



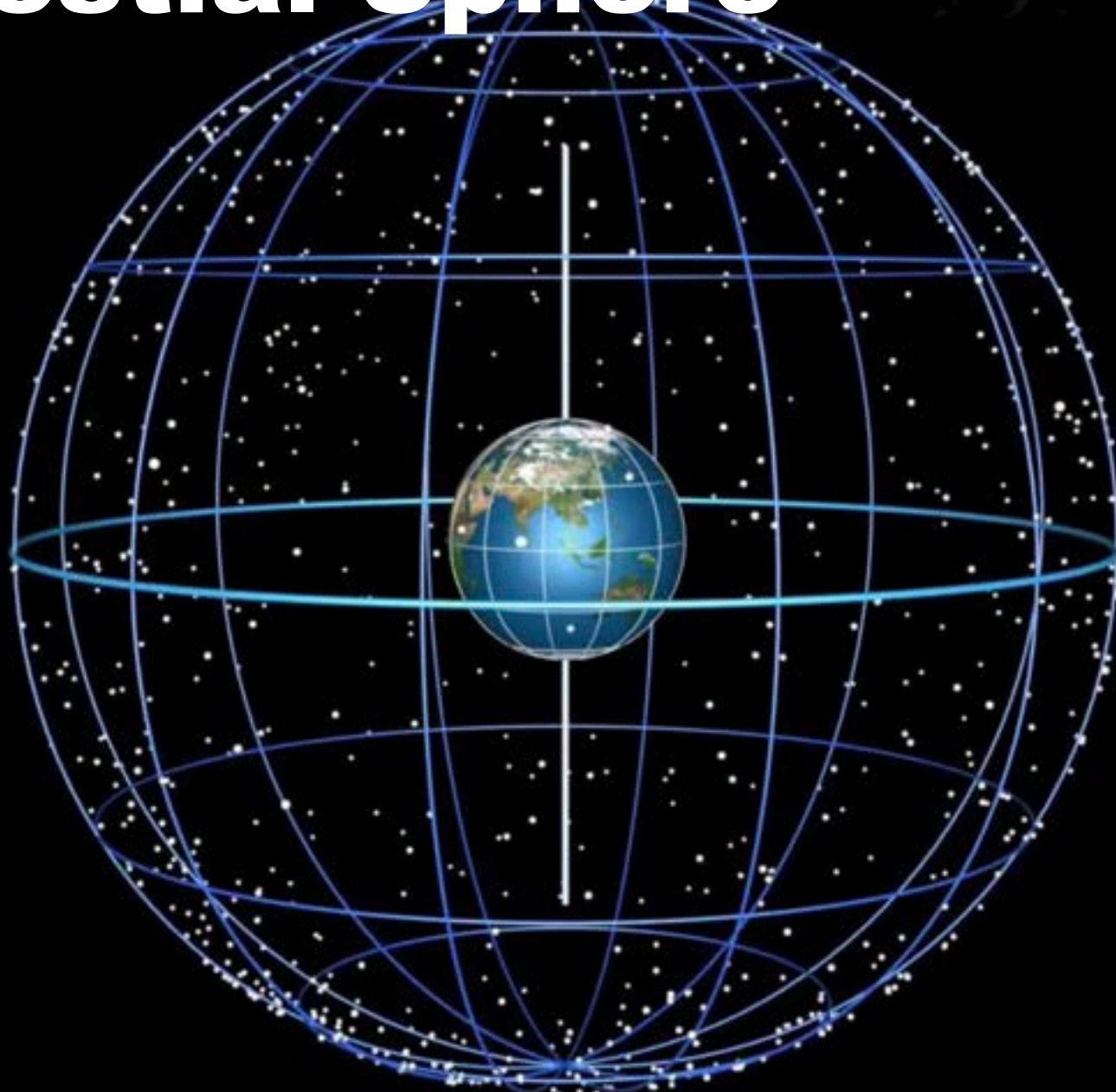
Stargazing+

Terms & Concepts

Celestial Sphere

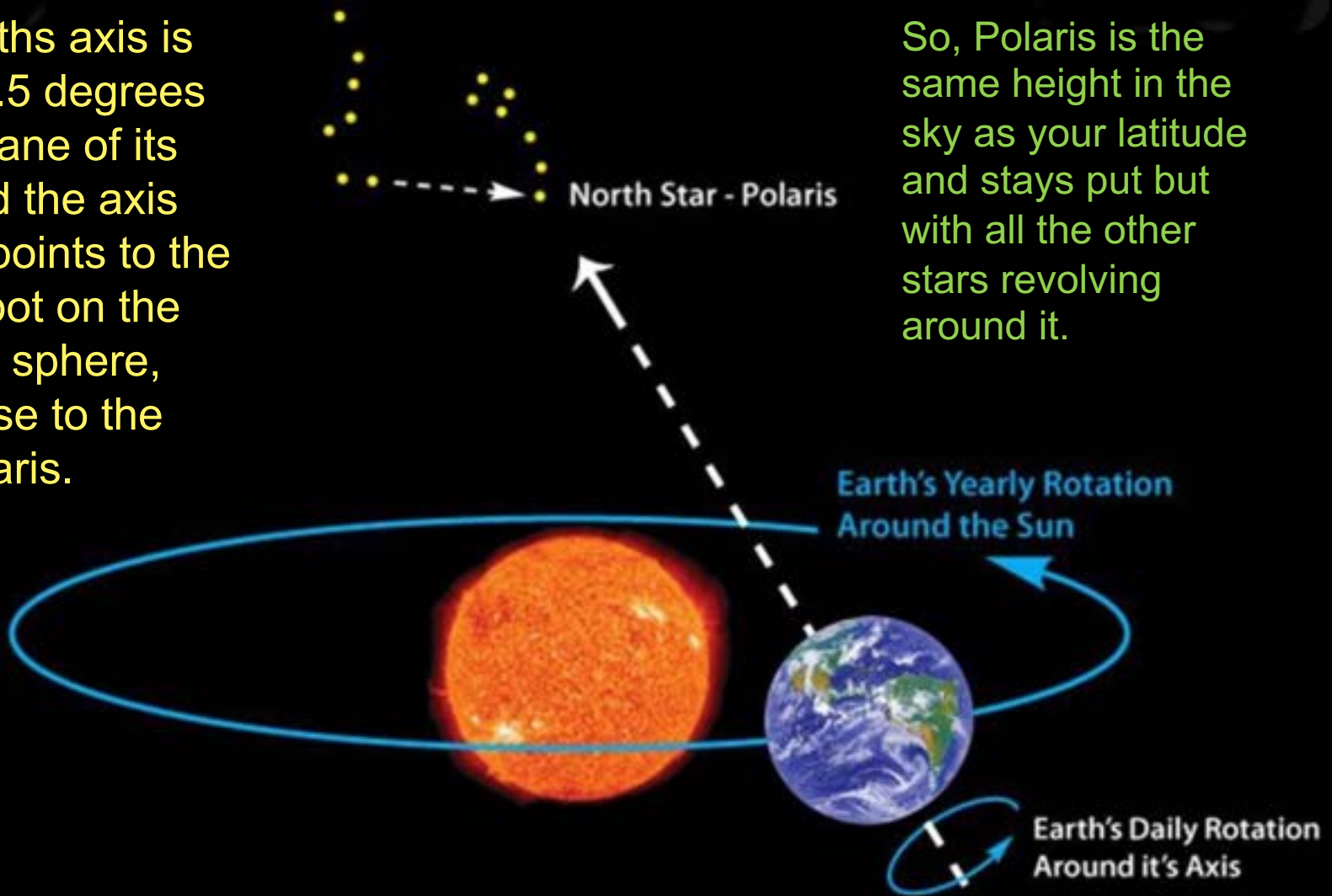
The stars are so far away that they appear fixed to a heavenly fabric that we call the Celestial Sphere.

Anything closer, like the Sun, Moon and our planets are seen to move amongst the stars on the celestial sphere.



Axis points to Polaris

The Earth's axis is tilted 23.5 degrees to the plane of its orbit and the axis *always* points to the same spot on the celestial sphere, very close to the star Polaris.



So, Polaris is the same height in the sky as your latitude and stays put but with all the other stars revolving around it.



Ecliptic

If you could see the stars when the Sun is out, you would notice that the Sun slowly moves along the same path, through the same constellations, in a year's time, completing a circle that is called the Ecliptic. This is a perspective thing created because the Earth circles the Sun.

All of our **planets and the Moon** are always very close to the Ecliptic because all of these bodies orbit the Sun in nearly the same plane as Earth.

The Sun passes through the 12 constellations of the **Zodiac**, a band above and below the Ecliptic. Only a section of the ecliptic stretches across the sky each night and its position in the sky changes throughout the night and year.



Ecliptic is the dashed line on the star chart. Where you find the Sun, Moon and Planets.

Star Magnitudes

Symbol	Star Wheel	Detailed Star Wheel
●	Brightest + Mag -1 to 0	●
●	Bright + Mag 1 to 2	●
●	Average + Mag 2 to 3	●
●	Faint + Mag 4 to 5	●

Names of Constellations are CAPITALIZED
Names of Stars are Italized.

Binocular and Telescope Objects

- ★ Double star
- Cluster of Stars
- Globular Cluster
- Nebula
- Galaxy

The M and NGC numbers are catalogue designations described on the back. Some Greek letter designations of stars are indicated, mostly double stars.

Star Chart

Hold this way when facing south.

1 AM, 2 AM, 3 AM, 4 AM, 5 AM, 5:30 AM, 6:30 PM, 7 PM, 8 PM, 9 PM, 10 PM, 11 PM, Midnight

JULY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER, JANUARY, FEBRUARY, MARCH, APRIL, MAY, JUNE

West, East

Northern Hemisphere
 Latitudes 35°N to 60°N

Face North
 Decide to face either due North or due South. If you face due south, turn the chart upsidedown.

Face South
 Hold this way when facing south.

Planet Notes & the Ecliptic
 The planets are not indicated on this chart because they and the Moon move along the dashed "circle" that is called the Ecliptic. Venus and Jupiter always outline the brightest stars—Venus being extremely bright. See the back for more information.

TWO SIDES to the Star Wheel
 Take it out and turn it over. One side is Simplified while the other is Detailed, plotting binocular & telescope objects.

This OVAL represents the horizon. The stars at its center are overhead.

PROUDLY Made in the USA!

The Binder & Grauer Star Finder

Instructions

- 1 Turn the star wheel and position the date under your observing time.
- 2 Face either due north or due south and orientate the chart accordingly.
- 3 Hold the chart in front of you and match the brightest stars on the chart to the brightest stars in the sky. If there is a bright star in the sky that cannot be found on the chart, then it is one of the visible planets.

Gray Band
represent the
Ecliptic.

Notice that it
passes through
the Astrological
constellations.



Where is the
Ecliptic?

Jup

Sat

Mar

Ven

Mer



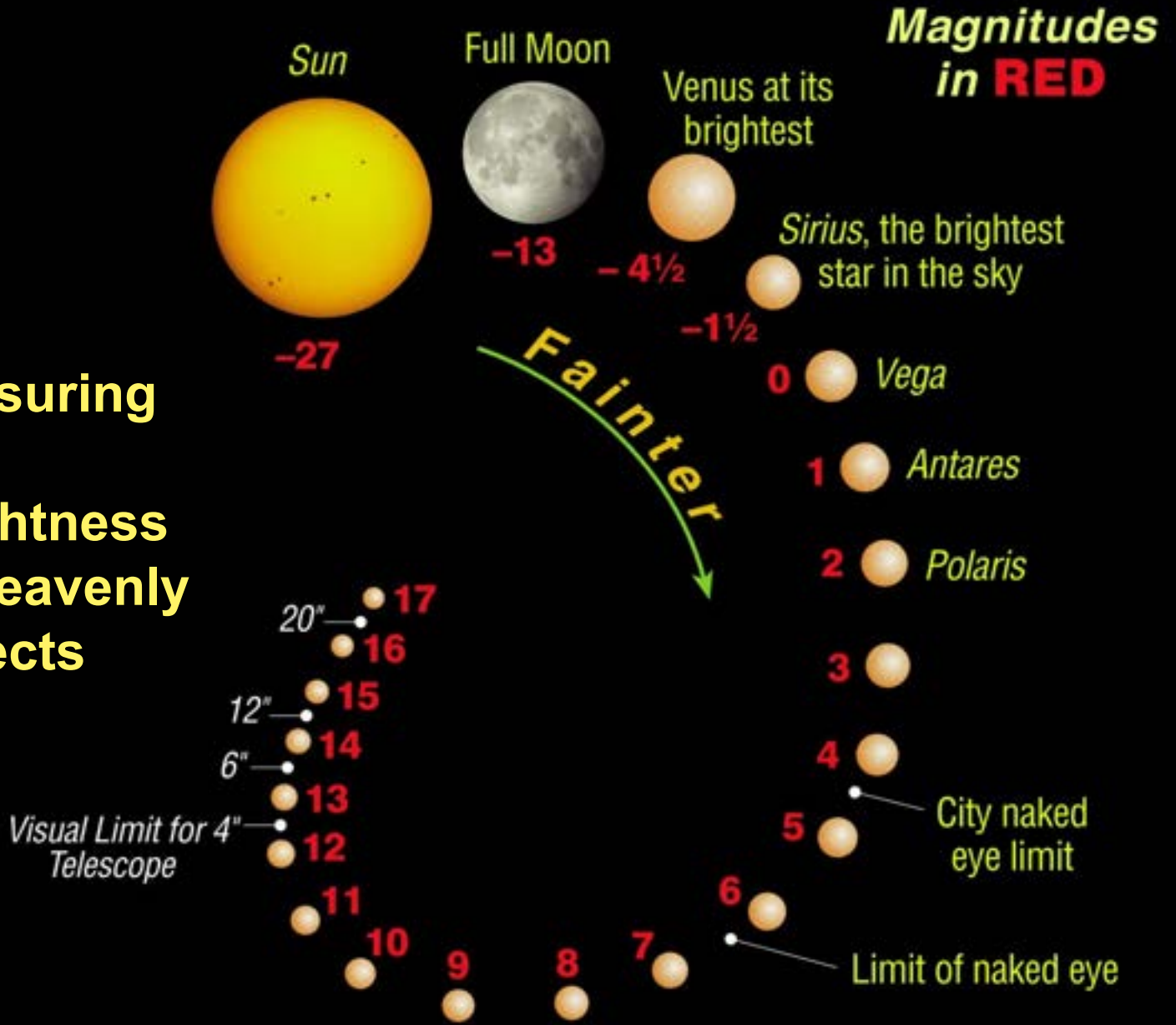


Constellations

1. There are a total of 88 constellations.
2. Overall, the constellations are bigger than what you might think and some have much brighter stars than others.
3. Interesting or noticeable patterns of the constellations are called Asterism. This includes the Big Dipper, Square of Pegasus, Backward Question Mark of Leo and others.
4. Most of the northern constellations were defined by the ancient Greeks. Most names of stars come from Arabic.

Magnitudes

Measuring
the
Brightness
of Heavenly
Objects



Milky Way Band

A composite image showing the Milky Way galaxy band in the night sky above the desert rock formations of the Sphinxes in Egypt. The Milky Way is a bright, multi-colored band of stars and dust stretching across the dark night sky. The rock formations are illuminated by a warm, orange light, likely from a low sun or moon, creating a dramatic contrast with the cool colors of the galaxy.

The Milky Way Band represents the majority of stars in our Milky Way Galaxy as viewed from the inside—we *are* inside.

It is the cumulative faint glow of billion of stars that are too far away to see individually.

The direction to the center of our galaxy is between Sagittarius and Scorpius and this is also the brightest part of the Milky Way.

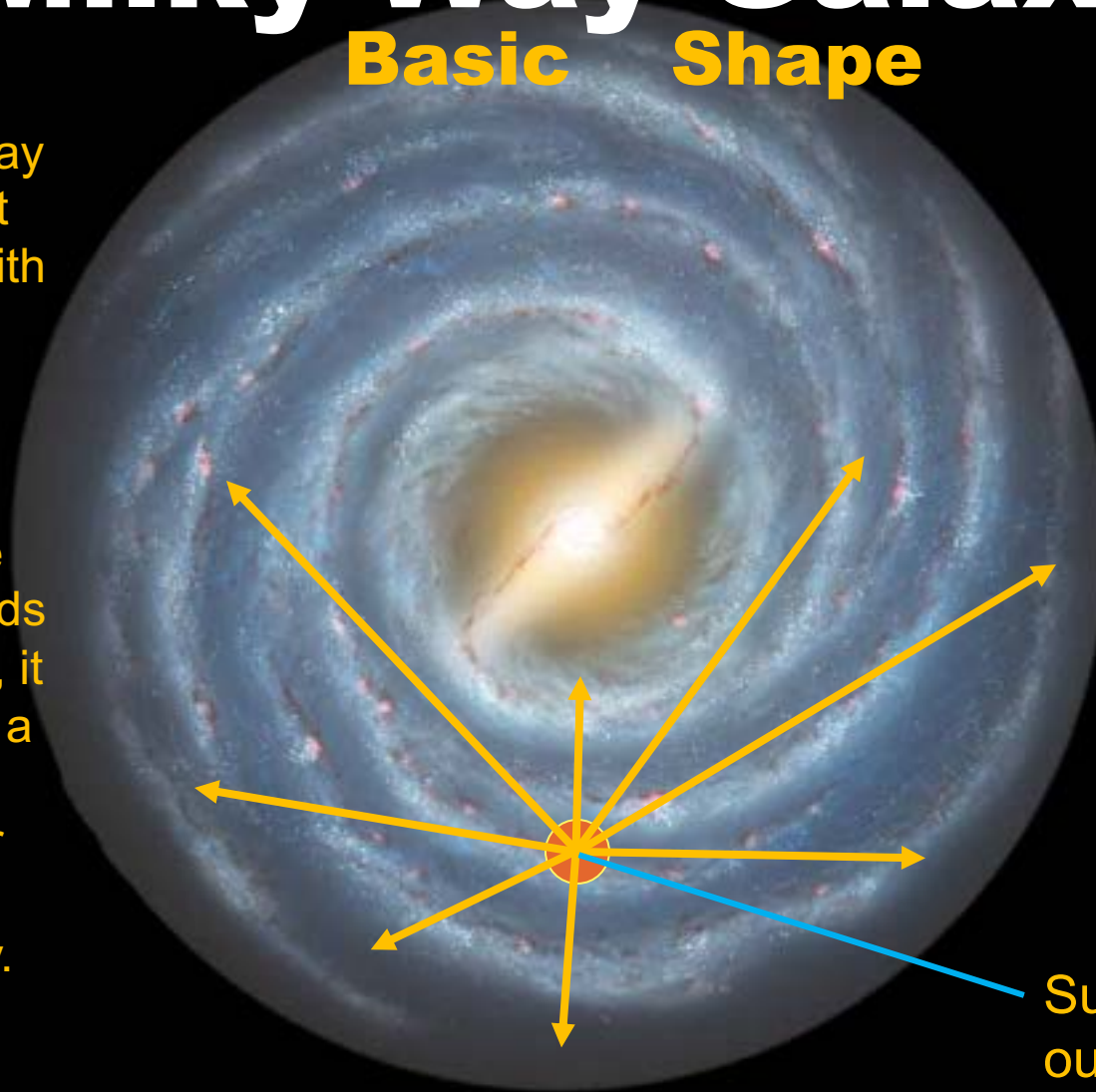
Milky Way Galaxy

Basic Shape

Our Milky Way Galaxy is flat like a dish with a bulging center.

Since we reside inside it, and towards the outskirts, it appears like a continuous and irregular faint band in the night sky.

If you put your head in the middle of a hula-loop, the band you see is the same as the Milky Way Band.



Sun and our Solar System

Celestial Coordinates

Just like Latitude & Longitude are used on Earth to define locations, for the sky, we use the coordinate system of Right Ascension & Declination.

RA

RA or Right Ascension is akin to Longitude on Earth except that it uses 24 hours for its divisions starting at the location of the Sun on the first day of Spring, or Vernal Equinox and progresses eastward. The Sun is in the constellation of Pisces at this time.

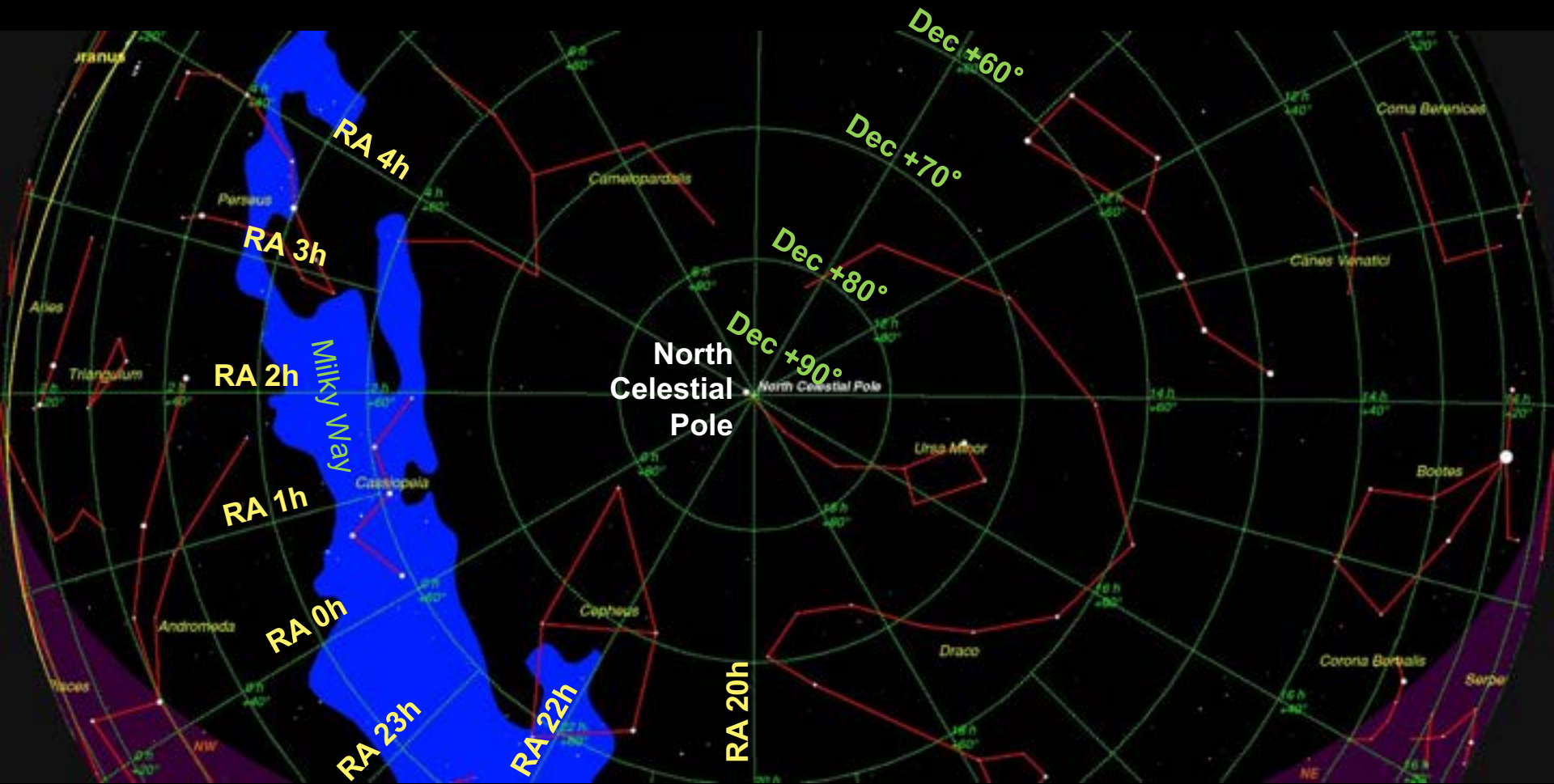
Dec

Dec or Declination is equivalent to latitude and uses the same increments. The only difference is that the plus sign is used for locations North of the Celestial Equator and the Negative sign for locations South of the Celestial Equator. Remember, the Celestial Equator is the projection of Earth's Equator onto the Celestial Sphere.

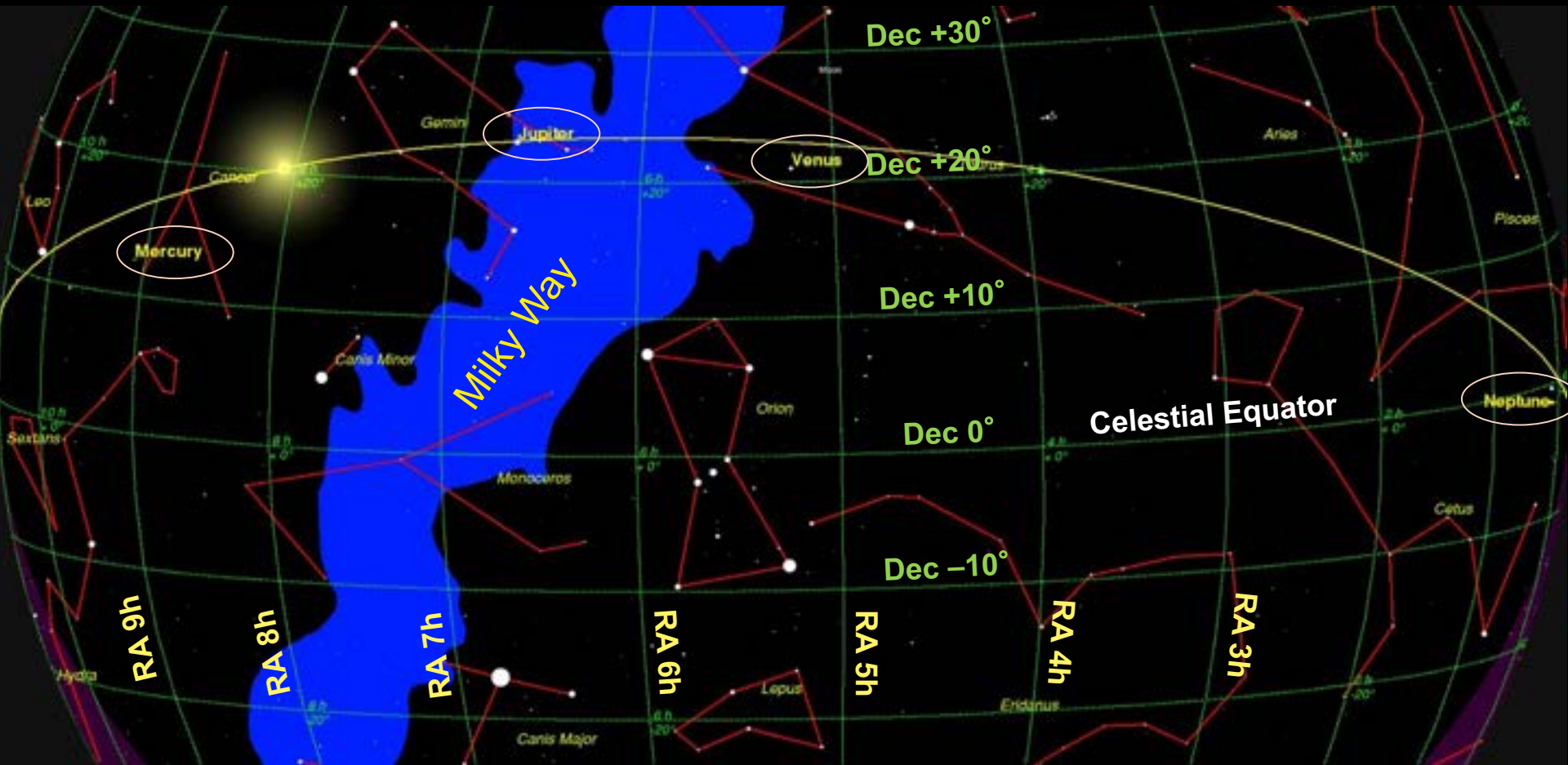
Examples

Sirius. RA 6h 45m Dec $-16^{\circ} 42' 58''$
Polaris. RA $2^{\text{h}} 41^{\text{m}} 39^{\text{s}}$ Dec $+89^{\circ} 15' 51''$
Arcturus. α 14h 15m 40s δ $+19^{\circ} 10' 56''$

Celestial Coordinates



Celestial Coordinates





Zenith...

is the highest point in the sky,
directly over your head.

Meridian...

is a line or half circle that divides
the sky in half. It starts at the due
north horizon, arcs to the zenith and
continues to the due south horizon.



Naked-eye Observing Tips

1. Find a place away from bright or glaring lights. Some white light is okay.
2. Give your eyes 5 to 10 minutes to adapt to the dark. This will help you tremendously to see the stars.
3. Avoid nights when the Moon is shining bright because its light will whiten the night sky making it difficult to see many stars.
4. Use a red-light flashlight to read star charts, etc. Now, many of these red-light flashlights are too bright and may not work as desired.
5. If you get to a really dark site, it may be difficult to recognize the constellations because many of the fainter stars will be brighter, *obscuring* the patterns.

MISSION UPDATE: CURIOSITY ROVER EXPLORES MARS p.34

SEPTEMBER 2022

Astronomy

The world's best-selling astronomy magazine

The
SECRET LIVES
of **CELEBRITY**
STARS p.16



See Saturn
at its best p.46

PLUS:

- The ABCs of observing p.12
- The wild history of impacts on Earth p.54
- Wide-angle sky wonders p.48

www.Astronomy.com



**Astronomy
magazine is
an excellent
resource for
beginners +**



stellarium

latest version is 0.22.2



Linux
source



Linux
snap



Linux
amd64;
AppImage



macOS
10.12+;
x86_64



macOS
10.12+;
arm64



Windows
32 bit



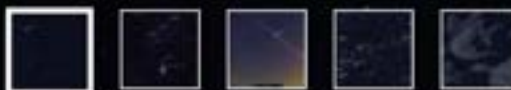
Windows
64 bit



Stellarium
Web

Stellarium is a free open source planetarium for your computer. It shows a realistic sky in 3D, just like what you see with the naked eye, binoculars or a telescope.

Planetarium Software



A shooting star flashes past the Jupiter. You can select different intensities in the View window.

[view screenshots »](#)

features

sky

- default catalogue of over 600,000 stars
- extra catalogues with more than 177 million stars
- default catalogue of over 80,000 deep-sky objects
- extra catalogue with more than 1 million deep-sky objects
- asterisms and illustrations of the constellations
- constellations for 40+ different cultures
- images of nebulae (full Messier catalogue)
- realistic Milky Way
- very realistic atmosphere, sunrise and sunset
- the planets and their satellites
- all-sky surveys (DSS, HIPS)

news

- Stellarium v0.22.2 has been released!
- Stellarium v0.22.1 has been released!
- Stellarium v0.22.0 has been released!
- Stellarium v0.21.3 released
- Stellarium v0.21.2 released
- Stellarium v0.21.1 released
- Stellarium v0.21.0 has been released!
- Presentation of Stellarium for the China-VO
- Stellarium v0.20.4 has been released!
- Presentation of Stellarium at IAUS367

system requirements

minimal

- Linux/Unix; Windows 7 and above; Mac OS X 10.12.0 and above

collaborate

You can learn more about Stellarium, get support and help the project from these links:

- [discussions](#)
- [mailing list](#)
- [wiki](#)
- [FAQ](#)
- [scripts](#)
- [landscapes](#)
- [sky cultures](#)
- [developers documentation](#)
- [scripting](#)
- [translations](#)

Planetarium App



SkySafari

Astronomy Guide To Night Sky

Designed for iPad. Not verified for macOS.

\$4.99

In-App Purchases

AGE

4+

Years Old

CHART

31

Reference

DEVELOPER



Simulation Curriculum Corp.

LANGUAGE

EN

+ 8 More

A Powerful Planetarium That Fits In Your Pocket



Travel in Time. Witness Past and Future Events.



iPhone and iPad Apps

SkySafari is a powerful planetarium that fits in your pocket, puts the universe at your fingertips, and is incredibly easy to use!

Simply hold your device to the sky and quickly locate planets, constellations, satellites, and millions of stars and deep sky objects. Use Augmented Reality (AR) mode to blend a simulated sky chart with a real view of your surround [more](#)

[Simulation Curriculum...](#)

[Website](#)

[Support](#)

Using the Star Finder

Star Magnitudes

Scale: Detailed Star Wheel

- Brightest + Mag -1 to 0
- Bright + Mag 1 to 2
- Average + Mag 2 to 3
- Faint + Mag 4 to 5

Names of Constellations are CAPITALIZED
Names of Stars are Italized.

Binocular and Telescope Objects

For the Detailed side of the Star Wheel:

- ★ Double star
- Cluster of Stars
- Globular Cluster
- Nebula
- Galaxy

The M and NGC numbers and catalogue designations described on the text. Some Greek letter designations of stars are indicated, mostly double stars.

Hold this way when facing south

1 AM **Midnight** **2** **11 PM** **10 PM** **9 PM** **1** **8 PM** **7 PM** **6:30 PM**

JULY **AUGUST** **SEPTEMBER** **OCTOBER**

West **East**

5 AM **5:30 AM** **3 AM** **4 AM**

3 **2** **1**

Face South **Face North**

Northern Hemisphere Latitudes 35°N to 60°N

Planet Notes & the Ecliptic
The planets are not indicated on this chart because they and the Moon move along the dashed "circle" that is called the Ecliptic. Venus and Jupiter always outline the brightest stars—Venus being extremely bright. See the back for more information.

The Binder & Grauer

Star Finder

Instructions

- 1 Turn the star wheel and position the date under your observing time.
- 2 Face either due north or due south and orientate the chart accordingly.
- 3 Hold the chart in front of you and match the brightest stars on the chart to the brightest stars in the sky. If there is a bright star in the sky that cannot be found on the chart, then it is one of the visible planets.

TWO SIDES to the Star Wheel
Take it out and turn it over. One side is Simplified while the other is Detailed, plotting binocular & telescope objects.

PROUDLY Made in the USA!

This is technically called a **Planisphere**