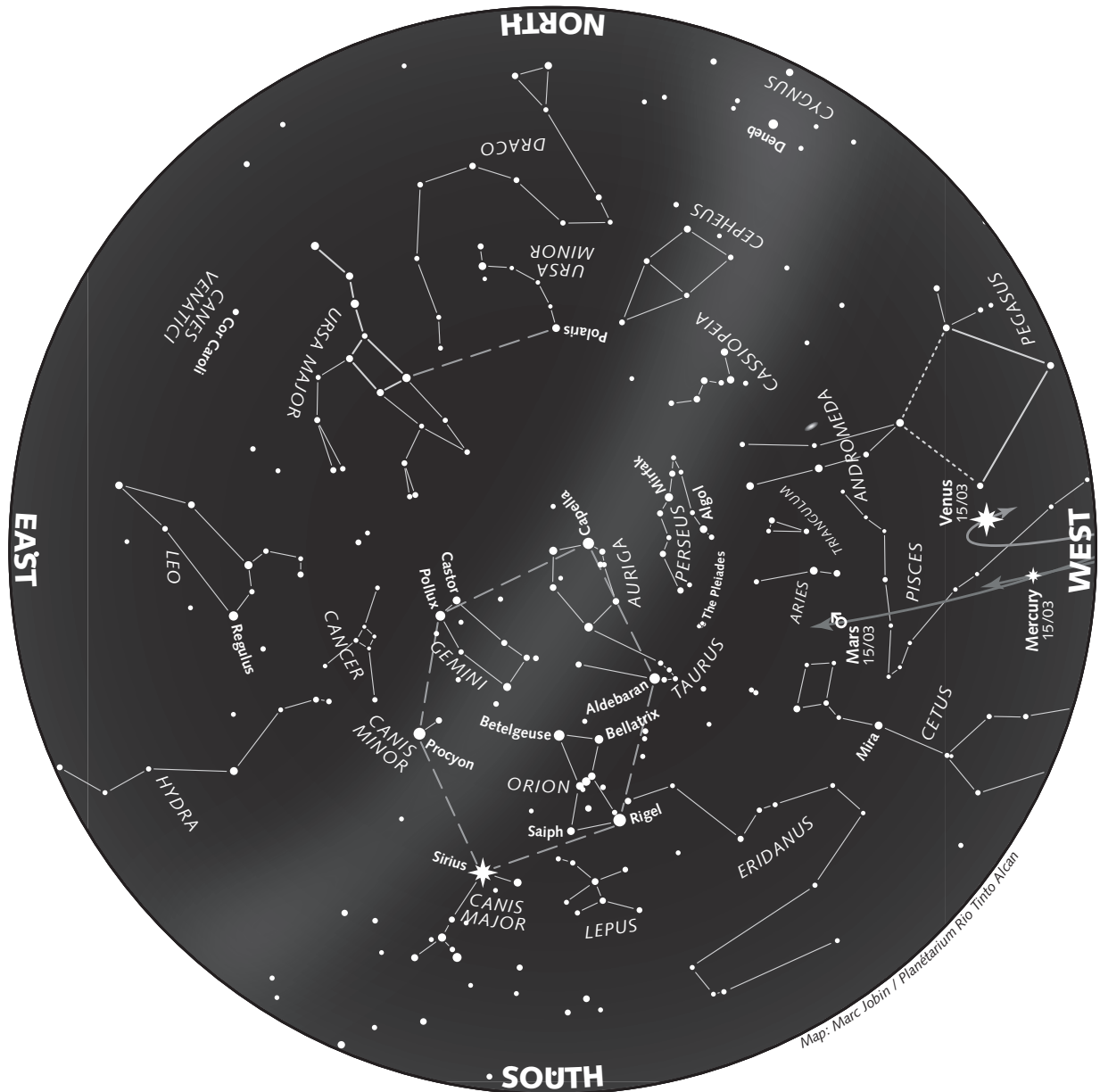


The Starry Sky — Winter 2016–17



How to Use this Map

The above map represents the night sky as it appears at the indicated times, and remains usable several hours before and after.

Hold the map up to the sky in front of you and turn it so the direction you are facing appears at the bottom. Lines identify the constellations. The light-coloured area outlines the Milky Way.

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This Star Map is Accurate on...

(Eastern Standard Time)

- December 21 at midnight
- January 6 at 11 p.m.
- January 21 at 10 p.m.
- February 6 at 9 p.m.
- February 21 at 8 p.m.
- March 6 at 7 p.m.

The Sky This Winter

Dazzling Venus is the feature attraction of the evening sky this winter; it will “star” opposite Mercury, Mars and the Moon.

Venus lights our winter evenings

Venus is impossible to miss, and conditions are ideal for observing it this winter: It shines as the brilliant Evening Star which appears as soon as the Sun dips below the horizon. On January 12, the gap between Venus and the Sun reaches a maximum of 47 degrees, and the planet climbs higher with each passing day; at the beginning of February, by nightfall, it appears 38 degrees above the southwest horizon and shines all evening, setting nearly 4 hours after the Sun. In February, Venus descends back toward the horizon, gradually at first, and then faster. In March, the planet plunges sunward and is at inferior conjunction on the 25th, when it passes a bit more than 8 degrees north of the Sun: Prior to that (the best date is **March 23**), it's possible to see Venus above the western horizon at twilight and above the eastern horizon at dawn, immediately before it sets and after it rises. The opportunity to accomplish this double observation only occurs every 8 years: Are you up for the challenge?

Venus is certainly impressive to see with the naked eye, but it's truly fascinating to view through a telescope. It exhibits phases (like the Moon) which evolve noticeably over a few days, and it varies in size considerably as its distance from Earth changes. Over the winter, the planet's appearance will transform dramatically: On December 21, its gibbous disk is illuminated 61% with an apparent diameter of 20 arc seconds; by **January 13**, Venus will appear like a half-moon (50% illuminated, 25" diameter). Following that, the dazzling planet will exhibit a crescent shape that gets thinner as it grows larger. On February 17, it has the largest illuminated area, and around this time it will also be brightest (mag. -4.8). By March 1, Venus' disk will be 16% illuminated and will grow to an apparent diameter of 48". Using caution, if you hide the Sun behind a building, you can observe the brilliant planet in broad daylight when it reaches inferior conjunction on March 25: Through a telescope, a very large, extremely thin crescent, illuminated just 1%, will be visible; its apparent diameter of 59" (three times larger than in December) is equivalent to 1/30th of the Moon's diameter in the sky.

Phases of the Moon

(Eastern Standard Time
except * = Eastern Daylight Time)

First quarter	Full moon
Dec. 7 at 4:03	Dec. 13 at 19:05
January 5 at 14:47	January 12 at 6:34
February 3 at 23:19	February 10 at 19:33
March 5 at 6:32	March 12 at 10:54*
Last quarter	New moon
Dec. 20 at 20:56	Dec. 29 at 1:53
January 19 at 17:13	January 27 at 19:07
February 18 at 14:33	February 26 at 9:58
March 20 at 11:58*	March 27 at 22:57*

On January 1, the lunar crescent will lie to the lower right of Venus, and on the following evening it will fall between Venus and Mars (which is higher and to the left). **On January 31**, the crescent moon will lie to the left of Venus, forming a spectacular triangle with Mars above.

Mars stays ahead of the Sun

The Red Planet is now far from Earth, which renders it small and of little interest in a telescope. The best way to see **Mars** this winter is with the naked eye. Because of its rapid motion among the constellations, Mars manages to keep ahead of the Sun: It moves from Aquarius into Pisces on January 19 and then into Aries on March 8, which places it in an increasingly higher part of the ecliptic, providing a more advantageous position at nightfall. In January and February, you'll find this orange-coloured “star” shining at twilight, about an hour after sunset, thirty degrees above the southwest horizon. But its altitude gradually declines: In March, Mars is less than 25 degrees above the western horizon at twilight. Venus rises to meet it during the first weeks of winter, and is just five degrees from the Red Planet at the beginning of February. However, a conjunction between the two is not forthcoming, since Venus then reverses its path in the sky. The crescent moon will lie between Venus and Mars on January 2, and will be to the upper left of Mars on the 3rd. Don't miss the spectacular triangle formed by the trio **on the evening of January 31**. The Moon will appear less than 5 degrees from the Red Planet on the evening of March 1.

Mercury at dawn and dusk

Mercury enjoys two periods of visibility this winter. First, it will appear at dawn in January: During the optimal window of observation, from the 10th to 31st, you'll find it low in the southeast from 30 to 45 minutes before sunrise. Using binoculars, look for the tiny planet to the lower left of Saturn; on the morning of January 26, a thin lunar crescent will lie 6 degrees to Mercury's left.

The planet's best apparition of the year will occur in the evening sky from mid-March to the first week of April, though it will be brightest and easiest to see around the beginning of this period. On the final evenings of the winter season, March 19 to 20, Mercury will appear a few degrees to the left of Venus (the latter will sink into the glow of twilight over the following days): Look for the tiny planet low in the west, 30 minutes after sunset. On the evening of March 29, the crescent moon will be situated 10 degrees to Mercury's left; the Red Planet, about 12 degrees higher, will form a large triangle together with Mercury and the Moon. The gap between Mercury and the Sun will be greatest on April 1.

Jupiter visible earlier and earlier

Jupiter currently shines in Virgo near the star, Spica. As winter gets underway, the giant planet is only visible during the latter half of the night, but it rises progressively earlier: By mid-Janu-

ary, it appears in the east before midnight and is high in the south before dawn breaks. In February, Jupiter rises around 10 p.m. and culminates in the south at about 4:00 in the morning; in March, it rises about 8:00 in the evening and culminates around 2 a.m. The giant planet moves westward, in retrograde (toward the right), relative to the background stars and arrives at opposition on April 7. The waning crescent moon will lie 4 degrees to the upper left of Jupiter on the morning of December 22, and the last quarter moon will fall 2 degrees to its left on the evening of January 19. The waning gibbous moon will be within 3½ degrees of the giant planet toward night's end on February 14 to 15; it will appear less than 4 degrees away on the evening of March 14, but the two objects will separate during the hours that follow.

Saturn reappears at dawn

Saturn was in conjunction behind the Sun on December 10, and it gradually re-emerges in the morning sky as winter begins. In January, the ringed planet becomes visible, low in the southeast, at the first light of dawn, but then it appears progressively earlier: At the beginning of February, it rises around 4:00 in the morning, more than 3 hours before the Sun; and by March, it emerges 4 hours before sunrise. On the final mornings of the winter season Saturn culminates at dawn, but it remains just 22 degrees above the southern horizon due to its current position on the border of Ophiuchus and Sagittarius: Unfortunately, this is too low for worthwhile telescopic observation, and the situation will not improve appreciably for another few years. Despite this drawback, the planet's magnificent rings are at their maximum inclination toward Earth this year—a situation worth taking advantage of. The waxing lunar crescent will appear less than 3 degrees from Saturn on the morning of January 24, and will be near the ringed planet again on the mornings of February 20 and 21; the last quarter moon will lie 2½ degrees above Saturn on the morning of March 20.

Clear skies!

Research and text: **Marc Jobin**
Adaptation: **Louie Bernstein**

Seasonal Milestones

The **winter solstice** takes place December 21, 2016 at 5:44 a.m. EST; the **spring equinox** occurs on March 20, 2017 at 6:29 a.m. EDT: Winter will last exactly 88 days 23 hours 45 minutes.

On January 4, at 9 a.m. EST, Earth will reach **perihelion**, the closest point to the Sun on its orbit: The Earth–Sun distance will then be 147 100 998 km.

Daylight Time takes effect early on the morning of Sunday, March 12: Timekeeping devices move one hour ahead.