

# FOCUS

Vol. 57, No. 8, October, 2012

## DELAWARE ASTRONOMICAL SOCIETY

**Next Meeting – Tuesday, October 16<sup>th</sup>, 2012 Beginning at 8:00 PM**

**Two Mini-Talks by DAS Members:**

***Assessing the Limits of Parallax for Measuring Stellar Distances -***

**Speaker: Mike Cimososi**

***Telescope Collimation with a Demonstration of our Club's New-for-Loan***

***"Barlowed Laser" Collimator - Speaker: Bill Hanagan***

**at the Mt. Cuba Astronomical Observatory**

### FROM THE PRESIDENT ■ *Bill Hanagan*

First off, I'd like to thank Greg Lee for his September presentation of "What's Up" and Mike Cimososi for describing his group's trip to the NASA Johnson Space Center in Houston, Texas where they flew in the G-Force Weightless Wonder. I also presented a photo review of our June 5th "last-in-a-lifetime" transit of Venus MSP and a summary of Fall DAS activities.

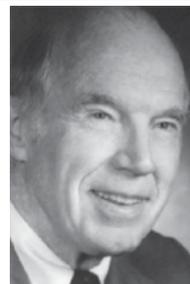
Thanks also go to Greg Lee and Fred DeLucia for providing the refreshments afterwards.

I'd like to remind you that we'll be holding an MSP in conjunction with the [Delmarva Stargazer's](#) "No-Frills" Stargaze at Tuckahoe State Park in MD on the nights of October 11-13, if the weather allows. The current long-range forecast predicts clear skies on all three nights, so we are likely to have a GO for at least one or two nights. More details are available in the section on DAS Member Star Parties appearing in this issue of the *FOCUS*.

Our main meeting program for October 16 will begin once again with a brief review of "What's Up in the Sky" by Greg Lee, followed by two mini-talks: 1) *Assessing the Limits of Parallax for Measuring Stellar Distances*, a demonstration of the parallax technique using laser triangulation, by Mike Cimososi; and 2) *Telescope Collimation*, a discussion of telescope alignment for beginners and experienced users alike, with a demonstration of our club's new "Barlowed Laser" collimator, by Bill Hanagan.

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 a variety of equipment donations, but more volunteers and donations are always needed. In particular, we still have empty slots for 4 to 6 mini-talks in our speaker schedule.

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.



*Daniel D. Friel, Sr.*

### ***DAS Loses a Long-Time Supporter with the Passing of Dan Friel, Chairman of the Board of Trustees of the Mount Cuba Observatory***

Daniel D. Friel, Sr., a founder and chairman of the Mt. Cuba Astronomical Observatory passed away on September 21, 2012. He was a resident of Greenville, DE and Chairman/Chief Executive Officer of the Edgecraft Corporation at the time of his death. He was 92.

Born in 1920 in Queenstown, MD, Mr. Friel received a Bachelor's of Science Degree in Chemical Engineering from Johns Hopkins University in 1942. He began his career on the Manhattan Project at the University of Chicago where the first atomic reactor was assembled.

Mr. Friel then spent 39 years with the DuPont Company where he helped pioneer such products as Riston Dry Film Resists used in the manufacturing of circuit boards. At the time of his retirement from the company, he was the Worldwide Director of Instruments and Biomedical Products.

At the age of 65, Mr. Friel founded Edgecraft Corporation, manufacturer of a unique and advanced line of Chef's Choice products including novel knife sharpeners, upscale kitchen cutlery and kitchen appliances. He authored numerous technical papers and hundreds of U.S. and foreign patents on his work at both DuPont and Edgecraft. A brilliant inventor and businessman, he ran the company actively up until the last week of his life.

Besides astronomy, Mr. Friel was a man of several passions who had an insatiable curiosity for all of life's beauty and wonder. These passions led to other personal achievements including pioneering the first high-speed photography studies of Hummingbirds and most recently inking exquisite watercolor paintings.

He was married in 1943 to June, who passed away in 2008 and remarried in 2010 to Carolyn Blish. Mr. Friel is survived (Continued on Page 2)

**The Veil Nebula -**  
 Photo taken Sept. 20, 2012  
 using an Astronomik UHC filter  
 stacking two 5 minute exposures.  
 Photo Credit: by DAS Member  
 Rob Lancaster.



## Observing with the Delaware Astronomical Society...

### **NEW** DAS Member Star Parties (MSP's) ■ Bill Hanagan

On Saturday, September 15<sup>th</sup>, we held our 8<sup>th</sup> MSP of the year, this time at the Sawin Observatory. A total of 13 people attended, including 7 DAS members and 6 guests. Although the skies were marred somewhat by haze and thin, scattered clouds, we nevertheless managed to star hop to M13, M15, M27, M31, M33, M57, M92, Epsilon Lyra (aka the "double double"), Albireo, NGC 457 (the owl cluster), and the Double Cluster in Perseus, among other objects.

Upcoming potential MSP dates include October 11, 12, and 13 (Thursday through Saturday night), when we are planning a multi-night MSP in conjunction with the Delmarva Stargazers' "No-Frills" Star Party at Tuckahoe State Park in MD. We'll be trying to gather DAS members at the NORTH end of the observing field, but the exact location on the field where we set up depends on where those who arrive before us decide to set up. So, be sure to take a look around for other DAS members before you decide where to park and set up. We might just be somewhere else!

At present, at least three of our members are planning to go down for observing and imaging on Thursday night if the weather allows.

In the past, our trips to the spring and fall Stargaze star parties at Tuckahoe have often been the best MSP's of the year, thanks to the combination of relatively dark skies, attendance by a large number of ob-

serving and imaging enthusiasts from the Mid-Atlantic region, and a relatively short drive time (1.5 hours).

Details on the Delmarva "No-Frills" Stargaze are available at <http://www.delmarvastargazers.org/archive/NoFrills2012/index.html>.

In addition to night-time observing at the Stargaze, there are many daytime activities around Tuckahoe to keep you occupied. There is always a telescope set up for solar prominence observing and it's always interesting and informative to tour the observing field in the afternoon and early evening hours to talk to other astronomy enthusiasts. The park itself offers hiking, canoeing, and fishing. A nearby airfield provides an opportunity for tandem hang-gliding and parachuting (with experts at the controls). On Saturday and Sunday, the Maryland-Delaware Rocketry Association (MDRA) will also be holding a rocket launch on a farm about 20 minutes from Tuckahoe. Our Treasurer, Bill McKibben, plans to fly a rocket that weekend (no, he won't be getting into the rocket).

I previously held the potential MSP dates of October 19 / 20, the weekend after the No-Frills Stargaze, for a possible trip to the Canaan Valley in West Virginia for observing in conjunction with observers from the Chesmont Astronomical Society (CAS). However, scheduling conflicts and the favorable weather expected for the Stargaze make it likely that any October 19 / 20 MSP will be held closer to home.

We're planning to hold the Fall Messier ½ Marathon MSP on November 9, 10, 16, or 17. As in years past, we are planning to hold this event at the Elk River site south of Elkton, MD. Gus Swartout will be the MSP supervisor for this event. If good weather allows the ½ Marathon to take place on November 9 or 10, we may hold an additional MSP on November 16 or 17.

The final plans for all of our MSPs will, as always, be announced via the DAS Yahoo Group email list in the days just before the event. The mechanics of the MSP program are described separately under "Notes on the Member Star Parties (MSPs)" which can be found at the top of page 4.

### **MCAO Trustee Dan Friel** (Continued from Page 1)

by his wife and three children, Barbara Holme of Denver, CO, Patricia Friel of Chadds Ford, PA, and Daniel Friel Jr. of Kennett Square, PA, along with six grandchildren and a great-grandson.

A time to remember Dan will be shared with family and friends at Ashland Nature Center, 3511 Barley Mill Road, Hockessin, DE 19707 on Saturday October 13, at 4pm.

In lieu of flowers, please send donations to Mt. Cuba Observatory, 1610 Hillside Mill Rd., Greenville, DE 19807 or Ashland Nature Center, PO Box 700, Hockessin, DE 19707.

## "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 October through December, 2012 follows:**

<b>Date</b>	<b>Speaker</b>	<b>Topic</b>
Oct. 22	James Dalessio	TBD
Nov. 5	Bill Hanagan	How to choose your first telescope
Nov. 26	Jack Fisher	Is there a God?
Dec. 10	Stan Owocki	TBD

**Note!**

**NOVEMBER IS OUR 2<sup>ND</sup> ANNUAL FEATURE ISSUE OF FOCUS WHICH CELEBRATES THE ACCOMPLISHMENTS OF THE DAS MEMBERS WHO SPEND A GREAT AMOUNT OF TIME, EXPENSE & EFFORT IN PHOTOGRAPHING THE WONDERS OF THE UNIVERSE. -- PLEASE SUBMIT PHOTOS BY OCT. 28<sup>TH</sup> TO THE EDITOR!--**

### 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](mailto:hanaganw@verizon.net).

**NEW**

Due to a computer crash, the on-site AP-SIG meeting at Ron Worden's was postponed and we met instead at Mount Cuba on September 29. Our on-site meeting series will resume with the November 2 / 3 meeting with Rob Lancaster acting as host. The exact date will be flex-scheduled based on the weather. Rob will demonstrate his astro-imaging rig and give us an update on his recent imaging efforts. Even if you aren't an AP-SIG member, you're welcome to attend the AP-SIG meetings to learn more. Be sure to sign up for the DAS Yahoo Group in order to receive the email announcements that provide directions and the date of the meetings.

The remaining potential dates and host for the AP-SIG on-site meetings for 2012 appear below. Please put these dates on your calendar!

Bill Hanagan      November 30 / December 1

The exact dates, as always, will be "flex-scheduled" according to the weather.

As always, please consider submitting one or more of your favorite astrophotos for publication in the *FOCUS*. A recent photo is not required. You can email your photo(s) as .jpg files to our *FOCUS* editor, Joe Neuberger at his address at [jneuberger@gmail.com](mailto:jneuberger@gmail.com).

### 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](mailto:hanaganw@verizon.net).

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

The refiguring of the club's Coulter 17.5" primary mirror is continuing. Multiple sessions have been held in the last months. Let me know soon if you would like to participate in this effort but have not yet advised me of your interest.



### 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.

## 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. These are usually 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. That means that we usually have 4 potential MSP dates associated with each lunar cycle. Which of the four potential dates is used for an MSP is "flex-scheduled" according to the weather using the DAS Yahoo Group email list system.

Please be sure to mark your calendars with the potential MSP dates that appear in the table below! Obviously, you need to keep as many of these dates open as possible so 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 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*.

## Laser Collimator Now Available for Loan to the Membership for Aligning Your Newtonian or Dob Scopes!

If you would like to take advantage of this new tool 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 things the club has ever offered for loan to the membership! You owe it to yourself to CHECK IT OUT!

### 2012 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)	Potential MSP Locations (The Sawin Observatory is always a backup)
Oct. 11-13	Possible multi-night MSP in conjunction with the Delmarva Stargazers "No Frills" MSP. Bright NGCs: 457 (Owl cluster). M objects: 31, 32,103, 110. Bright NGCs: 253.	Tuckahoe State Park, MD
Oct. 19, 20	Possible road trip for observing in WV or western MD in conjunction with Chesmont observers. M objects: 31, 32,103, 110. Bright NGCs: 253.	Timberline Resort, Canaan Valley, WV
Nov. 9, 10	Dates held for the Fall Messier ½ Marathon (part B). Best M objects: 33, 74, 76. Bright NGCs: 457 (Owl cluster).	Gus Swartout's Elk River Site
Nov. 16, 17	Dates held for the Fall Messier ½ Marathon (part B). Best M objects: 33, 74, 76. Bright NGCs: 457 (Owl cluster).	Gus Swartout's Elk River Site
Dec. 7, 8	Jupiter >30°AH by 7 PM and transits at 11:30 PM. Best M objects: 34, and 77. Bright NGCs: 884 and 869 (the double cluster in Perseus).	DAS Sawin Observatory
Dec. 14, 15	Jupiter >30°AH by 6:30 PM and transits at 10:59 PM. Best M objects: 34, and 77. Bright NGCs: 884 and 869 (the double cluster in Perseus).	DAS Sawin Observatory



**CLASSIFIEDS:** For sale - Celestron 8 inch Schmidt-Cassegrain -- Classic black Aluminum optical tube assembly with Celestron's premium Starbright coatings; 2032 mm focal length (f/10); Visual back comes with upgraded Blue Fireball Technologies 2" brass compression ring style SCT adapter, not the standard 1.25". This allows use of 2" accessories; and also includes Celestron's 9 x 50mm finderscope to help more easily and accurately locate objects in the night sky, not the normal 6 x 30 finderscope common to this model. To purchase a C8 new today would cost \$1049 - I am asking ONLY \$225! -



I've seen used C8 Tube Assemblies selling for hundreds of dollars more on Astromart than what I'm asking here. **Telescope has been well cared for.** Contact **Dave Sewell** by email at [troglimite@yahoo.com](mailto:troglimite@yahoo.com) or by phone at **302-757-5000** for any additional details or to arrange for a closer examination.

## Mount Cuba Public Night Lecture ----- Monday, November 5, 2012 **How to Choose Your First Telescope**

by Dr. Wm. D. Hanagan, Jr., DAS President

This presentation will review the following key points:

- The importance of learning about telescopes BEFORE you buy one;
- The value of telescope aperture, optical quality, and portability;
- The main types of telescopes available to amateurs and their relative advantages and disadvantages;
- Guidelines for determining the right type and size of your first telescope;
- Starter telescopes for young children.

**Please note** that you must call Mount Cuba between 9 and 12 AM on Monday, Wednesday or Friday at 654-6407 for reservations. Also, there is an admission fee for those who are not members of MCAO: \$2 for adults and \$1 for students.



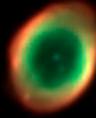
**FOCUS** uses plenty of photos  
in banners & elsewhere each issue, and  
**we want to use YOURS...not Hubble's!!**

Please forward photos to the *FOCUS* editor  
Joe Neuberger at [JRNeuberger@gmail.com](mailto:JRNeuberger@gmail.com)

**SPECIAL 2<sup>ND</sup> ANNUAL ASTROPHOTO  
ISSUE COMING THIS NOVEMBER...  
PLEASE SUBMIT YOUR PHOTOS  
BY OCTOBER 28TH!!**

**Messier 57, The Ring Nebula** - The famous Ring Nebula appears in the northern constellation of Lyra. It is a prominent example of a planetary nebula. This is a shell of ionized gas expelled into the surrounding interstellar medium by a red giant star, which was passing through the last stage in its evolution before becoming a white dwarf.

Photo Credit: by DAS Member Rick Davis.



## LIBRARY NEWS ■ Glenn Bentley

**NEW**

I invite the membership to drop by the library after the October meeting to check out our MANY selections.

## ASTRONOMICAL LEAGUE MEMBERSHIP

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](mailto:KLynnKing@verizon.net).

## MT. CUBA LENDING LIBRARY ■ Paul Stratton

May I first extend a hardy thanks to all of those using the Lending Library. Your interest has made this a rewarding effort. Stop by after the meeting and sign a book out for cold weather reading.

## 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*.

## DAS Main Meeting Topics and Speakers for 2012-2013

**October 16:** Mini-talks: 1) *Assessing the Limits of Parallax for Measuring Stellar Distances*-- A demonstration of the parallax technique using laser triangulation, by Mike Cimosori; 2) *Telescope Collimation*-- A discussion of telescope alignment for beginners and experienced users alike, with a demonstration of our club's new "Barlowed Laser" collimator, by Bill Hanagan.

**November 20:** Mini-talks: 1) *Harnessing the Full Power of Skytools 3*-- An in-depth guide to getting the most from this observing and astro-photography planning tool, by Doug Norton; 2) *Winter Observing Gear*-- A guide to keeping warm and happy while observing in cold weather, by Fred DeLucia.

**December 18:** *The DAS Annual Christmas Party and Swap Meet* (as in the last several years, there will be no Board meeting in December to allow time for setting up the Swap Meet and Christmas Party), plus mini-talks: 1) OPEN.

**January 15:** *Newtonian Mirror Making and the Mid-Atlantic Mirror Making Seminar*-- An overview of how amateur telescope makers (ATMs) make their own high-quality telescope optics, by Bill Hanagan.

**February 19:** Mini-talks: 1) *MCAO's Research Programs*-- by MCAO Astronomer Judy Provencal; 2) OPEN.

**March 19:** Mini-talks: 1) *Filters for Observing and Imaging*-- A review of the various filters available to enhance visual observing and imaging and how they work, by Rob Lancaster; 2) *The Blue Mountain Vista Observatory*-- A review of the observatory and its remote imaging capabilities, by Chesmont Astronomical Society's Frank Collisomo.

**April 16:** *Gamma-Ray Astronomy with VERITAS*-- A discussion of how ground based telescopes like VERITAS can detect gamma rays using the atmosphere, as well as the properties of known astronomical gamma ray sources, by University of Delaware Assistant Professor Jamie Holder

Here's the longer version of Dr. Holder's abstract:

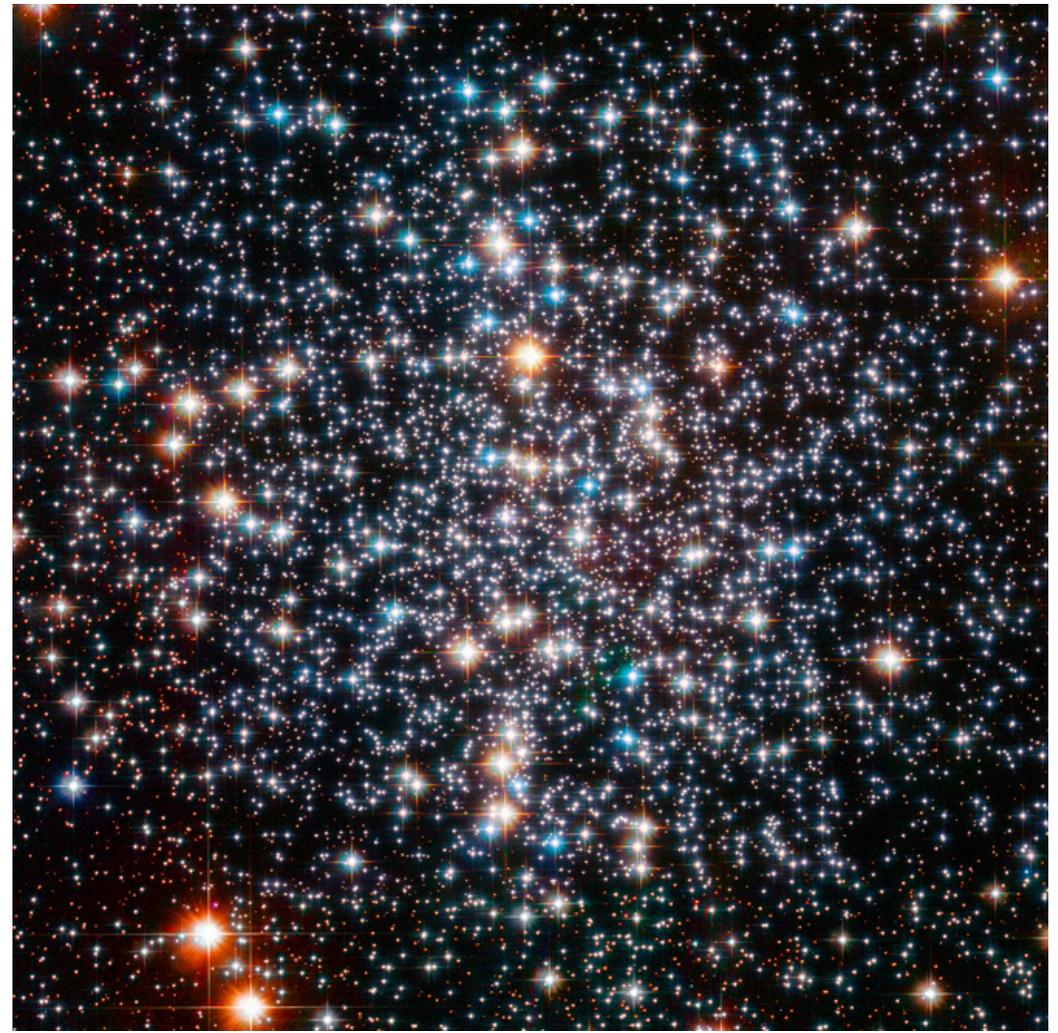
*Gamma-rays are the highest energy form of light (photons). They can only be produced in very extreme environments in the Universe, in places where charged particles have been accelerated up to almost the speed of light. These include the regions around objects such as pulsars, black holes and supernova blast waves. Gamma-rays cannot penetrate through the atmosphere, but ground-based telescope arrays, such as VERITAS, can detect gamma-rays by using the atmosphere itself as part of the detector. Dr. Holder will explain how this works, and describe some of the properties of known astronomical gamma-ray sources.*

**May 21:** *Annual Dinner Meeting*-- OPEN.

**June 18:** OPEN.

## ASTRO-PHOTO of the MONTH

# Hubble Watching Ancient Orbs of M4



*Photo Credit:  
The NASA / ESA  
Hubble Space Telescope*

*This sparkling picture shows the center of globular cluster M 4. The power of Hubble has resolved the cluster into a multitude of glowing orbs, each a colossal nuclear furnace.*

*M 4 is relatively close to us, lying 7200 light-years distant, making it a prime object for study. It contains several tens of thousands stars and is noteworthy in being home to many white dwarfs — the cores of ancient, dying stars whose outer layers have drifted away into space.*

*In July 2003, Hubble helped make the astounding discovery of a planet called PSR B1620-26 b, 2.5 times the mass of Jupiter, which is located in this cluster. Its age is estimated to be around 13 billion years — almost three times as old as the Solar System! It is also unusual in that it orbits a binary system of a white dwarf and a pulsar (a type of neutron star).*

*Amateur stargazers may like to track M 4 down in the night sky. Use binoculars or a small telescope to scan the skies near the orange-red star Antares in Scorpius. M 4 is bright for a globular cluster, but it won't look anything like Hubble's detailed image: it will appear as a fuzzy ball of light in your eyepiece.*

## WEBSITE of the MONTH

### **Night Sky Network**

Astronomy Clubs bringing the wonders of the universe to the public

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

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

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

**Join our vibrant stargazing community!**

We invite you to join the NASA Night Sky Network stargazing community on **Facebook** and **Twitter** for sky charts and lively conversation about all things stellar. Just click the logos at the right.



The NASA Night Sky Network is managed by the **Astronomical Society of the Pacific** in cooperation with NASA.



# DAS Member Attends U of D Astrobiology Club Seminar on Extrasolar Life ■ Mike Cimorosi

The University of Delaware's Astrobiology Club president, PhD student Mrinalini Nikrad, invited NASA Goddard Space Flight Center Planetary Scientist Dr. Shawn Domagal-Goldman, (Figure 1) to deliver the seminar topic, **"False Positive and False Negatives: Lesson from Earth's Archean Eon for our Search for Extrasolar Life."**

The seminar took place in Room 202 (Figure 2) at the University of Delaware College of Earth, Ocean, and Environment in Lewes, Delaware on Friday, October 5, 2012 at 12:30 PM. (Figure 3)

Being the sole physics/laser dude in the audience, I wasn't quite sure what I would glean from this seminar. However, I was there because I found the topic very interesting.

As he began to wade into his presentation, I had the impression that I was attending a seminar in astronomy. Words like dwarf star flares, constellations, 700 detected extrasolar planets, Mars Viking Mission, MSL Curiosity, and ALH84001 soared through the room. As the seminar progressed, I thought I was at a seminar in atmospheric chemistry. Words like ozone, atomic oxygen, methane, CO<sub>2</sub>, and water vapor were being bandied about. Then it happened ...

Stellar radiation distributions, photon absorption and emission charts were displayed. Looked like cool physics to me! Finally, geological and biological terms were interwoven into the presentation that gave me an appreciation for how interdisciplinary the study of extrasolar life is.

After the seminar, Dr. Domagal-Goldman entertained a few questions. One of my questions centered around the so-called "seasonal variations" in the production and detection of methane on our red planet neighbor. "That's the 'million-dollar' question" was his response. The



Figure 1: The speaker for the evening, NASA Planetary Scientist Dr. Shawn Domagal-Goldman, right, with U of D's Astrobiology Club president, PhD student Mrinalini Nikrad, left, organizer of this monthly series of talks on the many facets of the field of Astrobiology.

## FREE AND OPEN TO THE PUBLIC

Sponsored by:

Mt. Cuba Astronomical Observatory  
in conjunction with the Delaware Asteroseismic Research Center & the University of Delaware



Dr. Mark R. Morris



## 2012 Harlan C. "Ace" Vernon Memorial Lecture

October 25, 2012  
7:30 pm, Clayton Hall  
Featuring Guest Speaker  
Dr. Mark Morris

### "The Black Hole at the Center of Our Milky Way Galaxy: A Slumbering Giant"

Our Milky Way Galaxy harbors a massive sleeping monster. Large telescopes on Earth can pierce the distance to the galactic center, resolving individual stars circling an unseen object. The motions of these stars, at dizzying 3,000 miles per second (yes, second) give this invisible beast a mass exceeding 4 million solar masses. All this material is packed into a volume only about the size of the solar system. Professor Mark Morris will unravel the mysteries at the center of our home Milky Way Galaxy. Dr. Morris is a Professor of Astronomy and Chair of the Department of Physics and Astronomy at the University of California, Los Angeles. He has enjoyed research on the center of the Galaxy since starting as a graduate student in physics at the University of Chicago.

Join us on a cosmic journey to the center of the Milky Way and experience the bizarre behavior of space, time, and matter in the extreme environment of a Black Hole.



Figure 2: The meeting room at the U of D facility in Lewes, DE.

verdicts are not in yet. On Earth, two major sources of methane are volcanism and LIFE! More future sample missions will be required to deal with this tantalizing puzzle. After the audience departed, I asked Dr. Domagal-Goldman a question regarding the mysterious appearance and disappearance of "water" trails along an interior canyon wall of the red planet. Nobody knows for sure, but he indicated that if he were "king" of NASA, investigating that phenomenon would be at the top of his priority list.



Figure 3: The University of Delaware's College of Earth, Ocean, and Environment in Lewes, a most modern, state-of-the-art facility with wind power electric at left.

This seminar is part of a series of monthly seminars presented throughout the academic year to exchange ideas between industrial and academic researchers in the fascinating field of ASTROBIOLOGY.

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## Why Does Curiosity Matter?



In a new ScienceCast video, Adam Steltzner (above right) explains why Curiosity matters. [Click to Play Video](#)

**Sept. 21, 2012:** Adam Steltzner doesn't sound much like an ordinary engineer.

For instance, when we asked him if he would talk about Curiosity—and explain why the Mars rover matters to ordinary people—the former rock-n-roller responded “I’m totally down with that.”

He really is down with it. Steltzner is the NASA engineer who helped take the country’s cool new Curiosity rover to the surface of Mars with moves – and flair – even Evel Knievel would envy.

Steltzner begins, “I’m so thankful to Clara Ma for suggesting the name ‘Curiosity.’ It embodies a fundamental attribute that defines us as humans.”

“Why do we explore? It’s our nature,” he says. “Human curiosity is why you and I can talk across the country by phone. It’s why I’m sitting 60 feet above the ground in a building made of alloys and other high-tech composite materials. We dominate this planet because we wonder what’s around the next corner.”

When people ask Steltzner “Is the new rover worth 2 ½ billion dollars?” he has a compelling answer:

“It’s not 2 ½ billion dollars we stuffed in a trunk and blew into space. It’s thousands of high tech jobs spread over 37 states. It’s honing and developing our skills in science, engineering, and math.”

He notes that the U.S. has slipped to 14<sup>th</sup> in science education and 18<sup>th</sup> in math – in a world where we’re competing for economic prosperity with nations 1 through 13.

“This mission is an investment in high tech jobs, in inspiring the youth of our country, in stepping up rung by rung toward 1<sup>st</sup> place. It’s the best stimulus you could imagine!”

Okay, curiosity matters—but does it matter more than rock-n-roll? Steltzner played guitar in a rock band for years, so he has the chops to answer this question, too.

“In some sense, exploration and music are both art forms,” he says. “They’re both expressions of our humanity. But exploration can surprise us more - or at least differently - than music can. Music can surprise us only about what we find in ourselves. Exploration surprises us with what we learn of ourselves *and* of the universe.”

Steltzner says music led him to exploration. During high school he played in a rock band. One night driving home from a gig he noticed that the constellation Orion was in a different place than it had been before.

But why? “I hadn’t paid attention during high school classes at all. So I didn’t know.”

His curiosity made him decide to take an astronomy class. First, though, astronomy had prerequisites such as elementary algebra and conceptual physics. He took them all. “I basically redid my high school education at the community college.”

The rest—which includes a bachelor’s degree from UC Davis, a master’s degree from Caltech, a job at JPL, and a daredevil landing on Mars—is history.

After the glory of the Curiosity landing fades, what will this explorer do next?

“Our solar system offers us grand challenges,” says Steltzner. “I’d like to see a Mars sample return. I’d like to land on the surface of Europa – the most likely place in the solar system for life. And third, I’d like to float a boat on the methane lakes of Titan.”

“The solar system is calling out to us,” he says. “The wind’s at our back. It’s time to explore!”



A medallion adorned with the Stars and Stripes is attached to one of the Curiosity’s rocker arms. >> [Click for More information](#)  
>> [Click for More photos](#)>>

Author:  
[Dauna D. Coulter](#)  
Editor:  
[Dr. Tony Phillips](#)  
Credit:  
[Science@NASA](#)

# Weird Planets

Sept. 12, 2012: News flash: The Milky Way galaxy just got a little weirder.

Back in 2011 astronomers were amazed when NASA's Kepler spacecraft discovered a planet orbiting a double star system. Such a world, they realized, would have double sunsets and sunrises just like the fictional planet Tatooine in the movie Star Wars. Yet this planet was real.

Now Kepler has discovered a whole system of planets orbiting a double star.

The star system, known as Kepler-47, is located 4,900 light-years from Earth in the constellation Cygnus. Two stars orbit one another at the center of the system: One is similar to the sun in size, but only 84 percent as bright. The second star is smaller, only one-third the size of the sun and less than 1 percent as bright. Kepler found two planets orbiting this mismatched pair.

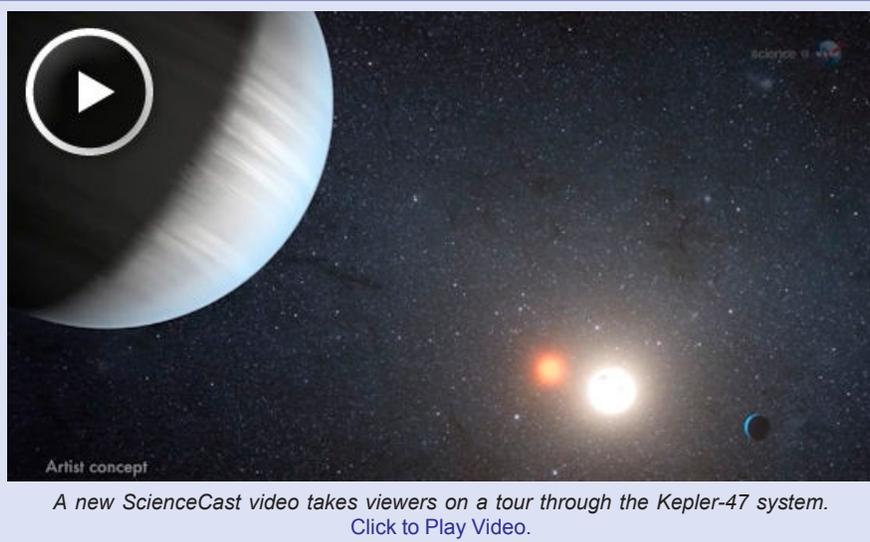
"The presence of a full-fledged planetary system orbiting Kepler-47 is an amazing discovery," says Greg Laughlin, professor of Astrophysics and Planetary Science at the University of California in Santa Cruz. "This is going to change the way we think about the formation of planets."

The inner planet, Kepler-47b, closely circles the pair of stars, completing each orbit in less than 50 days. Astronomers think it is a sweltering world, where the destruction of methane in its super-heated atmosphere might lead to a thick global haze. Kepler-47b is about three times the size of Earth.

The outer planet, Kepler-47c, orbits every 303 days. This puts it in the system's habitable zone, a band of orbits that are "just right" for liquid water to exist on the surface of a planet. But does this planet even have a surface? Possibly not. The astronomers think it is a gas giant slightly larger than Neptune.

The discovery of planets orbiting double stars means that planetary systems are even weirder and more abundant than previously thought.

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



A new ScienceCast video takes viewers on a tour through the Kepler-47 system. [Click to Play Video.](#)

"Many stars are part of multiple-star systems where two or more stars orbit one another. The question always has been -- do they have planets and planetary systems?" says William Borucki, Kepler mission principal investigator at NASA's Ames Research Center. "This Kepler discovery proves that they do."

Our own sun is a single, isolated

star, with a relatively simple gravitational field that rules the motions of the planets orbiting it.

But, as Borucki points out, not all stars are single. Astronomers estimate that more than half of the stars in the galaxy have companions. There are double, triple and even quadruple star systems. Any planets in such systems would have to navigate a complex gravitational field, tugged in multiple directions by multiple stars. In fact, for many years, astronomers doubted that planets could even form in such an environment.

Kepler-47 erases those doubts—and poses a conundrum: "These planets are very difficult to form using the currently accepted paradigm," says Laughlin. "I believe that theorists, myself included, will be going back to the drawing board to try to improve our understanding of how planets are assembled in the dusty gaseous disks that surround many young stars."

The Kepler spacecraft is on a mission to find Earth-like planets that might support life. Says Borucki: "In our search for habitable worlds, we have just found more opportunities for life to exist."



This diagram compares our own solar system to Kepler-47, a double-star system containing two planets, one orbiting in the so-called "habitable zone." Credit: NASA/JPL-Caltech/T. Pyle [Click for more Info.](#)

## Call for DAS Astroimages for Display in Mt. Cuba Lobby ■ Greg Weaver

MCAO is asking for any DAS members to submit their astroimages for display in the Observatory. It would like to display the club member's talents and update some of the images currently on display.

Images will be displayed for up to a year and replaced as new images are submitted. Full credits to the imager will be included. Please include all technical information with the image (date, telescope and camera used, exposure time, image processing software, etc.). You may email digital images to the Mt. Cuba website. Photos may be sent to the Observatory or brought to a DAS meeting. The Observatory looks forward to displaying your beautiful images!

# Mystery Spheres on Mars

Sept. 14, 2012:

NASA's long-lived rover Opportunity has returned an image of the Martian surface that is puzzling researchers.

Spherical objects concentrated at an outcrop called Kirkwood on the western rim of Endeavour Crater differ in several ways from iron-rich spherules nicknamed "blueberries" the rover found at its landing site in early 2004.

"This is one of the most extraordinary pictures from the whole mission," said Opportunity's principal investigator, Steve Squyres of Cornell University in Ithaca, N.Y. "Kirkwood is chock full of a dense accumulation of these small spherical objects. Of course, we immediately thought of the blueberries, but this is something different. We never have seen such a dense accumulation of spherules in a rock outcrop on Mars."

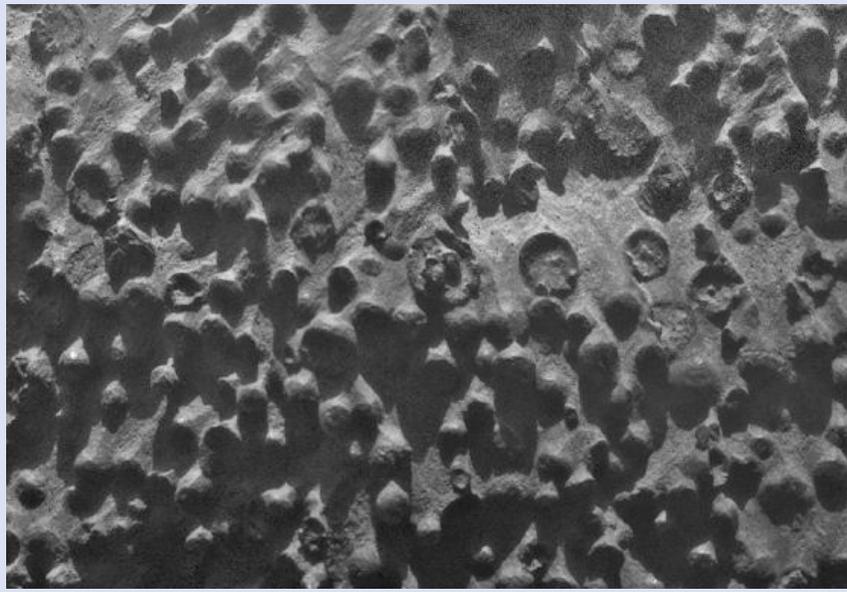
The spheres measure as much as one-eighth of an inch (3 millimeters) in diameter. The analysis is still preliminary, but it indicates that these spheres do not have the high iron content of Martian blueberries.

The Martian blueberries found elsewhere by Opportunity are concretions formed by action of mineral-laden water inside rocks, evidence of a wet environment on early Mars. Concretions result when minerals precipitate out of water to become hard masses inside sedimentary rocks. Many of the Kirkwood spheres are broken and eroded by the wind. Where wind has partially etched them away, a concentric structure is evident.

Opportunity used the microscopic imager on its arm to look closely at Kirkwood. Researchers checked the spheres' composition by using an instrument called the Alpha Particle X-Ray Spectrometer on Opportunity's arm.

"They seem to be crunchy on the outside, and softer in the middle," Squyres said. "They are different in concentration. They are different in structure. They are different in composition. They are different in distribution. So, we have a wonderful geological puzzle in front of us. We have multiple working hypotheses, and we have no favorite hypothesis at this time. It's going to take a while to work this out, so the thing to do now is keep an open mind and let the rocks do the talking."

Just past Kirkwood lies another science target area for Opportunity. The location is an extensive pale-toned outcrop in an area of Cape York where observations from orbit have detected signs of clay minerals. That may be the



Using its Microscopic Imager, Opportunity photographed these small spherical objects on Sept. 6, 2012. The view covers an area about 2.4 inches across at an outcrop called "Kirkwood" on the western rim of Endeavour Crater. [Click for Larger Image](#)

rover's next study site after Kirkwood. Four years ago, Opportunity departed Victoria Crater, which it had investigated for two years, to reach different types of geological evidence at the rim of the much larger Endeavour Crater.

The rover's energy levels are favorable for the investigations. Spring equinox comes this month to Mars' southern hemisphere, so the amount of sunshine for solar power will continue increasing for months. Indeed, Opportunity is

on the verge of completing the first Martian Marathon.

"The rover is in very good health considering its 8-1/2 years of hard work on the surface of Mars," said Mars Exploration Rover Project Manager John Callas of NASA's Jet Propulsion Laboratory in Pasadena, Calif. "Energy production levels are comparable to what they were a full Martian year ago, and we are looking forward to productive spring and summer seasons of exploration."

Production Editor: [Dr. Tony Phillips](#) | Credit: [Science@NASA](#)

## For More Information:

[Opportunity Runs the First Martian Marathon -- Science@NASA](#)

NASA launched the Mars rovers Spirit and Opportunity in the summer of 2003, and both completed their three-month prime missions in April 2004. They continued bonus, extended missions for years. Spirit finished communicating with Earth in March 2010. The rovers have made important discoveries about wet environments on ancient Mars that may have been favorable for supporting microbial life.

JPL manages the Mars Exploration Rover Project for NASA's Science Mission Directorate in Washington.

To view the image of the area, visit: [http://www.nasa.gov/mission\\_pages/mer/multimedia/pia16139.html](http://www.nasa.gov/mission_pages/mer/multimedia/pia16139.html)

For more information about Opportunity, visit: <http://www.nasa.gov/rovers> and <http://marsrovers.jpl.nasa.gov>

You can follow the project on Twitter and on Facebook at: <http://twitter.com/MarsRovers> and <http://www.facebook.com/mars.rovers>

# THE SUMMER OF 2012 — TOO HOT TO HANDLE?

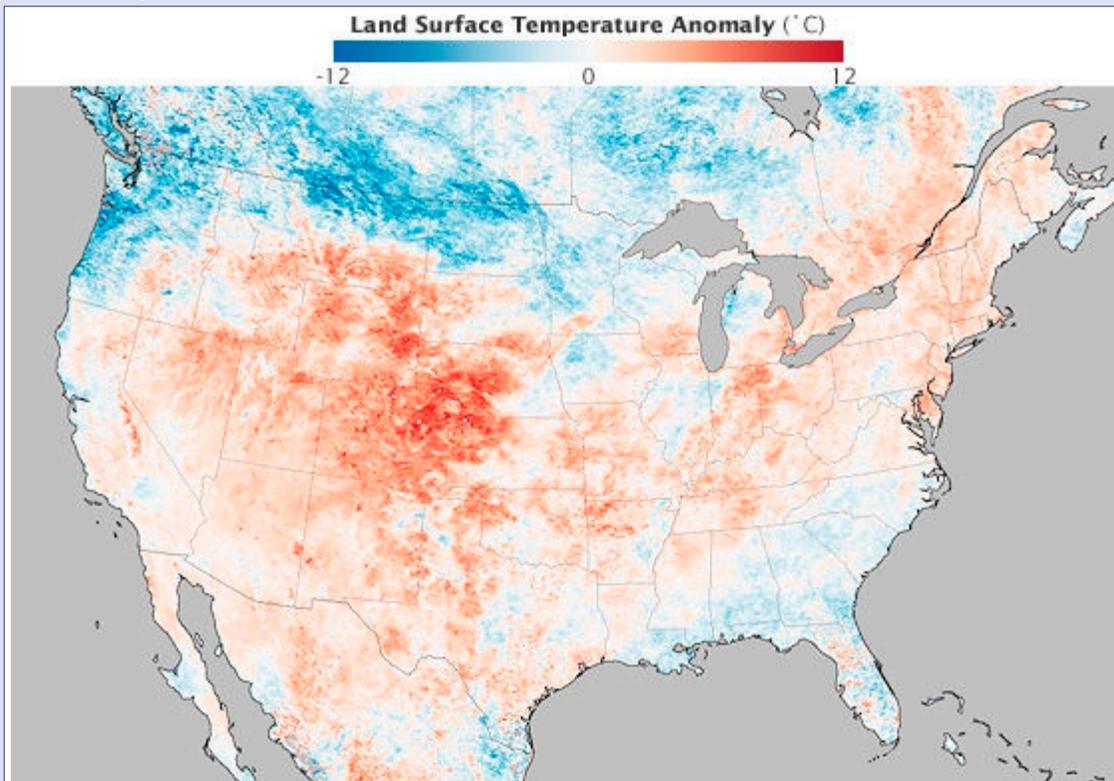
**August 3, 2012:** This past June more than 170 all-time US heat records were tied or broken—many of them originally set in the historically hotter months of July and August. And with a drought plaguing much of the country, the ground is as dry and crispy as a saltine cracker.

By early July, 56% of the contiguous U.S. was experiencing drought. That's the largest percentage in the 12-year record of the U.S. Drought Monitor. Fires scorched over 1.3 million acres across the US in June, reducing hundreds of homes to ashes in the West.

Just imagining prospects for the rest of the summer is enough to bring sweat to your brow. And last winter is partly to blame.

"799 daytime heat records were broken in the first five days of January in the US," says Jake Crouch, a climate scientist from the NOAA National Climatic Data Center. "Last year's was the fourth warmest winter since 1895. And it was dry, with a dearth of snowfall in many places. During most of this past winter and spring, a positive North Atlantic Oscillation pressure pattern kept the jet stream further north and the US warmer and drier than normal."

With little moisture in the soil to evaporate and dissipate some of the sun's energy, more solar radiation is converted to sensible heat, he says.



Surface temperature anomalies across the United States in June 2012. [Click for More information.](#)

Of course global warming is on the tips of many tongues.

"CO<sub>2</sub> is up from 280 parts per million in the 19th century atmosphere to almost 400 parts per million now — a 43% increase," says NASA climatologist Bill Patzert. "We're emitting six times more carbon from fossil fuel use now than we did 50 years ago. Atmospheric CO<sub>2</sub> hasn't been this high in 400,000 years."

Greenhouse gasses like CO<sub>2</sub> and methane have higher heat capacities than many other gasses, causing the atmosphere to retain more heat.

"The atmosphere becomes a heat source itself, radiating heat back onto the Earth. 85 to 90% of that heat is absorbed by the oceans, because water has a high heat capacity. So the oceans expand and rise. Global sea levels have risen 8 inches over the past 130 years, and the average surface temperature of the entire earth (land surface temperatures plus ocean temperatures) has increased 1.6 °F. These facts," he asserts, "are unequivocal proof of global warming."

But is the record-setting summer 2012 evidence of climate change?

"Not necessarily," says Patzert. "We've always had extreme weather. US history is written in great natural calamities — tornadoes, hurricanes, heat waves, droughts, floods. Global warming is happening, but it would be irresponsible to say that this heat wave and all these broken records are due to global warming from human causes. It's just not that simple."

John Christy, a scientist from the University of Alabama in Huntsville, agrees: "Heat waves are a natural part of the climate system, and while the recent heat wave was remarkable, it was not as intense as others in the past."

He offers a few examples of past heat waves and droughts.

"The central US suffered several heat waves in the 1930s — the dust bowl years — (Continued on Page 13)

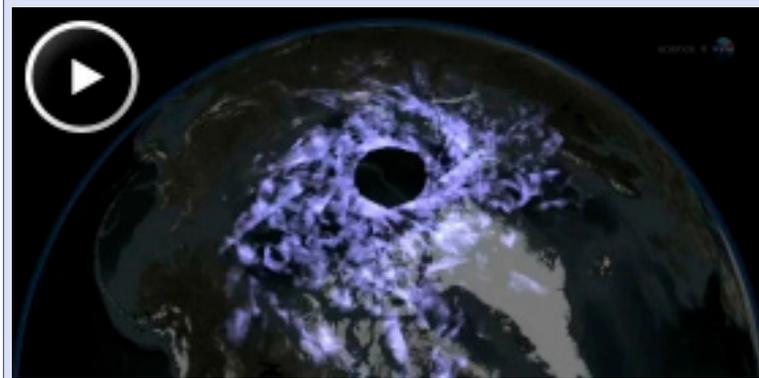
# Meteor Smoke Makes Strange Clouds

**August 7, 2012:** Anyone who's ever seen a noctilucent cloud or "NLC" would agree: They look alien. The electric-blue ripples and pale tendrils of NLCs reaching across the night sky resemble something from another world.

Researchers say that's not far off. A key ingredient for the mysterious clouds comes from outer space.

"We've detected bits of 'meteor smoke' embedded in noctilucent clouds," reports James Russell of Hampton University, principal investigator of NASA's AIM mission to study the phenomenon. "This discovery supports the theory that meteor dust is the nucleating agent around which NLCs form.

"Noctilucent clouds are a mystery dating back to the late 19th century. Northern sky watchers first noticed them in 1885 about two years after the eruption of Krakatoa. Ash from the Indonesian volcano caused such splendid sunsets that evening sky watching became a worldwide pastime.



A new ScienceCast video explains how "meteor smoke" seeds noctilucent clouds. [Click to Play Video.](#)

One observer in particular, a German named T.W. Backhouse who is often credited with the discovery of NLCs, noticed something odd. He stayed outside longer than most people, long enough for the twilight to fully darken, and on some nights he saw wispy filaments glowing electric blue against the black sky. Scientists of the day

figured they were some manifestation of volcanic dust.

Eventually Krakatoa's ash settled and the sunsets faded, but strangely the noctilucent clouds didn't go away. They're still present today, stronger than ever. Researchers aren't sure what role Krakatoa's ash played in those early sightings. One thing is clear, however: The dust behind the clouds we see now is space dust.

Mark Hervig of the company GATS, Inc, led the team that found the extraterrestrial connection.

"Using AIM's Solar Occultation (Continued on Page 14)

## THE SUMMER OF 2012 (Continued from Page 12)

when more statewide, all-time record high temperatures were set than in any other decade. And the western US experienced decades-long droughts in the 12th century. So dry were mountain areas that we can still see near-hundred-year-old trees standing upright in the bottom of alpine lakes where they grew on dry ground 900 years ago.<sup>1</sup> This shows that in the 12th century it was so dry and hot that the lakes dried up and allowed trees to grow over a significant period before moisture finally returned."



Previous heat waves in the 1930s contributed to the "dust bowl" phenomenon. In this picture, a dust storm approaches Stratford, Texas, in 1935. Credit: NOAA George E. Marsh Album

Patzert and Christy are on opposite sides of the global warming debate. Patzert firmly believes that Earth is warming up and humans are the main reason why. Christy, on the other hand, argues that natural climate variations are almost solely to blame. Yet they both agree that the summer 2012 weather might be just that – weather. They also both believe that improvement is needed in models indicating effects of human and other factors on weather and climate.

"Today's climate models are extremely sophisticated, constantly improving, and will be crucial to charting our future — but they aren't perfect," says Patzert.

One component that needs improvement: clouds.

"Clouds play a key role in climate because they affect the amount of sunlight reflected and absorbed," says Christy. "We need higher resolution models to portray them more accurately. The distance between grid measurement points in current models is too great to capture meter to meter variations in clouds, land cover, and other variables that affect climate."

One more point of agreement: the summer of 2012 is too hot to handle.

Author: Dauna D. Coulter-- Editor: Dr. Tony Phillips--Credit:Science@NASA

### For More information:

[What Happened to All the Snow?](#) —Science@NASA

[Europe Hammered by Winter; Is North America Next?](#) — Science@NASA

More from Crouch: "Another driver could be the La Nina which ended a few months ago. When there is a La Nina, most of the nation tends to be warmer and drier than average, with the exception of the Pacific Northwest. Although La Nina is officially over, there is a lag in the atmosphere and La Nina like conditions are still possible in the atmosphere. We provide an overview of what other atmospheric drivers were likely in play for the warm June that we just experienced at [this website.](#)"

Footnote: (1) For an article on some of these trees, see [http://www.nvwra.org/storage/newsletters/jnwra\\_2\\_article3\\_kleppe.pdf](http://www.nvwra.org/storage/newsletters/jnwra_2_article3_kleppe.pdf)

## Meteor Smoke (Continued from Page 13)

for Ice Experiment (SOFIE), we found that about 3% of each ice crystal in a noctilucent cloud is meteoritic,” says Hervig.

The inner solar system is littered with meteoroids of all shapes and sizes—from asteroid-sized chunks of rock to microscopic specks of dust. Every day Earth scoops up tons of the material, mostly the small stuff.

When meteoroids hit our atmosphere and burn up, they leave behind a haze of tiny particles suspended 70 km to 100 km above Earth’s surface.

It’s no coincidence that NLCs form 83 km high, squarely inside the meteor smoke zone.

Specks of meteor smoke act as gathering points where water molecules can assemble themselves into ice crystals. The process is called “nucleation.”

Nucleation happens all the time in the lower atmosphere. In ordinary clouds, airborne specks of dust and even living microbes can serve as nucleation sites. Tiny ice crystals, drops of water, and snowflakes grow around these particles, falling to Earth if and when they become heavy enough.

Nucleating agents are especially important in the ethereal realm of NLCs. The clouds form at the edge of space where the air pressure is little more than vacuum. The odds of two water molecules meeting is slim, and of sticking together slimmer still.

Meteor smoke helps beat the odds. According to AIM data, ice crystals can grow around meteoritic dust to sizes ranging from 20 to 70 nanometers. For comparison, cirrus clouds in the lower atmosphere where water is abundant contain crystals 10 to 100 times larger.

The small size of the ice crystals explains the clouds’ blue color. Small particles tend to scatter short wavelengths of light (blue) more strongly than long wavelengths (red). So when a beam of sunlight hits an NLC, blue is the color that gets scattered down to Earth.

Meteor smoke explains much about NLCs, but a key mystery remains: Why are the clouds brightening and spreading?

In the 19th century, NLCs were confined to high



Astronauts on board the ISS took this picture of noctilucent clouds near the top of Earth’s atmosphere on July 13, 2012. [Click for Larger Image.](#)

latitudes—places like Canada and Scandinavia. In recent times, however, they have been spotted as far south as Colorado, Utah and Nebraska. The reason, Russell believes, is climate change. One of the greenhouse gases that has become more abundant in Earth’s atmosphere since the 19th century is methane. It comes from landfills, natural gas and petroleum systems, agricultural activi-

ties, and coal mining.

It turns out that methane boosts NLCs.

Russell explains: “When methane makes its way into the upper atmosphere, it is oxidized by a complex series of reactions to form water vapor. This extra water vapor is then available to grow ice crystals for NLCs.”

If this idea is correct, noctilucent clouds are a sort of

“canary in a coal mine” for one of the most important greenhouse gases.

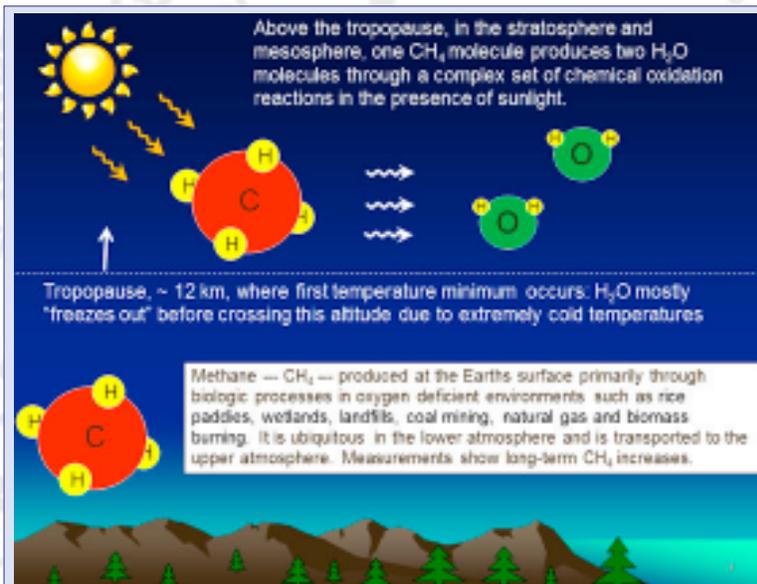
And that, says Russell, is a great reason to study them. “Noctilucent clouds might look alien, but they’re telling us something very important about our own planet.”

Author: Dr. Tony Phillips |  
Production Editor: Dr. Tony Phillips  
| Credit: [Science@NASA](mailto:Science@NASA)

### For More Information:

[AIM \(Aeronomy of Ice in the Mesosphere\)](#) — mission home page

[Strange Clouds](#) — [Science@NASA](mailto:Science@NASA)



A graphic prepared by Prof. James Russell of Hampton University shows how methane, a greenhouse gas, boosts the abundance of water at the top of Earth’s atmosphere. This water freezes around “meteor smoke” to form icy noctilucent clouds.

[Realtime Noctilucent Cloud Photo Gallery](#) —space-weather.com

**NLC Observing tips:** Look west 30 to 60 minutes **after sunset** when the Sun has dipped 6° to 16° below the horizon. If you see luminous blue-white tendrils spreading across the sky, you’ve probably spotted a **noctilucent cloud**. Although noctilucent clouds appear most often at arctic latitudes, they have been **sighted** in recent years as far south as Colorado, Utah and Nebraska. NLCs are seasonal, appearing most often in late spring and summer. In the northern hemisphere, the best time to look would be between mid-May and the end of August.

# Curiosity Finds Old Streambed on Mars

Sept. 27, 2012: NASA's Curiosity rover mission has found evidence a stream once ran vigorously across the area on Mars where the rover is driving. There is earlier evidence for the presence of water on Mars, but this evidence -- images of rocks containing ancient streambed gravels -- is the first of its kind.

"From the size of gravels it carried, we can interpret the water was moving about 3 feet per second, with a depth somewhere between ankle and hip deep," said Curiosity science co-investigator William Dietrich of the University of California, Berkeley. "Plenty of papers have been written about channels on Mars with many different hypotheses about the flows in them. This is the first time we're actually seeing water-transported gravel on Mars. This is a transition from speculation about the size of streambed material to direct observation of it.

"The finding site lies between the north rim of Gale Crater and the base of Mount Sharp, a mountain inside the crater. Earlier imaging of the region from Mars orbit allows for additional interpretation of the gravel-bearing conglomerate. The imagery shows an alluvial fan of material washed down from the rim, streaked by many apparent channels, sitting uphill of the new finds.

The rounded shape of some stones in the conglomerate indicates long-distance transport from above the rim, where a channel named Peace Vallis feeds into the alluvial fan. The abundance of channels in the fan between the rim and conglomerate suggests flows continued or repeated over a long time, not just once or for a few years.

The discovery comes from examining two outcrops, called "Hottah" and "Link," with the telephoto capability of Curiosity's mast camera during the first 40 days after landing. Those observations followed up on earlier hints from another outcrop, which was exposed by thruster exhaust as Curiosity, the Mars Science Laboratory Project's rover, touched down.

"Hottah looks like someone jack-hammered up a slab of city sidewalk, but it's really a tilted block of an ancient streambed," said Mars Science Laboratory Project Scientist John Grotzinger of the California Institute of Technology in Pasadena.

The gravels in conglomerates at both outcrops range in size from a grain of sand to a golf ball. Some are angular, but many are rounded.

"The shapes tell you they were transported and the sizes tell you they couldn't be transported by wind. They were transported by water flow," said Curiosity science co-investigator Rebecca Williams of the Planetary Science Institute in



**Remnants of Ancient Streambed on Mars:** NASA's Curiosity rover found evidence for an ancient, flowing stream on Mars at a few sites, including the rock outcrop pictured here, which the science team has named "Hottah" after Hottah Lake in Canada's Northwest Territories. Image Credit: NASA/JPL-Caltech/MSSS

Tucson, Ariz.

The science team may use Curiosity to learn the elemental composition of the material, which holds the conglomerate together, revealing more characteristics of the wet environment that formed these deposits. The stones in the conglomerate provide a sampling from above the crater rim, so the team may also examine several of them to learn about broader regional geology.

The slope of Mount Sharp in Gale Crater remains the rover's main destination. Clay and sulfate minerals detected there from orbit can be good preservers of carbon-based organic chemicals that are potential ingredients for life.

"A long-flowing stream can be a habitable environment," said Grotzinger. "It is not our top choice as an environment for preservation of organics, though. We're still going to Mount Sharp, but this is insurance that we have already found our first potentially habitable environment."

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

## For More Information:

During the two-year prime mission of the Mars Science Laboratory, researchers will use Curiosity's 10 instruments to investigate whether areas in Gale Crater have ever offered environmental conditions favorable for microbial life.

NASA's Jet Propulsion Laboratory, a division of Caltech, built Curiosity and manages the Mars Science Laboratory Project for NASA's Science Mission Directorate, Washington.

For more about Curiosity, visit: <http://www.nasa.gov/msl> and <http://mars.jpl.nasa.gov/msl>.

You can follow the mission on Facebook and Twitter at: <http://www.facebook.com/marscuriosity> and <http://www.twitter.com/marscuriosity>.

## The PRESIDENT'S DAS BOARD MEETING AGENDA for OCTOBER

7:00 p.m., Tuesday, October 16, 2012

In the Library at the Mt. Cuba Observatory

In addition to routine items of business such as the Treasurer's report, we'll discuss:

- 1) Purchase of a replacement secondary mirror for the Coulter 17.5" telescope.
- 2) Plans for the DAS Christmas Party
- 3) Other topics to be determined.

As always, DAS board meetings are open to all members.

# NASA Spacecraft Records 'Earthsong'

Oct. 1, 2012:

In space, they say, no one can hear you scream.

Nobody ever said anything about singing, though. A NASA spacecraft has just beamed back a beautiful song sung by our own planet.

"It's called chorus," explains Craig Kletzing of the

University of Iowa. "This is one of the clearest examples we've ever heard." [[Click to Play the Audio.](#)]

Chorus is an electromagnetic phenomenon caused by plasma waves in Earth's radiation belts. For years, ham radio operators on Earth have been listening to them from afar. Now, NASA's twin Radiation Belt Storm Probes are traveling through the region of space where chorus actually comes from—and the recordings are out of this world.

"This is what the radiation belts would sound like to a human being if we had radio antennas for ears," says Kletzing, whose team at the University of Iowa built the "EMFISIS" (Electric and Magnetic Field Instrument Suite and Integrated Science) receiver used to pick up the signals.

He's careful to point out that these are not acoustic waves of the kind that travel through the air of our planet. Chorus is made of radio waves that oscillate at acoustic frequencies, between 0 and 10 kHz. The magnetic search coil antennas of the Radiation Belt Storm Probes are designed to detect these kinds of waves.

"Chorus emissions are front and center for the Storm Probe mission," says Kletzing. "They are thought to be one of the most important waves for energizing the electrons that make up the outer radiation belt."

In particular, chorus might be responsible for so-called "killer electrons," high-energy particles that can endanger both satellites and astronauts. Many electrons in the radiation belts are harmless, with too little energy to do damage to human or electronic systems. But, sometimes, these electrons can catch a chorus wave, like a surfer riding a wave on Earth, and gain enough energy to become dangerous—or so researchers think.

The Radiation Belt Storm Probes are on a mission to



A new ScienceCast video explores the eerie-sounding radio emissions that come from our own planet. [[Click to Play Video](#)]

find out for sure.

"The production of killer electrons is a matter of much debate, and chorus waves are only one possibility," notes the Storm Probes' mission scientist Dave Sibeck.

Launched in August 2012, the two probes are orbiting inside the radiation belts, sampling elec-

tromagnetic fields, counting the number of energetic particles, and listening to plasma waves of many frequencies.

"We hope to gather enough data to solve the mystery once and for all," says Sibeck.

At the moment, the spacecraft are still undergoing their 60-day checkout phase before the main mission begins. So far, things are checking out very well.

"One of things we noticed right away is how clear the chorus sounds in the recording," notes Kletzing. That's because our data is sampled at 16 bits, the same as a CD, which has not been done before in the radiation belts. This makes the data very high quality and shows that our instrument is very, very healthy."

Eventually, Kletzing hopes to release unprecedented stereo recordings of Earth's chorus.

"We have two spacecraft with two receivers," he says, "so a stereo recording is possible. Such a recording would not only sound wonderful, but also have real scientific value. "One of the things we don't know is how broad the region is over which chorus occurs. The widely-separated 'stereo capability' of the Storm Probes will give us the ability to figure this out," he explains.

With a two-year mission planned for the Storm Probes, the chorus is just getting started.



The Radiation Belt Storm Probes are on a two-year mission to explore the Van Allen Belts. [[Click for More Info](#)]

Author: [Dr. Tony Phillips](#) | Production Editor: [Dr. Tony Phillips](#)  
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- DAS membership dues are \$30.00 per year and due on November 1 for all members.
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If you're just joining us for the first time,

**THANK YOU VERY MUCH, and welcome to the DAS!**

## The Last Word. . .



■ *FOCUS* editor  
Joe Neuberger

*As I stated in this space in last October's issue, there's nothing I admire more in this Club of Amateur Astronomers than those who experiment with the evolving technologies related to, and place considerable time and resources into the exploration that is the Art of Modern Astro-Photography...*

*And towards that end, the November issue of FOCUS will be the newsletter's 2nd annual issue to highlight the work of this group of experimenters in our midst and feature the photos of DAS Members & Friends so involved! If this is YOU, I ask that you PLEASE participate in the November issue by submitting your work for inclusion.*

*Please submit your photos by October 28th. Many Thanks!*