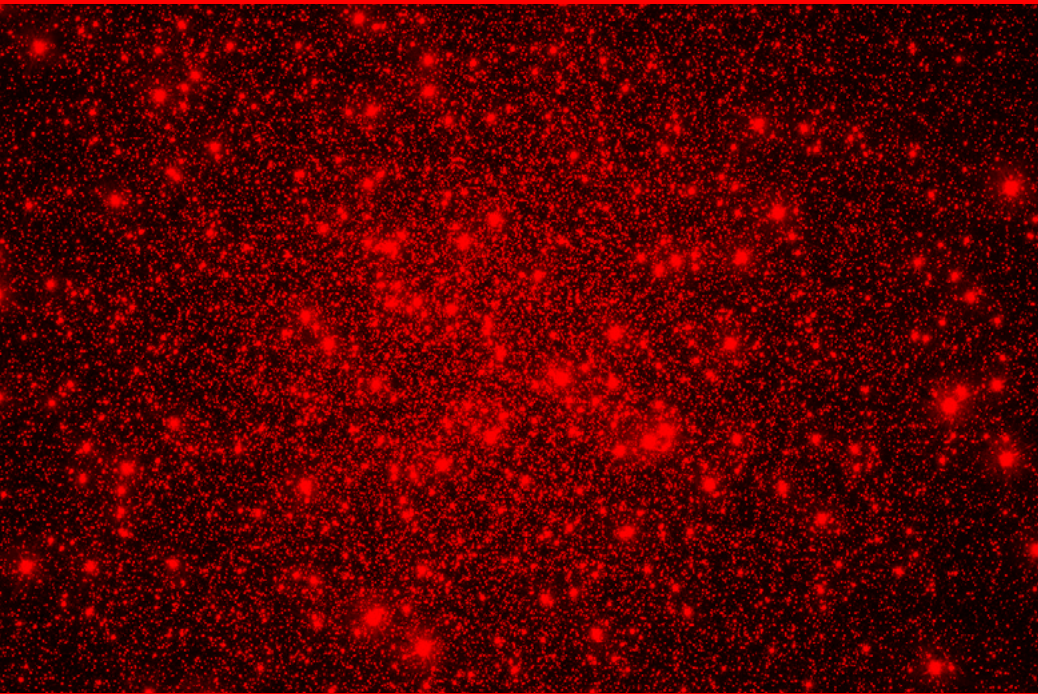




UNIVERSE DISCOVERY GUIDES

June

HERCULES CLUSTER



Globular Cluster M13, Hubble Space Telescope. Credit : NASA, ESA, and the Hubble Heritage Team (STScI/AURA)

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

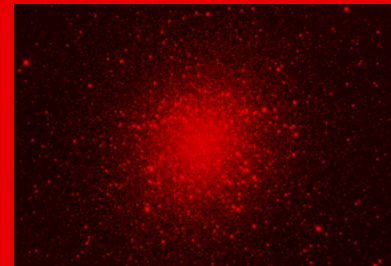
www.nasa.gov

ANCIENT STARS, ANCIENT STORIES

Like the eldest members of our society, the ancient stars inhabiting the Hercules Globular Cluster can tell us stories of times long ago.

Hundreds of thousands of stars are in this dense cluster and were born when our Milky Way Galaxy was first forming more than ten billion years ago. They have remained together ever since. Today, all the stars in this cluster are quite advanced in age, having been born long before our much younger five-billion-year-old Sun was even a twinkle in the eye of our Galaxy.

About 150 of these aging globular cluster communities orbit our Galaxy. Most are situated far out in the countryside, isolated from the teeming metropolis that is in the main disk of our Galaxy.



Hercules Globular Cluster. NASA Astronomy Picture of the Day. Credit: Marco Burali, Tiziano Capecchi, Marco Mancini (Osservatorio MTM)

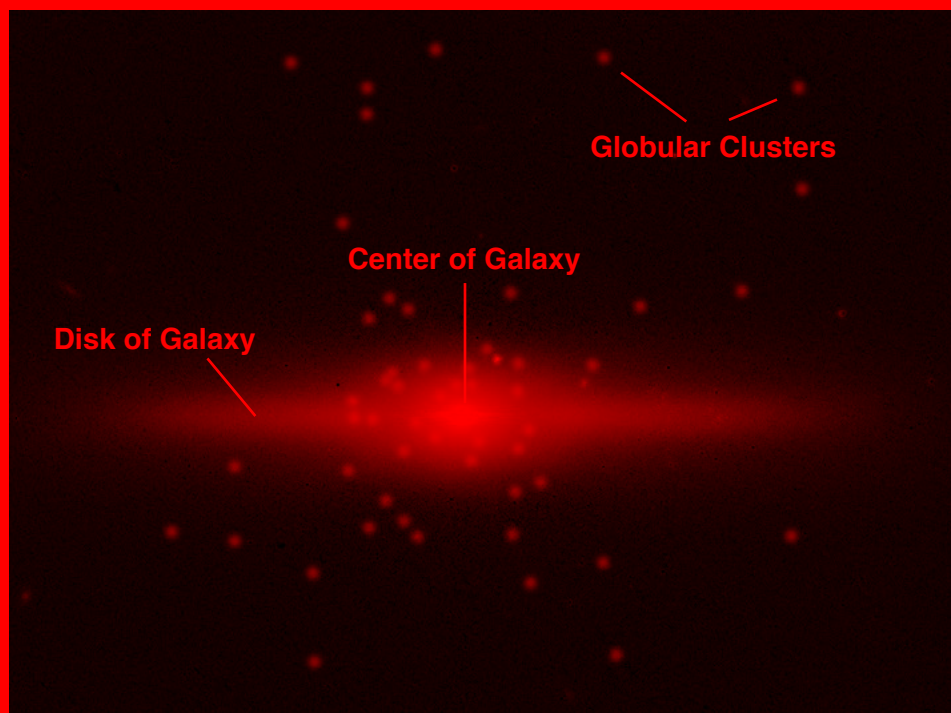


Diagram of Milky Way Galaxy and distribution of Globular Clusters. Credit: ASP

These isolated clusters preserve the story of some of the earliest stars that ever formed. They tell us that the first stars lacked the abundance of heavier elements that are found in stars born more recently. When the stars in the cluster were born, they were mostly made of just hydrogen and helium. Like our oldest relatives, they tell us tales of simpler times in their youth (sometimes a bit exaggerated): “When I was a kid, we didn’t *have* any iron to play with.”

Stars are factories where elements heavier than hydrogen and helium are forged. When stars die, these heavier elements, such as iron, oxygen, and carbon, are released into the Galaxy. These elements enrich the gas and dust clouds in the Galaxy that can later collapse to form new generations of stars and planets. Without these heavier elements no rocky planets would be formed. Our Galaxy likely required several generations of stars to live and die in order to manufacture the quantities of heavy elements needed to form rocky planets.

So stars born more recently, like our Sun, can have rocky planets like Earth and Mars. Since the stars of the Hercules Cluster are from a much older generation, before elements like iron were produced in large quantities, it's not likely that many planets like Earth or Mars orbit stars in the Hercules Cluster.

Without our oldest living relations, the globular clusters, we would not have the rich history of stars at the very beginning of our Galaxy. Those stories would not have been preserved.



A globular cluster's travels take it far above, through, and below the plane of our galaxy. (Artist's impression of a globular cluster's orbit. Credit: ESO)

SKY FEATURE: HERCULES GLOBULAR CLUSTER

How to Find it

Distance: 25,000 light-years

Consists of hundreds of thousands of stars

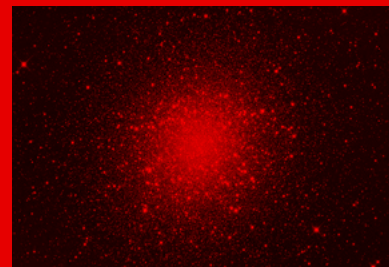
Visual Magnitude: 5.8

Apparent Dimension: 20 arcminutes

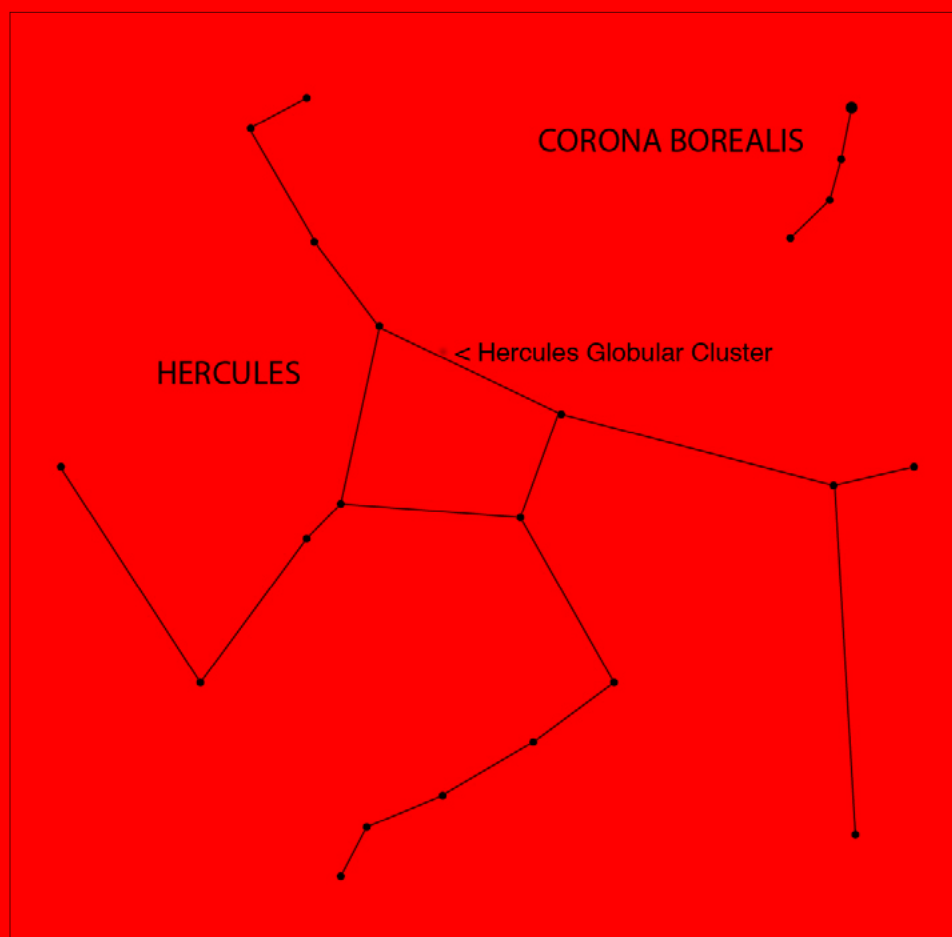
Actual dimension: About 150 light-years in diameter

To view: binoculars or telescope

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



Hercules Globular Cluster. NASA Astronomy Picture of the Day. Credit: Marco Burali, Tiziano Capecchi, Marco Mancini (Osservatorio MTM)



On a June evening, the Hercules Globular Cluster with its hundreds of thousands of stars is almost directly overhead in the constellation of Hercules. This is the view from the Northern Hemisphere. It is toward the northeast from the Southern Hemisphere.

The Hercules Cluster is between the two stars in the “keystone” of Hercules closest to the constellation of Corona Borealis.

Why is it called a “globular” cluster of stars? It’s shaped roughly like a ball: globe-shaped. All globular clusters share this feature.

TRY THIS!

Preserve stories of time past

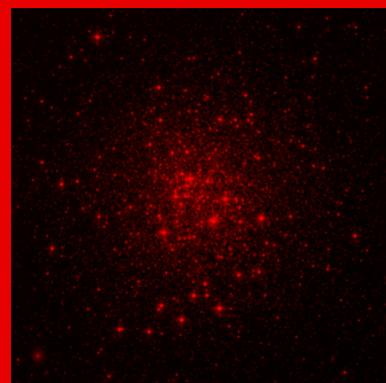
How is life different today than it was when the oldest person you know was born? Take some time to talk to a few elders and write down their earliest memories.



How many globular clusters existed at the beginning of our Galaxy?

See another spectacular image of a globular cluster and find out why many of them disappeared.

<http://apod.nasa.gov/apod/ap120819.html>



M72: A Globular Cluster of Stars.
Credit: NASA, ESA, Hubble, HPOW

Preserve your own image of the Hercules Globular Cluster!

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 Hercules Cluster and many other features of the sky.

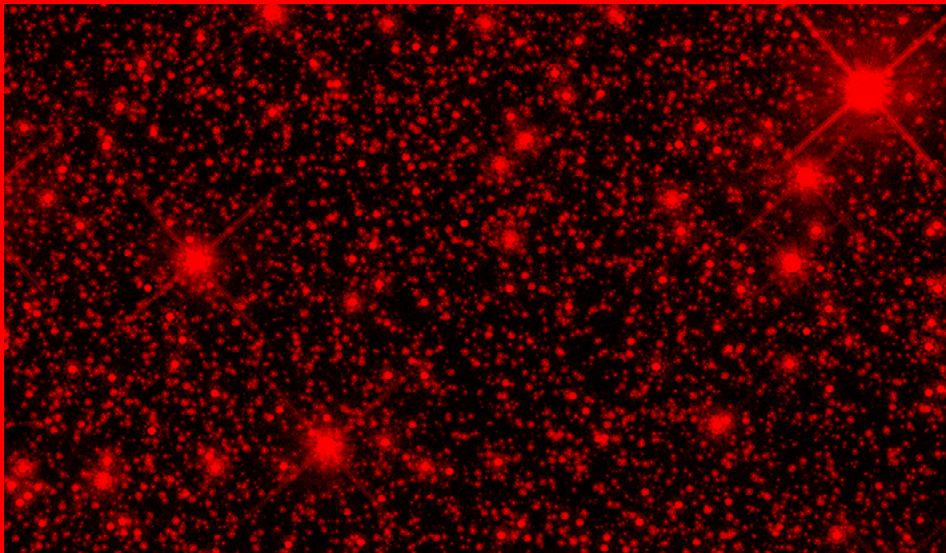
It's easy! Start here to select your target:

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



MicroObservatory Robotic
Telescope Network, Harvard
Smithsonian Center for
Astrophysics

ACTIVITY: LOOK DEEP INTO THE HEART OF A GLOBULAR CLUSTER



Heart of the Omega Centauri Globular Cluster. Credit: NASA, ESA, and the Hubble Heritage Team (STScI/AURA)

Time: One hour

Age: 15 and up

Learn about the nature of globular clusters using Hubble Space Telescope observations of the Omega Centauri Globular Cluster and the included activities. Find the Activity here:

http://amazing-space.stsci.edu/resources/print/lithos/omegacentauri_litho.pdf

Use this diagram to compare Globular Clusters, like the Hercules Cluster with Open Star Clusters, like the Pleiades.

<http://amazing-space.stsci.edu/resources/organizers/starclusters.php>

For more Hubble education and public outreach activities from the Space Telescope Science Institute:

<http://amazing-space.stsci.edu/>

Find more NASA Activities

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?

Watch this video that shows how scientists classify stars in a globular cluster:

<http://hubblesite.org/newscenter/archive/releases/2010/28/video/d/>

How do scientists determine the age and composition of a globular cluster?

http://www.nasa.gov/mission_pages/hubble/science/ancient-stars.html

How do globular clusters help scientists determine the age of the universe?

http://map.gsfc.nasa.gov/universe/uni_age.html

Omega Centauri, Not Your Typical Globular Cluster

The enormous Globular Cluster, Omega Centauri, is seen here in infrared light observed by the WISE space telescope.

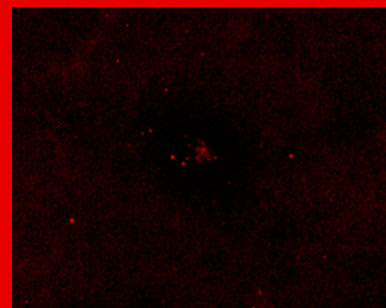
What makes it so unique? Find out:

http://wise.ssl.berkeley.edu/gallery_OmegaCentauri.html

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



<http://science.nasa.gov>



Omega Centauri. Credit: NASA/JPL-Caltech/WISE Team

Do ALL galaxies have globular clusters?

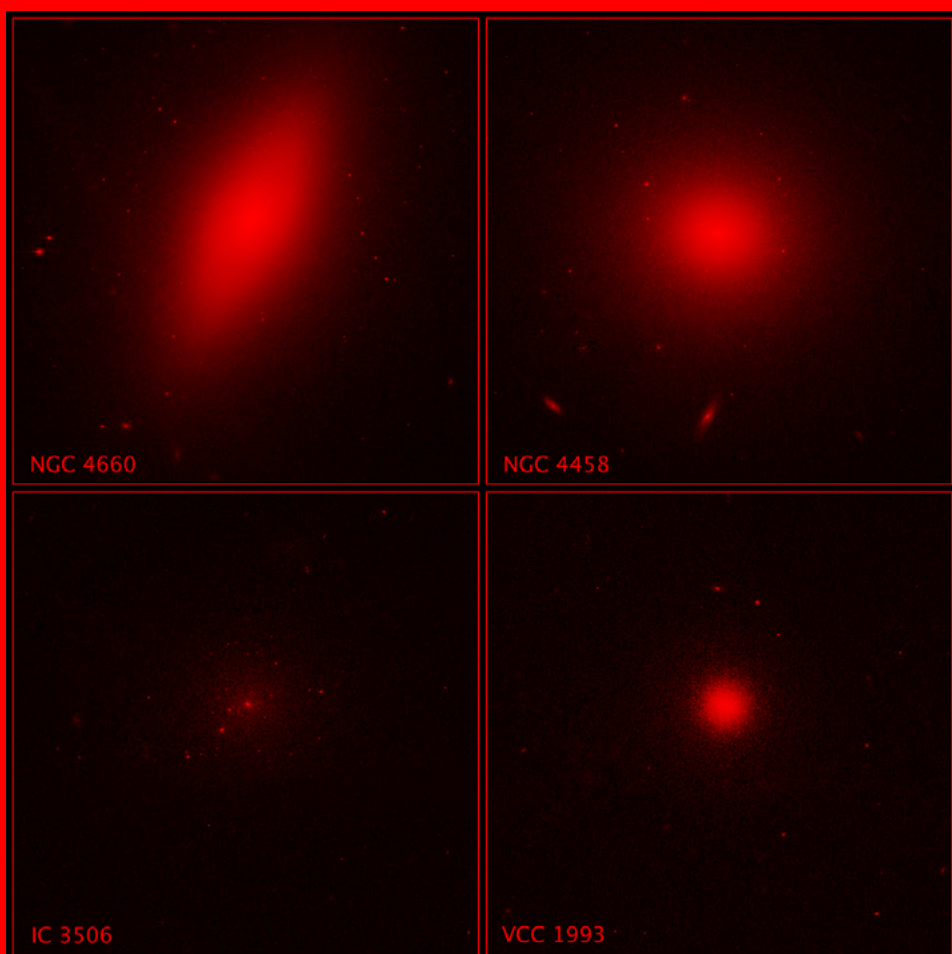
Studying globular star clusters is critical to understanding the early, intense star-forming episodes that mark galaxy formation.

<http://hubblesite.org/newscenter/archive/releases/2008/30/full/>

Like some people, stars in globular clusters may be hiding their ages:

<http://www.spacetelescope.org/news/heic1221/>

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



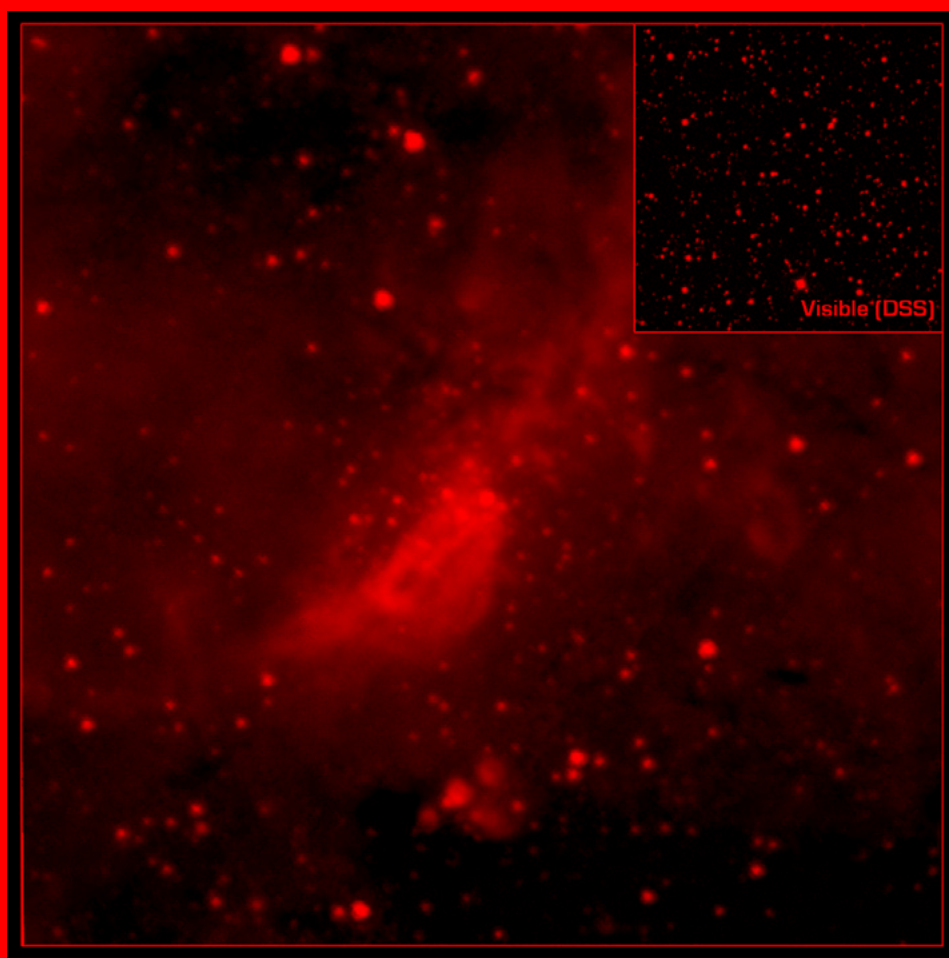
Most galaxies are found to have globular clusters in orbit around them. Credit: NASA, ESA, and E. Peng (Peking University, Beijing)

See a Globular Cluster that is passing through the plane of our galaxy

This infrared image taken by NASA's Spitzer Space Telescope shows a globular cluster previously hidden in the dusty plane of our Milky Way galaxy.

<http://www.spitzer.caltech.edu/images/1302-ssc2004-16a%20-Spitzer-Digs-Up-Galactic-Fossil>

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



New Globular Cluster. Credit: NASA/JPL-Caltech/H. Kobulnicky (Univ. of Wyoming)

To learn more about NASA Astrophysics Missions, visit:
<http://science.nasa.gov/astrophysics/>

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.

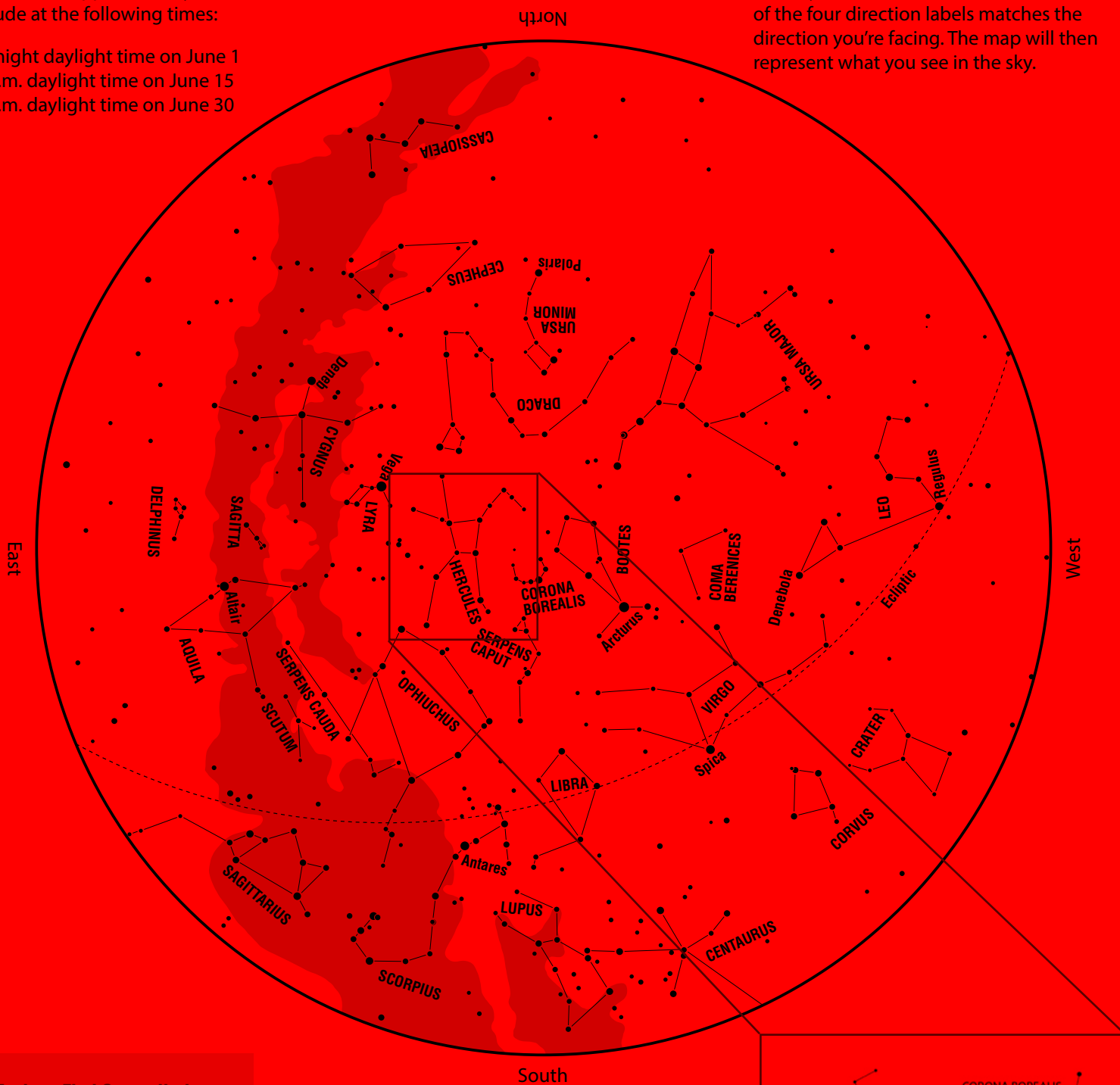
Contributing NASA Astrophysics E/PO programs include: Afterschool Universe, Alien Earths, Astronomy Picture of the Day (APOD), the Chandra X-ray Observatory, the Cosmic Background Explorer (COBE), Cosmic Questions, the Euclid mission, Exoplanet Exploration, the Fermi Gamma-ray Space Telescope, the Galaxy 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.

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

midnight daylight time on June 1
11 p.m. daylight time on June 15
10 p.m. daylight time on June 30

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.](#)

June Sky Feature:

Hercules Globular Cluster

[Jump to Sky Feature to find out about Hercules Globular Cluster](#)

