

Southwest Florida Astronomical Society

SWFAS



The Eyepiece December 2012

A MESSAGE FROM THE PRESIDENT

It's that time of year again. Officer election time that is.

If you are interested in helping with club positions, please let me know. We do need a Program Coordinator for sure. (As they say, attend to avoid being appointed!)

This month's meeting on Dec. 6th at 7:30 pm at the Calusa Nature Center Planetarium is a first for us. We are going to do a Live Remote Speaker. Tom Field will be doing his program *You Can Almost Touch the Stars!* about spectroscopy for amateurs over the internet. This should be a very interesting presentation.

I am still trying to find out about the January Meeting location. We often have it at FGCU, but I don't have a confirmation on holding it there. I will send out notices about the meeting later this month.

On Dec. 15th, we have a Star Party at Caloosahatchee Regional Park. Contact Bruce Dissette for any additional information.

On Dec. 13th, we have the Geminid meteor shower with no moon!

The star party at the CRP on Nov. 10th was a real nice night. We had clouds early, but then by the time Jupiter was rising, the skies cleared. We had a good turnout with some campers coming over to observe too.

The Jupiter Event at the Planetarium on Nov. 17th was a great success. We had a good turnout and Jupiter was well placed for observing. Since Jupiter is now at opposition, if you haven't had a chance to look at it, you really need to. Carol Stewart and I would like to thank Lee Kraemer and Ray Medhurst for helping.

Upcoming Meetings: January 3rd – Location/topic to be determined.

Moon: Last Quarter 6th, New 13th, 1st Quarter 20th, Full 28th

Planets: Mars is very low in the west at sunset. Saturn is now coming up in the predawn sky. Jupiter is getting high in Taurus rising at sunset. Venus is still shining bright in the morning sky. By the end of the month, Mercury will reach greatest elongation west of the sun on Dec. 4th and will be in the eastern sky before sunrise and on Dec. 20th will be very close to the moon.

Dues for 2013 are now due. If you recently joined after September, your dues were applied to 2013. I will send out email notifications to all members who have not already paid. Please pay at the meetings or events we are holding or send your payment in to SWFAS, P.O. Box 100127, Cape Coral, Florida 33910. If you have any questions about your dues, contact me.

Upcoming Events

- * Dec 13th Gulf Middle Parent Night event
 - * Fri Jan 18th Christa McAuliffe Charter School Evening Observing (1st Quarter Moon)
 - * Sat Feb 2nd Thomas A. Edison Kiwanis Science and Engineering Fair FGCU
- The Science Fair is now separate from the Edison Day of Discovery.
The Science Fair is planning outdoor activities at FGCU.
- * Fri Feb 15th Star Party at Rotary Park Cape Coral Parks and Rec
 - * Sat Feb 23rd Burrowing Owl Festival (Rotary Park Cape Coral 10am-4pm)

Club Positions

President:

Brian Risley

swfasbrisley@embarqmail.com (239-464-0366)

Vice President:

Bruce Dissette

bdissette@centurylink.net (239-936-2212)

Secretary:

Kathleen Hendrix

kathdmom@aol.com (239-689-8707)

Treasurer:

Tony Heiner

verahei@aol.com (941-457-9700)

Program Coordinator:

Vacant

Viewing Coords/
Fakahatchee:

Tony Heiner

verahei@aol.com (941-629-8849)

Chuck Pavlick

cpav4565@gmail.com (239-560-1516)

Viewing Coord/
Caloosahatchee

Bruce Dissette

bdissette@centurylink.net (239-936-2212)

Librarian:

Maria Berni

(239-940-2935)

Club Historian:

Danny Secary

asecary@gmail.com (239-470-4764)

Equipment Coordinator:

Brian Risley

swfasbrisley@embarqmail.com (239-464-0366)

Website Coordinator:

Dan Fitzgerald

bigdan2204@comcast.net (239-282-2292)

Astronomical League

Coordinator (ALCOR):

Carol Stewart

cjstewart@mindspring.com (239-772-1688)

Newsletter Editor:

Carole Holmberg

CaroleHel@aol.com (239-275-3435)

December Meeting

Our December monthly meeting will be held on Thursday December 6th at 7:30 pm at the Calusa Nature Center Planetarium. We have a remote presentation on amateur spectroscopy equipment, *You Can Almost Touch the Stars!* by Tom Field.

CRP Star Party Schedule

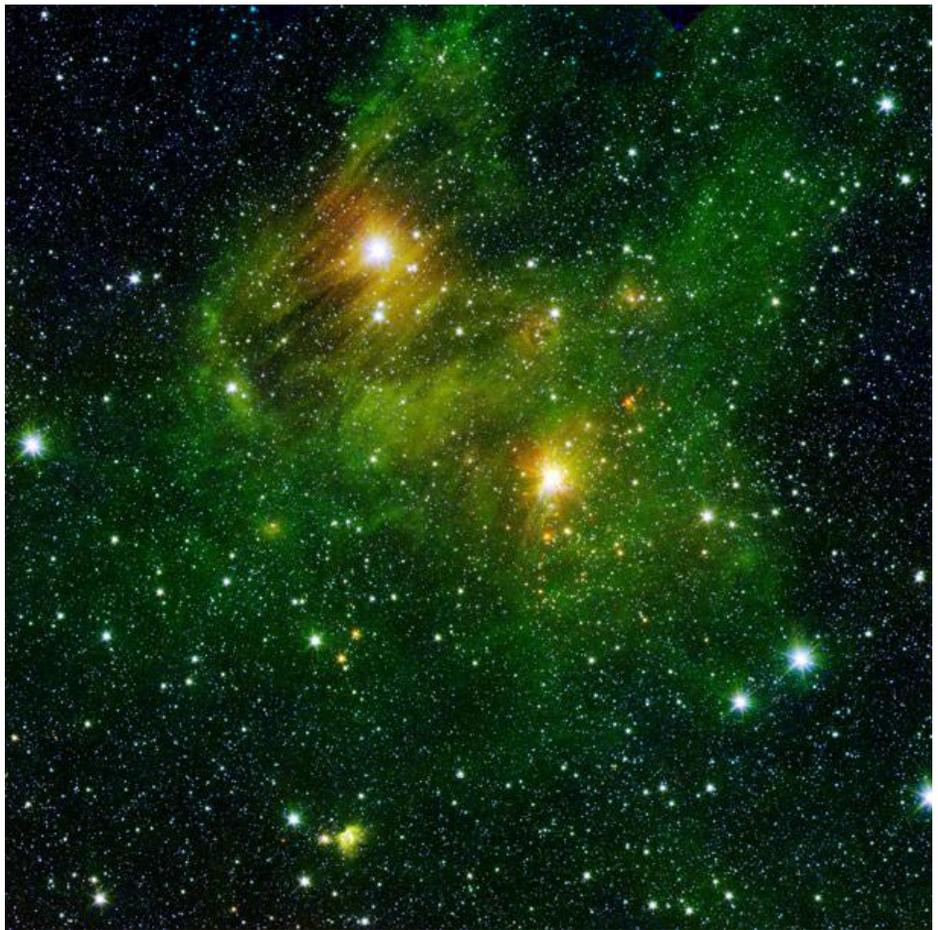
The next CRP star party is December 15th. Please contact Bruce Dissette if you have any questions.

The Coldly Warm Glow of Star Birth

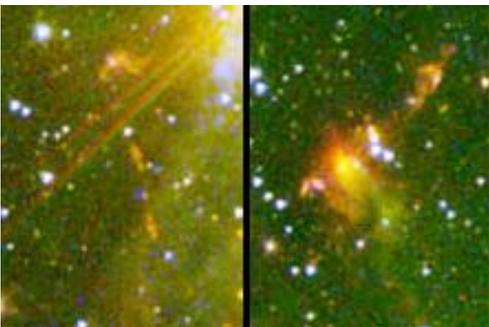
For centuries, scientists have wondered how stars were born. There were lots of ideas, but precious little evidence to back them up.

That's changed recently. Oh baby, how that's changed. Check out this *gorgeous* image of the star-forming compact gas cloud called GL490:

This image is a combination of pictures taken by the Spitzer Space Telescope and the 2 Micron All-Sky Survey. Both telescopes scan the sky in the infrared, well outside what our eyes can see. In this false-color image, blue represents 2.2 microns (the reddest light our human eyes can detect is about 0.7 microns, so this is three times that wavelength), green is 3.6 microns, and red is 4.5 microns. At these long wavelengths, what you tend to see are objects that astronomers call "warm", but that's compared to empty space. In non-geek terms, these objects are colder than 100 Kelvin: about -280°F!



The green glow is from PAHs, or polycyclic aromatic hydrocarbons. Again, in non-geek lingo: big molecules of stinky soot. These are created in lots of conditions in space, but are common where stars are being born. Another indication we're seeing star birth here is that the cloud is pumping out infrared light: it glows in the IR with thousands of times the Sun's total energy, which is what you expect if young, hot stars are embedded in thick layers of dust. The dust absorbs that light, warms up, and glows in the IR. And we know the dust is incredibly thick: it stops so much visible light that if you were to create a filter with the same light-blocking ability, it would be darker than a welder's mask. If you walked outside and held it up, it would totally prevent any sunlight from reaching your eyes.



But in the infrared GL490 glows! And that glow reveals a lot about what's going on. There are little blobs of material all over the cloud, like the two shown here. See how the blobs tend to line up, like a stream of glop in space? That's yet another indication we're seeing young stars. When a star is born, it spins rapidly, has strong magnetic fields, and is generally surrounded by a disk of material from which it (and maybe any planets it has) formed. This sets up conditions where twin beams (what astronomers call "jets") of matter can be blown out of the star from its poles. Since the gas is moving outward from the poles, it's called bipolar outflow.

In some cases there are clearly jets of matter coming from the stars, but using radio telescopes astronomers have looked at GL490 and seen that some of the outflow is perhaps not as well focused. Some stars may be blowing vast winds, like the solar wind, in all directions which expand and sweep up the gas around them. Blobs also seen to emit radio waves may be clumps of that material as it gets snowplowed by the

spherically-expanding winds.

Also, I have to point out the very cool star near the top of the image. See how it's surrounded by a yellower dust (remember, these are false colors; the green is really way out in the IR, and the yellow not quite so far)? That's probably not the dust *glowing*, but *reflecting* the light from the star itself. Some objects in space glow on their own, and some are bright because they're lit up by something bright nearby. That latter is the case here.



Interestingly, the dust appears to be laid out in long, thin ribbons. That may be due to the star's magnetic field; the dust grains line up along the field lines like iron filings on paper with a magnet underneath. I'll also note that if you look at the big picture, that star appears to be near the center of a huge, battered loop of dust. I suspect it's a young star blowing out a wind that's sweeping up the material in the cloud, carving out that cavity. Obviously, there's a lot going on here! The good news is that GL490 is relatively close — about 3000 light years — which gives us a pretty good view of what it's doing.

- by Phil Plait for full article, visit

<http://blogs.discovermagazine.com/badastronomy/2010/08/23/the-coldly-warm-glow-of-star-birth/>

NASA Rover Finds Clues to Changes in Mars' Atmosphere

NASA's car-sized rover, Curiosity, has taken significant steps toward understanding how Mars may have lost much of its original atmosphere. Learning what happened to the Martian atmosphere will help scientists assess whether the planet ever was habitable. The present atmosphere of Mars is 100 times thinner than Earth's.

A set of instruments aboard the rover has ingested and analyzed samples of the atmosphere collected near the "Rocknest" site in Gale Crater where the rover is stopped for research. Findings suggest that loss of a fraction of the atmosphere, resulting from a physical process favoring retention of heavier isotopes of certain elements, has been a significant factor in the evolution of the planet. Isotopes are variants of the same element with different atomic weights.

Initial results show an increase of 5% in heavier isotopes of carbon in the atmospheric carbon dioxide compared to estimates of the isotopic ratios present when Mars formed. These enriched ratios of heavier isotopes to lighter ones suggest the top of the atmosphere may have been lost to interplanetary space. Losses at the top of the atmosphere would deplete lighter isotopes. Isotopes of argon also show enrichment of the heavy isotope, matching previous estimates of atmosphere composition derived from studies of Martian meteorites on Earth.

Scientists theorize that in Mars' distant past its environment may have been quite different, with persistent water and a thicker atmosphere. NASA's Mars Atmosphere and Volatile Evolution, or MAVEN, mission will investigate possible losses from the upper atmosphere when it arrives at Mars in 2014.

Curiosity is set to analyze its first solid sample in the coming weeks, beginning the

search for organic compounds in the rocks and soils of Gale Crater. Analyzing water-bearing minerals and searching for and analyzing carbonates are high priorities for upcoming solid sample analyses.

Researchers are using Curiosity's 10 instruments to investigate whether areas in Gale Crater ever offered environmental conditions favorable for microbial life.

- *The full version of this story with accompanying images is at:*

www.jpl.nasa.gov/news/news.php?release=2012-348&cid=release_2012-348

Titan Glows in the Dark

A literal shot in the dark by imaging cameras on NASA's Cassini spacecraft has yielded an image of a visible glow from Titan, emanating not just from the top of Titan's atmosphere, but also - surprisingly - from deep in the atmosphere through the moon's haze. A person in a balloon in Titan's haze layer wouldn't see the glow because it's too faint - something like a millionth of a watt. Cassini was able to detect it because its cameras are able to take long-exposure images.

"It turns out that Titan glows in the dark - though very dimly," said Robert West, a Cassini imaging team scientist. "It's a little like a neon sign, where electrons generated by electrical power bang into neon atoms and cause them to glow. Here we're looking at light emitted when charged particles bang into nitrogen molecules in Titan's atmosphere."

Scientists are interested in studying the input of energy from the sun and charged particles into Titan's atmosphere because it is at the heart of the natural organic chemistry factory that exists in Titan's atmosphere.

The light, known as airglow, is produced when atoms and molecules are excited by ultraviolet sunlight or electrically charged particles. Scientists expected to see a glow in the high atmosphere (above 400 miles in altitude) where charged particles from the magnetic bubble around Saturn strip electrons off of atmospheric molecules at Titan. Although an extremely weak emission was seen in that region, they were surprised to see Titan's dark face glow in visible wavelengths of light from deeper in the atmosphere (at about 190 miles above the surface), as though illuminated by moonshine from nearby satellites.

The scientists took into account sunlight reflected off Saturn. There was still a glow from the part of Titan that was dark. The luminescence was diffusing up from too deep for charged particles from the sun to be exciting atmospheric particles. The area was also not affected by the shooting of charged particles into the magnetic fields, which is what causes auroras.

Scientists' best guess is that the glow is being caused by deeper-penetrating cosmic rays or by light emitted due to some kind of chemical reaction deep in the atmosphere.

"This is exciting because we've never seen this at Titan before," West said. "It tells us that we don't know all there is to know about Titan and makes it even more mysterious."

Scientists have previously reported that the nightside Venus atmosphere also produces a glow, called the Ashen light. Some have suggested that lightning on Venus is

responsible, although that explanation is not universally accepted. While Cassini's radio wave instrument has detected lightning at Saturn, it has not detected lightning at Titan. Scientists plan to keep looking for clues as Cassini continues to make its way around the Saturn system for another season.

- *The full version of this story with accompanying images is at:*

www.jpl.nasa.gov/news/news.php?release=2012-344&cid=release_2012-344

Stars Ancient and Modern?



This colorful view of the globular star cluster NGC 6362 was captured by the MPG/ESO 2.2-metre telescope at La Silla Observatory in Chile. This new picture provides the best view of this little-known cluster ever obtained. Globular clusters are mainly composed of tens of thousands of very ancient stars, but they also contain some stars that look suspiciously young.

Globular star clusters are among the oldest objects in the Universe, and NGC 6362 cannot hide its age in this picture. The many yellowish stars in the cluster have already run through much of their lives and become red giant stars. But globular clusters are not static relics from the past — some curious stellar activities are still going on in these dense star cities.

For instance, NGC 6362 is home to many blue stragglers — old stars that really do succeed in passing for a younger age. All of the stars in a globular cluster formed over a fairly short period of time, typically about 10 billion years ago for most globulars. Yet blue stragglers are bluer and more luminous — and hence more massive — than they should be after ten billion years of stellar evolution. Blue stars are hot and consume their fuel quickly, so if these stars had formed about ten billion years ago, then they should have fizzled out long ago. How did they survive?

Astronomers are keen to understand the secret of the youthful appearance of blue stragglers. Currently, there are two main theories: stars colliding and merging, and a transfer of material between two companion stars. The basic idea behind both of these options is that the stars were not born as big as we see them today, but that they received an injection of extra material at some point during their lifetimes and this then gave them a new lease of life.

The new image shows the entire cluster against a rich background of the carpet of stars in the Milky Way. This brilliant ball of stars lies in the southern constellation of Ara (The

Altar). It can be easily seen in a small telescope. It was first spotted in 1826 by the Scottish astronomer James Dunlop using a 9-inch telescope in Australia.

- <http://www.eso.org/public/news/eso1243/>

Cosmic Sprinklers Explained



Astronomers have discovered a pair of stars orbiting each other at the center of one of the most remarkable examples of a planetary nebula. The new result confirms a long-debated theory about what controls the spectacular and symmetric appearance of the material flung out into space.

Planetary nebulae are glowing shells of gas around white dwarfs — Sun-like stars in the final stages of their lives. Fleming 1 is a beautiful example that has strikingly symmetric jets that weave into knotty, curved patterns. It is located in the southern constellation of Centaurus and was discovered just over a century ago by Williamina Fleming, a former maid who was hired by Harvard College Observatory after showing an aptitude for astronomy.

Astronomers have long debated how these symmetric jets could be created, but no consensus has been reached. Now, a research team has combined new Very Large Telescope (VLT) observations of Fleming 1 with existing computer modelling to explain in detail for the first time how these bizarre shapes came about.

The team used the VLT to study the light coming from the central star. They found that Fleming 1 is likely to have not one but two white dwarfs at its center, circling each other every 1.2 days. Although binary stars have been found at the hearts of planetary nebulae before, systems with two white dwarfs orbiting each other are very rare.

When a star with a mass up to eight times that of the Sun approaches the end of its life, it blows off its outer shells and begins to lose mass. This allows the hot, inner core of the star to radiate strongly, causing this outward-moving cocoon of gas to glow brightly as a planetary nebula.

While stars are spherical, many of these planetary nebulae are strikingly complex, with knots, filaments, and intense jets of material forming intricate patterns. Some of the most spectacular nebulae — including Fleming 1 — present point-symmetric structures. For this planetary nebula it means that the material appears to shoot from both poles of the central region in S-shaped flows. This new study shows that these patterns for Fleming 1 are the result of the close interaction between a pair of stars — the surprising swansong of a stellar couple.

The pair of stars in the middle of this nebula is vital to explain its observed structure. As the stars aged, they expanded, and for part of this time, one acted as a stellar vampire, sucking material from its companion. This material then flowed in towards the vampire, encircling it with a disc known as an accretion disc. As the two stars orbited one another, they both interacted with this disc and caused it to behave like a wobbling spinning top — a type of motion called precession. This movement affects the behavior of any material that has been pushed outwards from the poles of the system, such as outflowing jets. This study now confirms that precessing accretion discs within binary systems cause the stunningly symmetric patterns around planetary nebulae like Fleming 1.

The deep images from the VLT have also led to the discovery of a knotted ring of material within the inner nebula. Such a ring of material is also known to exist in other families of binary systems, and appears to be a telltale signature of the presence of a stellar couple.

- <http://www.eso.org/public/news/eso1244/>

Good Night, Exoplanet: Baby Name Book to Raise Science Funds

When new planets are discovered beyond the solar system, they often get boring designations such as HD 85512b or Gliese 667Cc. A startup hoping to liven up these names has launched a project to create a Baby Planet Name Book full of more colorful suggestions.

The planet name project is the first official product from Uwingu, a new company that aims to raise money for space research, exploration and education.

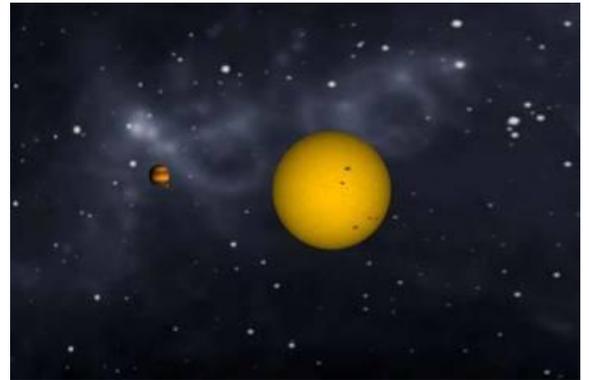
Now, for 99 cents apiece, you can nominate any name you like to join the new planet name registry, and you can also vote for your favorites among the current list.

"The many, many planets discovered across the galaxy in past 20 years are a tribute to our natural human desire to explore beyond the horizon," planet-hunting astronomer Geoff Marcy said in a statement. "Now people all over the world can participate in these discoveries in a new way, giving identities and even personality to billions of planets in our galaxy for the first time."

To be clear, Uwingu officials say the names won't be official, and won't be attached to particular planets — yet. The only body authorized to officially name celestial objects is the International Astronomical Union (IAU), which hasn't so far expressed an interest in changing the status quo of planet naming.

But Uwingu hopes astronomers might use the names from the project to refer to the new planets they keep finding, at least informally. The current tally of confirmed planets is almost 800 and growing, so that's a lot of worlds that need good names.

"This is a whole new way for the people of Earth, of every age, of every nation, of every walk of life to creatively connect to space!" said Uwingu cofounder Alan Stern, a planetary scientist at the Southwest Research Institute. "You can nominate planet names for your favorite town, state, or country, your favorite sports team, music artist, or hero, your favorite author or book, your school, for your loved ones and friends, or even for yourself. And tell your friends about the names you nominate, so they can help vote them to the top! It's fun, it's social, and it's for a great cause."



Uwingu will use the money raised from the project to support research efforts like SETI (the Search for Extraterrestrial Intelligence)'s Allen Telescope Array in California, as well as space launches and science outreach. The company has also released a suite of planet-related educational materials for teachers to go along with the new project. "At Uwingu, we think that it's important that kids learn, as well as play," said Uwingu education officer Emily CoBabe. "So we want to make Uwingu a place where teachers can stop by to get the best and most up-to-date space education materials."
- www.space.com/18420-exoplanet-name-baby-book-uwingu.html

Lost in Space: Rogue Planet Spotted?

Astronomers have identified a body that is very probably a planet wandering through space without a parent star. This is the most exciting free-floating planet candidate so far and the closest such object to the Solar System at a distance of about 100 light-years. Its comparative proximity, and the absence of a bright star very close to it, has allowed the team to study its atmosphere in great detail.

Free-floating planets are planetary-mass objects that roam through space without any ties to a star. Possible examples of such objects have been found before, but without knowing their ages, it was not possible for astronomers to know whether they were really planets or brown dwarfs — "failed" stars that lack the bulk to trigger the reactions that make stars shine.

But astronomers have now discovered an object, labeled CFBDSIR2149, that seems to be part of a nearby stream of young stars known as the AB Doradus Moving Group. The AB Doradus Moving Group is the closest such group to the Solar System. Its stars drift through space together and are thought to have formed at the same time. If the object is associated with this moving group — and hence it is a young object — it is possible to deduce much more about it, including its temperature, mass, and what its atmosphere is made of. There remains a small probability that the association with the moving group is by chance.

The link between the new object and the moving group is the vital clue that allows astronomers to find the age of the newly discovered object. This is the first isolated planetary mass object ever identified in a moving group, and the association with this group makes it the most interesting free-floating planet candidate identified so far.

"Looking for planets around their stars is akin to studying a firefly sitting one centimeter away from a distant, powerful car headlight," says Philippe Delorme, lead author of the new study. *"This nearby free-floating object offered the opportunity to study the firefly in detail without the dazzling lights of the car messing everything up."*

Free-floating objects like CFBDSIR2149 are thought to form either as normal planets that have been booted out of their home systems, or as lone objects like the smallest stars or brown dwarfs. In either case these objects are intriguing — either as planets without stars, or as the tiniest possible objects in a range spanning from the most massive stars to the smallest brown dwarfs.

"These objects are important, as they can either help us understand more about how planets may be ejected from planetary systems, or how very light objects can arise from the star formation process," says Philippe Delorme. *"If this little object is a planet that has been ejected from its native system, it conjures up the striking image of orphaned worlds, drifting in the emptiness of space."*

These worlds could be common — perhaps as numerous as normal stars. If CFBDSIR2149 is not associated with the AB Doradus Moving Group it is trickier to be

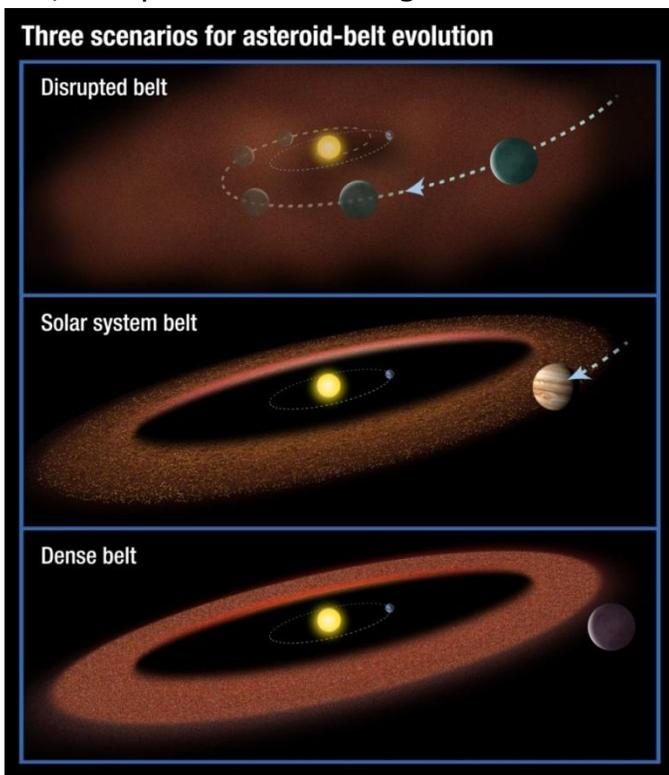
So why do we care where Jupiter hangs out? Well, the gravity of Jupiter, with its mass of 318 Earths, has a profound effect on everything in its region, including the asteroid belt. The asteroid belt is a region between Mars and Jupiter where millions of mostly rocky objects (some water-bearing) orbit. They range in size from dwarf planet Ceres at more than 600 miles in diameter to grains of dust. In the early solar system, asteroids (along with comets) could have been partly responsible for delivering water to fill the ocean of a young Earth. They could have also brought organic molecules to Earth, from which life eventually evolved.

Jupiter's gravity keeps the asteroids pretty much in their place in the asteroid belt, and doesn't let them accrete to form another planet. If Jupiter had moved inward through the asteroid belt toward the Sun, it would have scattered the asteroids in all directions before Earth had time to form. And no asteroid belt means no impacts on Earth, no water delivery, and maybe no life-starting molecules either. Asteroids may have also delivered such useful metals as gold, platinum, and iron to Earth's crust.

But, if Jupiter had not migrated inward at all since it formed far away from the Sun, the asteroid belt would be totally undisturbed and would be a lot more dense with asteroids than it is now. In that case, Earth would have been blasted with a lot more asteroid impacts, and life may have never had a chance to take root.

The infrared data from the Spitzer Space Telescope contributes in unexpected ways in revealing and supporting new ideas and theories about our universe. Read more about this study and other Spitzer contributions at spitzer.caltech.edu. Kids can learn about infrared light and enjoy solving Spitzer image puzzles at spaceplace.nasa.gov/spitzer-slyder.

Caption: Our solar system is represented by the middle scenario, where the gas giant planet has migrated inward, but still remains beyond the asteroid belt.



- This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

Special Days (from the Space Place)

Dec. 14: Geminids Meteor Shower

Get tips on the best meteor viewing techniques at <http://spaceplace.nasa.gov/meteor-shower>.

Dec. 25, 1642: Birthday of Isaac Newton

He understood how orbits work, and so can you by firing a cannon into space. With enough gunpowder, you, too, can achieve orbit! Go to <http://spaceplace.nasa.gov/how-orbits-work>.

Dec. 31, 1705: First recorded sighting of Halley's comet

Play "Comet Quest" and learn about comets at <http://spaceplace.nasa.gov/comet-quest>.



More free publicity - SkySafari now publicizes your events!

Publicity for your events is becoming easier and easier! SkySafari is the latest mobile astronomy app (it's a planetarium in your pocket!) to include your public events. All you have to do is post your upcoming events on the Night Sky Network public calendar and they automatically appear on all versions of the app. Check the app's Help menu for "Local Astronomy Events." SkySafari is available for Android and the iPhone, iPad, and iPod Touch.



The **Distant Suns** planetarium app also lists Night Sky Network club events. Tap on "Events" in the navigation bar. Distant Suns is available on iPhone, iPad, Kindle, and NOOK.

Astrobyte

Refer your visitors to the NASA Night Sky Network on Facebook and Twitter so your visitors will keep the excitement of learning about the sky. People usually want to know what's up in the sky, so refer them to NSN especially if your club doesn't have time to dedicate to social media.



Nominations Open - ASP's Las Cumbres Outreach Award



Do you know someone in your club who is a rock star at outreach? Nominate an outstanding amateur astronomer for ASP's Las Cumbres Outreach Award by January 1, 2013. The 2012 winner is Chuck McPartlin, outreach coordinator of the Santa Barbara Astronomical Unit.

Wishing you clear skies and oodles of outreach,



Marni Berendsen, Jessica Santascoy, & Vivian White, The Night Sky Network Team

nightskyinfo@astrosociety.org

The NASA Night Sky Network is a nationwide coalition of nearly 400 amateur astronomy clubs. The NASA Night Sky Network is managed by The Astronomical Society of the Pacific.

SWFAS Minutes

There was no business meeting in November, so there are no minutes to report.

Future Events

CALUSA NATURE CENTER PLTM	12-6-12	7:30 PM	MONTHLY MEETING
GULF MIDDLE SCHOOL	12-13-12		PARENT NIGHT EVENT
GEMINID METEOR SHOWER PEAKS	12-14-12		
CALOOSAHATCHEE REGIONAL PARK	12-15-12	DUSK	STAR PARTY

LOCATION TBA	1-3-13	7:30 PM	MONTHLY MEETING
CHRISTA McAULIFFE CHARTER SCHOOL	1-18-13		EVENING OBSERVING
FGC U	2-2-13		SCIENCE AND ENGINEERING FAIR

Southwest Florida Astronomical Society, Inc.
P.O. Box 100127
Cape Coral, FL 33910

www.theeyepiece.org