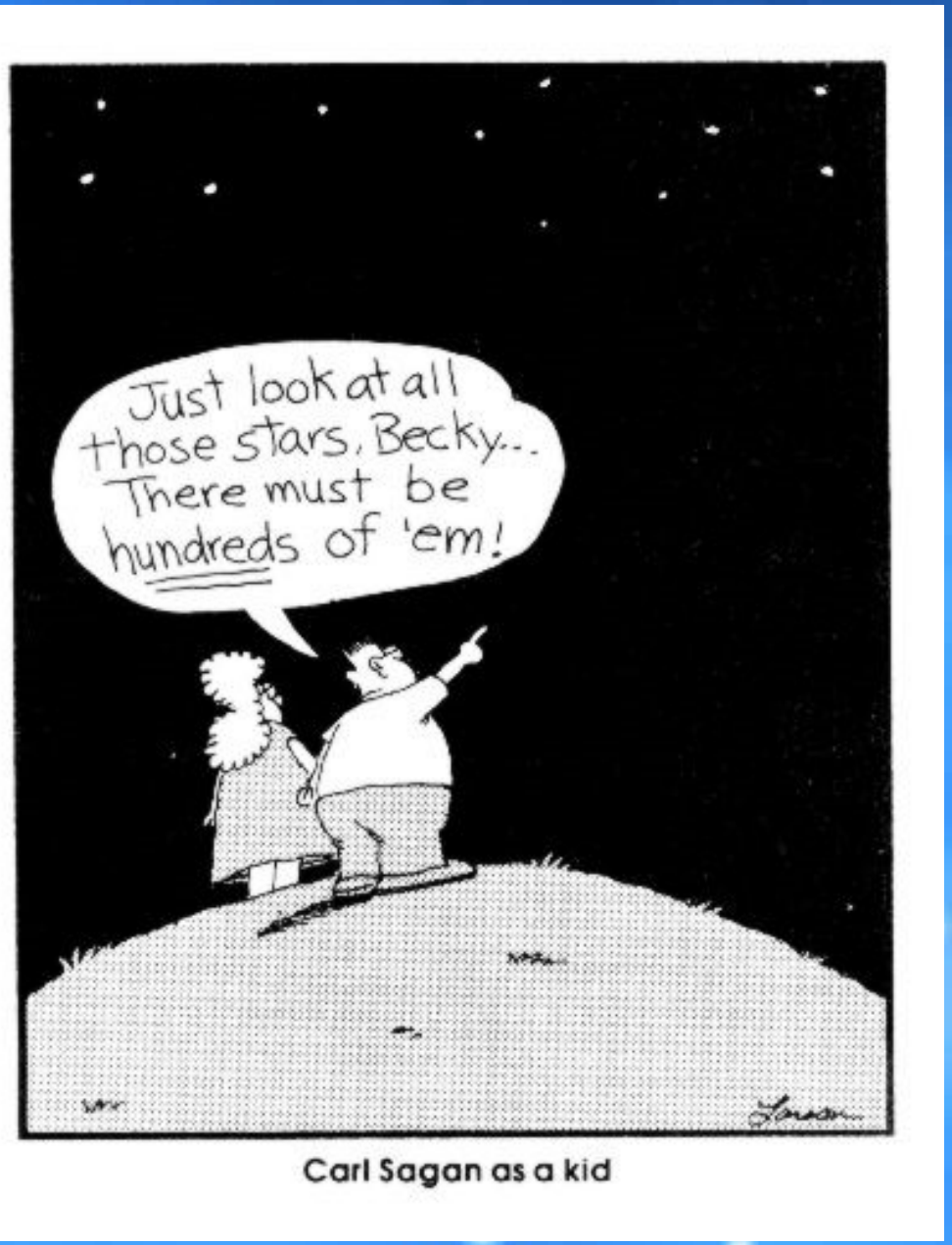
The Night Sky

Presented by Dr. Cran Lucas

Shreveport-Bossier Astronomical Society



Carl Sagan as a kid

Quotes from Carl Sagan

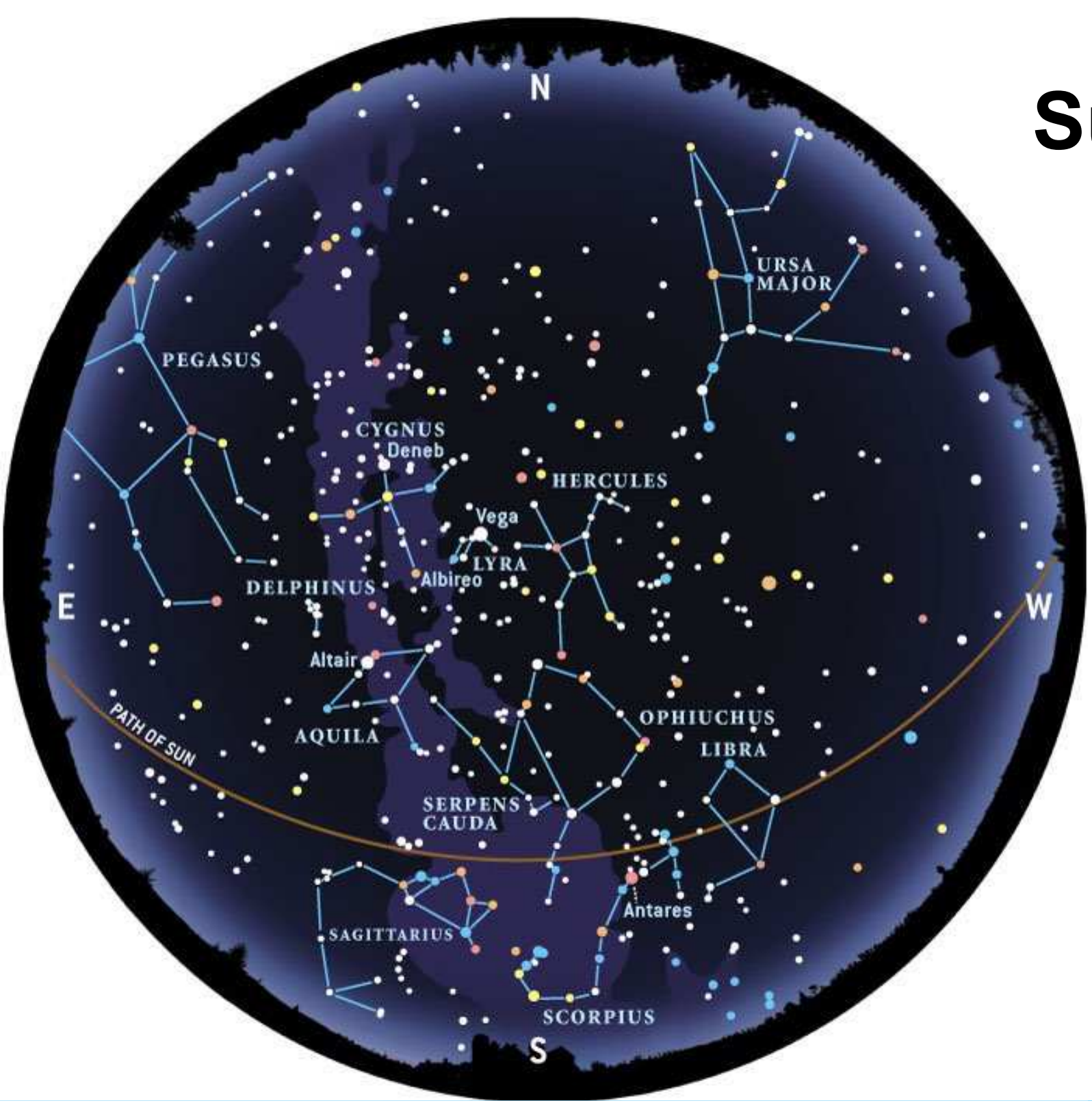
- **“The cosmos is within us. We are made of star-stuff. We are a way for the universe to know itself.”**
- **“Exploration is in our nature. We began as wanderers, and we are wanderers still. We have lingered long enough on the shores of the cosmic ocean. We are ready at last to set sail for the stars.”**
- **“Our species needs, and deserves, a citizenry with minds wide awake and a basic understanding of how the world works.”**

Tonight's Topics

- Constellations of the Seasons
- How to Learn the Sky
- The Moon and Eclipses
- Useful Equipment, Guides, and Software

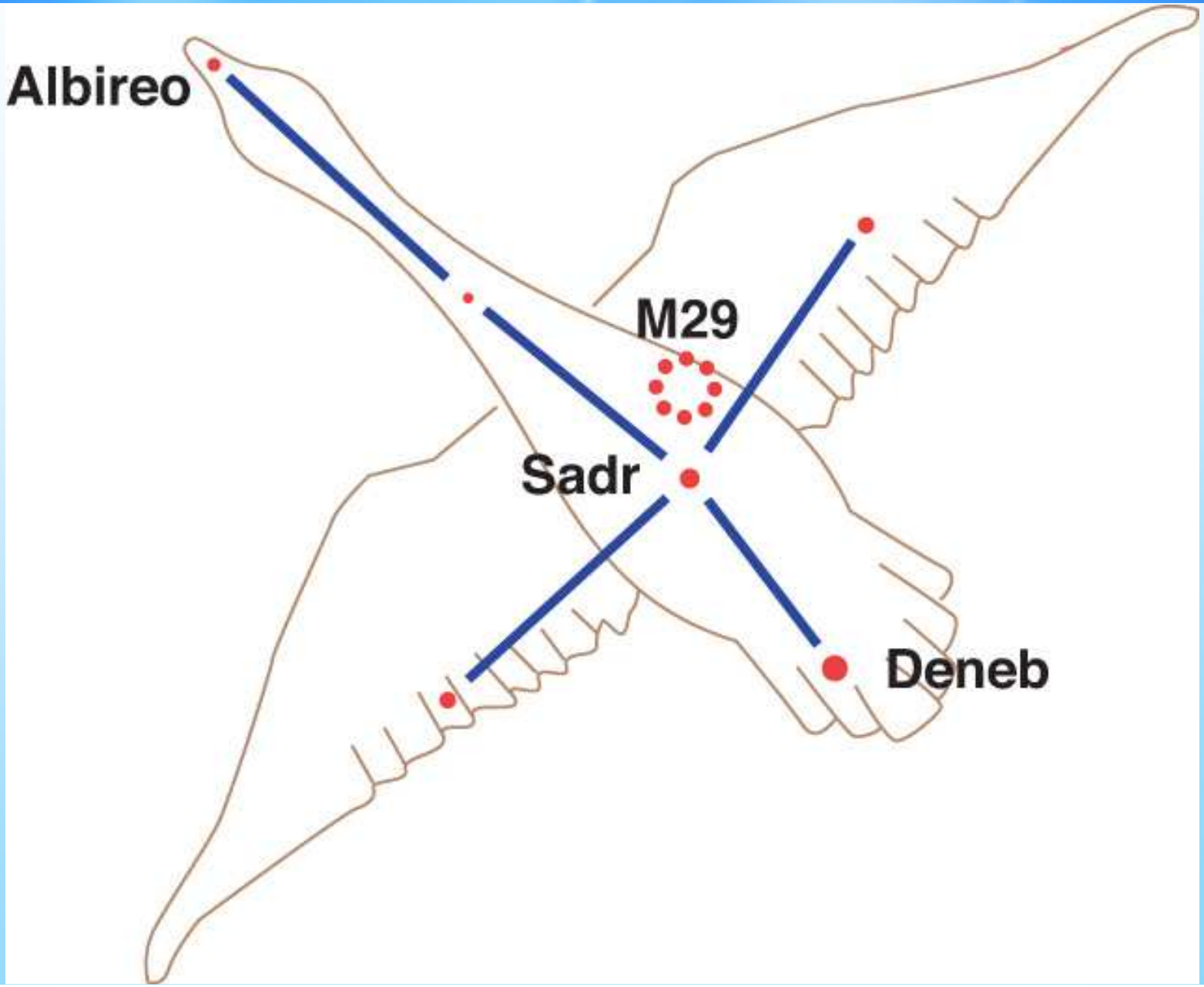
STARS AND CONSTELLATIONS

Summer

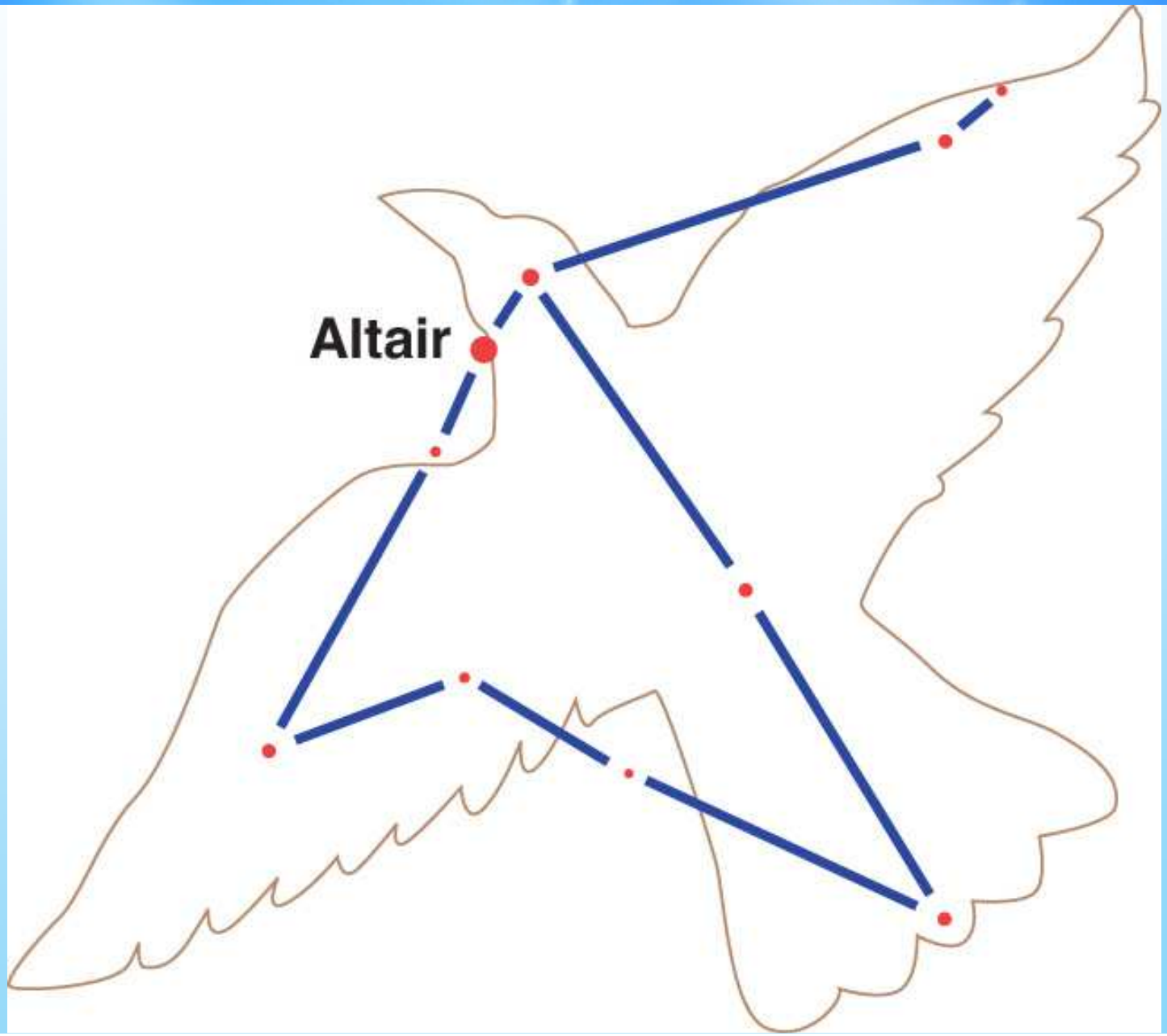


1 a.m. on June 1; 11 p.m. on July 1; 9 p.m. on August 1. Add one hour for daylight-saving time.

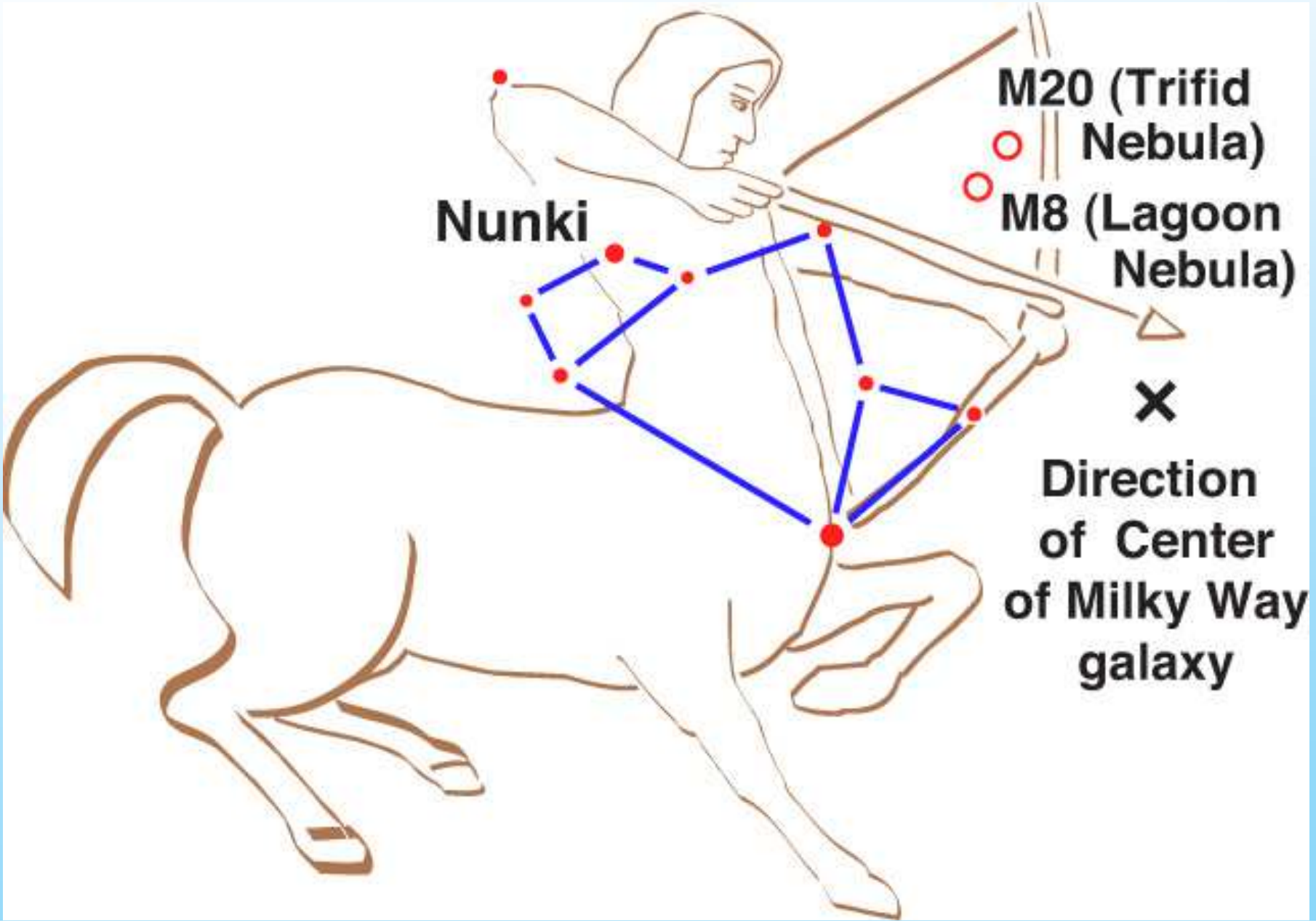
Cygnus-The Swan



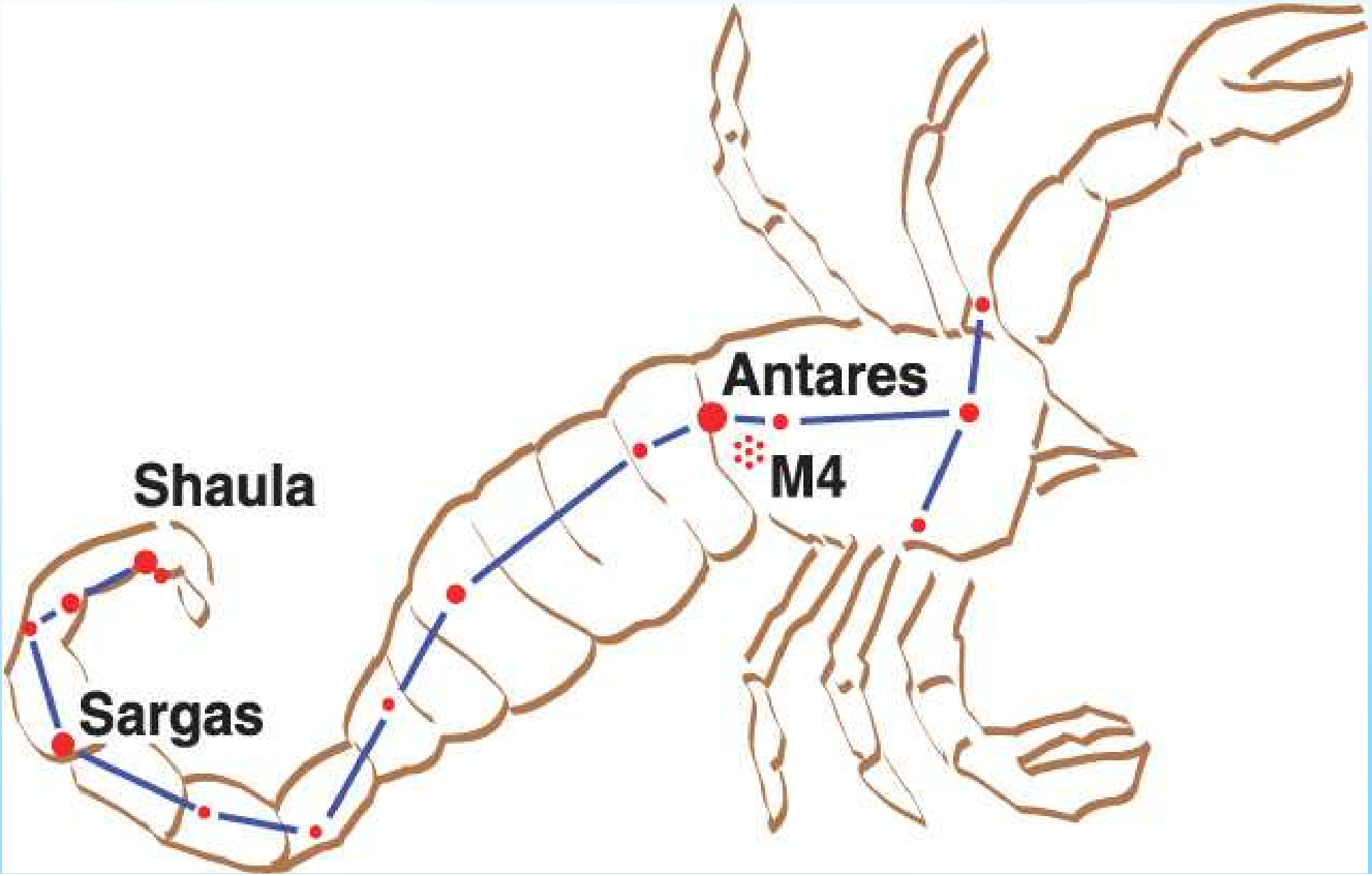
Aquila-The Eagle



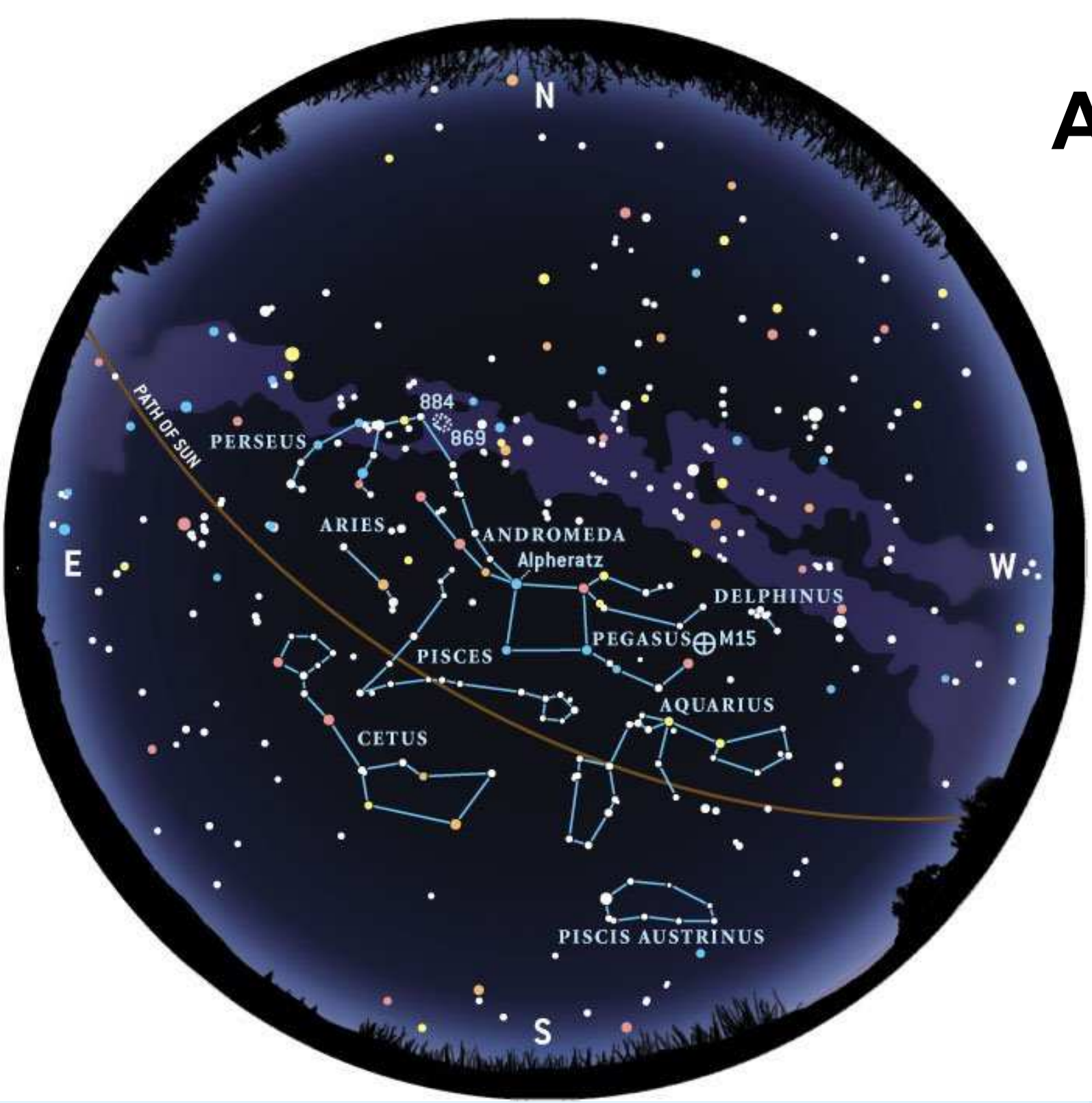
Sagittarius-The Archer



Scorpius-The Scorpion

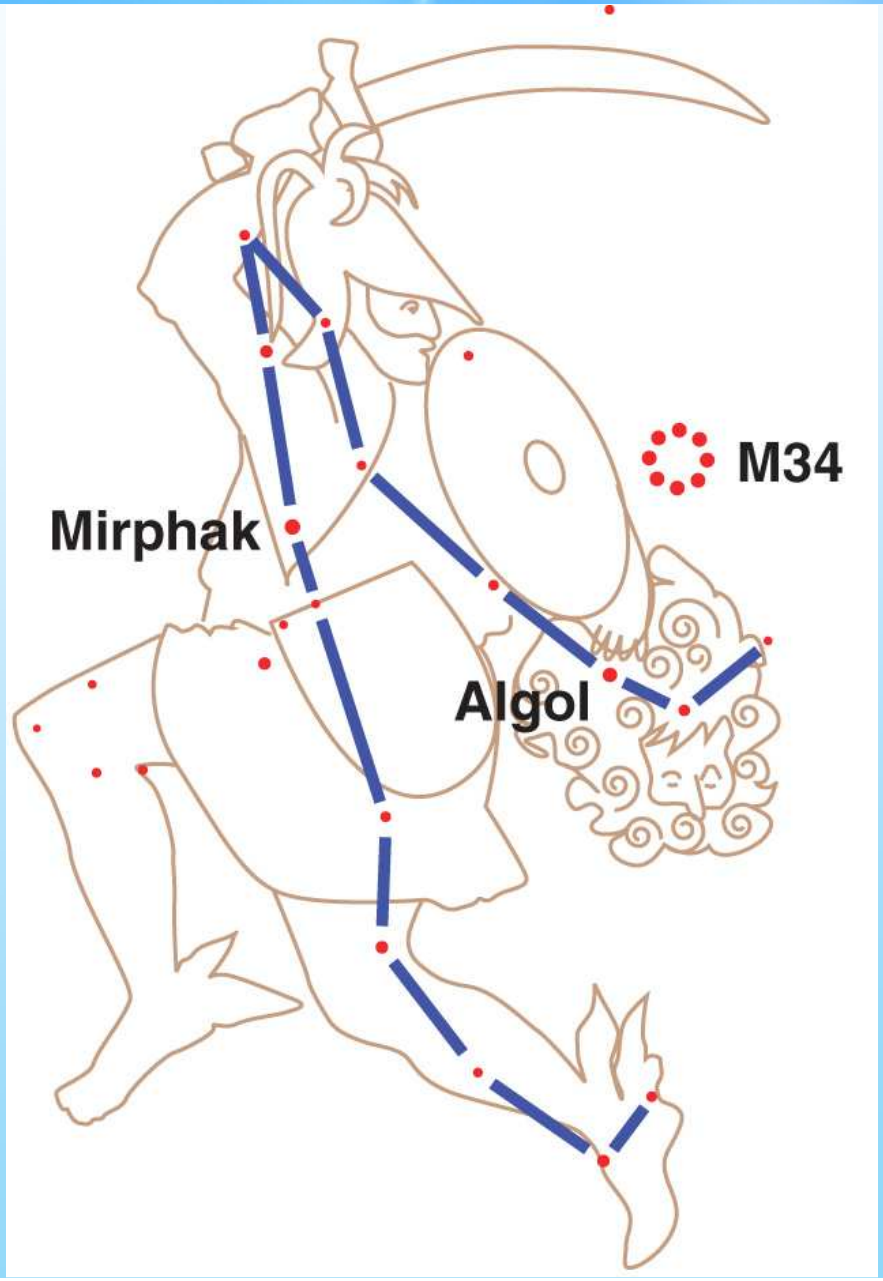


Autumn

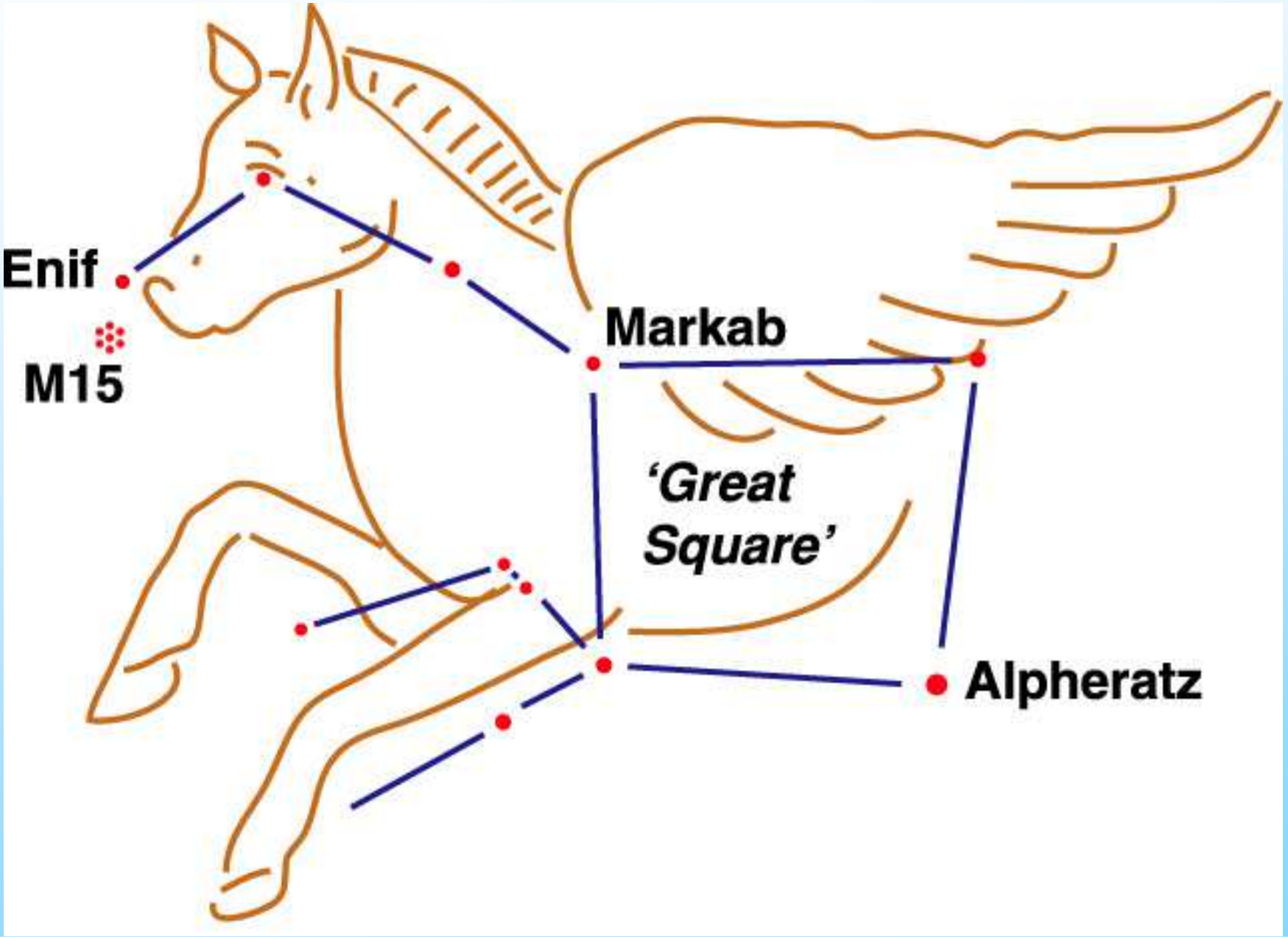


1 a.m. on September 1; 11 p.m. on October 1; 9 p.m. on November 1. Add one hour for daylight-saving time.

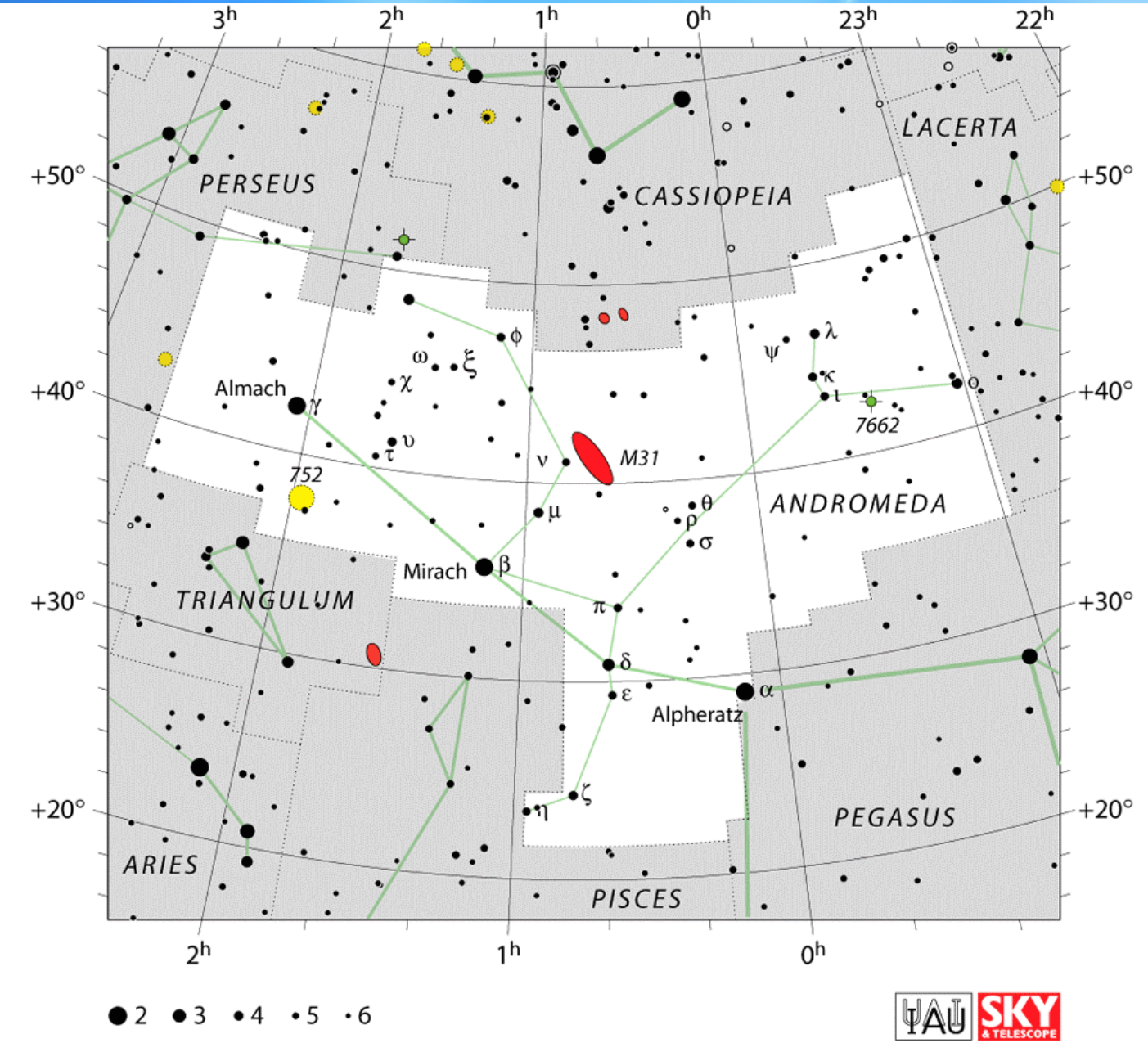
Perseus

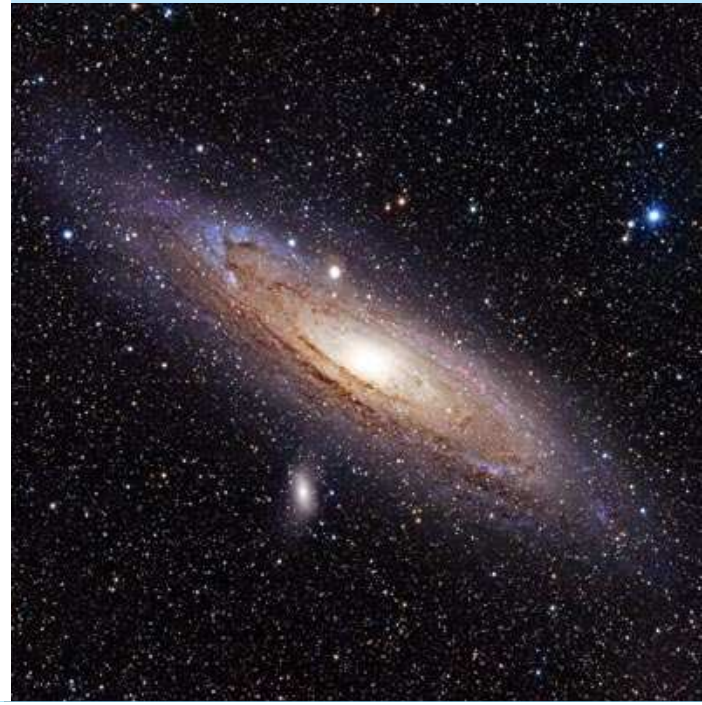


Pegasus-The Winged Horse

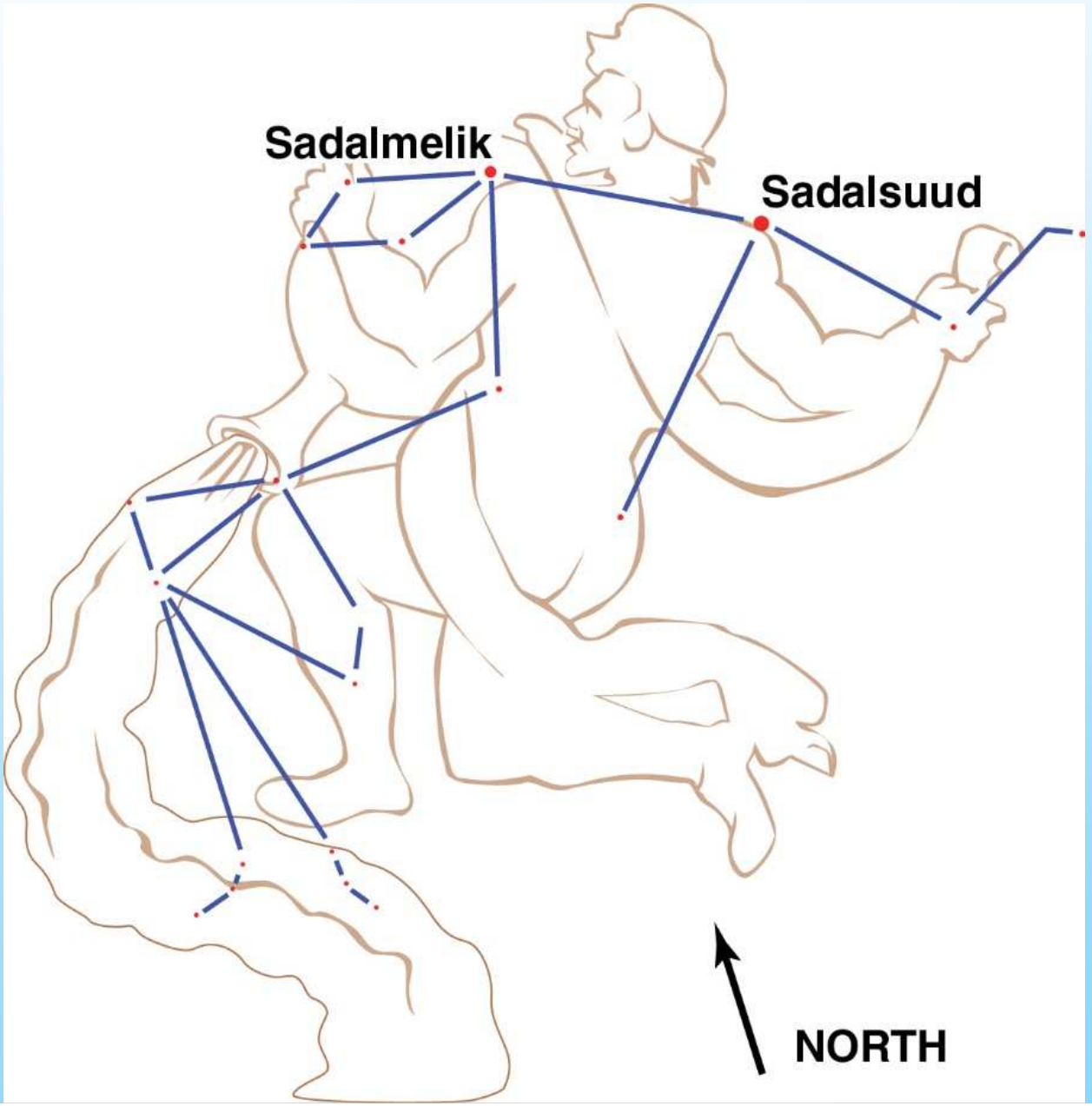


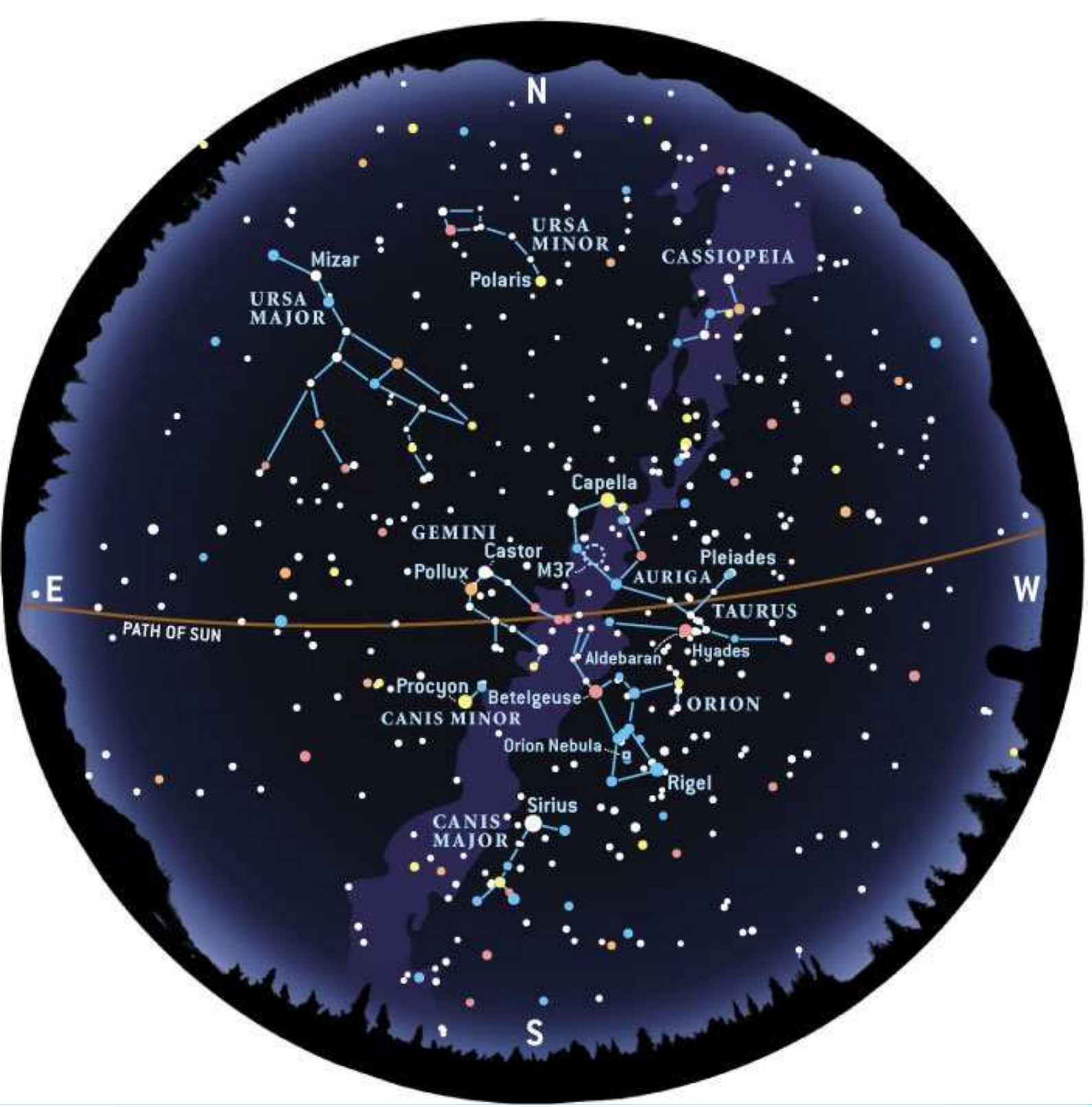
Andromeda


3h
2h
1h
0h
23h
22h
+50°
+40°
+30°
+20°
PERSEUS
CASSIOPEIA
LACERTA
ANDROMEDA
TRIANGULUM
ARIES
PISCES
PEGASUS
Almach
Mirach
Alpheratz
M31
752
7662
2
3
4
5
6
IAU
SKY & TELESCOPE



Aquarius-The Water-Bearer



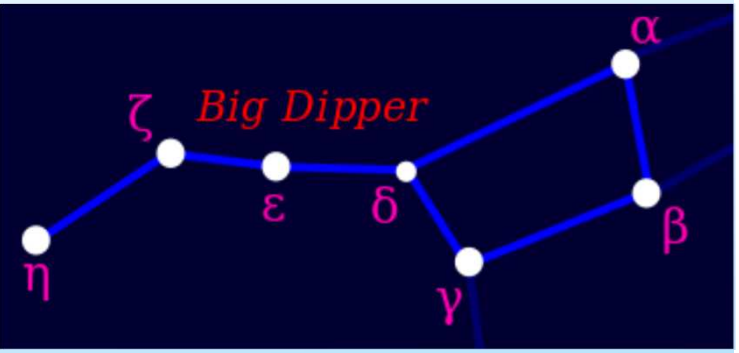


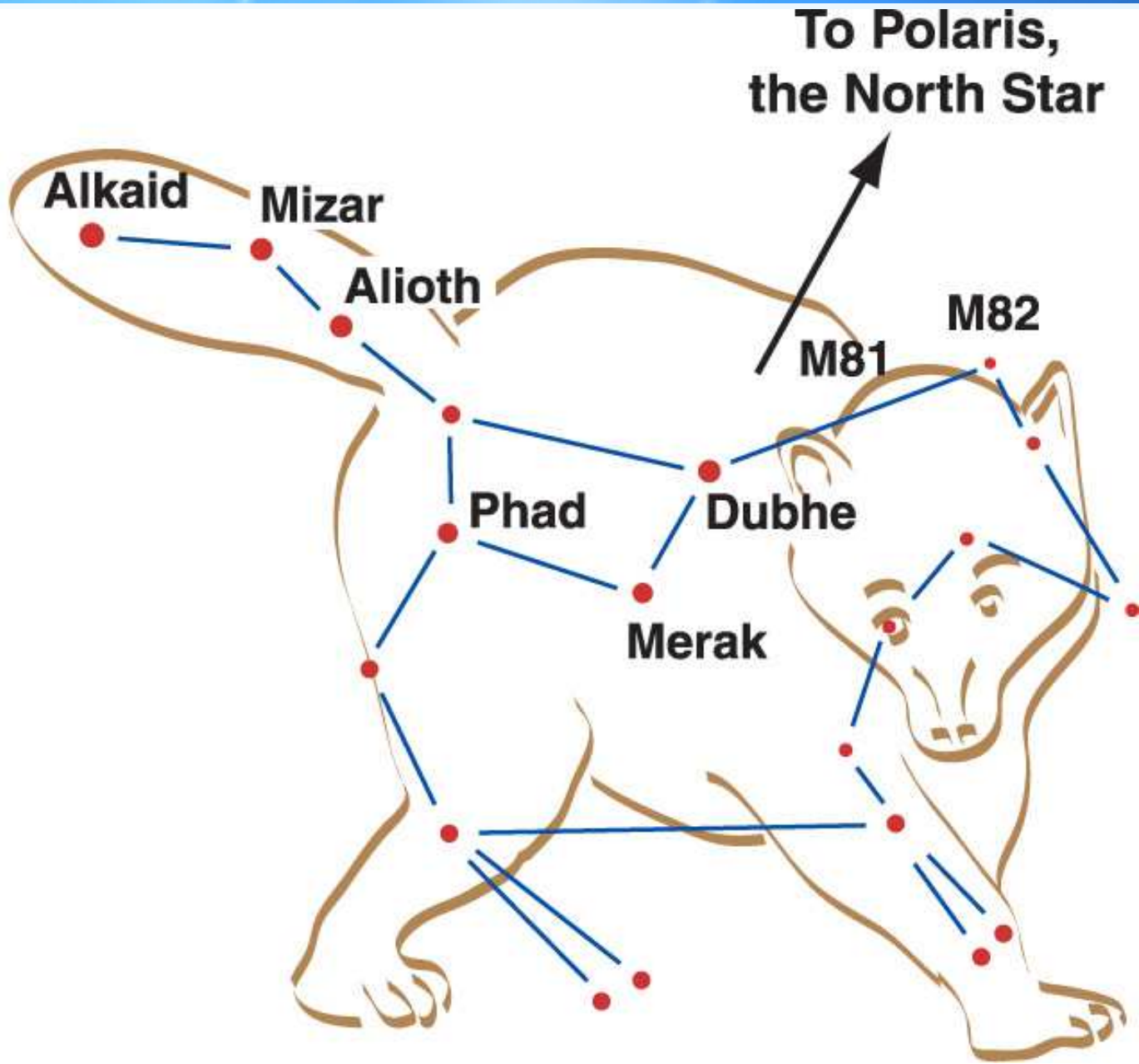
Winter

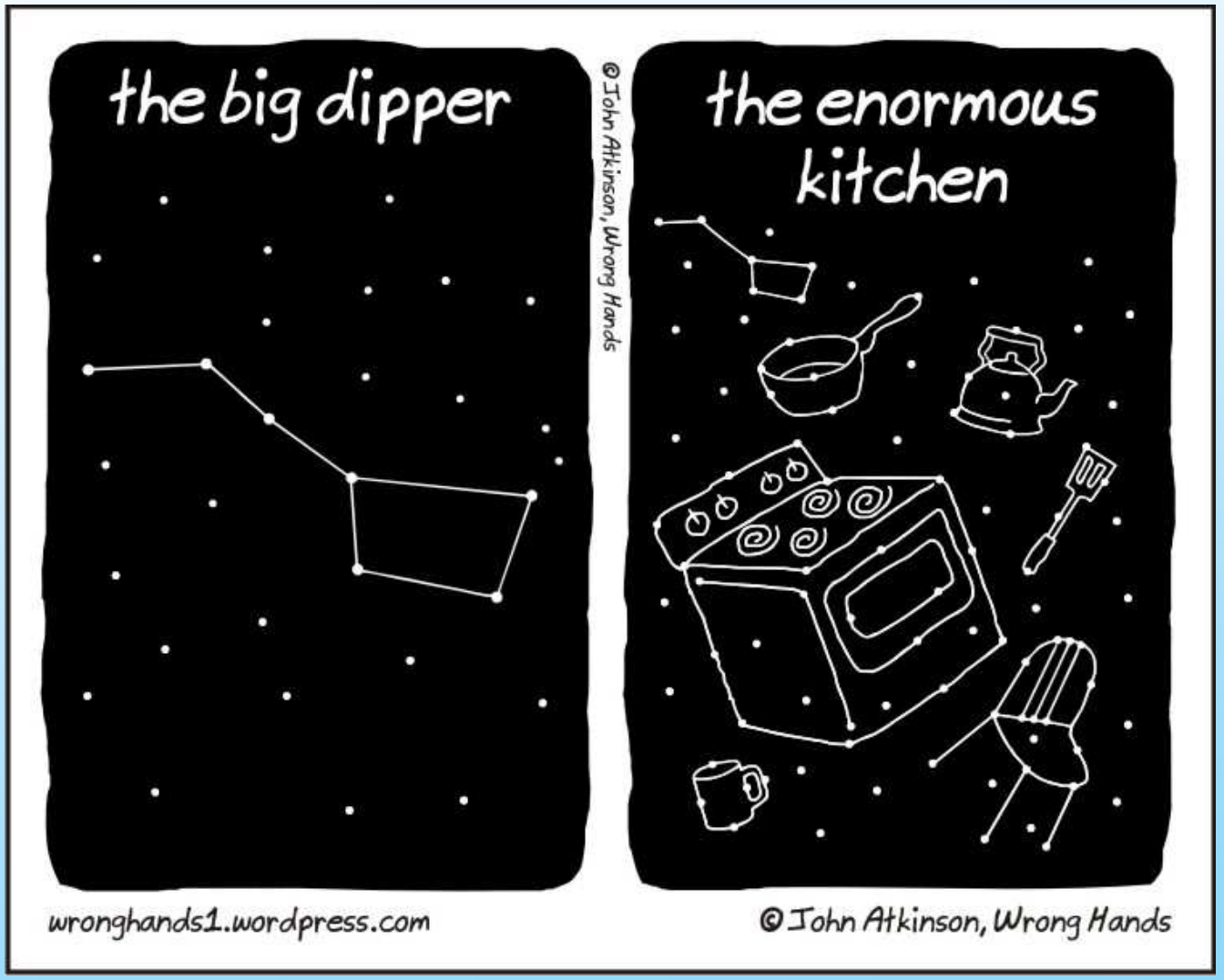
This map shows the winter sky at 2 a.m. on December 1; midnight on January 1; and 10 p.m. on February 1.

Ursa Major-The Great Bear

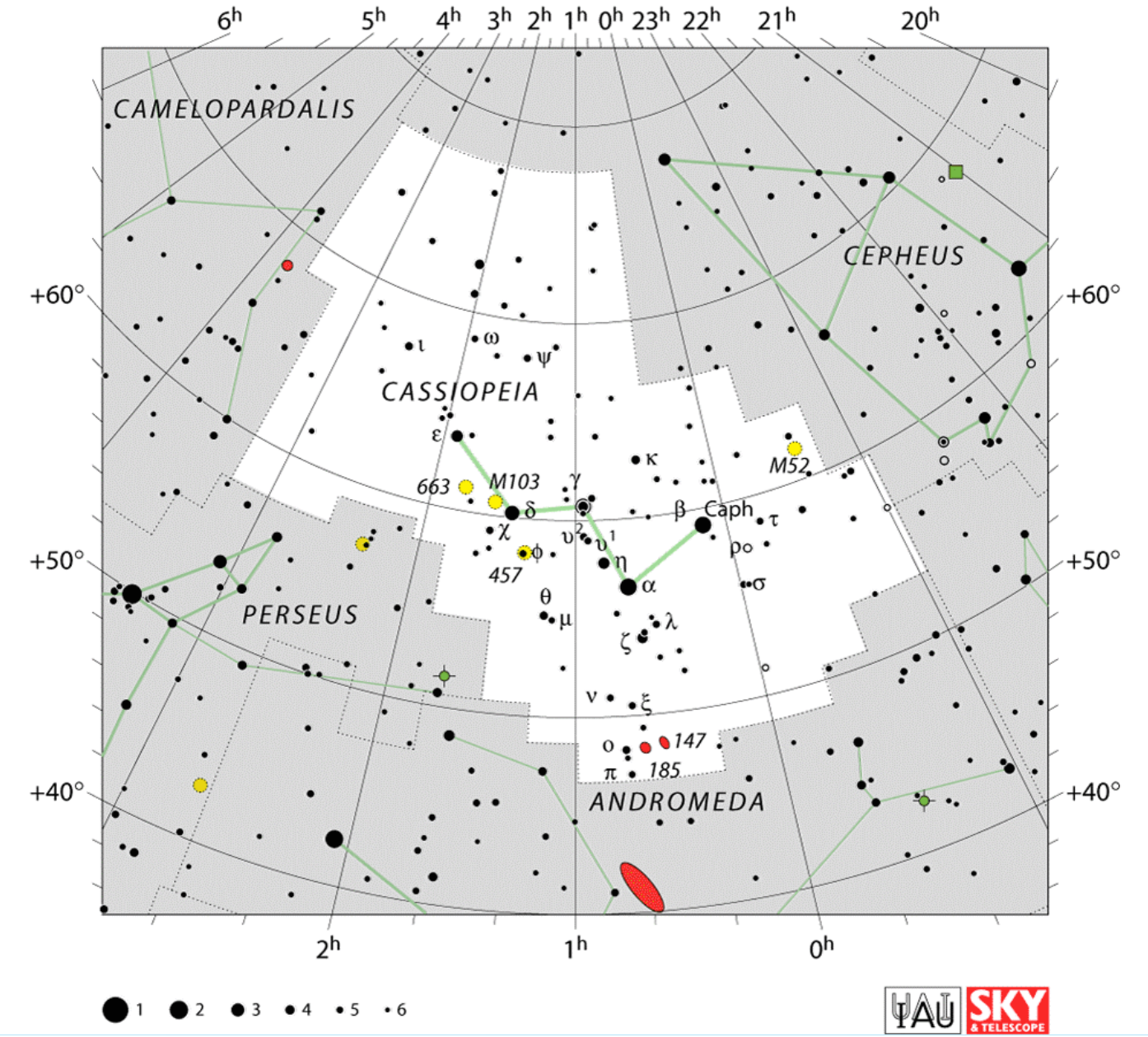
Asterism



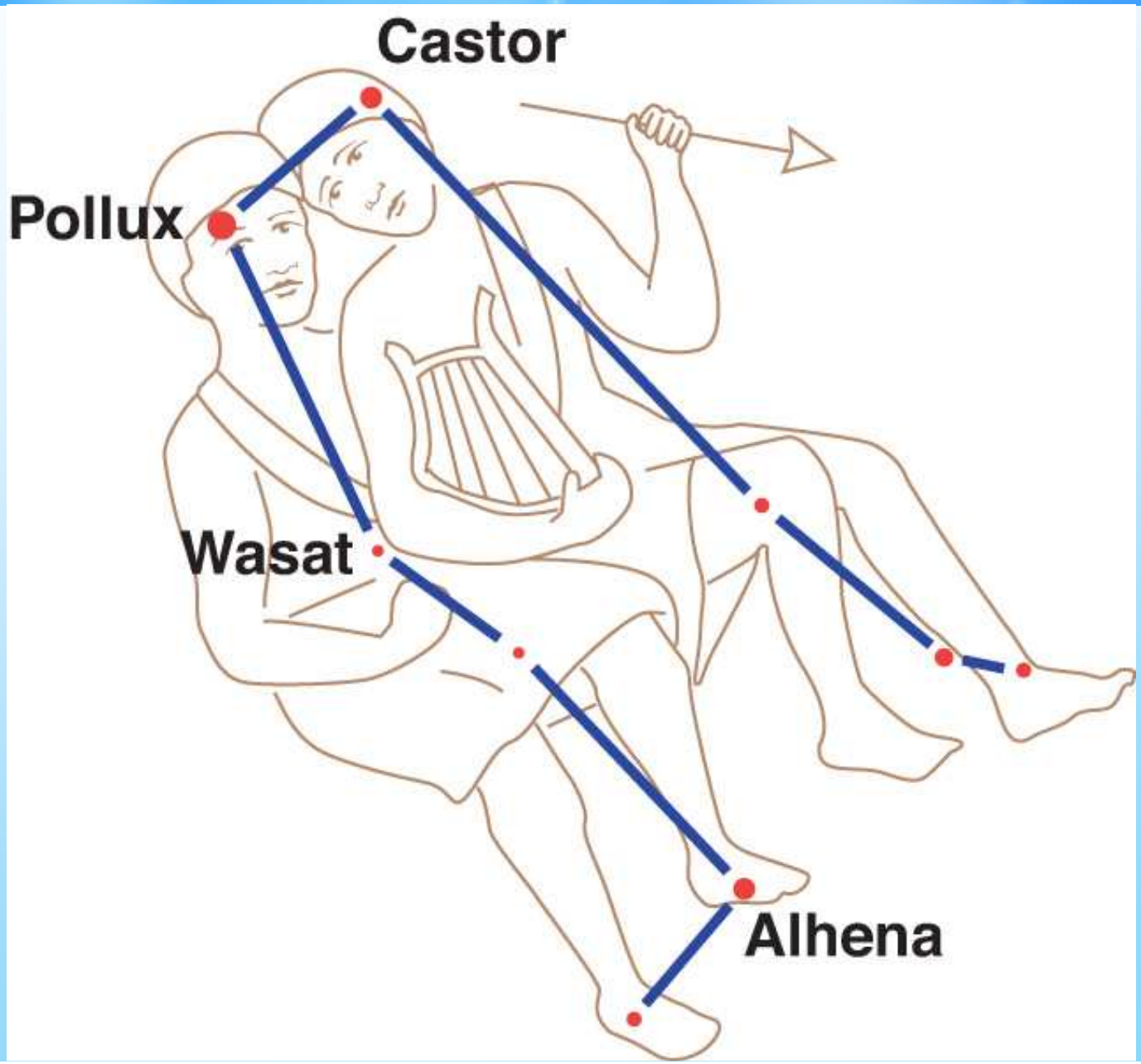



the big dipper
© John Atkinson, Wrong Hands
the enormous kitchen
wronghands1.wordpress.com
© John Atkinson, Wrong Hands

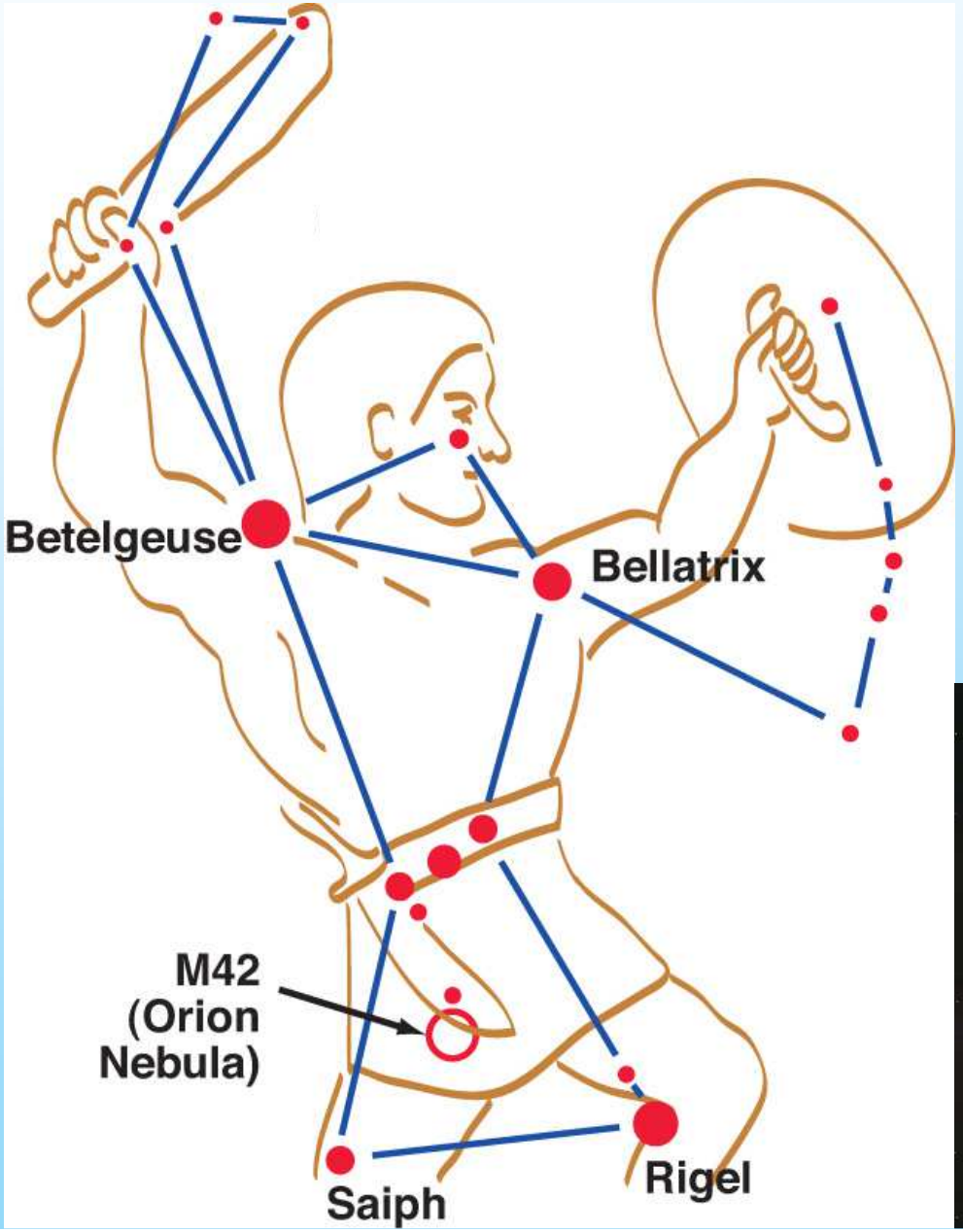
Cassiopeia & the “W” or “M”



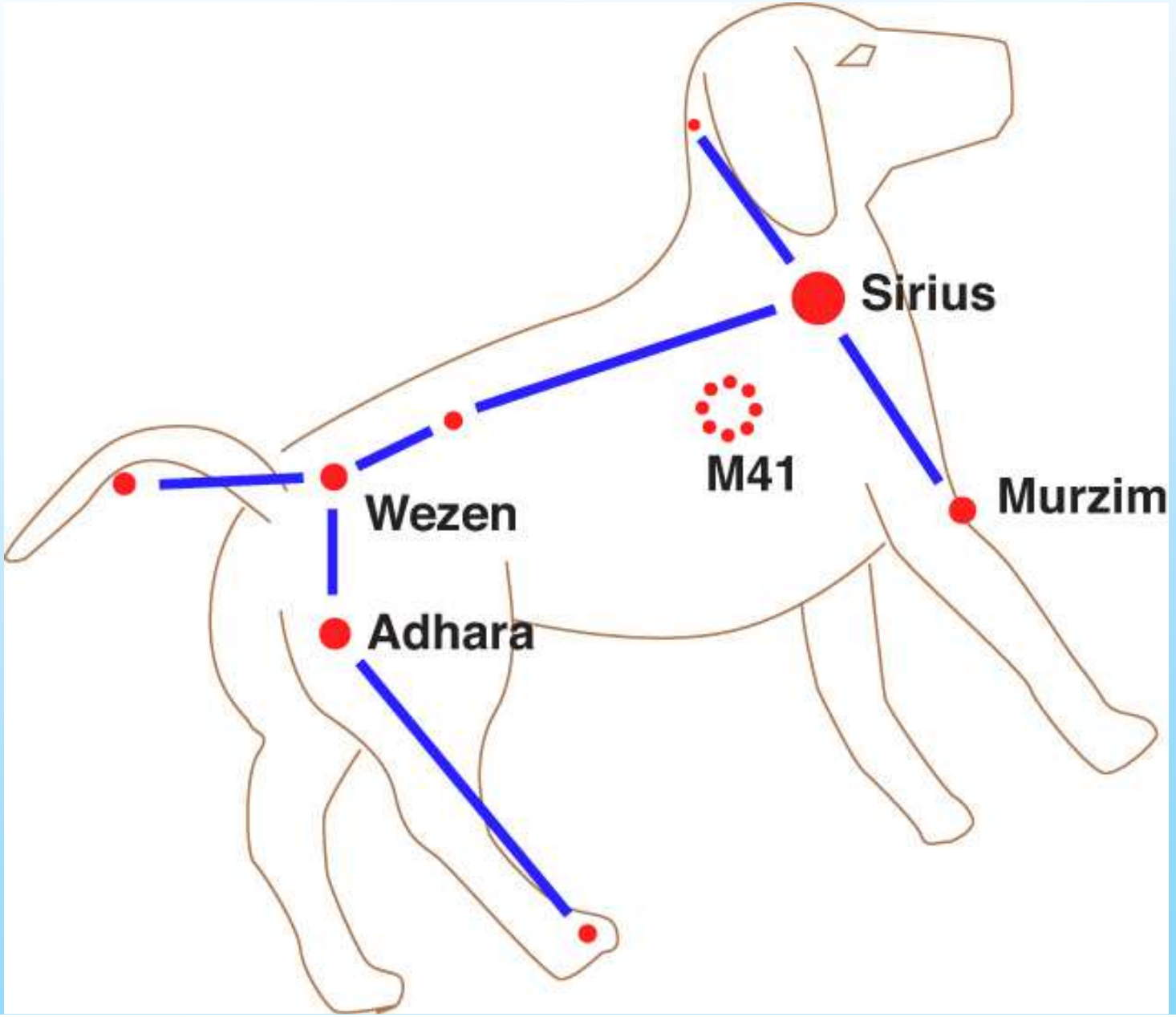
Gemini-The Twins



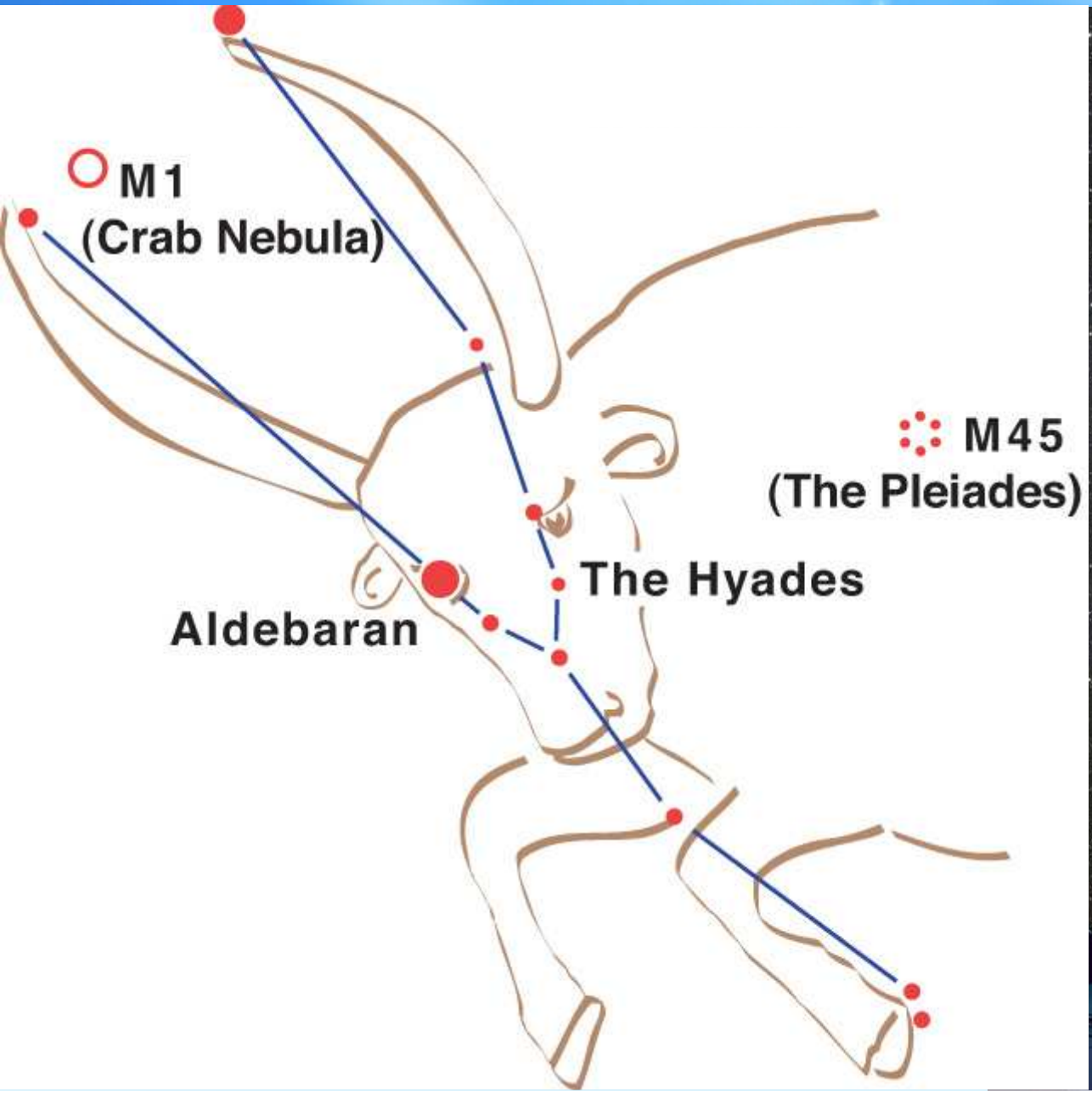
Orion-The Hunter

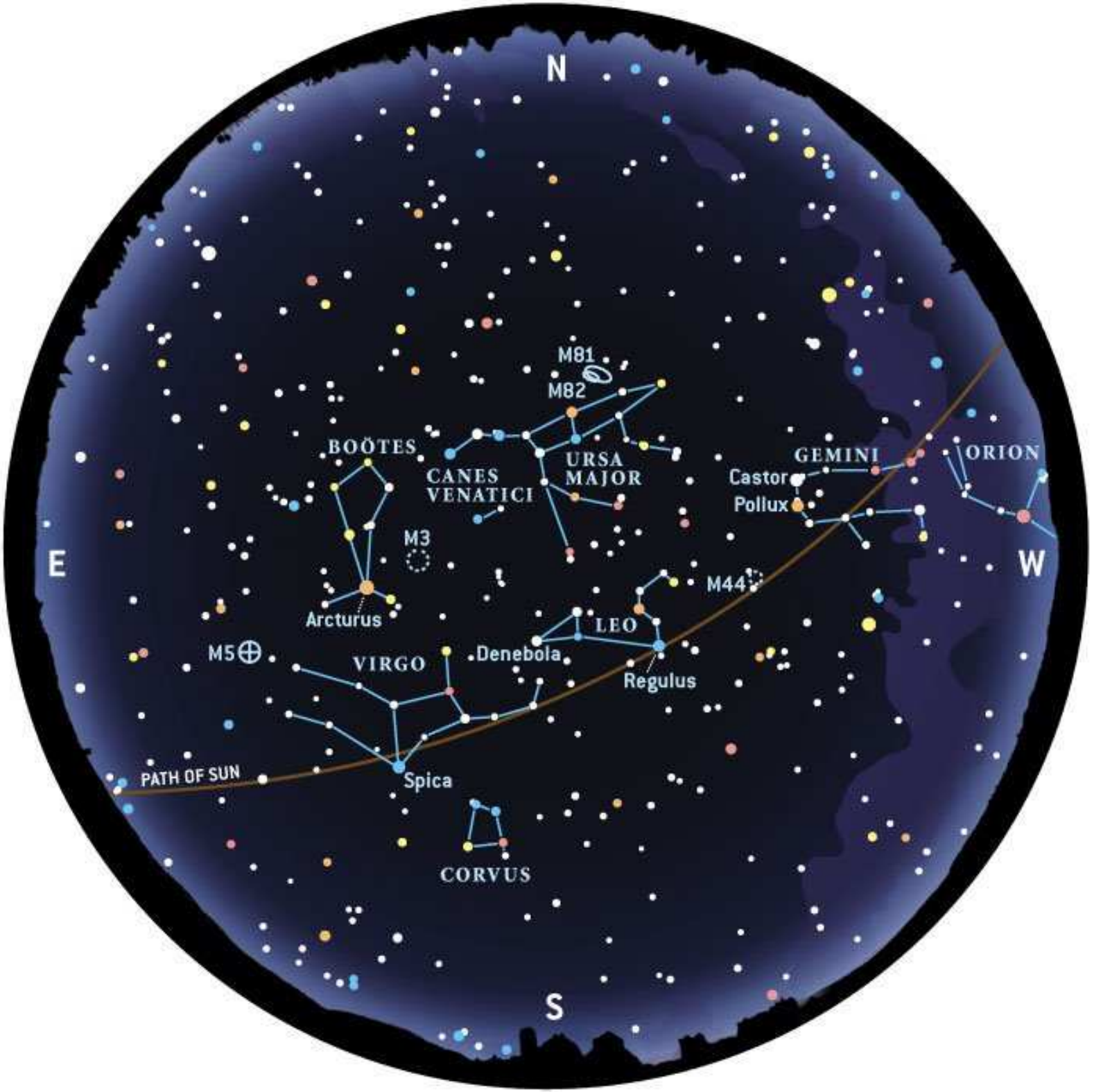


Canis Major-The Greater Dog



Taurus-The Bull

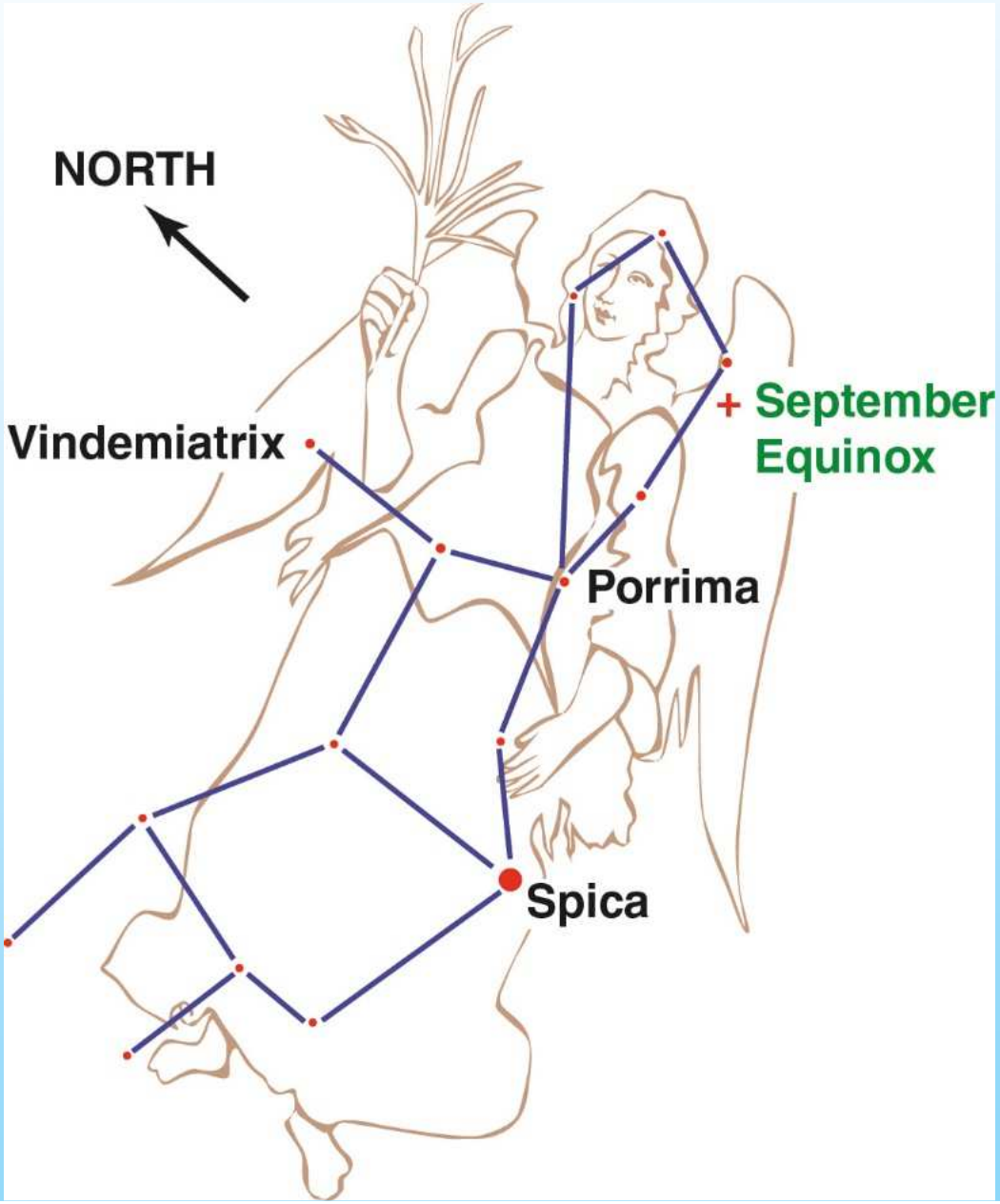




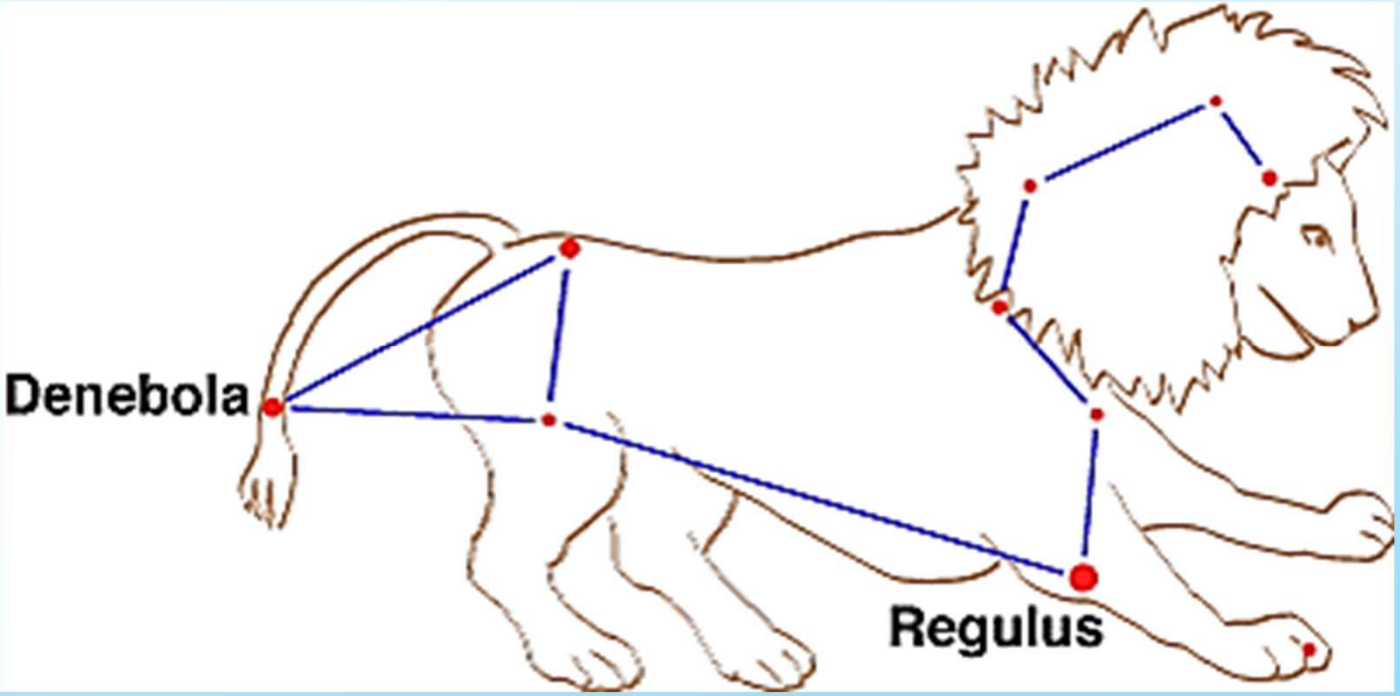
Spring

1 a.m. on March 1; 11 p.m. on April 1; 9 p.m. on May 1. Add one hour for daylight-saving time.

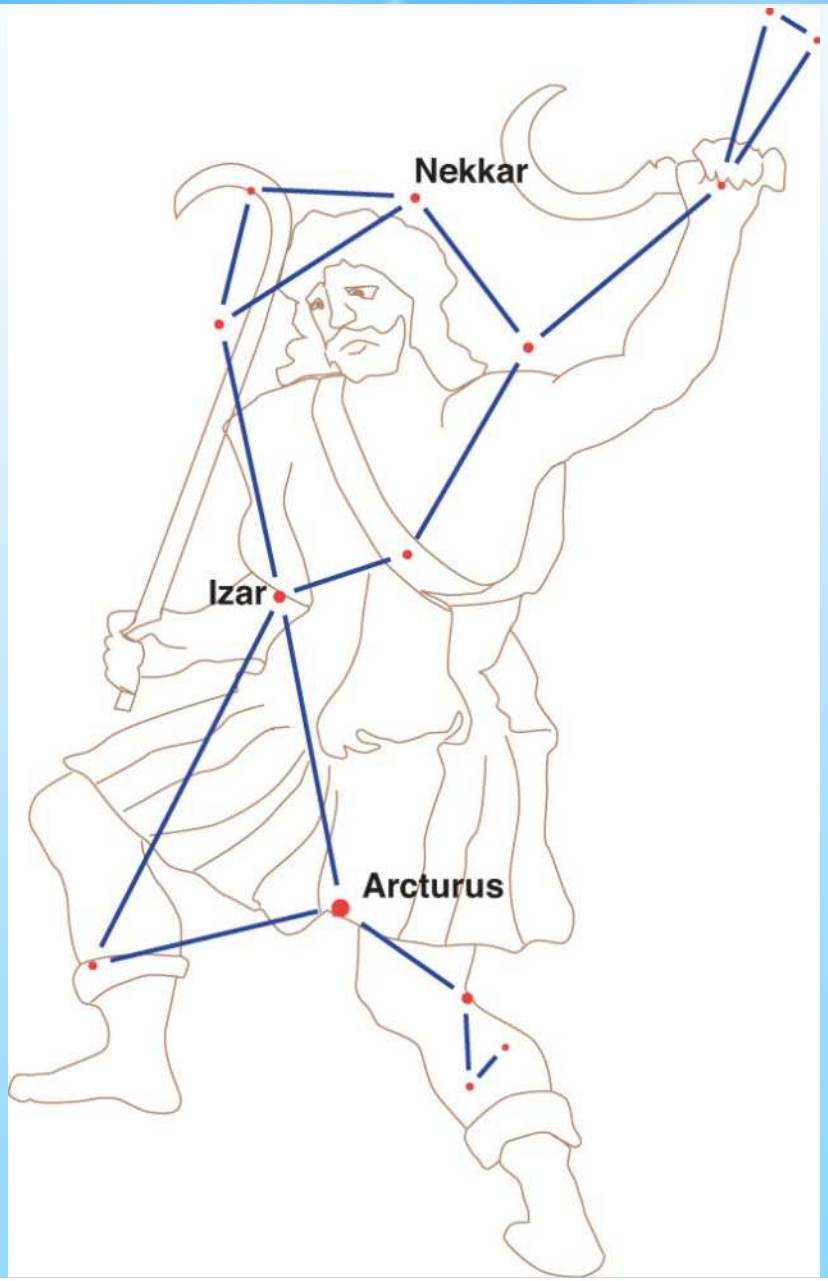
Virgo-The Maiden



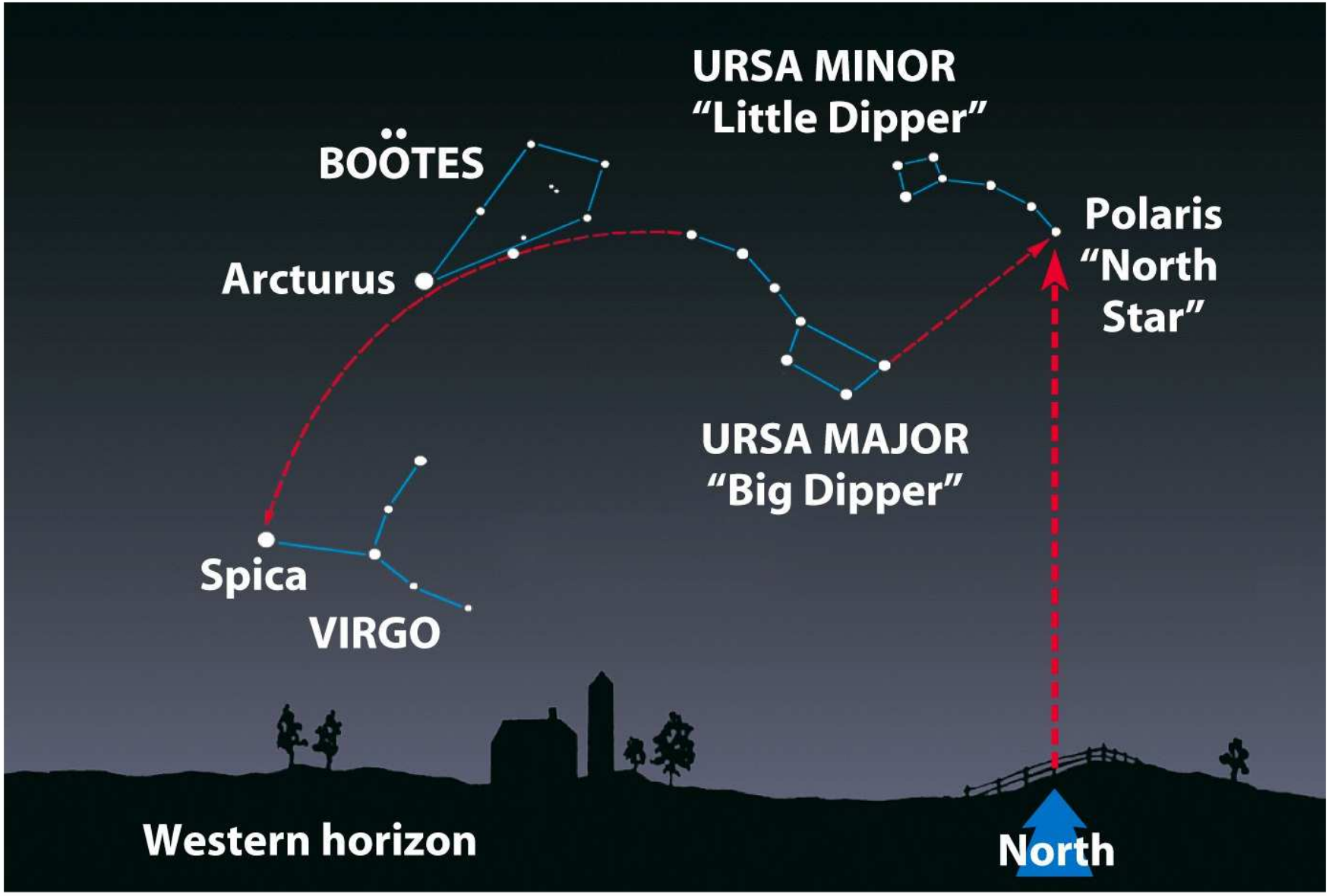
Leo-The Lion



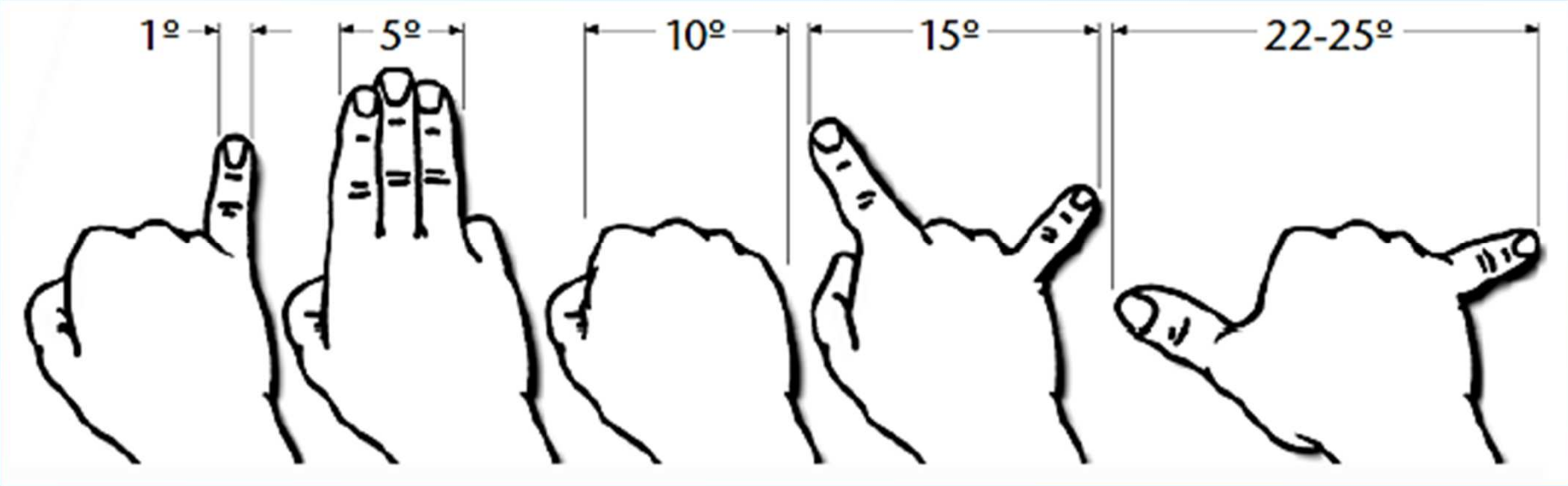
Boötes-The Herdsman

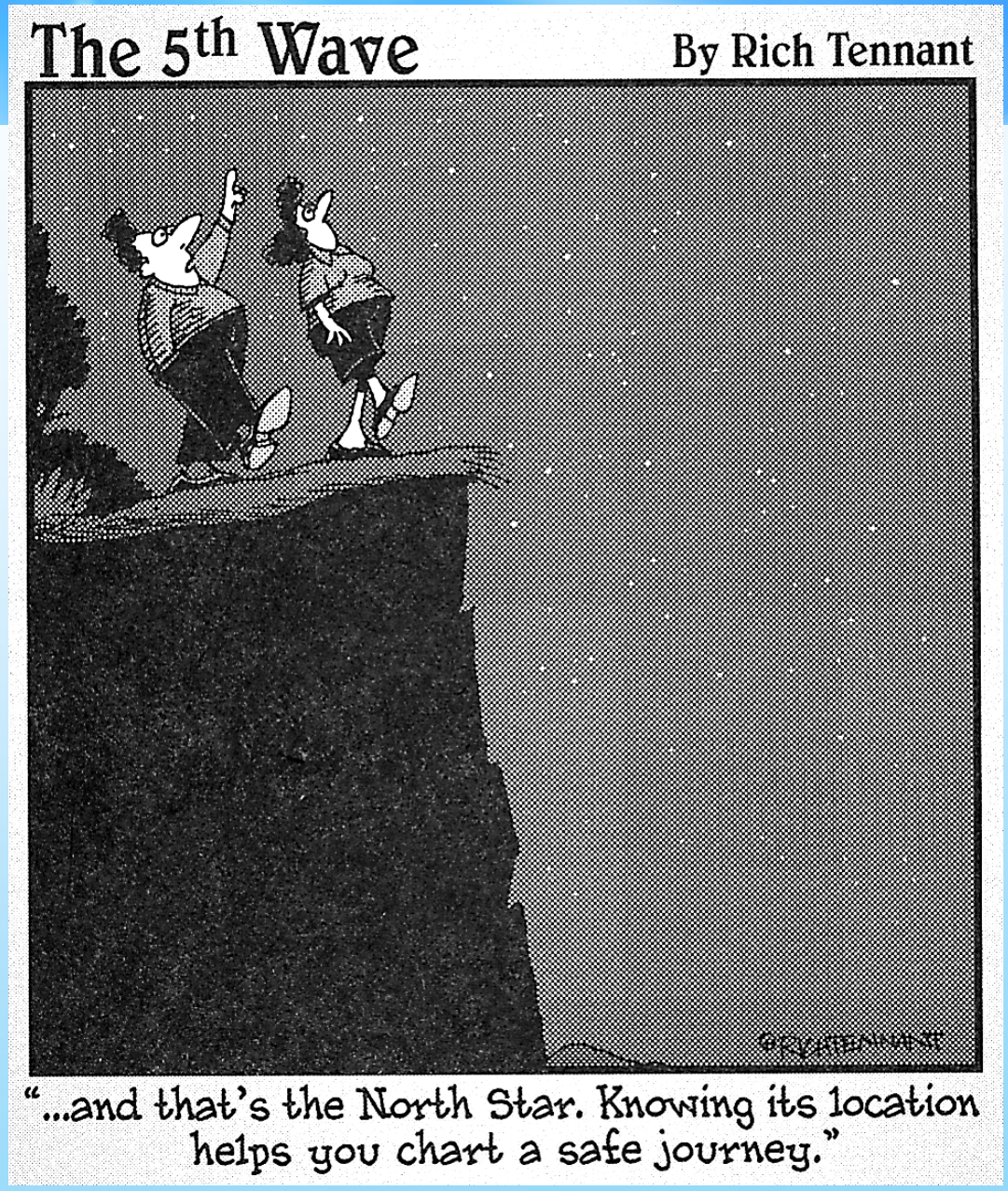


Star Hopping

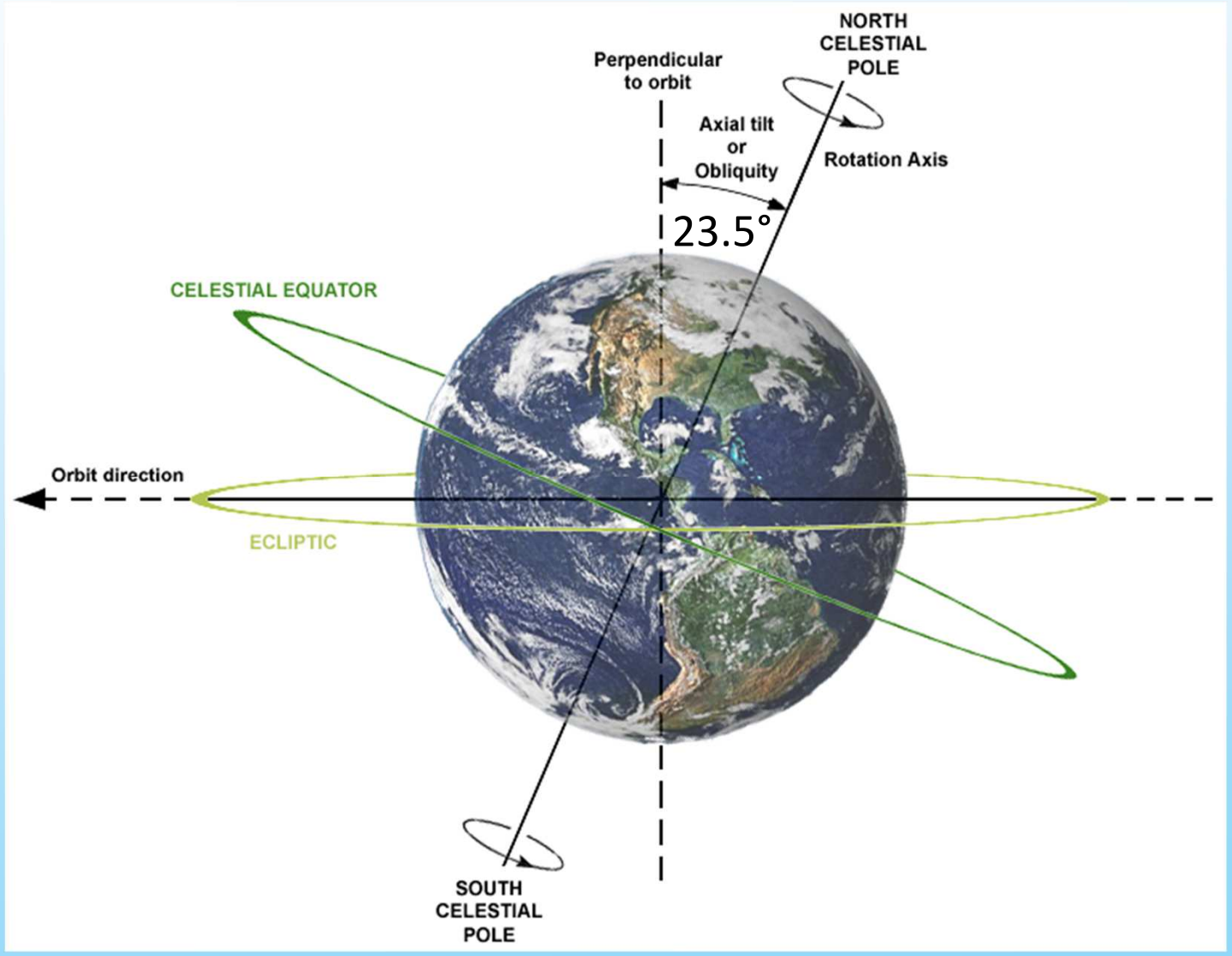


Approx. Degrees in the Sky



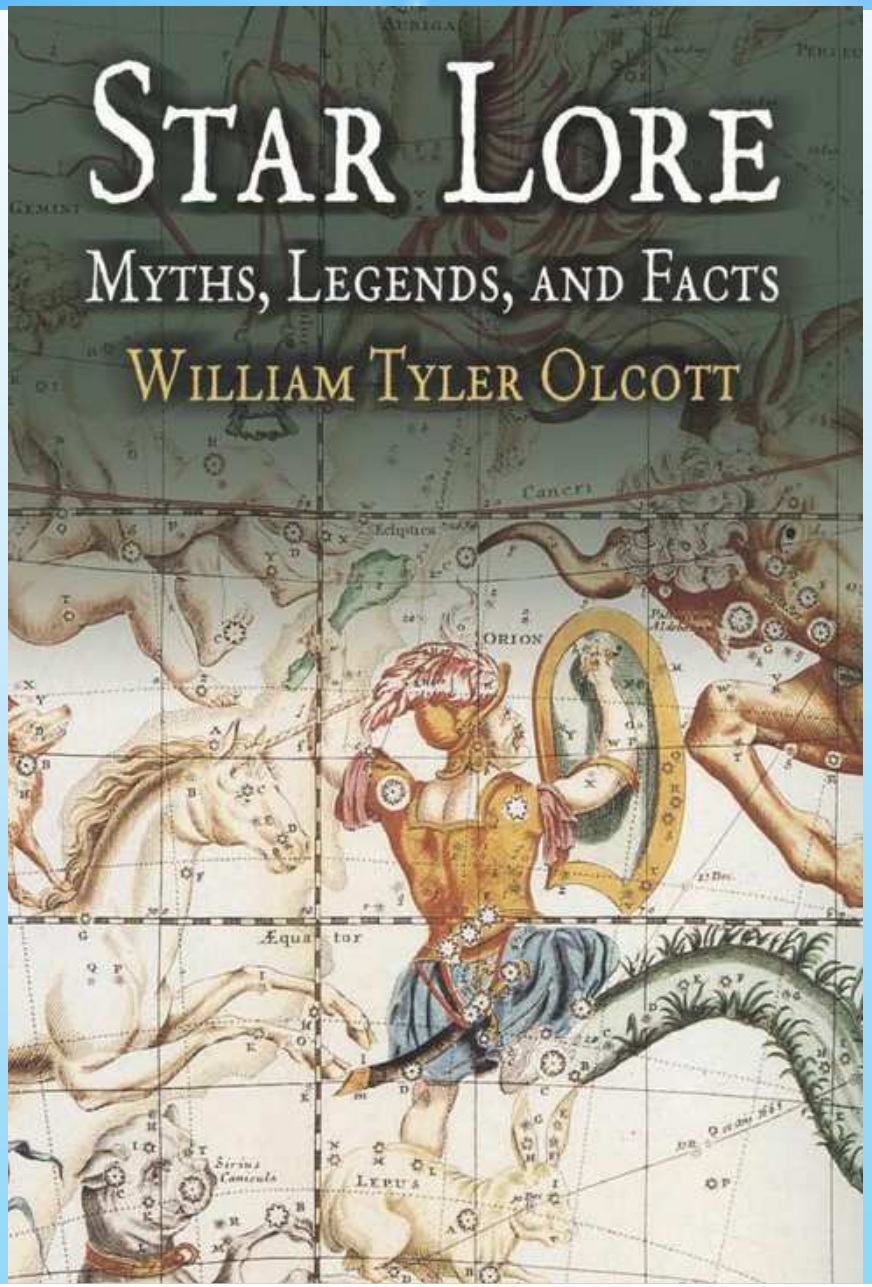

The 5th Wave
By Rich Tennant
"...and that's the North Star. Knowing its location helps you chart a safe journey."

Celestial Equator vs. Ecliptic

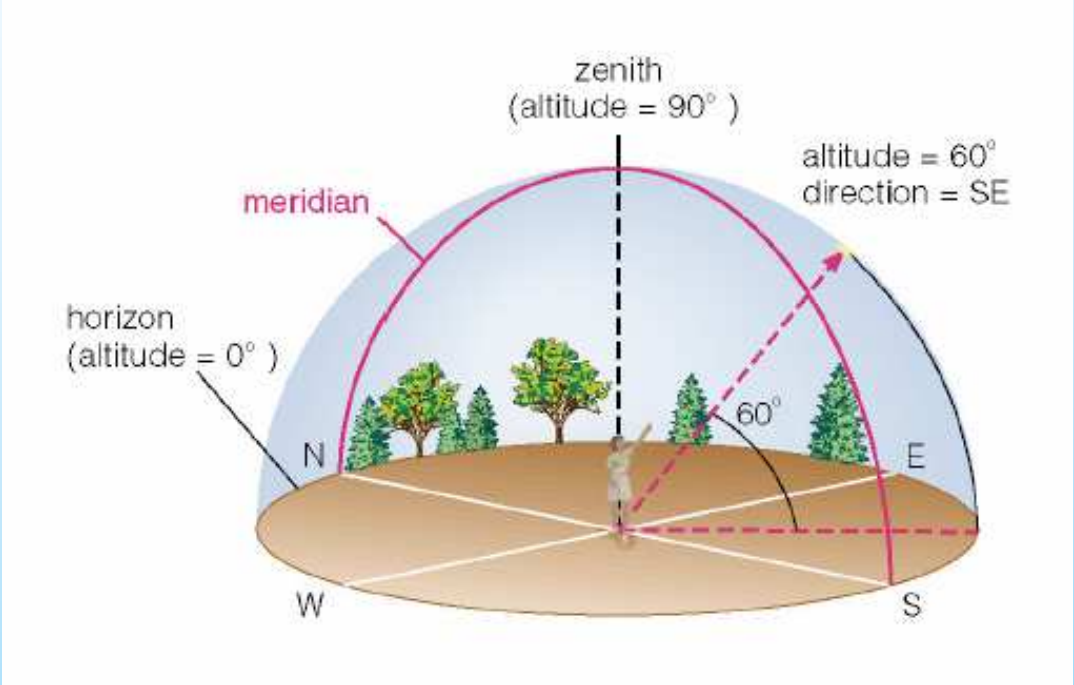


The Ecliptic & Signs of the Zodiac

Astronomical Myths & Legends



The Local Sky



- **Zenith:** The point directly overhead.
- **Horizon:** All points 90° away from zenith.
- **Meridian:** Line passing through zenith and connecting N and S points on the horizon.

The Equinoxs

- The **vernal equinox**, marking the beginning of spring in the Northern Hemisphere, occurs about March 21, when the Sun moves north across the celestial equator.

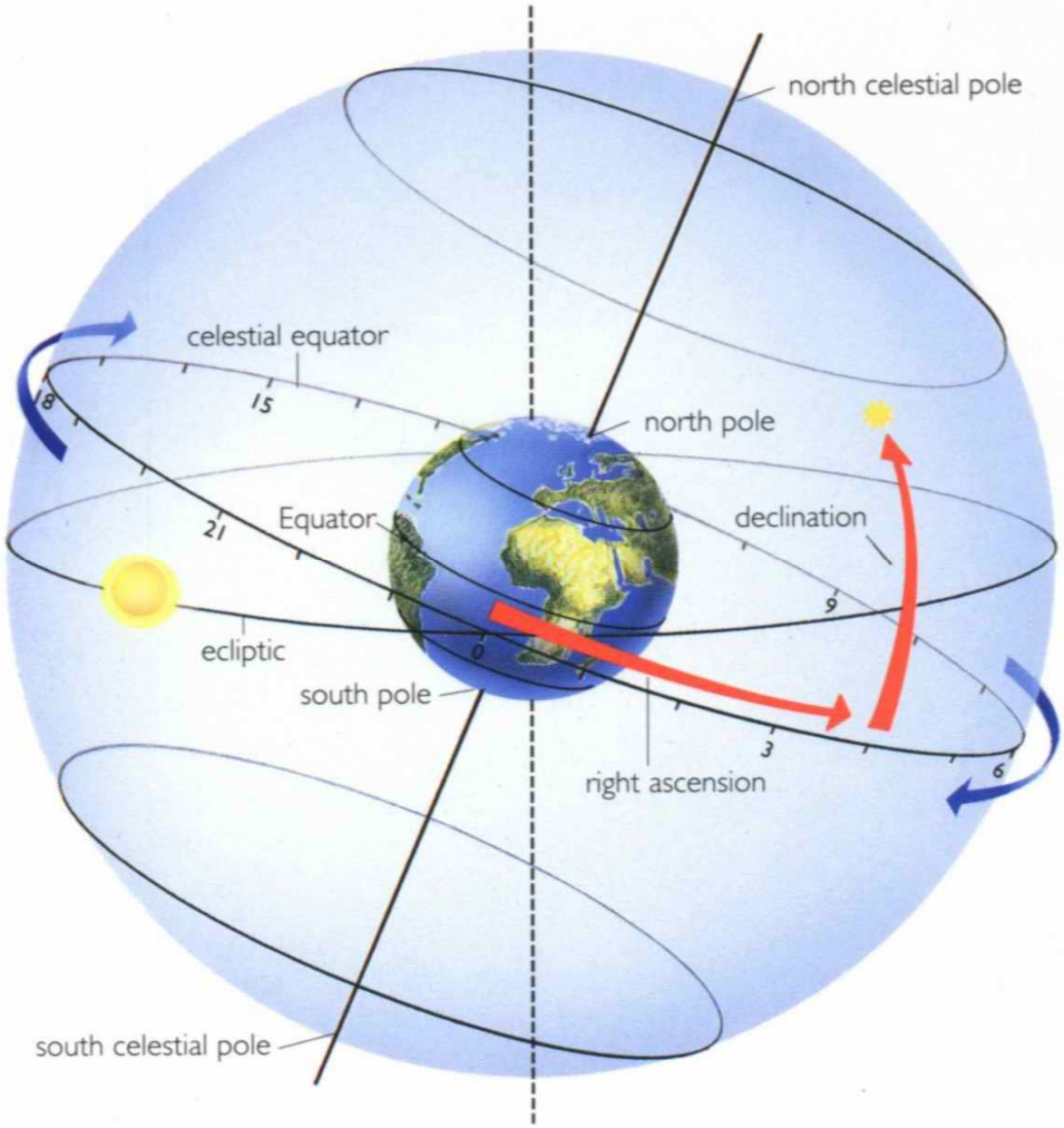
- The **autumnal equinox** falls about September 23, as the Sun crosses the celestial equator going south.

Difference Between Equinox and Solstice

- An **equinox** represents a day with equal duration of day and night (Mar 21 and September 23) and thus we have a spring and a fall equinox.

- A **solstice** refers to a day with either the longest day (June 21, also called summer solstice) or shortest day (Dec 21, also referred to as winter solstice).

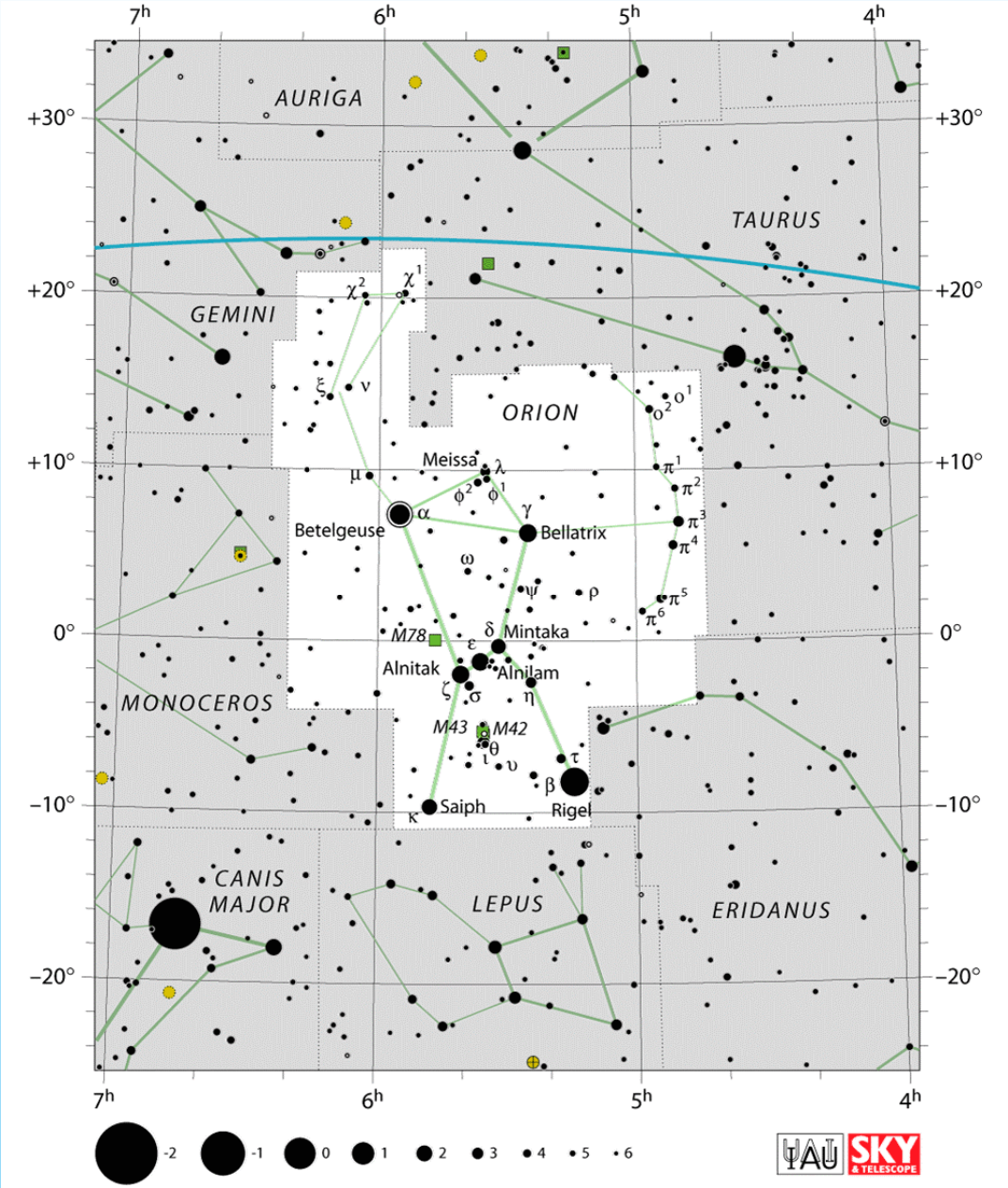
Right Ascension vs. Declination



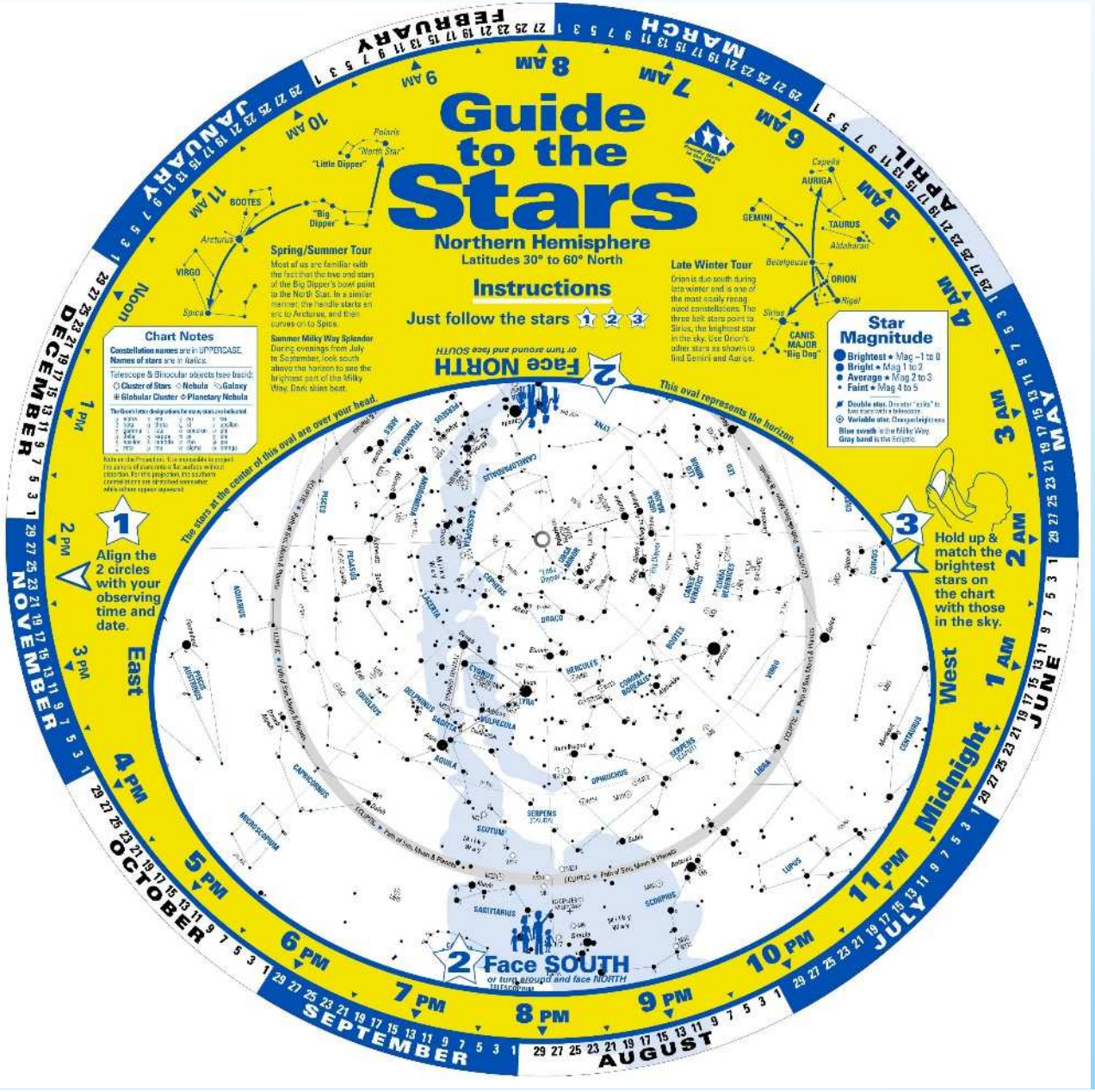
RA: Angular distance measured eastward along the celestial equator from the vernal equinox (usually measured in sidereal hours, minutes and seconds instead of degrees).

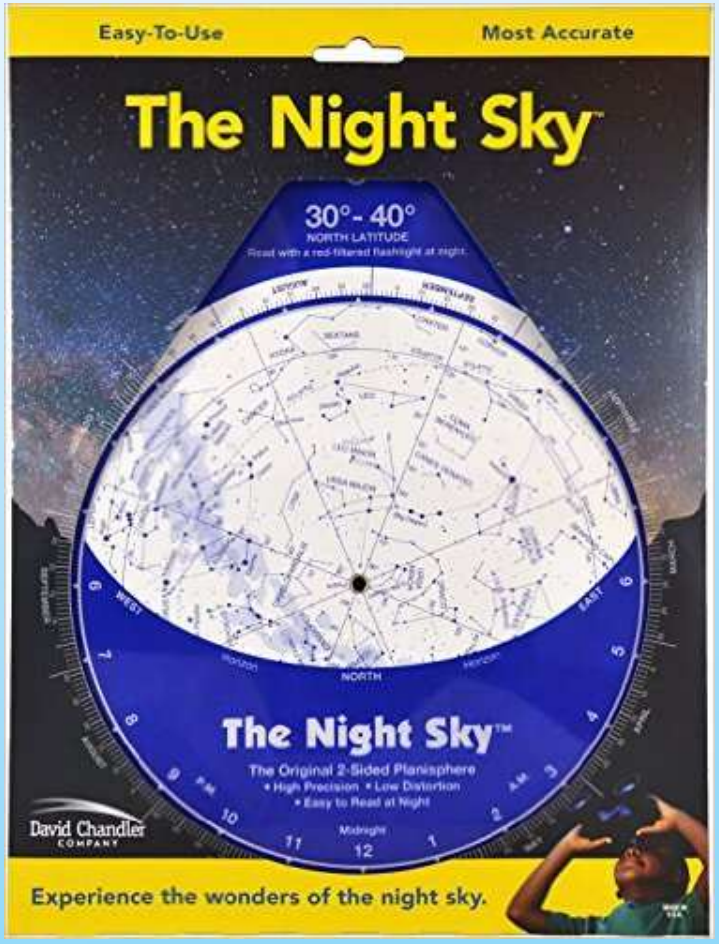
Dec: Measures the angular distance of an object perpendicular to the celestial equator, positive to the north, negative to the south.

R.A. (hours, min, sec) vs. Dec (degrees, arc min, arc sec)

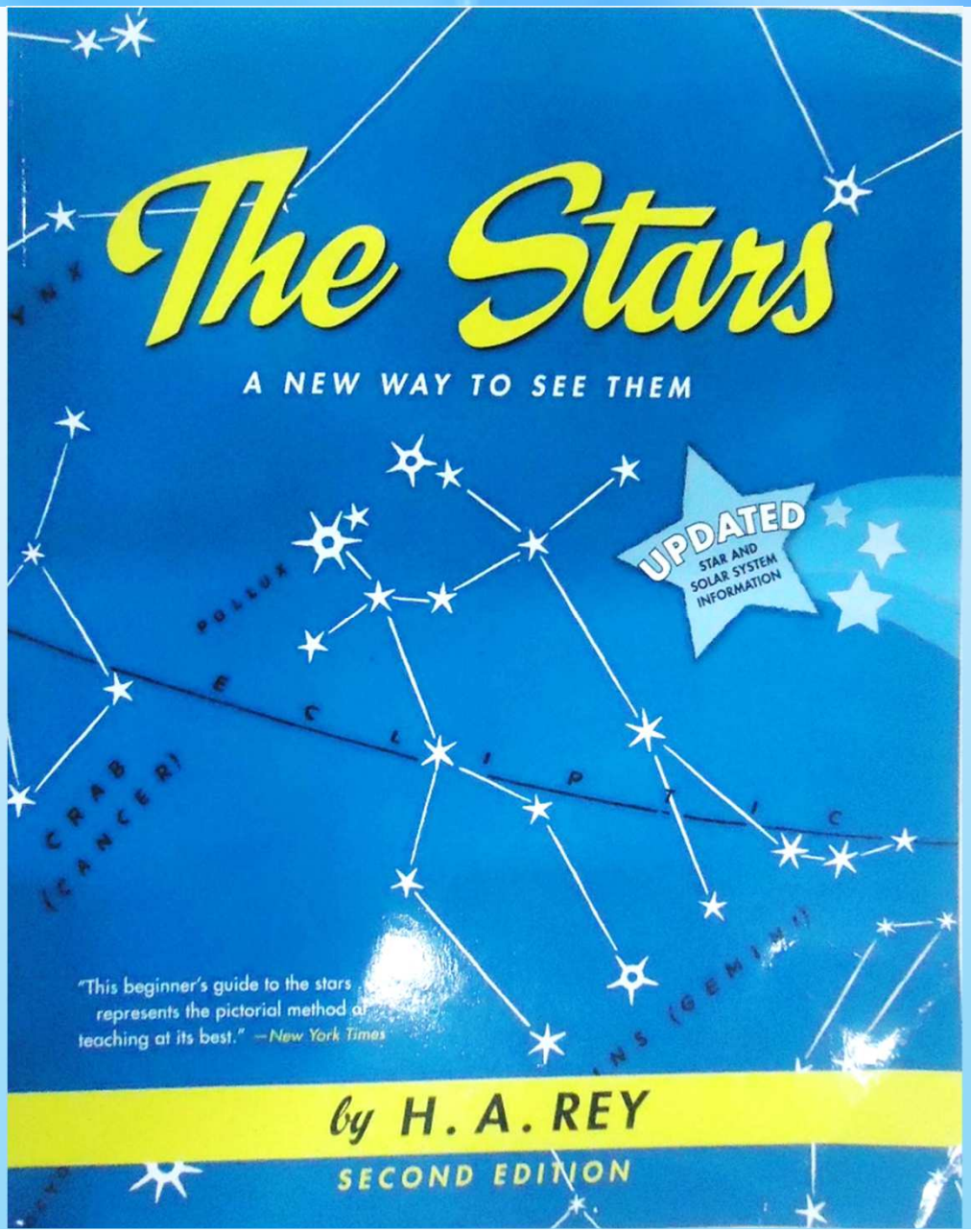


Planispheres

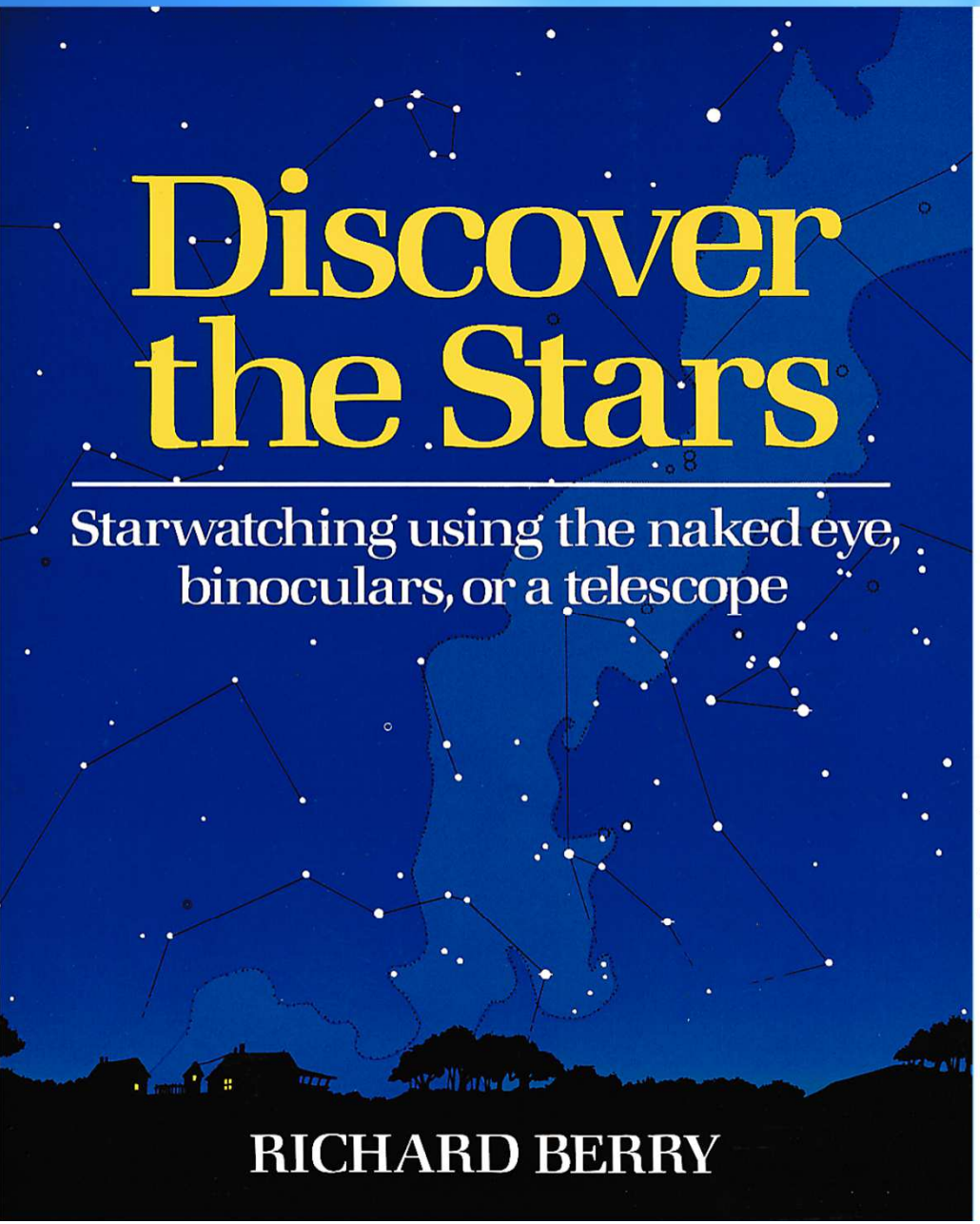


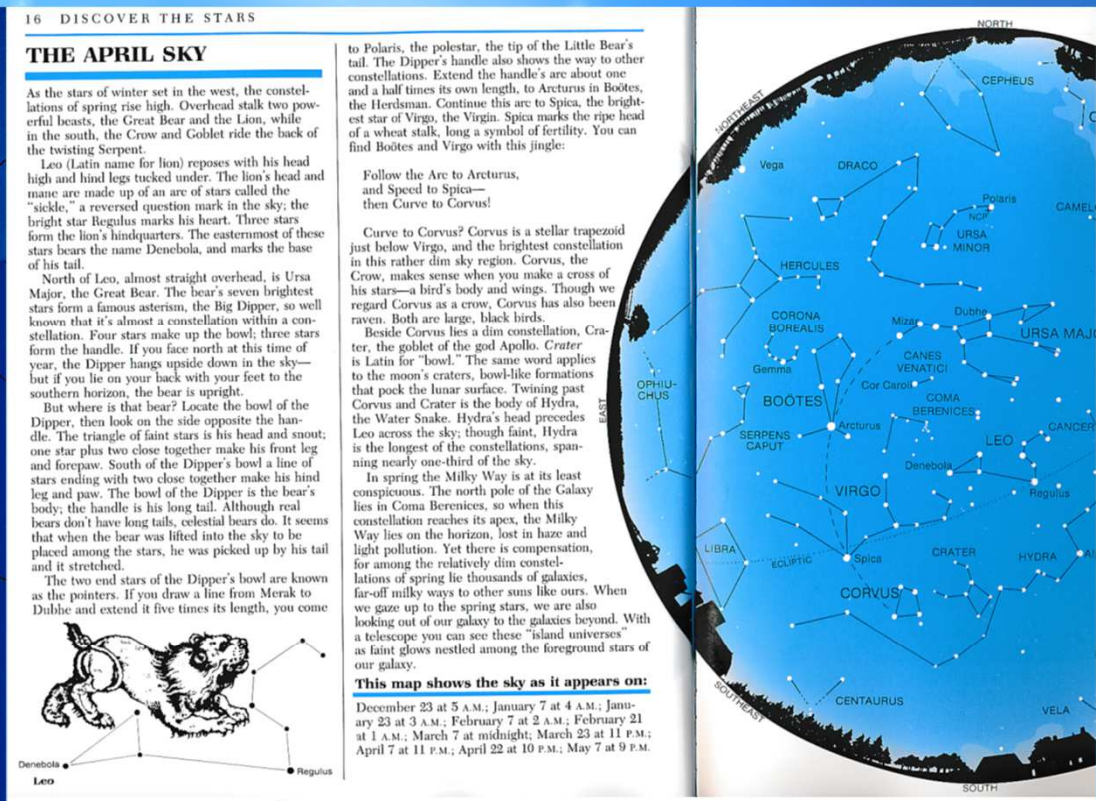


The Best Way to Learn the Constellations



An Excellent Starter Book





16 DISCOVER THE STARS

THE APRIL SKY

As the stars of winter set in the west, the constellations of spring rise high. Overhead stalk two powerful beasts, the Great Bear and the Lion, while in the south, the Crow and Goblet ride the back of the twisting Serpent.

Leo (Latin name for lion) reposes with his head high and hind legs tucked under. The lion's head and mane are made up of an arc of stars called the "sickle," a reversed question mark in the sky; the bright star Regulus marks his heart. Three stars form the lion's hindquarters. The easternmost of these stars bears the name Denebola, and marks the base of his tail.

North of Leo, almost straight overhead, is Ursa Major, the Great Bear. The bear's seven brightest stars form a famous asterism, the Big Dipper, so well known that it's almost a constellation within a constellation. Four stars make up the bowl; three stars form the handle. If you face north at this time of year, the Dipper hangs upside down in the sky—but if you lie on your back with your feet to the southern horizon, the bear is upright.

But where is that bear? Locate the bowl of the Dipper, then look on the side opposite the handle. The triangle of faint stars is his head and snout; one star plus two close together make his front leg and forepaw. South of the Dipper's bowl a line of stars ending with two close together make his hind leg and paw. The bowl of the Dipper is the bear's body; the handle is his long tail. Although real bears don't have long tails, celestial bears do. It seems that when the bear was lifted into the sky to be placed among the stars, he was picked up by his tail and it stretched.

The two end stars of the Dipper's bowl are known as the pointers. If you draw a line from Merak to Dubhe and extend it five times its length, you come to Polaris, the polestar, the tip of the Little Bear's tail. The Dipper's handle also shows the way to other constellations. Extend the handle's arc about one and a half times its own length, to Arcturus in Boötes, the Herdsman. Continue this arc to Spica, the brightest star of Virgo, the Virgin. Spica marks the ripe head of a wheat stalk, long a symbol of fertility. You can find Boötes and Virgo with this jingle:

Follow the Arc to Arcturus,
and Speed to Spica—
then Curve to Corvus!

Curve to Corvus? Corvus is a stellar trapezoid just below Virgo, and the brightest constellation in this rather dim sky region. Corvus, the Crow, makes sense when you make a cross of his stars—a bird's body and wings. Though we regard Corvus as a crow, Corvus has also been raven. Both are large, black birds.

Beside Corvus lies a dim constellation, Crater, the goblet of the god Apollo. *Crater* is Latin for "bowl." The same word applies to the moon's craters, bowl-like formations that pock the lunar surface. Twining past Corvus and Crater is the body of Hydra, the Water Snake. Hydra's head precedes Leo across the sky; though faint, Hydra is the longest of the constellations, spanning nearly one-third of the sky.

In spring the Milky Way is at its least conspicuous. The north pole of the Galaxy lies in Coma Berenices, so when this constellation reaches its apex, the Milky Way lies on the horizon, lost in haze and light pollution. Yet there is compensation, for among the relatively dim constellations of spring lie thousands of galaxies, far-off milky ways to other suns like ours. When we gaze up to the spring stars, we are also looking out of our galaxy to the galaxies beyond. With a telescope you can see these "island universes" as faint glows nestled among the foreground stars of our galaxy.

This map shows the sky as it appears on:

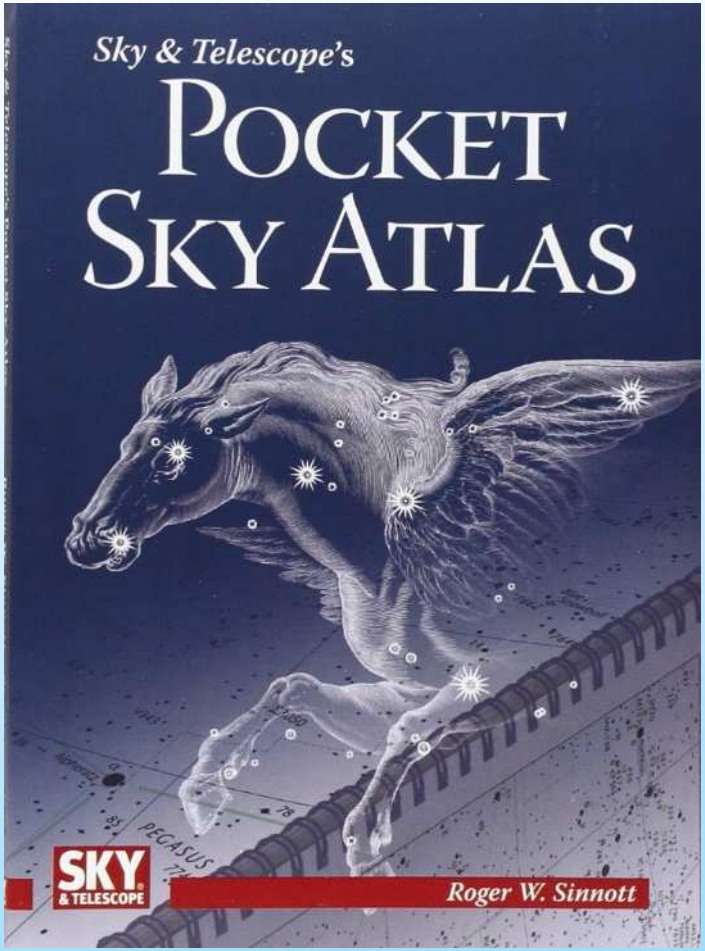
December 23 at 5 A.M.; January 7 at 4 A.M.; January 23 at 3 A.M.; February 7 at 2 A.M.; February 21 at 1 A.M.; March 7 at midnight; March 23 at 11 P.M.; April 7 at 11 P.M.; April 22 at 10 P.M.; May 7 at 9 P.M.

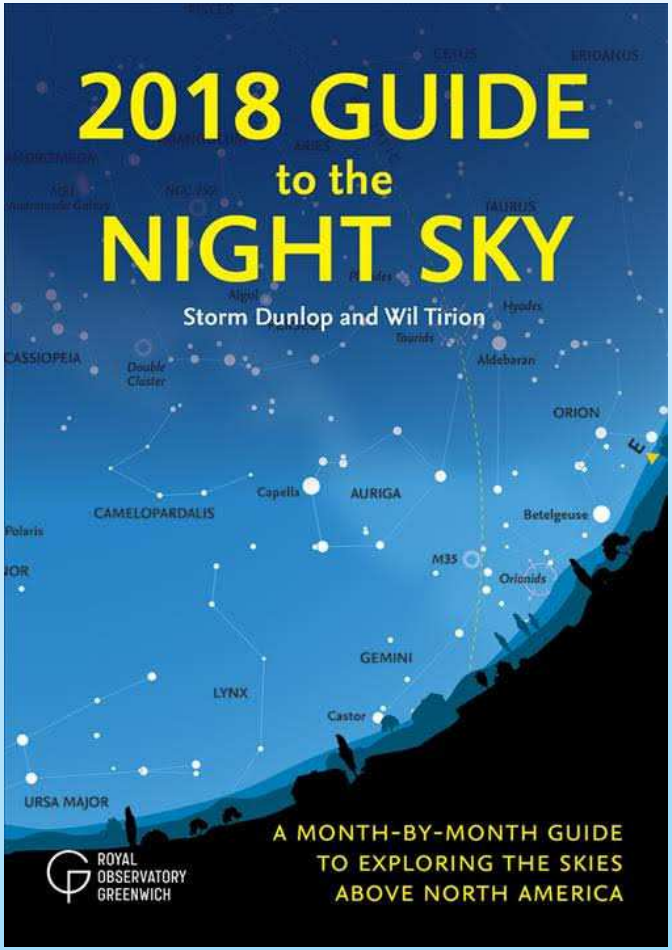
Appendix

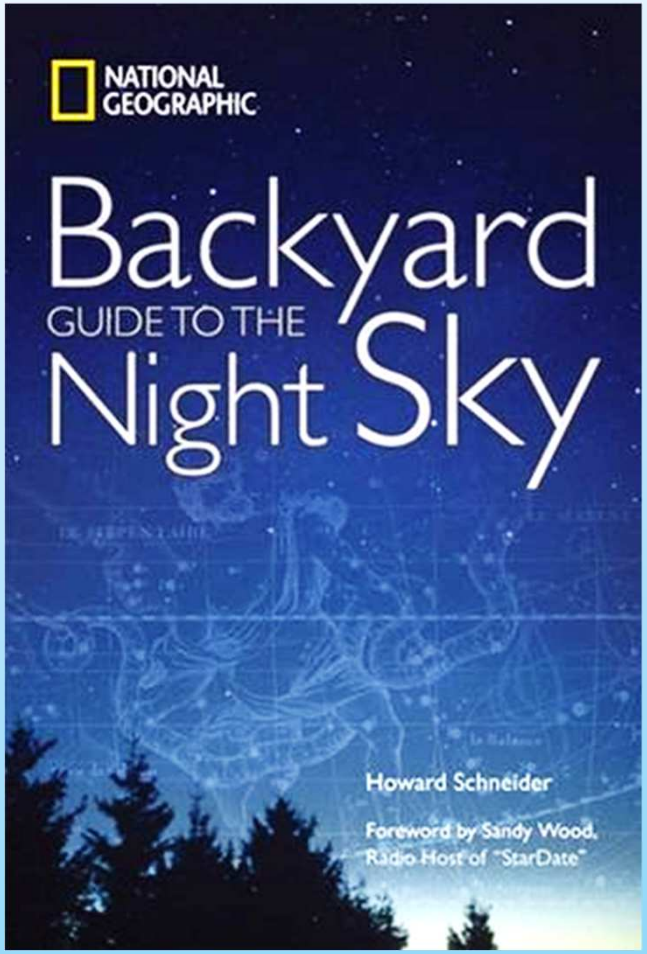
Which Sky Map to Use

	6 P.M.	7 P.M.	8 P.M.	9 P.M.	10 P.M.	11 P.M.	MIDNIGHT	1 A.M.	2 A.M.	3 A.M.	4 A.M.	5 A.M.	6 A.M.
Jan. 7	Nov		Dec		Jan		Feb		Mar		Apr		May
Jan. 23		Dec		Jan		Feb		Mar		Apr		May	
Feb. 7	Dec		Jan		Feb		Mar		Apr		May		Jun
Feb. 21		Jan		Feb		Mar		Apr		May		Jun	
Mar. 7	Jan		Feb		Mar		Apr		May		Jun		Jul
Mar. 23		Feb		Mar		Apr		May		Jun		Jul	
Apr. 7		Feb		Mar		Apr		May		Jun		Jul	
Apr. 22	Feb		Mar		Apr		May		Jun		Jul		Aug
May 7		Mar		Apr		May		Jun		Jul		Aug	

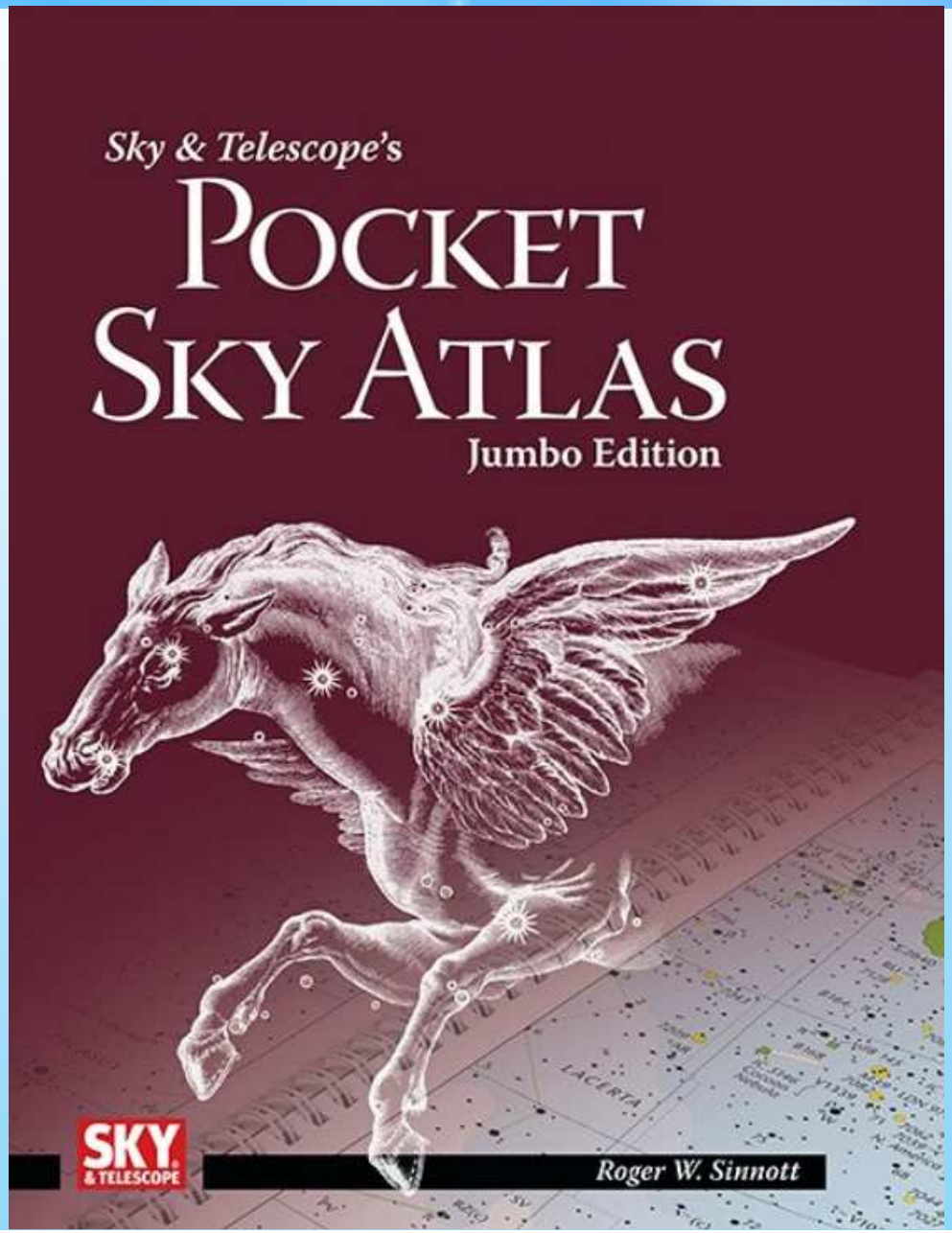
Various Sky Guides



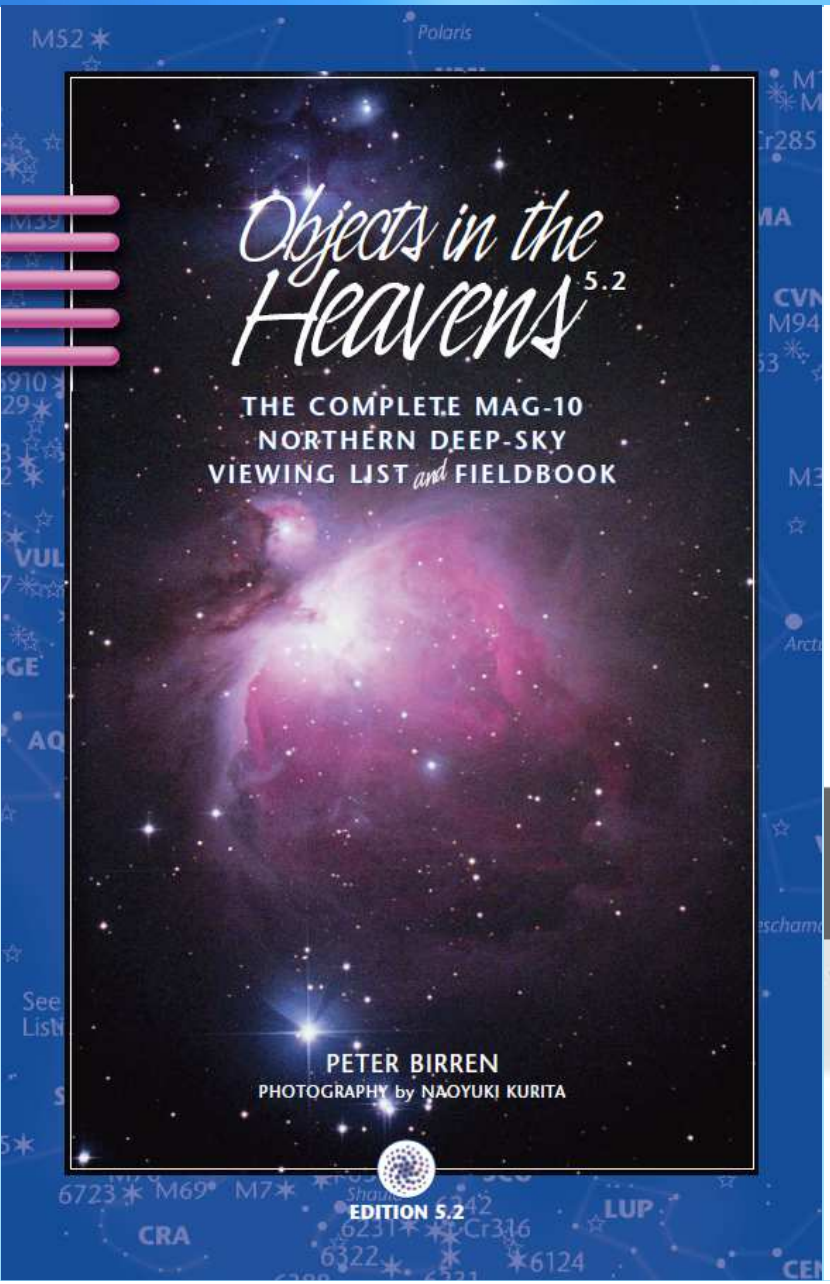


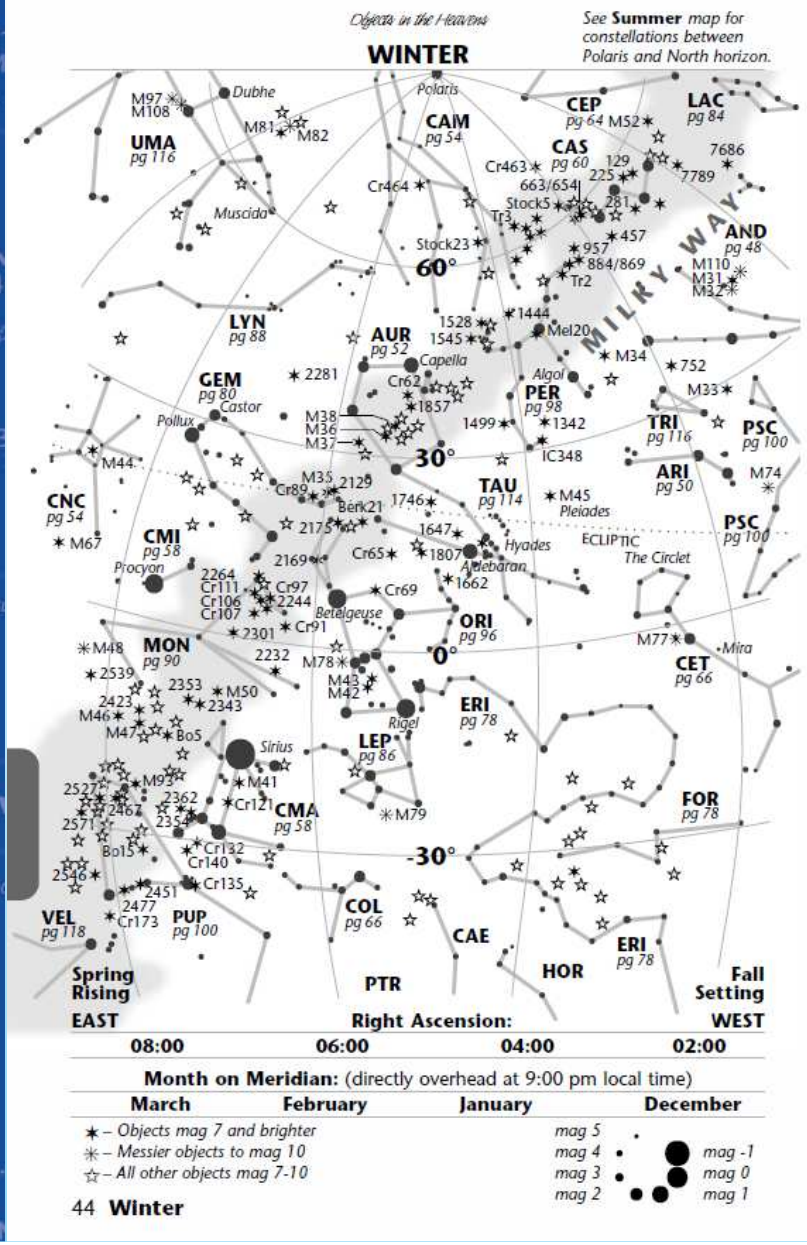


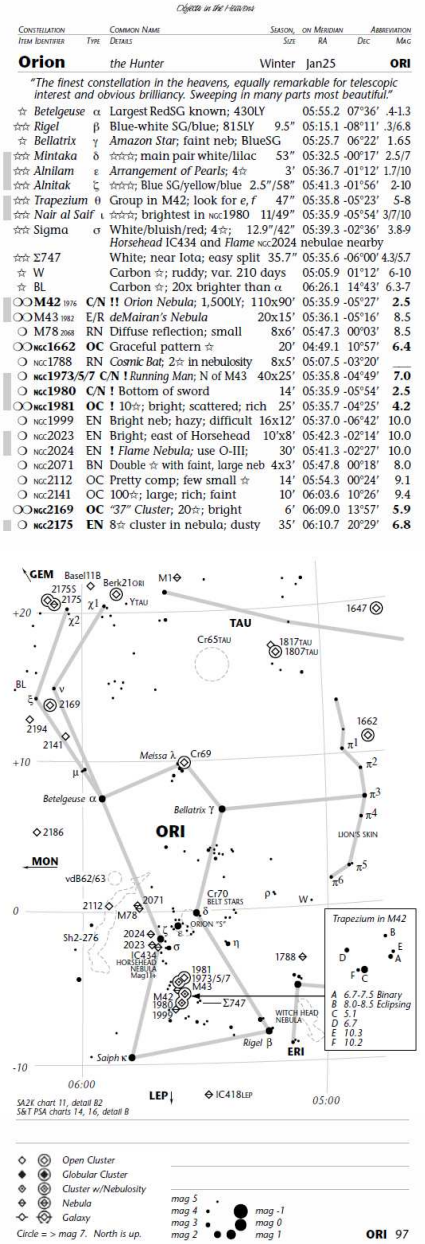
Bigger Version of Pocket Atlas



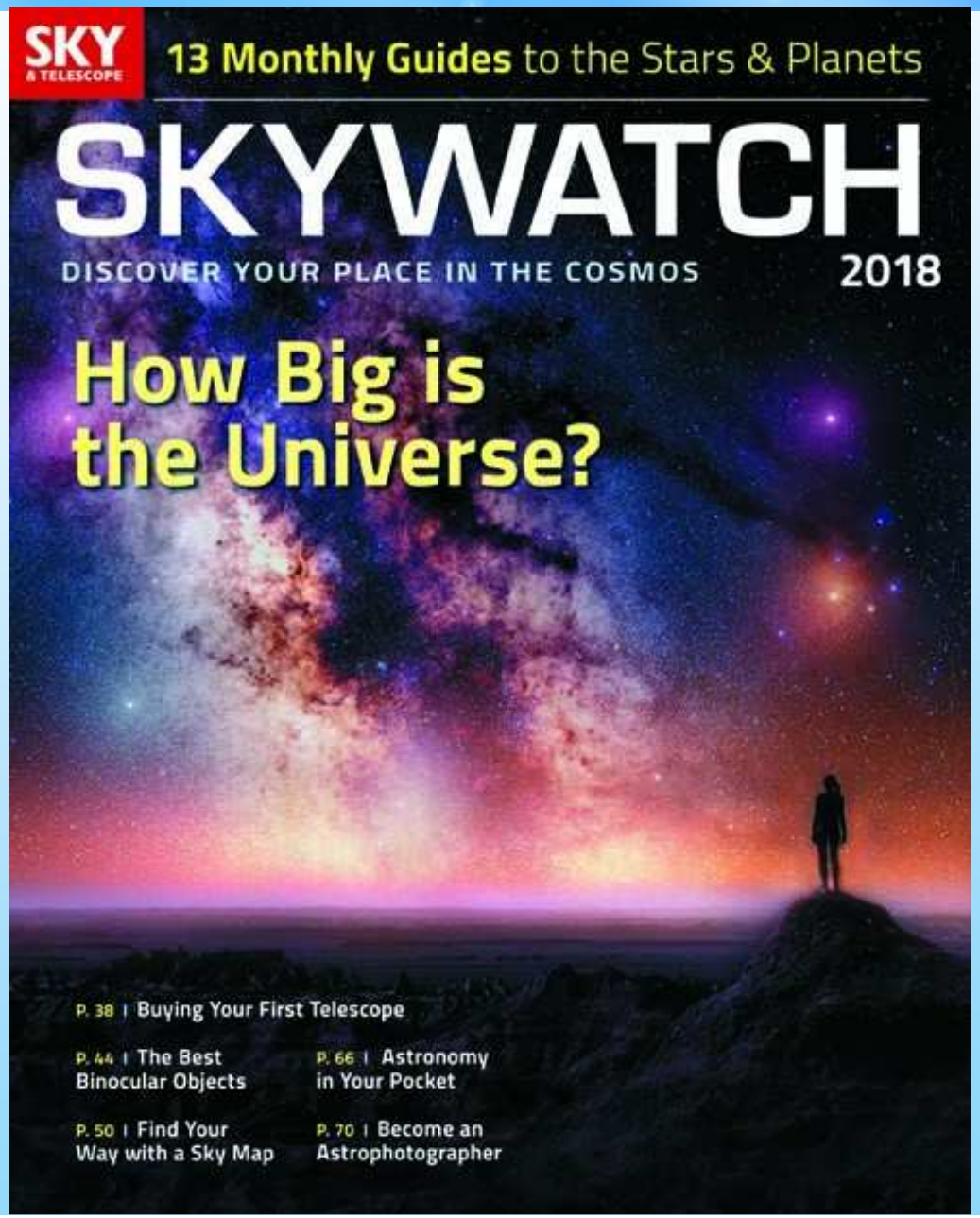
Sky Guides cont.



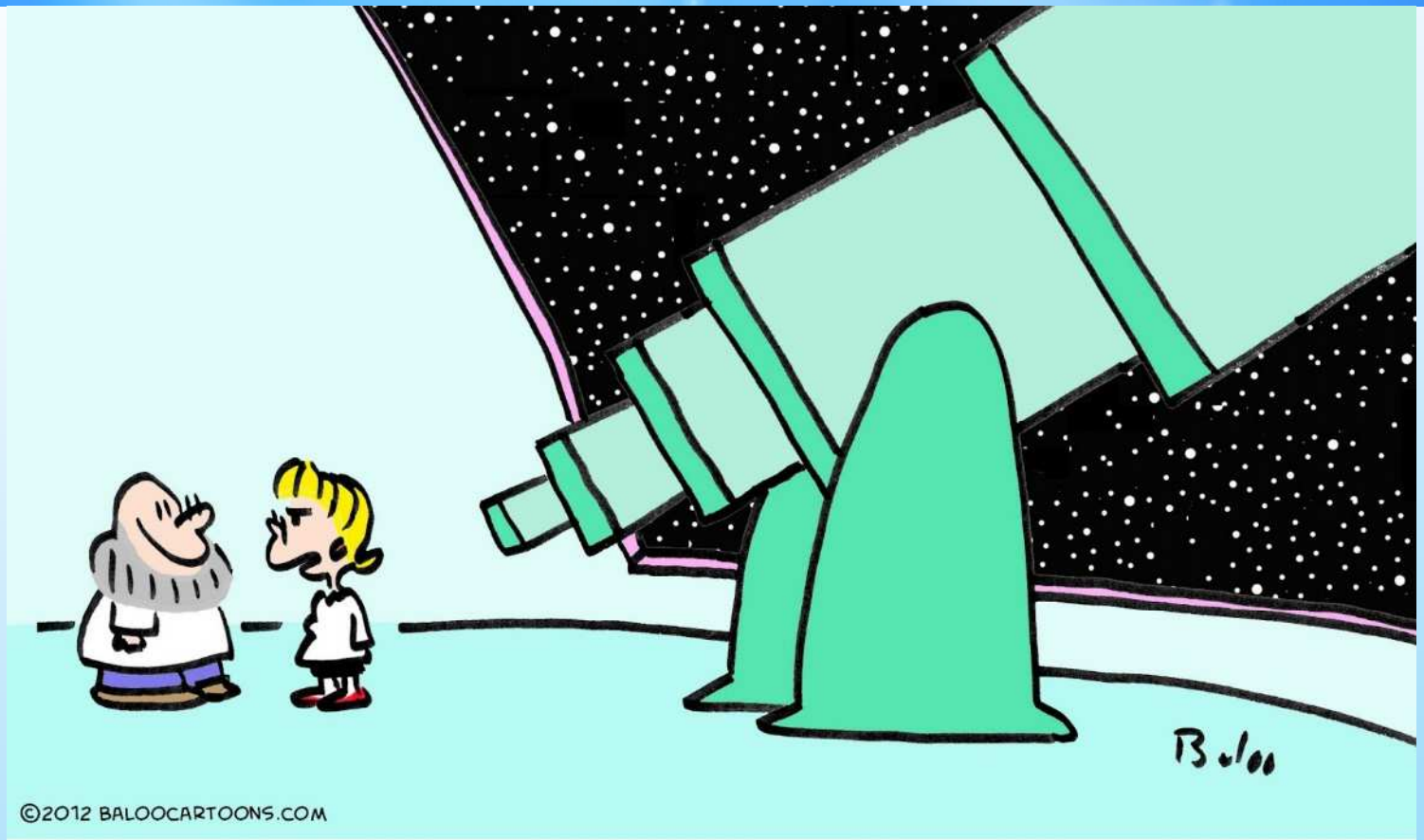




Monthly Sky Guide



Astronomy Humor



"What do you mean, you can't look at the Milky Way because you're lactose-intolerant?"

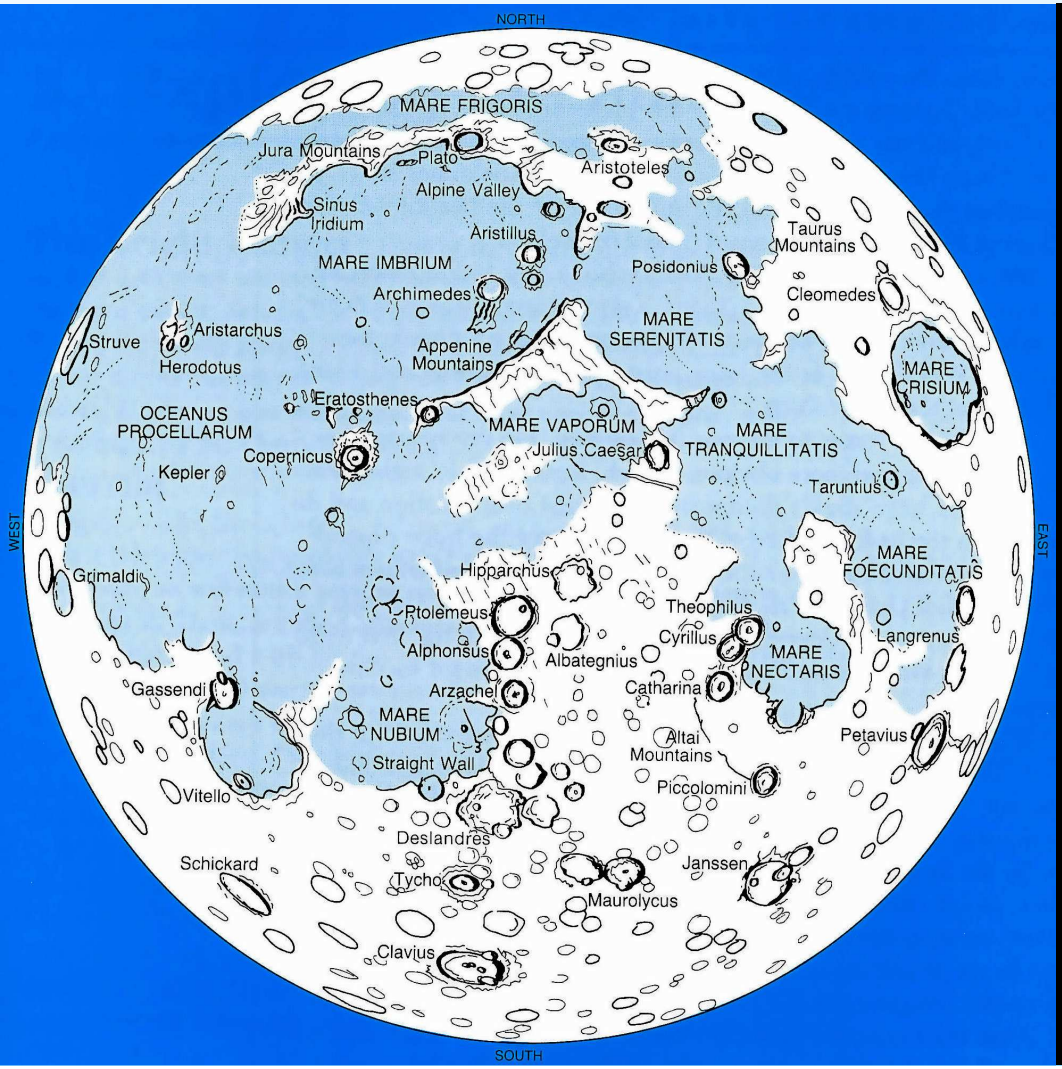
Astronomy Poem

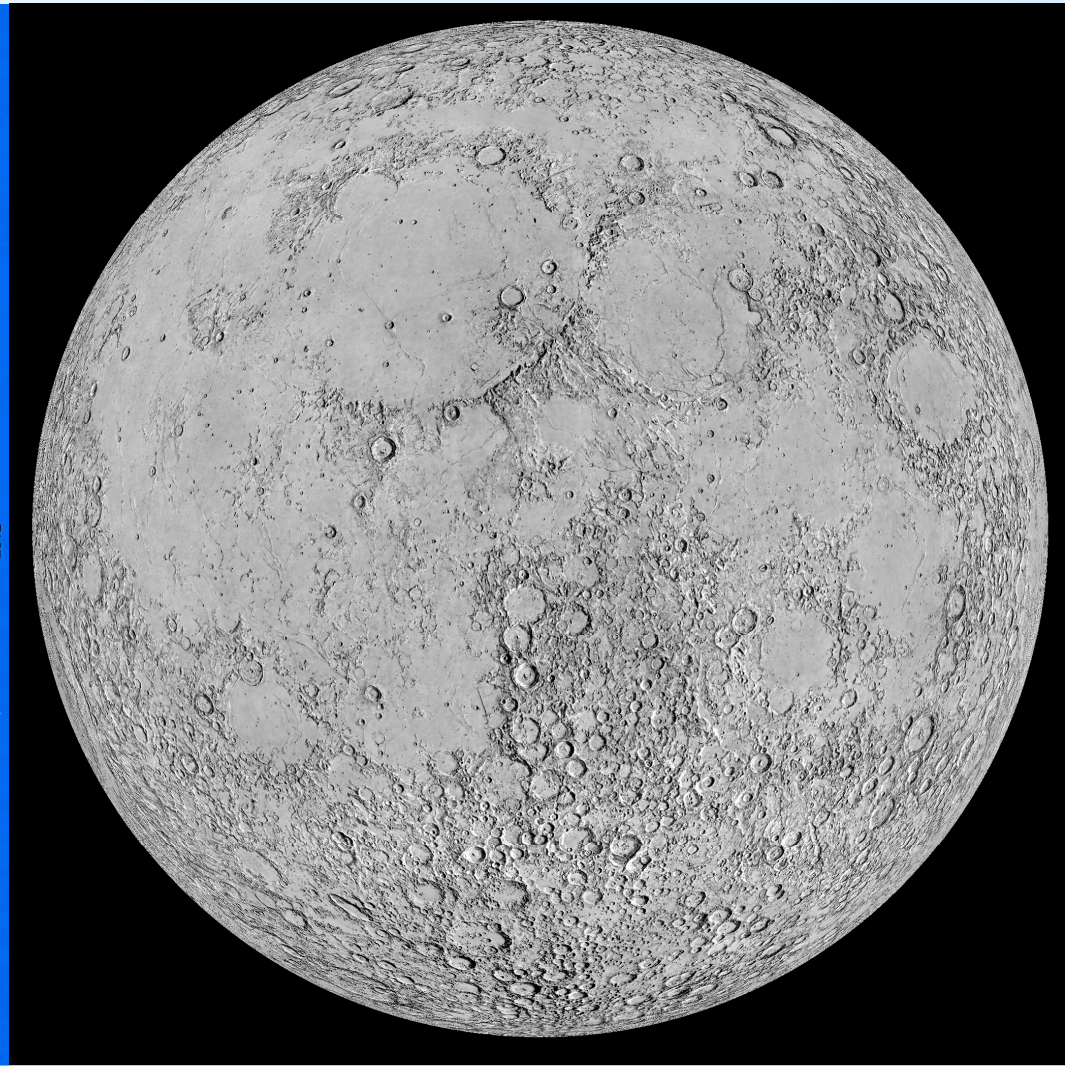
Star light, star bright
First star I see tonight
I wish I may, I wish I might
Oh wait, it's just a satellite

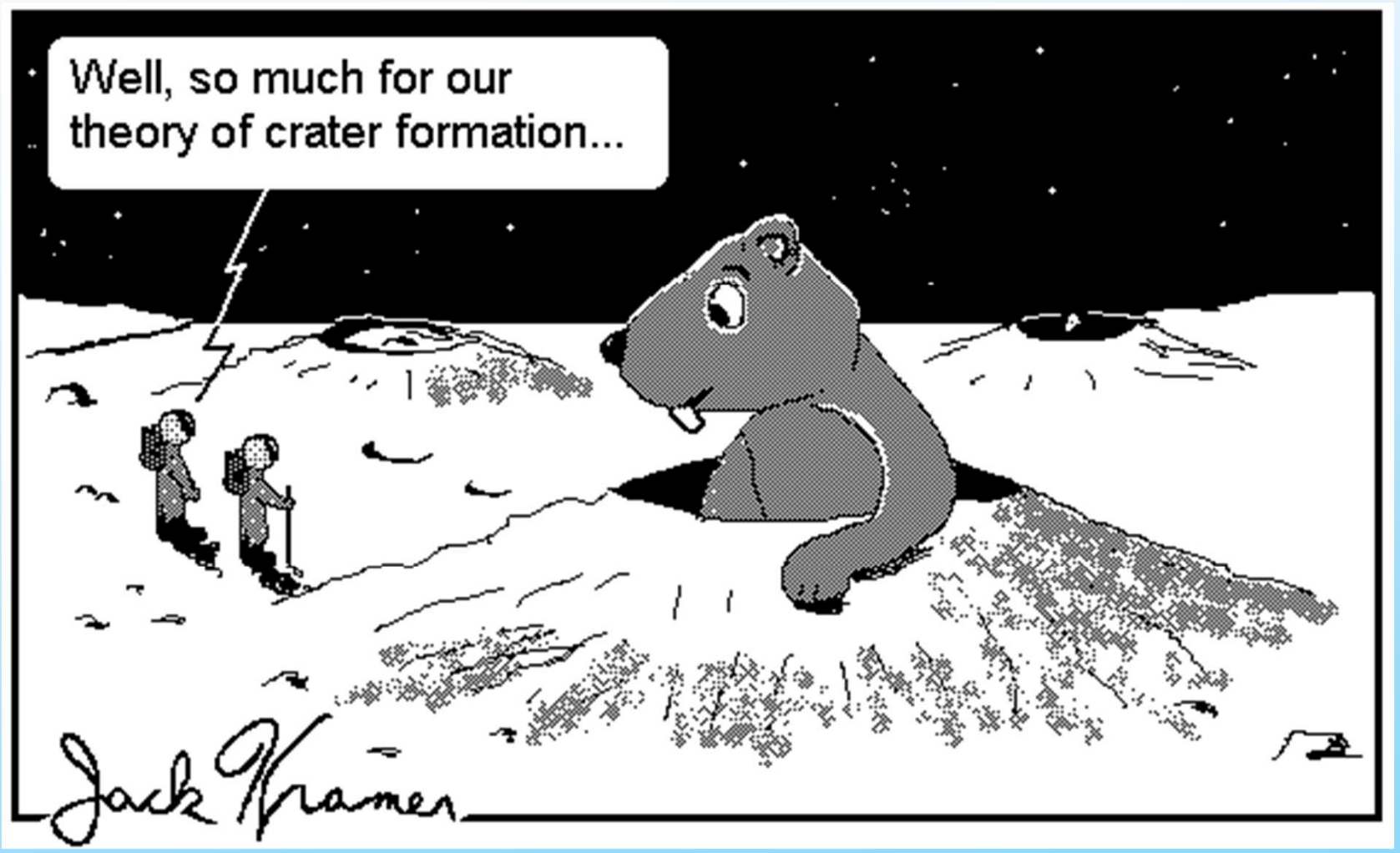
THE MOON AND ECLIPSES

Lunar Features

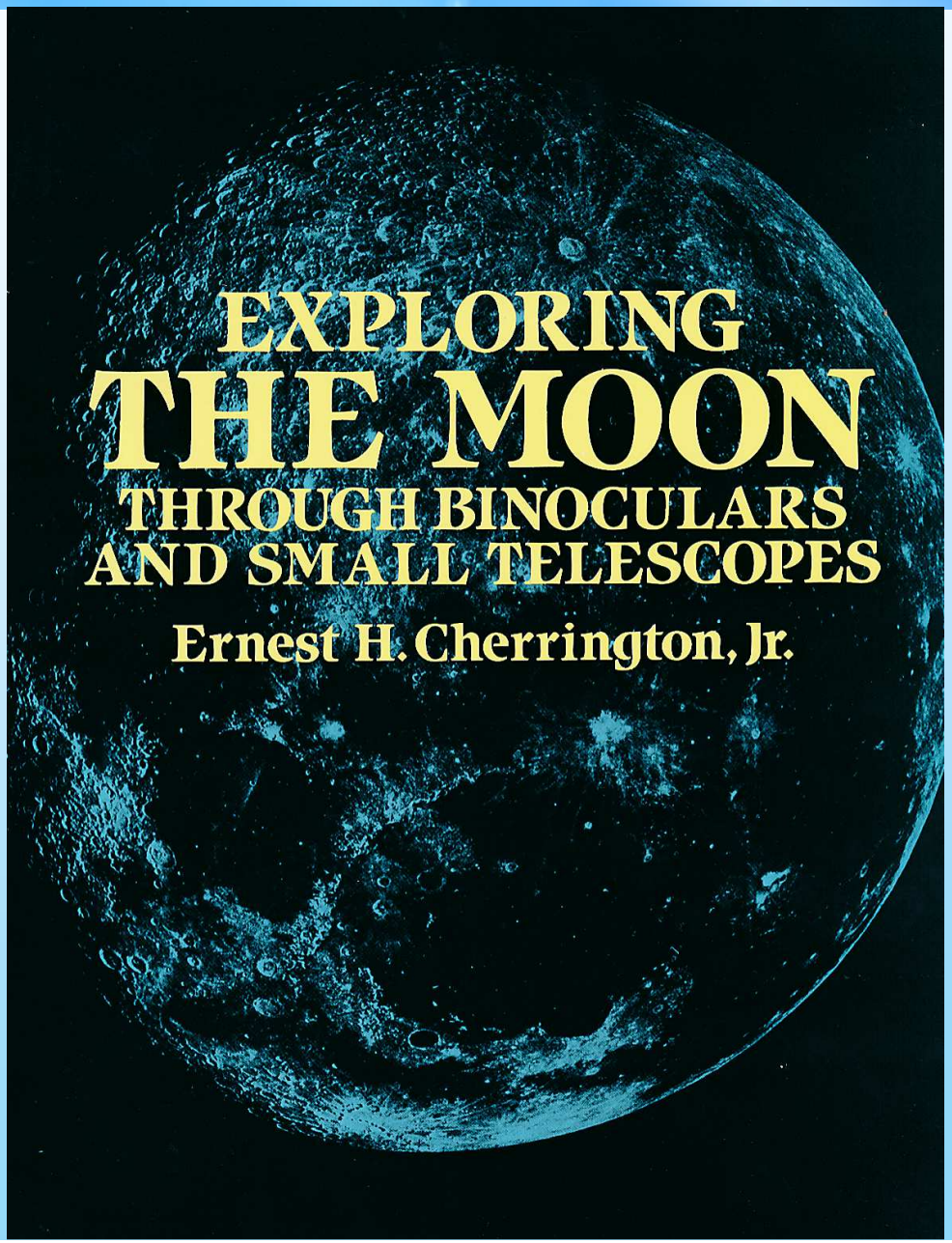
“Oceans” and Craters of the Moon



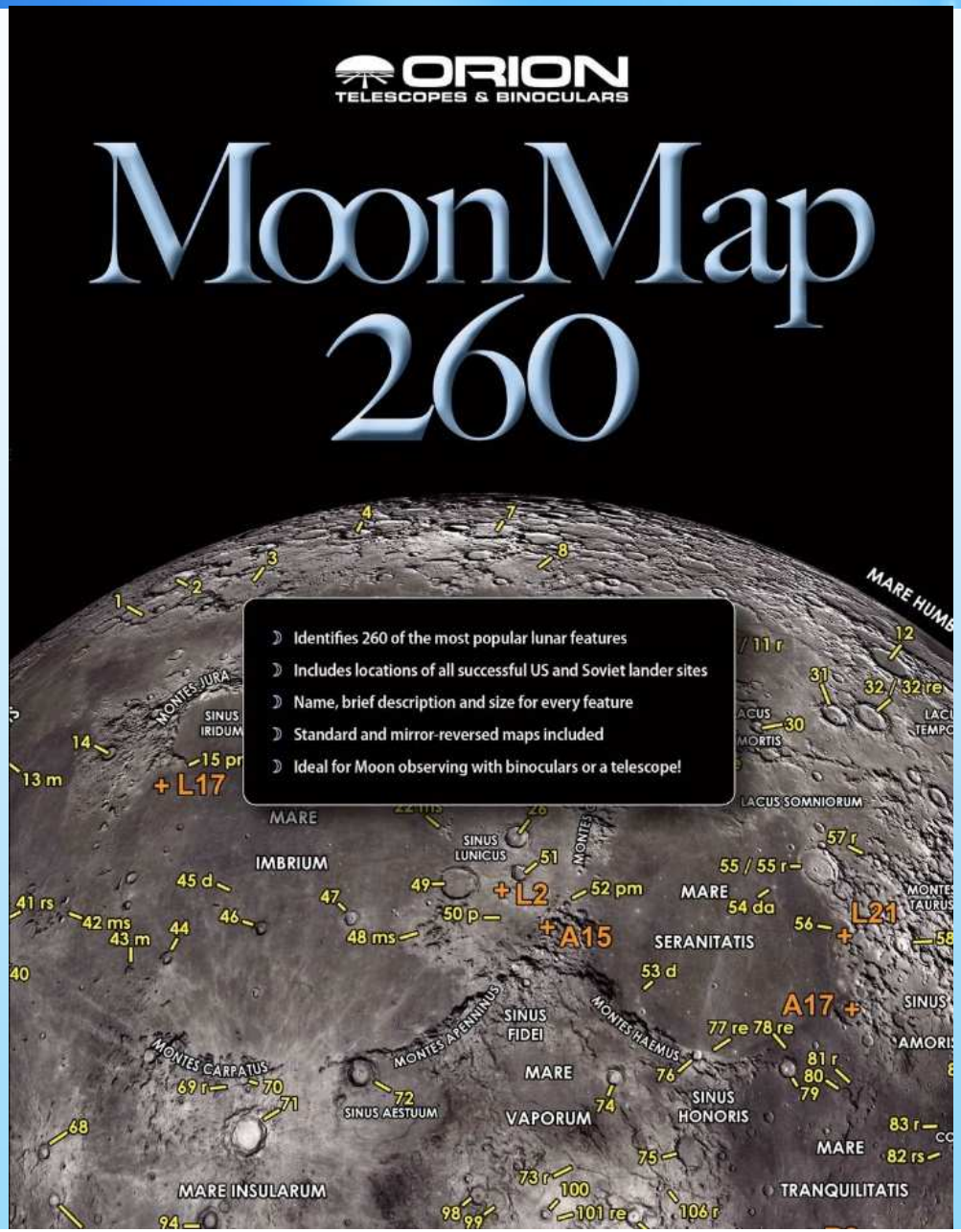


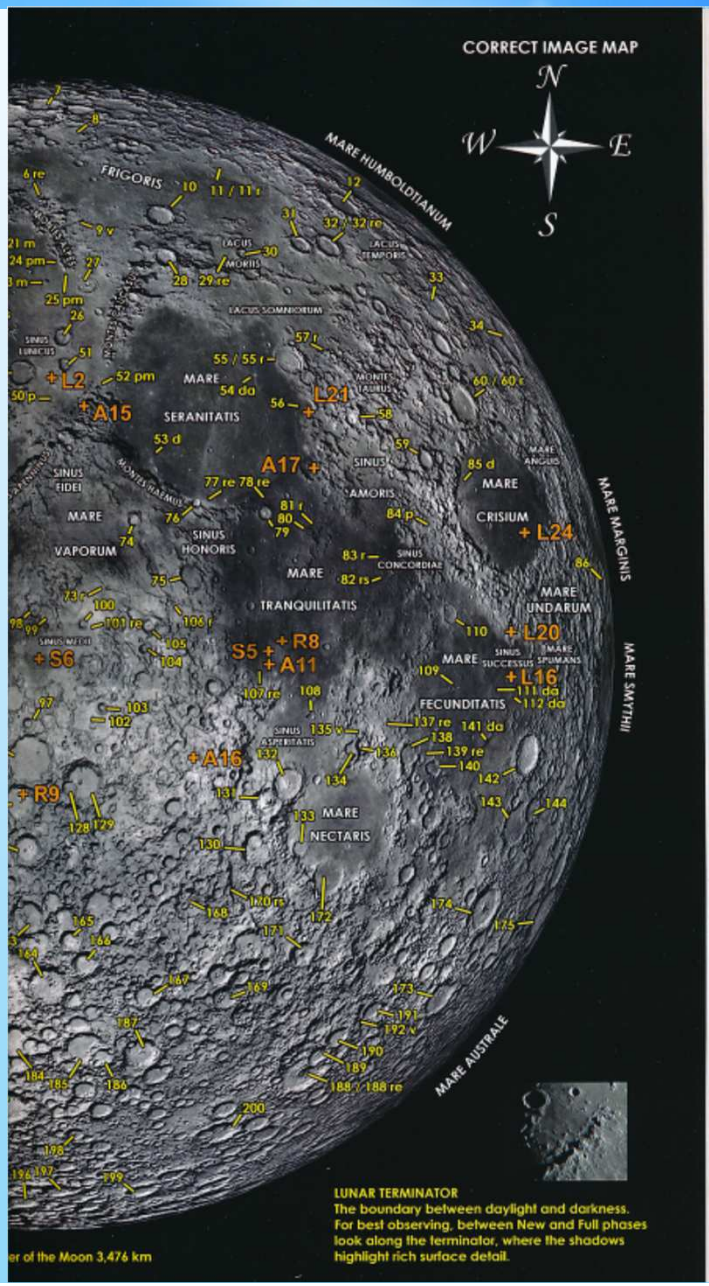

Well, so much for our theory of crater formation...
Jack Kramer

Lunar Guide


EXPLORING
THE MOON
THROUGH BINOCULARS
AND SMALL TELESCOPES
Ernest H. Cherrington, Jr.

Laminated Moon Map

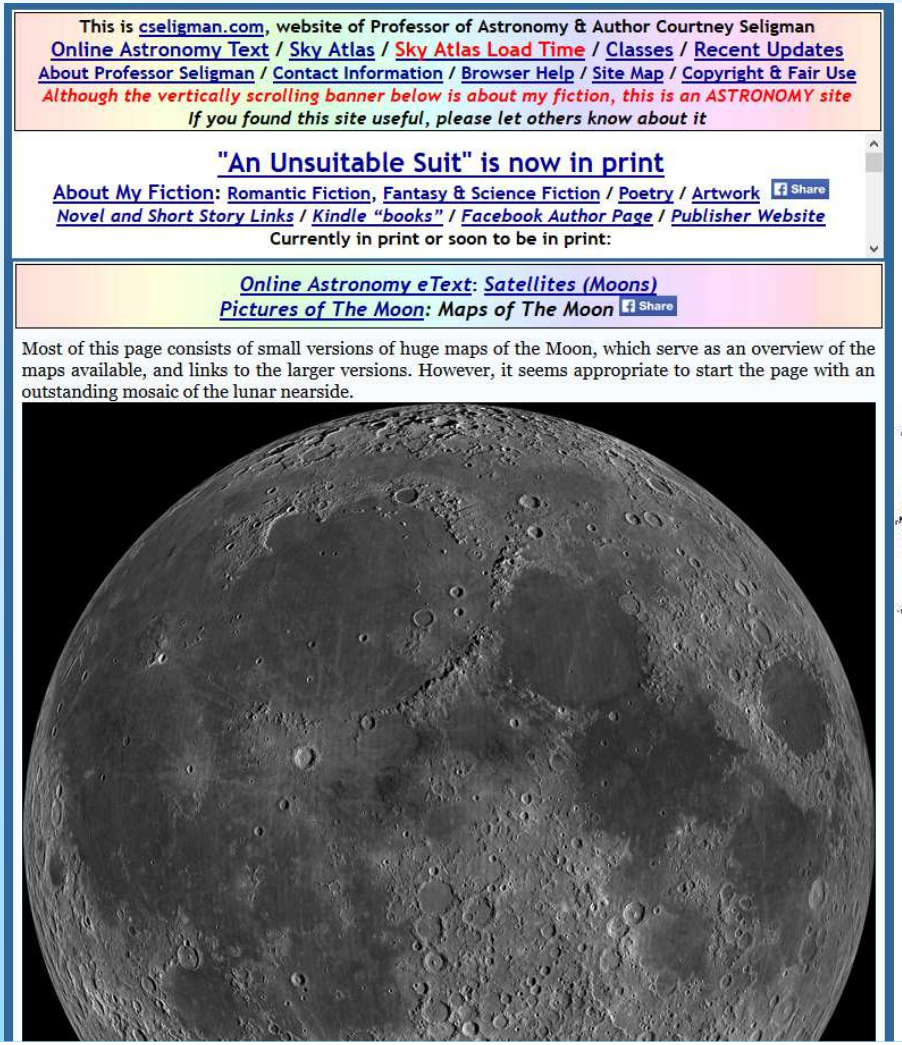


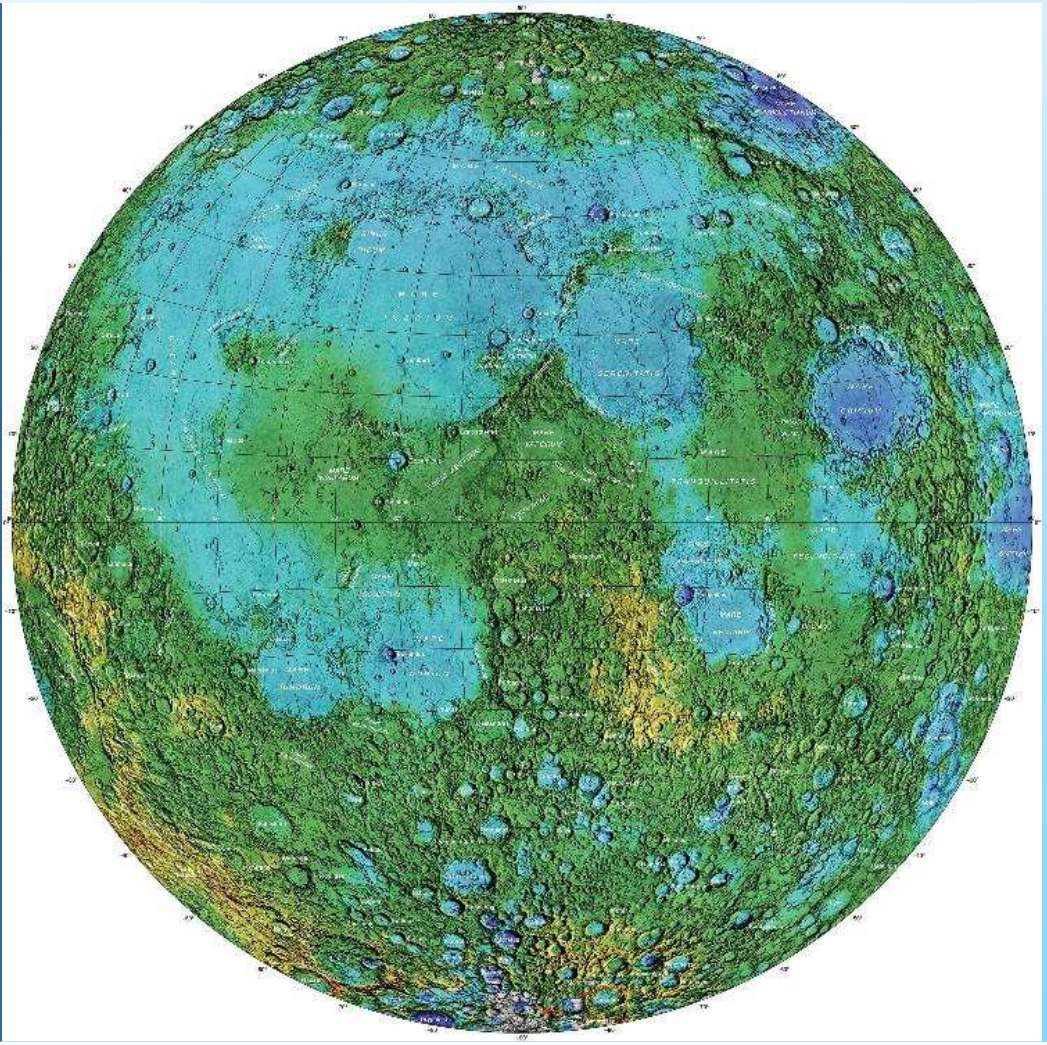


Albedo feature			
64	Reiner Gamma	Flat feature formed of bright material	70k
Catena (Crater Chain)			
62	Catena Krafft	Chain of craters	60k
123	Catena Davy	Chain of craters	50k
Mons (Mountain)			
13	Mons Rümker	Complex of lunar domes	70k
21	Mons Pico	Isolated mountain	25k
23	Mons Piton	Isolated mountain	25k
43	Mons Vinogradov	Mountain near Euler crater	25k
118	Mons Hansteen	Bright mountain	30k
Montes (Mountain Range)			
	Montes Jura	Jura Mountains	422
	Montes Alpes	The Alps	250
19	Montes Recti	Straight Range	90k
20	Montes Teneriffe	Teneriffe Mountains	110
22	Montes Spitzbergen	Spitzbergen Mountains	60k
38	Montes Agricola	Agricola Mountains	160
42	Montes Harbinger	Harbinger Mountains	90k
48	Montes Archimedes	Archimedes Mountains	140
92	Montes Riphaeus	Riphaeus Mountains	150
	Montes Caucasus	Caucasus Mountains	520
	Montes Apenninus	The Apennines	600
	Montes Carpatus	Carpathian Mountains	400
	Montes Haemus	Haemus Mountains	400
	Montes Taurus	Taurus Mountains	500
Vallis (Valley)			
9	Vallis Alpes	Alpine Valley	180
39	Vallis Schröteri	Schroter's Valley	168
135	Vallis Capella	Capella Valley	110
192	Vallis Rheita	Rheita Valley	580
Dorsum (Mare Ridge)			
45	Dorsum Zirkel	Mare ridge	270
53	Dorsum Buckland	Ridge	150
85	Dorsum Oppel	Prominent ridge	900
Dorsa (Network of Ridges)			
54	Dorsa Smirnov	System of mare ridges	150
111	Dorsa Grèlie	Large system of mare ridges	240
112	Dorsa Andrusov	System of mare ridges	190
141	Dorsa Mawson	System of mare ridges	180
Rima (Rille)			
11	Rima Gartner	Rille within crater Gartner	30
55	Rimae Posidonius	Rilles inside crater Posidonius	70
57	Rima Bond	Rille near crater Posidonius	15
60	Rima Cleomedes	Rille within crater Cleomedes	30
67	Rima Marius	Sinuous rille	25
69	Rima Gay-Lussac	Wide rille	40
73	Rima Hyginus	Rille centered by Hyginus Crater	22
81	Rima Jansen	Rille near crater Jansen	35
83	Rima Cauchy	Rille near Rupes Cauchy	21
106	Rima Ariadaeus	Wide rille	22
116	Rima Sirsalis	Wide rille	42
157	Rima Hesiodus	Wide rille	30
160	Rima Birt	Rille near Rupes Recta	50
Rimae (Network of Rilles)			
6	Rimae Plato	Rilles E of crater Plato	10
29	Rimae Burg	Rilles next to 40km crater Burg	10
32	Rimae Atlas	Rilles within crater Atlas	60
77	Rimae Menelaus	Rilles near crater Menelaus	14
78	Rimae Plinius	Rilles near crater Plinius	12
87	Rimae Hevelius	Rilles inside and S of Hevelius	19
101	Rimae Triesnecker	Rilles	20
107	Rimae Hypatia	Rilles	18
121	Rimae Gassendi	Rilles within crater Gassendi	17
137	Rimae Gutenberg	System of wide rilles	33
139	Rimae Goclenius	System of wide rilles	24
151	Rimae Hippalus	Rilles	24
188	Rimae Janssen	Rilles on floor of crater Janssen	14

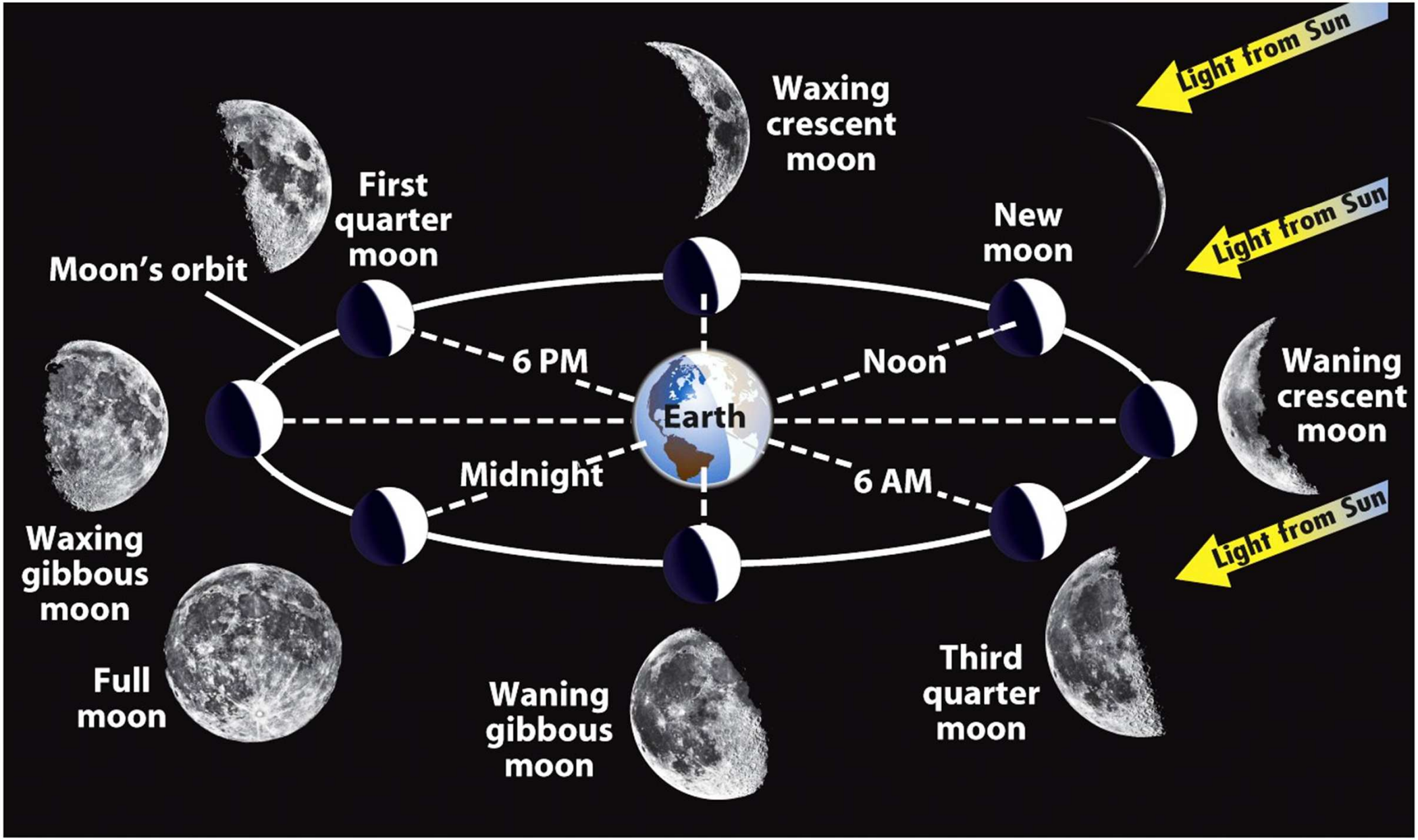
Large Lunar Maps

- http://cseligman.com/text/moons/moonmap.htm

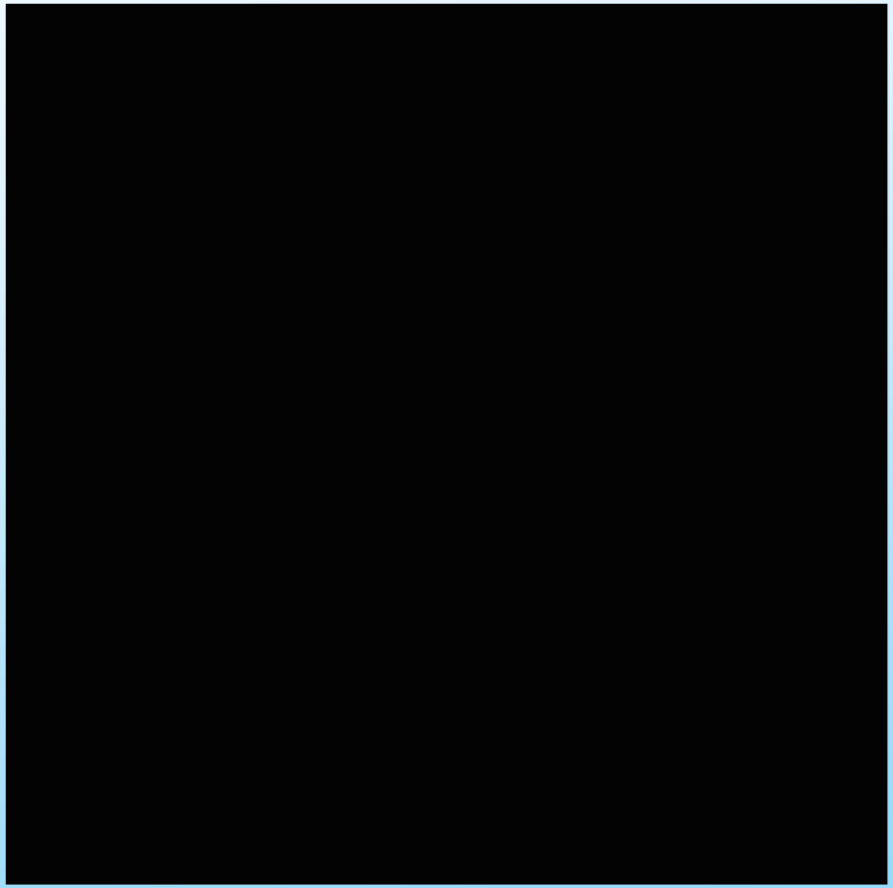




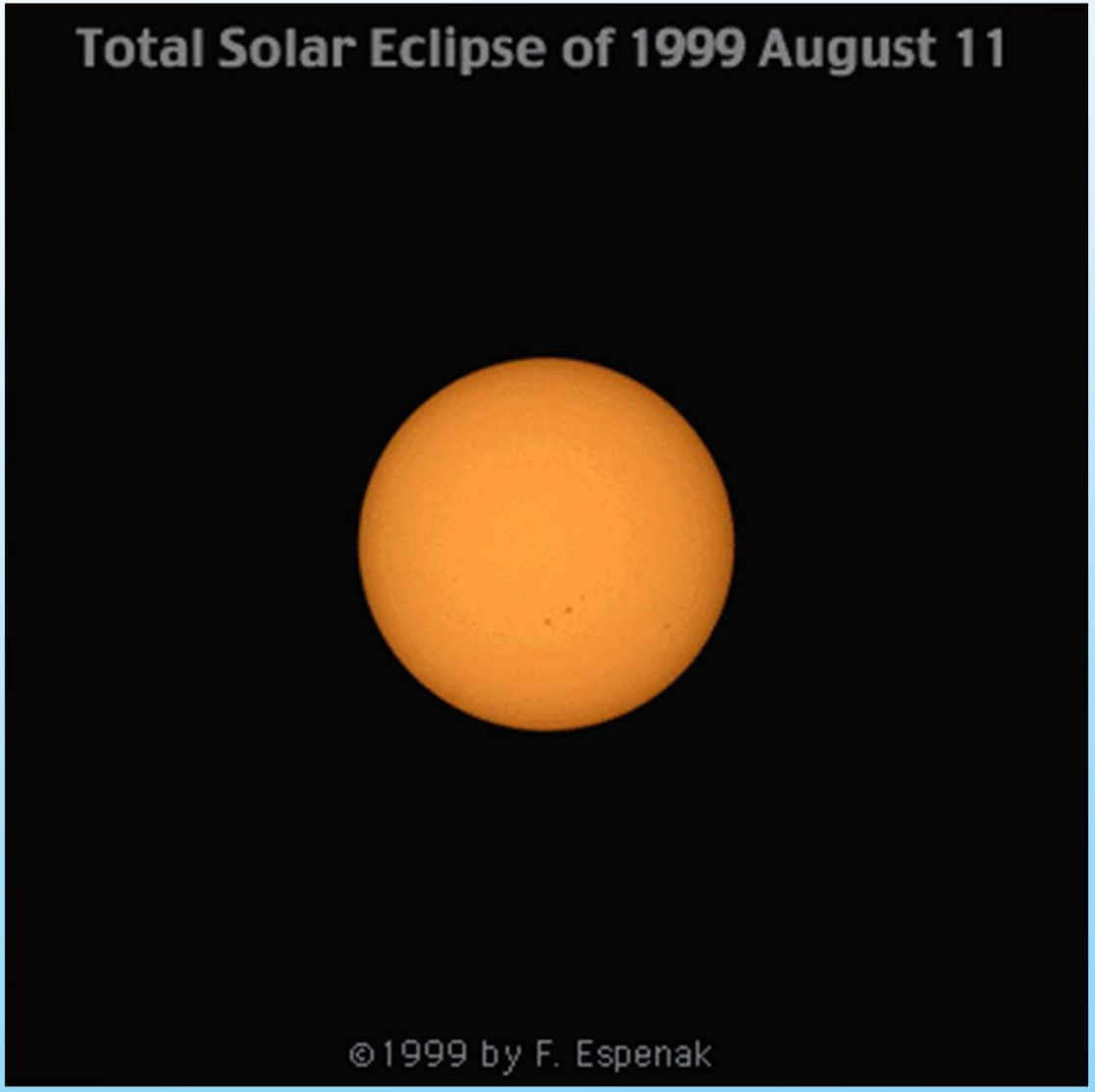
Phases of the Moon



Phases of the Moon

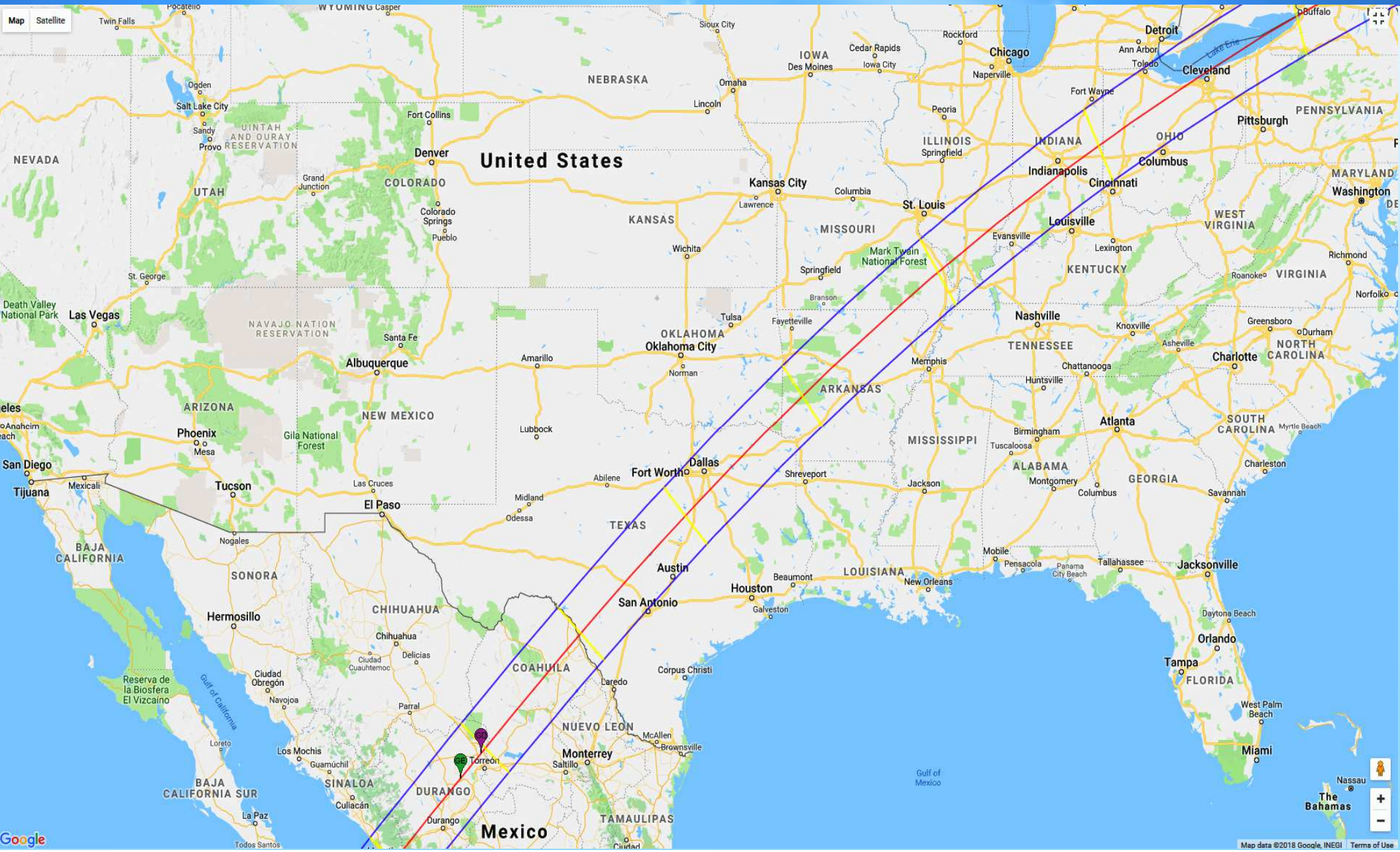


Solar Eclipse



Total Solar Eclipse, Aug. 21, 2017

Solar Eclipse April 8, 2024



Solar Filter Viewers

Lunar Eclipse

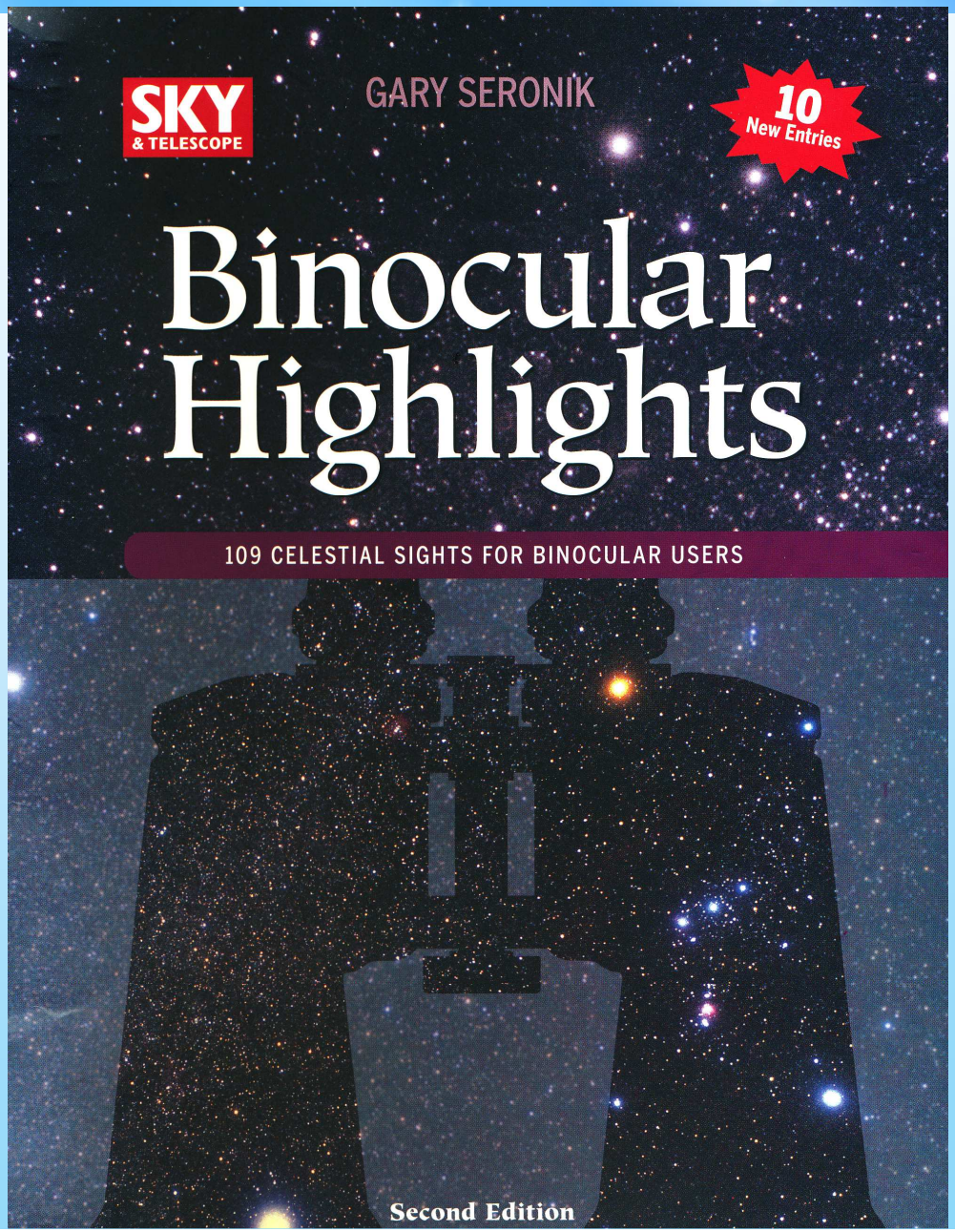
Lunar Joke

What do you think of that new restaurant on the moon?

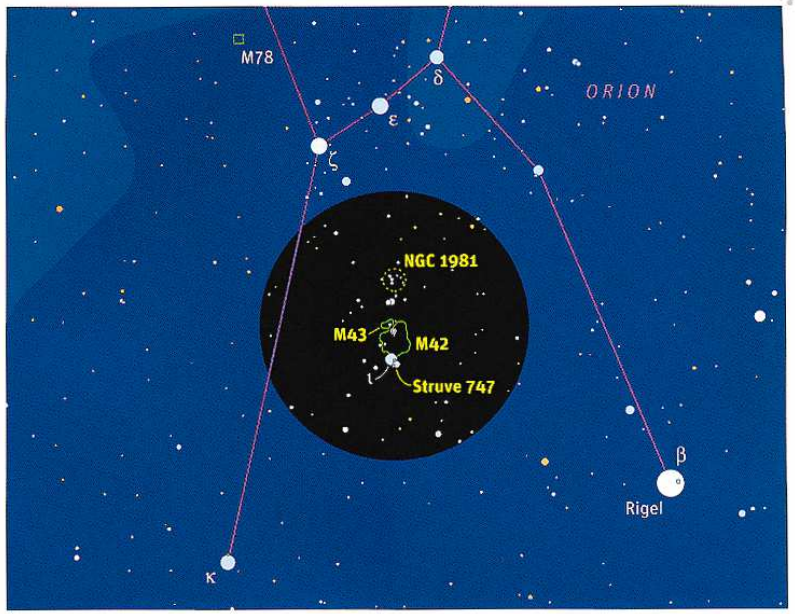
The food’s great but it has no atmosphere.

BINOCULARS AND GUIDES

Binocular Highlights, 2nd Ed.



DSOs for Binoculars-I



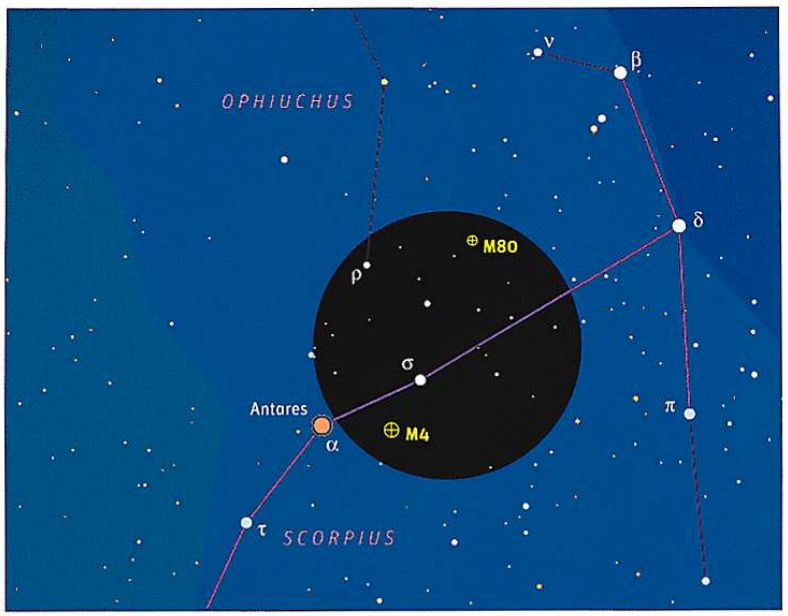
Orion's Sword

Few binocular sights pack as great a visual impact as Orion's Sword. Who could look at this collection of glittering stars and glowing nebulosity and fail to be impressed? Granted, nothing beats the sight of the Orion Nebula, M42, in a good telescope, but the binocular view provides a context — showing not only the nebula itself, but the entire neighborhood it calls home. And an attractive home it is indeed!

Orion's Sword is really three highlights in one. Of course the center of attention is M42 itself. Even under poor conditions, this nebular mist can be seen enshrouding three points of light. These are the Trapezium (its four main stars reduced to a single 5th-magnitude blip by the low magnification of binoculars), 5th-magnitude θ² (Theta²) Orionis, and its 6th-magnitude neighbor to the east. Together they are an arresting sight worthy of the accolades heaped upon them.

Due south of M42 lies Iota (ι) Orionis. At magnitude 2.8 it is the brightest star in the field of view, but look carefully at the star lying 8′ southwest. Notice anything? This is the double star Struve 747. In my 10 × 50 binoculars I can just split this pair of 4.8- and 5.7-magnitude suns — but only when I use a tripod to steady the view. My 15 × 45 image-stabilized binos have an easy time resolving the double.

The northernmost attraction in Orion's Sword is the loose open cluster NGC 1981. Even under bright suburban skies, steadily held 10× binoculars show a handful of cluster stars. Although this grouping is often overlooked because of its showier neighbor, it's an attractive cluster worth a long, careful look.



Globular Cluster Season

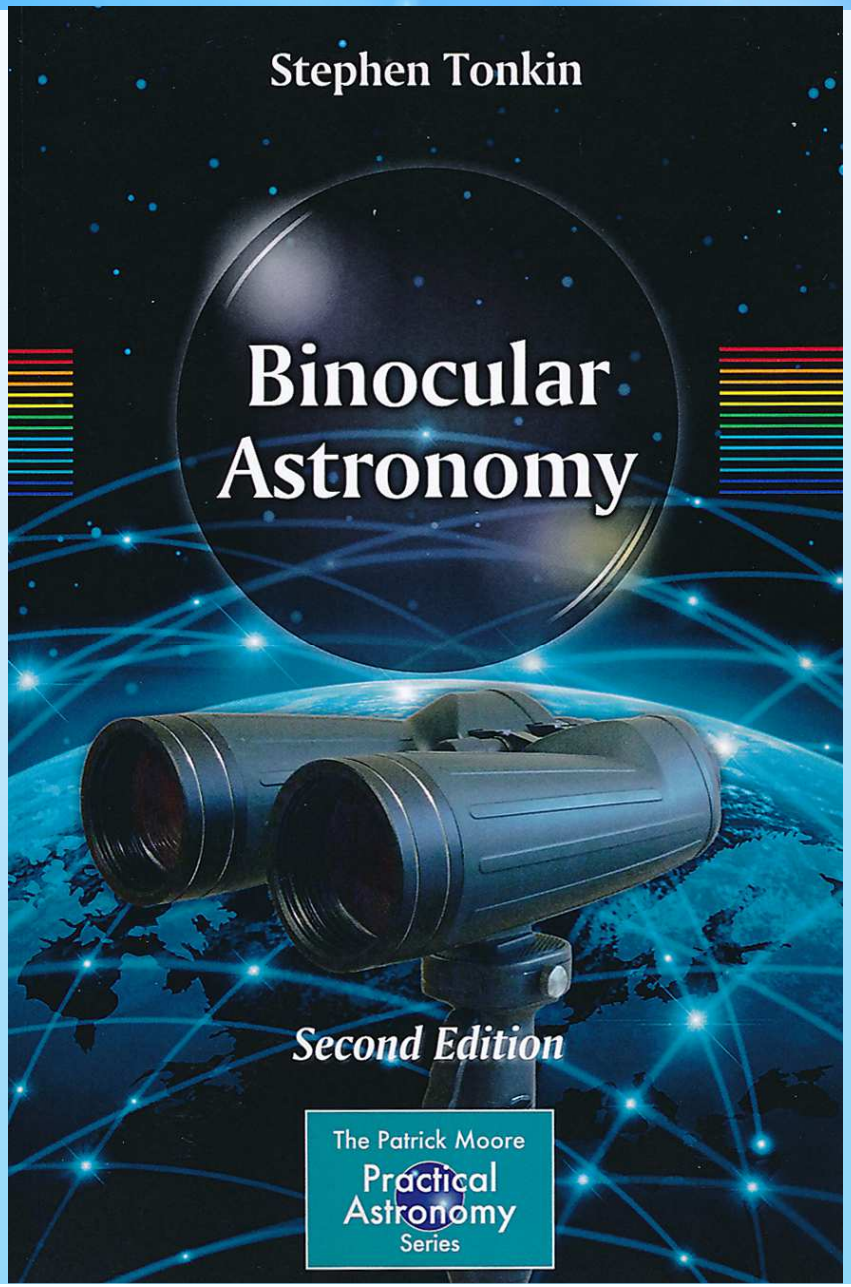
The Milky Way is home to more than 150 globular star clusters, of which 125 culminate more than 10° above the horizon at midnorthern latitudes. Of course, most of these will be too faint to see in standard binoculars. But how many can an experienced observer using steadily mounted 10 × 50 binoculars under a dark sky actually see? I suspect the answer lies somewhere between 50 and 67, which corresponds to cluster brightness limits of 9th and 10th magnitude, respectively. (Interestingly, all but 2 of the 67 are visible on July evenings.) Observers under excellent skies and using 10× binoculars will bag more than those using 7× binos under less ideal conditions, but these numbers are really only a crude estimate because so many variables come into play.

Of course, a cluster's limiting magnitude is only part of the story — the vast majority of these globulars will also appear stellar in binoculars. The pair of M4 and M80 near Antares illustrates what you're up against. M4 looks obviously nonstellar even in 7× binoculars. Not only does this cluster appear bigger than most other globulars, it lacks a distinctive, compact, starlike core. M4's unusual appearance is both a blessing and a curse. Its large apparent size and diffuse nature make it an obvious standout under dark skies, but in light-polluted conditions the lack of a condensed core can make the cluster difficult to see.

M4's neighbor, M80, is much smaller and fainter and, as such, more typical of the breed. Look closely at this cluster and keep in mind that most other globulars are both smaller and fainter still. Spotting most of them will be challenging and will require patience and careful star-hopping.

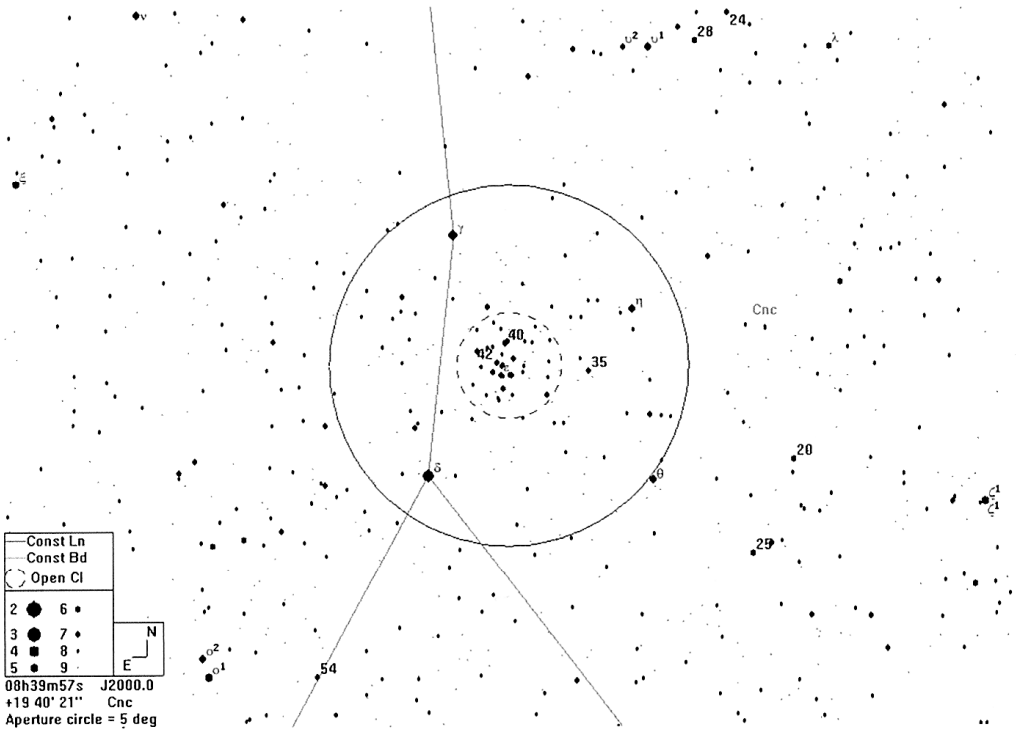
So, how many globulars can you find?

Binocular Astronomy 2nd Ed.



DSOs for Binoculars-II

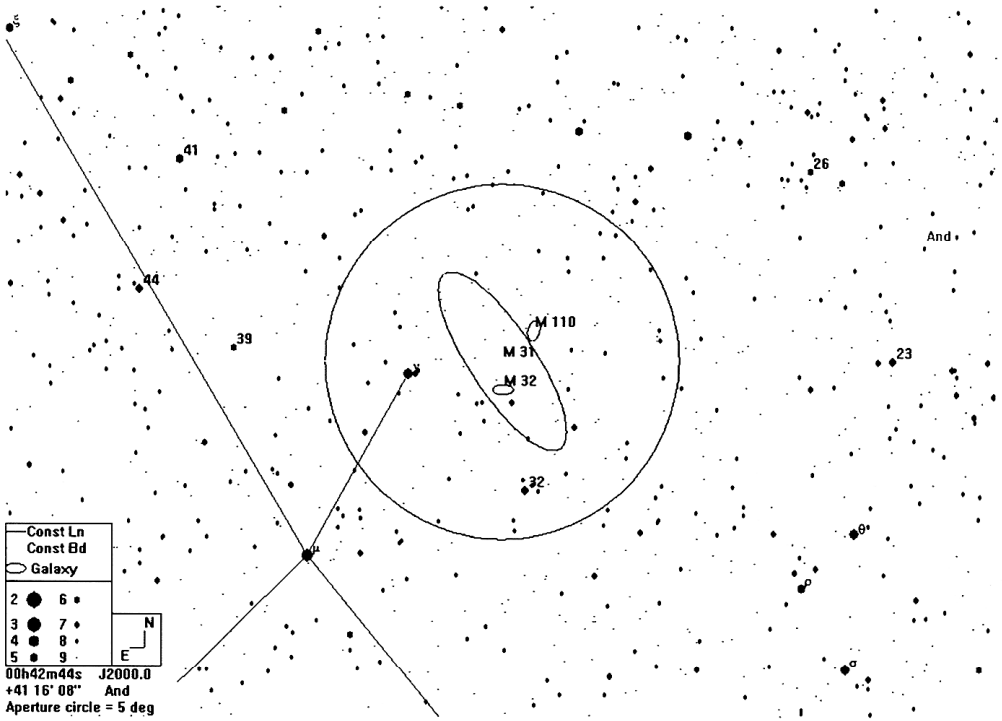
Cancer: Open Cluster: M44 (NGC 2632, *Praesepe*, the *Beehive Cluster*) (50 mm)



M44, which is visible to the naked eye, is in the same 5° field as **γ**, **δ**, and **η Cancri** and contains **ε Cnc**.

The Beehive is a very nice binocular object, in which you may be able to resolve up to 20 or so stars in 10×50 binoculars. You should also be able to resolve two binocular double stars, ADS 6915 and ADS 6921.

Andromeda: Galaxy: M31 (NGC 224, the *Great Andromeda Galaxy*) (50 mm)

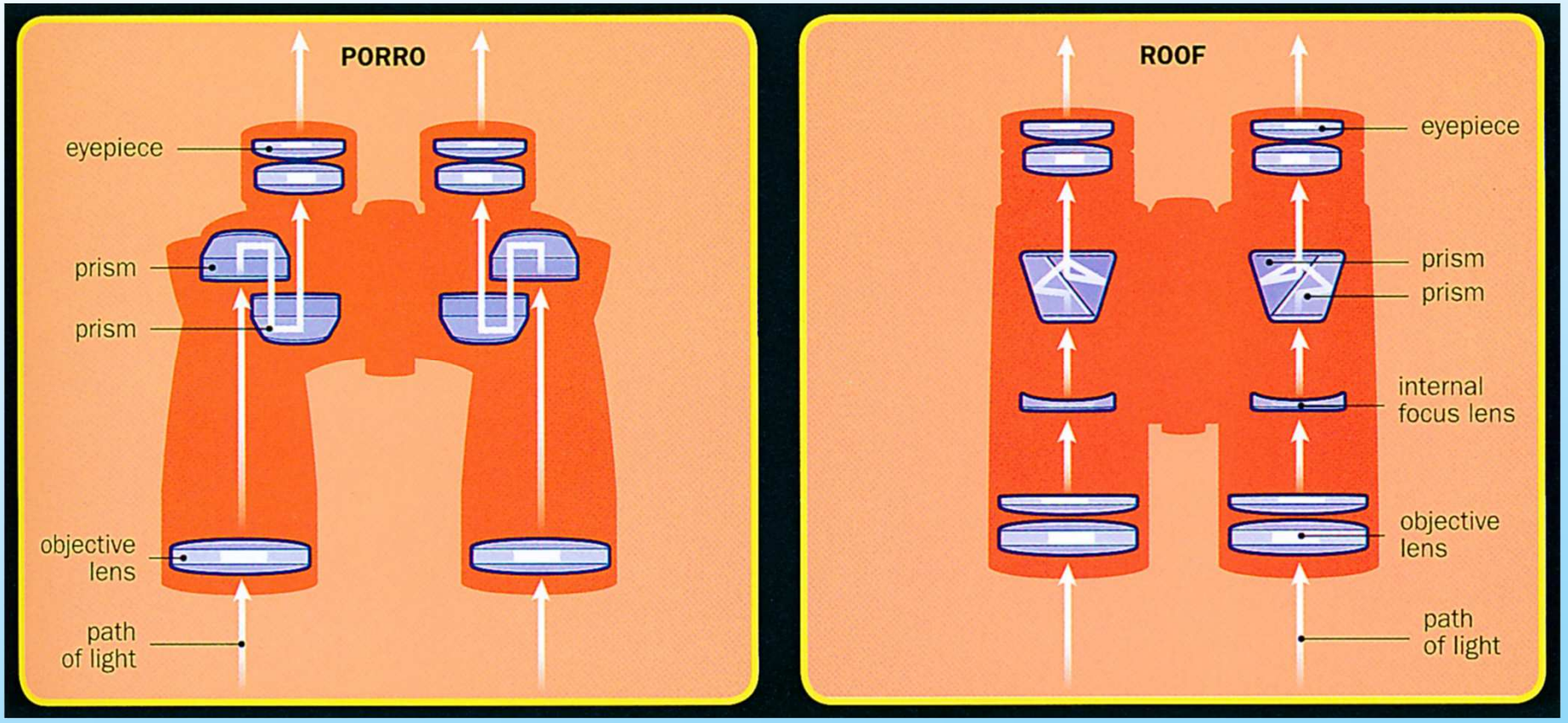


This magnitude 4.3 galaxy, which can be visible to the naked eye, is an easy star-hop from the yellowish **β And** *(Mirach)*. Place **β** near the SE edge of the field and find **μ** to the NW. Place **μ** where **β** was, and M31 will lie where **μ** was.

You should be able to see the elongated shape of M31 which, with patience and dark skies, extend almost across the field of view. Notice the significantly brighter glow of the nucleus and how the light of the galaxy drops off more abruptly at the NW edge as a consequence of a dust lane.

If you have good skies (or larger binoculars), you may be able to find the two companion galaxies. To the S of the nucleus lies M32 (NGC 221), making a right-angled

Types of Binoculars



7 x 50 vs. 10 x 50 Binoculars

15 x 70 Binoculars

Monopod vs. Tripod

Image Stabilized Binoculars

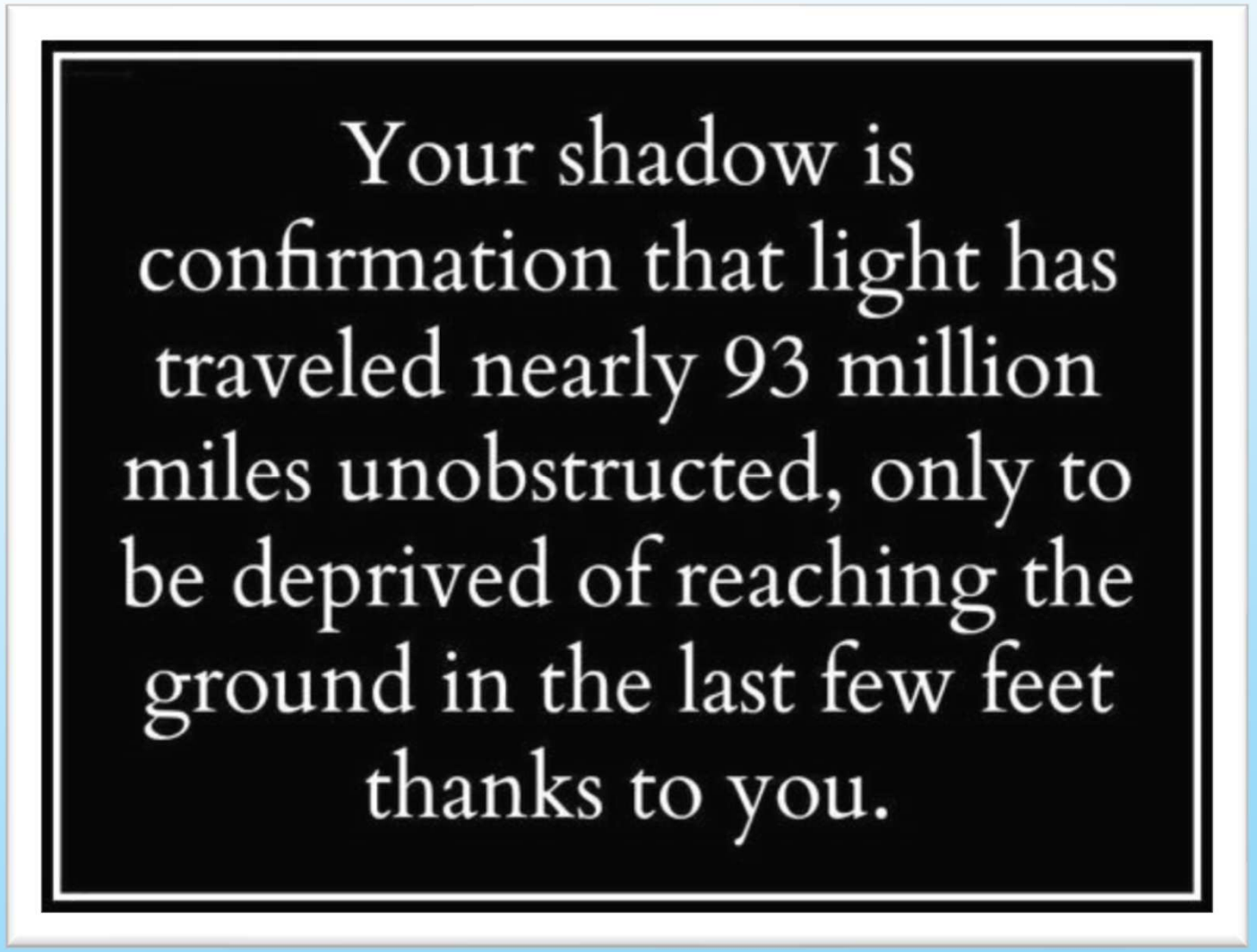
Dobsonian Reflector Telescope

Newtonian/Equatorial Mount

Schmidt-Cassegrain Telescope

Refractor Telescope

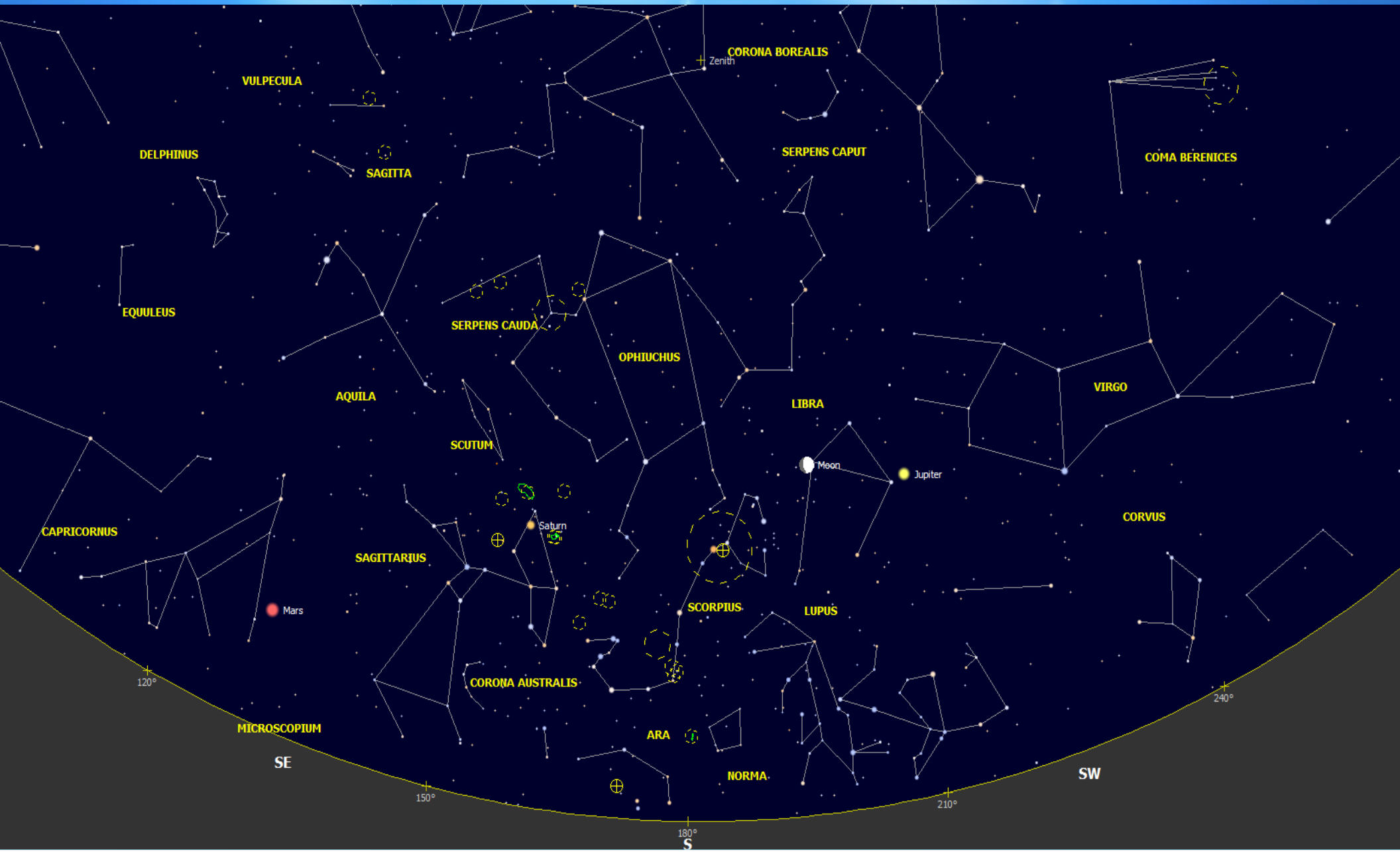
The Photon's Lament



Free Planetarium Software

- http://www.stellarium.org/en/

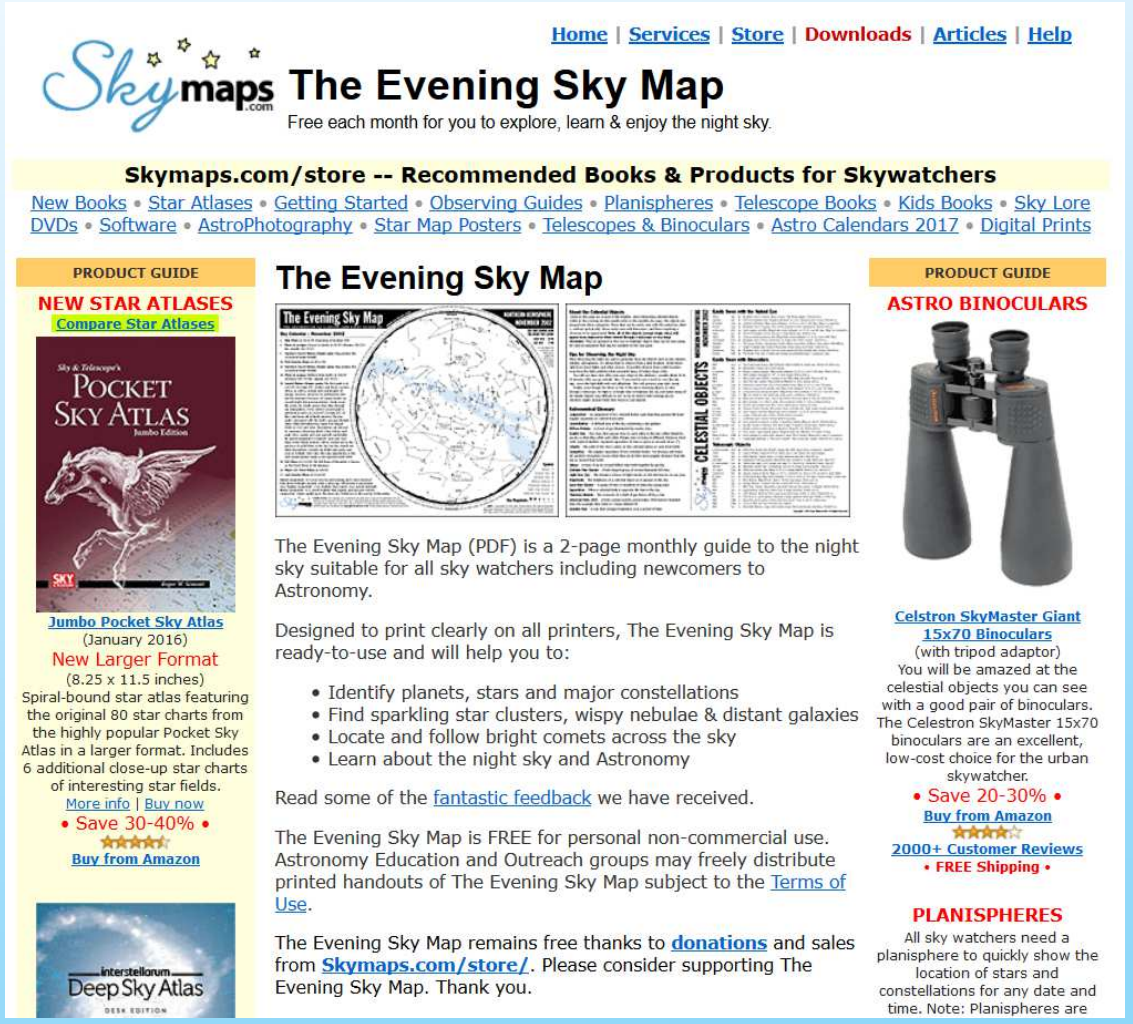
Tonight's Sky Looking South



"Sure it's beautiful, but I can't help thinking about all that interstellar dust out there."

Online Free Sky Maps

- http://www.skymaps.com/downloads.html



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PRODUCT GUIDE

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- Find sparkling star clusters, wispy nebulae & distant galaxies
- Locate and follow bright comets across the sky
- Learn about the night sky and Astronomy

Read some of the fantastic feedback we have received.

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PRODUCT GUIDE

ASTRO BINOCULARS

Celstron SkyMaster Giant 15x70 Binoculars
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You will be amazed at the celestial objects you can see with a good pair of binoculars. The Celestron SkyMaster 15x70 binoculars are an excellent, low-cost choice for the urban skywatcher.
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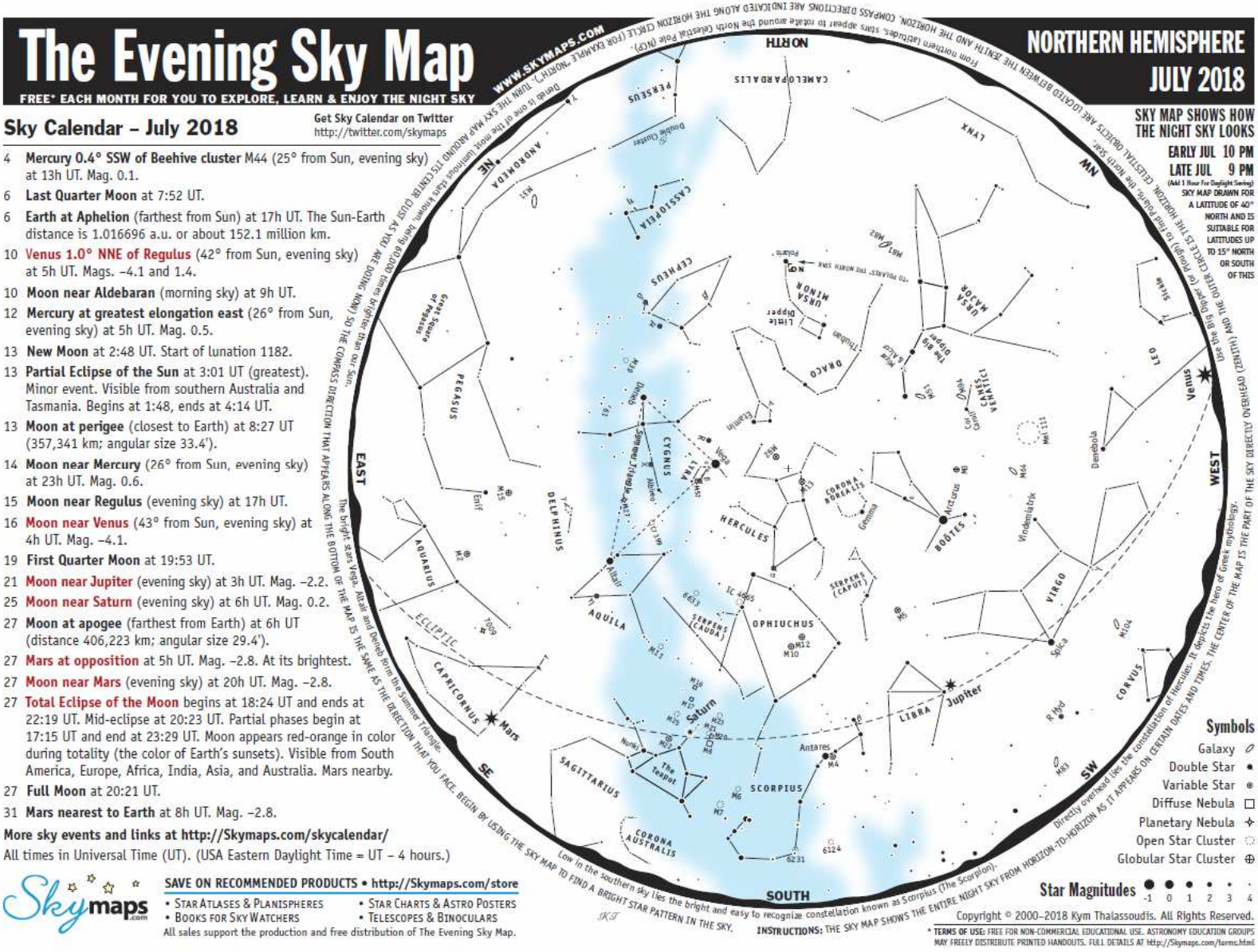
• FREE Shipping •

PLANISPHERES

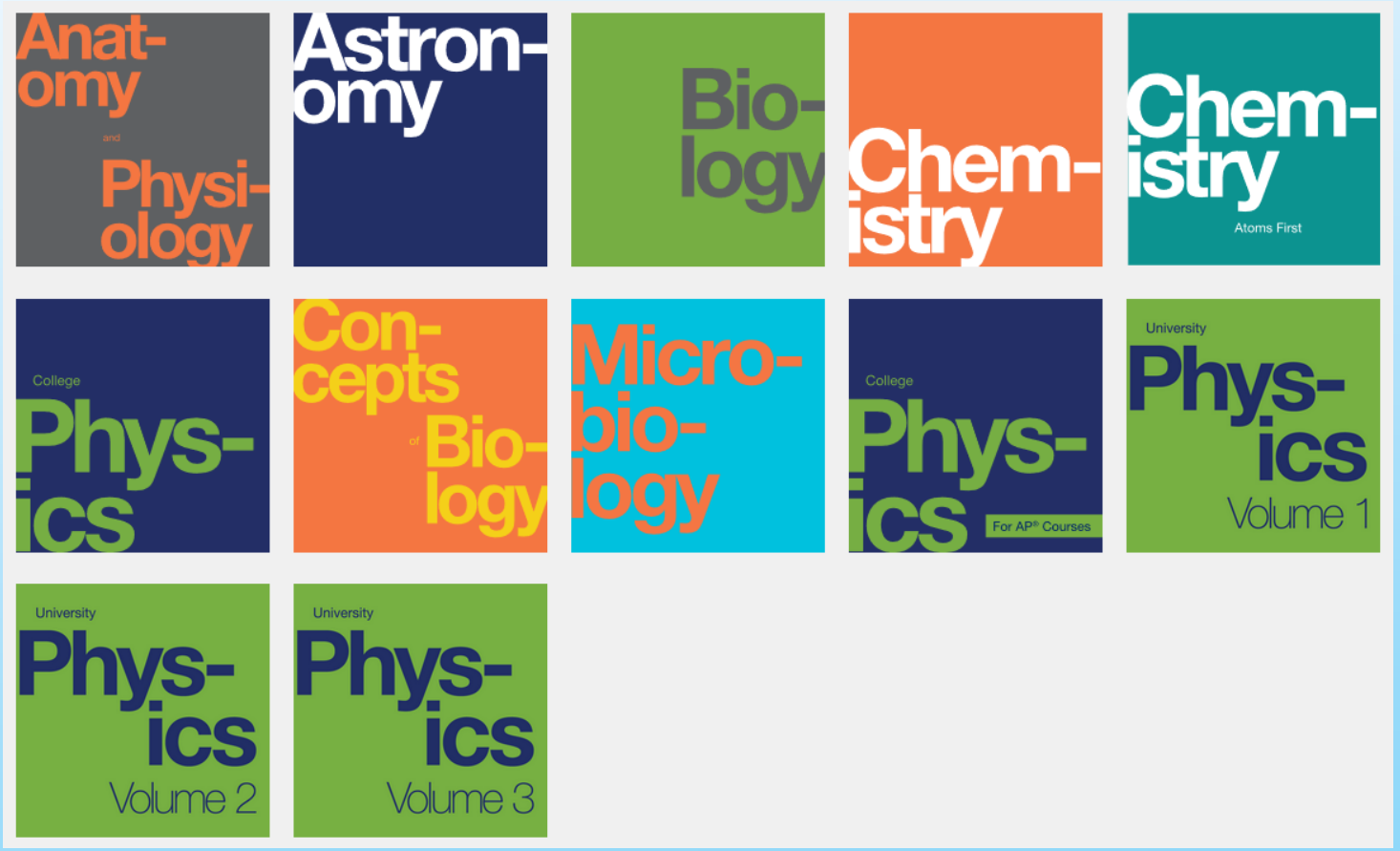
All sky watchers need a planisphere to quickly show the location of stars and constellations for any date and time. Note: Planispheres are

This Months Evening Sky Map



Free College Astronomy Book

- https://openstax.org/subjects



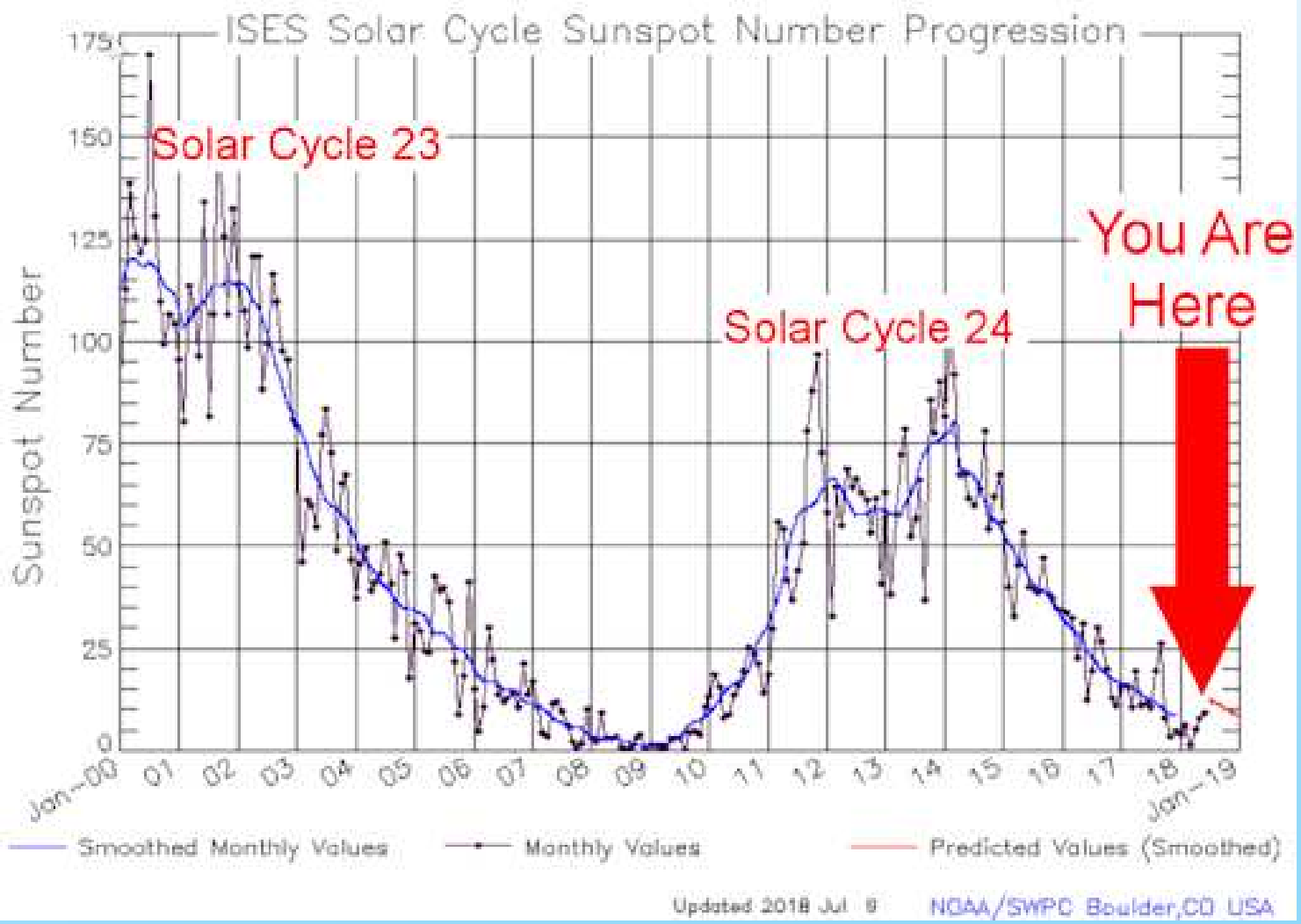
Shreveport-Bossier Astronomical Society

- http://shreveportastronomy.com/

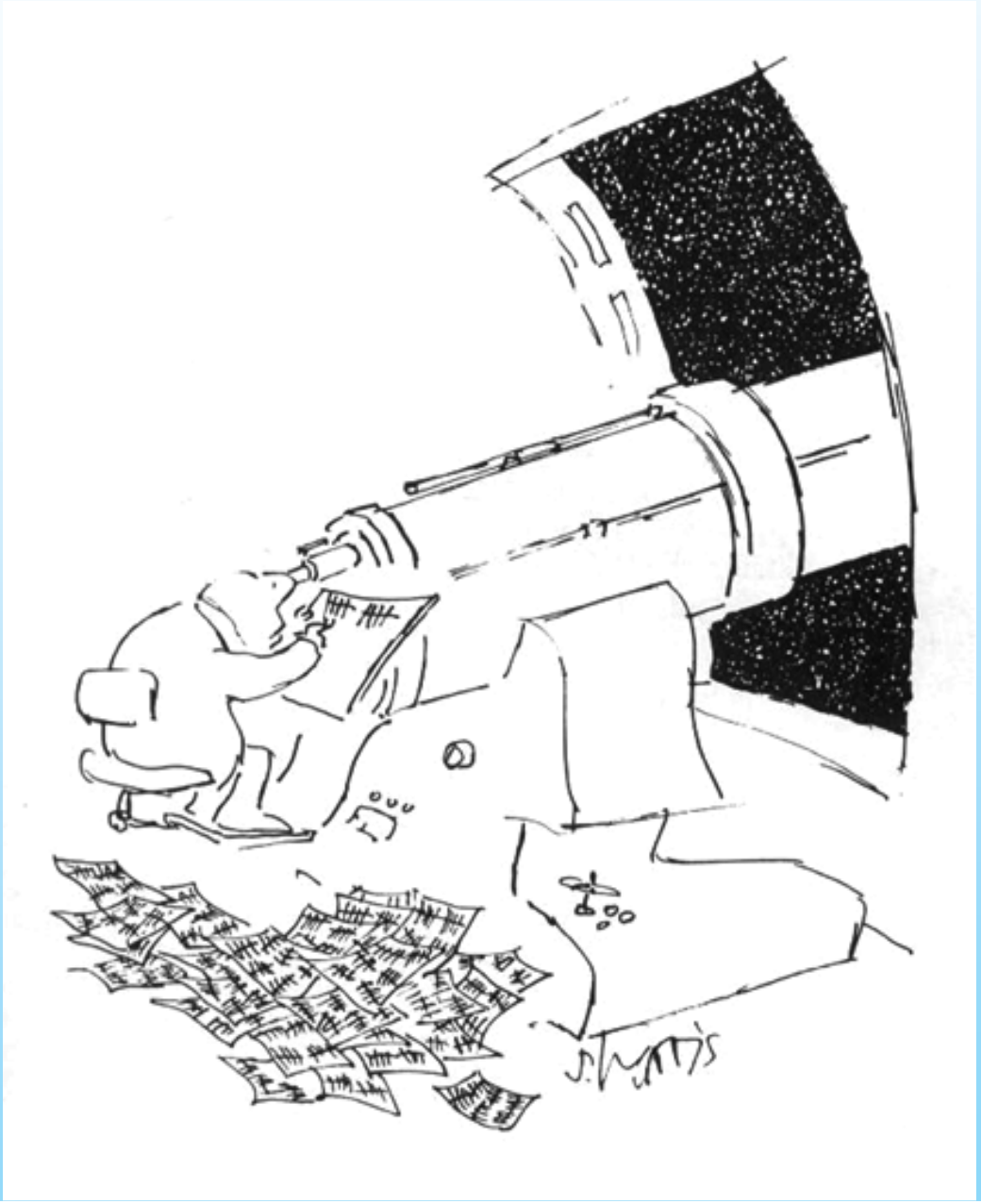
- Free public observing events ("star parties") every Spring and Fall at the Shreveport Observatory.

- Fall 2018:
  - October 13: National Astronomy Day. Evening Observing at Shreveport Observatory. Featuring the Moon, Mars, Saturn, and many other star clusters, galaxies, etc.
  - October 20: Solar observing at the Red River National Wildlife Refuge, 10am-2pm.

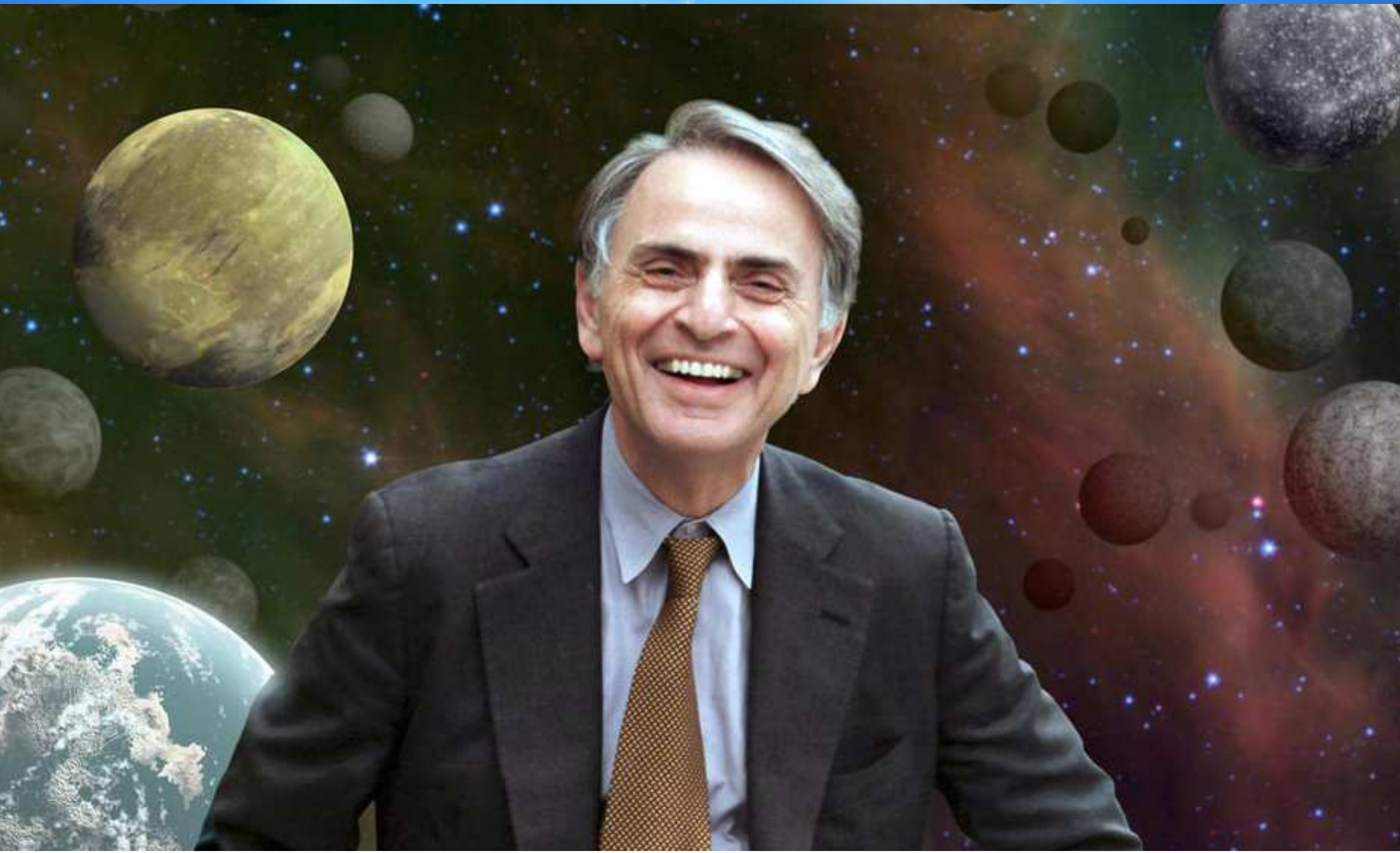
Solar Cycle Progression




ENTRY-LEVEL ASTRONOMER...
Do I have to count them, or what?
S. Morris



"The desire to be connected with the Cosmos reflects a profound reality: We are connected, not in trivial ways, but in the deepest ways.“ Carl Sagan, COSMOS




The End