



# FOCUS

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DELAWARE ASTRONOMICAL SOCIETY

**Annual Dinner Meeting – Tuesday, May 16<sup>th</sup>, 2017 at 6:00pm**

**Topic: “The Next 30 Years in the Search for Life on Planets Around Other Stars”**

**Speaker: – Shawn D. Domagal-Goldman  
From The NASA Goddard Space Flight Center**

**At the Ashland Nature Center**

*FROM THE PRESIDENT--Rob Lancaster*

DAS Members,

Are we alone? These words (or other syllables/sounds approximating their meaning) have been uttered by humans for thousands of years. Countless generations of humans have wondered about their place in the universe and ever since humanity discovered that other planets existed, the question of whether they are inhabited has been thoroughly debated. From science fiction stories hypothesizing about alien life forms, to actual scientific investigations to try to detect extraterrestrial life forms such as SETI searches and NASA experiments, humans have embarked on a quest to explore this topic. This month at our Annual Dinner Meeting, Shawn D. Domagal-Goldman from the NASA Goddard Spaceflight Center will be discussing NASA's plans to search for extraterrestrial life amongst the stars for the next 30 years. Please join us for a night of fine dining, scientific introspection, and friendly conversation.

Also, please keep in mind that we have a number of astronomical outreach events and club projects happening now. We are doing outreach in schools, the Woodside Farm Creamery, the Delaware Museum of Natural History, Longwood Gardens, and other places. Come on out and lend a hand! Announcements are made via the Yahoo Group. Please check out some of the improvements we have made over the last year in the Sawin observatory and test out some of the equipment. Now is when we need volunteers to come out, test the equipment and observatory modifications, and make recommendations. Also, if you are able to help with any of these projects, please do not hesitate to contact one of the club officers and join a project! Also remember that in addition to the regular monthly

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*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.*

## Observing with the Delaware Astronomical Society

### April AP-SIG Meeting Held on-site at the Wright's Bill Hanagan

The Astro-Photography Special Interest Group (AP-SIG) met on April 14 at Dana and Barbara Wright's home. The meeting got started about 45 minutes before sunset to give everyone a chance to inspect Dana's observatory and learn about the details of its construction. More photos and a review of the observatory appeared in the March 2017 issue of the FOCUS.



Before moving indoors, we stopped for a moment to take the photo below. From left to right are Bob Trebilcock, Ron Worden, Bill Hanagan, Dana Wright, Frank Colosimo, Chris Abissi, Julie Avila, and Jose Avila. Nico Carver was behind the camera. Dana's wife Barbara joined us later for the indoor part of the meeting.

In addition to Dana's review of his imaging rig, I presented an updated version of my talk on off-axis guiding (OAG) vs. the use of a separate guide scope for guiding. Frank Colosimo added some interesting comments about On Axis Guiding (ONAG), noting that he finds the "FocusLock" feature of the Innovations Foresight ONAG to be quite useful for improving the sharpness of his images.

Nico Carver also gave us an update on his plans for imaging the August 21 total solar eclipse and responded to some questions asked in the previous AP-SIG meeting

about this.

Thanks go to Dana and Barbara Wright, who were wonderful hosts!

## "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://](http://MountCuba.org)

[MountCuba.org](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".

#### Public Nights schedule Mondays at 8pm for 2017:

Date	Speaker	Topic
12 May (Friday-8:30pm)	Greg Weaver	Family Night
22 May	Hank Bouchelle	The Sun from Pluto
5 June	Jeff Lawrence	@ 8:30pm Common Misconceptions About the Moon
16 June (Friday-8:30pm)	Greg Weaver	Family Night

## Upcoming Events and Activities Extended

Check out the website at <http://www.delastro.org/> for ALL of the upcoming events and activities. There's PLENTY going on, so be sure you're informed and don't miss something that would interest you and your relation to the Heavens above!

# SAWIN OBSERVATORY REMINDER AND DAS LOANER TELESCOPES AND EQUIPMENT Bill Hanagan

The DAS owns and maintains The Sawin Observatory on the grounds of the Mt. Cuba Astronomical Observatory. The Sawin Observatory houses the club's equatorially mounted 12.5" reflecting telescope. The Sawin is also currently home base for our 17.5" split-tube Dobsonian telescope.

DAS members can obtain a key for access to the Sawin Observatory by being checked out on these telescopes and the use of the observatory. Naturally, all DAS members are invited to look through these telescopes during our Member Star Parties (MSPs) at the Sawin. DAS members who are interested in becoming key holders of the Sawin Observatory should contact Greg Lee to receive training in the use of the facility and the telescopes. See more information on Page 24.

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## LOANER TELESCOPES and EQUIPMENT

### 80 mm Celestron Refractor (on loan from Bill McKibben)

The club currently has on loan from our Secretary, Bill McKibben, an 80 mm Celestron Refractor with a Nextar GOTO mount. Contact Bill McKibben if you would like to give this scope a try.

### 6" Orion Dobsonian Telescope

We have a 6" Orion Sky-Quest XT6 Dobsonian reflector, complete with eyepiece set, available for loan to members. You can keep the telescope out on loan for a month or more. However, we use this telescope heavily for outreach star parties at the Woodside Farm Creamery, so if you have it on loan from April through October you may be asked to bring it out to one or more of these events.

### Meade 8" LX-10 Telescope

We also have an 8" Meade LX-10 Schmidt Cassegrain Telescope (SCT) available for loan. This telescope is equipped with an equatorial wedge and is driven in Right-Ascension only. If you have any thoughts about buying a telescope, especially an SCT, you are strongly advised to take this one out on loan so you can learn the advantages and disadvantages of this design.

### Barlowed Laser Collimator Toolset

Also available for loan to DAS members is Howie Glatter's version of the Barlowed Laser Collimator. This is actually made up of a set of three very nice tools: 1) a 1.25" Glatter laser collimator (which is useful on its own for collimating the secondary mirror); 2) a 1.25" "TuBlug", which converts the straight beam laser collimator into a "Barlowed" laser collimator, complete with a target screen that's visible from the back end of your Newtonian telescope; and 3) an Orion 2" to 1.25" centering adapter for use with 2" focusers.

Along with the center donut or triangle on your Newtonian primary mirror, a Barlowed laser collimator is a very accurate and incredibly easy way to collimate your Newtonian or Dobsonian telescope. It may sound complicated, but using the Barlowed laser collimator is incredibly quick and easy compared to earlier generations of collimation tools. As one person noted "It's one of the handiest and most useful tools the club has ever offered for loan to the membership!" Obviously, no one DAS member can keep these collimation tools out on loan forever, but borrowing this set of tools is a great way to become familiar with the new "Barlowed Laser Collimator" approach to collimation without having to buy the tool set sight unseen.

**If you're interested in borrowing any of the club's loaner telescopes or other items, please contact Bill Hanagan, Jeff Lawrence, or Greg Lee at one of our monthly meetings.**

## DAS FORUM / E-MAIL SITE ON YAHOO

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 any-one 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*.

# D A S Library News

“Keeping an Eye on the Night Sky”  
by correspondent Lisa Fieldman

Greenville & Hockessin LIFE Magazine

*Dr. Judith Provençal, Resident Astronomer at the Mount Cuba Observatory, coordinates the Whole Earth Telescope program. The WET, an international network of observers, can focus continually on a selected star at all times, concentrating on white dwarf stars.*

*Read about Dr. Provençal and this exciting project happening right here at Mount Cuba. Our DAS Library copy of the magazine is available in the Library Corner.*

## Observing Opportunities - Save the Dates

*Now that the cold weather has passed I'm anxious to get out for more than just peek-a-boo glimpses in my driveway. We've been talking about some "themed" observing events. Trying to find some dates among those already scheduled and when there's not too much moon leaves two back-to-back Fridays in May:*

**Friday May 19 - Mini Messier Marathon at Fair Hill Natural Resources Management Area near Elkton Md.** This is DAS's newest "dark" sky site and provides wide sky views without traveling too far. Directions will follow later.

**Friday May 26 - Double Star Night at Mt Cuba.** Here's an opportunity for side-by-side comparison of the capabilities of refractors vs reflectors on this kind of target.

*Put these dates on your calendar. I'll send out reminders with more details as we get closer to the event.*



## DAS Book Club Update

by Amy Hornberger

The DAS Book Club met on Tuesday, May 2 at Mt. Cuba. We gathered outside the Sawin Observatory to enjoy the pleasant weather and we had an enlightening conversation about Beyond UFOs: The Search for Extraterrestrial Life and Its Astonishing Implications for Our Future. For our current book, we decided to change it up and read The Other Einstein, which is a historical novel.

Our next meeting is scheduled for Tuesday, June 6 at around 7:00 pm. We welcome all interested DAS members to join us. For the commitment-phobic, please note that you are not required to attend every meeting... so don't be afraid to come and "check out" the club! (Who doesn't love library humor?)

### FROM THE PRESIDENT (Continued from Page 1)

meetings we meet at Mount Cuba every Tuesday that is not a monthly meeting date at 7 pm for the more informal Astronomy Workshops. At these workshops you can discuss astronomy topics, work on astronomy projects, and enjoy the company of those who love astronomy.

Thank you and Happy Spring,

Rob Lancaster  
DAS President

# Thank You to the Lemonade Brigade!

April 21st was our first outreach event with an important new partner, Longwood Gardens. We had elaborate plans. We had celebrity guests. At one point Longwood was going to make a sign for each scope labelling what that astronomer was focused on (thankfully we talked them out of that.) Transportation, special parking, Cushman carts, extra labor... it was all arranged. But the clouds moved in and it rained. Then just as the program started it cleared. And we made plans to move our gear out to the fountain railing to try and focus on Jupiter to the east. We were ready to Bug Out! as Colonel Potter would say. But during Derrick Pitts' lecture, a solid cloud cover moved back in.

So it was back to plan B, set up in the Conservatory. The public loved it! We had lots of interest, many questions, and potentially 3 new members! What a night! It may be the first time that we have targeted light fixtures in the ceiling across the room (it was a big room) but even that was thrilling to some of our guests. Everything about our scopes was explained many times over. Derrick Pitts made the rounds and looked at everyone's scope. He especially loved the member pictures Bill Hannagan had displayed on his laptop.

Everyone who helped turn lemons into lemonade on that Friday night did a great job and we had some fun doing it. I have no doubt we have a new partner in Longwood Gardens for future outreach events.

Photos of the event appear below and on the following



## The Lemonade Brigade (Continued from Page 5)



## DAS Board Members At Large Elections Nico Carver, Election Chair

*The terms for the three DAS Board Members At Large are expiring this year. Elections will take place in May via the usual electronic voting method of the past several elections. Board Members At Large hold voting positions on the DAS Board of Directors and, essentially, represent the interests of the general membership in all matters brought before the Board for discussion. The terms are for two years and begin on July 1 of odd numbered years.*

*To date, the following DAS members have been nominated and have agreed to stand for election:*

**Dave Groski**  
**Bill Hanagan**  
**Terry Lisansky**  
**Bob Trebilcock**  
**Amy Hornberger**

*These candidates will be announced at the April meeting at which time nominations will also be permitted to come from the floor. Nominations from any member in good standing will be accepted for the slate. Members can nominate themselves. Please, email me at [nico@udel.edu](mailto:nico@udel.edu) or call me at 302-353-2446 with your nominations or your questions.*



**COME and ENJOY  
Some of the BEST  
Ice Cream in all  
of DELAWARE!!  
And get a look at  
the Stars Above Too!**

## *Here are the dates for the Woodside Creamery events for this season:*

*All evening events to be held on Fridays,  
with a rain / cloud date for Saturday*

June 9	7:30 – 9:00
Saturday, July 15	2:00 – 4:00 (solar) – no rain date
August 18	7:00 – 9:00
September 29	6:00 – 8:00
October 27	6:00 - 8:00

## *WELCOME New Members to the DAS!*

## *We're GLAD to have You on Board!*

*Jane Snyder,  
Robert Stack  
and John Verdi.*

### **The May AP-SIG Meeting is scheduled for Saturday, May 20 at Mt. Cuba Bill Hanagan**

The May AP-SIG meeting is tentatively scheduled for Saturday, May 20 at 7:30 PM at Mount Cuba. Mark Mitchell will discuss the use of Deep Sky Stacker and Photoshop as alternatives to Pixinsight for deep-sky image processing. You may recall that the AP-SIG held a two-day workshop on deep-sky image processing using Pixinsight back in January and February. In addition, if the weather is favorable, we may image Jupiter using both the 12.5" Sawin Telescope and the 12" f/4 Imaging Newtonian, so bring along your planetary imaging gear.

As always, the specific date and time of the meeting depend on the weather and will be announced via DAS YAHOO GROUP EMAIL as well as by direct email to AP-SIG members, two days in advance of the meeting.

Anyone interested in astrophotography, from curious beginner to expert, is welcome to attend! But, if you're a visual observer, please note that while you're always welcome to come out to AP-SIG meetings to learn about imaging, the lighting conditions at our meetings are sometimes less than ideal for simultaneous visual observing because of the computers and cameras in use. Further, some telescopes may be configured for imaging during the meeting and it may not be convenient to reconfigure them for visual use until after the meeting.

The AP-SIG is very good at helping beginners improve their images, so don't be shy about bringing imperfect images along to get some advice on how to take even better images. If you are not an AP-SIG member you can always come to the meeting to see what goes on and sign up later.

We always have a Q&A period in which we present and discuss all types of imaging gear including telescopes, auto guiders, CCD cameras, DSLRs, camera lenses, etc. We also take a look at everyone's most recent photos. When you come, be sure to bring a USB memory stick with your astrophotos and any related project materials that you would like to show the group. Even if some of your photos have imperfections, it's a good idea to bring them along to promote the discussion of image acquisition and processing techniques.

# Statements to the Membership from Candidates for 2017 DAS Board Member at Large Election

As announced in the April Focus, this May the DAS will hold the 2017 election for DAS Board Members at Large. The ballots will be sent out in early May and must be completed/returned by May 31st. If you wish to vote in the election, and do not receive an email with instructions for electronic voting by May 15th, please contact Nico Carver (nico@udel.edu), DAS Elections Chair.

There are **three** board members at large positions, and there are five candidates running for these three positions. Therefore, in order to better inform the membership, the five candidates have prepared bios/statements that are presented in alphabetical order below. Please let me know if you have any questions. Thank you! Nico Carver, 2017 DAS Elections Chair

## David Groski

I have been an almost continuous member of the DAS since the mid 1970's when I joined as a junior member and I have been a very active member over the last 40+ years. I am also the Director of Mt Cuba Observatory. I have helped the club in many ways over the years. A few examples are that I started the out-reach activity at Woodside Creamery, taught mirror making classes for club members, organized a class where we made CCD cameras and have given many talks over the years. Most recently I have refigured both of the 12" mirrors for the Swain observatory. I was instrumental in having the land cleared around the observatory and I'm heading up the project that installed two new observatories on the ground of Mt Cuba in which DAS now houses our new 12" GOTO telescope. So my hope in becoming a DAS Board member is to continue to build a strong relationship between the DAS and Mt Cuba where both organization can benefit and foster an atmosphere of friendship and cooperation.

## William D. Hanagan, Jr., Ph.D.

### Background

Professionally, I'm an Analytical Chemist and an Atomic Spectroscopist with experience in designing and constructing custom optical instruments and robotic systems as well as interfacing existing instruments to computers for data acquisition and control.

This is my 20<sup>th</sup> year of continuous DAS membership. I was President of the DAS from 2009-2014 and have been a board member at large for several years, both before and after my terms as President. I received the **DAS Amateur Astronomer of the Year Award in 2002** and a **Special Meritorious Service Award in 2014**.

As a board member at large, and during my 2+ terms as President, I lead the club away from spending virtually all of its income on expense items, which for decades left us without significant funds for updating or adding to our equipment and facilities. I also raised club funds for capital improvements by promoting donations and the reconditioning and sale of donated telescope equipment that wasn't directly useful to the club. I also arranged our main meeting speaker schedule for several years, including our first remote live-video meeting.

I support all aspects of amateur astronomy and I'm active in most of them, including visual observing, astrophotography, telescope making, and outreach. I have given numerous talks at DAS meetings on subjects related to observing, astrophotography, and telescope optics, and I've been a regular contributor to the FOCUS for many years. I'm also a member of the Delmarva Stargazers and have given talks to nearby astronomy clubs. I'm an MCAO Technical Associate and have hosted and co-hosted multiple MCAO Public nights in addition to contributing to Jack Fisher's spectroscopy project. I was the main organizer and a lecturer for the most recent DAS Short Course on Astronomy, which was run in the spring of 2014. For many years, I assisted with and later ran DAS star parties in support of visual observing. I created the "Member Star Party" (MSP) program which introduced email "flex-scheduling" (which I introduced previously in the AP-SIG) so our Member star parties and other activities could be scheduled around the weather. Flex-scheduling made it possible to operate 11-14 MSPs each year on good-weather nights for a total of 13-16 nights of observing per year. More than 30 DAS members and guests turned out for some of the larger MSPs. Several of the MSPs were tailored around unique events, such as the June 5, 2012 Transit of Venus MSP and the December 13, 2012 Geminid Meteor Shower MSP. My accounts and photos from these and many other MSPs have appeared in numerous issues of the FOCUS over the years.

I founded the Astro-Photography Special Interest Group 15 years ago and have run it since then, organizing on-site meetings and imaging sessions, as well as educational lectures and hands-on demonstrations. In January and February of this year, the AP-SIG held its first multi-day workshop on deep-sky image processing at Mount Cuba.

With regard to Amateur Telescope Making, I've helped several other club members to construct their own telescopes and to finish their own Newtonian mirrors, instructed many people in mirror making over multiple years at the Delmarva Stargazer's Mirror Making Workshop, helped others to make solar filters for their own binoculars and telescopes in 2004 and 2012, and I lead the project to refigure the club's 17.5" Newtonian primary mirror. I've also helped others to build mirror testing equipment, including interferometers, and created a full set of customized pitch lap molds that have been heavily

(Continued on Following Page)



**Board Member at Large Election** (Continued from Preceding Page)  
used at the Mirror Making Seminar for the past several years.

I've helped to introduce the public to astronomy at numerous outreach star parties and hosted many group observing sessions both at MCAO and in the DAS Sawin Observatory.

I've also worked on the DAS 12.5" Sawin telescope and the Sawin Observatory many times over the years, replacing failing motors, re-greasing and aligning the gears, collimating the telescope, setting the primary mirror right for both imaging and visual observing, replacing the inferior primary mirror with a better mirror, and removing corrosion from parts of the old analog setting circles. I've also been heavily involved in the repair and improvement of the Sawin Observatory itself for many years.

**Why I Want to Serve on the Board**

I want to help the DAS to become a better Astronomy Club, which in my view is a club that fully supports member activity in ALL aspects of amateur astronomy, including but not limited to astro-imaging, visual observing, amateur telescope making, outreach, and other activities. An important part of that is insuring that the club owns and maintains high-functioning telescope equipment and observatories, which many club members often can't afford or don't have room for.

**Amy Hornberger**

Where it all began...

My interest in astronomy began when I was a young child. The space shuttle program was a big deal and I wanted to be an astronaut. I visited the Neag Planetarium frequently on school trips and with my dad. Presently, I am a teacher with certifications in Elementary Education, Reading, and French. I have taught children in every age group from preschool to high school.

My observing "résumé"...

Believe it or not, I have spent my time in the dark "on the ladder". Jack and I have several telescopes, ranging from a 20 inch Dob to a 4 inch APO refractor and a set of 16x70 binoculars at home. We've observed in various locations in Delaware and Pennsylvania (Cheslen, French Creek, and Cherry Springs, to name a few), and the highlight of my observing career was when we attended OzSky Star Safari in Coonabarabran, Australia to observe the Southern skies – which were truly breathtaking! I was able to see the Large and Small Magellanic Clouds. I can't wait to go back!

My involvement in DAS...

I founded the DAS Book Club and I am the current Awards Chair. I have supported several work days at Mt. Cuba and I am considered a "regular" at the Tuesday night workshops, as well as at DAS outreach events (Friday Night Lights, Woodside Creamery, Delaware Museum of Natural History, etc.). Jack and I made charitable donations to the club in an effort to try and make DAS more fun. We have permanently loaned Bruiser's Eyepiece to DAS and donated towards purchases (refrigerators, etc.) that will hopefully draw more and more usage at the observatory.

My involvement at MCAO...

I am an Educational Associate of Mt. Cuba. I speak at Mt. Cuba Public Nights, assist with field trip groups, and write reviews of astronomy-related children's books for the MCAO website. Additionally, I am trained to run planetarium programs and I am currently working with a group to develop more astronomy programming for kids.

My mission statement...

I am very fortunate to be able to share the hobby of astronomy with my family and friends. My desire is to nurture interest in and learning about astronomy in children and adults, through various pathways including observing, reading, experimenting, listening, and viewing. I really want to make DAS a fun and engaging club for people/families of all ages to be part of and to strengthen the camaraderie among all members of DAS.

**Terry Lisansky**

Hello, my name is Terry Lisansky and I'm running as an incumbent. It's been a privilege to represent you on the DAS board. For those of you that don't know me, I've been a member of the DAS since 1985. I'm also a Technical Associate of Mt. Cuba. I've already served three terms in this position and I'm as excited now, as I remember being when I started my first term. As a board member, it's important to keep in mind that I represent you, the members of our club. I have not forgotten this in my previous terms and will not forget this if you re-elect me. I have been proud to represent you and look forward to doing so in the future.

**Robert Trebilcock**

Family: Wife, Beth, three children and one grand daughter

Employment: Chemical Engineer at DuPont for 37 years

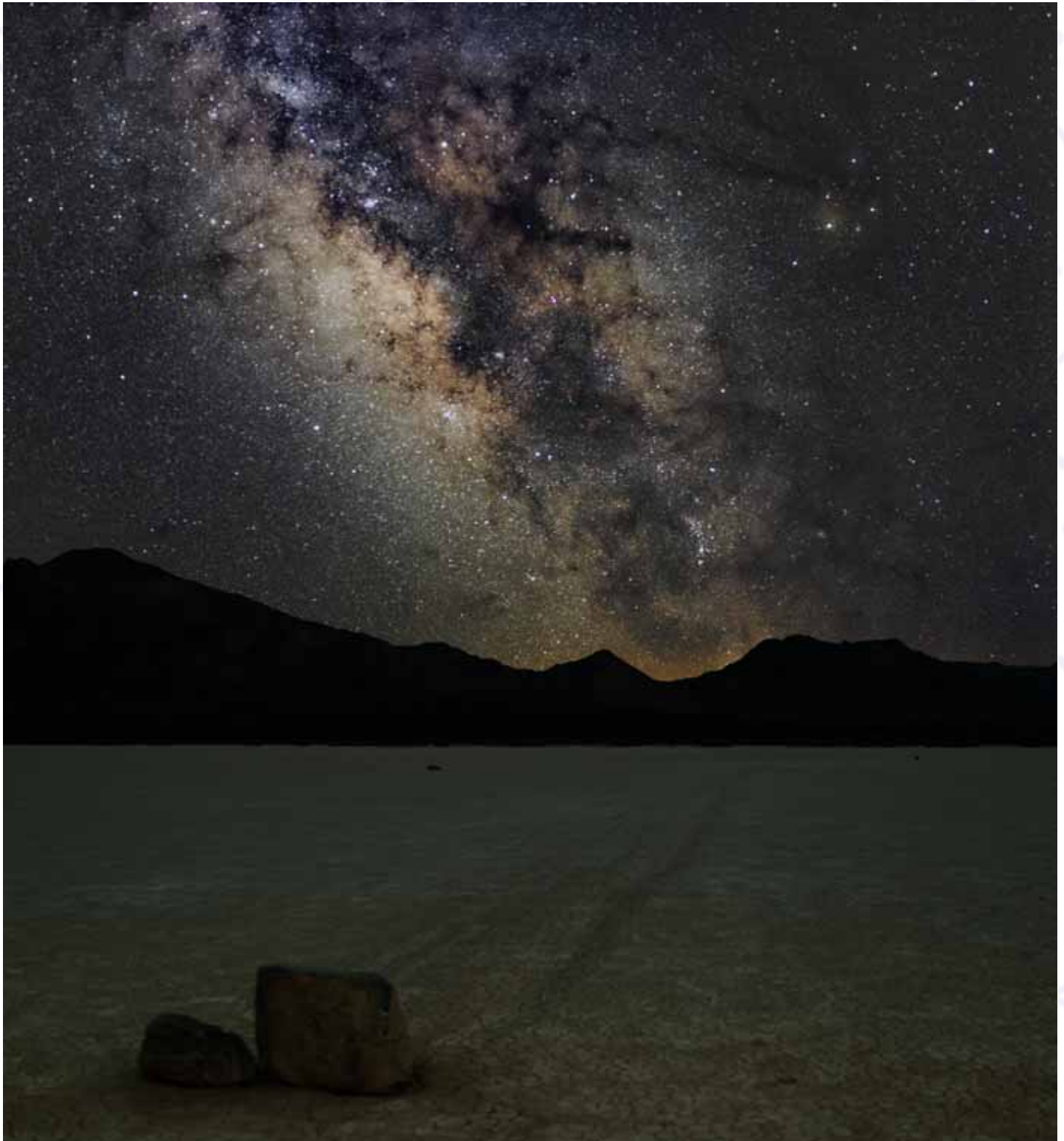
Interest in astronomy began in high school when I ground a 6 inch mirror and used it for observing and to take some astro photos using Tri X film. Became a member of DAS two years ago. I have provided support at several of the club's outreach activities. I am also involved in the club's Astrophotography Special Interest Group trying to learn how to take astro photos in the digital age.

As a Board Member at Large, I would be willing to serve the DAS membership by becoming more involved with the clubs activities and by providing a newer member prospective to the Board's decisions.

## *Photo by DAS Member Nico Carver*

The last week of April, I was at a conference for work in Las Vegas, NV. I took a couple extra days at the end of this trip to go camping in Death Valley National Park. Despite very windy nights and a flat tire, I had a great time, and experienced the darkest skies of my life. A crescent moon set each night right after twilight, and the earthshine was incredibly intense, the brightest I have ever seen it. The milky way was very well defined, and bright from horizon to horizon. I swear I could make out the shape of the lagoon nebula with my naked eye. I recently purchased a SQM light pollution meter device, and the average of my readings came out to 21.9 on the racetrack playa (I took the readings after the moon set, but before the milky way rose).

I could not take very many long exposures due to wind gusts, but I captured this photo of the core of the milky way in sagittarius with the sailing stones and the racetrack playa at around 3am when the wind died down for a bit. Tech specs: 25 exposures at 13 seconds each, ISO 1600, 35mm Rokinon lens at f/1.2.



# Close Approach Comets



Comets are some of the most interesting objects in the solar system. Water that filled the ancient oceans of Earth might have been delivered by comets. And there is growing evidence that many comets (as well as some primitive asteroids) contain molecules key to life. NASA has sent space probes to travel hundreds of millions of miles to study these icy interlopers from the outer solar system.

Comets are balls of frozen gases, rock and dust that orbit the sun. Jets of gas and dust from comets form long tails that can be seen from Earth when they fly close enough to our planet.

In 2017 and 2018, three comets will pass near the Earth.

Their names are 41P/Tuttle-Giacobini-Kresak, 45P/Honda-Mrkos-Pajdusakova, and 46P/Wirtanen. Astronomers call them “41P”, “45P”, and “46P”, for short.

At closest approach on April 1, 41P was only 56 times farther from Earth than the Moon. 45P was even closer at 31 lunar distances when it flew by on February 11. And 46P approaches 30 lunar distances, on December 16, 2018.

Kelly Fast, Program Manager in the Near-Earth Object Observations Program at NASA Headquarters says, “This provides a good opportunity to do science without having to launch a spacecraft.”

Telescopes around the world have been trained on the comets as they pass by, studying their structure and chemical compositions.

For the general public, comet 45P was an easy target for small telescopes when it passed closest to Earth in February, and 41P will be an easy telescope target through May of 2017. But 46P will be the biggest attraction. In December 2018, it could be visible to the naked eye from dark sky sites.

Astronomer Tony Farnham of the University of Maryland says, “46P has a small nucleus, but is known to be a ‘hyperactive’ comet. It is probably ejecting ice crystals from its surface, producing higher than normal activity.”

This hyperactivity may contribute to the naked-eye brightness of 46P. It also makes the comet somewhat unpredictable with unexpected surges in activity—and visibility—possible as it passes by.

These comets have been so close that amateur astronomers can help study them, too. Farnham is assisting Nalin Samarasinha at the Planetary Science Institute in Tuscon, Arizona with the organization of the “4\*P Coma Morphology Campaign” to coordinate the efforts of amateurs worldwide.

“Amateur astronomers can help us monitor these comets without interruption,” explains Farnham. “With observers distributed around the world, we can get much better coverage, with fewer and shorter breaks.”

“We can then combine amateur observations with observations from professional telescopes to study the structures in the comet’s atmosphere—or ‘coma.’ If we use the amateur data in our studies, then they get to be an author on any papers that result.”

“A few years back, we used this same type of network for our studies of comet ISON, and they proved very successful, with data from 23 different groups around the world.”

For more about objects in and around Earth’s neighborhood, stay tuned to [science.nasa.gov](http://science.nasa.gov).



# Readying the Webb Telescope for Launch



Full scale James Webb Space Telescope model at South by Southwest in Austin

The most sophisticated space science telescope ever constructed – the James Webb Space Telescope (JWST) – is targeted to launch in October 2018. With a primary mirror three times as wide as The Hubble Space Telescope and a special sensitivity to penetrating infrared radiation, Webb will peer into the far reaches of the universe to reveal how the first stars and galaxies formed after the Big Bang.

Stringent testing is underway to prove it can handle an Earth-shaking take-off and still capture the universe's first light while deeply ensconced in the hyper-cold of space. At NASA's Goddard Space Flight Center in Greenbelt, MD engineers are testing Webb's science payload in special facilities simulating launch vibration and noise.

Eric Smith is the JWST Program Director/Program Scientist. "This is the most dynamically complex large telescope ever subjected to vibration tests by NASA. The telescope must deploy in a precisely synchronized sequence as the temperature drops to near absolute zero on its journey to L2."

"Webb has many interconnected parts of different stiffnesses. All those parts – including the folded, stowed instruments and mirrors – have to survive launch at room temperature. These elements must then all come together seamlessly in extreme cold to form perfect optical images. All materials change shape as they cool. A flower blossom, a marshmallow, even some metals, will shatter or break if hyper-frozen and dropped onto a hard surface or bent."

"All of Webb's components, once assembled, must cool and move in precisely the right way so that the ultra-fine optical tolerances are met when everything is cold. Think of being able to repeatedly parallel park your car and know the position of your back bumper to within a 10th of a diameter of a human hair. That's how accurate we must be in knowing the position of our mirror surfaces."

To make this happen, Webb was vibration tested at Goddard, and it will undergo cryogenic testing at Johnson Space Center in Houston, TX. Cryogenic testing involves taking the entire telescope and instrument package to a temperature of approximately 40 degrees above absolute zero – that's a very chilly minus 388 degrees Fahrenheit (minus 198 degrees Celsius) – and making sure its components work as predicted. The science instruments, mirror segments, and mirror base structure were cold-tested previously. At Johnson, the whole assembly – instrument module plus mirrors -- will be cryogenically tested together for the first time.

Upon proving that it's up to cold snuff, Webb's science section will travel to a Northrop Grumman facility in Redondo Beach, CA for attachment to the spacecraft bus and sunshield. After further vibration and acoustic testing, it's off to French Guiana for launch atop an Ariane 5 rocket.

"Seeing our hopes realized in intricate, awe-inspiring hardware is thrilling. Of course, the ultimate goal of the mission is not the hardware itself but the knowledge it will return. We are just now beginning to once again reach out to the science research community for their ideas of what to observe with Webb, and that is the most exciting part by far!"

For more news about NASA's next great space telescope, stay tuned to [science.nasa.gov](http://science.nasa.gov).



## 05/16/17 DAS Board Meeting Agenda

No Board of Directors' Meeting this month due to the Annual Dinner Meeting.



## *Ancient Meteor Strike Triggered Eruptions Lasting Up to a Million Years* By Charles Q. Choi, Live Science Contributor | May 5, 2017



*A huge meteor that hit Earth about 2 billion years ago was responsible for explosive and long-lived volcanic eruptions, scientists have found. Credit: solarseven/Shutterstock*

A giant meteor impact on Earth nearly 2 billion years ago triggered more explosive and long-lived volcanic eruptions than previously thought, a new study finds.

This finding sheds light on how meteor bombardment may have dramatically shaped the evolution of the early Earth, researchers in the new study said.

Meteor strikes have left giant craters all over Earth. For instance, the cosmic impact that scientists think ended the age of dinosaurs about 66 million years ago left behind a crater more than 110 miles (180 kilometers) wide near the town of Chicxulub (CHEEK-sheh-loob) in Mexico.

Gargantuan craters are seen pockmarking the rest of the solar system as well. Recent studies of such impact craters on the moon, Mercury, Venus and Mars suggested that meteor strikes could trigger volcanic activity.

However, over the course of millions of years, geological activity has eradicated the vast majority of ancient impact craters on Earth. This has limited research into whether meteor strikes could also set off volcanism on Earth, said study senior author Balz Kamber, a geochemist in Trinity College Dublin in Ireland, and his colleagues.

To see what effects giant impacts might have had on the surface of the Earth, the researchers analyzed one of the oldest meteor craters on the planet, the 1.85-billion-year-old Sudbury basin in Canada. It's also the second-largest and best-preserved crater on Earth, measuring about 93 to 161 miles (150 to 260 km) in diameter. A 2015 study estimated that the crater may have been created by a comet about 9.3 miles (15 km) wide.

From 2013 to 2014, the scientists in the new study collected samples from the 0.93-mile-thick (1.5 km) layer of rock that filled the Sudbury crater. Although the crater is easy for researchers to get to, "there are lots and lots of blackflies in the spring, and later mosquitoes, and in the summer, there are a lot of blueberries, and so a lot of black bears," Kamber said.

*(Continued on Next Page)*

## 8" Celestron For Sale by Bill Westerguard-- Contact Bill directly at 302-827-8099



FOR SALE: 8" CELESTRON TELESCOPE WITH CARRYING CASE, WEDGE, & TRIPOD. THE TELESCOPE WAS MODIFIED FOR EASY POLAR ALIGNMENT AND ADJUSTMENTS FOR LEVELING. ALSO INCLUDED ARE THE FOLLOWING ITEMS:  
EYE PIECES, ALL 1 1/4" EXCEPT AS NOTED : 2" PLOSSL 55 mm, ORTHO 25,18, 12.5, & 6 mm. TELE VUE PLOSSL 26, 17, 10, & 7.4 mm. MEAD SUPER 20mm MULTI COATED PLOSSL. MEADE 2X-3X VARIABLE TELENEGATIVE MULTI COATED. UNIVERSITY KONIG 32 mm MULTI COATED. CELESTRON KELLNER 40 & 25 mm. TELE VUE 12 mm NAGLER TYPE 2. MEADE SUPER PLOSSL 32 & 6.4 mm MULTI COATED. MEADE 2X TELENEGATIVE AMPLIFIER AIR SPACEDTRIPLET MULTI COATED MODEL 140. CELESTRON STAR DIAGONAL, CELESTRON 90 DEG. ADAPTER. ROUND CRAFTSMAN

LEVEL. 2" ADAPTER FILTER. SET OF FIVE THREAD-IN FILTERS. ALL OF THE ABOVE 18 EYE PIECES AND EQUIPMENT COME IN TWO CARRYING CASES. IF INTERESTED, ALL ITEMS AND TELESCOPE LISTED ABOVE ARE CONSIDERED ONE ITEM AND WILL NOT BE SOLD SEPARITLY.  
**THE ASKING PRICE IS \$800.00**

### Ancient Meteor Strike (Continued from Preceeding Page)

The scientists examined 139 samples from 15 locations in the crater. Their analysis suggested that this material not only consisted of rock that had melted from the heat of the impact, but was also peppered with tiny fragments of volcanic rock.

The researchers noted that these volcanic rocks often had very distinctive angular shapes resembling crab claws. These shapes form when gas bubbles expand in molten rock that then catastrophically explodes, a feature of violent eruptions involving water, such as those seen under glaciers in Iceland, the researchers explained. They said these angular Sudbury volcanic rocks likely arose when seawater flooded the crater floor, either gradually or suddenly.

In addition, the scientists found that the composition of these volcanic-rock fragments varied in nature, with some originating from molten crust and others from "a deeper magma source," Kamber said. These findings suggested that the volcanic activity that created these rocks changed over time and was therefore prolonged, he said.

How long might this meteor-triggered volcanism have lasted? "I think 1 million years would have been an upper limit," Kamber said. "Hundreds of thousands of years is a more reasonable estimate."

These findings shed light on how meteors could have influenced the evolution of early Earth, Kamber said.

"About 3.8 billion to 4 billion years ago, we know the inner solar system experienced heavy bombardment from impactors," Kamber said. The oldest rocks on the planet coincide with the last peak of this bombardment, suggesting that "the older rocks on Earth were somehow destroyed by this bombardment," he said. "The bombardment alone would not have done sufficient damage to have caused the comprehensive loss of primordial rocks on Earth, but if that bombardment also triggered additional eruptions, that could have buried the primordial rocks and plowed them back into the mantle."

The scientists said they are now investigating whether the deep magma they detected in the crater came from the deep crust or from the mantle layer just beneath Earth's crust. They detailed their findings April 22 in the *Journal of Geophysical Research: Planets*.

# Dinner Meeting May 16, 2017

Please come to the May 16 Dinner Meeting at the beautiful Ashland Nature Center! Jeff and his parents will be preparing a Mexican specialty, chicken (or vegetarian) mole. Mole is a delicacy of Mexico traditionally containing chili peppers, nuts, seeds, fruits, seasonings, herbs and chocolate. The seasoning is complex and delicious. It will be peanut free.

Salad, bread and butter, and dessert are included. Water and soda are available, and tea and coffee. Beer and wine available with free will donation.

The NASA speaker is Shawn D. Domagal-Goldman, who is speaking about "The Next 30 Years in the Search for Life on Other planets Around Other Stars".

Social hour begins at 6 PM, with dinner at 7 and the program at 8:30.

You may sign up until 10 PM Friday May 12th.

You can sign up via Paypal, or send a check to

Diana Metzger  
604 Baldwin Lane  
Wilmington, DE 19803

Please specify chicken or vegetarian mole.

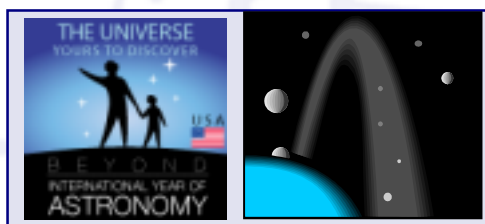
Thank you, and I hope to see you there!

Diana Metzger

Click here (<http://www.delastro.org/16-event-reports/168-dinnermeeting-2017>) for more information and to register.

**Click to**  
Sign up for  
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<http://science.nasa.gov/science-news/>

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EVERYTHING to do with  
Man's Exploration  
of the Universe!**



# DAS 2017 Dinner Meeting May 16th



Ashland Nature Center



The 2017 Dinner Meeting will be again held at the beautiful Ashland Nature Center. A map can be found here. Information on how to register and more details will follow soon.

6:00pm - Social Hour **Price Per Person STILL ONLY \$20**

7:00pm - Dinner served

8:30pm - Awards presentations and guest speaker



**Our 2017 Guest Speaker is**

**Shawn D. Domagal-Goldman From The NASA Goddard Space Flight Center**  
**Topic: "The Next 30 Years in the Search for Life on Planets Around Other Stars"**

Click <https://science.gsfc.nasa.gov/sed/bio/shawn.goldman> for information about Shawn D. Domagal-Goldman

## The Menu:

Bread & butter

Salad

Chicken or Vegetarian Mole served with rice and a vegetable

**\*\* note - mole traditionally contains peanuts, but for allergy reasons this will not**

Strawberry Shortcake

Water & soda

Beer & wine by free will donation

Hot tea & coffee

The easiest way to register, is via PayPal at <http://www.delastro.org/16-event-reports/168-dinnermeeting-2017>. Please select your main course choice. Note, if you are registering more than one person, please add all meal choices to the cart prior to checking out.

If you would prefer, you can mail a check along with a note indicating your meal choices to:  
Diana Metzger, DAS Treasurer, 604 Baldwin Lane, Wilmington DE 19803





# Star Formation in the Tadpole Nebula



## Astronomy Picture of the Day, May 7, 2017

Image Credit: WISE, IRSA, NASA; Processing & Copyright: Francesco Antonucci

**Explanation:** What's all of the commotion in the Tadpole nebula? Star formation. Dusty emission in the Tadpole nebula, IC 410, lies about 12,000 light-years away in the northern constellation of the Charioteer (Auriga). The cloud of glowing gas is over 100 light-years across, sculpted by stellar winds and radiation from embedded open star cluster NGC 1893. Formed in the interstellar cloud a mere 4 million years ago, bright newly formed cluster stars are seen all around the star-forming nebula. Notable near the image center are two relatively dense streamers of material trailing away from the nebula's central regions. Potentially sites of ongoing star formation in IC 410, these cosmic tadpole shapes are about 10 light-years long. The featured image was taken in infrared light by NASA's Wide Field Infrared Survey Explorer (WISE) satellite.

## DAS Now has a Discount Subscription Rate for *Amateur Astronomy Magazine*

Amateur Astronomy Magazine: DAS members must print, fill out and mail the form found in the "Files" section of our Yahoo email list website.

The magazine is issued quarterly. <http://www.amateurastronomy.com/index.htm>.

## The May AP-SIG Meeting is Scheduled for Saturday, May 20th at the Sawin by Bill Hanagan

Anyone interested in doing astro-photography or learning more about it, from the merely curious to beginners, to experts, is welcome! Please email me off-list at [hanaganw@verizon.net](mailto:hanaganw@verizon.net) to let me know if you plan to attend. It helps to know how many people will attend when it comes to preparing snacks and planning seating arrangements. Directions to the Wright's home appear at the end of this message.

We'll also have our usual presentation of images and Q&A session on imaging techniques, so be sure to bring your astrophotos along on a USB memory stick. The group is very good at helping beginners to improve their images, so don't be shy about showing your less-than-perfect photos to get some advice on how to produce better astro-photos. There is also likely to be some follow up discussion of how to photograph the upcoming solar eclipse. If time allows, I'll also give a special topic presentation on Off-Axis Guiding. Compared to the use of a small, separate guide scope, Off-Axis guiding offers a much higher level of sensitivity to tracking errors and eliminates blurring due to flexure of telescope structures, focuses sag, and mirror flop.

The subsequent (May) meeting of the AP-SIG is tentatively scheduled for May 20 at MCAO and the Sawin Observatory. Please mark these dates on your calendar! The special topic for the meeting will be a discussion of the most popular alternative to PixInsight for Deep-Sky Image Processing, the use of "DeepSkyStacker" followed by Photoshop, to be presented by AP-SIG member Mark Mitchell. And, if both the weather and seeing conditions are favorable, we may do some planetary imaging of Jupiter.

*M42 - The Orion Nebula.  
Photo taken by DAS Member Rob Lancaster*



### DAS AMATEUR TELESCOPE MAKING SPECIAL INTEREST GROUP Bill Hanagan

The DAS Amateur Telescope Making (ATM) Special Interest Group (SIG) is made up of DAS members who get together to work on their own as well as club related telescope making projects. The ATM SIG meets at times and locations appropriate for whatever projects are currently underway.

The general range of activities of the ATM SIG includes all manner of telescope making including Newtonian mirror making, the testing of complete telescopes as well as individual optics, and the making of telescope accessories. In the past, we've made several Newtonian telescope mirrors from scratch and completed some that members brought in as works in progress, including one that was started in the mid-60's! We've also made new telescope tubes, made secondary mirror holders, tested numerous telescope objectives, manufactured spiders, and made many solar filters for telescopes and binoculars. We recently completed the refiguring of the DAS 17.5" Newtonian mirror.

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).



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

Photos need NOT be current.

**So how about you?? HAVE ANY  
OLD or NEW ASTROPHOTOS??**

**PLEASE email to FOCUS editor**

(or tell us where they can be found on the web if your photos reside there!)

# Did You Know... DAS Has a Book Club?!

Amy Hornberger

The second meeting of the DAS Book Club took place on Tuesday, April 4 at Mount Cuba. We discussed *The Glass Universe: How the Ladies of the Harvard Observatory Took the Measure of the Stars*, which is the latest book by Dava Sobel. Robert Stack and Mary Webb shared their wonderful documentary about Annie Jump Cannon (who worked at the Harvard Observatory) with the rest of participants at the meeting. It was very informative and much appreciated.

Last month, at the premier meeting of the Book Club, we discussed *Hidden Figures*, the book on which the recent Academy Award-nominated movie was based. Our goal is to read a mix of "star-studded" fiction and non-fiction titles (because they're about astronomy, ha ha). Our current selection is *Beyond UFOs: The Search for Extraterrestrial Life and Its Astonishing Implications for Our Future*, which should dovetail nicely with the topic of Shawn Domagal-Goldman's talk at the DAS Dinner Meeting next month.

Our next meeting is scheduled for Tuesday, May 2 at around 7:00 pm. We welcome all interested DAS members to join us.

## 2017 Marks the Astro-Photography SIG's **15th Anniversary!! WOW!!**



### **The Astro-Photography Special Interest Group (AP SIG):**

*One of the GREAT Benefits of Belonging to the Delaware Astronomical Society. So Join or Re-Join and get involved In the Hobby's Most Advanced Element in Astronomy Today. And get a Look at what the Heavens REALLY look like --Something that can only be Found in Modern Astro-Photography!*

*And the DAS Has The Equipment and Expertise Needed for YOU to Get Started in Astro-Photography!*

***Celebrating 15 Years!***

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## Upcoming Monthly Meetings

**May 16, 2017**

***DAS Monthly Meeting*** -- Annual Dinner Meeting - Guest Speaker: Shawn Domagal-Goldman

**June 20, 2017 7:00 pm - 9:30 pm**

***DAS Monthly Meetin*** Topic: TBD; Board meeting at 7PM, all are welcome; General Meeting at 8PM. .

# Sawin Certification Program

The Sawin is the major centerpiece of DAS. In the past it was in use much more often and by a number of members on every clear Friday night. It has been largely underutilized for a number of reasons. One reason, I believe, is that newer members or members who do not own a telescope might feel intimidated by the equipment and the observatory's layout. We hope to address this by instituting the Sawin Certification Program. With the new upgrades installed, its use will be more inviting and user friendly to both new and experienced members. Certified Key Holders of the Sawin have access to its use at any time without supervision

The Program will consist of a minimum of 2 sessions, scheduled at the Sawin, to obtain the necessary knowledge and experience in using the Sawin equipment. These sessions will be supervised by a current Sawin Key Holder.

The first session, likely set for a weekend in the daylight (even if it's cloudy), will familiarize learners with the layout of the Sawin and overall operation, including opening the roof, uncovering and covering the telescopes, handling eyepieces and pointing the telescopes, etc.

If the supervising Sawin Key Holder determines that progression during the first session is acceptable, then the second session will be scheduled for a clear sky night session to address night time use of the equipment.

The Sawin Certification Program is for DAS members only who are in good standing and 16 years of age or older. Participants in the program who are under 18 years of age must be accompanied by a parent or guardian.

For information or sign-up, please contact Rob Lancaster, DAS President at [RLancaste@gmail.com](mailto:RLancaste@gmail.com).



## 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.
- Prorated discounts for new memberships starting mid-year are as follows:

*April 16 - July 15: \$7.50 per member*

*July 16 - Oct 15: \$5.62 per member*

*Oct 16 - Jan 15: \$3.75 per member*

*Jan 16 - April 15: \$1.87 per member*

For questions regarding Astronomical League, its observing programs and to sign off on completed observing programs before being submitted to the Astronomical League, contact Lynn King at [klynking@verizon.net](mailto:klynking@verizon.net).

Members should make their check out to DAS and mail it to the Treasurer whose information is below:

***Diana Metzger, Treasurer, 604 Baldwin Lane, Wilmington, DE 19803***

## Call for DAS AstroImages for Display in Mt. Cuba Lobby

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 in the lobby of the Observatory.

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! Contact Greg at [mtcuba@physics.udel.edu](mailto:mtcuba@physics.udel.edu).



# INFORMATION ON DAS MEMBERSHIPS AND MAGAZINE SUBSCRIPTIONS

## DAS MEMBERSHIP

- DAS membership dues are \$30.00 per year and due on November 1 for all members.
- There is no need to renew membership until the treasurer contacts you during the membership renewal drive starting in mid-October.
- New members joining at various times of the year may be eligible for a prorated dues amount.
  - \$20 when joining March-May
  - \$10 when joining June-August
  - \$30 for joining September-October through November 1 of the following year.

## SKY & TELESCOPE MAGAZINE

- The DAS offers subscriptions to *Sky & Telescope* at a discounted rate of \$32.95 per year.
- Call S&T magazine at 800-253-0245 and mention the club's name to receive the discount

## 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 the first subscription year only.
- Your subscription expiration date should be displayed on the mailing label on your magazine.
- Renewals can be handled by all club members on the Astronomy.com website using the following steps:
  - a. go to [www.astronomy.com](http://www.astronomy.com)
  - b. select the 'customer service' link in the upper right corner
  - c. select the 'renew your subscriptions' link
  - d. enter your customer number (found on the mailing label), postal code, and the renewal code of 'RCLUB040' and click 'continue'
  - e. follow the remaining steps from there.

## NEW MEMBERSHIP FORM

- Please review the membership and magazine information above carefully.
- PLEASE fill out the membership form below completely.

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## NEW MEMBERSHIP FORM

Please be sure to review the **Membership** and **Magazine** information above **carefully**.

Please make checks payable to DAS and forward to:

**Diana Metzger, Treasurer, 604 Baldwin Lane, Wilmington, DE 19803**



Membership	\$30.00/20.00/10.00	<input type="text"/>
Astronomy Magazine	\$34.00	<input type="text"/>
Total:		<input type="text"/>

Name \_\_\_\_\_ Email Address \_\_\_\_\_

Street Address \_\_\_\_\_ Phone Number \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Notes \_\_\_\_\_

For questions or concerns, contact Diana Metzger, DAS Treasurer at (302) 290-2108 [dmetzgermd@gmail.com](mailto:dmetzgermd@gmail.com)

# DAS CONTACTS Please Call Any of Us With Your Concerns or Problems

## Board Members

### Officers:

President: Rob Lancaster -- [RLancaste@gmail.com](mailto:RLancaste@gmail.com) -- also Webmaster

Vice-President: Jeff Lawrence -- [Jeff@DelAstro.org](mailto:Jeff@DelAstro.org) -- (302) 668-8277 -- also, Program Chair

Secretary: Bill McKibben -- [BillMcK21921@comcast.net](mailto:BillMcK21921@comcast.net)

Treasurer: Diana Metzger -- (302) 290-2108 -- [DMetzgerMD@gmail.com](mailto:DMetzgerMD@gmail.com)

### Board Members at Large:

Terry Lisansky -- [Terry@terry.cx](mailto:Terry@terry.cx)

Glenn Bentley -- (610) 869-0706 -- [GBentley@chesco.org](mailto:GBentley@chesco.org)

Bill Hanagan -- (302) 239-0949 -- [hanaganw@verizon.net](mailto:hanaganw@verizon.net) -- Astro-Photography Special Interest Group (AP SIG) --  
Amateur Telescope Making Special Interest Group (ATM SIG)

### Standing Chairs:

Publications: Joe Neuberger -- [JRNeuberger@gmail.com](mailto:JRNeuberger@gmail.com) -- (302) 723-2734 -- also *FOCUS* Newsletter, articles & Photo Contributions & Submissions

Observatory: Jack Goodwin -- (610) 457-2945 -- [Jack\\_Goodwin@yahoo.com](mailto:Jack_Goodwin@yahoo.com)

Education: Ted Trevarrow -- (302) 593-7949 -- [edt750@verizon.net](mailto:edt750@verizon.net)

Library: Maria Lavalle and Sue Bebon                      Astronomical League Coordinator--K Lynn King -- [klynking@verizon.net](mailto:klynking@verizon.net)

Observing Chair: Greg Lee                      Nominations Chair: Amy Hornberger -- [aehornberger@gmail.com](mailto:aehornberger@gmail.com)

Elections Chair: Nico Carver -- (302)353-2448 -- [nicocarver@gmail.com](mailto:nicocarver@gmail.com)



## See Preceding Page for New Membership Form

If you have any questions call any of the member representatives listed. Otherwise, just check the appropriate boxes and complete the form on the preceding page. Print it or cut it off and send it with your check to Diana Metzger at her 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!

### *It's Annual Dinner Meeting time!*

*Hats Off to Jeff Lawrence and his parents for preparing another Great Feast for us all -- And STILL at only \$20 per person!!*

*And who will our Club be honoring this year?*

*I find it an exciting event. We've a NASA speaker, great camaraderie, great food. What else could one ask for?*

*Hoping to see many of you there next Tuesday the 16th!*

The Last  
Word. . .



**FOCUS** Editor  
Joe Neuberger