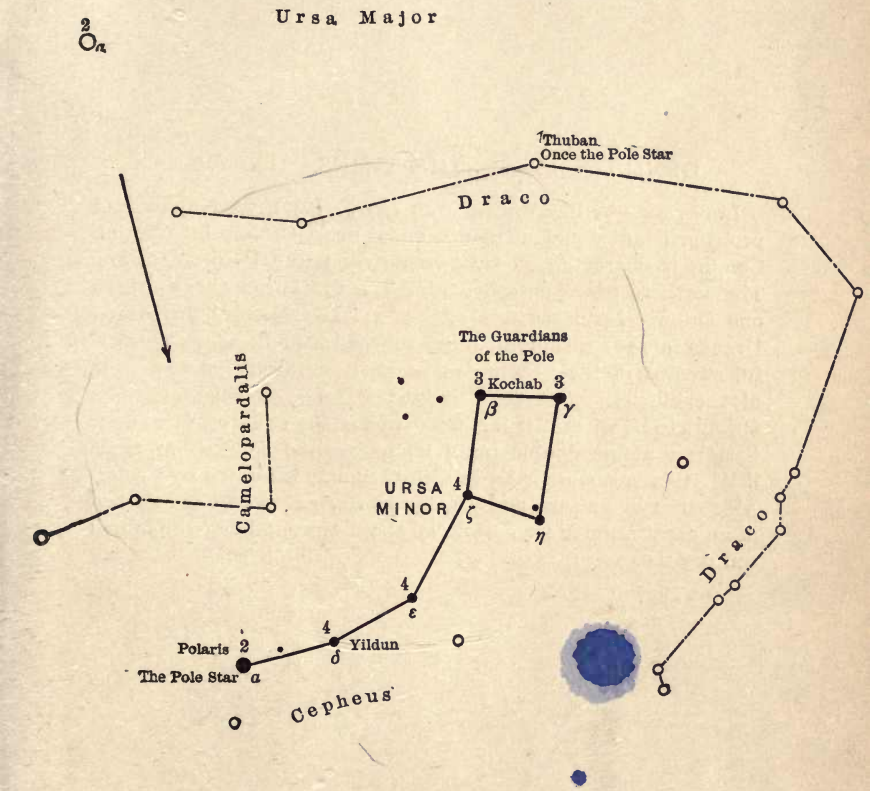
LOCATION.—The two pointer stars in Ursa Major indicate the position of Polaris, the North Star, which represents the tip of the tail of the Little Bear, and the end of the handle of the "Little Dipper." In all ages of the world, Ursa Minor has been more universally observed and more carefully noticed than any other constellation, on account of the importance of the North Star.

Polaris is a little more than one and one half degrees from the true pole. Its light takes fifty years to reach us.

A line joining (β) Cassiopeiæ, and Megres, in Ursa Major, will pass through Polaris.

Kochab, one of the guardian stars, is about 25 degrees distant from Benetnasch in Ursa Major, and about 24 degrees from Dubhe, in Ursa Major.

Note a pair of faint stars nearly north of Kochab.


Ursa Major
2
α
1
Thuban
Once the Pole Star
Draco
The Guardians
of the Pole
3
Kochab
3
β
γ
Camelopardalis
URSA
MINOR
4
ζ
η
4
ε
4
δ
Yildun
Polaris
2
The Pole Star
α
Cepheus
Draco

GEMINI (jem′-i-ni)—THE TWINS. (Face West.)

LOCATION.—A line drawn from (β) to ($\varkappa$) Ursæ Majoris and prolonged an equal distance ends near Castor, in Gemini. Gemini is characterized by two nearly parallel rows of stars. The northern row if extended would reach Taurus, the southern one Orion. Note the fine cluster 35. M. Herschel discovered Uranus in 1781 a short distance southwest of it. Two wonderful streams of little stars run parallel northwest on each side of the cluster. The cross indicates the spot where the sun appears to be when it is farthest north of the equator, June 21st. Castor is a fine double for a telescope, and Pollux has three little attendant stars. An isosceles triangle is formed by Castor, Aldebaran in Taurus, and Capella in Auriga. There is a record of an occultation in Gemini noted about the middle of the fourth century B.C.

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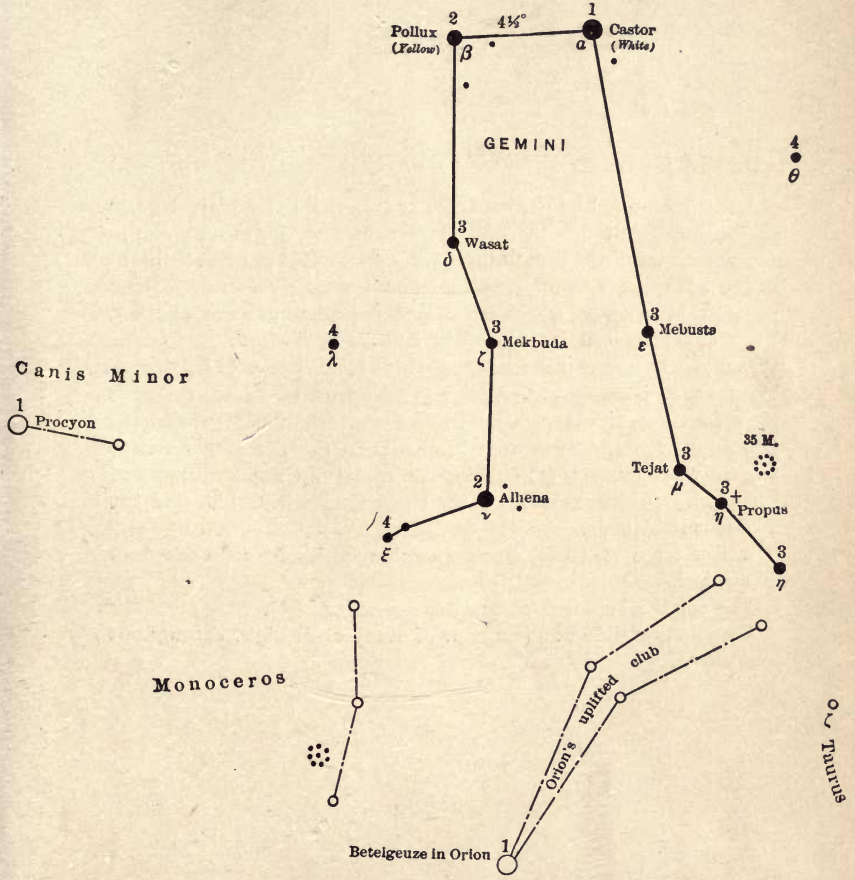


AURIGA (â-ri'-ga)—THE CHARIOTEER. (Face Northwest.)

LOCATION.—A line drawn from (δ) to (α) Ursæ Majoris, and prolonged about 45 degrees, ends near the bright Capella, in Auriga, a star of the first magnitude, and one of the most brilliant in the heavens. It is unmistakable, having no rival in brightness near it. Auriga is a beautiful and conspicuous constellation. It is characterized by a clearly defined pentagon. Note the three fourth-magnitude stars near Capella known as "The Kids." The star (β) is common to Auriga and Taurus, being the former's right foot and the latter's northern horn. The field within the pentagon is particularly rich in clusters. Capella forms a rude square with Polaris, (ε) Cassiopeiæ, and (o) Ursæ Majoris, and forms an equilateral triangle with Betelgeuze in Orion, and the Pleiades in Taurus.

A line from (θ) to (o) Aurigæ prolonged about 20° ends near (α) Persei.

The solstitial colure passes 2 degrees east of (β).

Capella is visible at some hour of every clear night throughout the year.

1
Castor
Gemini
Herschel's
Telescope
4
θ
Menkalinan
2
β
3
θ
Capella
(Creamy white)
1
α
The Goat
AURIGA
37 M.
The
Kids
4
ε
4
η
4
ζ
37
β
Tauri
2
Nath
38 M.
3
ι

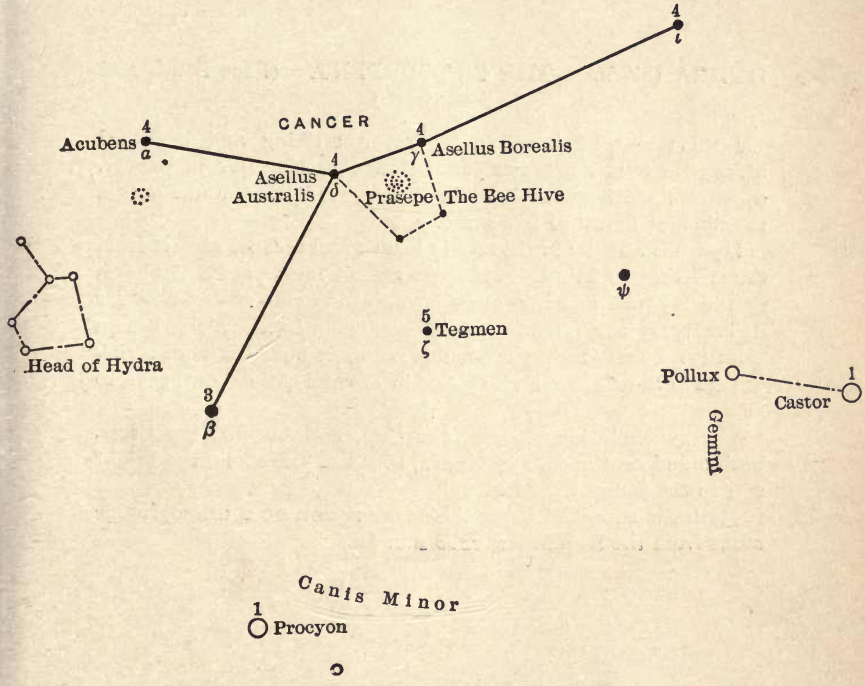
CANCER (kan'-ser)—THE CRAB. (Face West.)

LOCATION—Cancer lies between Gemini and Leo. A line drawn from Nath in Auriga to Pollux in Gemini, and prolonged about 15 degrees, ends in Præsepe, the Manger, the great star cluster in Cancer, which is also called the Bee Hive. It contains thirty-six stars. The stars (γ) and (δ) are called the Aselli—the ass's colts feeding from the silver manger.

The star (β) lies about 10 degrees northeast of Procyon. Acubens (α) lies on the same line the same distance beyond (β). These two stars form the tips of the inverted "Y" which distinguishes Cancer.

An imaginary line from Capella through Pollux will point out Acubens. Close to it are two faint stars. The Bee Hive lies within an irregular square formed by γ, δ, η, and θ., and looks like a nebula to the naked eye. (δ) is situated in the line of the ecliptic.

Halley's Comet first appeared here in 1531.


CANCER
4
ι
4
Acubens
α
4
Asellus
Australis
δ
4
γ
Asellus Borealis
Præsepe
The Bee Hive
ψ
5
Tegmen
ζ
Head of Hydra
3
β
Pollux
1
Castor
Gemini
Canis Minor
1
Procyon

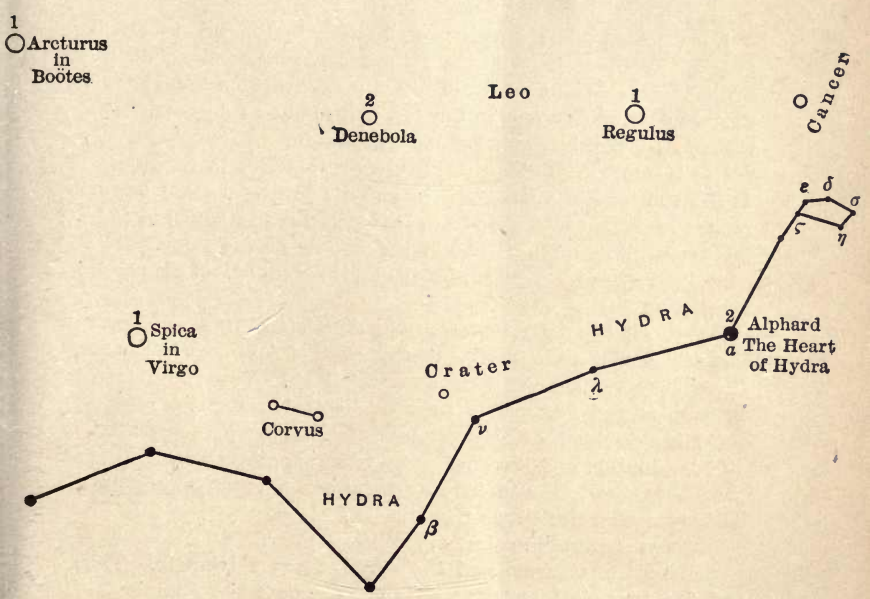
HYDRA (hi'-dra)—THE SEA-SERPENT. (Face South and Southwest.)

LOCATION—The head of Hydra, a striking and beautiful arrangement of stars, lies just below the Bee Hive in Cancer, 6 degrees south of Acubens in that constellation, and forms a rhomboidal figure of five stars.

Hydra is about 100 degrees in length and reaches almost from Canis Minor to Libra. Its stars are all faint except Alphard, or the Hydra's heart, a second-magnitude star remarkable for its lonely situation, southwest of Regulus in Leo. A line drawn from (γ) Leonis through Regulus points it out. It is of a rich orange tint. Castor and Pollux in Gemini point southeast to it.

The constellations Crater, the Cup, and Corvus, the Crow, both stand on the coils of Hydra, south of Denebola, the bright star in the tail of the Lion.

Hydra is supposed to be the snake shown on a uranographic stone from the Euphrates, 1200 B.C.


1
Arcturus
in
Boötes
2
Denebola
Leo
1
Regulus
Cancer
ε
δ
σ
ι
η
1
Spica
in
Virgo
HYDRA
2
Alphard
The Heart
of Hydra
α
Crater
λ
Corvus
ν
HYDRA
β

LEO (le'o)—THE LION. (Face South.)

LOCATION—A line drawn from Pollux, in Gemini, to (γ) in Cancer, and prolonged about 12 degrees, strikes Regulus, the brilliant star in the heart of the Lion. Regulus lies about 9 degrees east of Acubens in Cancer, and about 12 degrees northeast of Alphard, in the heart of Hydra.

Leo is one of the most beautiful constellations in the Zodiac. It lies south of the Great Bear, and its principal stars are arranged in the form of a sickle. This group is so striking as to be unmistakable. Regulus lies in the handle of the sickle. It is one of the stars from which longitude is reckoned, and is almost exactly on the ecliptic.

Denebola, the bright star in the Lion's tail, lies 25 degrees east of Regulus, and about 35 degrees west of Arcturus, in Boötes. It is the same distance northwest of Spica, in Virgo, and forms with Spica and Arcturus a large equilateral triangle.

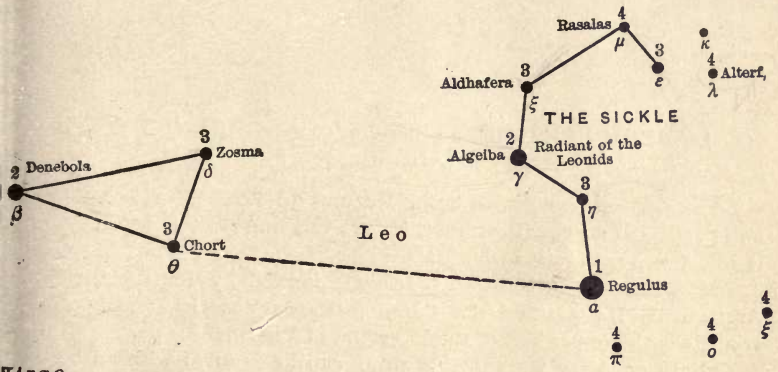
(γ) is a double for an opera-glass.

(ζ) is double, and has three minute companion stars.

(ε) has two minute seventh-magnitude companion stars, forming a beautiful little triangle.

Regulus is white in color, (γ) yellow, (π) red.

Denebola, Arcturus, and Cor Caroli form a triangle. This, and the triangle formed with Spica, compose the Diamond of Virgo.


Rasalas
4
μ
3
ε
κ
4
Alterf,
λ
Aldhafera
3
ξ
THE SICKLE
Algeiba
2
γ
Radiant of the
Leonids
3
η
1
Regulus
α
3
Zosma
δ
2
Denebola
β
3
Chort
θ
Leo
4
ξ
4
ο
4
π
Virgo
Alphard
in Hydra
(red)

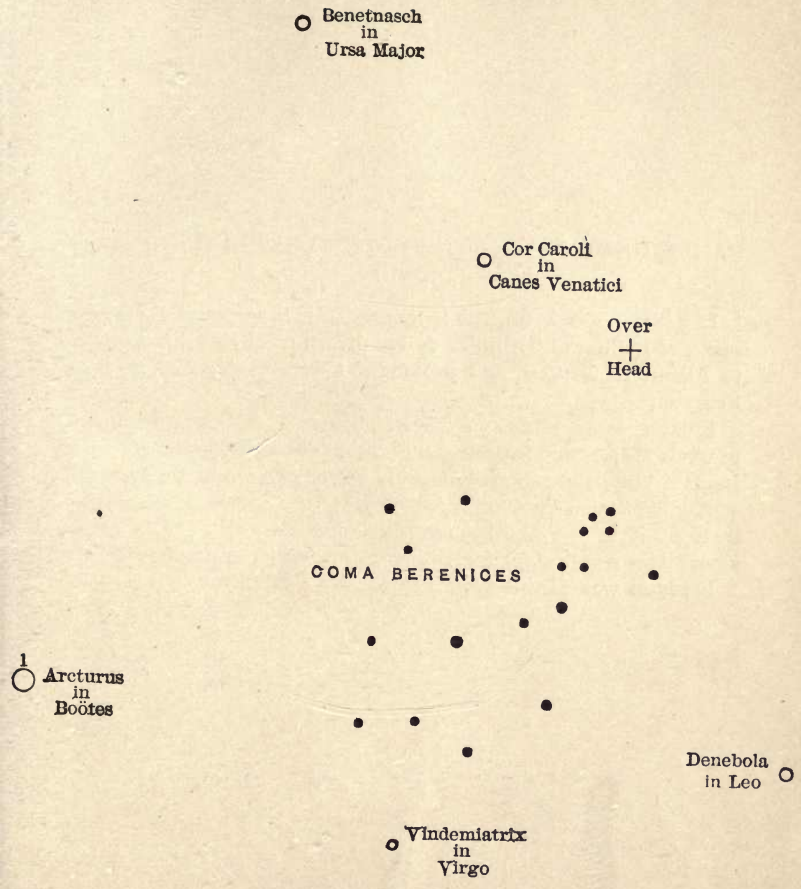
Cancer

COMA BERENICES (kō'-ma ber-e-nī'-sez)—BERENICE'S HAIR.

LOCATION—A line drawn from Regulus to Zosma, in Leo, and prolonged an equal distance, strikes this fine cluster, which is 18 degrees northeast of Zosma.

The group lies well within a triangle formed by Denebola, Arcturus in Boötes, and Cor Caroli in Canes Venatici, which triangle is the upper half of the Diamond of Virgo.

Twenty or thirty stars in this group can be counted with an opera-glass, and the group can be easily distinguished with the naked eye, when the moon is not visible.


Benetnasch
in
Ursa Major
Cor Caroli
in
Canes Venatici
Over
Head
COMA BERENICES
1
Arcturus
in
Boötes
Denebola
in Leo
Vindemiatrix
in
Virgo

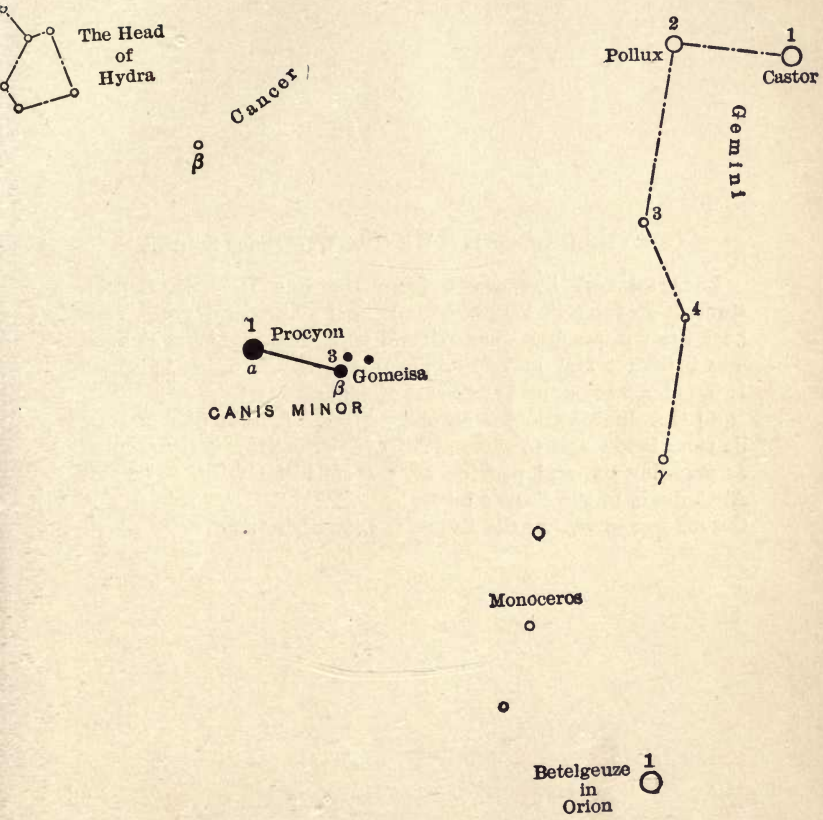
CANIS MINOR (kā'-nis mī'-nor)—THE LESSER DOG. (Face West.)

LOCATION—Procyon, the little dog star, lies about 23 degrees south of Pollux, in Gemini. A line drawn from Nath, in Auriga, to Alhena in Gemini, and prolonged about 18 degrees, reaches Procyon.

Procyon is equidistant from Betelgeuze in Orion, and Sirius in Canis Major, and forms with them an equilateral triangle. It forms a large right-angled triangle with Pollux and Betelgeuze.

The light from Procyon is golden yellow. Four degrees northwest of it is the third-magnitude star Gomeisa. The glass shows two small stars forming a right-angled triangle with it.

Procyon was distinctly mentioned by Ptolemy.

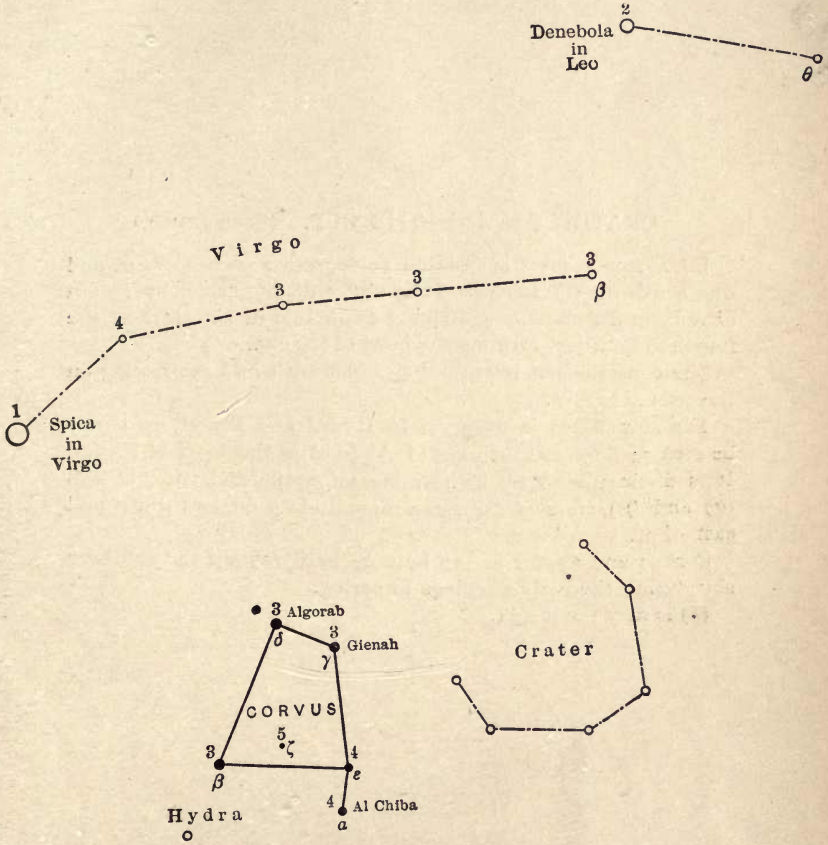

The Head
of
Hydra
Cancer
β
Pollux
2
1
Castor
Gemini
3
4
γ
1
Procyon
3
a
Gomeisa
β
CANIS MINOR
Monoceros
Betelgeuze
in
Orion
1

CORVUS (kôr'-vus)—THE CROW. (Face South.)

LOCATION.—A line drawn from the Bee Hive, in Cancer, through Regulus in Leo, and prolonged about 40 degrees, ends near the conspicuous quadrilateral which distinguishes Corvus. The brightest star in this region of the sky is Spica in Virgo. It lies about 10 degrees northeast of Algorab.

(ζ) is a double star for an opera-glass. A faint pair of stars lie close below and to the west of (β). The Crow is represented as standing on, and pecking at, the coils of Hydra. The star Al Chiba is in the Crow's bill.

Corvus was known as the Raven in Chaucer's time.


Denebola
in
Leo
2
θ
Virgo
3
3
3
β
4
1
Spica
in
Virgo
3 Algorab
δ
3
Gienah
γ
CORVUS
5
ζ
3
4
β
ε
4
Al Chiba
a
Hydra
Crater

CRATER (krā′-ter)—THE CUP. (Face South.)

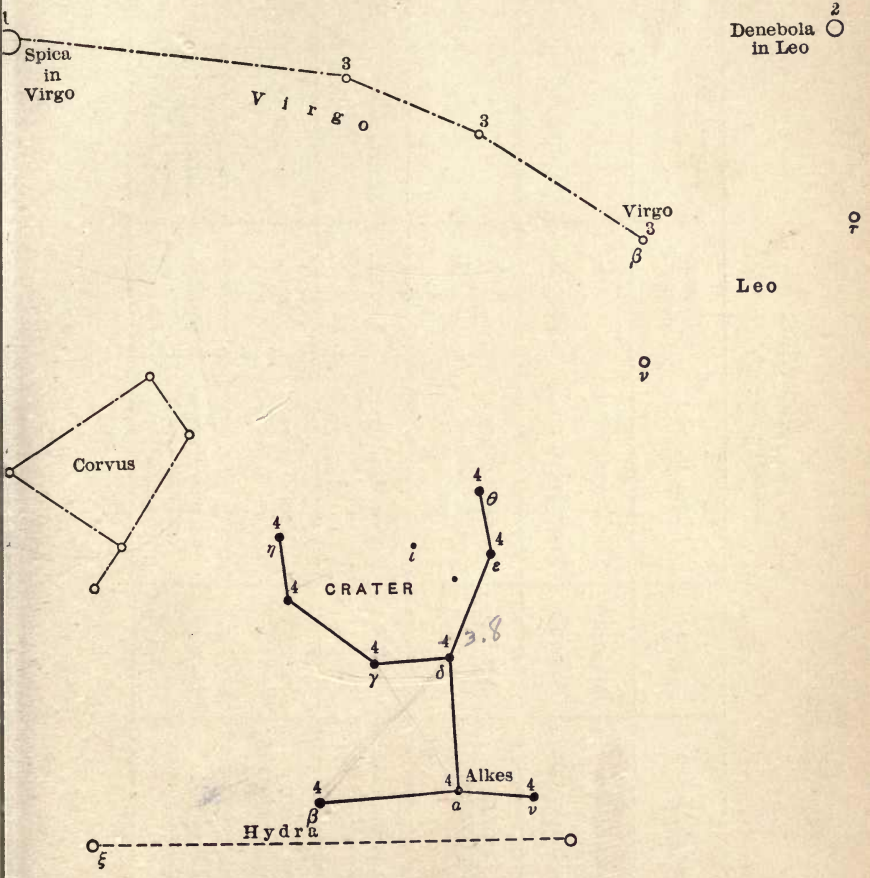
LOCATION—Crater is situated 15 degrees west of Corvus, and due south of (θ) Leonis. It is easily distinguished by reason of a beautiful and very striking semicircle of six stars of the fourth magnitude, forming the bowl of the cup.

The constellation resembles a goblet with its base resting on the coils of Hydra.

The star Alkes is common to Hydra and Crater, and may be seen 24 degrees southeast of Alphard in the heart of Hydra. It is distinguished by its forming an equilateral triangle with (α) and (γ), stars of the same magnitude 6 degrees south and east of it.

. Corvus and Crater are to be seen half way up the southern sky during the early evenings in spring.

(δ) is now the lucida.


Spica
in
Virgo
3
Virgo
3
3
Virgo
β
Denebola
in Leo
2
Leo
ν
Corvus
4
θ
4
η
ι
4
ε
4
CRATER
4
4
3.8
γ
δ
4
Alkes
4
4
β
a
ν
Hydra
ξ

METEORIC SHOWERS.

APRIL TO JULY.

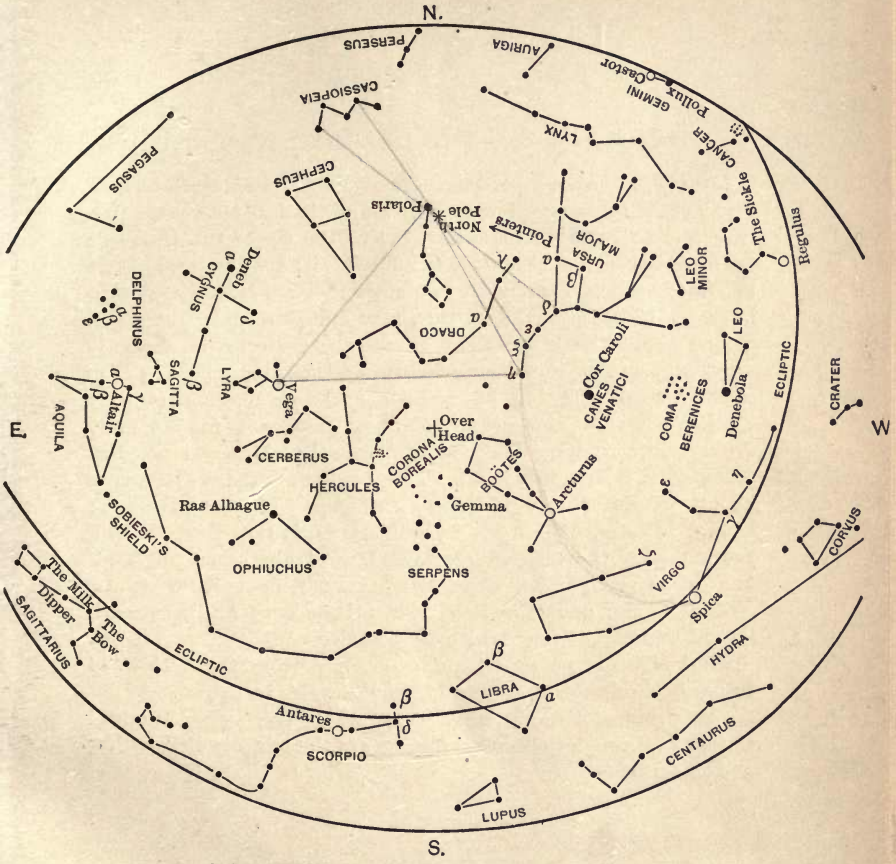
Name of Shower	*Date*	*Radiant Point*	*Characteristics*	*Other Dates of Observation*	*Location*
Beta or Mu Draconids	Apr. 9–16	The Dragon's head			N. E.
Beta Serpentids	Apr. 18	The Serpent's head	Sw. F.	Apr. 17–25	S. E.
Lyrids, rich shower	Apr. 20	About 10° from Vega toward Hercules	V. Sw.		N. E.
Eta Aquarids, fine annual shower	May 6	Near the Water Jar	Sw. Sk.	After 2 A.M.	E.
Alpha Coronids, well defined in 1885	May 11	Near Gemma (α) Coronæ B.	Sl. F.	May 7–18	N.
Iota Pegasids, well defined shower	May 30	Between Cygnus and the Great Square	Sw. Sk.	May 29–June 4 after 10 P.M.	N. E.

Beta Herculids	June 7	Near the Crown	Sl. B.	A fire ball radiant June 10, 13	S. E.
Beta Ophiuchids	June 10	About 8° S. of Ras Alhague	Sl.		S. E.
Delta Cepheids	June 20	About 13° from (β) Cassiopeiæ	Sw.	June 10–28, July 19, Aug. 25, etc.	N.

The Abbreviations under *Characteristics* are as follows:

V.—very. M.—moderately. Sw.—swift. Sl.—slow. Sh.—short. B.—bright. F.—faint. Sk.—streak-leaving meteors. T.—train-leaving meteors.

THE CONSTELLATIONS OF SUMMER.



○ *Stars of the first magnitude.*

△ *Variable stars.*

⁘ *Nebula.*

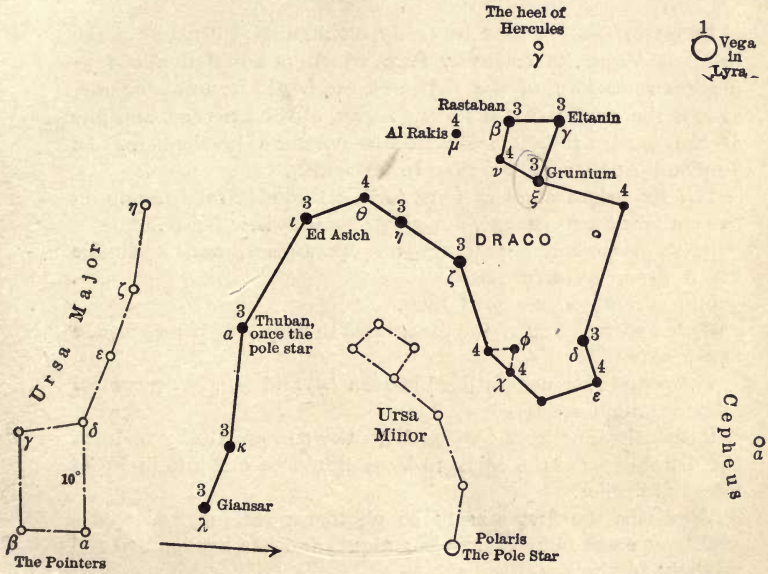
Map showing the principal stars visible from Lat. 40° N. at 9 o'clock, July first.

DRACO (drā′-ko)—THE DRAGON. (Face North.)

LOCATION.—About 10 degrees from (α) Ursæ Majoris—from (α) to (δ) is 10 degrees—slightly south of, that is above, the line from (α) to Polaris, is Giansar, (λ) in the tip of the Dragon's tail. Above (λ), and almost in line with it, are two more stars in Draco, which form with two stars in Ursa Major a quadrilateral. (See diagram.) Draco now curves sharply eastward, coiling about the Little Bear as shown, then turns abruptly southerly, ending in a characteristic and clearly defined group of four stars, forming an irregular square, representing the Dragon's head. This group is almost overhead in the early evening in summer. The star in the heel of Hercules lies just south of the Dragon's head. The brilliant Vega will be seen about overhead, 12 degrees southwest of the Dragon's head. Eltanin, one of the Dragon's eyes, is noted for its connection with the discovery of the law of aberration of light It is of an orange hue, while the star (β), near it, is white Note Thuban, once the Pole Star, at one corner of a quadrilateral that Draco forms with Ursa Major.

Thuban could be seen by day or night from the bottom of the central passage of several of the Pyramids in Egypt.

The rising of Eltanin was visible about thirty-five hundred years B.C. through the central passages of the temples of Hawthor at Denderah.


The heel of Hercules
γ
1
Vega in Lyra
Rastaban
Eltanin
Al Rakis
μ
β
γ
ν
Grumium
ξ
θ
ι
Ed Asich
η
DRACO
ζ
Thuban, once the pole star
α
φ
χ
δ
ε
Ursa Minor
Cepheus
α
Ursa Major
η
ζ
ε
δ
γ
10°
β
α
The Pointers
κ
Giansar
λ
Polaris
The Pole Star

LYRA (lī'-ra)—THE LYRE.

LOCATION.—Lyra may be easily distinguished because of the brilliant Vega, its brightest star, which is situated about 12 degrees southwest of the Dragon's head. It is unmistakable, as it is the brightest star in this region of the heavens, and one of the most brilliant stars in the northern hemisphere. In July and August Vega is close to the zenith.

The six bright stars in Lyra form an equilateral triangle on one corner of a rhomboid. A very characteristic figure.

(ε) is a pretty double for an opera-glass, and a double double for a powerful telescope.

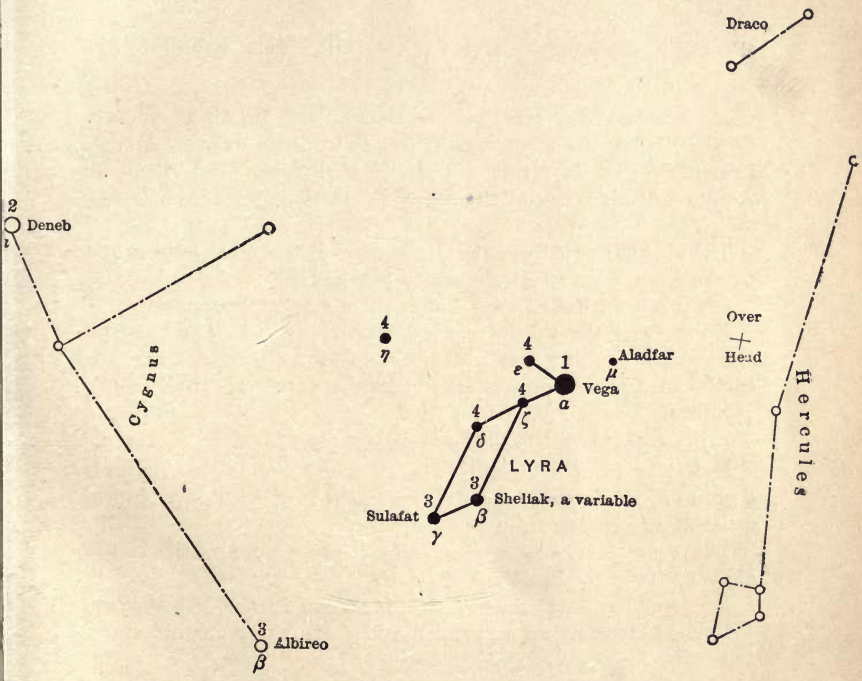
(ζ) is a double for a good glass.

(β) is a variable, changing from third to nearly fifth magnitude in a week's time.

The noted ring nebula lies between (β) and (γ). A powerful telescope alone renders it visible.

If the distance from the earth to the sun equalled one inch, the distance from the earth to Vega would be one hundred and fifty-eight miles.

Vega was the first star to be photographed, in 1850. It is visible at some hour every clear night, and has been called the arc-light of the sky.


Draco
2
Deneb
Cygnus
3
Albireo
β
4
η
4
ε
1
Aladfar
μ
Vega
α
4
ζ
4
δ
LYRA
3
Sulafat
γ
3
Sheliak, a variable
β
Over
Head
Hercules

CYGNUS (sig'-nus)—THE SWAN, OR THE NORTHERN CROSS.

LOCATION.—The star (α) or Deneb, the brightest star in Cygnus, is at the top of the cross, and a little over 20 degrees east of Vega. It forms a triangle with Vega and Altair in Aquila—Altair being at the apex, about 35 degrees from Deneb and Vega.

The star (β) or Albireo is at the base of the cross, and a line drawn from Vega to Altair nearly touches it.

(β) is a beautiful colored double for a small telescope.

Note "61," the second nearest star to us. It was the first star whose distance was measured. If the distance from the earth to the sun equals one inch, the earth to "61" equals $7\frac{1}{2}$ miles.

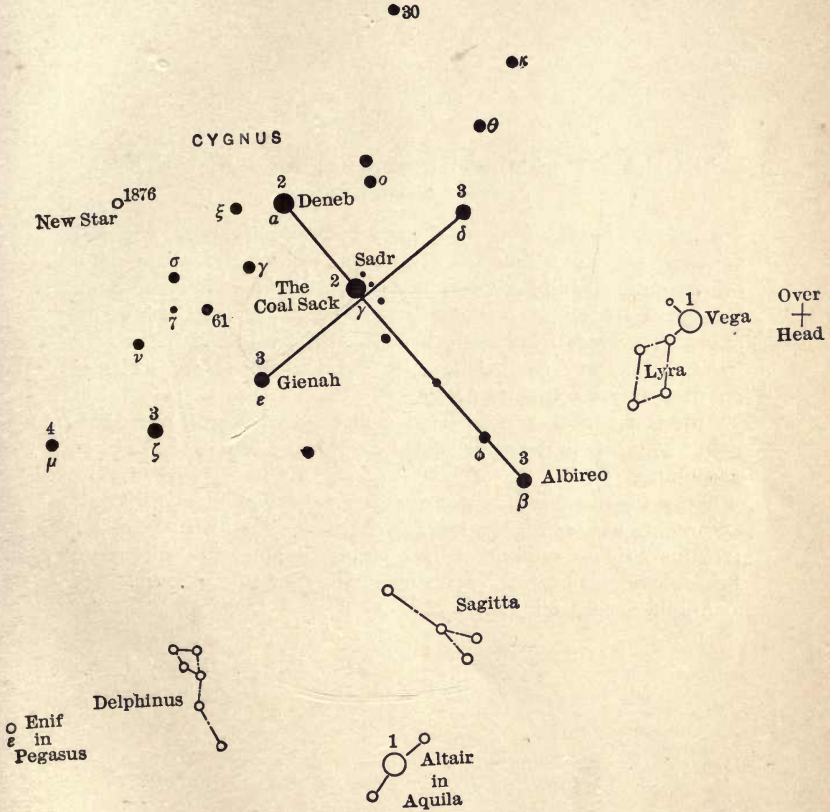
(o) is a double. There is a little star near it.

Half way from Albireo to the stars (ζ) and (ε) in Aquila is a group of six or seven stars in a straight row, with a garland of other stars hanging from the centre.

The cross is nearly perfect and easily traced out. It lies almost wholly in the Milky Way.

Note "The Coal Sack," the dark gap in the Milky Way.

Cygnus contains an unusual number of deeply colored stars.


30
κ
θ
CYGNUS
o
2
Deneb
α
3
δ
1876
New Star
ξ
σ
γ
Sadr
The
Coal Sack
2
γ
7
61
ν
3
Gienah
ε
Over
Head
1
Vega
Lyra
4
μ
3
ζ
φ
3
Albireo
β
Sagitta
Delphinus
Enif
ε
in
Pegasus
1
Altair
in
Aquila

AQUILA (ak′-wi-lä)—THE EAGLE, AND ANTINOÜS.

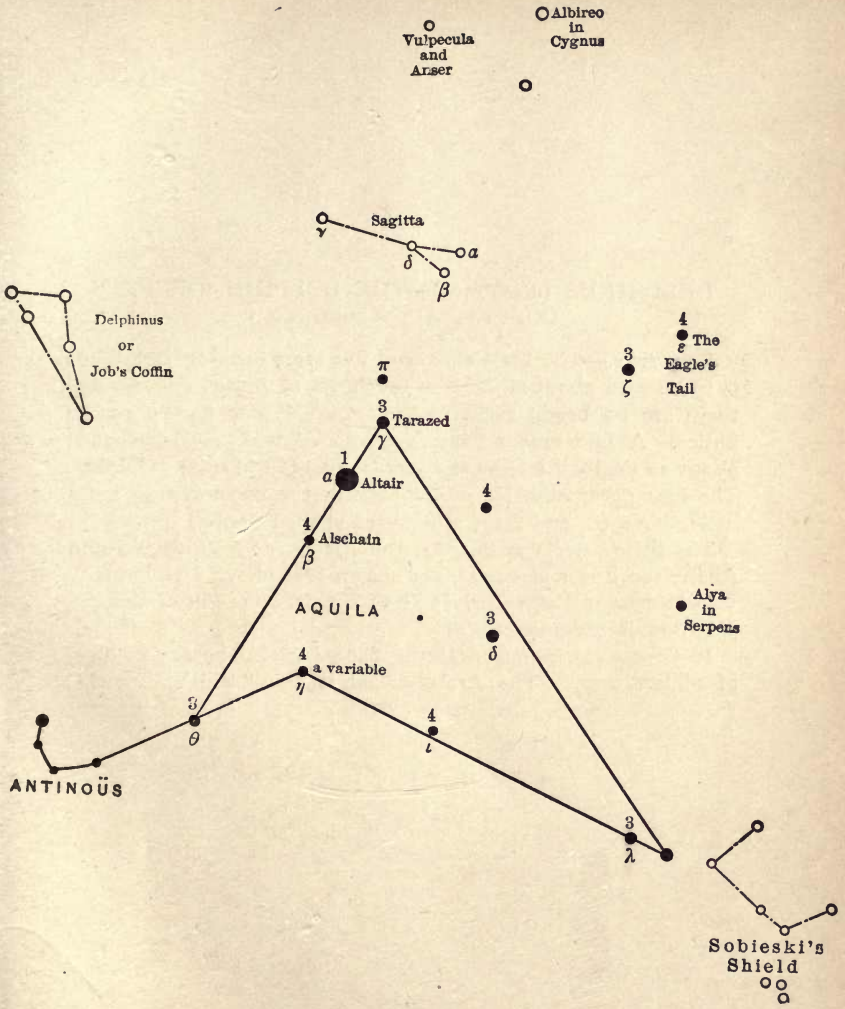
(Face Southeast.)

LOCATION.—Half way up the sky in the Milky Way, you will see three stars in a line, the middle one much brighter than the other two. This bright star is Altair in Aquila. It forms with Vega and Deneb an isosceles triangle. Altair is at the apex, about 35 degrees from the other two. A triangle is formed by Vega, Altair, and Ras Alhague, in the Serpent Bearer, which is about 30 degrees west of Altair.

This is a double constellation composed of Aquila and Antinoüs. Altair is in the neck of the eagle, Alschain in the head of Antinoüs.

When the moon is absent, a rude arrow head can be traced out, embracing almost all the stars in Aquila. For forty hours (η) remains bright, diminishes for sixty-six hours to minimum brightness, and is stationary in brilliancy for thirty hours.

Aquila dates back 1200 B.C.


Albireo
in
Cygnus
Vulpecula
and
Anser
Sagitta
γ
δ
α
β
Delphinus
or
Job's Coffin
4
ε
The
3
Eagle's
ζ
Tail
π
3
Tarazed
γ
1
α
Altair
4
4
Alschain
β
AQUILA
Alya
in
Serpens
3
δ
4
a variable
η
3
θ
4
ι
ANTINOÜS
3
λ
Sobieski's
Shield

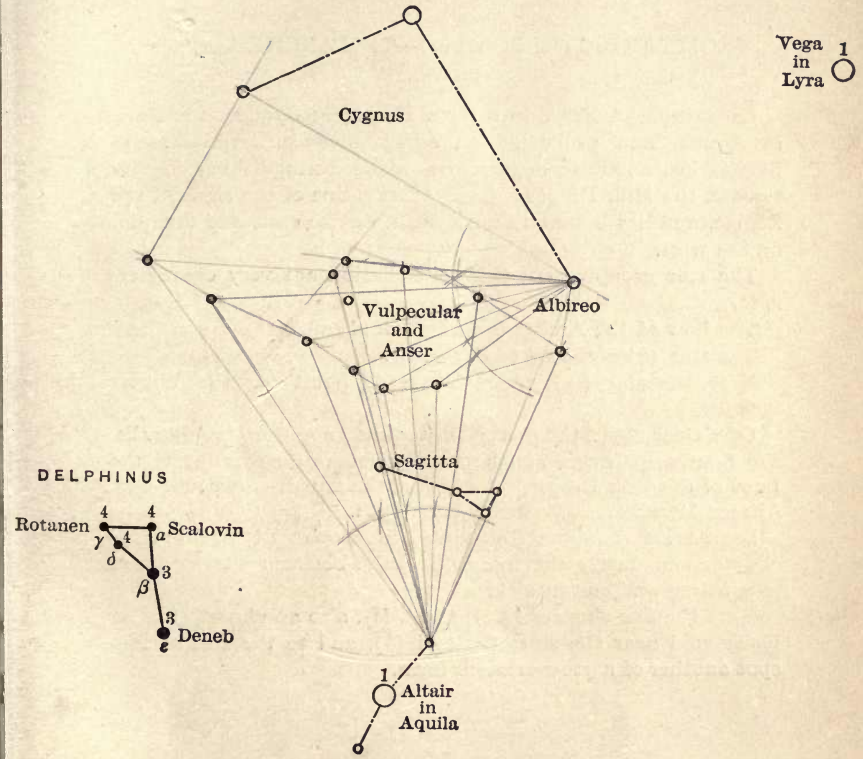
DELPHINUS (del-fi'-nus)—THE DOLPHIN, OR JOB'S COFFIN. (Face Southeast.)

LOCATION.—The little cluster of five stars forming Delphinus is to be seen about 10 degrees northeast of Altair, and, though there are no bright stars in the roup, it can hardly escape notice. A line drawn from Vega to Albireo, and prolonged about 20 degrees, strikes the star (ε) in the tail of the Dolphin. The four other stars of prominence in the constellation are a little above (δ), and form a diamond-shaped figure.

The little asterisms Sagitta, the Arrow, and Vulpecula and Anser, the Fox and Goose, are shown just above Delphinus.

Delphinus is also called Job's Coffin. The origin of this appellation is unknown.

In Greece, Delphinus was the Sacred Fish, the sky emblem of philanthropy. The Arabs called it the "Riding Camel."


Vega
in
Lyra
1
Cygnus
Albireo
Vulpecular
and
Anser
Sagitta
DELPHINUS
Rotanen
4
4
Scalovin
γ
4
α
δ
3
β
3
Deneb
ε
1
Altair
in
Aquila

SAGITTARIUS (saj-i-tā′-ri-us)—THE ARCHER. (Face South.)

LOCATION.—A line drawn from Deneb, in Cygnus, to Altair, in Aquila, and prolonged an equal distance, terminates in Sagittarius, about 10 degrees east of its distinguishing characteristic, the Milk Dipper. Sagittarius is one of the signs of the Zodiac, and lies between Capricornus, on the east, and Scorpio, on the west.

The star groupings in this constellation are very characteristic.

The bow of the Archer is easily traced out.

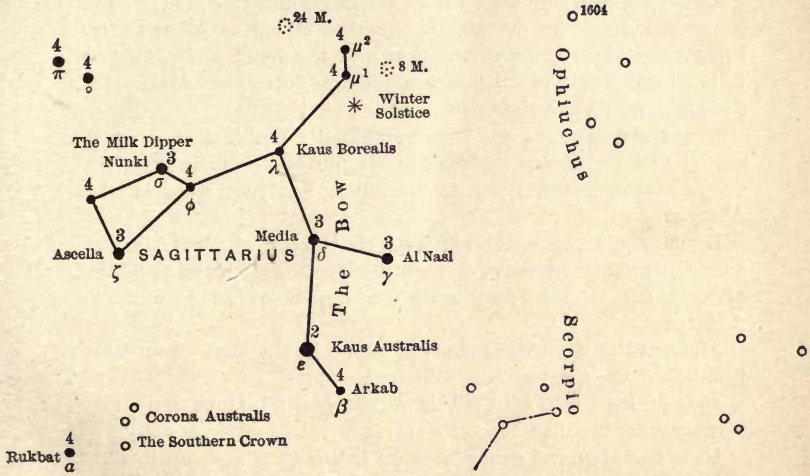
The star (γ) is the tip of the arrow.

Note the star (μ), which serves to point out the Winter Solstice.

On a clear night, the pretty cluster known as Corona Australis, the Southern Crown, can be seen about 10 degrees below the bowl of the Milk Dipper. Its lucida, the fourth-magnitude star Alfecca Meridiana, culminates Aug. 13th.

Sagittarius is about due south, in a splendid position for observation, during the month of July, between the hours of nine-thirty and eleven o'clock P.M.

Note the fine clusters 24 M. and 8 M.; also an almost circular black void near the stars (γ) and (δ), and to the east of this spot another of narrow crescent form.


24 M.
4
μ^2
4
μ^1
8 M.
Winter Solstice
4
Kaus Borealis
λ
The Milk Dipper
Nunki
3
σ
4
ϕ
4
4
π
Ascella
3
ζ
SAGITTARIUS
Media
3
δ
3
Al Nasl
γ
The Bow
2
Kaus Australis
ϵ
4
Arkab
β
Corona Australis
The Southern Crown
4
Rukbat
α
1604
Ophiuchus
Scorpio

OPHIUCHUS (of-i-ū'-kus)—THE SERPENT BEARER, AND SERPENS. (Face Southwest.)

LOCATION.—A line drawn from (ε) Delphinus to (γ) in Aquila, prolonged about 30 degrees, strikes the star Ras Alhague, the brightest star in the constellation and the head of Ophiuchus. It is at one angle of an isosceles triangle, of which Altair is at the apex, and Vega the third angle.

Two constellations are here combined. Ophiuchus is represented as an old man, holding in his hands a writhing serpent.

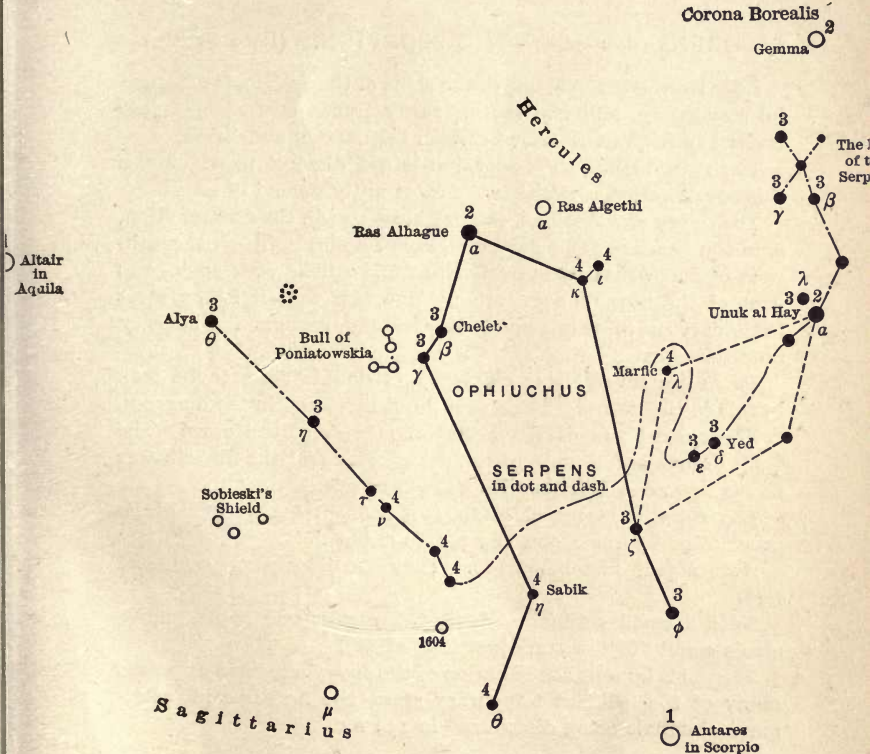
Ras Algethi, the head of Hercules, lies just west of Ras Alhague.

Equally distant southeast and southwest of Ras Alhague, are to be seen two stars close together, representing the shoulders of Ophiuchus. His foot rests on the Scorpion just above Antares.

The head of Serpens is the star group in the form of an "X" just below the Crown.

1604 indicates the spot where in that year a famous temporary star appeared, called Kepler's star.

Note the diamond group of stars below the "X", outlined in dotted line, and the asterism "The Bull of Poniatowskia" just east of (γ).


Corona Borealis
Gemma
Hercules
Ras Algethi
Ras Alhague
Altair in Aquila
Alya
Bull of Poniatowskia
Chelel
OPHIUCHUS
SERPENS in dot and dash
Marfic
Unuk al Hay
Yed
Sobieski's Shield
Sabik
1604
Sagittarius
Antares in Scorpio

SCORPIO (skôr'-pi-ō)—THE SCORPION. (Face South.)

LOCATION.—Scorpio, one of the signs of the Zodiac, is a beautiful star group, and one that is easily traced out. It lies just under the Serpent Bearer, between Sagittarius and Libra.

The resemblance to a Scorpion is not difficult to see, hence this constellation is perhaps the most aptly named of any.

The ruddy star Antares, the brightest star in the constellation, is in the heart of the Scorpion. It lies about 40 degrees southwest of Ras Alhague, in Ophiuchus, and a little over 20 degrees west of the bow of Sagittarius. The fact that it is the most brilliant star in this region of the sky renders its identity unmistakable.

There are several star clusters and double stars to be seen in this constellation. Their position is indicated in the diagram.

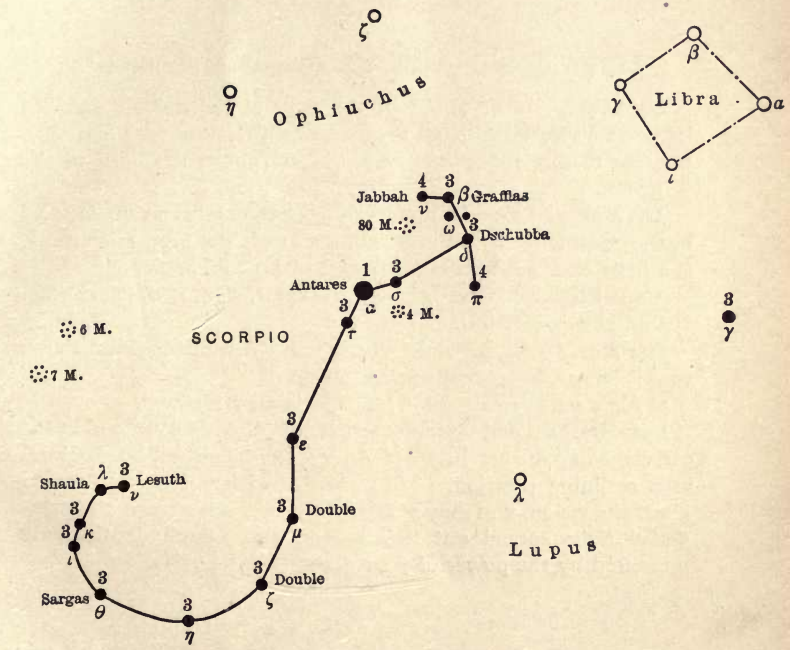
The curved tail of the Scorpion is very conspicuous. The stars Lesuth and Shaula are a striking pair and the fine clusters above them can be seen with the naked eye.

The ecliptic passes close to (β) Scorpii. A record of its occultation by the moon 295 B.C. is extant.

Note a pair just below (β). They are known as (ω^1) and (ω^2).

Note a small pentagon, Antares being at one of its points, also a small "X" of stars just west of (π).

Scorpio is famous as the region of the sky where have appeared many of the brilliant temporary stars, the first one in astronomical annals being discovered in 134 B.C.


ζ
η
Ophiuchus
Libra
β
γ
α
ι
Jabbah
ν
β Grafflas
80 M.
ω
Dschubba
δ
Antares
σ
π
τ
4 M.
6 M.
7 M.
SCORPIO
γ
ε
Shaula
λ
Lesuth
ν
κ
ι
Sargas
θ
η
Double
μ
Double
ζ
λ
Lupus
Sagittariu

LIBRA (lī'-bra)—THE SCALES. (Face Southwest.)

LOCATION.—Libra is one of the signs of the Zodiac, and lies between Virgo and Scorpio. Its two chief stars, (α) and (β), may be readily recognized west of and above the head of the Scorpion.

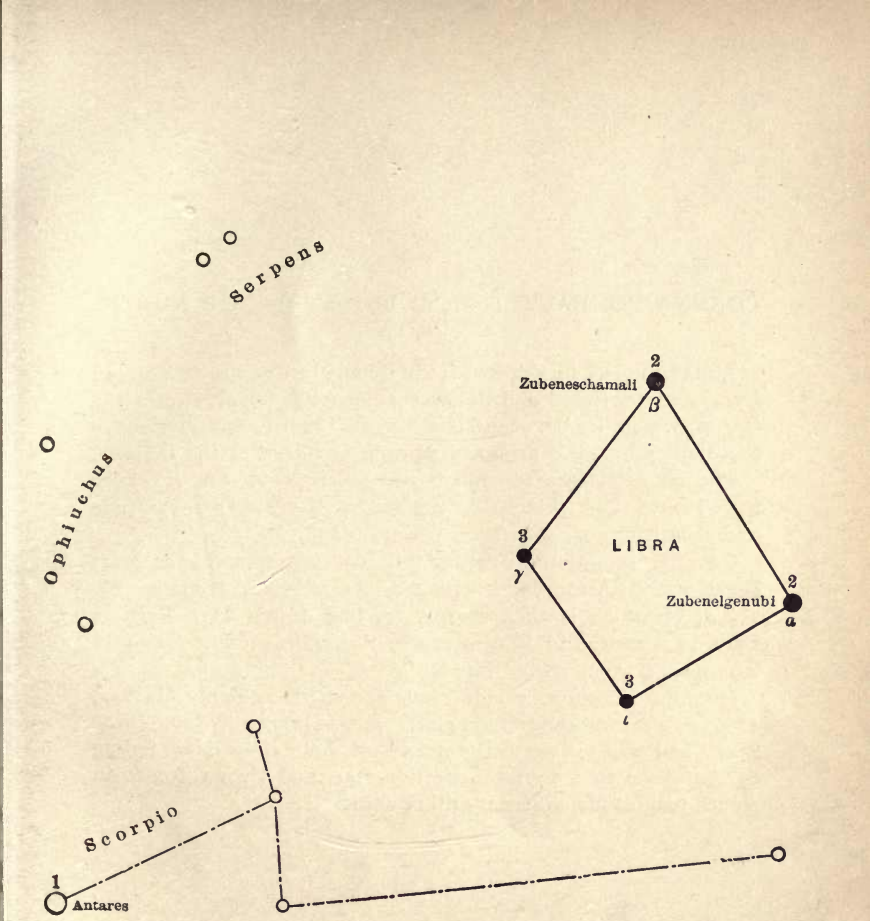
The star (ι) Libræ is about 20 degrees northwest of Antares in the Scorpion. Spica in Virgo, a star of the first magnitude, is a little over 20 degrees northwest of (α) Libræ.

A quadrilateral is formed by the stars α, β, γ, ι, which characterizes the constellation.

The star (α) Libræ looks elongated. An opera-glass shows that it has a fifth-magnitude companion.

(β) is a pale green star. Its color is very unusual.

Lyra, Corona, and Hercules are almost directly overhead in the early evening, during July and August, and can best be observed in a reclining position. Thus placed, with an opera-glass to assist the vision, you may study to the best advantage the wonderful sight spread out before you, and search depths only measured by the power of your glass.



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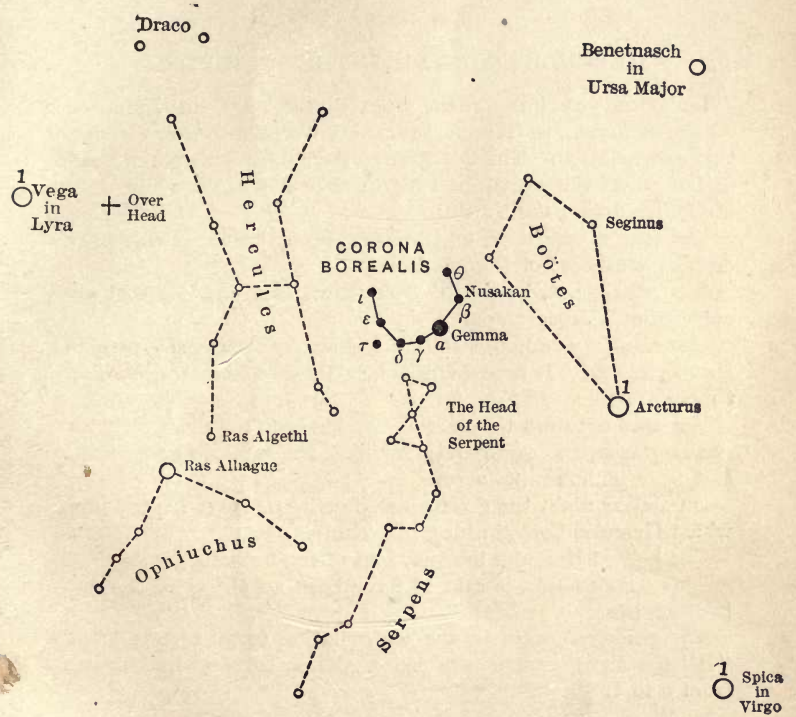
CORONA BOREALIS (kō-rō′nä bō-rē-a′-lis)—THE NORTHERN CROWN.

Location.—A line drawn from Deneb, in Cygnus, to Vega, in Lyra, and projected a little over 40 degrees, terminates in the Crown, which lies between Hercules and Boötes, and just above the diamond-shaped group of stars in the head of the Serpent.

The characteristic semicircle resembling a crown is easily traced out. The principal stars are of the fourth magnitude excepting Gemma, which is a second-magnitude star.

Gemma, sometimes called Alphacca, forms with the stars Seginus and Arcturus, in Boötes, an isosceles triangle, the vertex of which is at Arcturus. A line drawn from Vega in Lyra to Arcturus in Boötes passes through Corona. The star letters in Corona spell "Bagdei."

Note "*r*" Coronæ, a star that appeared suddenly May 12, 1866, as a second-magnitude star. It was known as the "Blaze Star" and was visible to the naked eye only eight days, fading at that time to a tenth-magnitude star, and then rising to an eighth-magnitude, where it still remains.


Draco
Benetnasch
in
Ursa Major
1
Vega
in
Lyra
Over
Head
Hercules
CORONA
BOREALIS
θ
Nusakan
ι
ε
β
τ
δ
γ
a
Gemma
Boötes
Seginus
1
Arcturus
The Head
of the
Serpent
Ras Algethi
Ras Alhague
Ophiuchus
Serpens
1
Spica
in
Virgo

HERCULES (her'-kū-lēz)—THE KNEELER.

LOCATION.—A line drawn from either Vega, in Lyra, or Altair, in Aquila, to Gemma, in Corona Borealis, passes through this constellation. The left foot of Hercules rests on the head of Draco, on the north, and his head nearly touches the head of Ophiuchus on the south.

The star in the head of Hercules, Ras Algethi, is about 25 degrees southeast of Corona Borealis.

Ras Alhague, the head of Ophiuchus, and Ras Algethi are only about 5 degrees apart.

The cluster 13 M, the Halley Nebula, can be easily seen in an opera-glass. It contains fourteen thousand stars, according to Herschel.

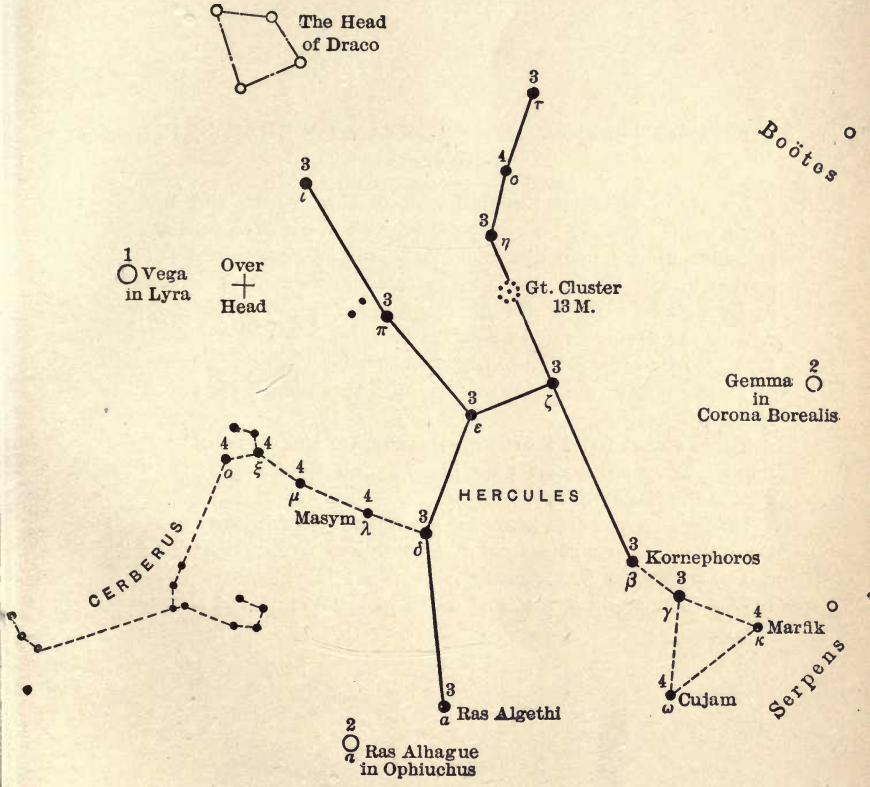
Hercules occupies the part of the heavens toward which the sun is bearing the earth and planets at the rate of one hundred and sixty million miles a year.

On a clear night the asterism Cerberus, the three-headed dog, which Hercules holds in his hand, can be seen.

The belt of Hercules lies just east of the Crown.

This constellation is said to have been an object of worship in Phœnicia.

The principal stars in the constellation form a rude letter "H" the short cross-stroke being the imaginary line drawn from ε to ζ.


The Head of Draco
Böötes
1 Vega in Lyra
Over Head
Gt. Cluster 13 M.
Gemma 2 in Corona Borealis
HERCULES
CERBERUS
Masym
Kornephoros
Marfik
Cujam
Serpens
Ras Algethi
2 Ras Alhague in Ophiuchus

BOÖTES (bō-ō′tēz)—THE HERDSMAN, OR BEAR DRIVER.

(Face West.)

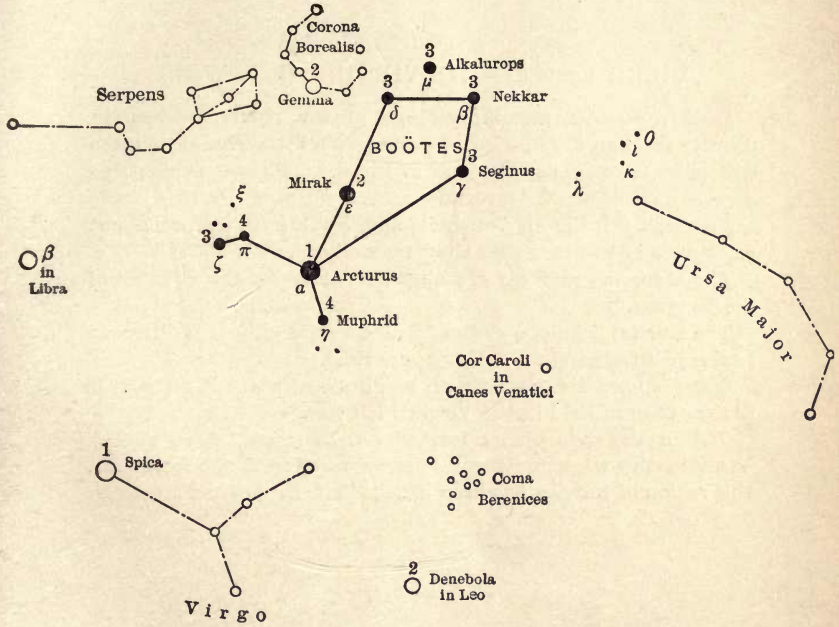
LOCATION.—Boötes lies just west of the Crown, and east of Cor Caroli. It may be easily distinguished by the position and splendor of its principal star, Arcturus, which shines with a golden yellow lustre. It is about 35 degrees east of Denebola, in Leo, and nearly as far north of Spica, in Virgo, and forms with these two a large equilateral triangle. A line drawn from (ζ) to (η) Ursæ Majoris and prolonged about 30 degrees locates it.

The brightest stars in Boötes outline a characteristic kite-shaped figure.

Three stars of the fourth magnitude are situated in the right hand. They are about 5 degrees beyond Benetnasch, the first star in the handle of the Dipper.

It takes twenty-five years for the light from Arcturus to reach the earth. Contrast its color with Spica, Antares, and Vega.

The trapezium β, γ, δ, and μ, was called "The Female Wolves," by the Arabians. θ, ι, κ, and λ, "The Whelps of the Hyenas."


Corona
Borealis
Alkalurops
Serpens
Gemma
Nekkar
BOÖTES
Seginus
Mirak
Arcturus
Muphrid
β
in
Libra
Cor Caroli
in
Canes Venatici
Ursa Major
Spica
Coma
Berenices
Virgo
Denebola
in Leo

VIRGO (ver'-gō)—THE VIRGIN. (Face West.)

LOCATION.—An imaginary line drawn from Antares in Scorpio through (α) Libræ and prolonged a little over 20 degrees strikes Spica, the brightest star in Virgo, which star is about 30 degrees southwest of Arcturus.

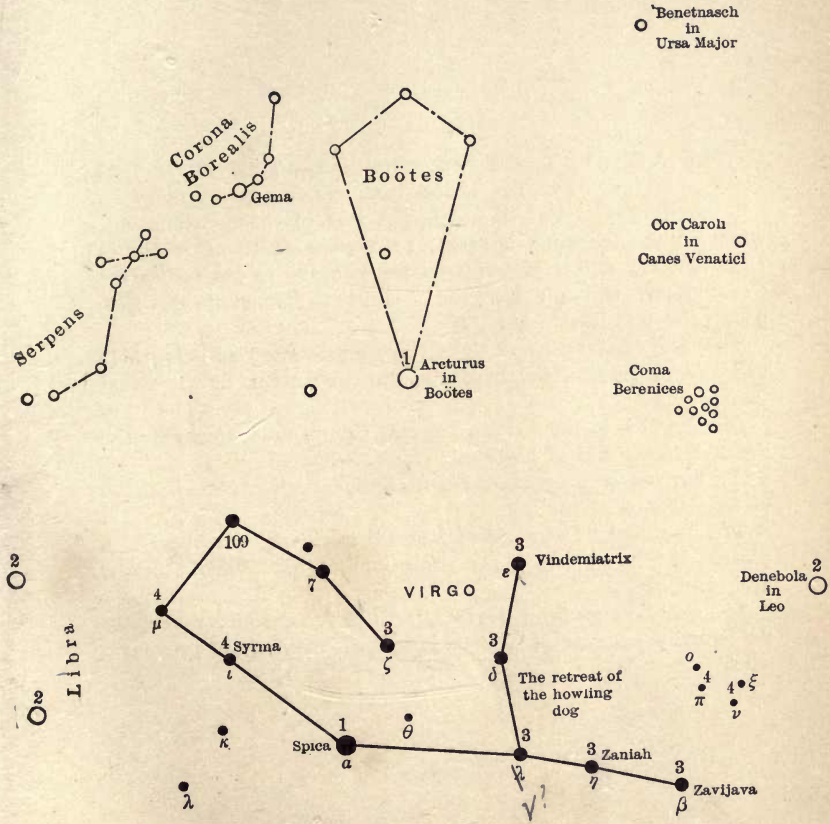
Arcturus, Cor Caroli, Denebola, and Spica form a figure about 50 degrees in length, called the Diamond of Virgo.

The stars (π) and (ξ) are almost exactly on the equator of the heavens.

The star (ε) is known as the "Grape Gatherer." It is observed to rise just before the sun at vintage time.

Spica is used for determining longitude at sea. It represents the ear of corn held in the Virgin's left hand.

Within the rude square formed by Denebola, ε, γ, and β, Virginis, the telescope reveals many wonderful nebulæ; hence this region of the sky has been called "The field of the Nebula."


Benetnasch
in
Ursa Major
Corona
Borealis
Gema
Boötes
Cor Caroli
in
Canes Venatici
Serpens
Arcturus
in
Boötes
Coma
Berenices
109
7
VIRGO
Vindemiatrix
Denebola
in
Leo
Libra
Syrma
The retreat of
the howling
dog
Spica
Zaniah
Zavijava

CANES VENATICI (kā'-nēz ve-nat'-i-cī)—THE HUNTING DOGS. (Face Northwest.)

LOCATION.—Cor Caroli, the bright star in this constellation, when on the meridian is about 17 degrees south of Alioth in Ursa Major. A line drawn from Benetnasch, in the tail of the Great Bear, through Berenice's Hair, to Denebola in Leo, passes through it.

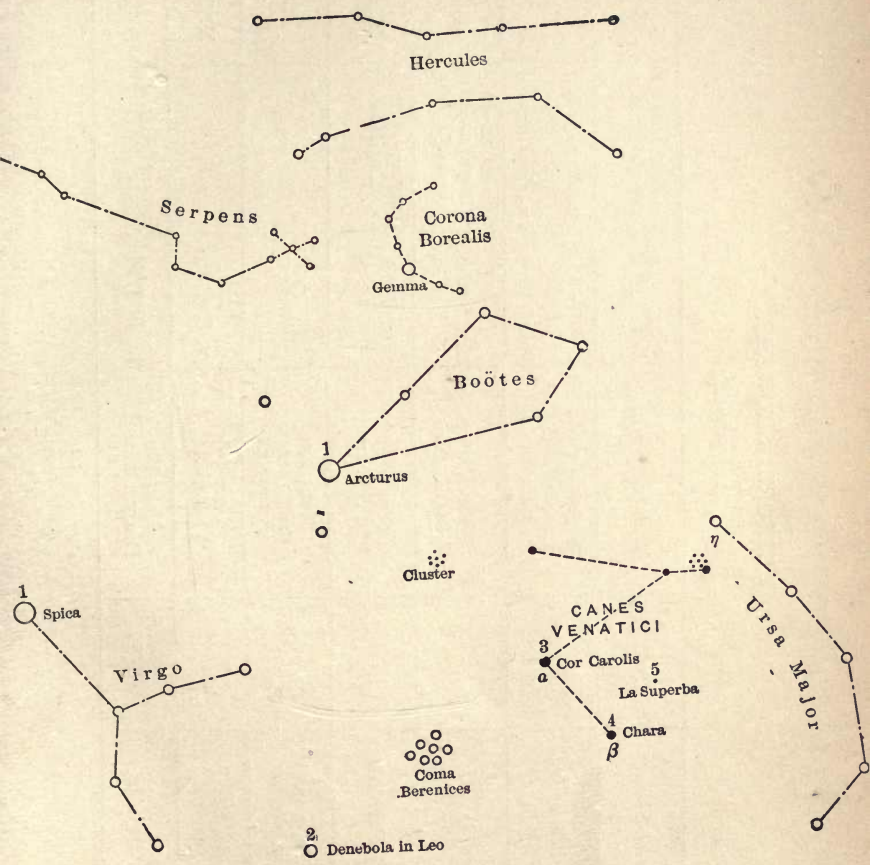
The dogs, Asterion and Chara, are represented as being held in leash by Boötes, the herdsman, in his pursuit of the Great Bear.

Cor Caroli is in the southern hound, Chara, and represents the heart of Charles II of England.

A glance at the diagram of Boötes indicates clearly the position of this constellation.

The so-called "Diamond of Virgo," is clearly shown on this plate. It is composed of the stars Cor Caroli, Denebola, Spica, and Arcturus.

The star La Superba 7 degrees north of Cor Caroli, is especially noteworthy because of the flashing brilliancy of its prismatic rays.


Hercules
Serpens
Corona
Borealis
Gemma
Boötes
1
Arcturus
Cluster
1
Spica
Virgo
CANES
VENATICI
3
Cor Carolis
a
5
La Superba
4
Chara
β
7
Ursa Major
Coma
Berenices
2
Denebola in Leo

METEORIC SHOWERS.

JULY TO OCTOBER.

Name of Shower	*Date*	*Radiant Point*	*Characteristics*	*Other Dates of Observation*	*Location*
Vulpeculids or Eta Sagittids	July 4	Between Cygnus and Delphinus	Sw.	June 13–July 7 Apr. 20, May 30	E.
Cygnids	July 19	Near Deneb (α) Cygni	Sh. Sw. F.	July 11–19, Aug. 22. July 6–Aug. 16	E.
(α)–(β) Perseids	July 25	Between (α) and (β)Persei	Sw. B. Sk. after 10 P.M.	July 23–Aug. 4 Sept.15,Nov.13	N. E.
Aquarids, a conspicuous shower	July 28	Near the water jar of Aquarius	Sl. B.		E.
Perseids, fine shower	Aug. 10	Near (α) Persei	v. Sw. Sk.		N. E.
Kappa Cygnids	Aug. 17	Near the Dragon's head	Sw. B. T. Sh.	Jan. 17, Aug. 4, Aug.21–25	S. E.

Alpha Aurigids	Aug. 21	Near Capella (α) Aurigæ	After 9.30 P.M. v. Sw. Sk.	Sept. 22, Oct. 2	N. E.
Omicron Draconids. Rich shower in 1879	Aug. 22	Near the Dragon's head	Sl. T.	Aug. 21–25	N
Epsilon Perseids	Sept. 7	Between Capella and the Pleiades	After 10 P.M. v. Sw. Sk.	Aug. 21, 25, Sept. 6–8, 21, Nov. 29.	N.E.
Alpha Arietids	Sept. 21	Near Hamal (α) Arietis	Sl. T.	Aug. 12, Oct. 7	E.
Gamma Pegasids	Sept. 22	Near and S. E. of Great Sq.	Sl.	July 31, Aug. 25, etc.	E.

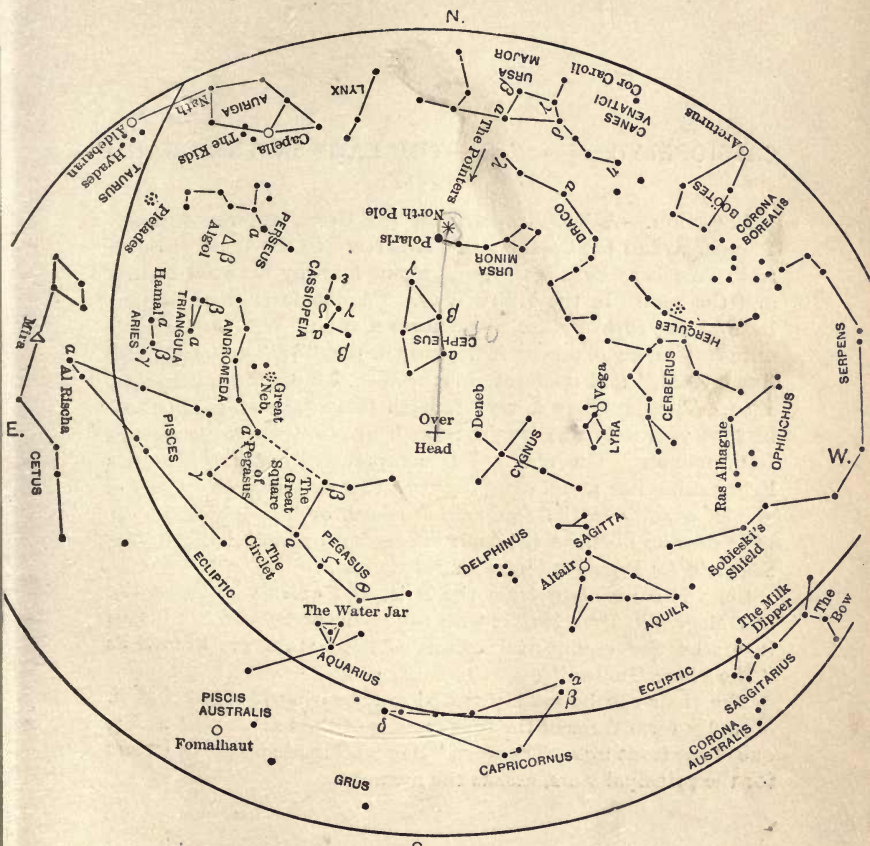
The Perseids are of a yellowish color. and move with medium velocity. Their line of flight is from northeast to southwest. They are probably visible for more than a month, from the latter half of July to the last week in August.

The August meteors are known as the "Tears of St. Lawrence."

The Abbreviations under *Characteristics* are as follows:

v.—very	Sl.—Slow	Sk.—Streak-leaving meteors.
M.—Moderately	B.—Bright	T.—Train " "
Sw.—Swift	F.—Faint	Sh.—Short "

THE CONSTELLATIONS OF AUTUMN



○ *Stars of the first magnitude.*

△ *Variable stars.*

⁂ *Nebula.*

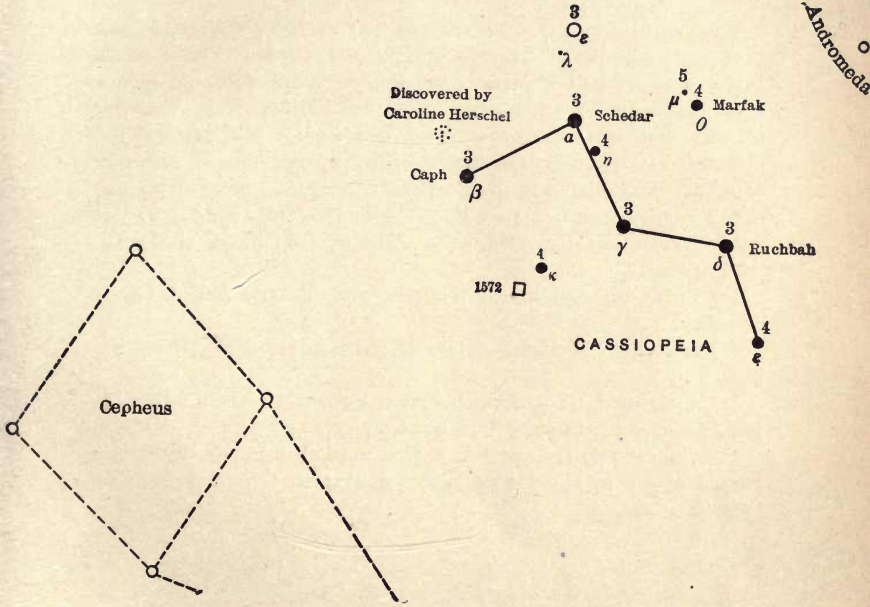
Map showing the principal stars visible from Lat. 40 ° N. at 9 o'clock, October first.

CASSIOPEIA (kas-i-ō-pē′-ya)—THE LADY IN THE CHAIR. (Face North.)

LOCATION.—A line drawn from (δ) Ursæ Majoris, through Polaris, strikes (α) Cassiopeiæ. It is situated the same distance from Polaris as Ursa Major, and about midway between Polaris and the zenith in the Milky Way. Cassiopeia is characterized by a zigzag row of stars which form a rude "W," but in mid-autumn, to an observer facing north, the "W" appears more like an "M," and is almost overhead. Note the spot marked 1572. This is where a very famous temporary star appeared in that year. It was bright enough at one time to be seen in full sunshine. The star (η) is comparatively near to us, its light taking not much over twenty years to reach us. Caph is almost exactly in the equinoctial colure, or first meridian. It is 30 degrees north of (α) Andromedæ, with which and the Pole Star and (α) Pegasi it forms a straight line.

Caph is equidistant from the Pole, and exactly opposite the star Megres in Ursa Major; with (α) Andromedæ and (γ) Pegasi it marks the equinoctial colure. These stars are known as "The Three Guides."

The chair can be readily traced out, bearing in mind that β, α, and γ form three of the four corners of the back, and δ and ε, one of the front legs. The word "Bagdei," made up of the letters for the principal stars, assists the memory.


Andromeda
3
ε
λ
5
μ
4
Marfak
0
Discovered by
Caroline Herschel
3
Schedar
α
4
η
3
Caph
β
3
γ
3
Ruchbah
δ
4
ε
4
κ
1572
CASSIOPEIA
Cepheus

CEPHEUS (sē'-fūs) (Face North.)

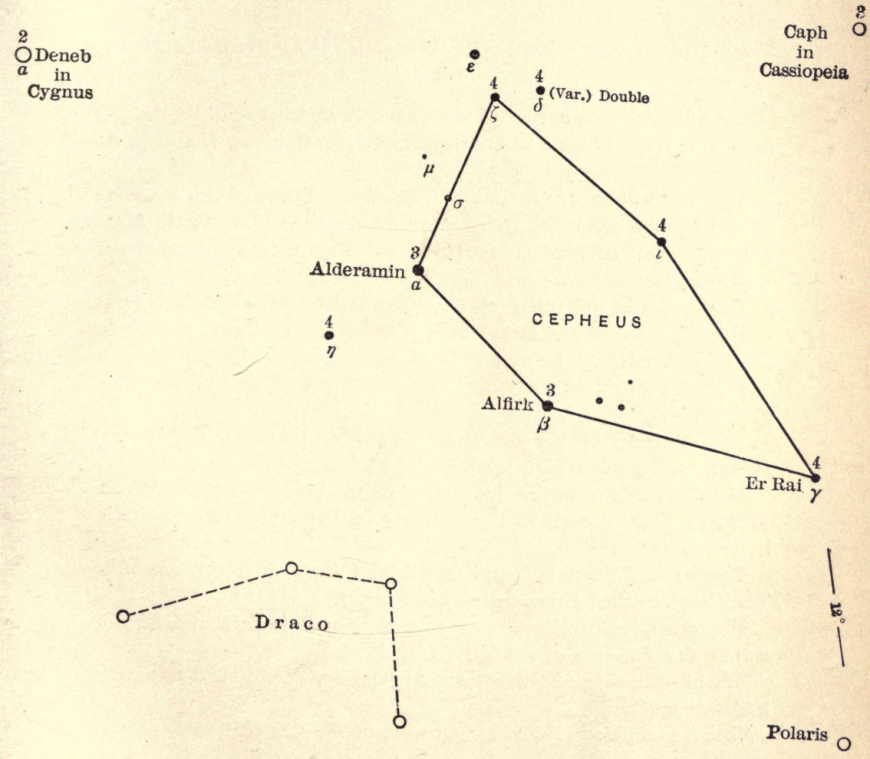
LOCATION.—A line drawn from (α) to (β) Cassiopeiæ and prolonged about 18 degrees strikes (α) Cephi. The nearest bright star west of Polaris is (γ) Cephi. Cepheus is an inconspicuous constellation, lying partly in the Milky Way. A view of this constellation through an opera-glass will repay the observer. Cepheus is characterized by a rude square, one side of which is the base of an isosceles triangle. Look for the so-called garnet star (μ), probably the reddest star visible to the naked eye in the United States. The star (ζ) has a blue companion star.

(α) forms an equilateral triangle with Polaris and (ε) Cassiopeiæ.

(δ) is a variable double. One of the pair is yellow, the other blue.

It is claimed that Cepheus was known to the Chaldæans twenty-three centuries before our era.

Surrounding δ, ε, ζ, and λ, which mark the king's head, is a vacant space in the Milky Way, similar to the Coal Sack of Cygnus.


2
Deneb
a
in
Cygnus
ε
4
ζ
4
δ
(Var.) Double
μ
σ
4
ι
3
Alderamin
a
CEPHEUS
4
η
3
Alfirk
β
4
Er Rai
γ
Caph
in
Cassiopeia
Draco
15°
Polaris

PEGASUS (peg'-a-sus)—THE WINGED HORSE. (Face South.)

LOCATION.—One corner of the Great Square is found by drawing a line from Polaris to Cassiopeia, and prolonging it an equal distance.

The Great Square is a stellar landmark. Three of the corners of the square are marked by stars in Pegasus; the fourth, and northeastern, corner is marked by the star Alpheratz in Andromeda.

The horse is generally seen upside down, with his fore feet projected up into the sky. Only the head, neck, and fore feet are represented. The star Enif is in the nose of Pegasus.

The star (π) is an interesting double, easily seen in an opera-glass.

The position of the asterism Equus or Eqüleus, the Little Horse, or Horse's Head, is shown in the diagram.

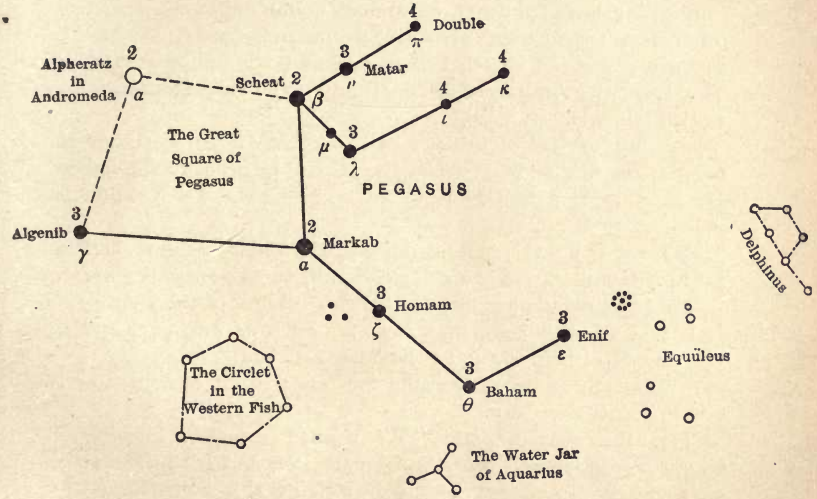
Delphinus, the water jar of Aquarius, and the circlet in the Western Fish, are all in the vicinity of Pegasus, and indicated in the diagram.

The winged horse is found on coins of Corinth 500 to 430 B.C. The Greeks called this constellation ἵππος.

Pegasus seems to have been regarded in Phœnicia and Egypt as the sky emblem of a ship.

Within the area of the Square Argelander counted thirty naked-eye stars.

Note a fine pair in Eqüleus just west of the star Enif in Pegasus.


4
Double
π
Alpheratz
in
Andromeda
2
α
Scheat 2
β
3
Matar
μ
4
κ
4
ι
3
μ
3
λ
The Great
Square of
Pegasus
PEGASUS
3
Algenib
γ
2
Markab
α
Delphinus
3
Homam
ζ
3
Enif
ε
Equüleus
The Circlet
in the
Western Fish
3
Baham
θ
The Water Jar
of Aquarius

ANDROMEDA (an-drom'-e-dä)—THE CHAINED LADY.

LOCATION.—The star (α) Alpheratz is at the northeastern corner of the great square of Pegasus, one of the stellar landmarks.

Running east from (α), at almost equal distances, are four other stars, two of which are of the second magnitude. The most easterly one is (β) Persei, known as Algol, the famous variable. The stars (γ) Andromedæ, Algol, and (α) Persei form a right-angled triangle.

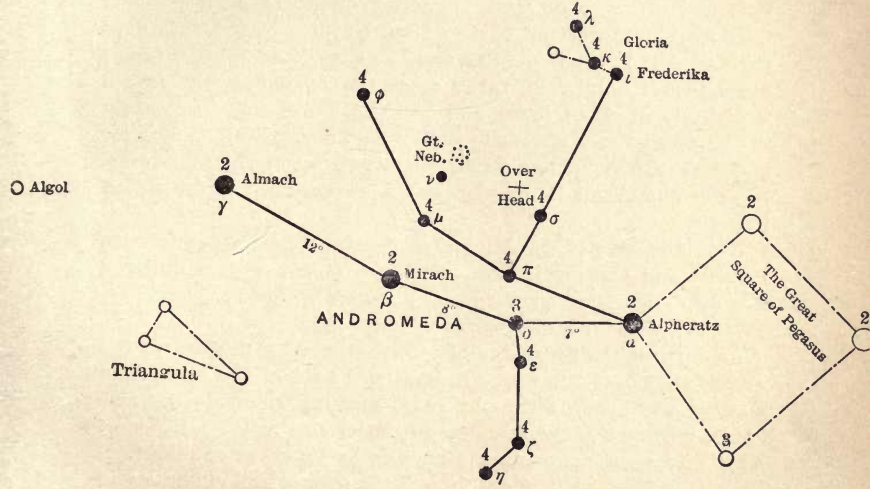
The chief object of interest in this constellation is the great nebula, the first to be discovered. It can be seen by the naked eye and it is a fine sight in an opera-glass. Its location is indicated in the diagram.

The star (γ) is the radiant point of the Bielid meteors, looked for in November. It is a colored double for a powerful glass.

The great nebula has been called the "Queen of the Nebulæ." It is said to have been known as far back as A.D. 905, and it was described before A.D. as the "Little Cloud."

Andromeda is very favorable for observation in September, low in the eastern sky.

Note the characteristic "Y" shaped asterism known as Gloria Frederica or Frederic's Glory. It lies about at the apex of a nearly isosceles triangle of which a line connecting Alpheratz and (β) Pegasi is the base. A line drawn from (δ) to (α) Cassiopeiæ and prolonged a little over twice its length points it out.



Algol
Triangula
Almach
γ
Mirach
β
ANDROMEDA
12°
8°
7°
Gt. Neb.
ν
Over Head
Gloria
Frederika
Alpheratz
α
The Great Square of Pegasus

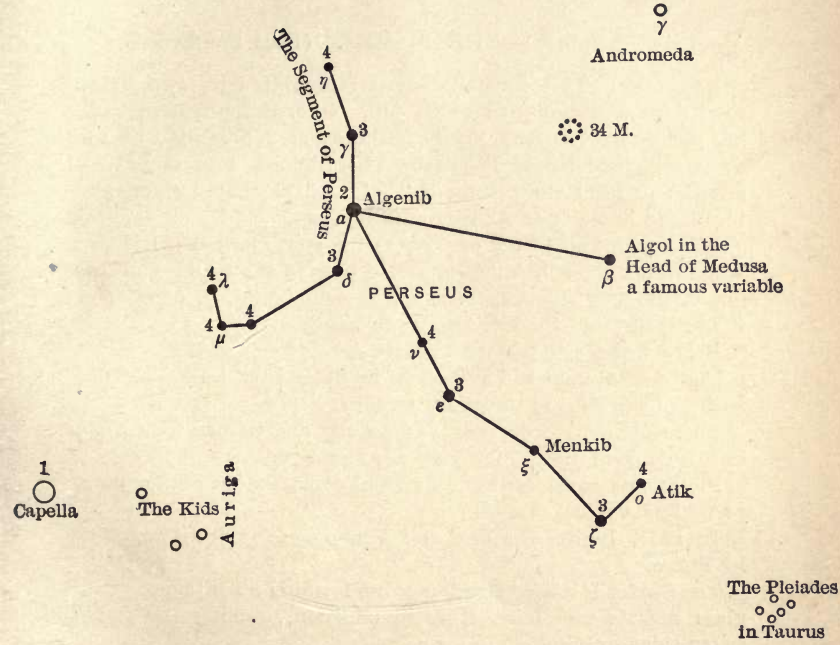
PERSEUS (per'-sūs)—THE CHAMPION. (Face Northeast.)

LOCATION.—(α) Persei lies on a line drawn from (β) to (γ) Andromedæ, and is about 9 degrees from the latter. The most striking feature in Perseus is the so-called "segment of Perseus," a curve of stars beginning about 12 degrees below Cassiopeia, and curving toward Ursa Major. Note the famous variable Algol. It represents the Medusa's head which Perseus holds in his hand. It varies from the second to the fourth magnitude in about three and one-half hours, and back again in the same time, after which it remains steadily brilliant for two and three-quarters days, when the same change recurs. Algenib and Algol form with (γ) Andromedæ, a right-angled triangle.

Note the cluster 34 M. and a fine one half way between Perseus and Cassiopeia seen with the naked eye, a dull red star near Algol, and a pretty pair just above Algenib.

(ϵ), (ζ), and (o) form a small right-triangle.

An opera-glass reveals much that is worthy of observation in this region of the sky. It has been said of the clusters in Perseus that they form the most striking sidereal spectacle in the northern heavens. Algenib never sets in the latitude of New York, just touching the horizon at its lower culmination. It is estimated that Algol is a little over a million miles in diameter. (η) has three small stars on one side nearly in a line, and one on the other—a miniature representation of Jupiter and his satellites.


γ
Andromeda
34 M.
The Segment of Perseus
4
η
3
γ
2
Algenib
α
3
δ
Algol in the
Head of Medusa
a famous variable
β
PERSEUS
4
λ
4
4
μ
4
ν
3
ε
Menkib
ξ
4
Atik
ο
3
ζ
1
Capella
The Kids
Auriga
The Pleiades
in Taurus

PISCES (pis'ēz)—THE FISHES. (Face Southeast.)

LOCATION.—This constellation is represented by two fishes each with a ribbon tied to its tail. One, the Northern Fish, lies just below (β) Andromedæ,—the other, represented by the circlet, is just below Pegasus. The ribbons, represented by streams of faint stars, form a "V" with elongated sides, and terminate in the star Al Rischa, The Knot.

Below (ω), and to the east of (λ) the spot marked (*) is the place which the sun occupies at the time of the equinox. It is one of the two crossing places of the equinoctial, or equator of the heavens, and the ecliptic or sun's path.

Below Pisces is Cetus, the Whale.

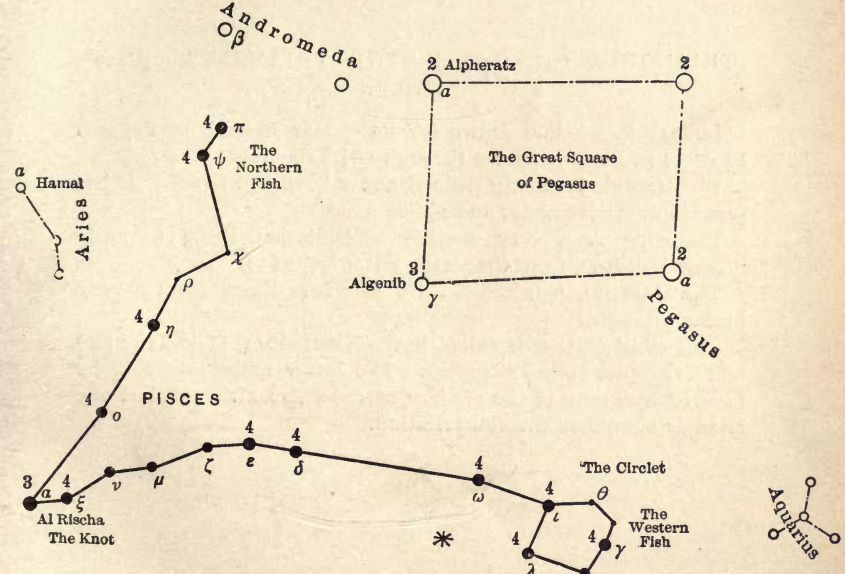
Pisces is thought to have taken its name from its coincidence with the sun during the rainy season.

Three distinct conjunctions of Jupiter and Saturn took place in this constellation in the year 747 of Rome.

Pisces was considered the national constellation of the Jews, as well as a tribal symbol.

In 1881, Jupiter, Saturn, and Venus were grouped together in Pisces.

The Circlet is a very striking group forming a pentagon. The glass reveals two faint stars in addition, making the figure seven-sided or elliptical in form.


Andromeda
β
2 Alpheratz
2
α
2
The Great Square
of Pegasus
3
Algenib
γ
2
α
Pegasus
4 π
4 ψ
The
Northern
Fish
χ
ρ
4 η
α
Hamal
Aries
4 PISCES
o
3
α
4
ξ
Al Rischa
The Knot
ν
μ
ζ
4
ε
4
δ
4
ω
4
ι
θ
The Circlet
The
Western
Fish
4
λ
4
γ
κ
Aquarius

TRIANGULA (trī-an'-gū-lă)—THE TRIANGLES. (Face East.)

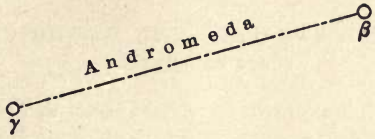
LOCATION.—A line drawn from the star Algenib in Pegasus to Algol in Perseus passes through (β) Triangulæ.

The triangle is clearly defined and a beautiful figure. It lies just below Andromeda, and above Aries.

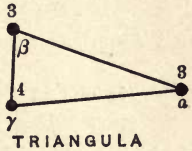
Triangula is a very ancient constellation, being formerly named Deltoton, from the Greek letter Delta(Δ).

The stars (δ), (γ), and a third star near them form a very pretty triangle.

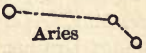
This constellation is called both Triangulum (The Triangle) and Triangula (The Triangles). The latter name seems to be favored by many of the modern astronomers, although but one triangle composes the constellation.

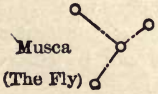

Andromeda
γ
β


The Northern Fish
Pisces


3
β
4
3
γ
α
TRIANGULA


Algol
in
Perseus


Aries


Musca
(The Fly)

AQUARIUS (a-kwā'-ri-us)—THE WATER CARRIER.
(Face Southwest.)

LOCATION.—A line drawn from (β) Pegasi to (α) of the same constellation, and prolonged as far again, ends just east of the so-called water jar of Aquarius, which is formed by a group of four stars in the form of a "Y," as indicated in the diagram. The Arabians called these four stars a tent.

The jar is represented as inverted, allowing a stream of water represented by dim stars in pairs and groups of three stars, to descend, ending in the bright star Fomalhaut, the mouth of the Southern Fish.

A rough map of South America can be traced in the stars $\theta, \lambda, \tau, \delta, \omega^2, \iota$.

A rude dipper can be made out in the western part of the constellation, formed of the stars $\alpha, \beta, \nu, \varepsilon$.

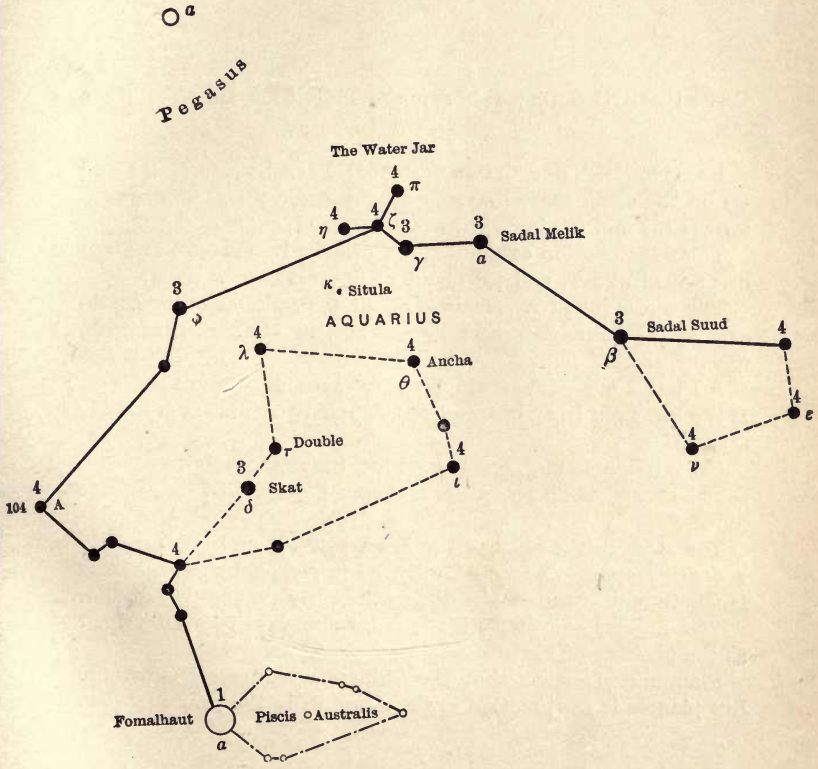
The stars (τ) and (104) are doubles. Of the former pair, one is white, the other orange in color. Fomalhaut was the object of sunrise worship in the temple of Demeter at Eleusis in 500 B.C.

(α) is one degree south of the celestial equator.

In the vicinity of (δ), Mayer observed in 1756 what he termed a fixed star. Herschel thought it a comet. It proved to be the planet Uranus.

(α) is almost exactly on the celestial equator.

(λ) is a red star, the most prominent of the first stars in the stream. The stars in Piscis Australis can be traced out with an opera-glass.


Pegasus
The Water Jar
Sadal Melik
Situla
AQUARIUS
Sadal Suud
Ancha
Double
Skat
Fomalhaut
Piscis Australis

CAPRICORNUS (kap-ri-kôr'-nus)—THE SEA GOAT. (Face Southwest.)

LOCATION.—A line drawn from (α) Pegasi through (ζ) and (θ) in the same constellation, and projected about 25 degrees, strikes (α) and (β) in Capricornus.

This constellation contains three principal stars—(α) and (β) mentioned above, and (δ) about 20 degrees east of them.

The water jar of Aquarius is about the same distance northeast of (δ) Capricorni that Fomalhaut, in the Southern Fish, is southeast of it.

(α) has a companion which can be seen by the naked eye. It is a fine sight in an opera-glass. These two stars are gradually separating.

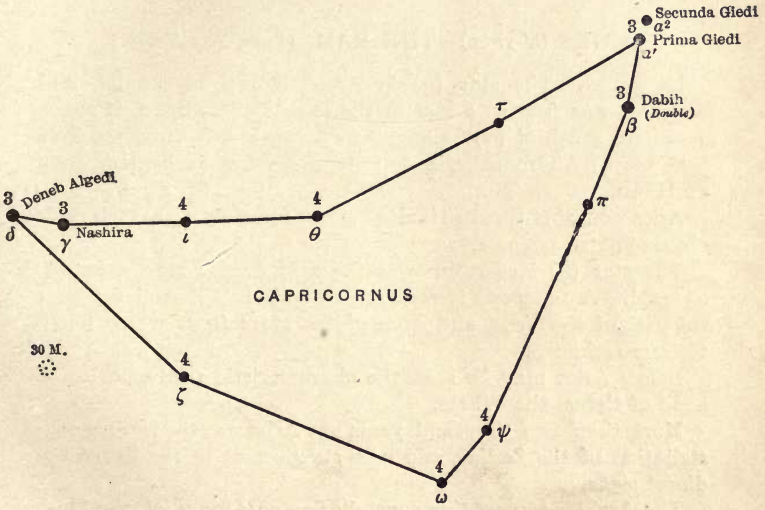
(β) is a double star, one being blue, the other yellow.

The constellation resembles a chapeau, or peaked hat, upside down.

The stars in the head of the Sea Goat, (α) and (β), are only 2 degrees apart, and can hardly he mistaken by an observer facing the southwestern sky during the early evening in autumn.

Five degrees east of (δ) is the point announced by Le Verrier as the position of his predicted new planet, Neptune.

Flammarion claims that the Chinese astronomers noted the five planets in conjunction in Capricornus, in the year 2449 B.C.


Secunda Giedi
3
a^2
Prima Giedi
α'
3
Dabih
(Double)
β
τ
3
Deneb Algedi
δ
3
γ
Nashira
4
ι
4
θ
π
CAPRICORNUS
30 M.
4
ζ
4
ψ
4
ω

ARIES (ā′-ri-ēz)—THE RAM. (Face Southeast.)

LOCATION.—The star (α) in Aries, known as Hamal, and sometimes as Arietis, a star of the second magnitude, is about 7 degrees south of (α) Triangulæ. A line drawn from the Pole Star to (γ) Andromedæ, and prolonged about 20 degrees, ends at Hamal.

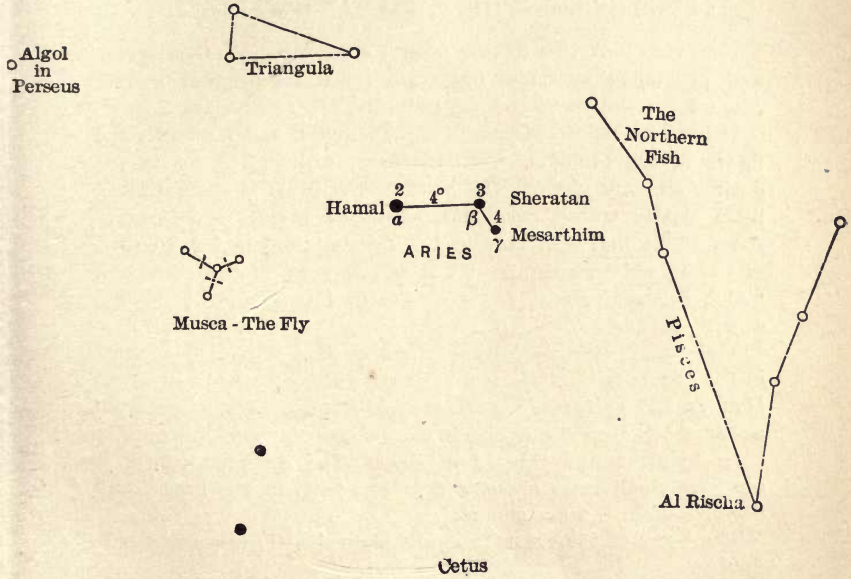
Aries contains three principal stars, forming a characteristic obtuse-angled triangle.

The star (γ) Mesarthim was the first double star ever discovered. A telescope is required to split it. Hamal lies near the path of the moon, and is one of the stars from which longitude is reckoned.

Below Aries may be seen the characteristic pentagon in the head of Cetus, the Whale.

More than two thousand years ago Aries was the leading constellation of the Zodiac, and now stands first in the list of Zodiacal signs.

The Arabians knew this constellation as Al Hamal, the Ship.


Algol
in
Perseus
Triangula
The
Northern
Fish
Hamal
2
4°
3
Sheratan
α
β
4
γ
Mesarthim
ARIES
Musca - The Fly
Pisces
Al Rischa
Cetus

CETUS (sē′-tus)—THE WHALE. (Face Southeast.)

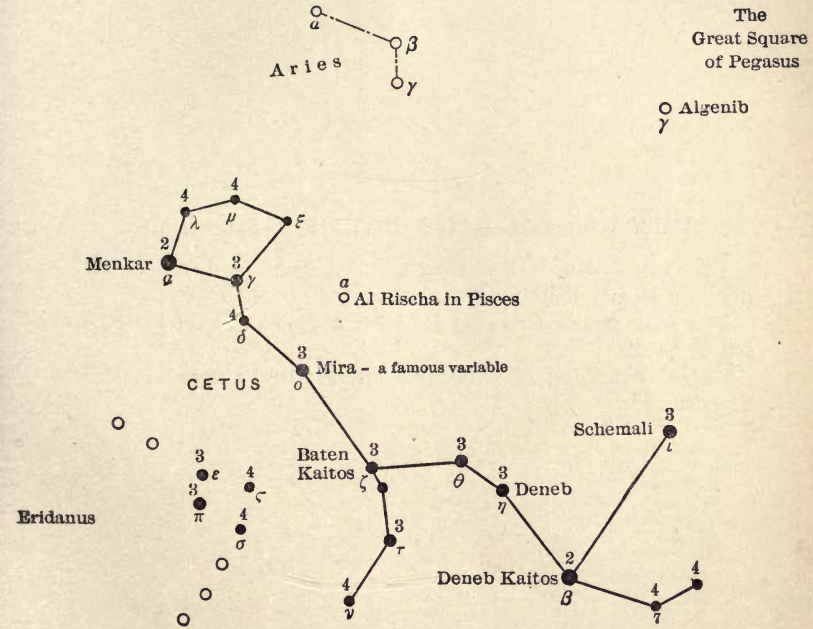
LOCATION.—A line drawn from Polaris, to (δ) Cassiopeiæ, and prolonged two and one third times its original length, reaches the centre of this constellation.

It lies just below Aries and the Triangles, and resembles the figure of the prehistoric icthyosaurus, while some see in the outline an easy chair. The head of the beast is characterized by a clearly traced pentagon, about 20 degrees southeast of Aries. The brightest star in the constellation is (α) Menkar, of the second magnitude. It is at one apex of the pentagon, about 15 degrees east of Al Rischa in Pisces, and 37 degrees directly south of Algol, (β. Persei).

The noted variable Mira (o) is the chief object of interest in the constellation. It is a little over 10 degrees southwest of Menkar, and 7 degrees southeast of Al Rischa. It changes from a star of the second magnitude so as to become invisible once in three hundred and thirty-four days. Ten degrees south of it are four small stars about 3 degrees apart, in the breast and paws. These form a square.

The body of the creature is kite-shaped. (ζ) is a naked-eye double.

Mira lies almost exactly on a line joining (γ) and (ζ), a little nearer the former.


Aries
α
β
γ
The
Great Square
of Pegasus
Algenib
γ
Menkar
α
Al Rischa in Pisces
α
Mira – a famous variable
CETUS
Schemali
ι
Baten
Kaitos
ζ
Deneb
η
Eridanus
Deneb Kaitos
β

MUSCA (mus'-kä)—THE FLY. (Face Southeast.)

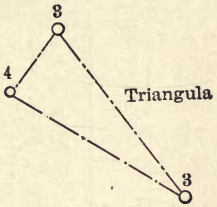
LOCATION.—Musca lies between Triangula and Aries, the diagram clearly defining its position.

The four stars composing it form a group shaped like the letter "Y."

There is nothing of particular interest to be noted in this asterism.

Algol
in
Perseus

β
Andromeda







METEORIC SHOWERS

OCTOBER TO JANUARY.

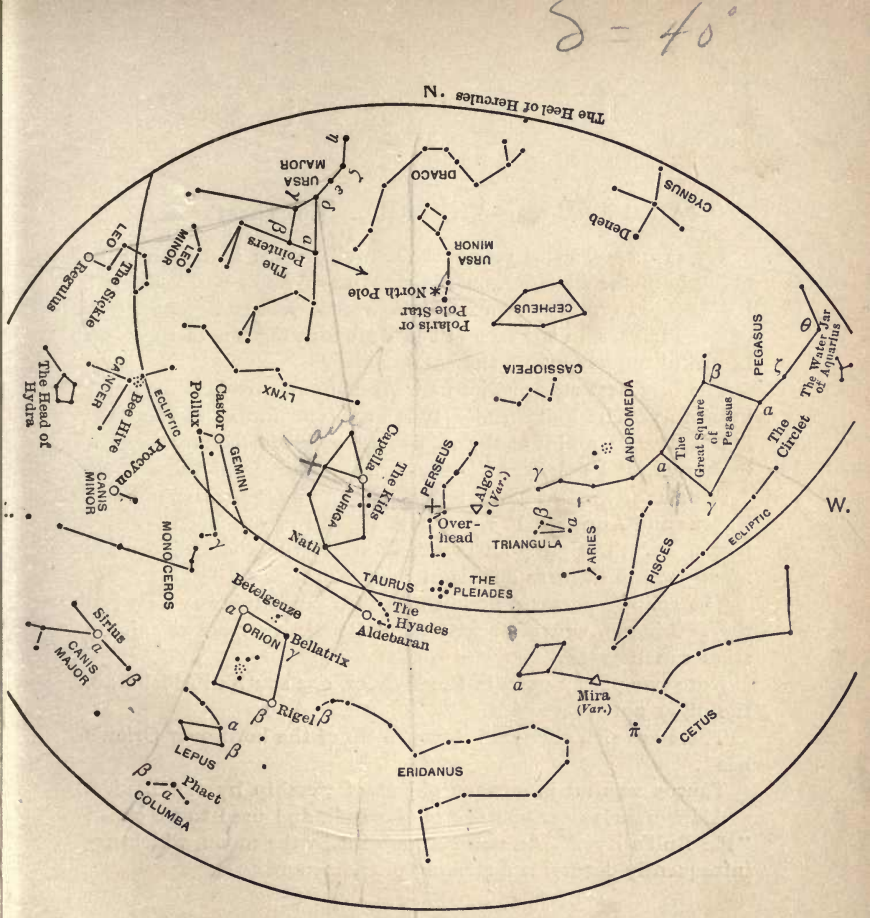
Name of Shower	*Date*	*Radiant Point*	*Characteristics*	*Other Dates of Observation*	*Location.*
Ursids	Oct. 4	Between Great Bear's head and Polaris	Sw. Sk.	Aug. 20–24	N.
Epsilon Arietids Rich shower 1877	Oct. 14	East of Hamal, near Musca	M. Sw.	Oct. 11–24, Oct. 30–Nov. 4	E.
Orionids Fine shower	Oct. 18	Near Alhena in Gemini	After 11 P.M. Sw. Sk.	Oct. 16–22	E.
Delta Geminids	Oct. 29	Near Castor and Pollux	After 10 P.M. v. Sw. Sk.	Nov. 7, Dec. 4, Oct. 16–22	N. E.
(e)Taurids. Rich shower in 1886	Nov. 2	About 13° S. E. of Aldebaran	Sl. B. T.	Nov. 2–3	E.
Leonids Brilliant shower	Nov. 13	Near (γ) Leonis In the Sickle	After midnight. v. Sw. Sk.	Nov. 12–14	N. E.
Leo Minorids	Nov. 16	Near (μ) Ursæ Maj., the Great Bear's hind feet	After 10 P.M. v. Sw. Sk.	Sept. 15, Oct. 16	N.

Andromedids. The Bielids. Fine display	Nov. 27	Near (γ) Andromedæ	Sl. T.	Nov. 17–23 Nov. 21–28	Overhead
Taurids	Nov. 30	Between Capella and (α) Persei	V. Sw.	Aug. 16 Sept. 15, Nov. 20	Overhead
Zeta Taurids. Active shower in 1876	Dec. 6	Near the horns of the Bull	Sl. B.		E.
Geminids. Fine shower	Dec. 10	Near Castor	Sw.	Dec. 1–14	E.
Kappa Draconids	Dec. 22	Near Thuban (α) Draconis	Sw. Sk.	Nov. 14–23 Dec. 18–29	
Fire Ball Dates				Nov.29 Dec. 2, 19, 21	

The Andromedes are usually red, sluggish in their movements, and leave only a small train. Brilliant displays were seen in 1872 and 1885.

The Leonids are characterized by their exceedingly swift flight. They are of a greenish or bluish tint and leave behind them a vivid and persistent train. In most years the display is not especially noteworthy. Once in thirty-three years they afford an exhibition grand beyond description as in 1833 and 1866.

THE CONSTELLATIONS OF WINTER



Map showing the principal stars visible from Lat. 40° N. at 9 o'clock, January first

TAURUS (tâ'-rus)—THE BULL. (Face Southwest).

LOCATION.—Taurus contains the well-known and unmistakable group the Pleiades, on the right shoulder of the Bull. A "V" shaped group known as the Hyades is just to the southeast of the Pleiades, in the face of the Bull, forming one of the most beautiful objects in the sky.

The brightest star in Taurus is Aldebaran, a ruddy-hued star known as "The Follower." It is at the beginning of the "V" in the Hyades, and is at the apex of a triangle formed by Capella, in Auriga, and (α) Persei, and equally distant from them both.

The star (β), called Nath, is peculiarly white, and is common to Taurus and Auriga. It represents the tip of one of the Bull's horns, and the right foot of the Charioteer. The Pleiades are mentioned in Chinese annals in 2357 B.C.

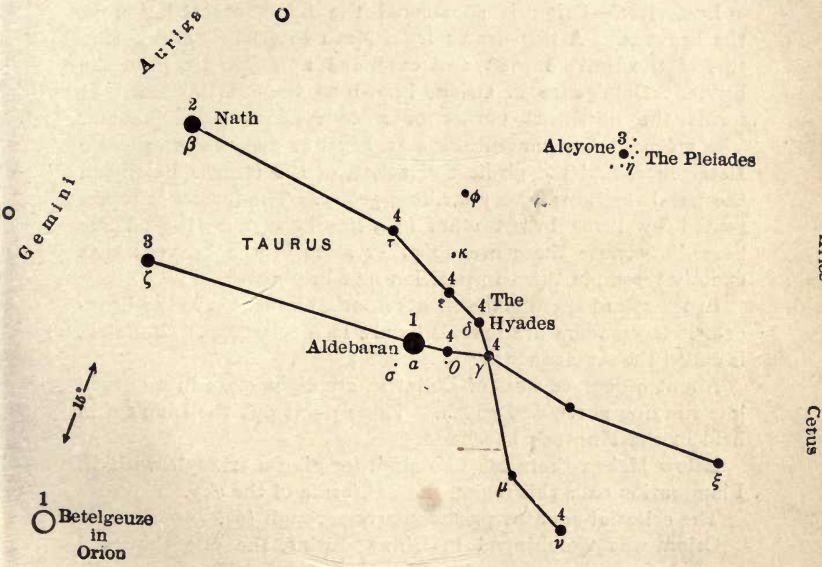
The ecliptic passes a little south of a point midway between the two horns, where a scattered and broken stream of minute stars can be seen.

Note two pretty pairs in the Hyades, one south of Aldebaran, the other northwest of it.

There are rich clusters below the tip of the horn over Orion's head.

Taurus was an important object of worship by the Druids.

Aldebaran is near one eye of the Bull, and used to be called "the Bull's Eye." An occultation of it by the moon, which not infrequently occurs, is a striking phenomenon.


Auriga
Gemini
Nath
Alcyone
The Pleiades
TAURUS
The Hyades
Aldebaran
Aries
Cetus
Betelgeuze in Orion
15°

ORION (ō-rī'-on)—THE GIANT HUNTER. (Face South.)

LOCATION.—Orion is considered the finest constellation in the heavens. A line drawn from Nath to (ζ) in Taurus (the tips of the Bull's horns), and extended 15 degrees, strikes the brilliant Betelgeuze in Orion, known as the martial star. It forms the northeast corner of a conspicious parallelogram. The splendid first-magnitude star Rigel is diagonally opposite Betelgeuze, and the girdle and sword of the Hunter lie within the parallelogram, a very striking group. The former is represented by three bright stars in a line known as the "Three Stars," because there are no other stars in the heavens that exactly resemble them in position and brightness.

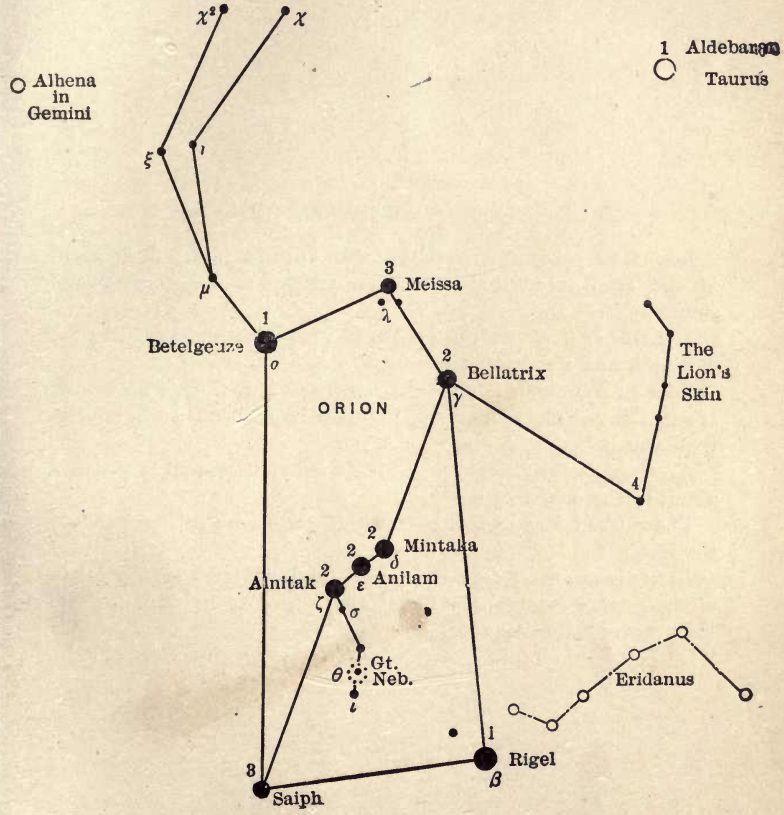
In the sword there is the most remarkable nebula in the heavens. Its wonders are revealed only in a telescope. Bellatrix is called the Amazon star.

About 9 degrees west of Bellatrix are eight stars in a curved line running north and south. These point out the Lion's skin held in the Hunter's left hand.

Below Meissa there are two stars forming a triangle with it. Flammarion calls this region the California of the sky.

The celestial equator passes nearly through (δ).

Orion was worshipped in China during the one thousand years before our era, and was known to the Chinese as the "White Tiger."


Alhena
in
Gemini
χ²
χ
ξ
ι
1 Aldebaran
Taurus
μ
3
Meissa
λ
1
Betelgeuze
ο
2
Bellatrix
γ
ORION
The
Lion's
Skin
4
2
2
Mintaka
δ
2
Alnitak
ε
Alnilam
ζ
σ
Gt.
Neb.
θ
ι
Eridanus
1
Rigel
β
3
Saiph

LEPUS (lē′-pus)—THE HARE. (Face South.)

LOCATION.—Lepus crouches under Orion's feet. Four stars of the third magnitude form an irregular and conspicuous square.

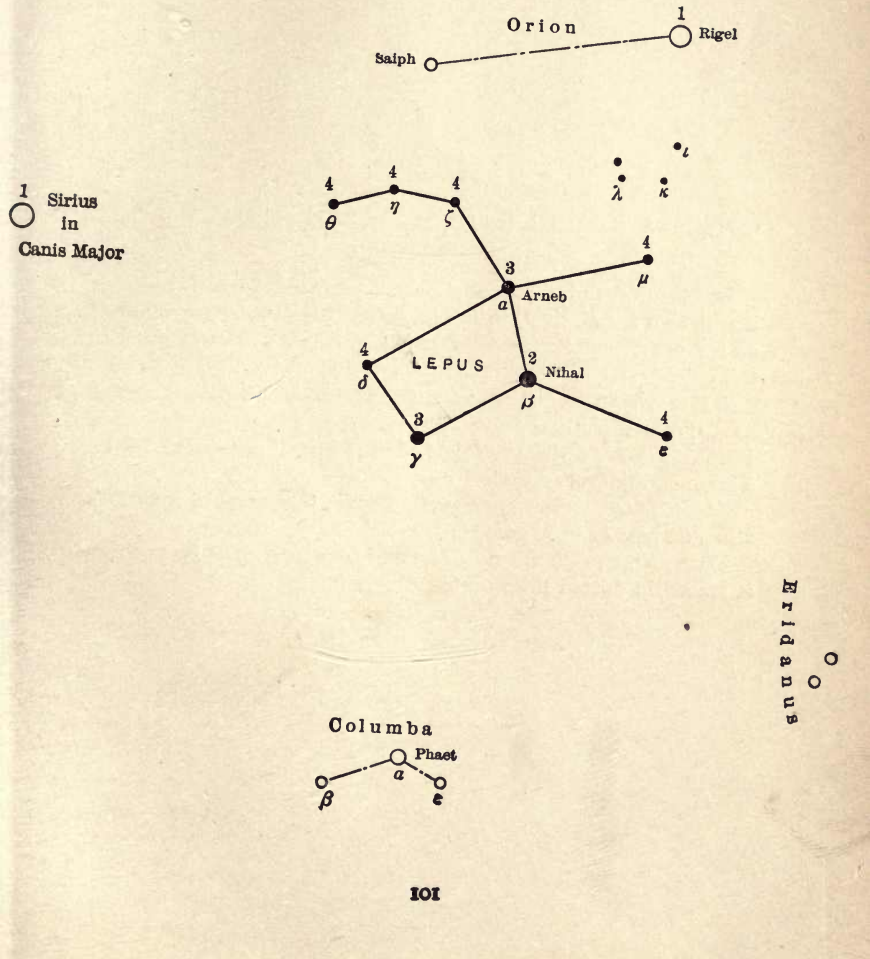
The star (γ), a beautiful double of a greenish hue, is southwest of Rigel, and north of Columba.

Four or five degrees south of Rigel are four faint stars which are in the ear of the hare. They can be seen on a clear night with the naked eye.

Arneb is the brightest star in the constellation and is situated about in the centre of it.

The curved line of three stars θ, η, and ζ, are in the back of the hare.

Lepus is about 18 degrees west of Canis Major, and, by reason of the earth's motion, the Great Dog seems to be pursuing the Hare around the heavens.


Orion
1
Rigel
Saiph
1
Sirius
in
Canis Major
4
4
4
θ
η
ζ
ι
λ
κ
4
μ
3
Arneb
α
4
δ
LEPUS
2
Nihal
β
3
γ
4
ε
Eridanus
Columba
Phaet
α
β
ε

COLUMBA NOACHI (co-lum′-bä nō-ä′-ki)—NOAH'S DOVE.
(Face South.)

LOCATION.—Columba is situated just south of Lepus. A line drawn from Rigel, in Orion, to (β) Leporis, and prolonged as far again, ends near (α) and (β), the two brightest stars in Columba.

A line drawn from the easternmost star in the belt of Orion, 32 degrees directly south, will point out Phaet, in Columba. It makes with Sirius, in Canis Major, and Naos, in the Ship, a large equilateral triangle.

The star (β) Columbæ may be known by means of a smaller star just east of it, marked (γ).

With an opera-glass a rude rectangle can be seen. Its position is traced in dotted lines on the diagram.

Sirius
Lepus
α
δ
β
γ
Canis Major
COLUMBA
2
Phaet
4
3
4
α
γ
β
Wezn
ε
Eridanus

CANIS MAJOR (kā'-nis mā-jor)—THE GREATER DOG
(Face South.)

LOCATION.—The three stars in Orion's girdle point southeast to Sirius, the dog star, in Canis Major, the most brilliant star in the heavens. It was connected in the minds of the Egyptians with the rising of the Nile, and is receding from the earth at the rate of twenty miles a second. Seventeen years are required for its light to reach us. There is a tiny star near Sirius.

The star (ν) is a triple. The cluster (41 M.) can be seen with an opera-glass, just below it.

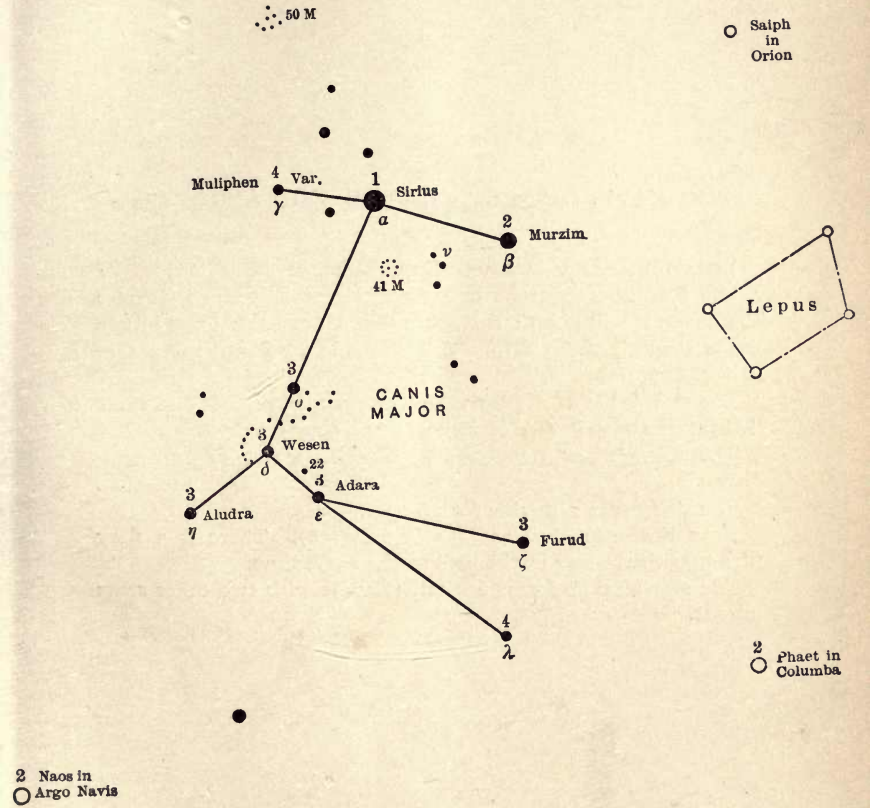
Between (δ) and (o^1) note a remarkable array of minute stars, also the very red star (22).

(δ) and (ζ) are doubles for an opera-glass.

Below (η) there is a fine group.

Betelgeuze, in Orion, Procyon, in Canis Minor, and Sirius form a nearly equilateral triangle. These stars with Naos, in the Ship, and Phaet, in the Dove, form a huge figure known as the Egyptian "X."

From earliest times Sirius has been known as the Dog of Orion.


50 M
Saiph in Orion
Muliphen
4
Var.
γ
1
Sirius
α
2
Murzim
β
ν
41 M
Lepus
3
υ
CANIS MAJOR
3
Wesen
δ
22
3
Adara
ε
3
Aludra
η
3
Furud
ζ
4
λ
2
Phaet in Columba
2
Naos in Argo Navis

ARGO NAVIS (ăr'-go nā'-vis)—THE SHIP ARGO. (Face South.)

LOCATION.—Argo is situated southeast of Canis Major. If a line joining Betelgeuze and Sirius be prolonged 18 degrees southeast, it will point out Naos, a star of the second magnitude in the rowlock of the Ship. This star is in the southeast corner of the Egyptian "X."

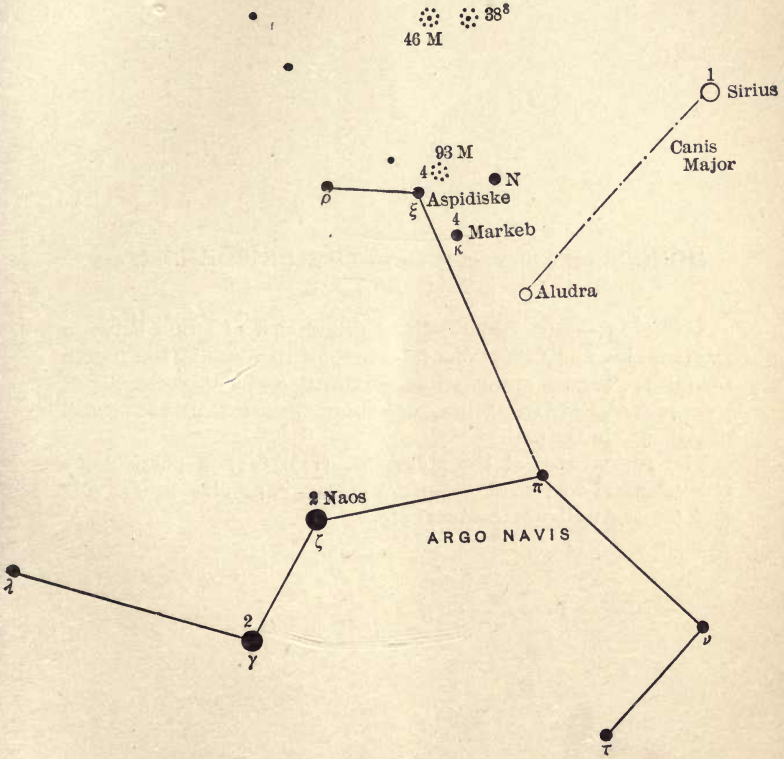
The star (π) is of a deep yellow or orange hue. It has three little stars above it, two of which form a pretty pair.

The star (ζ) has a companion, which is a test for an opera-glass.

The star ($\varkappa$) is a double for an opera-glass.

Note the star clusters (46 M) and (38). There is a fiery fifth-magnitude star in the field at the same time.

The star Markeb forms a small triangle with two other stars near it.

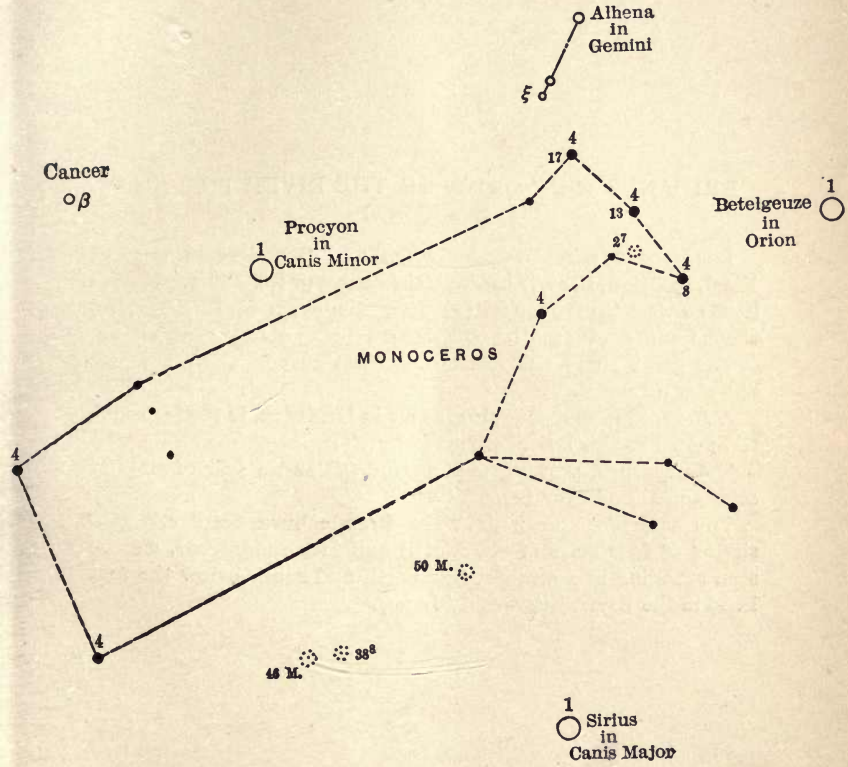


38⁸
46 M
1
Sirius
Canis
Major
93 M
4
N
ρ
Aspidiske
ξ
4
Markeb
κ
Aludra
π
2 Naos
ζ
ARGO NAVIS
λ
2
γ
ν
τ

MONOCEROS (mō-nos'-e-ros)—THE UNICORN. (Face South.)

LOCATION.—Monoceros is to be found east of Orion between Canis Major and Canis Minor. Three of its stars of the fourth magnitude form a straight line northeast and southwest, about 9 degrees east of Betelgeuze, and about the same distance south of Alhena, in Gemini.

The region around the stars (8), (13), (17) is particularly rich when viewed with an opera-glass. The clusters (50 M) and (2) are well worth observing.


Alhena
in
Gemini
ξ
Cancer
β
4
17
4
13
Betelgeuze
in
Orion
1
Procyon
in
Canis Minor
1
2⁷
4
8
4
MONOCEROS
4
50 M.
4
38⁸
46 M.
1
Sirius
in
Canis Major

ERIDANUS (ē-rid'-a-nus)—OR THE RIVER PO. (Face Southwest.)

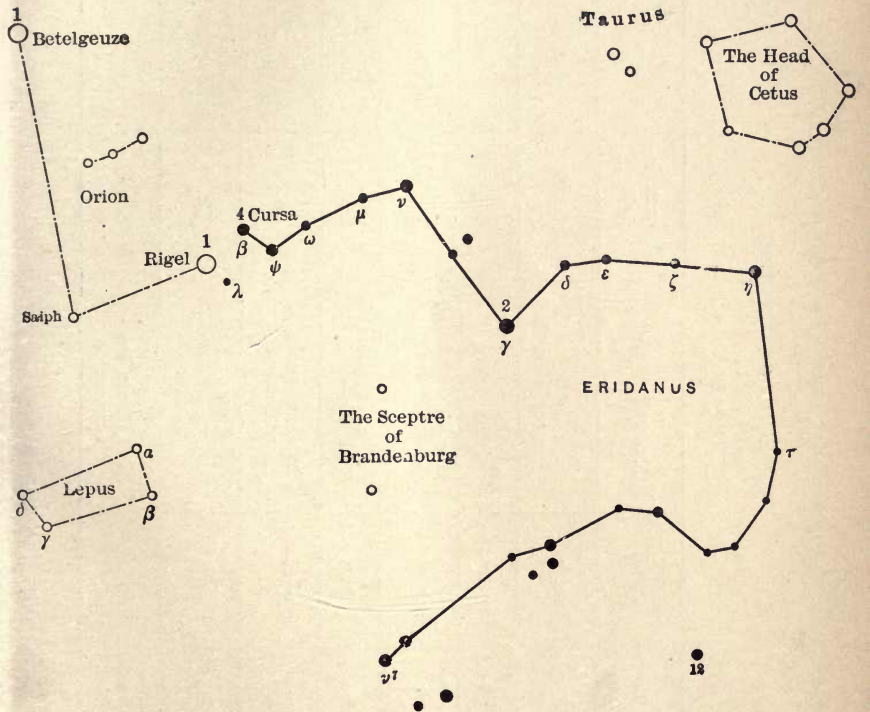
LOCATION.—Three degrees north and two degrees west of Rigel, in Orion, lies (β) Eridani, the source of the River. Thence it flows west till it reaches (π) Ceti, then drops south 5 degrees, thence east southeast, its total length being about 130 degrees.

The great curve the river takes, just east of the Whale, resembles a horseshoe.

Acherna, the first-magnitude star in Eridanus, is too far south to be seen in this latitude.

Note the pretty star group around (β) and a pair of stars of an orange hue below (ν).

The asterism known as "The Brandenburg Sceptre," consisting of four stars of the fourth and fifth magnitude, can be seen standing in a straight line north and south below the first bend in the River, just west of Lepus.


1
Betelgeuze
Orion
Rigel
1
Saiph
4 Cursa
β
ψ
ω
μ
ν
λ
2
γ
δ
ε
ζ
η
τ
Taurus
The Head
of
Cetus
ERIDANUS
The Sceptre
of
Brandeaburg
Lepus
α
β
γ
δ
υ¹
12

METEORIC SHOWERS

JANUARY TO APRIL.

Name of Shower	*Date*	*Radiant Point*	*Characteristics*	*Other Dates of Observation*	*Location*
Quadrantids. Rich annual shower	Jan. 2	(44) Boötis, between Boötes and Dragon's head	M. Sw. B.	Jan 3.	E.
Zeta Cancrids	Jan. 2–4	(ζ) Cancri, near Bee Hive			E.
Theta Ursids	Jan. 5	About 10° from (β) away from (γ) Ursæ Maj.	Small Sh. Sw. F.	Jan. 2–8	N.
Alpha Draconids	Feb. 1	Near Thuban (α) Draconis	Sl.	Jan. 9 Dec. 8	N.
Alpha Aurigids	Feb. 7	Near Capella (α) Aurigæ	Sl.	Aug. 21 Sept. 12–22	High in Southern sky
Tau Leonids	Feb. 16	(τ) Leonis, between Leo and Crater	Sl. Sk.	Nov. 27 Dec. 12 Mar. 1–4	E.
Alpha Canum Ven. Well defin'd 1877	Feb. 20	Near Cor Caroli and Coma Berenices	V. Sw. B.		E.

(α)–(β) Perseids	Mar. 1	Between (α) and (β) Persei	V. Sl.	July–Dec. Mar. 13–19	N. W.
Beta Leonids or Beta Virginids	Mar. 14	Near Denebola (β) Leonis	Sl. B.	Mar. 3, 4 Dec. 12	S. E.
Kappa Cepheids	Mar. 18	Near Polaris	Sl. B.	Oct. 4–17 Mar. 13–19	N.
Beta Ursids	Mar. 24	Near (β) Ursæ Maj.	Sw.	Apr. 10–16 Mar. 13–14 Dec. 2–9 Precise	N.
Zeta Draconids	Mar. 28	Near the Dragon's head	Sl.	July 29 Aug. 24, etc.	N.

The Abbreviations under *Characteristics* are as follows:

V. Very
M. Moderately
Sw. Swift
Sl. Slow
Sh. Short
B. Bright
F. Faint
Sk. Streak leaving meteors
T. Train leaving meteors

OF THE UNIVERSITY OF CALIFORNIA

THE PLANETS.

IT is not within the scope of this work to dwell at length on a discussion of the planets. Certain explanatory matter regarding them is necessary, however, to prevent confusion; for the student must bear in mind the fact that from time to time the planets appear in the constellations, and unless identified would lead him to think that the diagrams were inaccurate.

The reader is referred to any one of the four large plates that precede each season. He will observe that a portion of an ellipse has been traced on each of them, and that this line has been designated the Ecliptic, which simply means the sun's apparent pathway across the sky.

This pathway is divided into twelve equal parts of thirty degrees each, and to these twelve divisions are given the names of the constellations of the Zodiac in the following order: Aries (♈), Taurus (♉), Gemini (♊), Cancer (♋), Leo (♌), Virgo (♍), Libra (♎), Scorpio (♏), Sagittarius (♐), Capricornus (♑), Aquarius (♒), Pisces(♓).

The sun, starting from the first degree of Aries, the

first day of spring, passes through one constellation a month. The planets follow the same pathway.

Confusion, therefore, respecting their identity can only arise in connection with a study of one of the twelve constellations named above, so that whenever a star of any size is seen in one of these constellations, not accounted for in the diagram, the student may conclude that this is a planet; especially if the unknown star does not twinkle. It now remains to identify the planet.

This can best be done by referring to an almanac, which states what planets are above the horizon, and which are morning and evening stars. By morning star is meant that the planet is east of the sun; by evening star, that it is west of the sun.

If the planet is in the west, and very brilliant, it is safe to assume that it is the planet Venus.

If it is brighter than any of the fixed stars, and is some distance from the sun, it is doubtless the colossal Jupiter.

If it is very red, it will probably be Mars.

Saturn is distinguished because of its pale, steady, yellow light.

As for Mercury, Uranus, and Neptune, the former is very near the sun, and seldom seen; while Uranus and Neptune are so inconspicuous as to lead to no confusion on the part of the novice.

A few notes of interest relative to the planets follow, taking them up in regular order passing outward from

the sun: Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune.

MERCURY.

Mercury is the nearest to the sun of any of the planets. On this account, and because of its rapid changes, it is seldom seen.

The most favorable time for observing it is just after sunset, or just before sunrise, during the months of March, April, August, and September, when it may be seen for a few successive days.

The greatest distance it ever departs from the sun on either side varies approximately from sixteen to twenty-eight degrees. Its motion resembles a pendulum, swinging from one side of the sun to the other.

VENUS.

Venus approaches nearer to the earth and is more brilliant than any other planet. It is bright enough to cast a shadow at night, and is sometimes visible even at noonday. It is almost as large as the earth, and oscillates, as Mercury does, on either side of the sun.

It never appears more than three hours after sunset, and as long before the sunrise, and is never more than forty-eight degrees from the sun.

MARS.

Mars is most like the earth of any of the planets, and, although not as interesting an object to view as the

more brilliant planets, Venus and Jupiter, it claims our attention chiefly because of the surmises respecting its habitability.

Mars appears to the naked eye as a bright red star, and when at a favorable opposition to the earth (which occurs only once in every fifteen years) it rivals Jupiter in splendor.

The planet may be mistaken for the first magnitude stars, Antares in Scorpio, and Aldebaran in Taurus, near which it frequently passes.

The fixed stars, however, twinkle, while Mars glows steadily. If there is any doubt in the student's mind as to the identity of the planet, a few nights of observation, noting the changes in the planet's position, will decide the point. It takes Mars about fifty-seven days to pass over one constellation in the Zodiac.

JUPITER.

Jupiter is the largest of all the planets in the solar system, and it is easily distinguished from the fixed stars because of its brilliancy and splendor, exceeding in brightness all the planets excepting Venus, and casting a preceptible shadow.

It moves slowly and majestically across the sky, advancing through the Zodiac at the rate of one constellation yearly. It is therefore a simple matter to forecast its position, for, in whatever constellation it is seen to-day, one year hence it will be seen equally advanced in the next constellation.

Although Jupiter appears to move slowly, it really travels at the incomprehensible rate of five hundred miles a minute.

The most interesting feature about Jupiter is its four moons, which are visible with a good glass. They appear like mere dots of light, and their transit of or occultation with the planet (that is, their disappearance before or behind its disk) can be watched, and is a never failing source of pleasure. A telescope alone reveals Jupiter's fifth moon.

SATURN.

Saturn is farther removed from the earth than any of the planets in the solar system, visible to the naked eye. It is distinguished from the fixed stars by the steadiness of its light, which is dull and of a yellow hue, though to some it appears to be of a greenish tinge. It seems barely to move, so slow is its motion among the stars, for it takes two and one half years to pass through a single constellation of the Zodiac.

Saturn has eight moons. Titan, its largest one, can be seen with a good glass under favorable circumstances. As for its celebrated rings, a telescope alone reveals them.

URANUS.

The student will hardly mistake Uranus for a fixed star, as it is only under the most favorable circumstances that it can be seen with the naked eye.

At its nearest approach to the earth, it is as bright as a sixth-magnitude star. Uranus is accompanied by four moons, and takes seven years to pass over a constellation of the Zodiac.

NEPTUNE.

Neptune is the most distant of the planets in the solar system, and is never visible to the naked eye.

The earth comes properly under a discussion of the planets, but a description of it is hardly within the scope of this work.

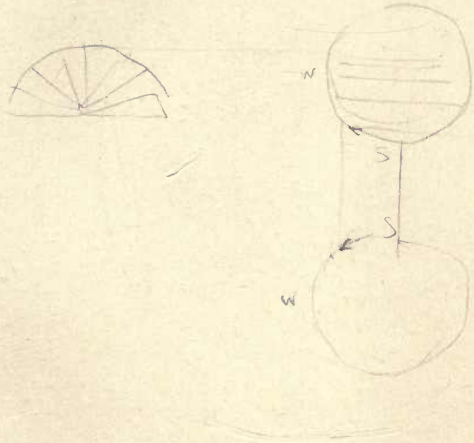
Confusion in identifying the planets is really confined to Mars and Saturn, for Venus and Jupiter are much brighter than any of the fixed stars, and their position in the heavens identifies them, as we have seen before.

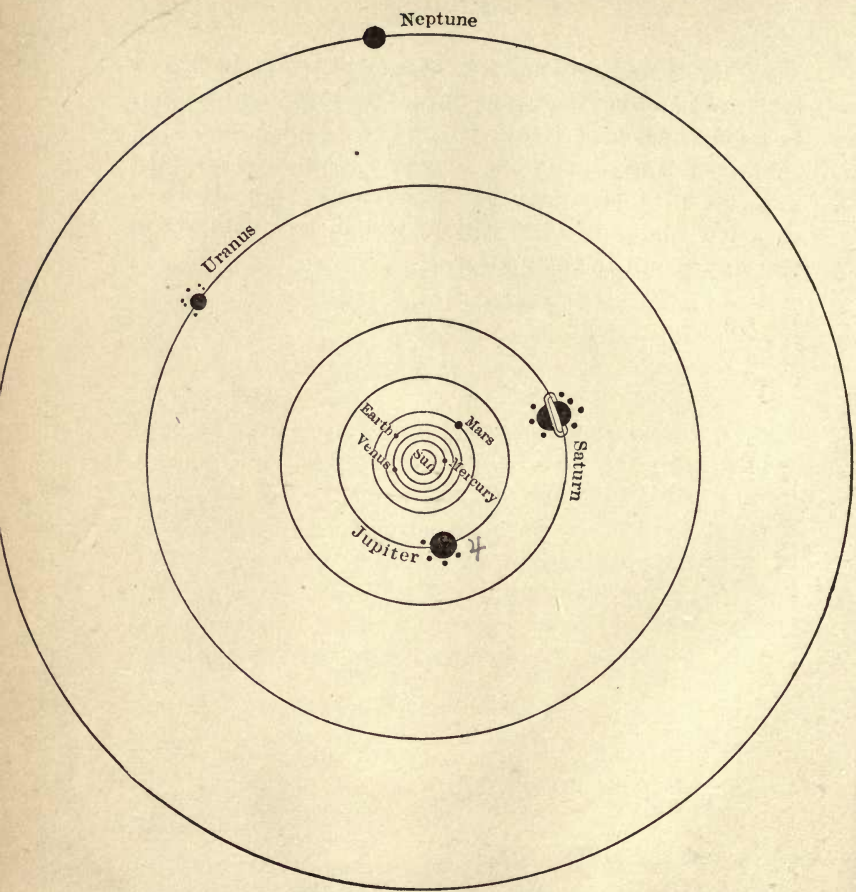
The following table of first-magnitude stars in the Zodiacal constellations confines the question of identifying the planets to a comparison of the unknown star with the following-named stars:

Castor and Pollux	in Gemini.
Spica	" Virgo.
Regulus	" Leo.
Aldebaran	" Taurus.
Antares	" Scorpio.

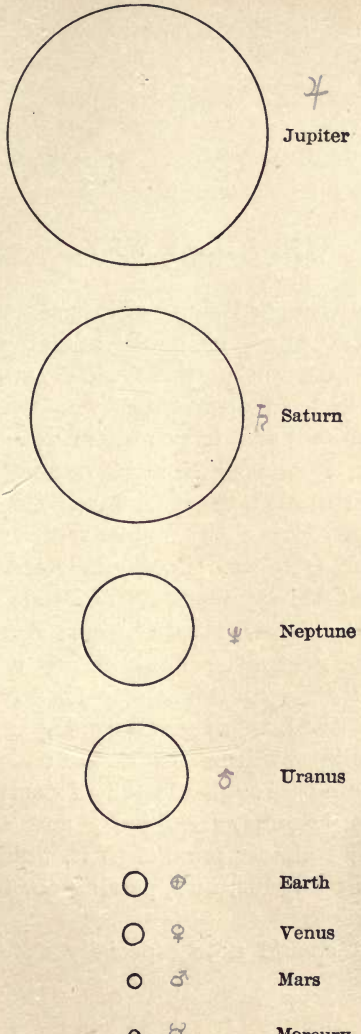
The first four stars named above are white in color, so that either Mars or Saturn is readily distinguished from them.

As for Aldebaran and Antares, which are both red stars, not unlike Mars and Saturn in color and magnitude, the fact that the latter do not twinkle, and that they do not appear in the diagrams, should satisfy the observer of their identity. Reference to an almanac, or a few nights of observation, will in any case set at rest any doubt in the matter.





THE PLANETARY ORBITS



COMPARATIVE SIZE OF THE PLANETS.

THE MILKY WAY.

THE Milky Way, or Galaxy as it is sometimes called, is a great band of light that stretches across the heavens. Certain portions of it are worthy of being viewed with an opera-glass, which separates this seemingly confused and hazy stream into numberless points of light, emanating from myriads of suns.

This wonderful feature of the heavens is seen to best advantage during the months of July, August, September, and October. Beginning near the head of Cepheus, about thirty degrees from the North Pole, it passes through Cassiopeia, Perseus, Auriga, part of Orion, and the feet of Gemini, where it crosses the Ecliptic, and thence continues into the southern hemisphere, beyond our ken in these latitudes.

It reappears in two branches in the region of Ophiuchus, one running through the tail of Scorpio, the bow of Sagittarius, Aquila, Delphinus, and Cygnus; the other above and almost parallel to it, uniting with the first branch in Cygnus, and passing to Cepheus, the place of beginning.

The student should note especially the strange gap

between (α), (γ), and (ε) Cygni. This dark space has been called the "Coal Sack."

The Milky Way in the vicinity of Cassiopeia is particularly rich, and well repays a search with an opera-glass.

"The Galaxy covers more than one tenth of the visible heavens, contains nine-tenths of the visible stars, and seems a vast zone-shaped nebula, nearly a great circle of the sphere, the poles being at Coma and Cetus."

THE MOTIONS OF THE STARS.

IT may be that the student desires to proceed in this conquest of the sky at a more rapid pace than the scheme of study permits. To assist such, it should be borne in mind that the circumpolar constellations, as Ursa Major, Ursa Minor, Draco, Cepheus, and Cassiopeia, are designated,—are visible in our latitude in the northern sky every night.

A reference to their diagrams, and a glance at any of the large plates showing the entire group in their respective positions, will suffice for the student to identify them.

The hours of darkness alone limit the speed with which a knowledge of the constellations can be acquired.

Let us suppose that the student begins his search for the constellations on the night of April 1st, at nine P.M. He has for his guide the large plate, and the spring group of eleven constellations set forth in the diagrams. The remaining three constellations of the circumpolar group are, as we have seen before, visible in the north.

If he faces the western sky, he will see Andromeda just setting, and Perseus, Taurus, Orion, Lepus, and Canis Major but a short distance above the horizon. If

he is so fortunate as to be able to identify these, and the spring group, he may turn his attention wholly to the eastern sky, where new constellations await him.

In the southeast he may see Virgo. In the east well up blazes Arcturus, the gem of Boötes, below which is the beautiful Northern Crown, with the diamond in the head of Serpens beneath it. Hercules is rising, and Vega in the Lyre should be seen just flashing on the view in the northeast.

This completes the list of wonders visible at this precise time, but the stars apparently are never still, and doubtless, while the student has been passing from one constellation to another in the western and southern skies, others have been rising in the east and northeast.

At ten P.M. the Lyre is well up, and Ophiuchus and Libra can be discerned. At midnight Scorpio and Cygnus are ready to claim the attention. By two o'clock A.M., Aquila, Delphinus, and Sagittarius have risen, and at break of day Andromeda, Pegasus, and Capricornus can be seen if the student has had the courage to remain awake this length of time.

In no way can the seeming movement of the stars be better understood than by actual observation. The observer must bear in mind that the movement is an apparent one: that it is the earth that is moving and not the stars. He has only to think of the analogy of the moving train beside the one that is standing still, and the true state of affairs will at once be evident.

To further appreciate this apparent change in the situation of the constellations, the student should refer to the large plates successively. In each successive one he will note the advancement westward of the constellations mentioned above, rising in the east late at night.

The student can best get an idea of this westward apparent movement of the stars by noting the position of some bright first-magnitude star from night to night. He will soon be able to calculate the position of this star a month or more ahead, and this calculation applies to all the constellations and stars.

It is not within the scope of this work to go into this matter in detail. The author merely desires to mention this fact of apparent change of position in the stars, a fact that will be noticeable to the observer in a short time, and a fact that it is hoped he will be able to explain to his own satisfaction with the aid of the foregoing remarks.

It will be noticed that the stars on the diagrams are all numbered and lettered. The numbers refer to the magnitude of the star,—that is, the brightness of it, the first-magnitude stars being the brightest, the second-magnitude stars less bright, etc.

The letters are those of the Greek alphabet, and the student if not familiar with it is advised to consult a Greek grammar.

In the text, in referring to certain stars in the con-

stellations, the genitive case of the Latin name of the constellation is given; for example, Vega is known as (α) Lyrae, meaning alpha of Lyra, Aldebaran as (α) Tauri, alpha of Taurus, etc.

The twilight hour affords an excellent opportunity of fixing the relative positions of the first-magnitude stars in the mind, for at that time they alone, save the planets, are visible.

METEORS, OR SHOOTING-STARS.

AS this work is designed primarily to cover what is observable in the starlit heavens with the naked eye, the subject of meteors, or shooting-stars, comes properly within its scope.

There are few persons, if any, who have not witnessed the sight of a splendid meteor speeding across the sky, and such a sight always calls forth exclamations of wonder and delight.

Apparently these evanescent wanderers in space are without distinctive features, and baffle classification; but, like all that nature reveals to us, they have been found, for the most part, to conform to certain laws, and to bear certain marks of resemblance that permit of their identification and classification.

By careful observation for over fifty years the meteors, generally speaking, have been so arranged that they come under the head of one of the nearly three hundred distinct showers which are now recognized by astronomers.

Many of these showers are too feeble and faint to be worthy of the attention of one not especially interested in the subject, but certain ones are well worth observ-

ing. There is always a pleasure in being able to recognize at a glance a certain definite manifestation of nature, be it a rare flower or a flashing meteor.

The generally accepted theory respecting the meteors is that they were all originally parts of comets now disintegrated, and the four well-known showers of April 20th, August 10th and 14th, and November 27th, bear testimony to this theory.

The apparent velocity of the meteors is between ten and forty-five miles a second, and their average height is about seventy-six miles at first appearance, and fifty-one miles at disappearance. Occasionally a meteor is so large and compact as to escape total destruction, and falls to the earth. Specimens of these meteorites are to be found in our best museums.

I have seen fit to divide the principal meteor showers into four groups, according to the seasons in which they appear, and have placed them respectively at the conclusion of each season's work on the constellations.

By radiant point is meant the point from which the meteors start on their flight. This point is an apparent one, however, due to an illusion of perspective, for the meteors really approach the earth in parallel paths.

The dates given for these showers are those of the maxima, and the meteors should be looked for several nights before and after the dates specified.

The showers that are to be seen after midnight are, unless of special note, omitted.

There are, besides the meteors that have been classified, certain shooting-stars that apparently have no determined radiant point. These are called sporadic meteors.

In these lists of meteors, the radiant point is only approximately given; for scientific purposes a far more exact position is required in terms of right ascension and declination. There are several good lists of meteoric showers to be obtained, which afford this information for those who care to pursue the matter more in detail. See the Rev. T. W. Webb's book, entitled *Celestial Objects for Common Telescopes*. For purposes of identification, the radiant points here given will be found for the most part sufficient.

THE NAMES OF THE STARS AND THEIR MEANINGS.

ACUBENS, (α) *Cancri*, "the claws."
Situated in one of the Crab's claws. It is white in color and culminates* March 18th.

ADARA, (ε) *Canis Majoris*, "the virgins," a name for four stars, of which Adara is brightest.
Situated in the Dog's right thigh. It is pale orange in color, and culminates Feb. 11th.

ADHIL, (ε) *Andromedæ*, "the train of a garment."
Situated in the left shoulder of the chained lady.

ALADFAR, (μ) *Lyræ*, "the talons" (of the falling eagle)
(al-ad-făr)
AL BALI, (ε) *Aquarii*, "the good fortune of the swallower."
AL-BI'-REO, (β) *Cygni*, origin doubtful.
or Situated in the beak of the Swan and the base of
Al-bir' ē-o the Cross. Its color is topaz yellow, and it culminates Aug. 28th.

*It will be noted that the date of culmination is given in almost every case. By culmination is meant the highest point reached by a heavenly body in its path, at which point it is said to be on the meridian. In this hemisphere this is in each case the highest point north.

For example:—the culmination of the sun occurs at noon.

The time when the stars here mentioned culminate on the dates specified is in each case nine o'clock P.M.

ALCAID, (η) *Ursæ Majoris.*
See Benetnasch.

ALCHIBA, (α) *Corvi*, "the tent," the desert title for the constellation. Situated in the eye of the Crow. Orange in color.
(al-kē-bä′)

ALCOR, (g) *Ursæ Majoris*, "the cavalier" or "the rider." Situated close to Mizar in the handle of the "Dipper." Silver white in color. The Arabs called this star "Saidak," meaning "the proof," because they used it to test a good eye.

AL-CY′-O-NE, (η) *Tauri.*
Greenish yellow in color. The brightest of the Pleiades. Situated in the neck of the Bull.

AL-DEB′-A-RAN, (α) *Tauri*, "the hindmost" or the "follower," *i. e.* of the Pleiades.
Situated in the eye of the Bull. Pale rose in color. It is receding from the earth at the rate of thirty miles per second, and culminates Jan. 10.
(α) Tauri is sometimes called Palilicium.

ALDERAMIN, (α) *Cephei* "the right arm." It now marks the shoulder of Cepheus.
(Al-der-am′-in) White in color. It culminates Sept. 27th.

ALDHAFERA, (ζ) *Leonis.*
Situated in the "Sickle," and the neck of the Lion. It culminates April 8th.

ALFIRK, or ALPHIRK (al-ferk′), "stars of the flock," (β) *Cephei*
The Arab name for the constellation.
Situated in the girdle of Cepheus.
White in color. It culminates Oct. 2d.

ALGEIBA, (γ) *Leonis*, "the mane."
(al-jē'-bä) Situated in the "Sickle," and the shoulder of the Lion. It is approaching the earth at the rate of twenty-four miles per second, and culminates April 9th.

AL'-GE-NIB, (γ) *Pegasi*, "the wing," possibly the "flank" or "side."
Situated in the wing of the Horse. White in color, and culminates Nov. 14th.

AL'-GE-NIB, (α) *Persei*, "the side," or Mirfak, "the elbow."
Situated in the right side of Perseus. Lilac in color and approaching the earth at the rate of six miles per second. It culminates Jan. 1st. This star is also called Alchemb.

ALGENUBI, (ε) *Leonis*, "the head of the Lion."
(al-je-nö'-bi) A yellow star situated in the Lion's mouth.

AL'-GOL, (β) *Persei*, "the ghoul" or "demon."
Situated in the head of the Medusa held in the Hero's left hand. White in color. It is approaching the earth at the rate of one mile per second, and culminates Dec. 23d.

ALGORAB, or ALGORES, (δ) *Corvi*, "the raven."
(al-go-räb') Situated on the right wing of the Crow. Pale yellow in color. It culminates May 14th.

ALHENA, (γ) *Geminorum*, "a brand on the right side of the
(al-hen'-ä) camel's neck," or a "ring" or "circlet."
Situated in the right foot of Pollux. White in color, and culminates Feb. 8th.
Alhena is sometimes called Almeisam.

AL-I-OTH, (ε) *Ursæ Majoris*, disputed derivation.
Situated in the tail of the Great Bear. It is approaching the earth at the rate of nineteen miles per second. It culminates May 20th.
Alioth, the name sometimes given to (α) and (η) Serpentis.

AL-KAID, *See* ALCAID.
(al-kād)

ALKALUROPS, (μ) *Boötis*, "a herdsman's club, crook, or staff."
(al-ka-lū′-rops) Situated near the right shoulder of the Herdsman. Its color is flushed white.

ALKES, (α) *Crateris*, from Al Kas, "the cup," the Arab name
(al′-kes) for the constellation.
Situated in the base of the Cup. Orange in color, and culminates April 20th.

ALMAC, (γ) *Andromedæ*, "a badger," possibly "the boot."
Situated in the left foot of Andromeda. Orange in color, and culminates Dec. 8th.

AL NAAIM, (τ) and (ν) *Pegasi*, "the cross bars over a well."

AL NASL, or ELNASL (el-nas′-l), (γ) *Sagittarii*, "the point head
(al-nas′l) of the arrow."
Situated in the arrow's tip. It is yellow in color, and culminates Aug. 4th.
This star cometimes called Nushaba and Warida.

AL NATH, (γ) *Aurigæ*, and (β) *Tauri*, "the heel of the rein- or holder," or the "butter" *i. e.* the "horn."
NATH Situated in the right foot of the Charioteer, and the tip of the northern horn of the Bull. Brilliant white in color, and culminates Dec. 11th.

ALNITAK, (ζ) *Orionis*, "the girdle."
(al-ni-tak′) Situated in Orion's belt. Topaz yellow in color It is receding from the earth at the rate of nine miles per second, and culminates Jan. 26th.

ALIYAT N, (σ) *Scorpii*, "the outworks of the heart."
Situated near the Scorpion's heart. It is creamy white in color.

AL′-PHARD, (α) *Hydræ*, "the solitary one in the serpent."
or Situated in the heart of Hydra. Orange in color,
(al-färd′) and culminates Mar. 26th.

AL-PHEC′-CA, (α) *Coronæ Borealis*, "the bright one of the dish."
See Gemma. Century Dictionary gives meaning "the cup or platter of a dervish."

AL′-PHE-RATZ, (α) *Andromedæ*, "the head of the woman in
or (al-fe-rats′) chains." "The navel of the horse."
Situated in the head of Andromeda. White and purplish in color. It culminates Nov. 10th. Alpheratz is sometimes called Sirrah.

AL RAKIS, (μ) *Draconis*, "the dancer."
Situated in the Dragon's nose. Brilliant white in color. The Century Dictionary gives for this star Arrakis, "The trotting camel."

AL RESCHA, (α) *Piscium*, "the cord or knot."
Situated in the knot joining the ribbons that hold the Fishes together. Pale green in color, and culminates Dec. 7th.

ALSAFI, (σ) *Draconis*

ALSCHAIN, (*β*) *Aquilæ*, part of the Arab name for the constel-
(al-shān′) lation.
Situated in the head of Antinoüs. Pale orange in color, and culminates Sept. 3d.

AL SHAT, (*ν*) *Capricorni*, "the sheep."

AL′-TAIR, or ATAIR, (*α*) *Aquilæ*, "the flying eagle," part of the Arab name for the constellation. Situated in the neck of the Eagle. Yellow in color, and culminates Sept. 1st.

ALTERF (*λ*) *Leonis*, "the glance," *i. e.* the Lion's eye.
(al-terf′) Situated in the Lion's mouth, the point of the Sickle. Red in color.

ALUDRA, (*η*) *Canis Majoris*, "the virgins." The four stars
(al-ö′-dra) near each other in Canis Major.
Situated in the Great Dog's tail. Pale red in color, and culminates Feb. 21st.

ALULA BOREALIS, (*ν*) *Ursæ Majoris*.
ALULA AUSTRALIS, (*ζ*) " " The "northern and southern wing."
Situated in the Southern hind foot of the Great Bear. The latter star is sometimes called El Acola.

ALYA, (*θ*) *Serpentis*.
Situated in the tip of the Serpent's tail. Pale yellow in color, It culminates Aug. 18th.

ANCHA, (*θ*) *Aquarii*, "the hip."
Situated in the right hip of Aquarius.

ANILAM, (*ε*) *Orionis*, "a belt of spheres or pearls."
(a-ni-lam′) Situated in Orion's belt. It is bright white in color, and is receding from the earth at the rate

of sixteen miles per second. It culminates Jan. 25th.

ANT-ĀR-ES, or AN-TA'-REZ, (α) *Scorpii*, "the rival of Mars."
Situated in the heart of the Scorpion. Fiery red and emerald green in color. It culminates July 11th.

ARC-TŪ-RUS, (α) *Boötis*, "the leg of the lance-bearer," or "the bear-keeper."
Situated in the left knee of the Herdsman. Golden yellow in color. It culminates June 8th.

ARIDED, *See* DENEB.

ARNEB, (α) *Leporis*, "the hare," the Arab name for the con-
(är'-neb) stellation.
Situated in the heart of the Hare. Pale yellow in color. It culminates Jan. 24th.
(α) *Leporis* is sometimes called Arsh.

ARKAB, (β) *Sagittarii*, "the tendon uniting the calf of the leg
(är'-kab) to the heel."
Situated in the Archer's left fore leg.

ASHFAR, (μ) and (ε) *Leonis*, "the eyebrows."
Situated close to the Lion's right eye. (μ) orange in color, sometimes called Alshemali or Asmidiske.

ASPIDISKI or ASMIDISKE, (ι) *Argus*, "in the gunwale."
(as-pi-dis'ke) Situated in the shield which ornaments the vessel's stern. Pale yellow in color.
The Century Dictionary gives "a little shield" as the meaning for this star name.

ASCELLA, (ζ) *Sagittarii*, "the armpit."
Situated near the Archer's left armpit. It culminates Aug. 19th.

ASCELLUS, (ι) *Boötis.*
It marks the finger tips of the Herdsman's upraised hand.

ASCELLUS BOREALIS, (ν) *Cancri*, "northern ass."
Straw color.

ASCELLUS AUSTRALIS, (δ) *Cancri*, "the southern ass."
Situated on the back of the Crab. Straw color.

ATIK, (ο) *Persei.*
Situated in the wing on the right foot of Perseus.

AZELFAFAGE, (π) *Cygni*, "the horse's foot or track."

AZHA, (η) *Eridani*, "the ostrich's nest."
Pale yellow in color.

BAHAM, (ϑ) *Pegasi*, "the young of domestic animals."
Situated near the left eye of Pegasus.

BATEN KAITOS, (ζ) *Ceti*, "the whale's belly."
A topaz-yellow-colored star, which culminates Dec. 5th

BEID, (bā'-id) (ο) *Eridani*, "the egg."
A very white star.

BEL'-LA-TRIX, (γ) *Orionis*, "the female warrior." The Amazon star.
Situated in the left shoulder of Orion. Pale yellow in color. It is receding from the earth at the rate of six miles per second, and culminates Jan. 22d.
The Century Dictionary gives the color as very white.

BE-NET'-NASCH, (η) *Ursæ Majoris*, "the chief or governor of the mourners" (alluding to the fancied bier).
Situated in the tip of the Great Bear's tail. Brilliant white in color. It is approaching the earth at the rate of sixteen miles per second, and culminates June 2d. This star is also called Alkaid.

Betelgeuze (Bet-el-gerz'), (α) *Orionis*, "the giant's shoulder," or "the armpit of the central one."
Situated in the right shoulder of Orion. Orange in color. It is receding from the earth at the rate of ten miles per second, and culminates Jan. 29th.
Sometimes called Mirzam, the roarer.

Botein, (δ) *Arietis*, "the little belly."
(bō-tē-in')

Ca-pel'-la, (α) *Aurigæ*, "the she-goat."
Situated in the left shoulder of the Charioteer. It is a white star, and is receding from the earth at the rate of fifteen miles per second. It culminates Jan. 19th. The color of Capella is nearly that of the sun.

Caph, (β) *Cassiopeiæ*, "the camel's hump," or "the hand."
(kaf) It is white in color, and culminates Nov. 11th.

Cas'-tor, (α) *Geminorum*, "the horseman of the twins."
Its color is bright white, and it culminates Feb. 23d. Situated in the head of Castor. The Century Dictionary gives the color as greenish.

Cheleb, (β) *Ophiuchi.*
Situated in the head of the Serpent. It is a yellow star, and culminates Aug. 30th.

Chort, (θ) *Leonis.*
(chôrt) Situated in the hind quarters of the Lion. It culminates April 24th. The Century Dictionary has (θ) *Centauri* for this star.

Cor Caroli, (α) *Can. Ven.*, "the heart of Charles II."
(kôr kar'-ō-lī) It is flushed white in color, and culminates May 20th. A yellowish star according to the Century Dictionary.

CUJAM, (ω) *Herculis*. Word used by Horace for the club of Hercules.

CURSA, (β) Eridani, "the footstool of the central one," or
(KER′ SA) "the chair or throne."
Situated about at the source of the river near Orion. Topaz yellow in color, and culminates January 13th. This star is also known as Dhalim (Tha′ lim) ("the ostrich").

DABIH, (β) *Capricorni*, "the lucky one of the slaughterers," or
(dā′-be) "the slayer's lucky star."
Situated in the head of the Sea-Goat. It is an orange-colored star, and culminates Sept. 10th.

DĒ′-NEB, or ARIDED (ar′-i-ded (α) *Cygni*, "the hen's tail," "the hindmost."
Situated in the tail of the Swan, and at the top of the Cross. Brilliant white in color. It is approaching the earth at the rate of thirty-six miles per second. It culminates Sept. 16th.

DENEB AL OKAB, (ε) and (ζ) *Aquilæ*, "the eagle's tail."
(den′-eb al-ō-kâb)

DENEB ALGEDI, (δ) *Capricorni*, "the tail of the goat."
(den′-eb al′-jē-dē) Situated in the tail of the Sea-Goat.

DENEB AL SHEMALI, (ι) *Ceti*.
(den′-eb-al-she-mā-le) A bright yellow star situated at the tip of the northern fluke of the monster's tail.

DENEB KAITOS, (β) *Ceti*, "the tail of the whale."
(den′-eb kī′-tos) Situated in the tail of the Whale. It is a yellow star, and culminates Nov. 21st. This star sometimes called Diphda.

Deneb'-o-la, (β) *Leonis*, "the lion's tail."
It is a blue star which is approaching the earth at the rate of twelve miles per second. It culminates May 3d. This star also called Dafirah, and Serpha.

Dschubba, (δ) Scorpii, "the front of the forehead."
Situated in the head of the Scorpion. It culminates July 4th.

Dsiban, (ψ) *Draconis*.
Pearly white in color.

Dub'-he, (α) *Ursæ Majoris*, "a bear."
(dŏb'-he) The northern pointer star. It is a yellow star, and is approaching the earth at the rate of twelve miles per second. It culminates April 21st. The Arabs called the four stars in the Dipper the "bier."

Eltanin, or Etanin (et'-ā-nin), (γ) *Draconis*, "the dragon," "the dragon's head."
It is orange in color and culminates Aug. 4th.
Rasaben, is another name for this star.

E'-nif, or en'-if (ε) *Pegasi*, "the nose."
Situated in the nose of Pegasus. It is a yellow star which is receding from the earth at the rate of five miles per second and culminates Oct. 4th.

Er rai, (γ) *Cephei*, "the shepherd."
(re-rā'-ē) Situated in the left knee of Cepheus. It is yellow in color and culminates Nov. 10th.

Fomalhaut, (Fō'mal-ō) (disputed pronunciation), (α) *Piscis Austri*, "the fish's mouth."
Situated in the head of the Southern Fish. It is reddish in color, and culminates Oct. 25th.

FURUD, or PHURUD (fu-rōd) (ζ) *Canis Majoris*, "the bright single one."
Situated in the left hind paw of the Greater Dog. It is light orange in color.

GEM'-MA, (α) *Coronæ Borealis*, "a bud."
The brightest star in the Northern Crown. It is brilliant white in color, and is receding from the earth at the rate of twenty miles per second. It culminates June 28th. This star is also known as Alphecca and Alfeta.

GIANSAR (λ) *Draconis*, "the twins," "the poison place."
Situated in the tip of the Dragon's tail. An orange-colored star. It culminates April 28th.

GIEDI, (α) *Capricorni*.
Situated in the head of the Sea-Goat. It is a yellow star, and culminates Sept. 9th.

GIENAH, (γ) *Corvi*, "the right wing of the raven."
Situated in the Crow's wing. It culminates May 10th.

GIENAH, (ε) *Cygni*, "the wing."
Situated in the Swan's wing. It is a yellow star, and culminates Sept. 17th.

GOMEISA, GOMELZA, (β) *Canis Minoris*, "Watery-eyed,
(gō-mī'-zā) weeping." A white star.
Situated in the neck of the Lesser Dog.

GRAFFIAS, (β) *Scorpii*, derivation unknown; the name may mean "the crab."
Situated in the head of the Scorpion. It is a pale white star, and culminates July 5th.

GRUMIUM, (ξ) *Draconis*, "the dragon's under jaw."
(grö'-mi-um) A yellow star.

HAM'-AL, (α) *Arietis*, "the head of the sheep."
or Situated in the forehead of the Ram. It is yellow
(ha-mäl') in color, and is approaching the earth at the rate of nine miles per second. It culminates Dec. 11th.

HOMAM, (ζ) *Pegasi*, "the lucky star of the hero, or the whisperer."
(ho-mam') Situated in the neck of Pegasus. Light yellow in color. It culminates Oct. 22d. The Century Dictionary gives this star name to (η) *Pegasi*.

HYADUM I, (γ) *Tauri*.
Situated in the Hyades, the nose of the Bull. A yellow star.

IZAR, MIRACH, or MIZAR, (ε) *Boötis*, "the girdle."
(ē-zär) Pale orange in color. It is approaching the earth at the rate of ten miles per second, and culminates June 16th. A beautiful colored double star.

JABBAH, (ν) *Scorpii*, "crown of the forehead."
(Jab'-bā) A triple star.

KAUS AUSTRALIS, (ε) *Sagittarii*, "the southern part of the bow."
(kâs) An orange-colored star. It culminates Aug. 8th.

KAUS BOREALIS, (λ) *Sagittarii*, "the northern part of the bow."
(kâs) Orange color.

KITALPHA, (α) *Equulei*, the Arab name for the asterism. In the head of the Little Horse. It culminates Sept. 24th.

KO'-CHAB, (β) *Ursæ Minoris*, "the star of the North."
(kō-kāb') Situated in the right shoulder of the Little Bear. One of the two Guardians of the Pole. It is reddish

in color, and is receding from the earth at the rate of eight miles per second. It culminates June 19th.

KORNEPHOROS, (β) *Herculis*, the Arab name for the constellation.
Situated in the right arm-pit of Hercules. Pale yellow in color. It is approaching the earth at the rate of twenty-two miles per second. It culminates July 12th.

LESUTH, (ν) *Scorpii*, "the sting."
Situated in the tip of the Scorpion's tail. It culminates July 27th.

MARFAK, (θ) *Cassiopeiæ*, "the elbow."
(mär'fak) Situated in the left elbow of Cassiopeia. This star name is also given to (u) Cassiopeiæ.

MARFIC, (λ) *Ophiuchi*, "the elbow."
(mär'-fik) Situated in the left elbow of the Serpent Bearer. Yellowish white in color.

MARFIK, or MARSIC, (κ) *Herculis*, "the elbow."
(mär' fik) Situated in the right elbow of Hercules. Light yellow in color.

MAR'-KAB, (α) *Pegasi*, Arab word for "saddle". Century Dictionary gives "a wagon" or "chariot."
(mär' kab) Situated in the base of the Horse's neck. It is a white star which is receding from the earth at the rate of three quarters of a mile a second. It culminates Nov. 3d.

MARKEB, (κ) *Argus*.
Situated in the stern of the Ship. It culminates Mar. 25th

MARSYM, (λ) *Herculis*, "the wrist."
Situated in the left wrist of Hercules. Deep yellow in color.

MATAR or SAD (Säd), "a lucky star," or more fully, Sad-Mator, (η) *Pegasi*, "the fortunate rain."
Situated in the left fore leg of Pegasus.

MEBUSTA, MEBSUTA (Meb-sö′-ta) or MEBOULA, (ε) *Geminorum*, "the outstretched."
A brilliant white star situated in the right knee of Castor.

MEDIA, or KAUS MEDIA, (ϑ) *Sagittarii*, "middle (of the) bow."
Orange yellow in color. It culminates Aug. 8th.

MĔ-GRES, or (Mē′-grez), (δ) *Ursæ Majoris*, "the root of the bear's tail."
It is a pale yellow star, and culminates May 10th. This star is the faintest of the seven which form the Dipper.

MEISSA, (λ) *Orionis*.
Situated in the face of the Giant Hunter. Pale white in color.

MEKBUDA, (ζ) *Geminorum*, "the contracted (arm)."
(mek-bū′-dā) Situated in the left knee of Pollux. Pale topaz in color.

MENKALINAN, (β) *Aurigæ*, "the shoulder of the rein-holder or driver."
(men-ka-lē-nan′ or Men-kal′-i-nan) Situated in the right arm of the Charioteer. A lucid yellow star which is receding from the earth at the rate of seventeen miles per second. It culminates Jan. 29th. This star was one of the first discovered and most remarkable "spectroscopic binaries."

MENKAR, (α) *Ceti*, "the nose, or snout."
(men′kär) Situated in the nose of Cetus. Bright orange in color. It culminates Dec. 21st. Sometimes written Menkab.

MENKIB, (ξ) *Persei*, "the shoulder."
Situated in the calf of the right leg of Perseus.

MERAK, (β) *Ursæ Majoris*, "the loin of the bear."
(mē'rak) A greenish white star which is approaching the earth at the rate of eighteen miles per second. It culminates Apr. 20th. The southern of the two "pointers."

MESARTIM, (γ) *Arietis*, the Hebrew word for "minister."
(mē-sär'tim) Situated in the Ram's left horn. Bright white in color.

MINTAKA, (δ) *Orionis*, "the belt (of the giant)."
(min'ta-kä) One of the three stars in Orion's belt. A brilliant white star with very little motion. It culminates Jan. 24th.

MĪ'-RA, (o) *Ceti*.
(mī'ra Situated in the neck of Cetus.
or A famous variable, flushed yellow in color. It culmi-
mē'ra) nates Dec. 15th.

MĪ'RACH, or MIRAK, (β) *Andromedæ*, "the girdle," or "the loins."
(mī'rak or A yellow star culminating Nov. 28th.
mē'rak)

MĪZAR, (ζ) *Ursæ Majoris*, "a girdle or apron."
(mīzär or Situated in the tail of the Great Bear. Brilliant
mē'zär) white in color. It is approaching the earth at the rate of nineteen miles per second. It culminates May 28th

MULIPHEN, (γ) *Canis Majoris*.
Situated in the neck of the Greater Dog. It culminates Feb. 16th.

MUPHRID, (η) *Boötis*, "the solitary star of the lancer."
(mū'-frid) Situated in the calf of the left leg of the Herdsman. Pale yellow in color. It culminates June 4th.

MURZIM or MIRZAM (mer-zäm'), (β) *Canis Majoris*, "the announcer" or "the roarer."
Situated in the Greater Dog's left fore paw. A white star culminating Feb. 5th.

MUSCIDA, (o) *Ursæ Majoris*, "the muzzle."
Situated in the nose of the Great Bear.

NEKKAR, or NAKKAR (nak'-kär), (β) *Boötis*, "the herdsman," the Arab name for the whole constellation.
Situated in the head of Boötes. A golden yellow star which culminates June 20th.

NAOS, (ζ) *Argus*, "the ship."
(nā'-os) Situated in the stern of the Ship. It culminates Mar. 3d.

NASHIRA, (γ) *Capricorni*, "the fortunate one, or the bringer of good tidings."
Situated in the tail of the Sea-Goat. It culminates Oct. 3d.

NIHAL, (β) *Leporis*.
Situated in the right foot of the Hare.
Deep yellow in color. It culminates Jan. 23d.

NODUS SECUNDUS, (δ) *Draconis*, "the second of the four knots or convolutions."
Deep yellow in color. It culminates Aug. 24th.

NUNKI, (σ) *Sagittarii*, "the star of the proclamation of the sea," or SADIRA (sad'-ē-ra) "the ostrich returning from the water."

Situated in the upper part of the Archer's left arm. It culminates Aug 17th.

PHAD, PHEC'-DA, or PNAED (fā'-ed), (γ) *Ursæ Majoris*, "the thigh" (of the bear).
Topaz yellow in color. It is approaching the earth at the rate of sixteen miles per second. It culminates May 4th.

PHAET or PHACT, (α) *Columbæ*.
Situated in the heart of the Dove. It culminates Jan. 26th.

PHERKAD (fer'-kad), (γ) *Ursæ Minoris*, "the calf."
Situated in the right fore leg of the Little Bear.

PO-LÁ-RIS, (α) *Ursæ Minoris*, "the pole star."
Situated in the tip of the Little Bear's tail. Topaz yellow in color. It is receding from the earth at the rate of sixteen miles per second.

POL'-LUX, (β) *Geminorum*, Ovid's "Pugil," the pugilist of the two brothers.
Situated in the head of Pollux. An orange-colored star which is receding from the earth at the rate of one mile per second. It culminates Feb. 26th. The Century Dictionary gives the color of Pollux as very yellow.

PORRIMA, (γ) *Virginis*, Latin name for "a goddess of prophecy."
(por'-i-mā) Situated in the Virgin's left arm. It culminates May 17th.

PRŌ'-CY-ON, (α) *Canis Minoris*, "before the dog."
A yellowish-white star. It is approaching the earth at the rate of six miles per second. It culminates Feb. 24th. It is situated in the right side of the Lesser Dog.

PROPUS, (η) *Geminorum*, "the forward foot."
(prō′-pus) Situated in the northern foot of Castor.

RASALAS, (μ) *Leonis*, "the lion's head toward the south."
(ras′-a-las) Situated in the Sickle, close to the Lion's right eye. An orange-colored star. It culminates Apr. 1st. Alshemali and Borealis are other names for this star.

RAS ALGETHI, (α) *Herculis*, "the kneeler's head."
(rās-al-ge′-thi) Orange red in color. It culminates July 23d.

RAS′-AL-HĂG′-UE, (α) *Ophiuchi*, "the head of the serpent charmer."
A sapphire-hued star. It is receding from the earth at the rate of twelve miles per second. It culminates July 28th.

RASTABAN, (β) or (γ) *Draconis* "the dragon's head," or "the
(rās-ta-bän′) head of the basilisk."
A yellow star culminating Aug. 3d. This star also called Alwaid (al-wīd′) "the sucking camel-colts." The three stars near it are included in this appellation.

REG′-U-LUS, (α) *Leonis*, diminutive of the earlier Rex.
Situated in the handle of the Sickle. and the right fore paw of the Lion. It is flushed white in color, and is approaching the earth at the rate of five miles per second. It culminates April 6th.

RIGEL (β) *Orionis*, "the [left] leg of the Jabbah, or giant."
(ri′-jel), A bluish-white star which is receding from the earth at the rate of ten miles per second. It culminates Jan. 20th. This star is sometimes called Algebar (al′-je-bär).

ROTANEV, (β) *Delphini*, from Venator, assistant to Piazzi, his
(rot'-a-nev) name reversed.
It culminates Sept. 15th.

RUCHBA, (ω) *Cygni*, "the hen's knee."
A pale red star.

RUCHBAH, or RUCBAH, (δ) *Cassiopeiæ*, "the knee."
Situated in the left knee of Cassiopeia. It culminates Dec. 2d.

RUKBAT, (α) *Sagittarii*, "the archer's knee."
Situated in the left fore foot of the Archer. It culminates Aug. 24th.

SABIK, (η) *Ophiuchi*.
A pale yellow star in the left leg of the Serpent Bearer. It culminates Aug. 21st.

SADACHBIA, (γ) *Aquarii*, "the luck star of hidden things."
(sād-ak-bē'-yä) Greenish in color and situated in the water jar of Aquarius. It culminates Oct. 16th.

SAD AL BARI, (λ) and (μ) *Pegasi*, "the good luck of the excelling one."
Situated close to the fore legs of Pegasus.

SADAL MELIK or RUCBAH, (α) *Aquarii*, "the lucky star of the
(sād-al-mel'-ik) king."
A red star situated in the right shoulder of Aquarius. It culminates Oct. 9th.

SADALSUND, or SADALSUUD (säd-al-sö-öd), (β) *Aquarii*, "the luckiest of the lucky."
Pale yellow in color. Situated in the left shoulder of Aquarius. It culminates Sept. 29th.

SADATONI, (ζ) *Aurigæ.*
(sad-a-tō′-ni) One of the three stars known as "the kids." Orange color.

SADR or SADIR (sā′-dēr), (γ) *Cygni*, "the hen's breast."
(sadr) This star is approaching the earth at the rate of four miles per second. It culminates Sept. 11th.

SAIPH, (κ) *Orionis*, "the sword of the giant."
(sā-if′) Situated in Orion's right knee. It culminates Jan. 27th.

SARGAS, (θ) *Scorpii.*
A red star situated in the tail of the Scorpion. It culminates July 27th.

SCHEAT or MENKIB, (β) *Pegasi*, "the upper part of the arm."
(she′-at) Situated in the left fore-leg of Pegasus. It is deep yellow in color, and is receding from the earth at the rate of four miles per second. It culminates Oct. 25th.

SCHEMALI, *see* Deneb al schemali, (ι) *Ceti.*

SEGINUS, (γ) *Boötis*, from Ceginus of the constellation, possibly.
(se-jī′nus) Situated in the left shoulder of Boötes. It culminates June 13th.

SHAULA, (λ) *Scorpii*, "the sting."
(shâ′-lä) In the tip of the Scorpion's tail.

SHEDAR, SCHEDIR, or SHEDIR, (α) *Cassiopeiæ*, "the breast," or from El Seder, "the sedar tree," a name given to this constellation by Ulugh Beigh.
Pale rose in color. It culminates Nov. 18th.

SHELIAK, or SHELYAK (shel′-yak), "a tortoise," (β) *Lyræ*, Arabian name for the constellation.
A very white star culminating Aug. 17th.

SHERATAN, (*β*) *Arietis*, "a sign," or "the two signs."
(sher-a-tan') Situated in the Ram's horn. A pearly white star culminating Dec. 7th.

SIR'-I-US, (*α*) *Canis Majoris*, "the sparkling star or scorcher." Situated in the mouth of the Great Dog. Brilliant white in color. The brightest of the fixed stars. It culminates Feb. 11th.

SITULA, (*κ*) *Aquarii*, "the water jar or bucket."
(sit'-ū-lă) Situated in the rim of the Water Jar.

SKAT, or SCHEAT, (δ) *Aquarii*, "a wish," or possibly it means a "shin bone."
Situated in the right leg of Aquarius.

SPĪ'CA, (*α*) *Virginis*, "the ear of wheat or corn" (held in the Virgin's left hand).
A brilliant flushed white star, which is approaching the earth at the rate of nine miles a second. It culminates May 28th.

SUALOCIN, or SVALOCIN (sval'-ō-sin), Nicolaus reversed, (*α*) *Delphini*.
A pale yellow star culminating Sept. 15th.

SULAFAT, or SULAPHAT (sō'-lă-făt), "the tortoise," (γ) *Lyræ*.
Arabian title for the whole constellation.
It is bright yellow in color, and culminates Aug. 19th.

SYRMA, (*ι*) *Virginis*; this name used by Ptolemy to designate this star in the train of the Virgin's robe.

TALITA, (*κ*) or (*ι*) *Ursæ Majoris*, "the third vertebra."
(tă'-lē-tă) Situated in the right fore paw of the Great Bear. Topaz yellow in color.

TANIA BOREALIS, (λ) *Ursæ Majoris.*

TANIA AUSTRALIS, (μ) *Ursæ Majoris*, a red star.
These stars are situated in the right hind foot of the Great Bear. The former star culminates Apr. 8th.

TARAZED, (γ) *Aquilæ*, "the soaring falcon," part of the Persian
(tar'-a-zed) title for the constellation.
Situated in the body of the Eagle. A pale orange star, culminating Aug. 31st.

TEGMENI, (ζ) *Cancri*, "in the covering."
A yellow-colored star.

THU'-BAN, (α) *Draconis*, "the dragon," the Arab title for the
or constellation.
(thö-bän') Situated in one of the Dragon's coils. It is pale yellow in color, and culminates June 7th.

UNUK AL HAY, (α) *Serpentis*, "the neck of the snake."
or A pale yellow star which is receding from the
UNUKALHAI earth at the rate of fourteen miles a second. It
(ū'-nuk-al-hā'-i) culminates July 28th.

VĔ'GA, or WEGA, (α) *Lyræ*, "falling," *i. e.*, the falling bird, "the harp star."
A beautiful pale star sapphire in color. It is approaching the earth at the rate of nine miles a second. It culminates Aug. 12th.

VINDEMIATRIX, (ε) *Virginis*, "the vintager or grape gatherer."
Situated in the Virgin's right arm. A bright yellow star culminating May 22d.

WASAT, (δ) *Geminorum*, "the middle."
(wā'-sat) Situated in the body of Pollux. Pale white in color. It culminates Feb. 19th.

WESEN, (δ) *Canis Majoris*, "the weight."
A light yellow star in the right side of the Great Dog. It culminates Feb. 17th.

YED PRIOR, (δ) *Ophiuchi*, "the hand." "the star behind or
(yed) following."
Deep yellow in color. It culminates July 7th. It is in the left hand of the Serpent Bearer.

YED POSTERIOR, (ε) *Ophiuchi*, "the hand."
A red star culminating July 8th.

YILDUM, (δ) *Ursæ Minoris*.
Situated in the tail of the Little Bear. A greenish-hued star culminating Aug. 12th.

ZANIAH, (η) *Virginis*.
Situated in the Virgin's left shoulder.

ZAURAK, (γ) *Eridani*, "the bright star of the boat."
(zâ'-rak), A yellow star.

ZAVIJAVA, (β) *Virginis*, "angle or corner," "the retreat
(zav-i-ja'-va) or kennel of the barking dog."
Situated in the Virgin's left wing. A pale yellow star culminating May 3d.

ZOSMA, (δ) *Leonis*, "a girdle."
(zŏs'-ma) Situated at the root of the Lion's tail. A pale yellow star which is approaching the earth at the rate of nine miles a second. It culminates Apr. 24th. This star is also called Duhr, and sometimes Zubra.

ZUBENAKRAVI, (γ) *Scorpii*, "the claw of the Scorpion."
(zŏben-ak'-ra-vi or -bi) A red star.

ZUBEN ELGENUBI, (zö-ben-el-jen-ū'-bi) (α) *Libræ*, "the southern claw" (of the Scorpion).

A pale yellow star culminating June 17th. This star is also called Kiffa Australis.

ZUBEN ESCHAMALI, (β) *Libræ*,
(zö-ben-es-she-ma'-li) "the northern claw.-"

A pale emerald color, a very unusual color for a star. It is approaching the earth at the rate of six miles a second and culminates June 23d. This star is also known as "Kiffa Borealis."

In the compilation of the foregoing list, the author has been greatly assisted by Allen's "Star Names and their Meanings."

TABLE SHOWING THE STARS OF THE FIRST AND SECOND MAGNITUDE RISING IN THE EASTERN SKY AT NINE O'CLOCK P.M. ON THE DATES SPECIFIED.

DATE	NAME OF STAR	CONSTELLATION
January 1	Regulus, 1st.	Leo.
" 8	Alphard, 2d.	Hydra.
" 11	Cor Caroli.	Canes Venatici.
February 20	Arcturus, 1st.	Boötes.
March 1	Spica, 1st.	Virgo.
" 5	Gemma, 2d.	Corona Borealis
April 1	Vega, 1st.	Lyra.
" 20	Ras Alhague, 2d.	Ophiuchus.
" 22	Deneb, 2d.	Cygnus.
May 9	Antares, 1st.	Scorpio.
" 26	Altair, 1st.	Aquila.
June 5		Delphinus.
July 17	Algenib, 2d.	Perseus.
August 6	Algol	Perseus.
" 21	Capella, 1st.	Auriga.
" "	Hamel, 2d.	Aries.
" 27	Fomalhaut, 1st	Piscis Australis.
September 13		The Pleiades in Taurus
October 2	Aldebaran, 1st.	Taurus.
" 26	Bellatrix, 2d.	Orion.
" 30	Castor, 1st.	Gemini.
" "	Betelgeuze, 1st.	Orion.
November 4	Pollux, 2d.	Gemini.
" "	Rigel, 1st.	Orion.
" 27	Procyon, 1st.	Canis Minor.
December 4	Sirius, 1st.	Canis Major.
" 8	Phaet, 2d.	Columba.
" 14		The Bee Hive in Cancer
" 16		The head of Hydra

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