Annual Holiday Party to Again Feature a GIANT Swap Meet...

FOCUS

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DELAWARE ASTRONOMICAL SOCIETY

Next Meeting – December 17th, 2013 at 8:00 PM

ANNUAL HOLIDAY PARTY & Swap Meet!

at the Mt. Cuba Astronomical Observatory

~ Please Join Us for Fellowship and Fun!! ~

With Mini-Talks: "What's Up in the Sky" by Greg Lee

***"Best Swap Meet Items" by Interested Sellers** (limit 5 min. each)*

"Videos" by Rob Lancaster, and "Slideshow of Longwood Christmas Lights" by Bill Hanagan

FROM THE PRESIDENT ■ *Bill Hanagan*

First, I'd like to thank Fred DeLucia for his November presentation of "What's Not Quite up Yet" along with his second installment of "Astro-Quiz". Thanks also go out to Laura Cimorosi for making the wonderful pumpkin roll that we enjoyed after the November meeting. I'd especially like to thank all of the DAS members other than myself who have contributed to the refiguring of the club's 17.5" Newtonian primary mirror, which I spoke about in November. They are: Rob Lancaster, Greg Lee, Jeff Lawrence, Terry Lisansky, Diana Metzger, and my wife Mary Ann.

Coming up at our December 17 meeting we have our annual Swap Meet and Holiday Party. If you have a special treat that you would like to share with other DAS members, please consider whipping up a batch for our Holiday Party!

We'll be setting up for the Swap Meet as well as the Holiday Party starting at 7:00 PM, so there will be no Board meeting in December. The swap meet starts as soon as the sellers put their items on display, so come early! We will have 3 large tables and several smaller ones set up in the lobby at Mount Cuba where you can display your swap meet items. What we need most to make the swap meet a success is for YOU to bring in your surplus astronomy gear for sale! And, be sure to bring a vehicle large enough to take home a telescope and other astronomy related gear!

At 8:00 PM, we'll suspend the swap meet and move into the lecture room for the presentations. We have several mini-presentations planned for the December 17 meeting: 1) Greg Lee will tell us about *"What's Up in the Sky;"* **2)** we'll hear about the *"Best Astro Swap Meet* *(continued on page 2)*

Each issue of FOCUS is full of useful hyperlinks. Just click on any graphic or telltale blue web address and your browser should take you to additional linked web resources.

IN THIS ISSUE:

The Dumbbell Nebula was taken in Rob's backyard. He was really pleased by the fact that this photo was taken in an extremely light polluted area with the target low and deep in the light pollution. It was a test for the UHC/Light pollution filter.

Photo captured using a 10" Newtonian telescope with a mirror Rob made at the Delmarva Stargazers Seminar mounted on a Losmandy G-11 Telescope Mount with a Canon XSi DSLR that was modified by removing the IR filter and replacing it with one more sensitive to H-Alpha Light. An Astronomik 2" UHC Nebula Filter was attached and a Macbook Pro Computer was used for Data Collection and Analysis.

Photo taken by DAS member ***Rob Lancaster.***

Observing with the Delaware Astronomical Society...

FROM THE PRESIDENT ■ *(continiued from page 1)*

Items" from any interested sellers (5 minutes per person); 3) Rob Lancaster will present one or two short videos for our entertainment, and 4) I'll present a slideshow of Longwood Christmas Lights set to music to help everyone get into the Holiday spirit.

After the presentations, we'll return to the swap meet and enjoy the treats brought in by our members.

I realize that for various reasons some of you can't make it out to our December celebration, so let me extend to all of you, now, the warmest of Holiday Greetings and my heartiest wishes for a Happy New Year!

As always, I'd like to remind you to keep thinking about how YOU can contribute to the DAS and how you can make the DAS a better astronomy club. We've had some volunteers step forward, and we've received donations of both equipment and funds, but more volunteers and donations are needed. In particular, we really could use some donations to allow us to buy a high quality, observatory class mount for the Sawin Observatory. Any help we can get in this regard would be most welcome.

Our talk schedule is still blank for both April and June. Please consider giving a talk on some aspect of astronomy that interests you. You might even consider recruiting someone from outside the DAS who you think could give an interesting talk on astronomy. You're also welcome to give a talk on any astronomy based topic of your own choosing. The September issue of the FOCUS has a list of ideas for talks in case you have any difficulty coming up with a topic.

We also need someone to take over as the Chairperson of the Awards Committee, since the position is currently open. Gus Swartout, the previous Awards Chair, will provide all of the instruction and assistance you need to get started. If you're interested, please let me know.

A club works best when all of its able-bodied members pitch-in and help out at club functions in whatever way they can. If you want to make the DAS a better astronomy club, give me a call at 302-239-0949. I'm sure we can come up with something that you can do to help the DAS that also suits your particular interests.

2013 DAS Member Star Party Wrap-Up ■ *Bill Hanagan*

As we conclude the fourth year of the Member Star Party Program, it's worth reflecting on how well the program has worked.

During 2013, the DAS held 12 star parties specifically for its members and their guests. Four of these were held at the ChesLen Preserve and four at the Sawin Observatory, two were held at Tuckahoe State Park, one was held at Gus Swartout's Elk River site, and one, the special PANSTARRS MSP, was held at the New Garden Township building. The two MSPs held at Tuckahoe were both multi-night events.

In all, we held one more star party for our members this year than we did during our record 2012 year, so it has been a very good year indeed for our Member Star Parties.

With respect to outreach events, we held 6 outreach star parties at the Woodside Farm Creamery, and supported two special outreach events at the ChesLen Preserve: "Friday Night Lights" and the "International *(continued on page 5)*

"PUBLIC NIGHTS" at the Mt. CUBA OBSERVATORY...

MCAO PUBLIC NIGHTS ■ *Greg Weaver*

The Mt. Cuba Observatory Public Nights continue year round! In addition to learning about many aspects of the heavens, you'll have a chance to visit and view our all-digital full-dome planetarium. You can pick up a schedule when you next come to a meeting or get the latest updated version off the website at: ***http://MountCuba.org***. Programs are presented on Monday nights at 8pm. Please check the website for full details and updates on programs planned. Interested individuals or groups can apply by letter or call 654-6407 (preferably between the hours of 9 and 11 am, Monday through Friday) to the Observatory to obtain reservations for these "Public Nights".

The Public Nights schedule for 2013 follows:

Date	***Speaker***	***Topic***
16 Dec.	Stan Owocki	When Giant Stars Collide.

Other dates for which topics and speakers have yet to be chosen:

13 Jan.	7 April	9 June
27 Jan.	21 April	23 June
10 Feb	5 May.	
24 Feb.	19 May	

DAS ASTROPHOTOGRAPHY SPECIAL INTEREST GROUP ■ *Bill Hanagan*

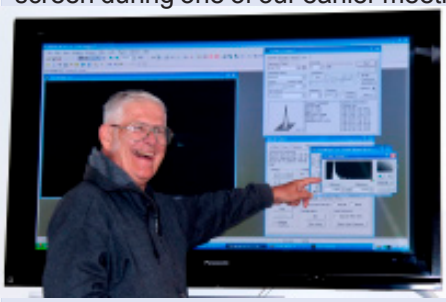
The DAS astrophotography special interest group (DAS AP SIG) meets on Friday nights at 7:30pm every other month at Mt. Cuba regardless of weather. The SIG also meets for photo shoots scheduled on 1-2 day notice to synchronize with the weather.

The monthly meetings are informal and typically include the presentation of astrophotos taken by the members along with an extended question and answer period. Objects commonly photographed include constellations, auroras, lunar eclipses, and planetary photos, as well as a wide variety of deep-sky objects such as nebulae, galaxies, star clusters, etc. The topics discussed cover the entire gamut of astrophotography, from how to get started with a minimum of equipment, to polar aligning your telescope, all of the way to the fine points of using auto-guiders and post-processing digital images.

You can get started in astrophotography with just your current camera mounted on a tripod or a motorized telescope by taking wide field photographs of meteor showers, conjunctions, constellations, and star trails. As you move to progressively fainter and smaller subjects, you'll need better equipment. Joining the AP SIG is a great way to learn what equipment you'll need and what works well before you spend your money. If you are interested in joining the AP SIG, just email your name, address, and phone number to me at hanaganw@verizon.net.

NEW Due to the weather, we got a very late start with the first of our annual "On-Site" series of AP-SIG meetings, which was held at Rick Davis's home on November 15. As the weather was still not conducive to imaging operations, we held our usual Q&A and review of astrophotos on Rick's 50" Plasma display while remaining warm indoors. Thanks, Rick, for being a great host!

The photo below shows AP-SIG member Ron Worden pointing out an aspect of image processing on Rick's plasma screen during one of our earlier meetings at Rick's.



Our next AP-SIG meeting is tentatively scheduled for January 17 or 18 at the Sawin Observatory, when Jupiter will be well positioned to demonstrate planetary imaging.

Keep an eye on your DAS Yahoo Group email for the weather related scheduling of AP-SIG meetings.

Even if you aren't an AP-SIG member, you're welcome to attend the AP-SIG meetings to learn more.

DAS AMATEUR TELESCOPE MAKING SPECIAL INTEREST GROUP ■ *Bill Hanagan*

The DAS Amateur Telescope Making (ATM) Special Interest Group (SIG) meets on evenings and weekends according to the availability of the members and the particular projects that are underway. Currently the ATM SIG has a medium Dob building program under way. The general range of activities of the ATM SIG includes all manner of telescope making, mirror making, and the making of accessories for telescopes and observing.

Anyone interested in joining the ATM SIG should email their name, address, and phone number to me at hanaganw@verizon.net.

Meeting dates are announced primarily by email, so if you are interested in telescope making, be sure to let me know!

LOANER TELESCOPES and SAWIN OBSERVATORY REMINDER ■ *Tom Sidowski*

One of the best advantages of being a member of the Delaware Astronomical Society is that all members have the privilege of being trained to use and then borrow equipment owned by the club for personal use. Currently, we have two scopes available for loan: a Celestron 8" Schmidt-Cassegrain, and a 6" Orion Sky-Quest XT6 Dobsonian reflector. The loan is for at least a month. If you're interested in checking out either of these scopes, contact Tom Sidowski at 302-239-1844.

The DAS also maintains a club observatory on the grounds of the Mt. Cuba Astronomical Observatory. The Sawin Observatory houses the club's permanently mounted 12.5" reflecting telescope and a 17.5" Coulter Odyssey 2 Dobsonian telescope. They are for the use of club members once they are trained and checked-out in a simple operating procedure. Members who are interested in becoming key holders of the Sawin Observatory should contact me at 302-239-1844 to arrange for training in the use of the facility.

NEW The PRESIDENT'S DAS BOARD MEETING AGENDA for DECEMBER

Tuesday, December 17th, 2013

There will be no DAS Board Meeting in December due to the **Annual Holiday Party and Swap Meet** that is Scheduled for this Date. Don't forget to JOIN IN and stop by for GREAT Camaraderie and Eats, along with a FABULOUS SWAP MEET to take care of some of those on your Holiday Gift List!! **SEE YOU THERE!**

2014 Potential Member Star Party (MSP) Dates

Potential MSP Dates	New Moon Date	Events, Planets, and a List of Deep Sky Objects Near the Meridian ~1 Hour After Twilight (or 9 P.M., whichever is later)
Jan. 3, 4	Jan. 1	M objects: 1, 35, 36, 37, 38, 42 (Orion Nebula), 43, and 78. Bright NGCs: 1232 and 1535.
Jan. 24, 25 Jan. 31, Feb. 1	Jan. 30	M objects: 45, 67, and 79; Bright NGCs: 2392 (Eskimo nebula).
Feb. 21, 22, 28; March 1	March 1	M objects: 41, 46, 47, 48, 50, and 93. Bright NGCs: 2264 (Christmas tree), 2403, and 2440.
March 28, 29 April 4, 5	April 29	Messier Half-Marathon, Part A—Why stay up all night? Do the spring and fall half-marathons instead! M objects: 44, 67, 81, 82, 96, 97 (owl nebula), 108, and 109. Bright NGCs: 2903, 3242, and 3521.
May 23, 24 May 30, 31	May 28	M objects: 3, 40, 49, 51, 53, 58, 59, 60, 61, 63, 64, 65, 66, 68, 83, 84, 85, 86, 87, 88, 89, 90, 91, 94, 98, 99, 100, 101, 104, and 106. Bright NGCs: 4565 (edge on galaxy with dust lane).
June 20, 21 June 27, 28	June 27	M objects: 4, 5, 10, 12, 13, 62, 80, 92, 102, and 107.
July 18, 19 July 25, 26	July 26	M objects: 6, 7, 8, 9, 11, 14, 16, 17, 19, 20, 21, 22, 23, 25, 56, and 57.
August 22, 23 August 29, 30	August 25	M objects: 18, 24, 26, 27, 28, 54, 55, 69, 70, and 71. Bright NGCs: 6818, 6822, 6826 (Blinking Planetary), and 6946.
Sept. 19,20 Sept. 26 27	Sept. 24	M objects: 2, 15, 29, 30, 39, and 75. Bright NGCs: 6946, 6960, 6992, 7000 (N. Am. nebula), 7009 (Saturn nebula), and 7027. Sep. 2 and 3 are reserved for Labor Day weekend.
October 17, 18 October 31, Nov. 1	Oct. 23	Messier Half-Marathon, Part B—Why stay up all night? Do the spring and fall Messier Half-Marathons instead! M objects: 52, 72, and 73. Bright NGCs: 7009 (Saturn nebula), 7293 (helix nebula), 7662 (blue snowball), and 7789.
Nov. 14, 15 Nov. 22, 22	Nov. 22	M objects: 31, 32, 33, 74, 76, 103, and 110. Bright NGCs: 253, 457 (Owl cluster).
Dec. 19, 20	Dec. 21	M objects: 34, and 77. Bright NGCs: 884 and 869 (the double cluster in Perseus).

In 2014, the locations and specific dates of upcoming MSPs will once again be scheduled using DAS Yahoo Group email. The mechanics of the MSP program are described in detail under "Notes on the Member Star Parties (MSPs)" below.

Notes on the Member Star Parties (MSPs) ■ *Bill Hanagan*

MSP cycles are timed for a minimum of intrusion by moonlight during the hours before midnight to maximize opportunities for deep sky observing and imaging. For each MSP cycle there are usually four potential dates designated in advance: the Friday and Saturday nights which immediately precede a new moon, and the Friday and Saturday nights that follow or include the new moon date. Which of the four potential dates is used for an MSP is "flex-scheduled" according to the weather using the DAS Yahoo Group email system.

Please be sure to mark your calendars with the potential MSP dates that appear in the table! Obviously, you need to keep as many of these dates open as possible so that when a GO announcement is made you're in a position to attend the DAS Member Star Party regardless of which date the weather favors!

The DAS has a core group of dedicated visual observers and astro-imagers who travel to Tuckahoe, Cherry Springs, West Virginia, and other dark sky sites as opportunities and the weather allow. If you're interested in going along or meeting up on any of the road trips mentioned in the MSP schedule, let me know and I'll fill you in on the details and keep you apprised as plans develop.

Road trips to distant observing sites like Cherry Springs State Park in Pennsylvania require that several DAS members commit to going in advance should the weather prove favorable for both nights. When the weather forecast only looks good for one night, the MSP will often be redirected to a closer site such as the Elk River site, the ChesLen Preserve, or the Sawin observatory.

While DAS members who go on road trips are often involved in both observing and imaging, these road trips are particularly valuable for visual observers because they offer the best opportunity to see deep sky objects through large aperture telescopes under dark skies.

Most of today's big Dobs produce vastly superior visual images compared to older, large aperture observatory telescopes with which you might be familiar, thanks in part to better optics, the use of a "thin" primary mirror which cools faster, and the use of fans to cool the primary mirror and to remove warm air from the optical path. If you are truly interested in visual observing, you owe it to yourself to see first-hand what dark skies and a modern large aperture telescope will allow you to see.

Finally, I'd like to remind you that you need to be signed up for the DAS Yahoo Group to receive the scheduling announcements for the MSPs. A full description of the MSP program appears on the DAS website at **http://delastro.org/** and in the December 2009 issue of the FOCUS.

The December 17 DAS Swap Meet ■ *Bill Hanagan*

Our swap meets over the last two years have been larger than in many previous years, but it would help if more people would offer their surplus astronomy gear for sale at the swap meet.

Several of our members have volunteered to bring in and set up tables for all DAS members to use, and Mount Cuba is providing 3 large tables which were previously not available, so there will be plenty of open table space for displaying your surplus astronomy gear. If you need an exceptionally large amount of space to hold all of your gear, though, you might want to bring an extra table along.

What sort of items are we looking for at the Swap Meet? Astronomy items! That includes telescopes, eyepieces, cameras, and any item or part that could be useful for visual observing, astronomical imaging, or telescope making, as well as any item with an astronomy theme. Obvious examples include telescopes of all types and sizes, lenses, finders, telescope mounts, tube rings, eyepieces, Barlow lenses, focal reducers, planispheres, astronomical CCD cameras, Digital Single Lens Reflex (DSLR) cameras, film based SLR cameras, camera lenses, tripods, mirror making supplies, telescope parts, books and DVDs on astronomy, astro-photos, astronomy posters, and calendars. Less obvious items might include a film SLR camera (Swap Meet items often include older technology), cable releases, a video camera, a web-cam (especially a Philips or other CCD based webcam), low light security cameras, a laptop computer, or even cold-weather gear.

If you have an item you would like to show people, but you're not sure you want to sell it, bring it along anyway! It can still spark an interesting discussion and you may pique someone's interest in another aspect of amateur astronomy.

Why bring items to our swap meet? The obvious reasons are to sell a few things you don't need and perhaps to find an unusual item at a great price. But, there are other, less obvious benefits. For one, a swap provides a great opportunity for members to talk to each other about the gear they use and how they use it.

For a swap meet to work, as many people as possible need to bring items out for sale. So, please look through your astronomy gear and pull out some of the items you don't use or don't have space for anymore, figure out what you want for them, and bring them in! Maybe someone else can use them and you can recover part of your cost and clear a little space for something new!

You can also bring in "display only" items that you think other members might be interested in seeing.

Even if you don't sell an item, it may spark someone's interest in another aspect of amateur astronomy.

I have found that it helps to attach a descriptive label and an initial asking price to each of the items that you bring to the swap meet, though this is not required. Finally, keep in mind that the selling price is ultimately the price that the buyer and seller agree on.

FOR SALE By DAS!

Brandon 92mm f/7 Vernon scope Refractor, $1100 -- Asking $1100. Triplet objective reportedly made by Roland Christen. Original wood shipping case included but, if shipped, will also box again with added protection. Hinged tube rings, dust cap and Kellner 20mm eyepiece included. Specific age is unknown, but the original owner passed away about 10 years ago. Glass looks excellent. See pics.at http://www.astromart.com/classifieds/details.asp?classified_id=840094 Mount in picture is not included in advertised price but available separately, if desired. Prefer a local sale but will ship to CONUS only. PayPal price is $1,133.00. Buyer pays shipping. Will also accept Money Order or Certified Bank Check. I will accept a Personal Check but will not ship until the check clears the bank of the buyer

Unitron 4" f/15 refractor Model 152 with Jaegers Objective plus accessories; Price TBD: Included with the scope: Mounted Finderscope (not sure of specs but likely a 10x42), Original wood case, Original objective and cell stored in its own wood case (the Jaegers replaced the original), EQ Mount, Tripod with eyepiece tray/spreader and one counterweight (note additional counterweight needed for proper balance), Original eyepiece/ accessory wooden case, Solar Projection Screen with mounting brackets, Unitron 2" 60mm eyepiece, Clave from 1.25 inch eyepiece Barlow (unspecified), 1.25 inch diagonal, 1.25 inch Herschel Wedge, Two Solar Eyepiece Filters (not recommended for use), 1.25 inch and .965 inch, .965 inch to 1.25 inch adapter, Two 36.4mm (1.465 inch) adapters, Extension tubes for various eyepiece focus requirements

At right, Brandon 94mm f/7 Vernon scope Refractor Asking $1000: Specific age is unknown, but the original owner passed away about 10 years ago. Glass looks very good with some dust present. Triplet objective reportedly made by Roland Christen. Some scratches on tube (picture available). Hard side case included but presently being relined with new foam. Hinged tube rings and dust caps included. Mount is not included in advertised price but available separately. Prefer a local sale but will ship to CONUS only. PayPal price is $1,025.00. Buyer pays shipping. Will accept Money Order or Certified Bank Check. Will accept a Personal Check but will not ship until the check clears the bank of the buyer. Or CASH in person.

Interested Parties should Contact Fred DeLucia
fredworld@verizon.net -- 484-480-4394

2013 DAS Member Star Party Wrap-Up *(continued from page 2)*

Observe the Moon Night". There were also other outreach events supported by DAS members at locations like the Delaware Natural History Museum and Bellevue State Park. So, I think it's fair to say that the DAS has been very active in terms of outreach during 2013.

Finally, I'd like to take this opportunity to thank all of those other than myself who acted as MSP supervisors or outreach star party supervisors during the year. Specifically, thanks go out to Fred DeLucia, Jeff Lawrence, Greg Lee, Bill McKibben, and Gus Swartout. While we've done well, most of the work has been done by a relatively small group of people. I'd like to see more DAS members become active as star party supervisors and outreach coordinators, so if you're interested please let either Greg Lee (our observing chairperson) or myself know.

DAS Looks for New Awards Chair–Special Thanks Go Out to Gus Swartout for a 1/2 Decade of Selfless Service in the Position!

The DAS is looking for a person to fill the position of Awards Chairperson, responsible for selecting the yearly DAS Amateur Astronomer of the Year, the clubs most prestigious award, and also the Luther Porter Educator Award. The person selected will be responsible also for putting together an "Awards Committee" to assist in this endeavor.

A very special debt of gratitude and hearty "thanks" goes out from the DAS to Gus Swartout, who has held this position for nearly five years and has done an exemplary job during that time.

It should also be mentioned that Gus is a former winner of the DAS' Amateur Astronomer of the Year Award and is also the gracious host for the twice annual Messier Half Marathons at his Elk River Dark Sky site in Elkton, Maryland which have become one of the most well attended MSP's on the DAS calendar. Though these will continue, Gus' efforts as Awards Chair will be sorely missed. **THANK YOU, GUS, for your past efforts on behalf of the DAS!** Your selfless service will not be soon forgotten.

The Swap Tables at Past Holiday Parties were a **GREAT SUCCESS**, So We're Doing it AGAIN...**SO BRING OUT YOUR STUFF--MAKE A MEMBER HAPPY & Put some Extra Holiday Money in Your Pocket as Well!!**

Last year's Swap Tables at the Annual Holiday Christmas Party were such a huge success that we're going to do it again this year--ONLY BIGGER. So rummage through those drawers and aluminum briefcases for what you're no longer putting to use, for there is a member out there who will likely think "This is just what I've been needing" and will take it off of your hands and put in them some extra cash for Holiday gifts for your family and friends!

There will be PLENTY of table space to display your wares, so start thinking now of that astronomical equipment, books, telescopes, binoculars, software, etc. that have been collecting dust. Something you've been thinking of getting rid of, to sell or just give away. There's someone in the Club that could put those items to good use! So check what you've got, and bring it to the December Holiday Party Swap Meet. You'll be glad you did!!

Attend, Mix with Your Fellow Members & Enoy!

2013 DAS Member Star Party (MSP) Potential Dates, Events, and Locations

Potential MSP Dates	Events, Planets, and a List of Deep Sky Objects Near the Meridian ~1 Hour After Twilight (or 9 P.M., whichever is later)	Likely MSP Locations
(Dec. 27, 28, Jan 3, 4)	These 4 dates are too close to Christmas and New Years to schedule an MSP. But, if you're observing on your own, Jupiter rises >30°AH by ~9 P.M. M objects: 34, and 77. Bright NGCs: 884 and 869 (the double cluster in Perseus).	None

ASTRO-PHOTO of the MONTH

The Andromeda Galaxy

Photo Credit: DAS Member Rick Davis

The Andromeda Galaxy, is a spiral galaxy approximately 2.5 million light-years from Earth in the Andromeda constellation. Also known as Messier 31, or NGC 224, it is often referred to as the Great Andromeda Nebula in older texts. The Andromeda Galaxy is the nearest spiral galaxy to our Milky Way galaxy.

Rick Davis' *photo was* acquired using an SBIG ST-4000XCM one shot color camera attached to a Takahashi FSQ-106N refractor (4" aperture, 530 mm focal length).Photo consists of twelve 10 minute images stacked and processed with calibrated color, converted and combined color balanced, with DDP 2 gradient removal curves to remove background color.

WEBSITE of the MONTH

BAD ASTRONOMY
THE ENTIRE UNIVERSE IN BLOG FORM

http://www.slate.com/blogs/bad_astronomy/2013/11/21comet_ison_12_cool_facts.html

Formally known as **Bad Astronomy** on the Discover website, this blog now resides at slate.com and contains interesting and thought-provoking stories. The popularity of the blog can be seen through how many comments are left after each article, tweets on Twitter and likes on Facebook. As an example the story about black holes posted in October after 2 days already had 422 comments, 2995 likes on Facebook and had been tweeted 535 times! That is an amazing amount of feedback in just 48 hours. To get to the Bad Astronomy section on this website just click on the logo or web address above. CHECK IT OUT!

Stay 'Up All Night' to Watch the Geminids!

The annual Geminid meteor shower will peak on the night of Dec. 13-14, 2013. NASA astronomer Bill Cooke, along with Danielle Moser and Rhiannon Blaauw from his team of experts, will be on hand to answer questions via a live web chat on Dec. 13 from 11 p.m. until 3 a.m. EST. A live Ustream feed of the skies over Marshall Space Flight Center will also be embedded on this page on the night of the chat.

The Geminid meteor shower is the most intense meteor shower of the year. It lasts for several days (Dec. 12-16), is rich in fireballs and can be seen from almost any point on Earth. The 2013 peak rate is between 100-120 meteors per hour. The waxing gibbous moon will reduce the rate by half, except for the brief time between moonset (4 a.m. local time) and sunrise. Convert to your local time here.

Photo: Geminid meteors and star trails, 2012. Copyright Jeff Berkes. Used with permission. All rights reserved.

How to See Geminid Meteors

The best time to view Geminids is normally around 1-2 a.m. your local time. This year, the presence of a bright moon may make 4 a.m. to dawn a better time. Find a place away from city lights, then allow 45 minutes for your eyes to adjust to darkness. Lie on your back and look straight up because no binoculars are needed.You might want to bring a blanket and some hot chocolate because baby, it's cold outside! Enjoy the show!

More About the Geminids

Most meteor showers come from comets, which spew ample meteoroids for a night of "shooting stars." The Geminid meteor shower is different. The parent is not a comet, but a weird rocky object named 3200 Phaethon that sheds very little dusty debris -- not nearly enough to explain the Geminids.

"The Geminids are my favorite because they defy explanation," said Bill Cooke, lead for NASA's Meteoroid Environment Office. "Of all the debris streams Earth passes through every year, the Geminids are by far the most massive. When we add up the amount of dust in the Geminid stream, it outweighs other streams by factors of 5 to 500."

This makes the Geminids the 900-lb gorilla of meteor showers.

Do You Have Photos of Geminid Meteors?

If you have some stellar images of the Geminid meteor shower, please consider adding them to the Geminid Meteors group in Flickr. Who knows - your images may attract interest from the media and receive international exposure.

15 Years Ago ISS Assembly Begins

Click for IMAX Photo. Image Credit: NASA

On Dec. 6, 1998, the crew of space shuttle mission STS-88 began construction of the International Space Station, attaching the U.S.-built Unity node and the Russian-built Zarya module together in orbit. The crew carried a large-format IMAX® camera, used to take this image of Unity lifted out of Endeavour's payload bay to position it upright for connection to Zarya.

Zarya, launched on Nov. 20, 1998, was the first piece of the International Space Station. Also known as the Functional Cargo Block (FGB), it would provide a nucleus of orientation control, communications and electrical power while the station waited for its other elements. Two weeks later, on Dec. 4, 1998, NASA's space shuttle Endeavour launched Unity, the first U.S. piece of the complex, during the STS-88 mission.

November is the Month That DAS Dues are Payable

If You've Not Already Done So, & While You're Thinking About It, Fill-Out the Form on Page 21 & Get Yours In NOW!

Two Comets Fly By Mercury

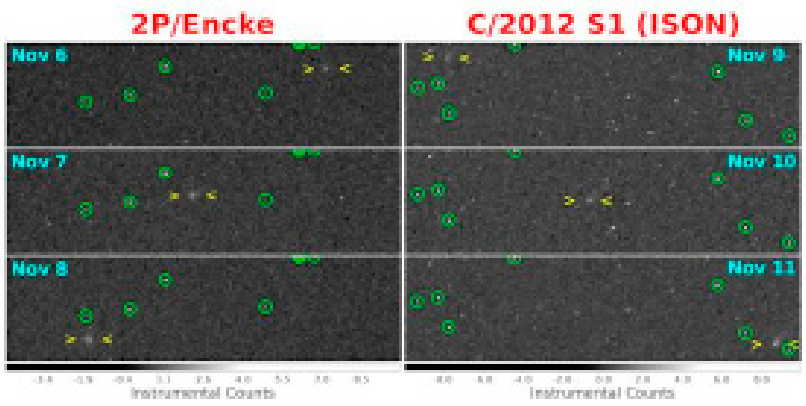
Nov. 15, 2013: What are the odds? On Nov. 18th and 19th not one but *two* comets flew by the planet Mercury.

A new Sciencecast video previews a rare double encounter between Mercury and two comets. **Click to Play it**

"This is a unique coincidence," says Ron Vervack an astronomer at the Johns Hopkins University Applied Physics Lab and a member of the science team for NASA's MESSENGER spacecraft, "and a golden opportunity to study two comets passing close to the sun."

On Nov. 18th Comet Encke passed within 0.025 AU of Mercury, followed a day later by Comet ISON at 0.24 AU (1 AU is the distance between the sun and Earth, 150 million km). The MESSENGER spacecraft, which is orbiting Mercury, turned its sensors toward the passing comets for a point-blank investigation of both.

The double flyby is exciting, says Vervack, but "it makes things a little crazy. We have to rush to complete our observations of Comet Encke, then do it all over again for Comet ISON. Everything is happening at more or less the same time."



MESSENGER's first images of the approaching comets. Larger image, details

MESSENGER was designed to study Mercury, not comets, "but it is a capable spacecraft with a versatile instrument package," he adds. "We hope to get some great data." Onboard spectrometers will analyze the chemical makeup of the two comets while MESSENGER's cameras snap pictures of atmospheres, jets and tails.

Comet ISON is already a media favorite. Astronomers have been tracking it since Sept. 2012 when it was discovered on a trajectory that would take it perilously close to the sun. On Nov. 28th of 2013, Thanksgiving Day in the USA, Comet ISON will pass through the sun's atmosphere little more than a million kilometers above the sun's fiery surface. If the icy comet survives, it could emerge as a beautiful naked-eye object for observers in the northern hemisphere. MESSENGER's glimpse of Comet ISON as it plunges inward could give astronomers the data they need to predict the comet's fate.

Comet Encke is less well known, but no less interesting. For one thing, it is the source of the Taurid meteor shower, a slow display of midnight fireballs that occurs every year in early- to mid-November. Comet Encke dips inside the orbit of Mercury every 3.3 years, so it is regularly exposed to solar activity. In 2007, NASA's STEREO spacecraft watched as a solar storm ripped off Encke's tail—which promptly grew back: Click for movie.

"We'll be catching Comet Encke just days before its closest approach to the sun (0.3 AU)," Vervack says, "so we get to see it at its most active."

Ironically, the fact that MESSENGER is designed to study a rocky planet could prove advantageous for the icy comets. MESSENGER's x-ray spectrometer, in particular, could detect signs of 'comet dirt.'

"We hope to obtain the first definitive detections of x-ray emissions from silicon, magnesium and aluminum," he explains. "If you think of a comet as a dirty snowball, these are elements that make up the dirt. Close to the sun is where we expect the dirt to be vaporized."

In total, Vervack expects MESSENGER to gather 15 hours' worth of data on Comet Encke and another 25 hours on Comet ISON. With that kind of observing time, discoveries are a distinct possibility.

Vervack says the first images will be beamed back and released to the public within days of the flybys. "There are no guarantees," he cautions, "but I can't wait to see the pictures."

Credits:

Author: Dr. Tony Phillips | Production Editor: Dr. Tony Phillips | Credit: Science@NASA

For More information:

Comet ISON: What's Next? — Science@NASA

MESSENGER — home page

The Sun Rips off a Comet's Tail — Science@NASA

MESSENGER's First Images of Comets Encke and ISON

Comet ISON: What's Next?

Updated Nov. 16, 2013:

Comet ISON is now inside the orbit of Earth as it plunges headlong toward the sun for a fiery close encounter on Nov. 28th. The comet is putting on a good show for observatories around the solar system, especially after an outburst on Nov. 13-14 that boosted the comet's brightness 10-fold. NASA spacecraft and amateur astronomers alike are snapping crisp pictures of the comet's gossamer green atmosphere and suddenly riotous tail.

Comet ISON photographed on Nov. 15th by amateur astronomer Mike Hankey of Auberry, California. The comet's bright head and riotous tail are consequences of an outburst on Nov. 13-14 that significantly boosted the comet's level of activity. **Click for More**

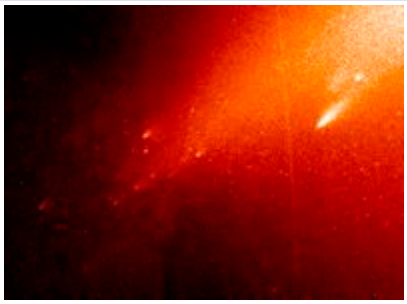
Because ISON has never passed through the inner solar system before (it is a first-time visitor from the distant Oort cloud), experts aren't sure what will happen next. Can the comet survive its Thanksgiving Day brush with the sun? Will it emerge as a bright naked-eye object?

Lowell Observatory astronomer Matthew Knight, a member of NASA's Comet ISON Observing Campaign, lays out some of the possibilities.

"I've grouped the possible outcomes into three scenarios, discussed in chronological order," says Knight. "It is important to note that no matter what happens, now that ISON has made it inside Earth's orbit, any or all of these scenarios are scientifically exciting. We're going to learn a lot no matter what."

#1 Spontaneous Disintegration before Thanksgiving:

The first scenario, which could happen at any time, is that ISON spontaneously disintegrates. A small fraction (less than 1%) of comets have disintegrated for no apparent reason. Recent examples include Comet LINEAR (C/1999 S4) in 2000 and Comet Elenin (C/2010 X1) in 2011. ISON is now reaching the region of space, within ~0.8 AU of the Sun where comets like these have disintegrated.



The breakup of Comet LINEAR (D/1999 S4) as viewed by Hubble Space Telescope in 2000. Click for More

Comet ISON is being observed by a tremendous variety of telescopes on Earth and beyond. If ISON does disintegrate, it would be the best-observed case of cometary disruption in history and would likely contribute vast new information about how comets die.

#2 Death by Sunburn around Thanksgiving Day

Assuming ISON survives the next few weeks intact, it faces an even more daunting challenge: making it around the Sun. At closest approach to the Sun, the comet's equilibrium temperature will approach 5000 degrees Fahrenheit, hot enough to cause much of the dust and rock on ISON's surface to vaporize.

While it may seem incredible that anything can survive this inferno, the rate at which ISON will likely lose mass is relatively small compared to the actual size of the comet's nucleus. ISON needs to be 200 m wide to survive; current estimates are in the range 500 m to 2 km. It helps that the comet is moving very fast so it will not remain long at such extreme temperatures.

Unfortunately for ISON, it faces a double whammy from its proximity to the Sun: even if it survives the rapid vaporization of its exterior, it gets so close to the sun that the suns gravity might actually pull it apart.

Destroyed comets can still be spectacular, though. Sungrazing Comet Lovejoy, for instance, passed within 100,000 miles of the sun's surface in December 2011. It disintegrated, forming a long tail of dust that wowed observers on Earth.

#3 Survival

The final case is the most straightforward: ISON survives its brush with the sun and emerges with enough nuclear material to continue as an active comet. If ISON survives intact, it would likely lose enough dust near the Sun to produce a nice tail. In a realistic best-case scenario, the tail would stretch for tens of degrees and light up the early morning sky like Comet McNaught (C/2006 P1) did in 2007.

The best of all possible worlds would be if ISON broke up just a bit, say, into a few large pieces. This would throw out enough extra material to make the comet really bright from the ground, while giving astronomers pieces of a comet to study for months to come.

"I'm clearly rooting for #3," says Knight.

"Regardless of what happens, we're going to be thrilled," he predicts. "Astronomers are getting the chance to study a unique comet traveling straight from 4.5 billion years of deep freeze into a near miss with the solar furnace using the largest array of telescopes in history."

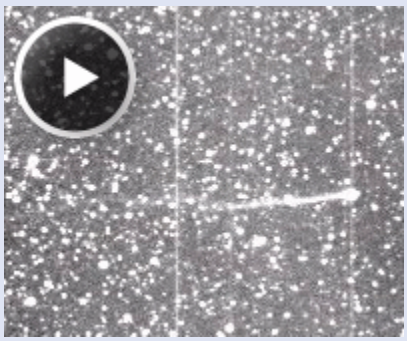
"Hang on," he says, "because this ride is just getting started."

For updates and more information about Comet ISON as it approaches the sun, visit http://isoncampaign.org.

Author: Dr. Tony Phillips | Production Editor: Dr. Tony Phillips
| Credit: Science@NASA

Comet ISON vs. the Solar Storm

Nov. 24, 2013: In 2007, astronomers were amazed when a solar storm hit Comet Encke. NASA STEREO spacecraft watched as a CME (coronal mass ejection) struck the comet head on and ripped off its tail.The same thing could be in store for Comet ISON—only worse.



A CME strikes Comet Encke in April 2007. Click for Movie, or Full story

On Nov. 28th, Comet ISON will pass through the sun's atmosphere, flying little more than a million kilometers above the sun's surface. It will be ~30 times closer to the sun than Encke was in 2007 and more likely to encounter a ferocious solar storm.

"For one thing," says Angelos Vourlidas of the Naval Research Lab and a participant in NASA's Comet ISON Observing Campaign (CIOC), "the year 2007 was near solar minimum. Solar activity was low. Now, however, we are near the peak of the solar cycle and eruptions are more frequent."

"I would absolutely love to see Comet ISON get hit by a big CME," says Karl Battams, an astronomer at the Naval Research Lab who also works with the CIOC. "It won't hurt the comet, but it would give us a chance to study extreme interactions with the comet's tail."

CMEs are magnetized clouds of plasma hurled into space by the explosions of sunspots. The gas inside a CME is not very dense, so its impact would not shatter a comet's core. The fragile tail is another matter. Comet tails are as gossamer as the CMEs themselves, so the interactions can be intense and unpredictable.

"The CME that ran over Comet Encke back in 2007 was slow, barely creating a pressure pulse by compressing the solar wind ahead of it," notes Vourlidas. "It was this compression which caused the Encke's tail to fly off."

He believes that Comet ISON would experience something more dramatic. "Any CME that hits Comet ISON close to the sun would very likely be faster, driving a shock wave with a much stronger magnetic field. Frankly, we can't predict what would happen."

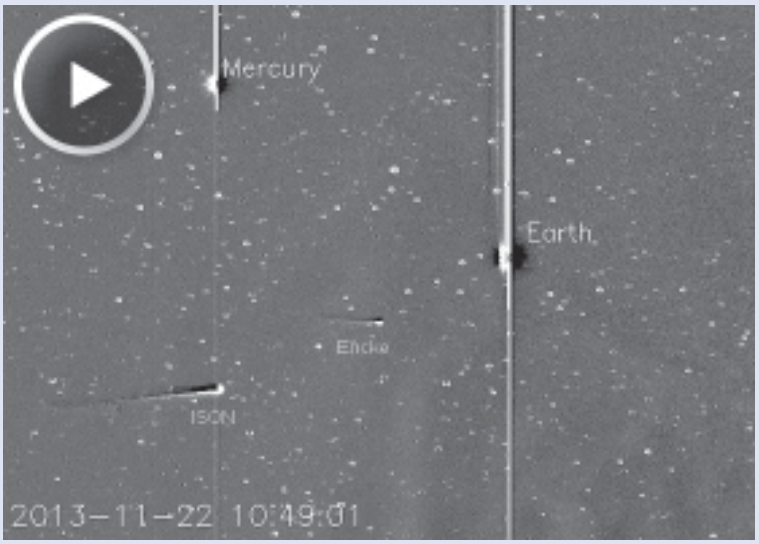
Comet ISON entered the field of view of STEREO-A's Heliospheric Imager on Nov. 21st. Coincidentally, Comet Encke is there, too. Presently, the two comets are being gently buffeted by solar wind and their tails are wagging back and forth accordingly.

If the sun erupts, both comets could be engulfed by the same CME. This would turn the two comets into solar probes. Like wind socks, they would sample the storm from two widely separated locations, giving researchers a rare 3D view of a CME's inner structure.

Comet ISON will be passing over the sun's equator on Nov. 28th on the same side of the sun where a group of active sunspots was recently clustered. In other words, says Battams, "we're going to be in the 'hot zone' for CMEs."

NASA's entire fleet of solar observatories will be watching when ISON takes the plunge. This includes STEREO-A and STEREO-B, the Solar Dynamics Observatory, and the Solar and Heliophysics Observatory (SOHO), which NASA operates along with the European Space Agency. If a CME strikes the comet, all of the spacecraft are likely to see what happens.

It would be pretty new territory for us," says Battams.



The Heliospheric Imager on NASA's STEREO-A spacecraft is tracking Comet ISON as it plunges toward the sun. In this movie, which spans a two day period from Nov. 20 to Nov. 22, 2013, the sun is off-screen to the right. Coincidentally, Comet Encke is present too. Click for Movie, Click for Commentary

"...and a nice preview of what NASA's Solar Probe+ spacecraft might experience when it plunges into the sun in the 2020s," adds Vourlidas.

Stay tuned!

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For More information:

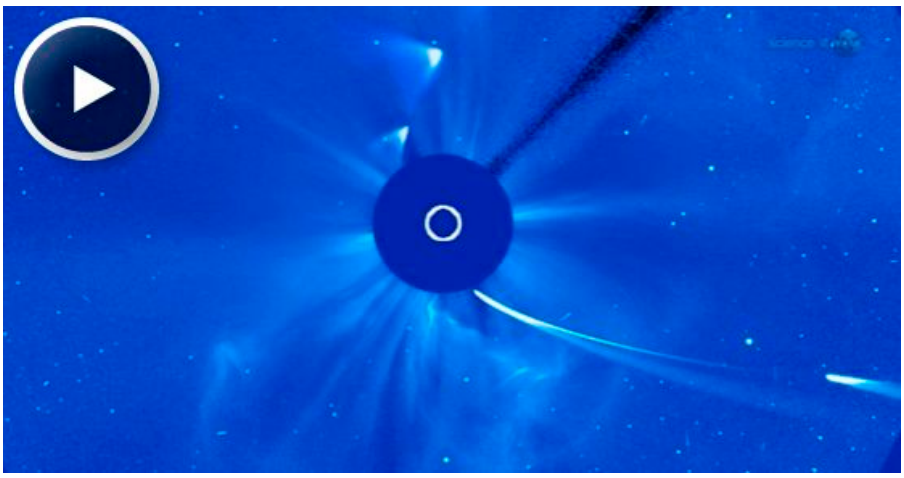
Comet ISON: What's Next? — Science@NASA

The Sun Rips off a Comet's Tail — Science@NASA

What Happened to Comet ISON?

Dec. 4, 2013: Astronomers have long known that some comets like it hot. Several of the greatest comets in history have flown close to the sun, puffing themselves up with solar heat, before they became naked-eye wonders in the night sky.

Some comets like it hot, but Comet ISON was not one of them.



An astonishing movie from the Solar and Heliospheric Observatory shows Comet ISON's Thanksgiving Day flyby of, and disintigration by, the sun. Click to Play it

The much-anticipated flyby of the Sun by Comet ISON on Thanksgiving Day 2013 is over, and instead of becoming a Great Comet….

"Comet ISON fell apart," reports Karl Battams of NASA's Comet ISON Observing Campaign. "The fading remains are now invisible to the human eye."

At first glance this might seem like a negative result, but Battams says "rather than mourn what we have lost, we should perhaps rejoice in what we have gained—some of the finest data in the history of cometary astronomy."

On the morning of Nov. 28th, expectations were high as ISON neared perihelion, or closest approach to the sun. The icy comet already had a riotous tail 20 times wider than the full Moon and a head bright enough to see in the pre-dawn sky with the unaided eye. A dose of solar heat could transform this good comet into a great one.

During the flyby, more than 32,000 people joined Battams and other solar scientists on a Google+ Hangout. Together they watched live images from a fleet of solar observatories including the twin STEREO probes, the Solar Dynamics Observatory, and SOHO. As Comet ISON approached the sun it brightened and faded again.

"That might have been the disintegration event," says Matthew Knight of NASA's Comet ISON Observing Campaign.

Cameras onboard the Solar Dynamics Observatory followed the comet all the way down to perihelion and saw … nothing.

"We weren't sure what was happening," recalls Knight. "It was such a roller coaster of emotions."

The researchers were surprised again when a fan-shaped cloud emerged from the sun's atmosphere. No one knows for sure what was inside. Possibilities include a remnant nucleus, too small for SDO to detect, or a "rubble pile" of furiously vaporizing fragments. By the end of the day, Comet ISON was nothing but a cloud of dust.

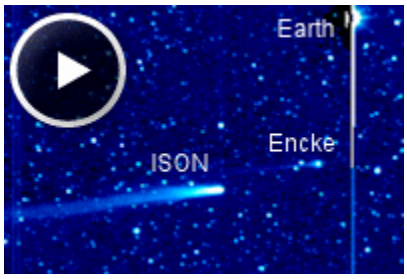
"It's disappointing that we didn't get a spectacular naked eye comet," says Knight, "but in other ways I think Comet ISON was a huge success. The way people connected with Comet ISON via social media was phenomenal; our Comet ISON Observing Campaign website earned well over a million hits; and I had trouble downloading images near perihelion because NASA's servers were swamped."

"So maybe ISON WAS the 'Comet of the *New* Century,'" he says.

Battams agrees: "The comet may be dead, but the observing campaign was incredibly successful." Since its discovery in Sept. 2012, Comet ISON has been observed by an armada of spacecraft, studied at wavelengths across the electromagnetic spectrum, and photographed by thousands of telescopes on Earth. For months at a time, uninterrupted, someone or some spacecraft had eyes on the comet as it fell from beyond the orbit of Jupiter to the doorstep of the sun itself. Nothing was missed.

The two astronomers hope that the wealth of data will eventually allow them and their colleagues to unravel the mystery of exactly what happened to Comet ISON.

"This has unquestionably been the most extraordinary comet that Matthew and I, and likely many others, have ever witnessed," says Battams. "The universe is an amazing place and it has just amazed us again."



A highlight of Comet ISON's approach to the sun was this conjunction between Comet Encke and Comet ISON recorded by NASA's STEREO-A spacecraft. Credit: NASA/STEREO/Rob Matson. Click to Play Movie

Credits:

Author: Dr. Tony Phillips | Production Editor: Dr. Tony Phillips | Credit: Science@NASA

For More information:

Comet ISON Observing Campaign

Dec. 6, 2013
Joshua Buck, Headquarters, Washington
202-358-1100 -- jbuck@nasa.gov -- **RELEASE 13-357**

NASA Initiative Helps Launch Student-Built Satellites

With help from NASA, four student-built CubeSat research satellites launched into space Friday from the California coast as part of the agency's CubeSat Launch Initiative

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The CubeSats were included as auxiliary payloads aboard a United Launch Alliance Atlas V rocket that lifted off from Vandenberg Air Force Base in Lompoc, Calif., at 11:14 p.m. PST Dec. 5 (2:14 a.m. EST Dec. 6) carrying the National Reconnaissance Office's NROL-39 satellite. The CubeSats, are a part of the Educational Launch of Nanosatellite (ElaNa) mission, NASA's fifth ElaNa mission launch into space. The miniature satellites deployed from their protective cases into Earth orbit about three hours after liftoff.

The teams responsible for the satellites are beginning to receive signals as the CubeSats come online. Although it could take several days for full confirmation, all of the spacecraft appear to be doing well in their new home in low-Earth orbit.

"This was another great moment for the ELaNa mission and the CubeSat community," said Jason Crusan, director of NASA's Advanced Exploration Systems Division, which oversees the CubeSat Launch Initiative. "With each successful mission, we are demonstrating that frequent access to space provides a great opportunity for NASA to gain engineering results at a low cost while affording students real-world exposure to spaceflight."

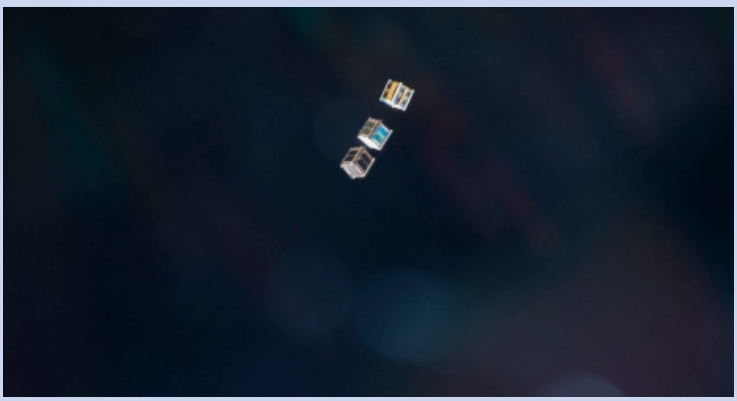
NASA Helps Launch Student-Built Satellites and latest PhoneSat as Part of CubeSat Launch Initiative

Ten universities and one high school will watch their research satellites launch into space and spend months retrieving data.

NASA's CubeSat Launch initiative (CSLI) provides opportunities for small satellite payloads to fly on rockets planned for upcoming launches. These CubeSats are flown as auxiliary payloads on previously planned missions.

The CubeSats were prepared by NASA's Jet Propulsion Laboratory in Pasadena, Calif., and students at Medgar Evers College at the City University of New York; Montana State University in Bozeman; and the University of Michigan at Ann Arbor in collaboration with the University of New Hampshire in Durham.

CubeSats are a class of research spacecraft called nanosatellites. The cube-shaped satellites measure about 4 inches on each side, have a volume of about 1 quart and weigh less than 3 pounds. CubeSat research addresses science, exploration, technology development, education or space missions.



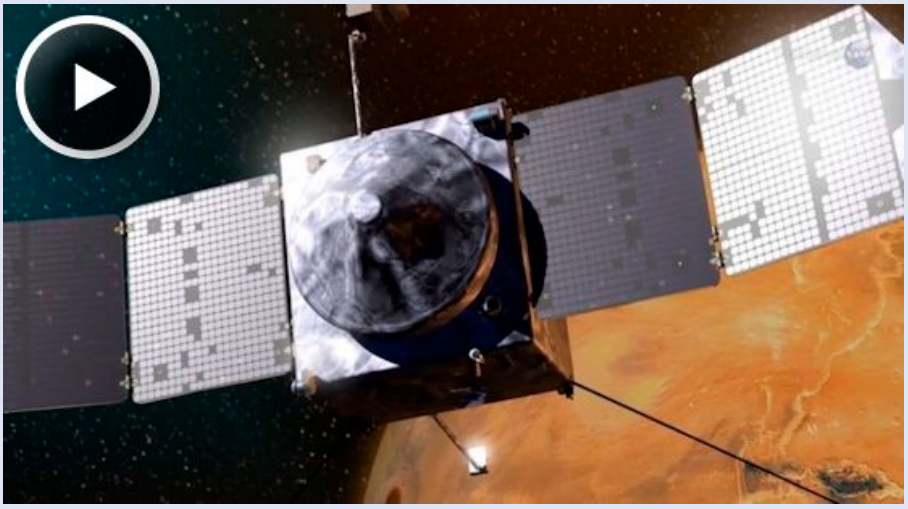
Cubesats Released From Space Station

ELaNa missions, conducted under NASA's CubeSat Launch Initiative, give students, teachers and faculty hands-on experience developing flight hardware by providing access to a low-cost avenue for research. Since its inception in 2010, the CubeSat Launch Initiative has selected more than 90 CubeSats from primarily educational and government institutions around the United States.

NASA chose these miniature satellites from respondents to public announcements for the agency's CubeSat Launch Initiative. NASA will announce another call for proposals in August.

For additional information about NASA's CubeSat Launch Initiative, visit: http://www.nasa.gov/cubesat

What Happened to Mars? A Planetary Mystery



A new ScienceCast video ponders the question, What Happened to Mars? **Click to Play it**

Nov. 12, 2013: Billions of years ago when the planets of our solar system were still young, Mars was a very different world. Liquid water flowed in long rivers that emptied into lakes and shallow seas. A thick atmosphere blanketed the planet and kept it warm. In this cozy environment, living microbes might have found a home, starting Mars down the path toward becoming a second life-filled planet next door to our own.

But that's not how things turned out.

Today, Mars is bitter cold and desiccated. The planet's thin, wispy atmosphere provides scant cover for a surface marked by dry riverbeds and empty lakes. If Martian microbes still exist, they're probably eking out a meager existence somewhere beneath the dusty Martian soil.

What happened? This haunting question has long puzzled scientists. To find the answer, NASA is sending a new orbiter to Mars called MAVEN (Mars Atmosphere and Volatile Evolution).

"The goal of MAVEN is to figure out what processes were responsible for those changes in Martian climate," says Bruce Jakosky, Principal Investigator for MAVEN at the University of Colorado at Boulder.

Scheduled for launch in Nov. 2013, and due to arrive in Sept. 2014, MAVEN is bristling with instruments to study Mars' upper atmosphere. That's where many researchers believe the answer lies.

The only way Mars could have been wet and warm 4 billion years ago, is if it also had a thick atmosphere. CO_2 in the Martian atmosphere is a greenhouse gas, just as it is in our own atmosphere. A thick blanket of CO_2 and other greenhouse gases would have provided the warmer temperatures and greater atmospheric pressure required to keep liquid water from freezing solid or boiling away.

Something caused Mars to lose that blanket. One possibility is the solar wind. Unlike Earth, Mars is not protected by a global magnetic field. Instead, it has "magnetic umbrellas" scattered around the planet that shelter only part of the atmosphere. Erosion of exposed areas by solar wind might have slowly stripped the atmosphere away over billions of years. Recent measurements of isotopes in the Martian atmosphere by Mars rover Curiosity support this idea: light isotopes of hydrogen and argon are depleted compared to their heavier counterparts, suggesting that they have floated away into space.

Scientists have also speculated that the planet's surface might have absorbed the CO_2 and locked it up in minerals such as carbonate. However, this theory has faded in recent years as Mars rovers and orbiters have failed to find enough carbonate to account for the missing gas.

MAVEN will be the first mission to Mars specifically designed to help scientists understand the ongoing escape of CO_2 and other gases into space. The probe will orbit Mars for at least one Earth-year. At the elliptical orbit's low point, MAVEN will be 125 km above the surface; its high point will take it more than 6000 km out into space. MAVEN's instruments will track ions and molecules in this broad cross-section of the Martian atmosphere, thoroughly documenting the flow of CO_2 and other molecules into space for the first time.

NASA's MAVEN spacecraft is hoisted to the top of a Atlas V rocket at Cape Canaveral. Launch is scheduled for Nov. 18th. **Click for More**

Once Jakosky and his colleagues know how quickly Mars is losing CO_2 right now, they can extrapolate backward in time to estimate the total amount lost during the last four billion years. "MAVEN will determine if loss to space was the most important player in driving Martian climate change," Jakosky says.

In the grand scheme of the Solar System, Earth orbits alongside a world that began with as much promise for life as our own … yet turned out so differently. After all these years, MAVEN could write the final chapter in a haunting planetary mystery.

Credits:

Author: Dr. Tony Phillips | Production Editor: Dr. Tony Phillips | Credit: Science@NASA

For More information:

Mars Atmosphere and Volatile Evolution — MAVEN home page

MAVEN social media: Facebook and Twitter

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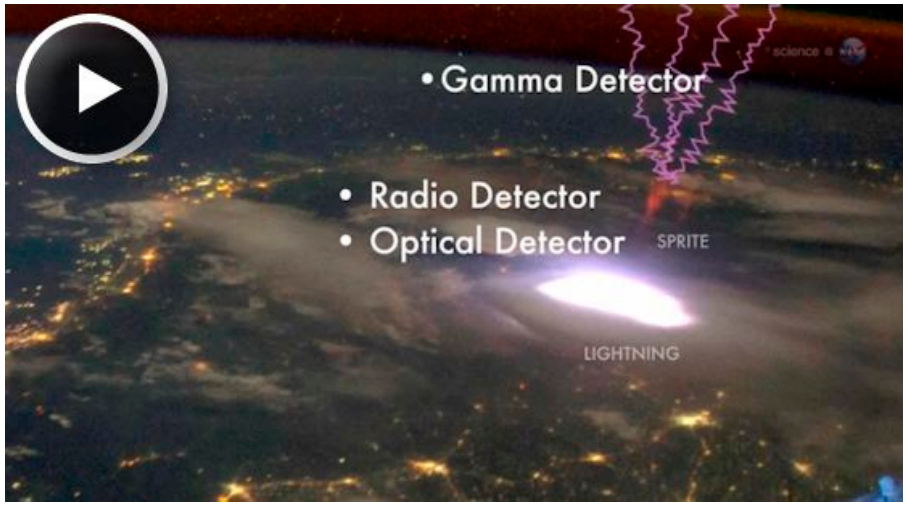
ISS "Firestation" to Explore the Tops of Thunderstorms

Sept. 10, 2013: We all know what comes out of the bottom of thunderstorms: bolts of lightning. Jagged columns of light plunge Earthward, heating the air to 50,000 degrees F, about five times hotter than the surface of the sun. Claps of thunder announce this process some where on Earth as often as 50 times a second.



A new ScienceCast video explores the strange things coming from the tops of thunderstorms. Click to Play it

Have you ever wondered, though, what comes out of the top?

In recent decades researchers have discovered some strange things happening in the cloud tops. High above ordinary lightning, exotic forms known as red sprites and blue elves shoot toward the heavens, cold cousins to the fiery bolts below. In some places jets of antimatter fly upwards, triggering the detectors on NASA's orbiting high-energy observatories. And as often as 500 times a day, Earth briefly mimics a supernova, producing a powerful blast of gamma-rays known as a Terrestrial Gamma-ray Flash or TGF.

No know knows exactly how these phenomena are related either to each other or to the lightning down below.

A new experiment called "Firestation" onboard the ISS aims to find out. Firestation is a package of sensors designed to explore the links between TGFs, ordinary lightning, and sprites.

“The space station's orbit will carry Firestation directly above thousands of active thunderstorms during the one-year lifetime of the experiment,” says principal investigator Doug Rowland at NASA’s Goddard Space Flight Center. "The ISS is perfect for this kind of research.”

Unlike previous experiments in upper atmospheric lightning, Firestation has the unique ability to observe thunderstorms at multiple wavelengths simultaneously. It can record the radio static from lightning, measure its optical glow (including the red and blue light of sprites and elves), and detect the gamma-rays and electrons associated with TGFs and antimatter events.

Rowland expects Firestation to observe up to 50 lightning strokes per day, at least one TGF every few hours, and a large TGF every couple of days. Such a firehose of multi-wavelength data will allow researchers to sort out cause-and-effect connections impossible to see in previous studies.

"There are several different types of lightning," Rowland says. "At the moment, we don't even know which type produces a gamma-ray flash." Firestation could solve that decades-old mystery in its first few weeks of operation.

The thing that intrigues Rowland most about TGFs is their surprising energetics.

"Gamma-rays are thought to come from the most violent events in the cosmos like stars colliding or exploding," he points out. "What a surprise to find them shooting out of the cold upper atmosphere of our own planet."

Something up there is accelerating low-energy particles of air to nearly the speed of light, producing gamma-radiation and, sometimes, a cascade of antimatter. Rowland wants to find out what that strange, unknown "something" is.

Firestation is poised to crack the mystery.

The experiment was delivered to the ISS on August 3, 2013, by the Japanese robotic cargo vessel "Kounotori-4." It has since been installed on the station's exterior by the station’s robotic arm. All of the sensors were checked out at the end of August and full-time science operations are slated to begin in early September 2013.

Credits:

Author: Dr. Tony Phillips | Production Editor: Dr. Tony Phillips | Credit: Science@NASA

Related Links:

Dark Lightning -- ScienceCast video

Are TGFs Hazardous to Air Travelers? -- Science@NASA

Firefly Mission to Study Terrestrial Gammaray Flashes -- Science@NASA

Thunderstorms Make Antimatter -- Science@NASA

November is the Month That DAS Dues are Payable
If You’ve Not Already Done So, & While You’re Thinking About It, Fill-Out the Form on Page 21 & Get Yours In NOW!

"Genius Materials" on the ISS

Nov. 27, 2013: If you have a smartphone, take it out and run your fingers along the glass surface. It's cool to the touch, incredibly thin and strong, and almost impervious to scratching. You're now in contact with a "smart material."

With proper coaxing, molecules in microgravity can assemble themselves into forms with surprising properties. A new ScienceCast video explores the possibilities. Click to Play it

Smart materials don't occur naturally. Instead, they are designed by human engineers working at the molecular level to produce substances made-to-order for futuristic applications. The Corning Gorilla Glass that overlays the displays of many smartphones is a great example. It gets its toughness, in part, from "fat" potassium ions stuffed into the empty spaces between old-fashioned glass molecules. When the molten glass cools during manufacturing, dense-packed molecules solidify into a transparent armor that gives Gorilla Glass its extraordinary properties.

Around the world, designers are working on other smart materials such as alloys that can change shape on demand, plastics that heal themselves when ruptured, and fluids that obey magnetic commands to flow or stiffen under computer control.

"One of the great challenges in creating a smart material is arranging the molecules," says Eric Furst of the University of Delaware. "They're so small!"

Furst wants to create a new class of materials, beyond smart. "We need 'genius materials'—materials that arrange themselves," he says.

The research to accomplish this is already underway on the International Space Station.

Furst is the principal investigator of an experiment called InSPACE-3. In the microgravity of Earth orbit, vials of fluid mixed with very small 'colloidal' particles (about a millionth of a meter in diameter) are exposed to magnetic fields. Magnetism is switched on and off again very rapidly. This jostles the particles, causing them to bump together and self-assemble into microscopic structures that currently no supercomputer can predict.

"Astronauts enjoy watching this process in action through microscopes," says Furst. "Because the samples are backlit by a green lamp, they sometimes call it the 'green blob experiment.'"

Furst recently won an award from the American Astronautical Society for his work on InSPACE-3. "I'm excited," he continues. "Just by toggling a magnetic field, we're learning how to take any kind of microscopic building blocks and get them to spontaneously form interesting structures."

Recently, observers have seen the colloidal particles forming long fibrous chains. Furst speculates that these could lead to materials that conduct heat or electricity in one direction only. The experiment has also yielded crystalline structures that the team is just beginning to investigate.

The fluids underlying these tests are themselves very smart. They are called magnetorheological or "MR" fluids because they harden or change shape when they feel a magnetic field.

If you own a sports car or a Cadillac, you might have MR fluids in your shock absorbers. The stiffness of magnetic shocks can be electronically adjusted thousands of times per second, providing a remarkably smooth ride. Similar but more powerful devices have been installed at Japan's National Museum of Emerging Science and China's Dong Ting Lake Bridge. They're there to counteract vibrations caused by earthquakes and gusts of wind. Some researchers have speculated that MR fluids might one day flow through the veins of robots, moving artificial joints and limbs in lifelike fashion.

Furst and colleagues are using these fluids as a laboratory for studying self-assembly. MR fluids are, by definition, responsive to the magnetic nudging that sets self-assembly in motion. Furthermore, in space the particles don't sediment out due to gravity. "We can study the full 3D evolution of the material," he adds.

A Quicktime movie (31 MB) of the InSPACE-3 "green blob" experiment. Click to Play it

Varying the shape of the colloidal particles, the cadence of magnetic toggling, the temperature of the fluid and other factors will allow researchers and astronauts to further explore the frontiers of self-assembly.

Touch the surface of your smartphone again. Maybe that's just the beginning.

Credits:

Author: Dr. Tony Phillips | Production Editor: Dr. Tony Phillips | Credit: Science@NASA

For More information:

InSpace-3 — Investigating the Structure of Paramagnetic Aggregates from Colloidal Emulsions - 3 (InSPACE-3)

Robot Blood — Science@NASA

Rock Comet Sprouts a Tail

Nov. 27, 2013: Astronomers have long been puzzled by a certain meteor shower.

Every year in mid-December the sky fills with flashes of light shooting out of the constellation Gemini. The Geminids are fast, bright, and reliable. They never fail to show up and many observers count them as the finest meteors of the year.

But where do they come from? That is the puzzle.

A new ScienceCast video explores the mysteries of "rock comet" 3200 Phaethon. Click to Play it

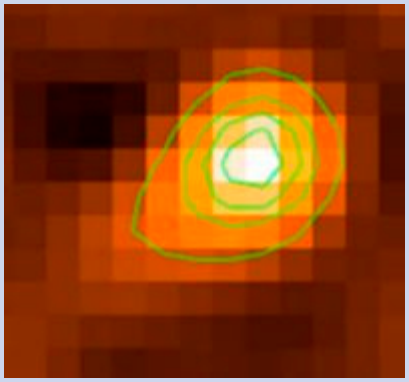
Meteor showers are supposed to come from comets, yet there is no comet that matches the orbit of the Geminid debris stream. Instead, the orbit of the Geminids is occupied by a thing called "3200 Phaethon." Discovered in 1983 by NASA's IRAS satellite, Phaethon looks remarkably like a rocky asteroid. It swoops by the sun every 1.4 years, much like a comet would, but it never sprouts a dusty tail to replenish the Geminids.

That is, until now.

A group of astronomers led by Dave Jewitt of UCLA have been using NASA's STEREO probes to take a closer look at 3200 Phaethon when it passes by the sun. The twin spacecraft were designed to monitor solar activity, so they get a good view of sungrazing comets and asteroids. In 2010 one of the STEREO probes recorded a doubling of Phaethon's brightness as it approached the sun, as if sunlight were shining through a cloud of dust around the asteroid. The observers began to suspect 3200 Phaethon was something new:

"A rock comet", says Jewitt. A rock comet is, essentially, an asteroid that comes very close to the sun—so close that solar heating scorches dusty debris right off its rocky surface. This could form a sort of gravelly tail.

Indeed, in further STEREO observations from 2009 and 2012, Jewitt along with colleagues Jing Li of UCLA and Jessica Agarwal of the Max Planck Institute have spotted a small tail sticking out behind the "rock."



This STEREO image of 3200 Phaethon reveals a stubby but distinct tail. Click for More

"The tail gives incontrovertible evidence that Phaethon ejects dust," says Jewitt.

Jewitt's team believes that the dust is launched by thermal fracturing of the asteroid's crust. A related process called "desiccation fracturing"—like mud cracks in a dry lake bed—may play a role too.

Seeing 3200 Phaethon sprout a tail, even a small one, gives researchers confidence that Phaethon is indeed the source of the Geminids—but a mystery remains: How can such a stubby protuberance produce such a grand meteor shower?

Adding up all of the light STEREO saw in Phaethon's tail, Jewitt and colleagues estimate a combined mass of some 30 thousand kilograms. That might sound like a lot of meteoroids but, in fact, it is orders of magnitude too small to sustain the massive Geminid debris stream.

Perhaps Phaethon experienced a "big event" in the recent past. "The analogy I think of is a log in a campfire," says Jewitt. "The log burns, makes a few embers, but occasionally will spit out a shower of sparks."

Continued monitoring by NASA's STEREO probes might one day catch the rock comet spitting out a shower of dust and debris, solving the mystery once and for all.

Until then, it's a puzzle to savor under the stars. This year's Geminid meteor shower peaks on the nights of Dec. 13-14 with dozens of "rock comet meteors" every hour. `

Bundle up and enjoy the show.

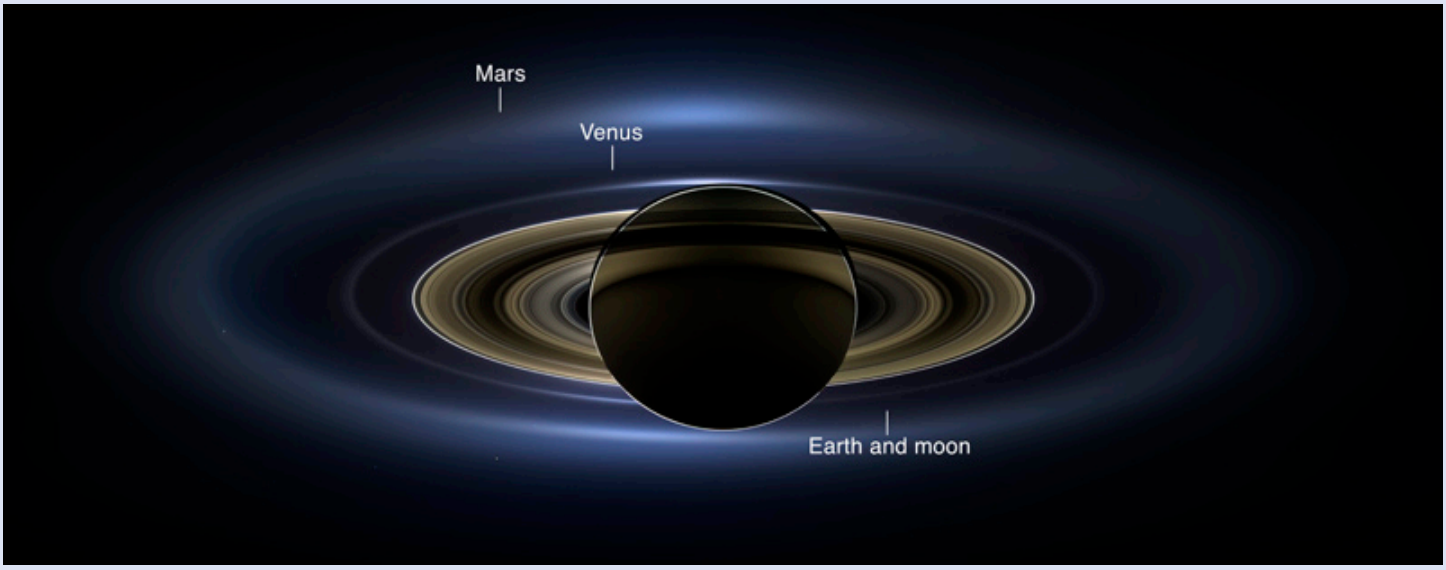
Credits:

Author: Dr. Tony Phillips | Production Editor: Dr. Tony Phillips | Credit: Science@NASA

For More information:

Phaethon Confirmed as Rock Comet by STEREO Vision — press release

Spectacular New View of Saturn and Earth



On July 19, 2013, in an event celebrated the world over, NASA's Cassini spacecraft slipped into Saturn's shadow and turned to image the planet, seven of its moons, its inner rings -- and, in the background, our home planet, Earth. Click for Full-sized Image

This collage includes about 1,600 images submitted by members of the public as part of the NASA Cassini mission's "Wave at Saturn" campaign. Image Credit: NASA/JPL-Caltech/SSI Click for Larger Image

Nov. 12, 2013: NASA has released a natural-color image of Saturn from space, the first in which Saturn, its moons and rings, and Earth, Venus and Mars, all are visible.

The new panoramic mosaic of the majestic Saturn system taken by NASA's Cassini spacecraft, which shows the view as it would be seen by human eyes, was unveiled at the Newseum in Washington.

An annotated version of the Saturn system mosaic labels points of interest. Earth is a bright blue dot to the lower right of Saturn. Venus is a bright dot to Saturn's upper left. Mars also appears, as a faint red dot, above and to the left of Venus. Seven Saturnian moons are visible, including Enceladus on the left side of the image. Zooming into the image reveals the moon and the icy plume emanating from its south pole, supplying fine, powder-sized icy particles that make up the E ring.

The E ring shines like a halo around Saturn and the inner rings. Because it is so tenuous, it is best seen with light shining from behind it, when the tiny particles are outlined with light because of the phenomenon of diffraction. Scientists who focus on Saturn's rings look for patterns in optical bonanzas like these. They use computers to increase dramatically the contrast of the images and change the color balance, for example, to see evidence for material tracing out the full orbits of the tiny moons Anthe and Methone for the first time.

"This mosaic provides a remarkable amount of high-quality data on Saturn's diffuse rings, revealing all sorts of intriguing structures we are currently trying to understand," said Matt Hedman, a Cassini participating scientist at the University of Idaho in Moscow. "The E ring in particular shows patterns that likely reflect disturbances from such diverse sources as sunlight and Enceladus' gravity."

"With a long, intricate dance around the Saturn system, Cassini aims to study the Saturn system from as many angles as possible," said Linda Spilker, Cassini project scientist based at NASA's Jet Propulsion Laboratory in Pasadena, Calif. "Beyond showing us the beauty of the Ringed Planet, data like these also improve our understanding of the history of the faint rings around Saturn and the way disks around planets form -- clues to how our own solar system formed around the sun."

Launched in 1997, Cassini has explored the Saturn system for more than nine years. NASA plans to continue the mission through 2017, with the anticipation of many more images of Saturn, its rings and moons, as well as other scientific data.

Credits:

Production Editor: Dr. Tony Phillips | Credit: Science@NASA

For More information:

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. JPL, a division of the California Institute of Technology, Pasadena, manages the mission for NASA's Science Mission Directorate in Washington. JPL designed, developed and assembled the Cassini orbiter and its two onboard cameras. The imaging team is based at the Space Science Institute, Boulder, Colo.

A new version of the collage of photos shared by the public, with the Saturn system as backdrop, is available at: http://www.jpl.nasa.gov/spaceimages/details.php?id=PIA17679.

More information about Cassini is available at: http://www.nasa.gov/cassini and http://saturn.jpl.nasa.gov .

DAS Main Meeting Topics and Speakers for the Remainder of 2013-2014 ■ *Bill Hanagan*

December 17: *The DAS Holiday Party and Giant Swap Meet*. We will be setting up for the Holiday Party and Swap Meet starting at 7:00 PM, so there will be no board meeting in December. We need YOU to bring in your surplus astronomy gear for sale as well as your favorite holiday snack. Be sure to bring a vehicle large enough to take home a telescope or two—there will be some for sale! At 8:00 PM, we'll suspend the swap meet and move into the lecture room for the presentations. We'll have several mini-presentations for December: 1) Greg Lee will tell us about *What's Up in the Sky*; 2) we'll hear about the *Best Swap Meet Items* from any interested sellers (5 minutes per person); and 3) I'll present a slideshow of *Longwood Christmas Lights* set to music to help everyone get into the Holiday spirit. After the presentations, we'll return to the swap meet and enjoy the holiday treats brought in by our members.

January 21 mini-talks: 1) Jeff Lawrence will present *Space Mission Quiz*; and 2) Greg Lee and Bob Mentzer will tell us *All about Sundials*.

February 18: *"The Search for Exoplanets—A Report on McDonald Observatory's Solar Systems Uncovered Workshop"*, by Julia Duffy; Julia will share a presentation provided by Dr. Kevin Gullikson of the University of Texas Department of Astronomy on searching for exoplanets using the Harlan Smith 2.7m telescope.

March 18: *"The Most Massive Stars and a pair of X-ray Goggles"*, by Veronique Petit, University of Delaware Postdoctoral Associate. This talk will examine X-ray astronomy and the unique information it can give us about the exciting lives of the most massive stars.

April 15: Open; **May 20:** Open; **June 17:** Open-- **We need more presentations to fill the schedule! See pg. 2 in the September issue of the *FOCUS* for Ideas!**

Seeking Venue for May Dinner Meeting

Our May dinner meeting has always been a fun event, and a highlight of our meeting season. However, the price of the event has steadily crept up to an unacceptable level. We are considering other options for our next dinner meeting to bring the price down considerably. One option is to have the event catered. To be even more cost effective, we could provide the food ourselves. Either of these options would require a venue. Therefore, we would like to know if any club members have access to an extremely inexpensive, or even free venue that could accommodate 50-100 people. Kitchen facilities would be especially nice. Places such as churches or community buildings sometimes will offer a banquet or meeting room for free to its members. If you have something that could work, please contact Jeff Lawrence at jef.law76@gmail.com or (302) 668-8277.

Nominations for the Luther Porter Award ■ *Bill Hanagan*

Once again in 2014 we will be looking for nominations for the Luther Porter Award. *This award is given to an individual for making a sustained, exceptional, and selfless effort to promote amateur astronomy among the public within the Mid-Atlantic region of the United States.*

Please note that this award is **NOT** restricted to "educators". If you know anyone who meets the requirements stated above and you would like to place their name in nomination for this award, please contact our awards committee chairman Gus Swartout.

Report on the DAS 17.5" Newtonian Primary Mirror ■ *Bill Hanagan*

We're very close to being done, but there is still room for improvement. The Strehl ratio for the mirror is now 0.800 by interferometer with the target conic constant set to -1 (paraboloid). Resetting the target conic constant to -.983 (the best fit value) only brings the Strehl up to 0.816, so the overall correction of the mirror is excellent. The asymmetric errors, including the astigmatism revealed when we switched to interferometry for testing, has been eliminated. Nearly all of the loss of Strehl relative to a perfect value of 1.00 is due to localized high and low areas scattered over the surface of the mirror.

What we need most of all now is to smooth out the local highs and lows. To do that, we'll need some more localized polishing to knock down a few high areas and then some time spent polishing the entire surface to "bring up" the localized low areas and to smooth out any high frequency variations. After that, we'll probably also need to add correction again to compensate for what gets lost during smoothing, but we can add correction very predictably. If all goes well, we might have the mirror done in 1 or 2 more sessions.

REQUESTS FOR ASTROPHOTOS ■ *Bill Hanagan*

Please consider submitting one or more of your favorite astrophotos for publication in our club's newsletter, the *FOCUS*. A recent photo is not required. You can email your photo(s) as .jpg files to *FOCUS* editor Joe Neuberger at jrneuberger@gmail.com.

Be sure to include a text file (in Microsoft Word format) including appropriate photo credits and a caption. If you would like, you can write a more in-depth discussion to go with your photos. Joe has done a great job improving the look of the *FOCUS* and adding relevant links to take advantage of the fact that the *FOCUS* is now on-line, but like all newsletter editors, he needs as much material as he can get from club members.

In addition, Greg Weaver, the manager of MCAO, has asked for astro-photos and accompanying information on how they were made for display in the lobby at Mount Cuba. Contact Greg at mtcuba@physics.udel.edu. The one requirement is that the image should be an accurate representation of the area being photographed. Photos may be sent to the Observatory or brought to a DAS meeting. The Observatory looks forward to displaying your beautiful images!

Saturn *- This image of Saturn was obtained through a Celestron CG-11 Schmidt-Cassegrain Telescope (SCT) that was iced down with cold packs for over an hour to cool the entire telescope including the primary mirror. The cold packs were removed about 30 minutes before acquiring images so the tube and the air inside could warm up, in the ideal case leaving the mirror cooler than its surroundings, but in any case cooler than it would have been without applying the cold packs. A better solution to the problem of heat inside an SCT would be to install a cooling fan to blow air across the face of the primary mirror and homogenize the air within the telescope.*

Working jointly with Rob Lancaster, Bill used an EOS 50D DSLR and 2x Televue "Big Barlow" lens to capture several video sequences containing about 1800 frames each. The single best video obtained was then processed by selecting the best individual frames. I selected the best frames in a semi-manual fashion using the program Virtual Dub and stacked the selected frames using Registax V4.

Photo taken by DAS member Bill Hanagan.

LIBRARY NEWS ■

The DAS Library is open for business and is undergoing a reorganization. Stop by during the December Holiday Party to see what's up and take our some reading for the cold Winter evenings ahead! ALL ARE WELCOME!

ASTRONOMICAL LEAGUE MEMBERSHIP

■ *Lynn King*

DAS members have the opportunity to become members in the Astronomical League at the discounted rate of $7.50 per year. Benefits include the *Reflector* (a quarterly newsletter), observing programs, awards, discounts on books and educational materials. For questions on joining the Astronomical League, contact Lynn King at meetings, call 302-764-8816 or email KLynnKing@verizon.net.

MT. CUBA LENDING LIBRARY ■ *Paul Stratton*

The MCAO Library has received as a donation a copy of the Atlas of Galaxies.

This book is for the use of those on staff. Due to it's size, I have found a place next to the copier in the library.

Happy Galaxy gazing.

Some of you may find two new additions to the Lending Library of interest.

The Amazing Story of Quantum Mechanics by James Kakalios. A math-free exploration of the science that made our world.

Also, *13 Things that don't make sense* by Michael Brooks which includes such interesting topics as

THE WOW SIGNAL - Has ET already been in touch?
LIFE - Are we more than just a bag of chemicals?
SEX - There are better ways to reproduce. Hummmmm.

DAS FORUM / E-MAIL SITE ON YAHOO

■ *Don Shedrick*

This is a restricted e-mail service for use by DAS members for DAS purposes. To use this site, go to http://groups.yahoo.com; search for Delaware Astronomical Society; and click on the link that comes up. To join, you must have a Yahoo ID and password; if you don't, you can register at this time by following Yahoo's instructions. You will then be allowed to "Join the group" upon clicking in that box. You must then register for the DAS group and add your profile by clicking on "add new profile" and completing the form.

When adding or editing your profile, you will need to enter your actual name in the "Real Name" box so you can be identified as a DAS member so Don Shedrick can approve your application to join the DAS group, and everyone will know to whom they are communicating.

Finally, specify your desired email address for delivery of messages. Note: you may choose to not have your name and email address displayed to anyone other than DAS members who are members of the Yahoo DAS email group.

For more detailed instructions, go to the DAS website under *DAS Resource Links*.

Annual Calendar Availability ■ *Lynn King*

For those of you who are new each year, and a reminder to those who have gotten calendars in the past, I make available to DAS members Astronomy calendars at the discounted price of $7.00. One is in the lecture room of MCAO. If you are intersted, please respond to me at klynnking@verizon.net.

Extra calendars are always ordered whcih will be available for those who have not pre-ordered until they are sold out.

Laser Colimator Available for Aligning Your Newtonian & Dob Scopes!

If you would like to take advantage of this new tool, it is available for lending to the membership. Please contact the O&E Group by calling Tom Sidowski at 302-239-1844. It's a quick and easy procedure and will improve your visual observing experience GREATLY! **EASY to USE & YOU'LL LOVE IT, GUARANTEED!** It's one of the handiest and most useful tools the club has ever offered for loan to the membership! You owe it to yourself to CHECK IT OUT!

You'll be AMAZED at the improvement in the performance of your scientific instrument! Correctly aligned your instrument can give you so much more than you'd ever imagined!

INFORMATION ON DAS MEMBERSHIPS AND MAGAZINE SUBSCRIPTIONS

■ *Jeff Lawrence, DAS Treasurer*

DAS MEMBERSHIP

- DAS membership dues are $30.00 per year and due on November 1 for all members.
- New members joining at various times of the year may be eligible for a prorated dues amount.
  - New members joining March-May pay $20 for membership through November 1 of the current year.
  - New members joining June-August pay $10 for membership through November 1 of the current year.
  - New members joining September-October pay $30 for membership through November 1 of the following year.

ASTRONOMICAL LEAGUE MEMBERSHIP

- The DAS offers an optional membership in the Astronomical League (AL) at a discounted rate.
- AL membership dues are $7.50 per year and are due on June 1 for all members.
- The AL does not offer any prorated discounts for new memberships starting mid-year.

SKY & TELESCOPE MAGAZINE

- The DAS offers subscriptions to Sky & Telescope at a discounted rate of $32.95 per year.
- Subscriptions to S&T will be processed by the club for the first subscription year only.
- The publisher should then send renewal notices directly to the subscriber at the club rate of $32.95.
- You may receive renewal offers for amounts other than $32.95. If so, check to see if they are special offers and how close you are to your renewal date.
- Your subscription expiration date should be displayed on the mailing label on your magazine.
- If you are within 3 months of your renewal date and still have not received the correct renewal notice, please contact the publisher and tell them you should receive the member rate.
- If all else fails, send a check to the treasurer and request to have it renewed by the club.

ASTRONOMY MAGAZINE

- The DAS offers subscriptions to Astronomy magazine at a discounted rate of $34.00 per year.
- Subscriptions to Astronomy will be processed by the club for new and renewal subscriptions.
- Your subscription expiration date should be displayed on the mailing label on your magazine.
- For renewals, please send a check for $34.00 payable to "Astronomy" to the treasurer to have it renewed by the club.

MEMBERSHIP FORM

- Please review the membership and magazine information above carefully.
- New members are requested to fill out the membership form completely.
- Renewal members do not need to fill out any information we already have but, be sure to include any corrections.

MEMBERSHIP or RENEWAL FORM

Please be sure to review the membership and magazine information above carefully

Please make checks payable to DAS and forward to:

Jeff Lawrence, Treasurer, 815 Leeds Lane, Newark, DE 19711

For those wishing to utilize PayPal, use: https://www.paypal.com/cgi-bin/webscr?cmd=_s-xclick&hosted_button_id=NDGKG4CWCX8GU

New Member ☐
Renewal ☐

Senior / Family Membership	$30.00	
Junior Membership (16 or under)	$10.00	
Astronomical League	$ 7.50	
Sky & Telescope Magazine	$32.95	
Astronomy Magazine	$34.00	
Total		

Name_____ Email Address_____

Street Address_____ Phone Number_____

City_____ State_____ Zip_____

Notes_____

For questions or concerns, contact Jerf Lawrence, DAS Treasurer at (302) 668-8277 or jef.law76@gmail.com

DAS CONTACTS **Please call any of us with your concerns!**

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Vice-President: John Case -- 302-838-1568 or case@mail.eecis.udel.edu

Secretary: Bill McKibben, Secretary billmck21921@comcast.net

Treasurer: Jeff Lawrence jef.law76@gmail.com; (302) 668-8277also *Sky & Telescope* & *Astronomy* magazine issues

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Glenn Bentley -- 610-869-0706 or gbentley@chesco.org

Standing Chairs:

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Awards: Gus Swartout - dave.swartout@gmail.com

Education: Mike Cimorosi

Observing: Greg Lee -- 762-5358 or GregLee28@hotmail.com, also, *What's Up in the Night Sky?* segment at each monthly meeting.

Observatory: Tom Sidowski -- 302-239-1884 or Sidowski@udel.edu

Library Maria Lavalle and Sue Bebon

Elections & Program Chair Rob Lancaster -- RLancaste@gmail.com

MCAO Web Page: **www.MountCuba.org**

DAS Web Page: **www.DelAstro.org**

Other Chairs and Important People:

Sheila Vincent --302-322-4739, Ad-hoc star parties

Daniel Chester-- chester@cis.udel.edu, DAS' Web presence

SEE PRECEEDING PAGE FOR MEMBERSHIP or RENEWAL FORM

If you have questions, call any of the member representatives listed. Otherwise, just check the appropriate boxes and complete the form on the preceeding page. Print it or cut it off and send it with your check to Jeff Lawrencet his address on the form. The magazine prices are group rates to DAS members.

If you're just joining us for the first time, THANK YOU VERY MUCH, and *WELCOME* to the DAS! It's GREAT to have you with us!

The Last Word. . .

■ *FOCUS editor Joe Neuberger*

I can hardly believe that this is my 54th issue as Your Publications Chair and FOCUS Editor, which I have been doing since September, 2008.

And it has been my Pleasure to serve the membership in this manner.

I strive to make each issue of the FOCUS a little better than the last, and hope I succeed in that effort. Only YOU can say.

And I look forward to another year in 2014.

So, before 2013 comes to a close, let me say ***"Thank You"*** *for your wide ranging support, and to wish Everyone a sincere* ***"Happy Holidays!"***

And ***"Best Wishes*** *for a* ***Safe & Happy New Year to ALL!"***