

# Southwest Florida Astronomical Society

SWFAS



## The Eyepiece May 2013

### A MESSAGE FROM THE PRESIDENT

It's time to say hello to Saturn and Venus and goodbye to Jupiter!

The event on April 6th at Shell Point Village was very good. We had a good turnout. Next time we want to do it when the sunset is earlier, as many had to go when it just started to get dark.

Our picnic on the 13th at the CRP was great! We had a good turnout, great food and company. Thanks to all who came out and brought things! Unfortunately, the evening only provided a limited amount of observing. It was nice to observe down the road away from the parking lot. Horizons are nice and low there. As we get into the fall star parties, we plan to open one per quarter more to the public with publicity help from Lee County Parks and Rec.

Tony Heiner and his wife Vera did a STEM event at Peace River Elementary on April 26th with about 100 people attending.

Carol Stewart and I went out the Skyline Elementary 25th Anniversary event on April 27th. Weather was great, the sun was real nice. A little slow at first, but we did get more people later on.

This month's meeting program is **Observing Saturn** by Brian Risley. I am looking for someone to do the June Meeting program.

Moon: Last Quarter 2nd, New 10th, 1st Quarter 18th, Full 25th, Last Quarter 31st

Planets: Mars just passed behind the sun so is not visible. Jupiter is in the west in Taurus at sunset, last chance to see it as it slips behind the sun in June. Venus is creeping into the evening sky and Mercury will reappear in the evening sky reaching greatest elongation on June 7th. Saturn just passed opposition and is well placed in the sky most of the night. We have the Eta Aquarid Meteor Shower on the morning of the 5th. This is primarily a southern hemisphere shower, but it can be nice for us in Florida and the moon is near new! In the last weeks of May, Venus, Jupiter and Mercury will be in a very tight grouping, closest on the 26th.

Dues for 2013 are now due. I will be sending out last notices 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.

### Club Positions

President:

**Brian Risley**

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

Vice President:

**Bruce Dissette**

bdissette@centurylink.net

(239-936-2212)

Secretary:

**Lee Kraemer**

kraemerlee@hotmail.com

(239-339-7624)

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)

## Upcoming Events

- \* Thurs May 2nd Monthly meeting at the Calusa Nature Center Planetarium, 7:30pm, Program: Observing Saturn, Brian Risley
- \* Sat May 11th Club Star Party at Caloosahatchee Regional Park (Dusk -?)
- \* Fri May 17th Program and Telescope Observing at Calusa Nature Center, 8:30 pm (Carole Holmberg: CaroleHel@aol.com)
- \* Thurs June 6th Monthly meeting at the Calusa Nature Center Planetarium, 7:30pm
- \* Sat June 8th Club Star Party at Caloosahatchee Regional Park (Lakeland Christian School will be there) (Dusk -?)

## May Meeting

Our May monthly meeting will be held on May 2nd at 7:30 pm at the Calusa Nature Center Planetarium. Brian Risley will give a talk entitled *Observing Saturn*.

## CRP Star Party Schedule

The remaining Star Parties for 2013 will be May 11, June 8, July 6, August 3, September 14, October 5, November 2, November 30, and December 28.

## Club Assistance Needed for Telescope Observing

On Friday, May 17, the Calusa Nature Center will have a free planetarium show and telescope observing session for the public focused on Saturn. The Moon will be about first quarter and also an easy target. The event starts at 8:30 pm. If you can help, please let me know.

-Carole Holmberg, CaroleHel@aol.com

## Donald Lambrecht

I regret to inform you that my father Donald W. Lambrecht passed away 3/8/2013 in Fort Myers, FL. I know he did love his star gazing!

- Lynne Dubinski, daughter

## Curiosity's Parachute Shifts in the Martian Wind

Photos from NASA's Mars Reconnaissance Orbiter show how the parachute that helped NASA's Curiosity rover land on Mars last summer has subsequently changed its shape on the ground.

Seven images taken by HiRISE between Aug. 12, 2012, and Jan. 13, 2013, show the



used parachute shifting its shape at least twice in response to wind.

Researchers have used HiRISE to study many types of changes on Mars. Its first image of Curiosity's parachute, not included in this series, caught the spacecraft suspended from the chute during descent through the Martian atmosphere.

The images in the sequence of photos are available online at <http://uahirise.org/releases/msl-chute.php> and at [www.jpl.nasa.gov/spaceimages/details.php?id=PIA16813](http://www.jpl.nasa.gov/spaceimages/details.php?id=PIA16813) .

For more information about the Mars Reconnaissance Orbiter, which has been studying Mars from orbit since 2006, visit [www.nasa.gov/mro](http://www.nasa.gov/mro) .

- [www.jpl.nasa.gov/news/news.php?release=2013-121&cid=release\\_2013-121](http://www.jpl.nasa.gov/news/news.php?release=2013-121&cid=release_2013-121)

## **Saturn in the News**

### **Blame it on the Rain (from Saturn's Rings)**

A new study tracks the "rain" of charged water particles into the atmosphere of Saturn and finds there is more of it and it falls across larger areas of the planet than previously thought. The study reveals that the rain influences the composition and temperature structure of parts of Saturn's upper atmosphere.



In the early 1980s, images from NASA's Voyager spacecraft showed two to three dark bands on Saturn, and scientists theorized that water could have been

showering down into those bands from the rings. Those bands were not seen again until this team observed the planet in near-infrared wavelengths with the W.M Keck Observatory in April 2011. The effect was difficult to discern because it involves looking for a subtle emission from bright parts of Saturn. It required an instrument like that on Keck, which can split up a large range of light.

The ring rain's effect occurs in Saturn's ionosphere, where charged particles are produced when the otherwise neutral atmosphere is exposed to a flow of energetic particles or solar radiation. When the scientists tracked the pattern of emissions of a particular hydrogen ion with three protons (triatomic hydrogen), they expected to see a uniform planet-wide infrared glow. What they observed instead was a series of light and dark bands - with areas of reduced emission corresponding to water-dense portions of Saturn's rings and areas of high emission corresponding to gaps in the rings.

They surmised that charged water particles from the planet's rings were being drawn towards the planet along Saturn's magnetic field lines and were neutralizing the glowing triatomic hydrogen ions. This leaves large "shadows" in what would otherwise be a planet-wide infrared glow. These shadows cover some 30 to 43% of the planet's upper atmosphere surface from around 25 to 55° latitude. This is a significantly larger area than suggested by images from NASA's Voyager mission.

Both Earth and Jupiter have an equatorial region that glows very uniformly. Scientists expected this pattern at Saturn, too, but they instead saw dramatic differences at different latitudes.

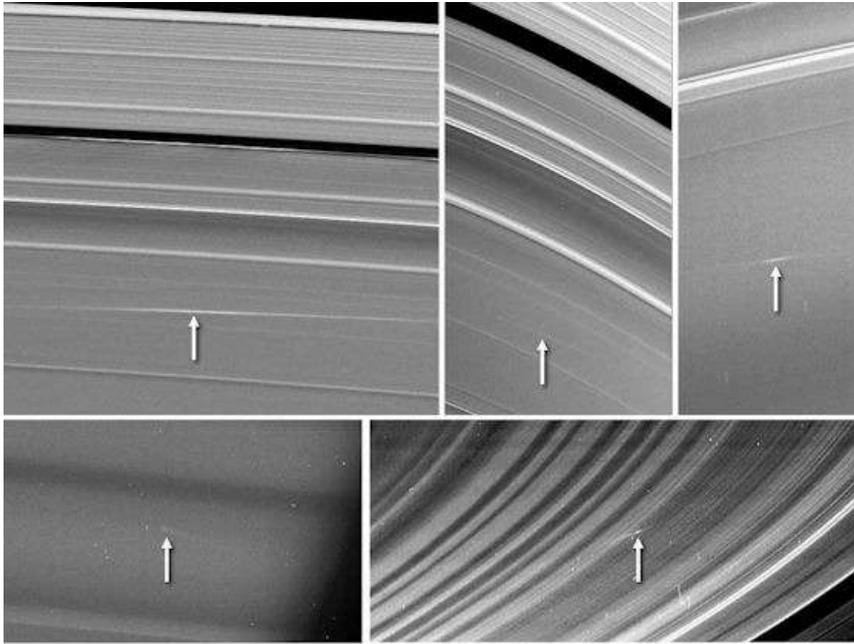
- [www.jpl.nasa.gov/news/news.php?release=2013-130&cid=release\\_2013-130](http://www.jpl.nasa.gov/news/news.php?release=2013-130&cid=release_2013-130)

### **Cassini Catches Meteors Hitting Saturn's Rings**

NASA's Cassini spacecraft has provided the first direct evidence of small meteoroids crashing into Saturn's rings and breaking into streams of rubble.

These observations make Saturn's rings the only location besides Earth, the moon and Jupiter where astronomers have been able to observe impacts as they occur. The meteoroids Cassini

detected range in size from about one-half inch to several yards. Scientists scrutinizing images from the probe took years to distinguish tracks left by nine meteoroids in 2005, 2009 and 2012.



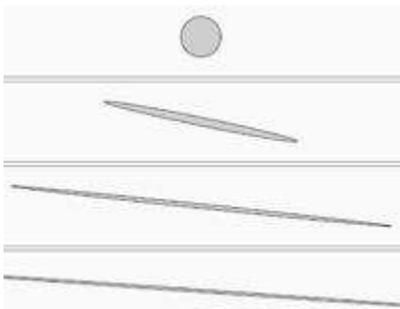
Caption: Five images of Saturn's rings, taken by NASA's Cassini spacecraft between 2009 and 2012, show clouds of material ejected from impacts of small objects into the rings. Image credit: NASA/JPL-Caltech/Space Science Inst/Cornell

The solar system is full of small, speeding objects such as comet dust and chips off asteroids. These objects frequently pummel planetary bodies.

The Saturnian equinox in summer 2009 was an especially good time to see the debris left by meteoroid impacts. The very shallow sun angle on the rings caused the clouds of debris to look bright against the

darkened rings in pictures from Cassini's imaging science subsystem.

"We knew these little impacts were constantly occurring, but we didn't know how big or how frequent they might be," said Matt Tiscareno, a Cassini participating scientist. "Sunlight shining edge-on to the rings at the Saturnian equinox acted like an anti-cloaking device, so these usually invisible features became plain to see."



*Caption: This illustration depicts the shearing of an initially circular cloud of debris as a result of the particles in the cloud having differing orbital speeds around Saturn. Image credit: NASA/Cornell*

Tiscareno now thinks meteoroids of this size probably break up on a first encounter with the rings, creating smaller, slower pieces that then enter into orbit around Saturn. The impact into the rings of these secondary meteoroids creates clouds of debris. The tiny particles forming these clouds have a range of orbital speeds around Saturn. As a result they are soon are pulled into diagonal, extended bright streaks such as Cassini observed.

The finding could shed light on a long standing question: How old are Saturn's rings?

"Saturn's rings are unusually bright and clean, leading some to suggest that the rings are actually much younger than Saturn," said Jeff Cuzzi, a Cassini interdisciplinary scientist specializing in planetary rings and dust.

Some estimates have even put the formation of Saturn's rings during the age of dinosaurs on Earth. That would make the rings very young compared to Saturn.

- Production editor: Dr. Tony Phillips | Credit: Science@NASA

[http://science.nasa.gov/science-news/science-at-nasa/2013/26apr\\_saturnids/](http://science.nasa.gov/science-news/science-at-nasa/2013/26apr_saturnids/)

## Cassini Gets Close-Up Views of Large Hurricane on Saturn

NASA's Cassini spacecraft has provided scientists the first close-up, visible-light views of a behemoth hurricane swirling around Saturn's north pole.

In high-resolution pictures and video, scientists see the hurricane's eye is about 1,250 miles wide, 20 times larger than the average hurricane eye on Earth. Thin, bright clouds at the outer edge of the hurricane are traveling 330 mph. The hurricane swirls inside a large, mysterious, six-sided weather pattern known as the hexagon.



"We did a double take when we saw this vortex because it looks so much like a hurricane on Earth," said Andrew Ingersoll, a Cassini imaging team member. "But there it is at Saturn, on a much larger scale, and it is somehow getting by on the small amounts of water vapor in Saturn's hydrogen atmosphere."

Scientists will be studying the hurricane to gain insight into hurricanes on Earth, which feed off warm ocean water. Although there is no body of water close to these clouds high in Saturn's atmosphere, learning how these Saturnian storms use water vapor could tell scientists more about how terrestrial hurricanes are generated and sustained.

Both a terrestrial hurricane and Saturn's north polar vortex have a central eye with no clouds or very low clouds. Other similar features include high clouds forming an eye wall, other high clouds spiraling around the eye, and a counter-clockwise spin in the northern hemisphere.

A major difference between the hurricanes is that the one on Saturn is much bigger than its counterparts on Earth and spins surprisingly fast. At Saturn, the wind in the eye wall blows more than four times faster than hurricane-force winds on Earth. Unlike terrestrial hurricanes, which tend to move, the Saturnian hurricane is locked onto the planet's north pole. On Earth, hurricanes tend to drift northward because of the forces acting on the fast swirls of wind as the planet rotates. The one on Saturn does not drift and is already as far north as it can be.

"The polar hurricane has nowhere else to go, and that's likely why it's stuck at the pole," said Kunio Sayanagi, a Cassini imaging team associate.

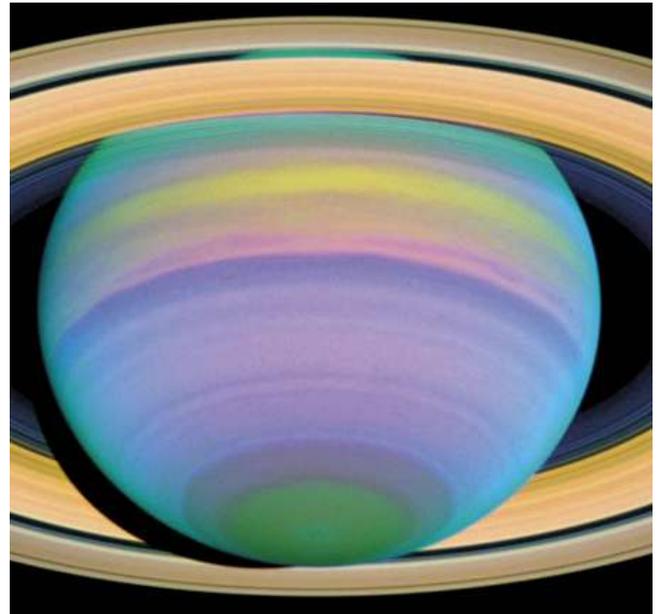
Scientists believe the massive storm has been churning for years. When Cassini arrived in the Saturn system in 2004, Saturn's north pole was dark because the planet was in the middle of its north polar winter. During that time, the Cassini spacecraft's composite infrared spectrometer and visual and infrared mapping spectrometer detected a great vortex, but a visible-light view had to wait for the passing of the equinox in August 2009. Only then did sunlight begin flooding Saturn's northern hemisphere. The view required a change in the angle of Cassini's orbits around Saturn so the spacecraft could see the poles.

"Such a stunning and mesmerizing view of the hurricane-like storm at the north pole is only possible because Cassini is on a sportier course, with orbits tilted to loop the spacecraft above and below Saturn's equatorial plane," said Scott Edgington, Cassini deputy project scientist. "You cannot see the polar regions very well from an equatorial orbit. Observing the planet from different vantage points reveals more about the cloud layers that cover the entirety of the planet." Cassini changes its orbital inclination for such an observing campaign only once every few years.

Images and two versions of a movie of the hurricane can be viewed online at <http://go.usa.gov/TQSB> .  
- [www.jpl.nasa.gov/news/news.php?release=2013-149&cid=release\\_2013-149](http://www.jpl.nasa.gov/news/news.php?release=2013-149&cid=release_2013-149)

## Saturn Looming Large

Saturn reached opposition on April 28, which means it is opposite the Sun as seen from Earth. Only celestial objects in the outer solar system (relative to Earth) can reach opposition. At opposition an object rises at sunset and is visible all night. It's also the time when Earth is closest to the object and the object appears largest. The farther away the object is during opposition, the less pronounced the difference in size. Mars can appear 600% larger during opposition than it does when it is on the opposite side of the Sun. Jupiter appears about 60% larger, and Saturn about 33% larger. Although opposition refers to a precise moment, changes in apparent size are gradual, taking place over the course of weeks or months. This 2003 ultraviolet view of Saturn is from the Hubble Telescope.

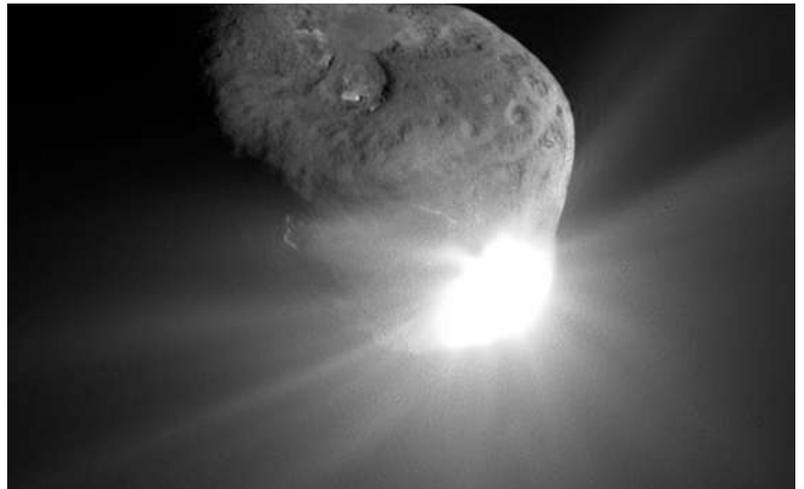


- *The Year in Space calendar, Image credit: NASA and E. Karkoschka (University of Arizona)*

## How to Target an Asteroid

Like many of his colleagues at NASA's Jet Propulsion Laboratory, Shyam Bhaskaran is working a lot with asteroids these days. And also like many of his colleagues, the deep space navigator devotes a great deal of time to crafting, and contemplating, computer-generated 3D models of these intriguing nomads of the solar system.

But while many of his coworkers are calculating asteroids' past, present and future locations in the cosmos, zapping them with the world's most massive radar dishes, or considering how to rendezvous and perhaps even gently nudge an asteroid into lunar orbit, Bhaskaran thinks about how to collide with one.



"If you want to see below the surface of an asteroid, there's no better way than smacking it hard," said Bhaskaran. "But it's not that easy. Hitting an asteroid with a spacecraft traveling at hypervelocity is like shooting an arrow at a target on a speeding race car."

The term hypervelocity usually refers to something traveling at very high speed - two miles per second (6,700 mph) or above. Bhaskaran's hypothetical impacts tend to be well above.

"Most of the hypervelocity impact scenarios that I simulate have spacecraft/asteroid closure rates of around eight miles a second, 30,000 miles per hour," said Bhaskaran.

"High-speed impacts on asteroids can tell you so many things that we want to know about asteroids," said Steve Chesley, a near-Earth object scientist at JPL. "They can tell you about their composition and their structural integrity -- which is how they hold themselves together."

These are things that are not only vital for scientific research on the origins of the solar system, but also for mission designers working on ways to potentially move asteroids, either for exploitation purposes or because they may be hazardous to Earth."

Hypervelocity impacts by spacecraft are not just a hypothetical exercise. Scientists have taken the opportunity to analyze data from used spacecraft and rocket stages that have impacted the moon and other celestial bodies since the Apollo program. On July 4, 2005, NASA's Deep Impact spacecraft successfully collided its dynamic impactor with comet 9P/Tempel 1 - it was the first hypervelocity impact of a primitive solar system body.

"Impacting an asteroid presents slightly different challenges than impacting a comet," said Bhaskaran. "Comets can have jets firing material into space, which can upset your imaging and guidance systems, while potential asteroid targets can be as small as 164 feet and have their own mini-moons orbiting them. Since they're small and dim, they can be harder to spot."

Along with the size of the celestial body being targeted, Bhaskaran also has to take into account its orbit, targeting errors, how hard an impact the scientists want, and even the shape.

"Asteroids hardly ever resemble perfect spheroids," said Bhaskaran. "What you've got floating around out there are a bunch of massive objects that look like peanuts, potatoes, diamonds, boomerangs and even dog bones - and if the spacecraft's guidance system can't figure out where it needs to go, you can hit the wrong part of the asteroid, or much worse, miss it entirely."

The guidance system Bhaskaran is referring to is called "AutoNav," which stands for Autonomous Navigation. To reach out and touch something that could be halfway across the solar system and traveling at hypervelocity requires a fast-thinking and fast-maneuvering spacecraft. It is a problem that even the speed of light cannot cure. "When it comes to these high-speed impact scenarios, the best info you get on where you are and where you need to be comes very late in the game," said Bhaskaran. "That's why the last few hours before impact are so critical. We need to execute some final rocket burns, called Impactor Targeting Maneuvers (ITMs), quickly. With Earth so far away, there is no chance to send new commands in time.

"So, instead, we have AutoNav do the job for us. It is essentially a cyber-astronaut that takes in all the pertinent information, makes its own decisions and performs the actions necessary to make sure we go splat where we want to go splat."

Currently, Bhaskaran is running simulations that make his virtual impactor go splat against the furrowed, organic-rich regolith of asteroid 1999 RQ36. The 1,600-foot-wide space rock is the target of a proposed JPL mission called the Impactor for Surface and Interior Science (ISIS). The impactor spacecraft, which looks a little like a rocket-powered wedding ring, would hitch a free ride into space aboard the rocket carrying NASA's InSight mission to Mars. The impactor's trajectory would then loop around Mars and bear down on RQ36.

The part of the ISIS mission Bhaskaran is most interested in is what happens after our rocket-festooned, cyber-hero rounds Mars and begins to close the distance with the asteroid at a speed of 8.4 miles per second. Over the next several months, the mission navigators would plan and execute several deep space maneuvers that refine the spacecraft's approach. Then, with only two hours to go, AutoNav would take over to make the final orbital changes.

"AutoNav's imaging system and its orbit determination algorithms will detect the asteroid and compute its location in space relative to the impactor," said Bhaskaran. "Without waiting to hear from us, it will plan for and execute three ITMs at 90 minutes, 30 minutes and then three minutes out. That last rocket firing will occur when the asteroid is only 1,500 miles away. Three minutes later, if all goes according to plan, the spacecraft hits like a ton of bricks."

The resulting data would not only provide information on what makes up the asteroid, but how its orbit reacts to being hit by a NASA spacecraft.

NASA detects, tracks and characterizes asteroids and comets passing relatively close to Earth using both ground- and space-based telescopes. The Near-Earth Object Observations Program, commonly called "Spaceguard," discovers these objects, characterizes a subset of them, and predicts their paths to determine if any could be potentially hazardous to our planet.

- [www.jpl.nasa.gov/news/news.php?release=2013-138&cid=release\\_2013-138](http://www.jpl.nasa.gov/news/news.php?release=2013-138&cid=release_2013-138)

## Comet ISON Meteor Shower

Anticipation is building as Comet ISON plunges into the inner solar system for a close encounter with the sun in November 2013. Blasted at point-blank range by solar radiation, the sungrazer will likely become one of the finest comets in many years.

When NASA's Swift spacecraft observed the comet in January 2013, it was still near the orbit of Jupiter, but already very active. More than 112,000 pounds of dust were spewing from the comet's nucleus *every minute*.

It turns out, some of that dust might end up on Earth.

Veteran meteor researcher Paul Wiegert of the University of Western Ontario has been using a computer to model the trajectory of dust ejected by Comet ISON, and his findings suggest that an unusual meteor shower could be in the offing.

"For several days around January 12, 2014, Earth will pass through a stream of fine-grained debris from Comet ISON," says Wiegert. "The resulting shower could have some interesting properties.

According to Wiegert's computer models, the debris stream is populated with extremely tiny grains of dust, no more than a few microns wide, pushed toward Earth by the gentle radiation pressure of the sun. They will be hitting at a speed of 125,000 mph. Because the particles are so small, Earth's upper atmosphere will rapidly slow them to a stop.

"Instead of burning up in a flash of light, they will drift gently down to the Earth below," he says. Don't expect to notice. The invisible rain of comet dust, if it occurs, would be very slow. It can take months or even years for fine dust to settle out of the high atmosphere.

Wiegert notes another curiosity: "The shower is going to hit our planet from two directions at once."

When Earth passes through the debris stream, we will encounter two populations of comet dust. One swarm of dust will be following the Comet ISON into the sun. Another swarm will be moving in the opposite direction, pushed away from the sun by solar radiation pressure. The streams will pepper opposite sides of Earth simultaneously.

"In my experience, this kind of double whammy is unprecedented," says Wiegert.

Bill Cooke, lead scientist at NASA's Meteoroid Environment Office, says there's little danger to Earth-orbiting spacecraft. "These particles are just too small to penetrate the walls of our satellites, and they don't stand a chance against the heavy shielding of the ISS." However, he adds, mission operators will be alert around January 12th for possible anomalies.

Sky watchers should probably be alert, too. The odds of seeing anything are low, but Comet ISON could prove full of surprises.

- Author: Dr. Tony Phillips, Credit: Science@NASA

[http://science.nasa.gov/science-news/science-at-nasa/2013/19apr\\_isonids/](http://science.nasa.gov/science-news/science-at-nasa/2013/19apr_isonids/)

## Einstein's Gravity Theory Passes Toughest Test Yet

A strange stellar pair nearly 7,000 light-years from Earth has provided physicists with a unique cosmic laboratory for studying the nature of gravity. The extremely strong gravity of a massive neutron star in orbit with a companion white dwarf star puts competing theories of gravity to a

test more stringent than any available before.

Once again, Albert Einstein's General Theory of Relativity, published in 1915, comes out on top. At some point, however, scientists expect Einstein's model to be invalid under extreme conditions. General Relativity, for example, is incompatible with quantum theory. Physicists hope to find an alternate description of gravity that would eliminate that incompatibility.

A newly-discovered pulsar -- a spinning neutron star with twice the mass of the Sun -- and its white-dwarf companion, orbiting each other once every two and a half hours, has put gravitational theories to the most extreme test yet. Observations of the system, dubbed PSR J0348+0432, produced results consistent with the predictions of General Relativity.

The tightly-orbiting pair was discovered with the Green Bank Telescope (GBT), and subsequently studied in visible light with the Apache Point telescope in New Mexico, the Very Large Telescope in Chile, and the William Herschel Telescope in the Canary Islands.

In such a system, the orbits decay and gravitational waves are emitted, carrying energy from the system. By very precisely measuring the time of arrival of the pulsar's radio pulses over a long period of time, astronomers can determine the rate of decay and the amount of gravitational radiation emitted. The large mass of the neutron star in PSR J0348+0432, the closeness of its orbit with its companion, and the fact that the companion white dwarf is compact but not another neutron star, all make the system an unprecedented opportunity for testing alternative theories of gravity.

Under the extreme conditions of this system, some scientists thought that the equations of General Relativity might not accurately predict the amount of gravitational radiation emitted, and thus change the rate of orbital decay. Competing gravitational theories, they thought, might prove more accurate in this system.

"We thought this system might be extreme enough to show a breakdown in General Relativity, but instead, Einstein's predictions held up quite well," said Paulo Freire, of the Max Planck Institute for Radioastronomy in Germany.

That's good news, the scientists say, for researchers hoping to make the first direct detection of gravitational waves with advanced instruments. Researchers using such instruments hope to detect the gravitational waves emitted as such dense pairs as neutron stars and black holes spiral inward toward violent collisions.

Gravitational waves are extremely difficult to detect and even with the best instruments, physicists expect they will need to know the characteristics of the waves they seek, which will be buried in "noise" from their detectors. Knowing the characteristics of the waves they seek will allow them to extract the signal they seek from that noise.

[www.sciencedaily.com/releases/2013/04/130425142250.htm?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+sciencedaily%2Fspace\\_time+%28ScienceDaily%3A+Space+%26+Time+News%29&utm\\_content=Yahoo!+Mail](http://www.sciencedaily.com/releases/2013/04/130425142250.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fspace_time+%28ScienceDaily%3A+Space+%26+Time+News%29&utm_content=Yahoo!+Mail)



## **Exploring the Water World**

*By Diane K. Fisher*

In some ways, we know more about Mars, Venus and the Moon than we know about Earth. That's because 70% of our solar system's watery blue planet is hidden under its ocean. The ocean contains about 98% of all the water on Earth. In total volume, it makes up more than 99% of the space inhabited by living creatures on the planet.

As dominant a feature as it is, the ocean—at least below a few tens of meters deep—is an alien world most of us seldom contemplate. But perhaps we should.

The ocean stores heat like a “fly wheel” for climate. Its huge capacity as a heat and water reservoir moderates the climate of Earth. Within this Earth system, both the physical and biological processes of the ocean play a key role in the water cycle, the carbon cycle, and climate variability.

This great reservoir continuously exchanges heat, moisture, and carbon with the atmosphere, driving our weather patterns and influencing the slow, subtle changes in our climate. The study of Earth and its ocean is a big part of NASA’s mission. Before satellites, the information we had about the ocean was pretty much “hit or miss,” with the only data collectors being ships, buoys, and instruments set adrift on the waves.

Now ocean-observing satellites measure surface topography, currents, waves, and winds. They monitor the health of phytoplankton, which live in the surface layer of the ocean and supply half the oxygen in the atmosphere. Satellites monitor the extent of Arctic sea ice so we can compare this important parameter with that of past years. Satellites also measure rainfall, the amount of sunlight reaching the sea, the temperature of the ocean’s surface, and even its salinity!

Using remote sensing data and computer models, scientists can now investigate how the oceans affect the evolution of weather, hurricanes, and climate. In just a few months, one satellite can collect more information about the ocean than all the ships and buoys in the world have collected over the past 100 years!

NASA’s Earth Science Division has launched many missions to planet Earth. These satellites and other studies all help us understand how the atmosphere, the ocean, the land and life—including humans—all interact together.

Find out more about NASA’s ocean studies at <http://science.nasa.gov/earth-science/oceanography>. Kids will have fun exploring our planet at The Space Place, <http://spaceplace.nasa.gov/earth>.



*Caption:  
This image from  
September 2012, shows  
that the Arctic sea is the  
smallest recorded since  
record keeping began in  
1979. This image is from  
NASA’s Scientific  
Visualization Studio at  
Goddard Space Flight  
Center.*

*- This article was written  
by Diane K. Fisher and  
provided through the  
courtesy of the Jet  
Propulsion Laboratory,*

*California Institute of Technology, under a contract with the National Aeronautics and Space Administration.*



Happy Spring, Astronomy Clubs!

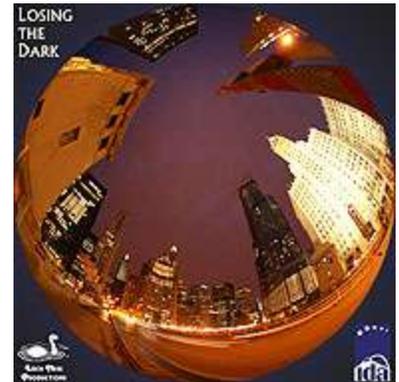
It's Earth Month 2013 and NASA is celebrating our global connections. Find out how to connect

with NASA scientists through Night Sky Network telecons and international astronomy clubs through a new IAU initiative. Plus, get your club and community involved in preserving dark skies for all. Let's get connected!

### **Saving the Dark – GLOBE at Night and a light pollution PSA**

New from the International Dark Sky Association: A short public service announcement on Light Pollution.

*Losing the Dark* introduces and illustrates some of the issues regarding light pollution, and suggests three simple actions people can take to help mitigate it. Available as a FREE Download! Find out more at [www.darksky.org/component/content/article/252](http://www.darksky.org/component/content/article/252)



This year's final Globe at Night campaign begins this month. Get in on the fun and be a part of this worldwide citizen science project April 29-May 8 at [www.globeatnight.org](http://www.globeatnight.org)

### **Save the Date – May 21st for High Energy Telecon**



NSN members, join us on Tuesday, May 21 at 6pm PT/9pm ET for *Blazing Galaxies, Exploding Stars and Monstrous Black Holes: High energy visions of the Universe* with Dr. Lynn Cominsky.

Hear about the latest updates from high-energy missions like Fermi, Swift, and XMM-Newton.

More information at

[http://nightsky.jpl.nasa.gov/download-view.cfm?Doc\\_ID=521](http://nightsky.jpl.nasa.gov/download-view.cfm?Doc_ID=521)

*Left: High energy image of the W44 supernova remnant*

*Credit: NASA/DOE/Fermi LAT Collaboration, NRAO/AUI, JPL-Caltech, ROSAT*

### **International Astronomical Union Launches Astro Clubs Portal**

The IAU Astro Clubs Portal will be much more than a list of clubs: it will be a global network to bring established and newly formed associations (particularly those in developing countries) together. This is the start of an ambitious project, which we hope will grow into a valuable web community. This is a complementary network to NSN, with the aim of building global links between astronomy clubs. The IAU encourages clubs around the world to join this new initiative as it gets off the ground: [www.universedowntoearth.org/clubsportal/](http://www.universedowntoearth.org/clubsportal/)



### **Update on NASA and Sequestration**

Many of you have expressed concern about the effects of the budget sequestration on NASA and the Night Sky Network. We have not yet heard how this might effect most NASA programs, but can assure you that the NASA Night Sky Network website is stable and will remain active. We have every confidence that your efforts will continue to be supported, but we have very little information presently and will be sure to keep you updated in the member's article as we learn more. Login to stay up to date or keep up with NASA here:

[www.nasa.gov/offices/education/about/sequestration-NASA-education-guidance.html](http://www.nasa.gov/offices/education/about/sequestration-NASA-education-guidance.html)

Wishing you clear skies!



Vivian White, Night Sky Network

[nightskyinfo@astrosociety.org](mailto:nightskyinfo@astrosociety.org)

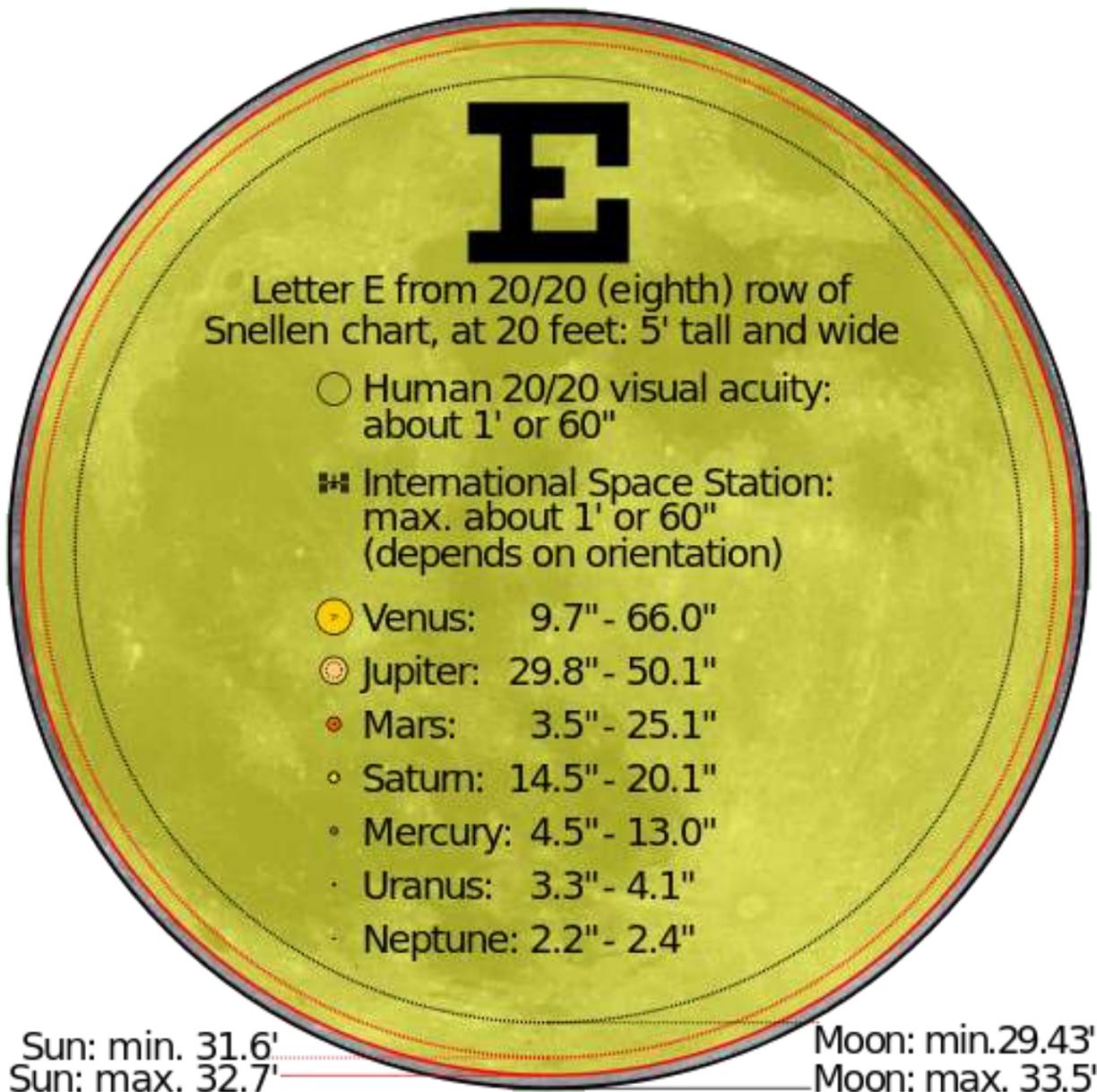
*The NASA Night Sky Network is a nationwide coalition of over 425 amateur astronomy clubs. The NASA Night Sky Network is managed by The Astronomical Society of the Pacific.*

## SWFAS Minutes

April Minutes will be published in a future newsletter.

Comparison of angular diameter of the Sun, Moon and planets. To get a true representation of the sizes, view the image at a distance of 103 times the width of the "Moon: max." circle. For example, if this circle is 10 cm wide on your monitor, view it from 10.3 m away.

- from [http://en.wikipedia.org/wiki/Angular\\_diameter#Use\\_in\\_astronomy](http://en.wikipedia.org/wiki/Angular_diameter#Use_in_astronomy)



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

[www.theeyepiece.org](http://www.theeyepiece.org)