MARCH
APRIL
MAY
JUNE
JULY
FEBRUARY
JANUARY
Microscopium
Piscis Australis
Capricornus
Sagittarius
Corona Australis
Scutum Sobieski
Aquila
Delphinus
Pegasus
Andromeda
Pisces
Aries
Cetus
Fluvius Eridanus
Chemica Fornax
Sceptrum Brandenburgium
Caela Sculptoris
Lepus
Columba
Orion
Taurus
Auriga
Perseus
Camelopardalis
Draco
Hercules
Ophiuchus
Serpentarius
Quadrans Muralis
Bootes
Canes Venatici
Coma Berenices
Ursa Major
Leo Minor
Lynx
Cancer
Monoceros
Canis Major
Sextans
Virgo
Ecliptic
Equinoctial
Hydra
Centaurus
Corvus
Crater
Felis
Antlia Pneumatica
Norma
Lupus
Magnitudes

DIRECTORY
OF THE
STARRY HEAVENS,
By HENRY WHITALL.
SIXTH EDITION, IMPROVED.

Whenever we see a *Star* in any part of the sky, and wish to know its name, this Movable Planisphere can be set for that minute, and on its face can be read the name of the star. This will be as easy as to look into a *directory* for the name and residence of one of our citizens. Should it be a *Planet* which we are observing, a following rule will enable us as easily to know its name—the points of the compass, and time of rising or setting, and southing. To ascertain the variation of the Magnetic Needle, and to get a Meridian line, as well as most of the useful Problems in Astronomy, are very much simplified and easily explained by this "invaluable substitute for a Celestial Globe, being as much better as it is cheaper than that expensive school apparatus."

It can be sent by mail, being portable, accurate, containing much within a small space, and is sold at so moderate a price, as to bring it within the means of all lovers of Science, and of every teacher who may desire his pupils to become acquainted with the wonders of the Heavens. This knowledge need no longer be confined to the learned few, for the use of the Planisphere will enable any one to become familiar with the stars and constellations, and will prove both pleasing and instructive. The desideratum so long sought for is thus supplied, and reading the stars is no longer a mystery.

"Should be in *every* book-store for sale, and in every family and school for use." "If I could not get another I would not sell mine for **Fifty Dollars**."—GEO. H. CHACE, *Lynn, Mass.*

"I have used Mr. Whitall's Planisphere in my school, and can teach more of the Starry Heavens from it in one *day*, than I can in a *year* from any other Celestial Atlas, Map or Globe I have ever seen." C. B. METCALF, Principal of Highland School, Worcester, Mass.

"Old methods compared with it are like *footmen* to a *steam engine*, or a *news-boy* astride a rack of bones, resembling death's warping bars, to the *telegraph*."—*Christian Messenger, N. Y.*

PROBLEMS
WHICH MAY BE SOLVED ON THIS PLANISPHERE.

The day of the month, the hour and minute being given, to find what stars are rising, setting, on the meridian, or in any part of the firmament.

APPLICATION.—Bring the given hour and minute to the given day of the month; hold it overhead, with the meridian in a line, north and south; the Planisphere will then represent the constellations visible in the Heavens at that time. The stars which are rising are in the eastern, and those setting in the western horizon. And thus can be seen the stars in any part of the sky, at all times, sufficiently accurate for most practical purposes.

Given, this evening at 9 o'clock, or any other time, to find what constellations are in the east, in the west, in the northern or southern horizon, in the zenith or in any other part of the firmament.

"If we look directly overhead at 10 o'clock, on the 10th of November, we shall see the constellation celebrated in fable by the name of ANDROMEDA. It is represented on the map by the figure of a woman having her arms extended, and chained by her wrists to a rock. It is bounded N. by Cassiopeia, E. by Perseus and the head of Medusa, and S. by the Triangles and the Northern Fish. It is situated between 20° and 50° of N. declination. Its mean right ascension is nearly 15°; or one hour E. of the equinoctial colure.'—*Burritt's Geography of the Heavens, page* 18.

Bring 10 o'clock to the 10th of November; in the zenith will be found Andromeda, bounded N. by Cassiopeia, E. by Perseus, altogether on one map. If we look into Burritt, p. 18, we find Andromeda, map II; p. 22, Cassiopeia, map VI; p. 35, Perseus, maps III & IV. The insurmountable difficulty of patching these maps together on the sky is entirely overcome, and made practically easy by the Planisphere, which shows all the visible Heavens at one view, not only for Nov. 10th, at 10 o'clock, but for any other time.

Where will Deneb, *a* in the Swan be at 9 o'clock on the 16th of September? *Ans.* On the meridian. (Burritt, p. 124.)

Where will Deneb, *a* be at 9 o'clock this evening?

"What bright constellation will be near setting in the S. W. at 8 o'clock in the middle of September?" *Ans.* The Scorpion. (Olmstead's School Astronomy, p. 261, and Introduction to Astronomy, page 288.)

"At 10 o'clock, in the middle of December, where will Perseus be?" *Ans.* On the meridian. (Olmstead, pages 263 and 289.)

"At 9 o'clock, about the middle of June, where will Bo-o'tes and the Scales be?" *Ans.* On the meridian. (Olmstead, pages 264 and 290.)

"At what time will Sirius, *a* in the Great Dog rise, culminate and set at New York, on the 25th of December?" (M'Intire, p. 282.) At what points of the compass first and last seen? What is its right ascension and declination? *Ans.* Rises near E. by S. 7 h. 15 m.; culminates 12 h. 20 m.; declination 16½° S., can be seen on the meridian opposite the star; right ascension 100 on the equator, opposite 0 on the meridian; sets near W. by S. 5 h. 24 m.

"On the 21st of October, when it is 7 o'clock in the evening at Philadelphia, what stars are rising, what stars are setting, and what stars are culminating?" *Ans.* Menkab, *a* in the Whale, rising near E.; Capella, *a* in the Wagoner, a little above the N. E.; Deneb, *a* in the Swan, near the zenith; Arcturus, *a* in Bootes, a little above the W. by N., Antares, *a* in the Scorpion set in the W. S. W. (M'Intire, page 280.)

"On the 20th of May, at 9 h. 27 m. in the evening, I observed a lone bright star on the meridian. What star was it?" *Ans.* Spica, *a* in the Virgin. (Robinson's University, p. 55, and Elementary, p. 52.)

"On the 20th of June, lat. 40° N., and long. 75° W., at 1 h. 47 m. clock time, past midnight, I observed a star of the first magnitude nearly on the meridian, two other stars, of about the third magnitude, within 3° of it; the three stars forming nearly a right line principal star about 60°. What star was it?" *Ans.* Altair, *a* in the Eagle.

What stars will be on and near the meridian about 9 o'clock on the 5th of Nov.? *Ans.* Caph, *β* in Cas-si-o-pe'ia, Alpheratz, *a* in An-drom'e-da, and Al'gen-ib, *γ* in Peg'a-sus, marking out the first meridian.

"The Calender of the stars, or an easy method of finding the stars for every season of the year."

"About the middle of January, at half past 9 o'clock in the evening:—

"The Constellation Orion, (Plate VI) Hare and Dove, (Plates XII & XIII) Little Dog, (Plate VI) Capella, (Plate VI) Great Dog, (Plate XIII) Cor Hydræ, (Plate XIV) Castor and Pollux, (Plate VI) Regulus, (Plate VIII) Hydra's Head, (Plate XIV) Berenice's Hair, (Plate VIII) Cor Caroli, (Plate III) Ursa Major, (Plate IV) The principal star in Dragon, (Plate III) Little Lion, (Plate IV) Bull, (Plate VI) River Po, (Plate XII) Menkab, (Plate XII) Ram, (Plate V) Algol, (Plate IV) Alamach, (Plate V) A line drawn from Pollux (Plate VI) to Regulus (Plate VIII) passes through the Crab, (Plate VI) Cassiopeia, (Plate IV) Deneb, (Plate III) Cepheus, (Plate III)." E. Otis Kendall's Uranography, p. 140—143.

Bring 9½ o'clock, evening, to the 15th of January, and compare Prof. Kendall's *easy* method of finding the stars for that evening with this Planisphere.

Among all the stars visible on a clear evening, which is Jupiter? which is Saturn, or any other of the Planets, or the Moon?

Find in the almanac the time at which the given planet *rises, souths or sets.* Bring that time to the day of the month; if *rising*, its place will be where the eastern horizon meets the ecliptic; if *southing*, where the meridian meets the ecliptic; if *setting*, where the western horizon meets the ecliptic. Notice its place among the stars, and then bring the time of observation to the day of the month, and the position of the planet in the heavens will be shown. Or, find in the almanac the nearest day upon which the planet is in conjunction with the moon; and find the POSITION OF THE MOON on that day in like manner, which will be nearly the place of the planet on the given day.

To find at what time any star will come to the meridian, or rise, or set, on any given day of the month.

Turn the graduated side of the meridian, or the eastern or western horizon, to the centre of the star; opposite the day of the month will be found the time required.

On the 10th day of March at what time will Castor, *a* in the Twins be on the meridian? *Ans.* 8 h. 10 m. evening.

To find on what day of the year any star passes the meridian, or rises, or sets, at any given time.

Bring the meridian, or the eastern or western horizon, to the centre of the star; opposite the given time will be found the day required.

When will Reg'-u-lus, *a* in the Lion be on the meridian at 9 o'clock, evening? *Ans.* 7th of April.

To convert time into degrees, or degrees into time.

Bring the meridian to the centre of the star. The degrees of Right Ascension will be read on the Equator or equinoctial opposite 0 on the meridian. The arrow at March 22d will point at the hour and minute of R. A., reading from 12 noon around to 12 noon, counting 24 hours. Reg'-u-lus, *a* in the Lion is 150¾° R. A. How many hours is it? *Ans.* 10 h. 3 m. Arc-tu'rus, *a* in Bootes is 14 h. 10 m. How many degrees is it? *Ans* 212½°.

The right ascension and declination of the Sun, Moon, Planet, Star or Comet being given, to find its place on the Planisphere.

Bring the graduated side of the meridian to the degrees of right ascension marked on the equator, or bring the hours and minutes of R. A. opposite the arrow, near March 22d; its place will be under the declination marked on the meridian.

What star has its R. A. 22 h. 51 m., or 342¾°, D. 30½° south? *Ans. a* Fo'mal-haut.

To find the right ascension and declination of the Sun for any day in the year.

The Sun's place among the stars, is on the ecliptic where the day of the month is. Bring the meridian to the day required. The declination will be found on the meridian opposite the day, and the degrees of right ascension on the equator, under the meridian; the hours and minutes opposite the arrow, reading from 12 o'clock, noon, to 24 hours.

What is the right ascension and declination of the Sun on the 20th of March? *Ans.* 0

What is the right ascension and declination of the Sun on the 21st of June? *Ans.* 90° or 6 h. right ascension, 23° 27½′ north declination.

What is the right ascension and declination of the Sun on the 21st of December? *Ans.* 270° or 18 h. right ascension, and 23° 27½′ south declination.

"On what day of the month does the Sun enter each of the signs?" (M'Intire, page 212.) *Solution:* The day of the month is marked opposite each sign on the ecliptic.

"What is the declination and right ascension of the Sun on the 5th of June?" [Olmstead, p. 34 and 27.] *Ans.* 22½° north declination, 73¾° or 4 h. 55 m. right ascension.

To find the Azimuth, Amplitude, Altitude, Zenith distance, and Vertical Circle of a Star at any time.

Bring the given time to the day of the month; lay a straight edge on the zenith; let it pass through the star to meet the horizon; that line will be a quarter of a *vertical circle.* From the south or north, measured on the horizon to the line, will be the *azimuth.* From the east or west which is nearest to the line, will be the *amplitude;* from the horizon to the star measured on the vertical line, will be the *altitude;* from the star to the zenith, will be the *zenith distance.*

[To measure the azimuth in degrees, we know that a circle is 360°, from N. to S. will be 180°, from S. to E. 90°, from S. to S. E. 45°, from S. to S. S. E. 22½°, from S. to S. by E. 11¼°.]

Change of Seasons. Different lengths of days and nights.

On any day in March or September, bring the Sun's place on the ecliptic to the eastern horizon, and opposite the same day on the outer circle will be found the mean time of the *Sun's rising.* Bring the Sun's place to the western horizon, and opposite the same day will be found the mean time of the *Sun's setting.* The days and nights will be found to be nearly equal.

In like manner, in June the days will be found to be long and the nights short; whereas, in December the days will be found short and the nights long.

Equation of Time; to find how much the Sun is fast or Slow.

Bring the meridian to the given day on the ecliptic; opposite the same day on the outer circle will be the time the Sun is on the meridian; if before 12 o'clock, the Sun is fast; if after 12 o'clock, the Sun is slow.

[illegible] the ecliptic; opposite that date will be found

Beginning and end of Twilight.

Bring the Sun's place on the given day to the line of Twilight, (which is 18° below the horizon) and opposite the same day on the outer circle will be the hour and minute it begins or ends.

To Explain that in Summer, when the Sun runs highest, the full Moon runs lowest, and in Winter, when the Sun runs lowest, the full Moon runs highest.

Bring the graduated side of the meridian to the 21st of June on the ecliptic, the Sun's place among the stars at its greatest distance north; should the Moon full on that day she will be at her greatest distance south, in the opposite part of the sky; shown by bringing the meridian to the 21st of December on the ecliptic, at its greatest distance south. Bring the first date to the W. N. W. horizon, and the second date will be near the E. S. E.; when the Sun sets at his greatest distance north in summer, the full Moon will rise at her greatest distance south.

For winter, reverse the above by bringing the second date near the W. S. W., showing the Sun's setting at his greatest distance south, while the full Moon can be rising in the E. N. E. at her greatest distance north.

By the almanac, see when the Moon is full and the time she is south, by which find her place on the Planisphere; the full Moon of June will be found at her greatest distance south, and the full Moon in December will be found at her greatest distance north.

The Harvest Moon, so called in some parts of Europe, is of great benefit to the husbandman by lengthening the day while gathering the fruits of the earth, and takes place at the full Moon in September, when the Moon rises for several evenings near the same hour. Shown on the Planisphere by bringing 6 o'clock, evening, to the 20th day of September. The Eastern Horizon, First Meridian, Ecliptic and Equator meet at the Vernal Equinox. Should the Moon be full on that day, and rise at the Vernal Equinox at 6, on the following evening she will have moved eastward about 13° then turn the horizon until 13° on the ecliptic rises, opposite the 21st day of September, will be found the time of the Moon's rising to be about 28 minutes later. Bring 13° more above the horizon, opposite the 22d of September, will be found about the time of the Moon's rising to be about 28 minutes later. The ecliptic being nearly parallel to the horizon, it changes less than half an hour per night. Now turn 6 o'clock, evening, to March 22d, the eastern horizon meets the Autumnal Equinox. Bring 13° of the ecliptic up, and opposite March 23d will be found 7 o'clock, making more difference in one day then there was before shown in two days; the ecliptic being now nearly perpendicular to the horizon.

To tell the course and position of the Milky Way at any given time.

Bring the given time to the day of the month; the course and position can be readily traced on the Planisphere.

What will be the course of the Milky Way on the 5th of September, at 6, 9, 12 and 6 o'clock? *Ans.* At 6 o'clock, evening, starting from northern horizon to east of zenith, to southern horizon. At 9 o'clock it appears in the N. E. in zenith, to S. W. At 1½ o'clock it appears in the east, passes the meridian at 60° north, to the west. At 6 o'clock, morning, it appears in the S. E., passes the zenith to the N. W.

In midsummer the Sun shines on the north side of the house when it rises, and on the south side at noon of the same day.

Solution: Bring the E. N. E. point of the horizon to the 20th of June, on the ecliptic, where the Sun rises, and our shadows at that time will be in the W. S. W. direction, we standing below the zenith: move the horizon until June 20th is between the east and zenith on the prime vertical line; then our shadows will be west; bring June 20th on the meridian, and our shadows will be north, looking from the zenith, the Sun south.

"At what hour will the Sun be due east at Philadelphia on the 25th of May?" [M'Intire, p. 307.] *Solution:* Lay a straight edge on the zenith and east, then turn the horizon until the edge strikes the 25th of May, on the ecliptic; 6 h. 38 m., A. M., the time sought, will be found opposite May 25th.

"The fixed star Castor was observed to pass the meridian 12° 13′ north of the zenith. What was the latitude? *Ans.* 20° north," [Robinson's Elementary, p. 201.] *Solution:* Turn the index until the meridian line meets Castor; its declination will be found 32° 13′ N., then take from it 12° 13′, and the remainder will be 20°, the latitude of the observer.

"The star *a* in Cassiopeia, whose right ascension is 31 m. 49 s., and declination 55° 42′ north, was observed to pass the meridian (below the pole) 64° 20′ from the zenith. What was the latitude? *Ans.* 59° 58′ north." [Robinson's Elementary, p. 202.] *Solution:* Turn the index until *a* Schedir is on the meridian 34° 18′ below the pole, which, taken from 64° 20′, gives 30° 2′, the distance the zenith is from the pole, which, taken from 90°, will give 59° 58′, the latitude of the observer. "Had the zenith distance been the same when the star was above the pole, measured towards the north, what would have been the latitude? *Ans.* 8° 38′ south." *Solution:* Bring the meridian on *a* in Cassiopeia above the pole; its north declination is 55° 42′, which, taken from the zenith distance, 64° 20′, will give 8° 38′, south latitude of the observer. Very useful for NAUTICAL MEN.

To find the variation of the Magnetic Needle, or get a Meridian Line.

Bring the meridian to 17¼° on the equator, the arrow will point at 1 h. 9 m., the right ascension of the north pole star; opposite the day of every month will be found the time the north pole star is on the meridian; a correct range at that time will be a true meridian. Six hours after it will be at its greatest elongation west, and six hours later on the meridian below the pole, and six hours later at its greatest elongation east.