



## UNIVERSE DISCOVERY GUIDES

February

# ORION NEBULA



Orion Nebula, Hubble Space Telescope. Credit: NASA, ESA, M. Roberto (STScI/ESA), and the HST Orion Treasury Project Team.

## IN THIS GUIDE

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- » **ORION NEBULA, NURSERY OF NEWBORN STARS**
- » **SKY FEATURE: ORION NEBULA**
- » **TRY THIS!**
- » **ACTIVITY: STARS AND THEIR LIVES**
- » **CONNECT TO NASA SCIENCE**
- » **Acknowledgements**
- » **Appendix: February Star Map**

Published 2013.

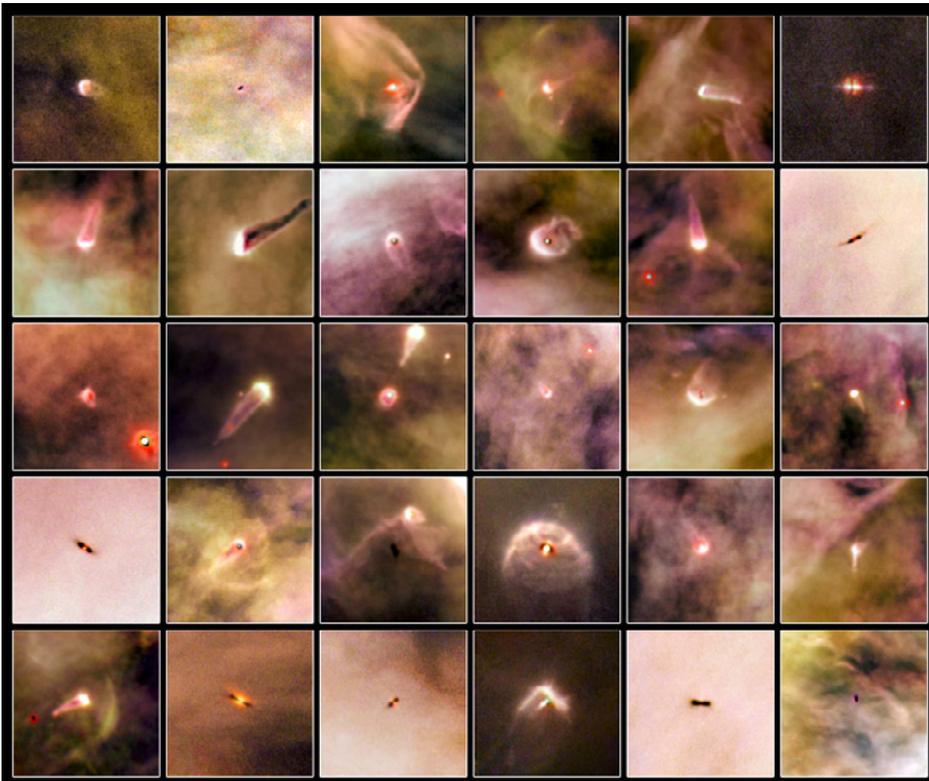
The universe is a place of change. NASA missions advance our understanding of the changing universe.

[www.nasa.gov](http://www.nasa.gov)

## ORION NEBULA, NURSERY OF NEWBORN STARS

Ever looked through the window of a hospital nursery full of newborn babies? You may have noticed that the babies are wrapped in warm fleecy blankets.

Ever looked through the window of a nursery full of newborn stars? In the constellation of Orion, the hazy area in the sword of Orion is an opening into a huge cloud of gas and dust where new stars are being born, called the Orion Nebula.

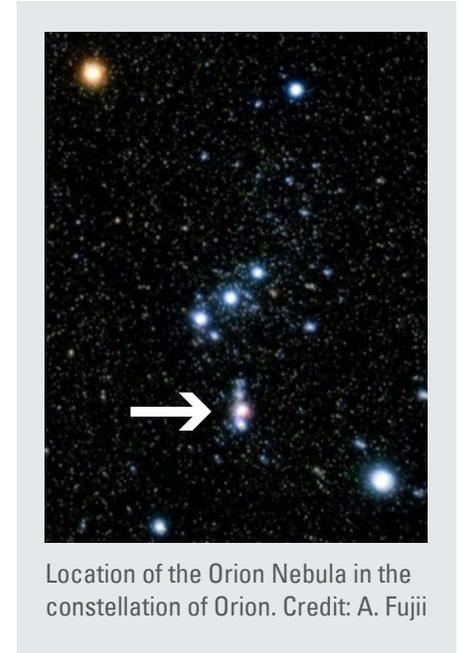


Newborn stars in the Orion Nebula wrapped in dusty blankets. (Credit: NASA/ESA and L. Ricci (ESO))

NASA's telescopes have revealed that many of the infant stars in the Orion nursery are wrapped in blankets of gas and dust.

These blankets of gas and dust can, in a few million years, develop into planets that orbit around the stars.

In the ever-changing universe, new stars and planets are continuously being born. Our star, the Sun, was born in a nursery similar to the Orion Nebula about five billion years ago. The infant Sun, too, was likely wrapped in a dusty blanket that transformed into the planets, including Earth, which now orbit our Sun.



Location of the Orion Nebula in the constellation of Orion. Credit: A. Fujii

## SKY FEATURE: ORION NEBULA

### How to Find it

**Distance:** 1,300 light-years

**Visual Magnitude:** 4.0

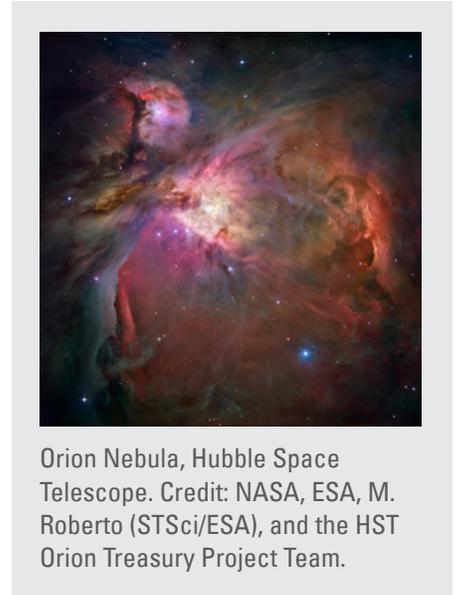
**Apparent Dimension:** 85x60 arcminutes  
(You can cover it with one finger held at arm's length.)

**Actual dimension:** About 24 light-years across

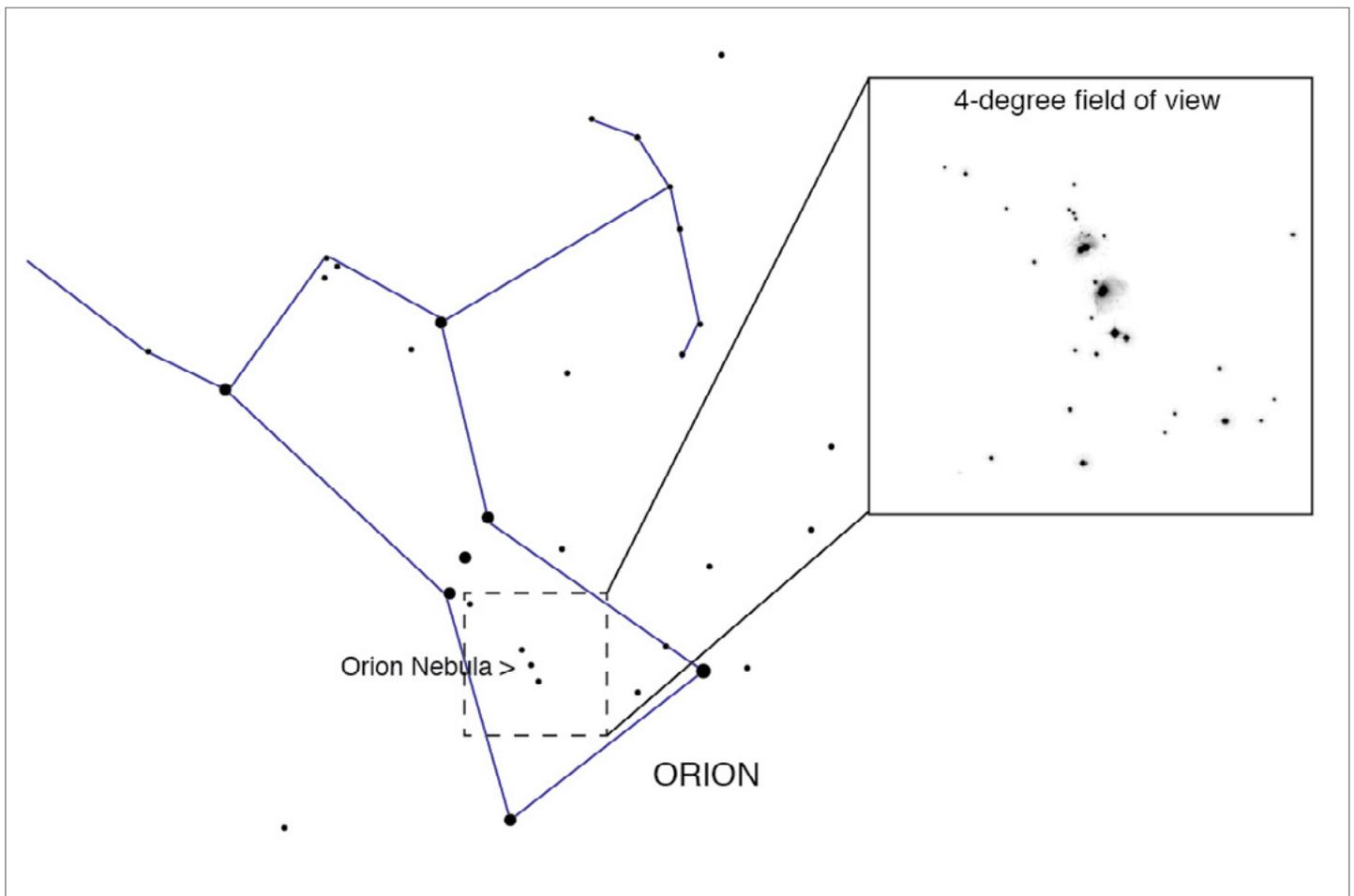
**To view:** binoculars or telescope

[Click here to jump to the full-sky February Star Map.](#)

On February early evenings, face toward the south and you'll easily spot three stars in a row that mark the belt of Orion, the Hunter. The Orion Nebula is near the tip of the "sword" hanging from Orion's belt.



Orion Nebula, Hubble Space Telescope. Credit: NASA, ESA, M. Roberto (STScI/ESA), and the HST Orion Treasury Project Team.



## TRY THIS!

### Imagine being inside the Orion Nebula

Imagine you can shrink the Sun to the size of a small grain of sand. Place that sand grain, representing the Sun, on the ground and get a group of people to join hands and make a 10-foot (3-meter) diameter circle around it. All the orbits of the planets in our Solar System are inside your circle.

Now imagine your circle is in the middle of the Orion Nebula. Your circle represents a small part of the dusty blanket surrounding a single newborn star. The Nebula would extend about 20 miles (32 km) in all directions around you. In your mind, go back 5 billion years when the Sun was just starting to shine and your circle now represents a small part of the dusty blanket surrounding the newborn Sun.



### Take your own baby picture of the Orion Nebula!

NASA's portal to the MicroObservatory Network allows you to control a telescope right from your home computer or mobile device and tell the telescope to take your own images of the Orion Nebula and many other targets.

It's easy! Start here to select your target:

<http://mo-www.harvard.edu/cgi-bin/OWN/Own.pl>



MicroObservatory Robotic  
Telescope Network, Harvard  
Smithsonian Center for  
Astrophysics

### Take a video tour of the Orion Nebula

Explore the dusty secrets of the Orion Nebula through Spitzer's infrared vision.

<http://www.spitzer.caltech.edu/video-audio/381-hiddenuniverse026-Orion-Nebula-Gallery-Explorer->



## ACTIVITY: STARS AND THEIR LIVES

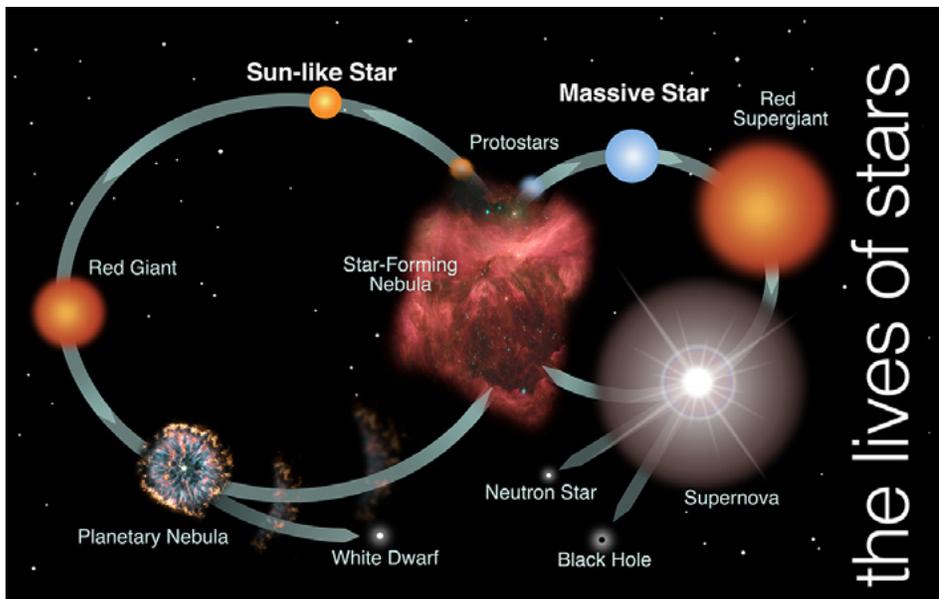
### Stellar Life Cycles Kinesthetic Activity

Session 6: Stars and Their Lives (Activity II) from the *Afterschool Universe*

Time: About 30 minutes

Age: 11 and up

Follow this link, <http://universe.nasa.gov/au/curriculum.html> and scroll down to Session 6 — **Stars and Their Lives**. Select and download the “Full Session 6 Instructions [PDF].” On page 6 of the PDF is Activity II where participants act out the life cycle of a small star and a large star to learn the different stages stars go through from birth to death.



Portions of this activity are adapted from the ‘Kinesthetic Life Cycle of Stars’ activity developed by Erika Reinfeld at the Harvard-Smithsonian Center for Astrophysics and Mark Hartman at the MIT Kavli Institute for Astrophysics and Space Research.

For more education and public outreach activities from the Afterschool Universe program, visit <http://universe.nasa.gov/au/>

## Seeing the Invisible

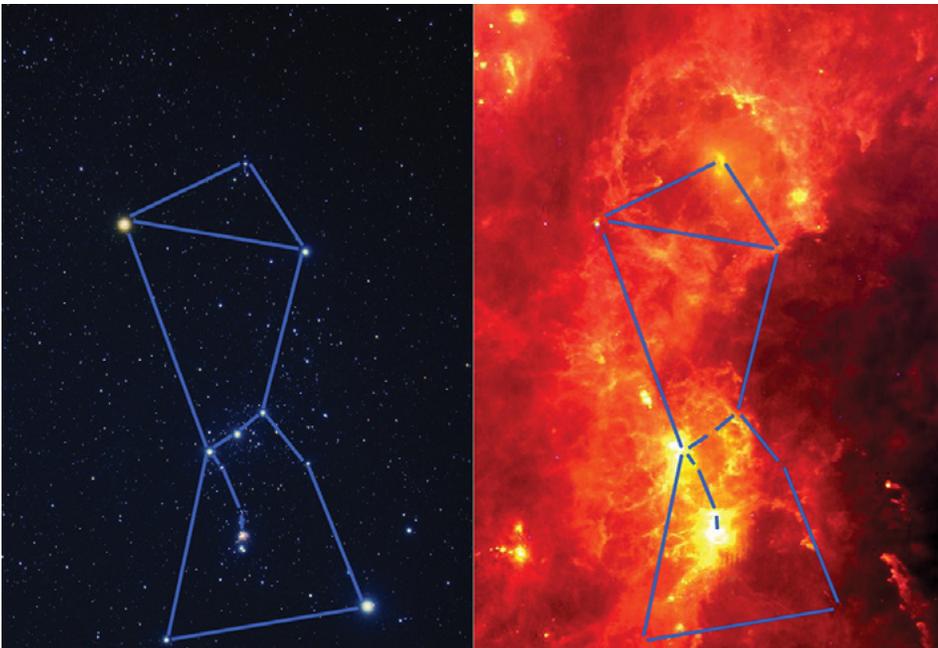
Time: About 90 minutes

Age: 12 and up

How do scientists peer through opaque clouds of gas and dust to see stars being born?

Try out the **Active Astronomy: Learning about Infrared Light** resource. Many of the classroom activities, such as ‘Section 2 — What’s Getting Through?’ can be tailored to informal settings.

<http://www.sofia.usra.edu/Edu/materials/activeAstronomy/activeAstronomy.html>



The visible light (left) and infrared (right) images of the constellation Orion shown here are of the exact same area. These images dramatically illustrate how features that cannot be seen in visible light show up very brightly in the infrared. (Credits: Visible light image: Akira Fujii; Infrared image data: Infrared Astronomical Satellite)

For more education and public outreach activities from SOFIA, visit <http://www.sofia.usra.edu/Edu/edu.html>

Looking for more Earth and Space Science formal and informal education activities?

Try out NASA’s digital collection of resources at NASA Wavelength: <http://nasawavelength.org>



## CONNECT TO NASA SCIENCE

### How do we know?

How are stars born from clouds of gas and dust? NASA tells the story here:

<http://science.nasa.gov/astrophysics/focus-areas/how-do-stars-form-and-evolve/>

What does invisible light reveal about infant stars?

<http://www.sofia.usra.edu/Edu/docs/InfraredAstronomy.pdf>

By peering deep into the Orion Nebula, see how scientists discover secrets to how stars are born:

[http://www.sofia.usra.edu/Gallery/science/SCI2011\\_0003.html](http://www.sofia.usra.edu/Gallery/science/SCI2011_0003.html)

For the latest news from SOFIA, visit  
[http://www.sofia.usra.edu/News/news\\_updates.html](http://www.sofia.usra.edu/News/news_updates.html)

### Keeping the Infants Warm

See a closer view of the dusty blankets keeping the infant stars in the Orion Nebula nice and cozy.

[http://wise.ssl.berkeley.edu/gallery\\_OrionNebula.html](http://wise.ssl.berkeley.edu/gallery_OrionNebula.html)

For the latest news from WISE, visit  
<http://wise.ssl.berkeley.edu/news.html>

### Temperamental Infants

Infant stars, just like babies, are temperamental. This 13-day exposure of the Orion Nebula from NASA's Chandra X-Ray Observatory reveals that infant stars have energetic and unpredictable outbursts. Our Sun likely was just as temperamental when it was very young!

The blue and orange dots in this image captured the energetic X-ray flare-ups of the infant stars.

<http://chandra.harvard.edu/photo/2007/orion/>

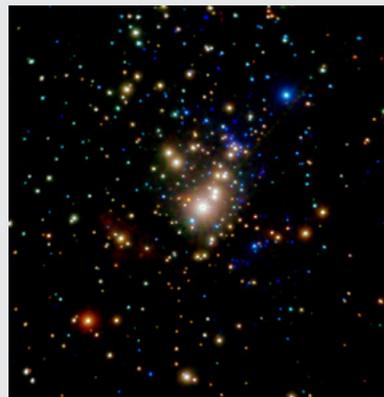
For the latest news from Chandra, visit  
<http://chandra.harvard.edu/press/>



<http://science.nasa.gov>



Credit: NASA/JPL-Caltech/WISE Team



Credit: NASA/CXC/Penn State/E. Feigelson & K. Getman et al.

## Even More Infants

Images from the Herschel and Spitzer Space Telescopes reveal where even younger embryonic stars are just beginning to form:

[http://www.esa.int/Our\\_Activities/Space\\_Science/Herschel/Fledgling\\_stars\\_flicker\\_in\\_the\\_heart\\_of\\_Orion](http://www.esa.int/Our_Activities/Space_Science/Herschel/Fledgling_stars_flicker_in_the_heart_of_Orion)

For the latest news from Herschel, visit <http://www.herschel.caltech.edu/index.php?SiteSection=News&NewsCategory=Press%20Release>

For the latest news from Spitzer, visit <http://www.spitzer.caltech.edu/news>



Credit: ESA/PACS/NASA/JPL-Caltech/IRAM

## Nurseries come in all shapes and sizes

As far as stellar nurseries go, the Orion Nebula may be one of the nearest to Earth, but it is also one of the smallest. The Hubble Space Telescope has imaged the giant 30 Doradus star-forming region in the nearby Large Magellanic Cloud. Whereas the Orion Nebula is tens of light-years in size, 30 Doradus is hundreds of light-years in size. The largest known stars have been discovered in 30 Doradus. Read more here:

<http://www.hubblesite.org/newscenter/archive/releases/2012/01/image/a/>



Credit: NASA, ESA

For the latest news from Hubble, visit <http://hubblesite.org/newscenter/>

## ACKNOWLEDGEMENTS

The Universe Discovery Guides are a collaborative effort between members of the NASA Astrophysics education and public outreach (E/PO) community and the NASA Astrophysics Science Education and Public Outreach Forum. We also gratefully acknowledge the informal educators from the Astronomy from the Ground Up (AFGU) and the Sky Rangers communities who field-tested the guides.

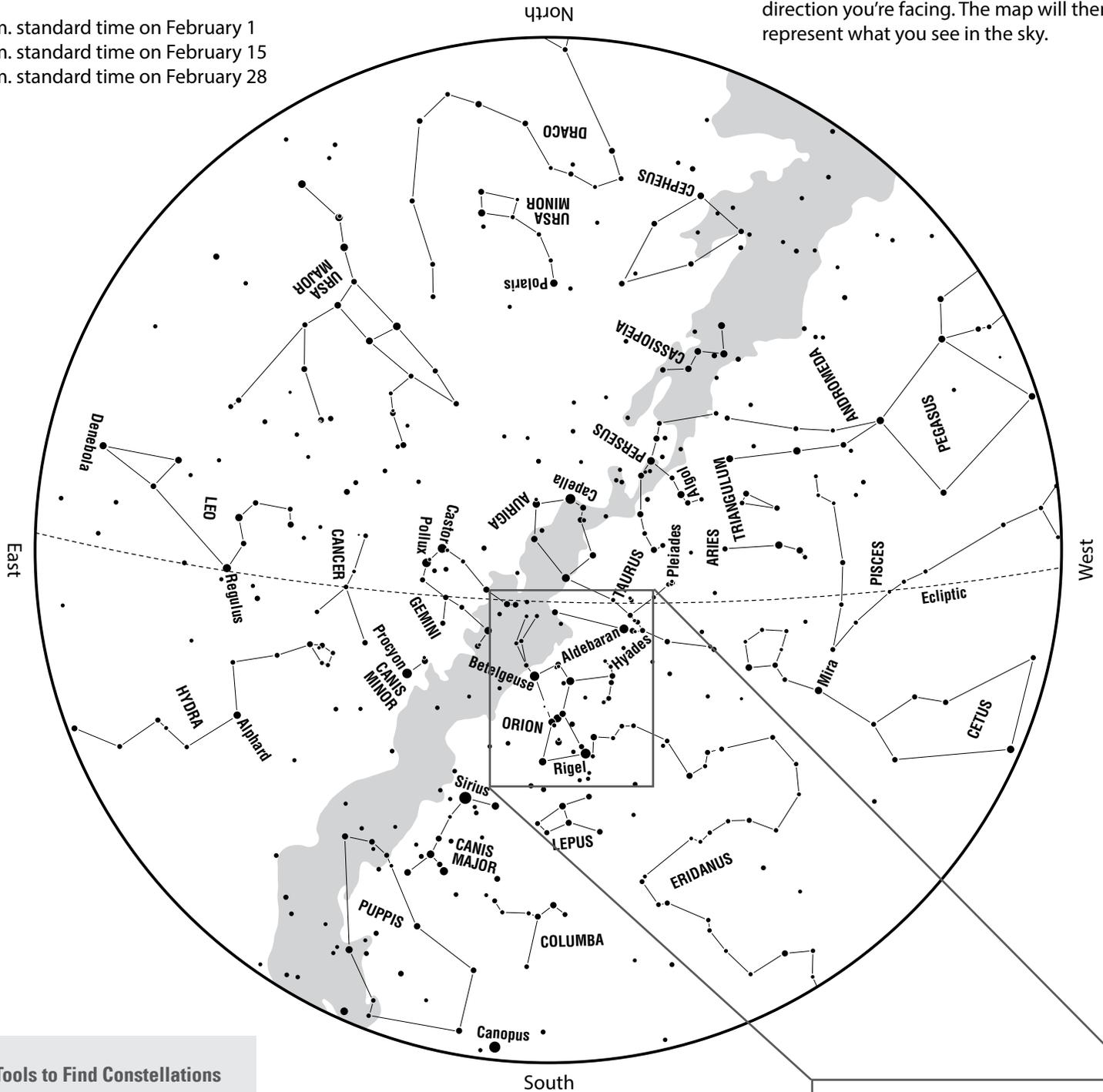
Contributing NASA Astrophysics E/PO programs include: Afterschool Universe, Alien Earths, Astronomy Picture of the Day (APOD), the Chandra X-ray Observatory, the Cosmic Background Explorer (COBE), Cosmic Questions, the Euclid mission, Exoplanet Exploration, the Fermi Gamma-ray Space Telescope, the Galaxy Evolution Explorer (GALEX), the Herschel Space Observatory, the High Energy Astrophysics Science Archive Research Center (HEASARC), the Hubble Space Telescope, Imagine the Universe, the Infrared Processing and Analysis Center (IPAC), the James Webb Space Telescope, the Kepler Mission, the Milky Way Project, the Night Sky Network (NSN), the Nuclear Spectroscopic Telescope Array (Nu-STAR), Observing with NASA (OwN), Other Worlds, the Planck mission, PlanetQuest, Planet Hunters, the Spitzer Space Telescope, StarChild, the Stratospheric Observatory for Infrared Astronomy (SOFIA), the Swift mission, the Two Micron All-Sky Survey (2MASS), the Wide-Field Infrared Survey Explorer (WISE), the Wilkinson Microwave Anisotropy Probe (WMAP), the X-ray Multi-Mirror Mission (XMM-Newton), and Zooniverse.

The Astrophysics Forum is supported by NASA's Science Mission Directorate under Cooperative Agreement NNX09AQ11A to the Space Telescope Science Institute, Astronomical Society of the Pacific, Adler Planetarium and Astronomy Museum, and Johns Hopkins University.

The all-sky map represents the night sky as seen from approximately 35° north latitude at the following times:

- 9 p.m. standard time on February 1
- 8 p.m. standard time on February 15
- 7 p.m. standard time on February 28

To locate stars in the sky, hold the map above your head and orient it so that one of the four direction labels matches the direction you're facing. The map will then represent what you see in the sky.



### Tools to Find Constellations

#### For mobile device users:

Search your app store for “planetarium” or “sky map” to find free or low-cost apps. These help you more easily locate constellations.

[View a video on how to read a star map.](#)

### February Sky Feature: Orion Nebula

[Jump to Sky Feature to find out about the Orion Nebula](#)

