



## NIRCam's Education and Outreach Newsletter

September 2015

### **"Origins" and Belief**

The Search for Extraterrestrial Intelligence (SETI) recently received a major, private donation of 100 million dollars. The revamped project also received endorsement from Dr. Stephen Hawking. According to astronomer Dr. Andrew Siemion of the University of California, Berkeley, *"We're going to do the 10-year, \$100 million dollar initiative. It's a dream come true and we're going to do a great project with it, but the most likely outcome is that we won't detect anything. But then maybe people will start to think that we're the only intelligent life in the Universe and I think that would be an incredibly profound realization. If the Breakthrough Listen project succeeded in communicating that fragility and rareness to the public, I think it would have been a success."*

[http://www.spacedaily.com/reports/SETI\\_reborn\\_The\\_New\\_Search\\_for\\_Intelligent\\_Life\\_999.html](http://www.spacedaily.com/reports/SETI_reborn_The_New_Search_for_Intelligent_Life_999.html)

### **Our New Web site**

We are putting the final touches on our new Web site for NIRCam's education and outreach program. All our activities and resources are available including the monthly Newsletter, interesting Web links, publications, and long-term feedback from our GSUSA workshop graduates. We welcome all your comments and feedback!

<http://zeus.as.arizona.edu/~dmccarthy/GSUSA/index.htm>

### **Facebook Page**

As a reminder, GSUSA leader, Sherry Robinson, has created a Facebook page for our group. Please join and share your experiences, and post pictures, documents, or anything you are doing with your troops and community. Here is the link: <https://www.facebook.com/groups/astronomycamp/>

### **International Observe the Moon Night**

The next International Observe the Moon Night will be held on September 19. Check with your local astronomy club or museum to see if they are hold an observing event that night. If not, you can set up your own event and register at this site:

<http://observethemoonnight.org/>

### **Name That Exoplanet**

In April the International Astronomical Union held a contest for the naming of a small selection of planets around other stars. At that time, they let astronomical organizations and clubs come up with a list of suggested names for 32 planets orbiting 20 stars. In addition they were able to suggest names for 15 of the host stars. Five of the stars already have common names, such as Fomalhaut and Pollux, so the organization and clubs were also allowed to suggest names for 15 stars. Now the voting is open to individuals. Here is the official IAU sit where you can vote:

<http://nameexoworlds.iau.org/>

## **JWST in the News**

This fall the James Webb Space Telescope begins its final assembly, including the integration of all 18 primary mirror segments and the science instruments, all of which have been thoroughly tested in separate experiments. Final assembly is expected to complete in late spring 2016. Launch will occur in October 2018.

The backplane which holds the primary mirrors was recently delivered to Goddard Space Flight Center for mirror assembly. Details are available in this press release:

<http://www.nasa.gov/feature/goddard/james-webb-space-telescope-backplane-arrives-at-nasa-goddard-for-mirror-assembly>

The science instrument module recently passed a severe sound test under conditions simulating the sound levels and vibrations of launch. Details and pictures are available in this press release:

<http://www.nasa.gov/feature/goddard/james-webb-space-telescopes-isim-passes-severe-sound-test>

## **Journey to the Center of the Milky Way**

On a clear dark night, we can see the center of our galaxy (from the Greek word meaning milky), the Milky Way, in the direction of Sagittarius. The following video takes us on a journey from our backyards to a “close-up view of the center of our galaxy: <http://tinyurl.com/o5t4j2u>

The first attached *Starry Night image* shows the Milky Way as seen on September 1 at 9:00 pm Daylight Saving Time (8:00 pm Tucson time) with an X marking the center of our galaxy.

## **Science in the News**

The International Astronomical Union held its latest meeting a few weeks ago and so there have been a number of scientific announcements made. Some of these are highlighted below.

### ***Solar System:***

There are spacecraft in orbit around the dwarf planet Ceres and Comet 67P/Churyumov-Gerasimenko, and New Horizons has now flown by Pluto and its satellites and is continuing to send back exciting images. If you have any questions about news releases you see, please contact Larry and Don and we will try to answer them as best we can.

### ***Dawn at Ceres:***

On August 17, Dawn reached its High Altitude Mapping Orbit of 1,470 km, with a surface resolution of about 140 meters. In December, it will lower its orbit to 375 km where will have a resolution of 35 meters. So, far, only three images have been released to the public with 140-meter resolution.

- The 6-kilometer high conical peak on Ceres shows white streaks on one side that seem to stop at the bottom of the peak. There seems to be evidence of some slumping of material from the peak into the neighboring crater.
- One image shows a mountain range near the edge of a 163-kilometer crater. It is not clear what internal processes would cause mountains like this or the peak.
- The third image shows an 84-kilometer diameter crater with a central depression rather than a central peak.

<http://www.jpl.nasa.gov/news/news.php?feature=4697>

- Just a few days ago a new image of the crater Occator was released, show the white spots in the crater in greater detail, including two “fly-around” animations.

<http://www.nasa.gov/image-feature/jpl/dawn-takes-a-closer-look-at-occator>

<http://www.jpl.nasa.gov/spaceimages/details.php?id=pia19890>  
<http://www.jpl.nasa.gov/spaceimages/details.php?id=pia19891>

*Rosetta at comet 67P/Churyumov-Gerasimenko:*

Unfortunately, it appears that there has been no contact with the lander. The Rosetta spacecraft has been staying fairly far away from Comet 67P because of the increased activity around the time of perihelion (closest approach to the Sun) on August 13.

- At least twice now, Rosetta has seen brief and very focused outbursts from the comet. This was totally unexpected and I have not seen anything reported that says where on the comet these outbursts came from:  
<http://www.jpl.nasa.gov/news/news.php?feature=4687> [July 29]  
[http://www.slate.com/blogs/bad\\_astronomy/2015/08/14/rosetta\\_and\\_comet\\_67p\\_eruption\\_at\\_perihelion.html](http://www.slate.com/blogs/bad_astronomy/2015/08/14/rosetta_and_comet_67p_eruption_at_perihelion.html) [August 12]  
and a bigger outburst ten days later:  
<http://blogs.esa.int/rosetta/2015/08/28/cometwatch-22-august-2/> [August 22]
- A “boulder” was seen “flying by” Comet 67P. This object was estimated to be between 1 and 50 meters in diameter. We do not know if it came off of the comet, just happened to be a random small asteroid that flew by the comet, or is a temporary satellite of the comet (these do not last very long because the orbits are unstable).  
<http://sci.esa.int/rosetta/56346-boulder-flying-by-comet-67p/>

*New Horizons and the Pluto System:*

The flyby of Pluto and its five satellites has brought scientists and the public some wonderful images. Because of the slow data rate, images will be coming back for months to come. There have been no new images since the end of July while information from other instruments is being sent back to Earth. New images will start arriving in mid-September. The ones already sent back have been exciting. To sum it up, Pluto and Charon have geology. They are active bodies. This implies some level of internal heating that was not expected. Since Pluto and Charon are tidally locked, the rotation rate of Pluto is the same as the orbital rate of Charon, the internal heating of Pluto cannot come from tidal interactions as we see with the satellites of Jupiter and Saturn.

What we have seen so far:

- Mountains and mountain ranges on Pluto. These are probably made of water ice.  
<https://www.nasa.gov/image-feature/the-icy-mountains-of-pluto>
- Smooth areas (glaciers?) on Pluto which might have formed within the last 100 million years. These are probably made of nitrogen ice. Here is an article that tries to explain the source of the nitrogen ice glaciers on Pluto.  
<https://blogs.nasa.gov/pluto/2015/08/10/atmospheric-escape-and-flowing-n2-ice-glaciers-what-resupplies-plutos-nitrogen/>
- The New Horizons team has chosen a Kuiper belt object as their next target. If their proposal is accepted (extended mission funding) they will redirect the spacecraft and fly by the 45-kilometer diameter object 2014 MU69 in 2019.  
<http://pluto.jhuapl.edu/News-Center/News-Article.php?page=20150828>
- Charon images show features that are similar to lunar rilles (created by the freeze of liquid water rather than fluid lava)  
<http://www.planetary.org/blogs/emily-lakdawalla/2015/07161539-charon-moon.html>

- A composite image of Pluto was just released. It shows an amazingly complex surface that scientist are trying to understand: ice flows, mountains, deltas(?), dunes(?), etc. A new image of Pluto’s largest moon, Charon, was also released:  
<http://www.nasa.gov/feature/new-pluto-images-from-nasa-s-new-horizons-it-s-complicated>
- The latest news and images from New Horizons can be found at: <http://pluto.jhuapl.edu/>

### ***Stars and Exoplanets:***

Astronomers have discovered another transiting circumbinary planet, a tenth “Tatooine.” In other words, a planet that is orbiting two stars. It is also the third one that is orbiting within the Goldilocks zone, but is unlikely to have life as we know it because it is about six times the diameter of the Earth and so is assumed to be a gas giant. Here is a link to an article about it: <http://tinyurl.com/orxd9pf>

### ***Galaxies and Cosmology:***

The Universe is fading! Using telescopes around the world and in space to survey 200,000 galaxies and wavelengths from the ultraviolet to the far infrared. They discovered that, in the part of the Universe they were able to survey, these galaxies are putting out half as much energy as they did two billion years ago. The first link is to the original IAU press release and the second article expands on the press release and also includes a flythrough of the part of the sky they surveyed.

<http://www.iau.org/news/pressreleases/detail/iau1509/>

<http://tinyurl.com/p82jkqd>

## **September’s Night Sky**

### ***Where are the planets?***

We have attached four *Starry Night* evening images of the sky for September 1 and 30. Two of these are for 8:00 pm Daylight Saving Time (7:00 pm Arizona time) and two are for 6:00 am Daylight Saving Time (5:00 am Arizona time). In the evening sky, Saturn is in the southwest in Libra all month, but gets lower in the southwest as the month progresses. Mercury is low in the west for a short while in early September. In the morning sky in early in September, Venus and Mars are in the east in Cancer. By the end of the month they have moved into Leo and are joined by Jupiter, low on the horizon.

### ***Total Lunar Eclipse September 27-28***

In the evening of September 27, there will be a total lunar eclipse that will be visible throughout the US. This will be the fourth total lunar eclipse in a row (since April 2014) without an intervening partial eclipse. In the west, by the time the Moon rises, the eclipse will have already begun, so you will miss a few minutes of it. Here are two links that will give you general details of the eclipse and specific details for your location. This full moon is called the Harvest Moon, the one closest to the fall equinox on September 23. This is also a “supermoon,” a full moon or new moon that occurs when the Moon is at perihelion, closest to Earth in its elliptical orbit. Unfortunately, this is a term that has been overused in recent years as supermoons occur about twice a year.

<http://earthsky.org/?p=51212>

<http://www.timeanddate.com/eclipse/lunar/2015-september-28>

This second link gives Don and Larry Tucson times (when the Moon rises, etc.). We think it will automatically give you times for your location. The last line of “Where to See the Eclipse” should give your location. If it does not, you can click on it and it will give you a choice of cities.

## **Connecting with the Human Orrery**

Using the Orrery, it is easy to model the positions of the planets relative to each other and to the Sun. As we have noted before, because the stars in the constellations are not at their true relative distances (many kilometers away in this model), the positions of the planets relative to the constellations may be “off” by more than a constellation. In August, Venus was between us and the Sun and Jupiter was on the far side of the Sun. Saturn is still visible in the evening sky and Mercury is visible for a short period of time after sunset early in September. Now, Venus, Mars, and Jupiter (toward the end of September) are morning objects that are visible to us just before the Sun rises.

