STAR CHART FOR MID-LATITUDES OF THE NORTHERN HEMISPHERE

What's Out Tonight?

OPTIMIZED FOR 1½ HOURS AFTER SUNSET
but can be used after that for several more hours.

July 2027 Sky Chart

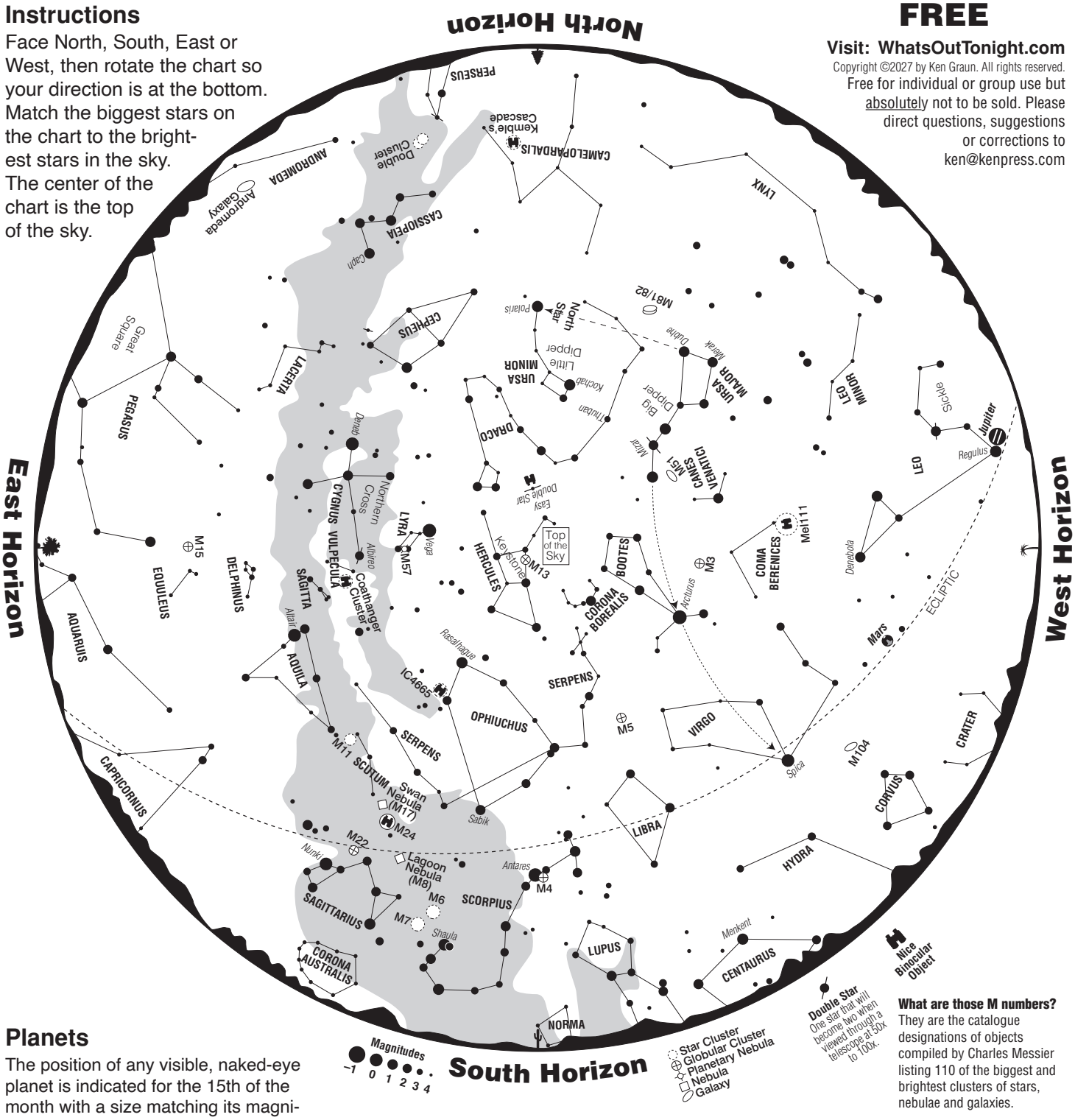
Instructions

Face North, South, East or West, then rotate the chart so your direction is at the bottom. Match the biggest stars on the chart to the brightest stars in the sky. The center of the chart is the top of the sky.

FREE

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What are those M numbers?
They are the catalogue designations of objects compiled by Charles Messier listing 110 of the biggest and brightest clusters of stars, nebulae and galaxies.

Planets

The position of any visible, naked-eye planet is indicated for the 15th of the month with a size matching its magnitude. If the planet moves significantly during a month, other positions will be noted with dates. The **ECLIPTIC** is the path of the Sun through the sky but the planets and Moon move along it, too. It passes through the constellations of the zodiac.

July 2027 Planet Notes (15th of each month)

Venus, at magnitude –3.9, rises in the east 30 minutes before the Sun. **Mars,** at magnitude +1.2, in Virgo, sets in the west at 10:30 pm. **Jupiter,** at magnitude –1.8, in Leo, sets in the west at 9 pm. **Saturn,** at magnitude +0.6, in Pisces, rises in the east at midnight.

Distances planets are from Earth the 15th of this month:
Venus: 159,000,000 miles, **Mars**: 155,000,000 miles, **Jupiter**: 575,000,000 miles, **Saturn**: 869,000,000 miles.

July Notes

At the top of the sky is HERCULES, containing the 4 stars of the Keystone and on one of its sides, the favorite globular cluster, M13. To its west side is CORONA BOREALIS and BOOTES, punuctuated by *Arcturus*. The **Big Dipper's** handle curves and points to *Arcturus* and then "speeds on" to *Spica* in VIRGO. To the east of Hercules is small LYRA and then, CYGNUS, the **Northern Cross**. The three stars, *Vega*, *Deneb* and *Altair* form the Summer Triangle. Due south, just above the horizon, is SCORPIUS and to its left SAGITTARIUS. The center to our Milky Way Galaxy lies in this direction, where a giant black hole resides. This is the thickest part of the Milky Way Band and is a great area to scan with bincoulars—you will see many interesting objects and "clumps."

SELECTED Clusters, Nebulae, Galaxies +

ly = Light Year, a unit of distance. 1 ly = 6 trillion miles.
Our Moon (and Sun) spans 30' (30 arc minutes) or 1/2°.

Albireo. This 3rd magnitude stars becomes two stars, a blue and gold splendor, in a telescope with just 50x. In CYGNUS.

Coma Cluster. Sprinkle of 40+ stars. Appears as a faint haze in dark skies. Spans 4.5°. In COMA BERENICES.

Coathanger Cluster. Ten stars that form the shape of a single-wire coathanger. In VULPECULA.

IC4665. A cluster of 30 stars that is best in binoculars. It spans an area larger than the Moon. In OPHIUCHUS.

M24 Star Cloud. Very thick patch of the Milky Way Band. Mag 3.5 / Spans 1° x 1.5°. In SAGITTARIUS.

M7. Ptolemy's Cluster. A great cluster, nice in binoculars or telescope. About 80 stars at magnitude 3.3 spaning an area lager than the Moon. Can see as a "patch" with eyes. In SCORPIUS.

M8. **Lagoon Nebula**. Distance: 4,100 ly / Diameter: 100 ly / Mag 6 / Spans 1.5°. Star being born in nebula. In SAGITTARIUS.

M11. **Wild Duck Cluster**. Distance: 6,120 ly / Stretches: 25 ly / Mag 5.8 / Spans 14'. Contains 200+ stars. In SCUTUM.

M13. Globular Cluster. Distance: 21,000 ly / Diameter: 104 ly / Mag 5.8 / Spans 17'. Contains 500,000 stars. In HERCULES.

M22. Globular Cluster. Distance: 10,400 ly / Diameter: 88 ly / Mag 5.1 / Spans 29'. 100,000+ stars. In SAGITTARIUS.

M57. **Ring Nebula** (Planetary). Distance: 1360 ly / Diameter: 0.5 to 1 ly / Mag 9 / Spans 1.3'. In LYRA. Remnants of a dying star.

M81/82. Bode's Galaxies. Visible in many light polluted skies. M82 shaped like a cigar. Mags 6.8/8.1. In URSA MAJOR.

Mizar. Two stars with good eyes or binoculars. Three stars with a telescope at 50x. Located in the handle of the Big Dipper.

Observing Tips for above Objects

If possible, observe at a dark location and when the Moon is not bright. A bright Moon will make it more difficult to see the stars and impossible to see clusters, nebulae and galaxies. Only a small telescope at lower magnifications, around 50x, is required to see the objects listed above. The planets and Moon are best observed with a telescope around 50x or more! To get a feel for the size of objects, the Moon extends 30' (30 arc minutes). The binocular objects are best with binoculars because these objects are large in size—telescopes have too much magnification.

Meteor Showers

The **Southern Delta AQUARIDS** peak around **July 29** with 20 meteors/hour.

Brightest Stars

Antares. In SCORPIUS. Magnitude +1.1. Distance: 604 ly. Diameter: 300 times the Sun's. Red Supergiant.

Altair. In AQUILA. Magnitude +0.9. Distance: 17 ly. It has a mass 1.75 times and brightness 11 times that of our Sun.

Arcturus. In BOOTES. Magnitude –0.04. Distance: 37 ly. Diameter: 26 times the Sun's. It's an Orange Giant.

Deneb. In CYGNUS. Magnitude +1.3. Distance:about1500 ly. Burning fast & might supernova in a few million years.

Polaris. In URSA MINOR. Magnitude +2. Distance: 431 ly. 2,400 times brighter than the Sun. Supergiant star.

Thuban. In DRACO. This "inconspicious" magnitude +3.7 star was, 4740 years ago, the North Star. Notice that the inside two stars of the Big Dipper point to Thuban.

Spica. In VIRGO. Magnitude +1.1. Distance: 262 ly. Actually two close stars revolving around each other in 4 days.

Vega. In LYRA. Magnitude +0.0. Distance: 25 ly. Rotates on axis once ever 12.5 hours. Mass is about 2.3 times our Sun.

July Mythology

FOR THE CENTRAL CONSTELLATIONS, NORTH TO SOUTH

Arcas and his beautiful mother, Callisto were turned into the Little and Big Bears, **URSA MINOR** and **MAJOR** because of jealous Juno, wife of promiscuous Jupiter.

During a war between the Titans and Olympians, **DRACO**, the Dragon was flung to the North and frozen in place by the cold.

CANES VENATICI are the Hunting Dogs of **BOOTES** who is sometimes seen as a Ploughman. **CORONA BOREALIS** is the crown of Bacchus, the god of wine.

HERCULES, the Strongman, was tasked with 12 labors to fulfill for a virtuous life.

LYRA, the Lyre was invented by Mercury and mastered by Apollo's son, Orpheus whose music had magical powers.

AQUILA is Jupiter's Eagle that carries out tasks. **SAGITTARIUS**, the Archer is a warlike centaur.

CYGNUS, the Swan helped Helios find the pieces of his son, having fallen from the chariot that pulls the Sun across the sky.

Mother Earth lets the Scorpion, **SCORPIUS** crawl out of the great Milky Way crack to kill Orion, for boasting, but it is kept at bay by **OPHIUCHUS**, a Healer handling the Snake, **SERPENS** that has medicinal powers. **LIBRA**, the Scales, weighs the length of day and night.

When **VIRGO**, the Virgin is in the night sky, crops grow. The growing season ends when, in the early evening, she sets on the western horizon.

Moon Phases

● **New Moon**. Saturday, **July 3**, 10:02 pm, CDT
◗ **First Quarter**. Saturday, **July 10**, 1:39 pm, CDT
○ **Full Moon**. SUnday, **July 18**, 10:44 am, CDT
◖ **Third or Last Quarter**. Monday, **July 26**, 11:54 am, CDT

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July 2027 Sky Chart

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What's Out Tonight? • Sky Chart Supplement

Clusters, Nebulae & Galaxies

An **Open Cluster** is a group of several to hundreds of stars that were born out of the same nebula cloud. A group often forms a pretty pattern. The Pleiades and Praesepe are great examples. Open clusters reside in our Milky Way Galaxy. Our Sun is no longer in its group.

Globular Clusters look like fuzzy balls because they contain tens of thousands stars held together by their mutual gravity. There are 150+ of them that surround our Milky Way Galaxy like a halo—about 30 brigher ones visible from the northern hemisphere. M22 in SAGITTARIUS and M13 in HERCULES are favorites.

A **Planetary Nebula** is an old term that has nothing to do with the planets. Instead, it is a round or symmetrical nebula that is the shed atmosphere of a dying star. At its center is a white dwarf star. When our Sun dies, it will create a planetary nebula. These objects have diameters of a few light years and are located in our galaxy. The Ring Nebula, M57, in LYRA is a favorite.

A **Nebula** is a giant hydrogen gas cloud that is located in our galaxy. Within these clouds, concentrations of gas can occur and gravitationally condense to form stars and accompanying planets. A set of stars created by a nebula is known as an Open Cluster. The Orion Nebula, M42 is a favorite.

Galaxies contain billions of stars. All galaxies are beyond our Milky Way Galaxy, where our Sun resides. When you are observing a galaxy, you are looking through our galaxy into the true depths of the universe. The Andromeda Galaxy, M31 can be seen with the naked eye.

At arm's length...

One thumb width is 4 Moon diameters.



Orion's height is one hand span.



The width of a fist spans the Big Dipper's bowl.

Double Stars

A Double Star is a star that looks like one star but when magnified sufficiently (from 6x to 200x+), it separates into two or more stars. Some are very pretty because of contrasting colors. *Castor* in GEMINI is a favorite and *Albireo* in CYGNUS is very much enjoyed for its blue & gold colors.

Moon

Starting from New Moon, the Moon cycles through phases every 29 days, 12 hours, 44 minutes, 3 seconds. It is 2,160 miles in diameter and averages 239,000 miles from Earth. A New Moon is not visible in the sky because the Moon is positioned very close to the Sun. Solar eclipses occur at New Moon. The best time to observe the Moon is during a phase because the craters appear their sharpest near the terminator, the line that separates the lighted side (day side) from the dark side (night side).

Cycle of Moon Phases



Planets

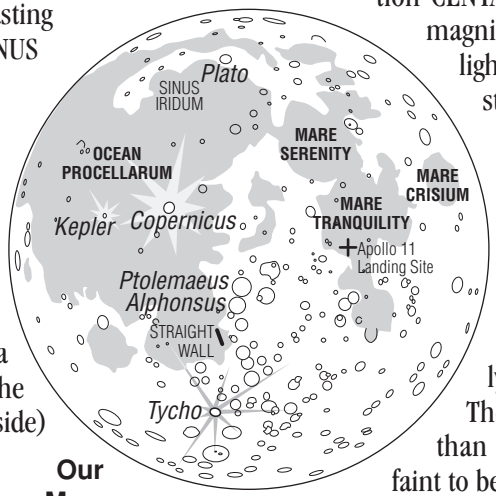
The planets are best observed with a telescope using magnifications from 50x to 250x but 100x+ is dependent on a steady night sky. The five naked-eye planets are Mercury, Venus, Mars, Jupiter and Saturn. Venus is the brightest "star" and hangs close to the Sun, so you see it for a short time in the west after sunset or in the east before sunrise. Jupiter can be out all night and always outshines any star. Everyone enjoys its cloud bands and four Galilean moons that are easily visible at 50x and possible with well-focused binoculars. Saturn has its beautiful rings. Mars gets close to Earth every 2 years at which time it is very bright. This is the best time to observe it but you need higher magnifications around 150x+ to more easily see the surface coloration.

	Diameter In Miles	Rotation Its Day	Distance from Sun In Miles	Revolution Its Year
SUN	865,000	30 days	—	—
MERCURY	**3,032**	**59 days**	**36,000,000**	**88 days**
VENUS	7,521	243 days	67,000,000	225 days
EARTH	**7,926**	**24 hours**	**93,000,000**	**365 days**
MARS	4,228	24.6 hours	142,000,000	687 days
JUPITER	**88,844**	**9.8 hours**	**484,000,000**	**11.8 years**
SATURN	74,900	10.2 hours	887,000,000	29 years
URANUS	**31,764**	**17.9 hours**	**1,800,000,000**	**84 years**
NEPTUNE	30,777	19.2 hours	2,800,000,000	164 years
PLUTO*	**1,433**	**6.4 days**	**3,700,000,000**	**248 years**

*Demoted to a Dwarf Planet in 2006 because it is part of an outer debris field.

Light Year (ly) & Nearest Stars

A Light Year (ly) is a *unit of length* and is equal to the distance light travels in 1 year. Since light moves at the speed of 186,282 miles a second, 1 light year is nearly 6 trillion miles long. The closest star visible to the naked eye is the southern hemisphere *Alpha* (α) *Centauri* or *Rigel Kentaurus* in the constellation CENTAURUS. It shines brightly at magnitude –0.27 and is just 4.4 light years away. The very closest star is *Proxima* in CENTAURUS at just 4.22 ly away but at magnitude +11, it's too faint to see with the eyes. The second closest star visible to the naked eye is *Sirius* at 8.6 ly followed by *Epsilon* (ε) *Eridani* at 10.5 ly and *Procyon* at 11.4 ly. There are several stars closer than these three but they are too faint to be seen with the naked eye.



Our Moon

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More Celestial Tidbit about . . .

. . . the M-number Designations.

The Frenchman, Charles Messier, from Paris, during the mid-1700s compiled the very first catalogue of what is known today as Deep Sky Objects, which are clusters of stars, nebulae and galaxies. As the leading observational astronomer of his time he catalogued these non-stellar objects because such a catalogue did not exist, discovering a total of 110. Since he was the first to compile such a catalogue, his listing included most of the biggest and brightest objects that can be seen from the northern hemisphere—he used the equivalent of 4-inch diameter telescopes. Even though there are other, more comprehensive catalogues, Messier's is still used today but with an added M placed in front of his numbering. His catalogue serves beginning amateurs well as a first foray into observing Deep Sky Objects.

. . . the Constellations.

There are a total of 88 constellations in the sky. Each constellation has a boundary. If you include the boundary areas, CRUX (visible from the southern hemisphere) occupies the least area and HYDRA the most.

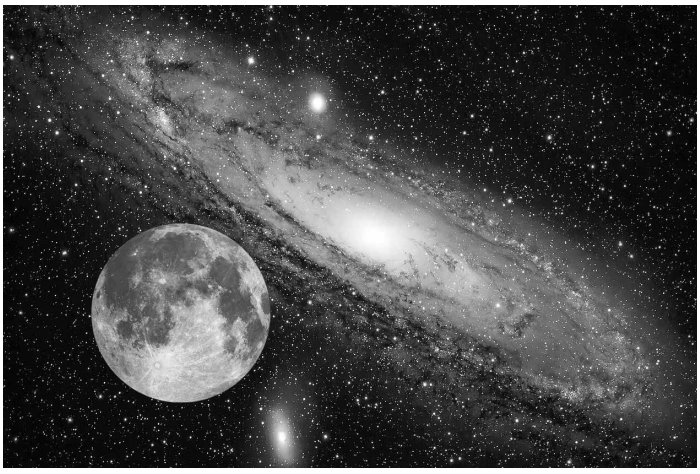
SERPENS is the only constellation that is split between two parts of the sky—on opposite sides of OPHIUCHUS. The eastern part is known as SERPENS Cauda (Cauda means tail) and the western part is known as SERPENS Caput (Caput means head).

In the northern hemisphere, we use the same constellations described by (visible to) the ancient Greeks, but a few have been added since then.

Brightest Naked-eye Stars

	CONSTELLATION	MAG.
Sun		**–26.73**
[Full Moon]		–12.7
[Venus] average brightness		**–4.1**
[Jupiter] average brightness		–2.2
Sirius	**Canis Major**	**–1.46**
Canopus*	Carina	–0.72
Arcturus	**Bootes**	**–0.04**
Rigel Kent*	Centaurus	–0.27
[Saturn] average brightness		**0.0**
Vega	Lyra	+0.03
Capella	**Auriga**	**+0.08**
Rigel	Orion	+0.11
[Mercury] average brightness		**+0.23**
Procyon	Canis Minor	+0.34
Achernar*	**Eridanus**	**+0.50**
[Mars] average brightness		+1.0

*Southern Hemisphere



The Moon and the Andromeda Galaxy never get this close to one another in the sky, but this photo shows their comparative size. If Andromeda was very bright, as pictured, it would take 6 Moons to span its length. This image of the galaxy does not show the extremities of the galaxy. Many galaxies and nebulae span an area in the sky greater than that of the Moon, but because they are very faint, this evades attention and these faint objects do seem smaller than the Moon when viewed in a telescope—but they are not!

. . . the Stars.

The names of many stars are derived from Arabic. About 5,000 stars can be seen with the naked eyes—this includes both hemispheres. With a good dark sky, many people can see to about magnitude +6. Stars twinkle because of turbulence in the atmosphere and twinkle most when low in the sky because their pinpoint light gets easily refracted from different and moving layers of the atmosphere.

Greek Star Designations. Many of the "brighter" stars in the northern hemisphere have an associated lowercase Greek letter designation. This starts anew with each constellation and usually with the brightest star designated alpha (α) and so on down the line. Of course, many of these designated stars are named, too. These Greek letter designations were assigned by Johann Bayer in the early 1600s.

. . . the Milky Way.

The Milky Way Band is the faint glow from most stars that make up our Milky Way Galaxy. Our Sun and its accompanying solar system reside in the Milky Way Galaxy, which consists of hundreds of billions of stars all gravitationally bound to one another. The shape of our galaxy is that of a flat dish with a central bulge and having an overall diameter of around 100,000 light years. The direction to the center of our galaxy is between the constellations SAGITTARIUS and SCORPIUS, which happens to be the brightest part of the Milky Way Band. The Andromeda Galaxy is in the constellation ANDROMEDA, is a companion galaxy to ours, and can just be seen with the naked eyes under dark skies. If you could see its full extent, it would span 6 Moon diameters—there are plenty of pictures on the internet of this beautiful galaxy. Our galaxy and Andromeda are part of the Local Group of about 30 galaxies—most are on the smaller size. There are a few hundred billion galaxies in the Universe.

Star Charts

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