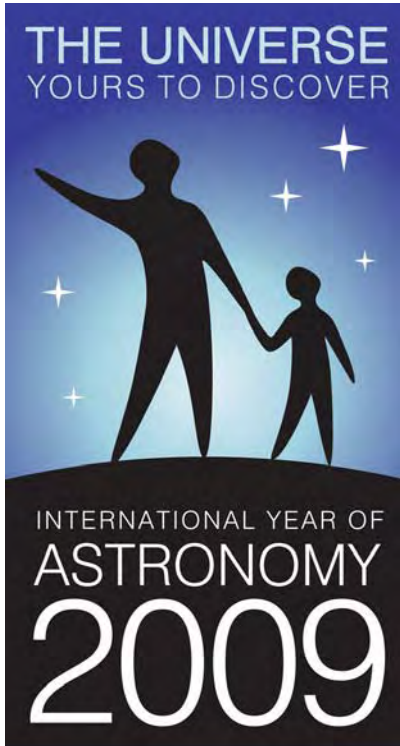


June 2009

IYA Discovery Guide



This Month's Theme:

Clusters of Stars

Featured Activity:

Trip Around the Triangle

Featured Observing Object:

The Hercules Cluster

The International Year of Astronomy is a global celebration of astronomy and its contributions to society and culture, highlighted by the 400th anniversary of the first use of an astronomical telescope by Galileo Galilei.

Join us as we look up! <http://astronomy2009.us>



The Astronomical Society of the Pacific increases the understanding and appreciation of astronomy by engaging scientists, educators, enthusiasts and the public to advance science and science literacy.

<http://www.astrosociety.org>

June's Topic: Clusters of Stars

Look up in a dark sky and you will see from a few to a few thousand stars. Some of these stars, like our Sun, are loners as they move around the galaxy. Many stars are gravitationally bound in pairs, called binaries, and some are caught in a gravitational dance of three or more companions. Others reside in bigger clusters, and these clusters can be some of the most beautiful sights visible in a backyard telescope. Why are some stars in clusters and some not?

To begin with, there are two different types: open clusters and globular clusters. They are both groups of stars but that is where the similarity ends. Think of an open cluster like a stellar kindergarten class while a globular cluster could be thought of as huge retirement home for the stars in the countryside.

[Open clusters](#) contain up to a few hundred young stars that have been recently born from a cloud of gas and dust in the spiral arms of our Milky Way Galaxy. Usually these clusters don't stick together very long. Like teenagers, they eventually leave home. [The Pleiades](#) (also called the Seven Sisters) is a well-known open cluster in the Northern Hemisphere.

[Globular clusters](#), like the one pictured at the right, are much bigger and older than open clusters. They shine steadily in their "retirement community" where they will stay for many billions of years. In spiral galaxies they don't stay in the disk like most stars, but orbit in all directions, making what scientists call a "halo," or spherical pattern. In 1918, astronomer Harlow Shapley used their locations to determine that we live in the "suburbs" of our galaxy, instead of the center as we thought before.



Credit NASA, ESA, HST

The age of globular clusters was a source of confusion for scientists for many years because they appeared older than the universe. It turns out that astronomers were very good at measuring the age of stars, but not at calculating the age of the universe. Estimates based on data from the [Hubble Space Telescope](#), and observations of the early universe by [NASA's WMAP](#) spacecraft, have put things right. Stars in globular clusters are almost 12 billion years old, in a universe that is 13.7 billion years of age. That's old!

Use the Trip Around the Triangle activity in this guide to see examples of both types of clusters, and many more night sky treats. For the most impressive globular cluster in the Northern Hemisphere, check out the Finder Guide for the Great Hercules Globular Cluster included here.



Learn more about Star Clusters from [NASA](#).
Find more [activities](#) featured during IYA 2009.
See what else is planned for the [International Year of Astronomy](#).

June 2009 Featured Observing Object

M13: Hercules Globular Cluster Finder Chart

For information about M13: <http://seds.org/messier/M/m013.html>

R.A. 16h 41.7m

Dec +36:28

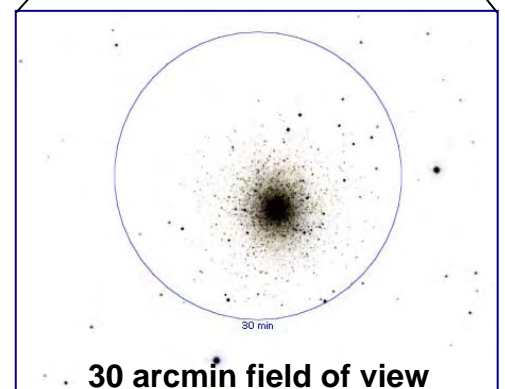
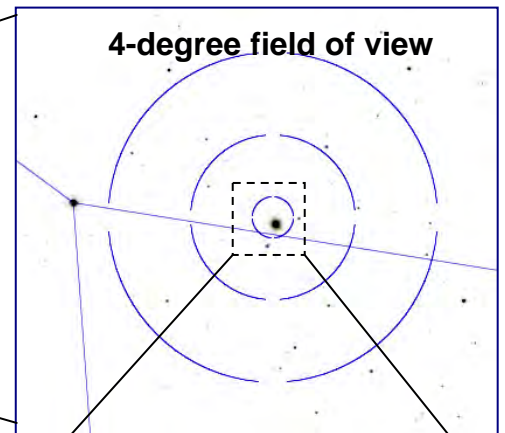
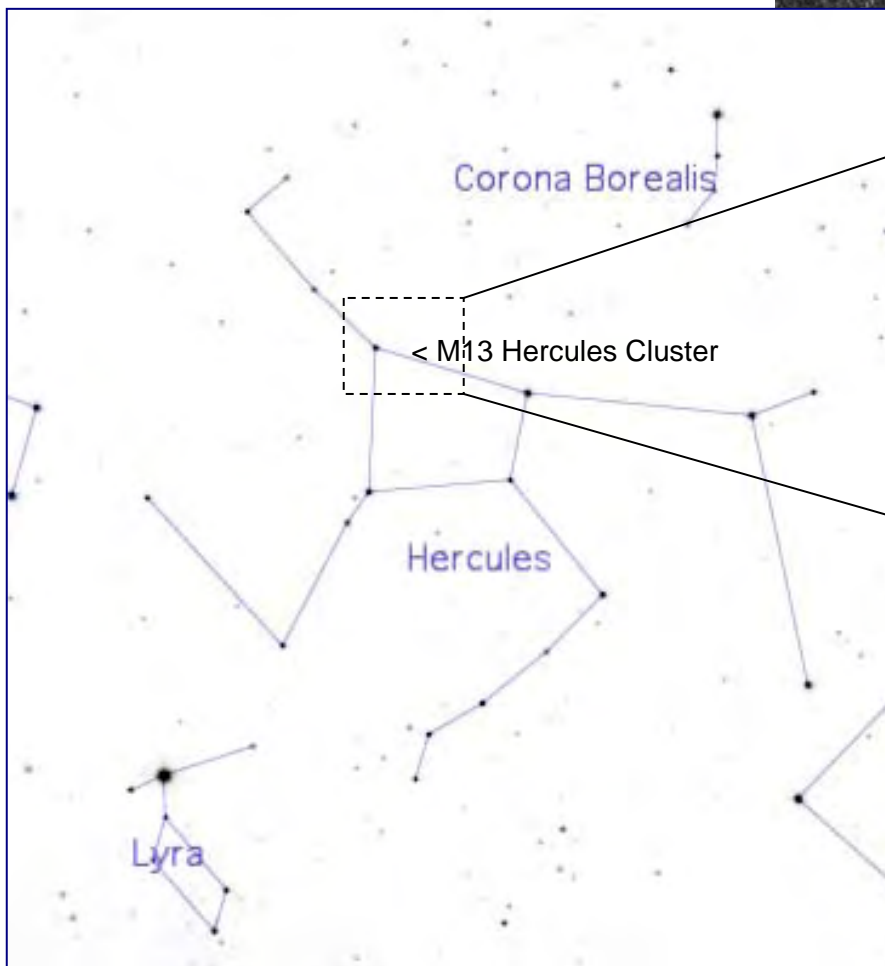
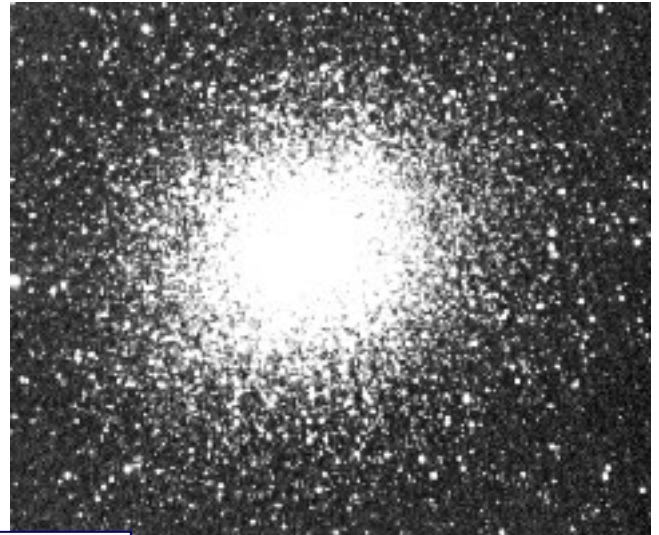
Distance: 25,000 light years

Visual Magnitude: 5.8

Apparent Dimension: 20 arcmins

To view: binoculars or telescope

Evenings in June from the Northern Hemisphere, the Hercules Cluster (M13) is almost directly overhead in the constellation of Hercules. M13 is toward the northeast in the Southern Hemisphere. M13 is between the two stars in the “keystone” of Hercules closest to the constellation of Corona Borealis.





Trip Around the Triangle

What can be seen in the Summer Triangle?

Where will the Kepler Mission be looking for Earth-sized planets?

About the Activity

This is a great way to organize a star party. Give visitors a context to what they will be viewing. Observe the variety of naked-eye and telescopic treats that occupy the Summer Triangle. Hand out a printed guide to your visitors for their "Trip Around the Triangle" where they can keep a record of what objects they saw.

Materials Needed

- Telescopes
- Copies of Trip Around the Triangle handout
- Pencils
- *Optional:* Stickers or small prizes

Topics Covered

- What can be seen with and without a telescope in and around the Summer Triangle asterism
- The location of the Kepler Mission's target field of view and its primary mission
- Finding the stars of a selection of constellations

Participants

Appropriate for families, the general public, and school groups ages 7 and up.

Location and Timing

This activity is perfect for use at the telescopes during a star party. The "Trip Around the Triangle" can be used for the duration of the star party, typically one or two hours.



Included in This Activity

Detailed Activity Description

Helpful Hints

Background Information

"Trip Around the Triangle" Handout



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Copies for educational purposes are permitted.

Additional astronomy activities can be found here: <http://nightsky.jpl.nasa.gov>



Set Up Instructions

Make enough copies of the "Trip Around the Triangle" handout (below) for your visitors. These should be 2-sided.

Detailed Activity Description

Trip Around the Triangle

Leader's Role	Participants' Role
<p><i>To do:</i></p> <ol style="list-style-type: none">1. Give each participating club member a copy of the handout. Explain that your visitors will have these and be on a "Trip" to look at objects on the handout. Members operating telescopes are not limited to the objects listed or just to the area surrounding the Summer Triangle. Your visitors will just be asking the operator whether or not the object being viewed is on the handout.2. One or two members may want to volunteer to point out constellations or other naked-eye objects on the "Trip".	
<p>Introduction with your visitors:</p> <p><u>To Ask:</u> Who can show me what a Triangle looks like?</p> <p><u>To Say:</u> Well, tonight you will each take a trip around a triangle – the "Summer Triangle" – as you look through our club members' telescopes tonight.</p> <p><u>To Do:</u> Hold up a copy of the handout.</p> <p><u>To Say:</u> Here are all the sights you might have a chance to see. Some you can see with just your eyes, others you'll want to find a telescope operator who can show you the object. Just ask each telescope operator what they are showing and whether it is on your trip list.</p>	Participants hold their hands or arms in the form of a triangle.



Leader's Role	Participants' Role
<p><i>(Optional):</i> This map might look a little complicated? Well, who can find some <i>little</i> triangles on the map? Each of those marks the location of a nebula – some are where stars might be born and some mark a dying or dead star. How about a dotted circle? Those are groups of young stars. Open star clusters. <i>(You can continue this, pointing out a few other details on the map. This helps your audience get oriented and familiar with the map. This reduces their sense of being overwhelmed.)</i></p>	<p>Nods. I can! I can see a few.</p> <p>Yes!</p>
<p><u>To Say:</u> Be sure not to miss the area where NASA's Kepler Mission will be searching for Earth-size planets around other stars. Scientists have been able to find <u>large</u> planets orbiting other stars. The challenge has been to find <u>Earth-size</u> planets. The Kepler Mission, a space-based telescope, will continuously monitor 100,000 stars in one area of the Summer Triangle for a period of four years. Hold your fist out at arm's length. The area of the sky Kepler will be monitoring for Earth-size planets is just a little larger than your fist. After it gets dark, I (or another member) can show you where that area is.</p>	<p>Hold out fists.</p>
<p><u>To Say:</u> You might want to check off each item on your Trip as you find it.</p> <p><i>(Optional):</i> After you have seen at least (three / six / pick a number) sights on the Trip, you will have earned a completion sticker. (Explain the procedure you have chosen to distribute completion stickers or other prize).</p> <p><u>To Do:</u> Pass out handouts.</p> <p><u>To Say:</u> So enjoy your Trip around the Triangle tonight!</p>	<p>Take handouts.</p>



Leader's Role	Participants' Role
	

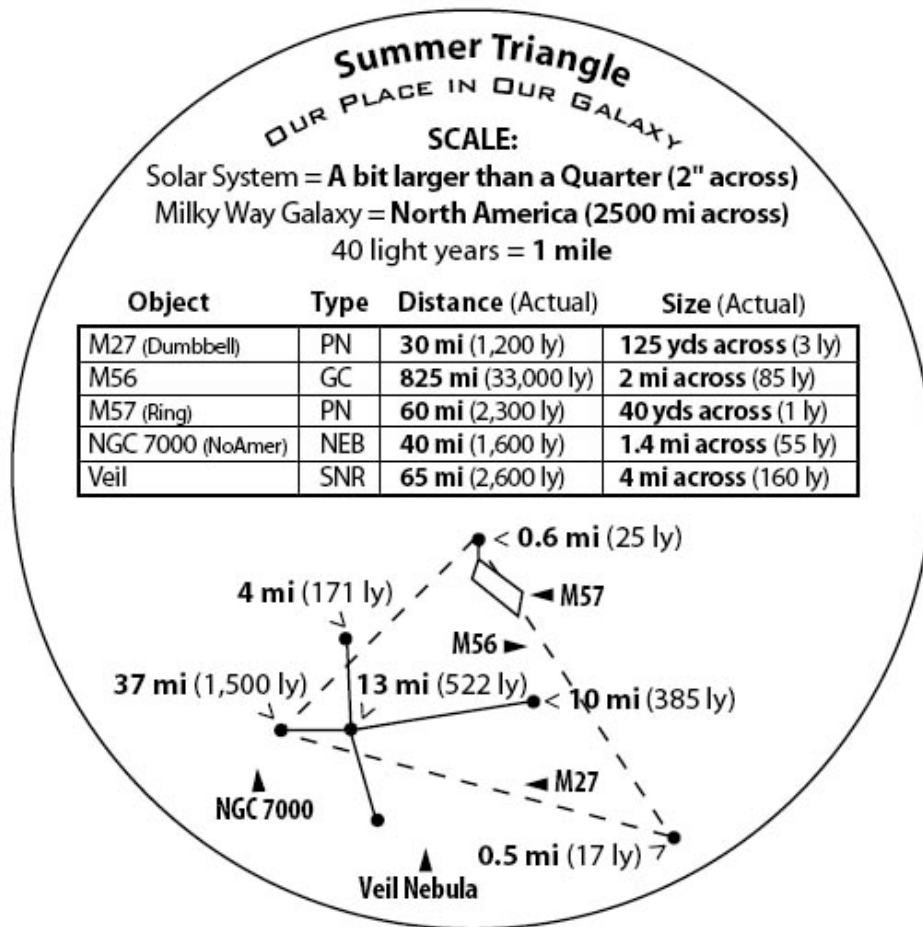


Presentation Tip:

You can use the activity "Our Place in Our Galaxy" to make a scale model of the stars in the Summer Triangle.

<http://nightsky.jpl.nasa.gov/download-search.cfm>

Look for the CD label on the Summer Triangle and make copies for the telescope operators. They can then include the scaled distances as they talk about their object at the telescope. Here is a copy of it:



Helpful Hints

The Summer Triangle is visible in the evening sky June through January and in the early morning sky February through May.

Background Information

Notes on Trip around the Triangle objects:

Gliese 777a: Star with planets (yellow subgiant – just starting to evolve off the main sequence – 52 light years away)

<http://www.extrasolar.net/startour.asp?StarCatId=normal&StarID=172>

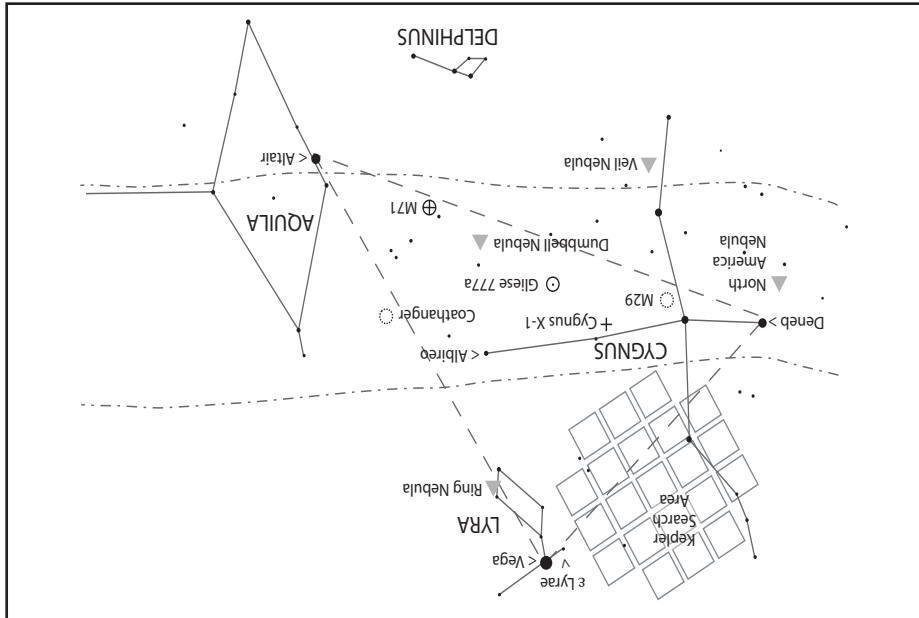
Kepler Search Area: For more information on the Kepler Mission and its target field of view:

<http://kepler.nasa.gov/sci/basis/fov.html>

To locate other objects on the handout, refer to star maps in any astronomy-related magazine or observing manual.



the Triangle



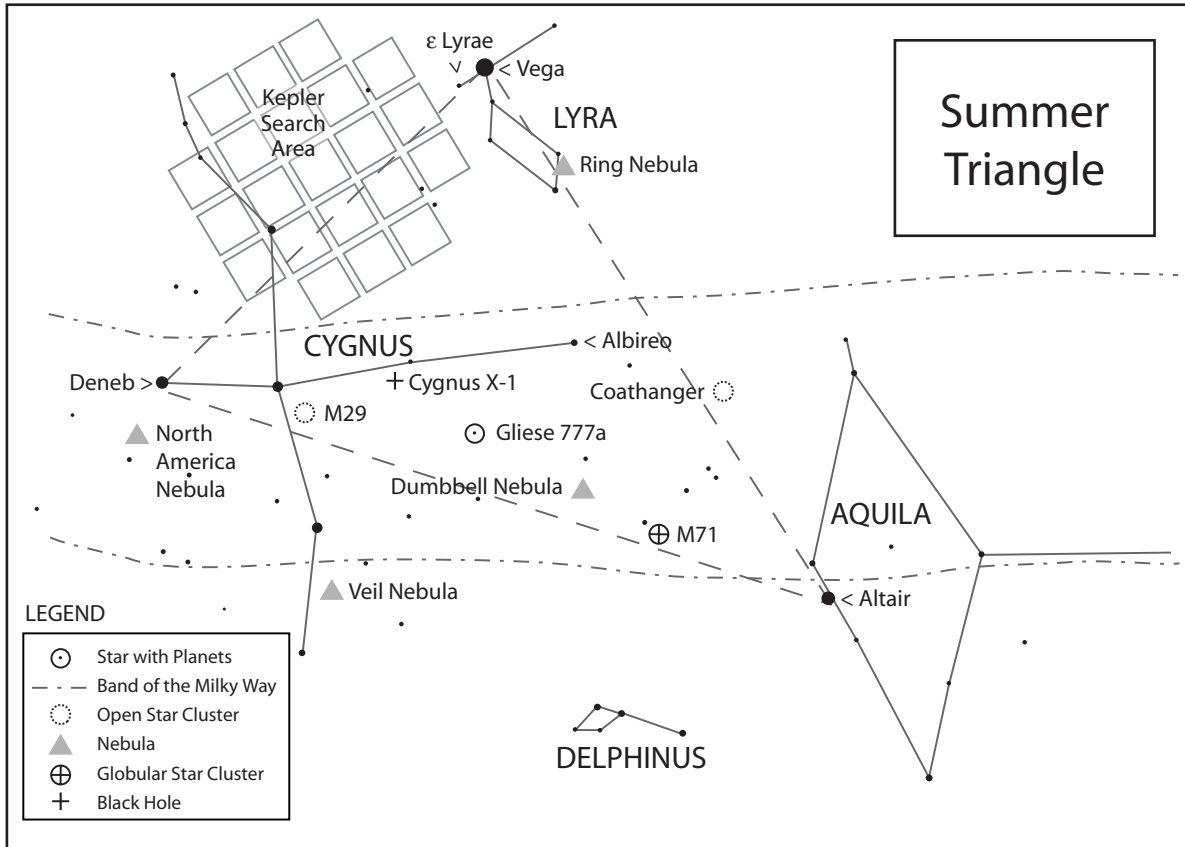
Trip Around



For more information on NASA's *Kepler Mission* to search for Earth-size planets:

<http://Kepler.NASA.gov>

What can you find in the Triangle?



Stars & Star Clusters:

Vega	✓
Deneb	
Altair	
Albireo *	
ϵ Lyrae (double-double stars)*	
Gliese 777a (a star with planets)*	
M29 (Open star cluster)*	
M71 (Globular star cluster)*	
Coathanger *	
Cygnus X-1 (location of a black hole)	

Constellations:

LYRA	
CYGNUS	
AQUILA	
DELPHINUS	

Nebulae:

Ring (planetary - dying star)*	
North America (gas & dust cloud)*	
Dumbbell (planetary - dying star)*	
Veil (supernova remnant)*	

Band of the Milky Way	✓
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Kepler Search Area

Scientists have been able to find *large* planets (similar to Jupiter) orbiting other stars. The challenge has been to find *Earth-size* planets. The *Kepler Mission's* objective is to detect planets crossing in front of their stars in order to locate planets orbiting in the habitable zone around Sun-like stars.

NASA's Kepler Mission, a space-based telescope, will continuously monitor 100,000 stars in this star field in the Summer Triangle for a period of at least four years, watching for a slight dimming of the star due to a planet crossing in front of the star. This is called a "transit."

The area of the sky Kepler will be monitoring for Earth-size planets is just a little larger than your fist held at arm's length.

* **Visible in the telescope or binoculars** (depending on sky conditions)



The Night Sky Network's International Year of Astronomy (IYA) Discovery Guides are supported and sponsored by these NASA Forums and missions:

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Special Advisor: Denise Smith

NASA [JPL's PlanetQuest Exoplanet Exploration Program](#)
Special Advisor: Michael Greene

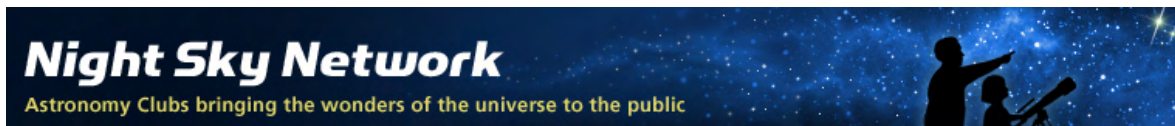
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NASA [Education Forum on Solar System Exploration](#)

NASA [Education and Public Outreach at Sonoma State University](#)

NASA Goddard Space Flight Center [Suzaku Mission E/PO Program](#)

NASA's [Kepler Discovery Mission](#)



[The Night Sky Network](#) is a nationwide coalition of amateur astronomy clubs bringing the science, technology, and inspiration of NASA's missions to the general public.

We share our time and telescopes to provide you with unique astronomy experiences at science museums, observatories, classrooms, and under the real night sky.

<http://nightsky.jpl.nasa.gov>

The International Year of Astronomy (<http://astronomy2009.us>) aims to help citizens of the world rediscover their place in the Universe through the daytime and nighttime sky. Learn more about NASA's contributions to the International Year of Astronomy at <http://astronomy2009.nasa.gov>

