



## December Notes

The Summer and Winter constellations teeter-totter on opposite horizons. In the west, the setting bright stars, *Deneb*, *Vega* and *Altair* form the **Summer Triangle**. At the bottom of Cygnus, the **Northern Cross**, is *Albireo*, a beautiful blue/gold double star, as seen in a telescope. In the middle of the sky is Pegasus, and its **Great Square**, with the Andromeda Galaxy nearby. In the east, the **Pleiades** are gaining height with red *Aldebaran* below and *Capella* to its left. The **Belt of Orion** hugs the horizon with *Sirius*, the brightest star rising in an hour's time.

## Clusters, Nebulae & Galaxies

ly = Light year, a unit of distance. 1 ly = 6 trillion miles.

- Alpha Persei Cluster.** Distance: 600 ly / Diameter: 31 ly / Mag 1.2 / Spans 3° / 30 stars.
- Andromeda Galaxy.** Companion to our Milky Way Galaxy. Distance: 2,400,000 ly / Diameter: 120,000 ly / Mag 3.5 / Spans 3° x 1°.
- Coathanger Cluster.** 10 stars shaped like a bar-type coathanger. It spans 2° and its stars are 150 ly away.
- Double Cluster.** Two side-by-side clusters. Distances: 7,200 ly / Diameters: 63 ly / Mag 3.5 / Span 1° / 320 stars total. Best in a telescope.
- Great Orion Nebula.** A birthplace of stars. Distance: 1,500 ly / Diameter: 30 ly / Mag 4 / Span 1x1° / Best in a telescope.
- M15.** Globular Cluster. Distance: 34,000 ly / Diameter: 122 ly / Mag 6.2 / Spans 13'.
- M11. Wild Duck Cluster.** Distance: 5,600 ly / Diameter: 23 ly / Mag 5.8 / Spans 14' / 200 stars.
- M13.** Favorite Globular Cluster. Distance: 21,000 ly / Diameter: 104 ly / Mag 5.8 / Spans 17'.
- M34.** Large Cluster. Distance: 1,400 ly / Diameter: 14 ly / Mag 5.2 / Spans 35' / 60 stars. Try with binoculars, too.
- M35.** Large Cluster. Distance: 2,800 ly / Diameter: 23 ly / Mag 5.1 / Spans 28' / 200 stars.
- M36.** Cluster. Distance: 3,700 ly / Diameter: 13 ly / Mag 6.0 / Spans 12' / 60 stars. Try with binoculars, too.
- M37.** Cluster. Distance: 4,200 ly / Diameter: 29 ly / Mag 5.6 / Spans 24' / 150 stars. Try with binoculars, too.
- M57. Ring Nebula.** Planetary Nebula that looks like a smoke ring. Smaller than what you might think. Estimated to be 1 ly in diameter and 2,000 ly away. Mag 9 / Spans 76" or 1.3'.

## Observing Tips

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 100x. 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

- GEMINIDS.** Peaks around **December 14** with 120 meteors/hour.
- URSIDS.** Peaks around **December 22** with 10+ meteors/hour.

## Brightest Stars

- Aldebaran.** In TAURUS. Magnitude +1. Distance: 65 ly. Diameter: 36 times the Sun's. Orange Giant.
- Altair.** In AQUILA. Magnitude +0.9. Distance: 19 ly. Diameter: 1.9 times the Sun's.
- Capella.** In AURIGA. Magnitude +0.1. Distance: 42 ly. Diameter: 15 times the Sun's. It's actually 4 orbiting stars.
- Deneb.** In CYGNUS. Magnitude +1.3. Distance: 3200 ly. Diameter: 222 times the Sun's. Blue-White Supergiant.
- Fomalhaut.** In PISCIS AUSTRINUS. Magnitude 1.2. Distance: 25 ly. Diameter: +1.9 times the Sun's.
- Mirach.** In ANDROMEDA. Magnitude +2.1. Distance: 199 ly. Diameter: 89 times the Sun's.
- Mirfak.** In PERSEUS. Magnitude +1.8. Distance: 592 ly. Diameter: 64 times the Sun's.
- Polaris.** In URSA MINOR. Magnitude +2. Distance: 431 ly. 2,400 times brighter than the Sun. Supergiant Star.
- Vega.** In LYRA. Magnitude +0.02. Distance: 25 ly. Diameter: 2.4 times the Sun's.

## 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, who favored Callisto. During an early war between the Titans and Olympians, **DRACO**, the Dragon was flung to the North and frozen in place by the cold.

King **CEPHEUS** and Queen **CASSIOPEIA** ruled Ethiopia. Their daughter **ANDROMEDA** is being rescued by **PERSEUS** from the Sea Monster, **CETUS**. Andromeda was to be sacrificed to Cetus because Cassiopeia boasted of her and her daughter's beauty.

**CAPRICORNUS** is a "Seagoat," the partially transformed, half-goat, half-fish body of the god Pan who got scared and hurriedly escaped the monster Typhoon in order to warn Jupiter. The word panic is derived from Pan. **AQUARIUS** is the Water and Cup Bearer, a servant of the gods. **PEGASUS**, the Winged Horse is the deliverer of Jupiter's thunderbolts. **CYGNUS**, the Swan helped Helios find the pieces of his son, having fallen from the chariot that pulls the Sun across the sky. **AQUILA** is Jupiter's Eagle that carries out tasks. **LYRA**, the Lyre was invented by Mercury and mastered by Apollo's son, Orpheus whose music had magical powers. **PISCES** represents Venus and Cupid who changed themselves into Fishes tied with a length of string to stay together and escape the monster Typhoon. **ARIES**, the Ram with the golden fleece, could fly and was used by the goddess of the Nebulous Cloud, Nephelē to rescue her children.

## Moon Phases

- ☽ **First Quarter.** Wednesday, **December 4**, 12:58 am, CT
- ☾ **Full Moon.** Wednesday, **December 11**, 11:12 pm, CT
- ☾ **Third or Last Quarter.** Wednesday, **December 18**, 10:57 pm, CT
- **New Moon.** Wednesday, **December 25**, 11:13 pm, CT

## What's Out Tonight? December 2019 Sky Chart

Visit: [WhatsOutTonight.com](http://WhatsOutTonight.com)

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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. All of the globulars that can be seen in the sky are part of our Milky Way Galaxy, and there are about 200 of them that surround our galaxy like a halo. M22 in SAGITTARIUS is a northern favorite.

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.

### 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 well liked 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 200x. The five naked-eye planets are Mercury, Venus, Mars, Jupiter and Saturn. Venus is extremely bright and hugs 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 4 Galilean moons and cloud bands, easily visible at 50x. It is possible to see the moons with well-focused binoculars. Saturn is everyone's favorite because of its beautiful rings. Mars gets close to Earth about 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 see the surface coloration.

At arm's length...



One thumb width is 4 Moon diameters.



Orion's height is one hand span.



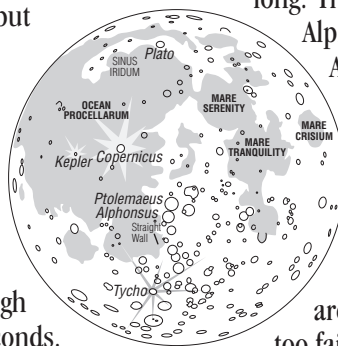
The width of a fist spans the Big Dipper's bowl.

	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

### Light Year (ly) & Nearest Stars

A Light Year (ly) is a unit of length and is equal to the distance light travels in one year. Since light moves at the speed of 186,282 miles a second, one light year is nearly 6 trillion miles long. The closest nighttime star visible to the naked eye is Alpha ( $\alpha$ ) Centauri in the constellation CENTAURUS. Alpha Centauri shines brightly at magnitude  $-0.01$  and is just 4.4 light years away. The very closest star is Proxima in CENTAURUS at just 4.22 ly away. It is too faint to see with the eyes because it shines at magnitude  $+11$ . The second closest star visible to the naked eye is Sirius at 8.6 ly followed by Epsilon ( $\epsilon$ ) 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



#### Guide to the Stars

- 11-inch diameter, ISBN 1-928771-03-3
- 16-inch diameter, ISBN 1-928771-01-7
- Equatorial, ISBN 1-928771-77-7
- Southern Hemisphere, ISBN 1-928771-11-4
- Kid's, ISBN 1-928771-22-X

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## What's Out Tonight?

### Sky Charts

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