



FOCUS

Vol. 62, No. 3, MARCH, 2017



DELAWARE ASTRONOMICAL SOCIETY

Next Meeting – Tuesday, March 21st, 2017 at 8:00pm

**Topic: “The Effects of the Sun on Earth's Climate”
Speaker: DAS Member Mike Turco presenting –**

At the Mt. Cuba Astronomical Observatory

FROM THE PRESIDENT--Rob Lancaster

DAS Members,

I hope most of you were able to attend last month's meeting at Spitz Inc. We had an excellent turnout, literally filling the room with people. I would estimate there were more than 50 people in attendance, which is awesome! We had a really great time touring the facilities, getting an introduction to some of the newer features of Starry Night Dome, seeing planetarium dome fabrication for the global marketplace, watching planetarium shows in their world class facility, and visiting with the friendly folks at Spitz. In the image below, you can see one of the special treats we were offered, a chance to see one of the original prototypes for a planetarium projector by Armand Spitz.



Early Spitz Planetarium

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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.

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Observing with the Delaware Astronomical Society...

Some Lessons in Observational Astronomy Fred De Lucia

For this past dark window two rewarding observing sessions graced my photon starved eyeball (make that eyeballs for the time I was using binoviewers) bringing to conclusion the longest lasting and most often recurring atrocious observing conditions in one season. Both nights (February 19 and 26) provided a welcome change of long hours of clear sky observing time with seeing and transparency that varied from quite good to below average. The 19th was a dry night of no consequential dew. On the morning of February 20th, I left the Blue Mountain Vista Observing (BMVO) field at 3:13AM at a bearable 37°F. When I arrived for another session at 5:15PM on the 26th it was, again, 37°F but as the night wore on my equipment accumulated a noticeable layer of crusty frost covering all the surfaces. When I left at 4:20AM it was 22°F. What a difference a week and 1 hour makes!

On the 19th there was a nice line-up of Dobsonian telescopes, all with tracking motors and GoTo digital setting circles. All were manned by long-time observing companions anxious to take advantage of the forecasts: Lionel (16" F/4.2), Lou B (17.5" F/4.1), Josh (25" F/4), Robert W (22" F/3.6), John H (18.5" F/4.0) with his Binocular Photon Machine (BIPH [<http://nightvisionastronomy.com/>]) and Igor who had the only imaging rig present consisting of a 6" AstroTech Ritchey-Chretien astrograph and Canon T3 camera on an



Orion Atlas equatorial mount. Skipping ahead to the 26th there was a larger turnout, although Lionel, Igor and John weren't there, Rob C added his 20" F/5 to the mix, again, with Robert, Josh and Lou, plus several DVAA (Continued on Pg 5)

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

MCAO PUBLIC NIGHTS Greg Weaver



The Mt. Cuba Observatory Public Nights continue year round! In addition to learning about many aspects of the heavens, you'll have a chance to

visit and view our all-digital full-dome planetarium. You can pick up a schedule when you next come to a meeting or get the latest updated version off the website at: <http://MountCuba.org>. Programs are presented on Monday nights at 8pm. Please check the website for full details and

updates on programs planned. Interested individuals or groups can apply by letter or call 654-6407 (preferably between the hours of 9 and 11 am, Monday through Friday) to the Observatory to obtain reservations for these "Public Nights".

Public Nights schedule Mondays at 8pm for 2016:

| Date | Speaker | Topic |
|--------|---------------------|--|
| 27 Mar | Billie Westergard | Globular Clusters Very Young & Very Old |
| 10 Apr | Carolyn Stankiewicz | Differences and Similarities Between Astronomy and Astrology |
| 24 Apr | Paul Stratton | Our Solar System |
| 8 May | James Dalessio | TBD |
| 22 May | Hank Bouchelle | The Sun from Pluto |
| 5 June | Jeff Lawrence | Common Misconceptions About the Moon |

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.

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*.

Photo by DAS Member Frank Colosimo
NGC 2359, Sharpless 2-298, or Thor's Helmet



NGC 2359, Sharpless 2-298, or Thor's Helmet, is an emission nebula in Canis Major. It is about 12,000 light years away and 30 light years across. The central star is a Wolf-Rayet star, a super hot star thought to be in a pre-supernova stage.

Date: Feb 20,25, 26, Mar 2 2017

Location: New Ringgold PA

Optics: Hyperion f/8 12.5 inch, FL 2540 mm

Mount: Paramount ME

Camera: Sbig STL-11000

Exposure: Ha:14x20min R:10x10 min, G:10x10 min, B:16x10 min for a total of 10.6 hrs.

Processing: Image acquisition using CCD Autopilot and Maxim DL. The RGB color image was created in Maxim. The HA and RGB image were combined and processed in Photoshop.

FROM THE PRESIDENT—Rob Lancaster (Continued from Page 1)

As the weather continues to warm and we approach the Vernal Equinox on March 20th (in fact the day before our March DAS meeting), let us “spring” into action and get outdoors to do some observing! We also have a number of opportunities to get out and volunteer, from outreach events to improvements at the Sawin/Mt. Cuba Observatory. You will find another article later in this Focus explaining our current progress. This month at our meeting our very own Mike Turco presents – “The Effects of the Sun on Earth’s Climate.” It should be excellent.

Rob Lancaster, DAS President



Lessons in Observational Astronomy *(Continued from Page 2)*

members that showed with scopes including a 14" Edge HD, 8" SCT, some refractors and other Dobs. The 14" EdgeHD parked beside me, I watched as the owner ramped out a hydraulic lift on wheels to hoist the 14" onto his Celestron CGE-Pro mount. But the lift failed, so both the owner and his son had to wrestle the scope onto the shoulder high mount/saddle accompanied by quite a few audible grunts and huffs as they repeatedly attempted to lock it all down over the next half hour.

Lesson: if mechanical assists are necessary for a large "portable" scope, it's advisable to have a Sherpa on hand.

An early pre-sunset setup put me in position to spend plenty of time on the Orion Nebula and its nearby neighbor, the Horsehead. The Horsehead, of course, is only visible in sufficiently dark skies with Hydrogen-Beta filtering so that the emission nebula IC434 can deliver the necessary contrast to silhouette the dark Horsehead. It was just barely visible with steady averted vision on each of the two nights. It "paled" to what I recalled seeing in early November when visiting a friend on the eastern shore of the Chesapeake where the Horsehead popped beautifully and easily under the inky black sky there. But I take what I can get after several months of not using my 18" F/4.3 Dob.

The Orion Nebula always delights regardless of conditions, but clearly resolving the E and F stars of the Trapezium was difficult due to the seeing conditions of the early night. When encountering this again on the 2nd night it prompted me to spend time making comparisons in Lou's 17.5" F/4.1 at similar magnification and those proto stars appeared to be easier catches in his scope, although Josh, whose eyes are 30 years younger than mine, believed the views were exactly the same after he checked out both scopes. Lesson: obsessing over optics can impede quality observing time.

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Cone Nebula

Lessons in Observational Astronomy (Continued from Page 5)



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By 9PM I had attained several highlights. Among them were the Pinwheel Galaxy, Cleopatra's Eye, Thor's Helmet, Hubble's Variable Nebula and open cluster M46. Eight hundred light years closer but visually positioned near the center of M46 is planetary nebula NGC2438. I pushed the power somewhat with an OIII filter which fetched a good hint of NGC2438's annular form but not to the extent seen on other better nights. By 9:30PM the bright Eskimo Nebula was transiting the meridian at 70° altitude and held up very well at various power levels, all the way up to 904x. Sharing the view with nearby observers from the DVAA brought a few flattering remarks, like, "I haven't seen that kind of detail except in a photograph." Robert W had it at 1600+x in his 22". Stupid power tricks as he calls it... but a fun view nonetheless. I spent some time with John H at his 18.5" and his BIPH. When using the BIPH John installs a reducer to bring his F ratio to 2.5. He had many pieces of exciting eye candy that kept me and others entertained for some time, such as NGC 4565, NGC 4631 (The Whale), M81, M82, the Leo Triplet and the Cone Nebula. The views were all against a green background just as night vision goggles display and there is video noise in the form of speckling which can be distracting for some but the definition and details that emerged from the unit's screen were captivating. The BIPH is large enough for glasses wearers and presents a very comfortable "stereo" view. The exercise inspired me to hook up my Binotron 27 binoviewers at my scope so I could do some mental comparisons. I didn't get, nor did I expect, the same amount of detail, nor brightness that the BIPH exhibits but the green background and speckles were absent. Lesson: everything is a compromise in this hobby.

Igor was imaging the Cone Nebula. He partially processed a black and white image of 26 x 5 minute sub-frames which was not enough to produce a decent color image. It accompanies this report that Igor said I could share. Lesson: I'm sure there's a lesson lurking there but I'm not an imager so I don't know what it is.

At Lou's scope I saw a superb view of the Ghost of Jupiter (NGC3242) on the night of the 19th, which is when I noticed that my glasses were missing. Lionel, Josh, John H, Robert W and Igor, all with red lights and later at least one white light, were treading softly looking for my spectacles to no avail. I was going to write them off but the next morning I decided to make a trip back to BMVO in the afternoon. While there with my wife, she found them in about 5 minutes near where Lou was set up. She's an avid reader of mysteries so she's well versed in seeking out clues. The glasses' location was consistent with one of my many musings on how the glasses got lost: when I bent over to read Lou's UTA's cheat sheet of EP magnifications the glasses fell out of my vest pocket. The really surprising thing is that they were intact. Lou's Sienna mini-van and trailer's tires somehow managed to miss running over them. Even Lou's feet missed them while he relentlessly walked back and forth when packing up! Lesson: attach a lanyard to your glasses.

For challenges, on both Sundays, I observed comets 41P Tuttle-Giacobini-Kresak and 45P Honda-Mrkos-Pajdusakova. After a fair amount of protracted pondering on each of these diffuse objects I decided to stick with easier targets, like M51 (the Whirlpool Galaxy). I returned to it repeatedly throughout both Sunday nights (Monday mornings) as the galaxy climbed higher by the hour. Each observation uncovered more interesting facets. When the Big Dipper's handle was just about overhead I gave M51 a final prolonged stab, absorbing all I could. The spirals wound nicely around a small cotton ball core. I don't think I was imagining the faint outer arm straining to reach out to connect to M51a. That arm seemed very delicate, just mere wisps at best or perhaps my tiring eyes were doing silly observing tricks. Regardless, it was a gratifying, appreciative view of a favorite galaxy. With the help of the thinnest layer of atmosphere M51's spiral strands of dark and light contrasted well against the black sky for what qualified, to me, to be the View of the Night on both nights. Lesson: get under the clear night sky as often as possible, there's always a View of the Night to catch.

Clear, dark and steady skies to all.

Photo by DAS President Rob Lancaster **The Seven Sisters**



The Messier Object list is a fantastic list for visual observers. It is a good compilation of a wide range of bright objects of various types and sizes that are all visible to just about any observer in the northern hemisphere. It works great with a range of instruments from binoculars, to very large aperture Dobsonian scopes. It is also a very nice size, with just 110 objects, it feels very approachable. When it comes to astrophotography, this list can still be extremely useful because all of the objects are bright and can be photographed both in the city and countryside with a wide range of instruments. However, it can also be extremely limiting because it was not made with photography in mind. Many objects are great photographic targets, but are not very bright visually. Some objects were just way too big or too unlike comets to make Messier's list. And still others were just not observed by Messier. As a result, I have found myself searching through various catalogs such as the NGC, IC, Caldwell, Sharpless, and Barnard catalogs looking for good photographic targets among the thousands listed. I thought it would be useful to make several lists of what I think to be the best photographic targets.

Some attributes of my Photographic Observing Lists I am putting together.

One list would include objects that would fit nicely in wide fields greater than 60 arc minutes in width and height (such as a camera lens or wide field refractor).

A second list would cater to field sizes between 10 arc minutes and 60 arc minutes (such as many large and small amateur telescopes).

A third list would include objects that fit in small field sizes less than 10 arc minutes.

All of the objects on this list will have a declination of -30 degrees or higher, for good observations in Delaware.

None of the objects will be just a cluster of stars because clusters tend to look better visually than in photographs. If the cluster also has a nebula, it might be included.

All of the objects will be visually interesting, no elliptical galaxies without structure.

All of the objects will be approachable, nothing should be too dim as to be invisible in a 5 minute photograph from a reasonably dark site in a 6 inch scope.

These observing lists are still a work in progress and it is my intent to create documents to support people who intend to photograph these objects. Also, I would like to potentially recognize anybody who successfully photographs all the objects in the list in our club because that could be really fun!

On the DAS website at <http://www.delastro.org/14-ap-articles/141-photographic-observing-lists>, I have detailed the objects on each of the 3 rough drafts of the lists. Also I have the beginnings of the document for the intermediate list in PDF form, but right now the document is very large. Please click the address above and from the contextual menu, download the PDF rather than just opening it in your browser. Then you can open the PDF.

Thanks, Rob Lancaster

Photos by DAS Secretary Bill McKibben
The Whirlpool Galaxy



The Whirlpool Galaxy



The Moon

Part 2 of AP-SIG Deep-Sky Image Processing Workshop Held on February 18 by Bill Hanagan

On February 18, the Astro-Photography Special Interest Group (AP-SIG) hosted the second day of a two-day workshop on Deep Sky Image Processing at MCAO. Nico Carver and I were once again the principal instructors. In all, 8 members of the AP-SIG attended. Six of them attended the first day of the workshop, which was held on February 4. For lunch, we had sandwiches from Capriotti's that were picked up and delivered to the workshop by my wife Mary Ann.

A number of advanced techniques for image processing were reviewed including techniques for noise reduction and for selectively masking and stretching images to achieve a variety of effects.

One of our newest AP-SIG members, Dana Wright, attended the workshop and he and I later met to work on some M51 data he had collected. The end result of that collaboration appears below. M51 is the larger of the two galaxies and M52 is the smaller companion galaxy. This galaxy pair is a rather small target, and not particularly bright, making it a moderately difficult subject.

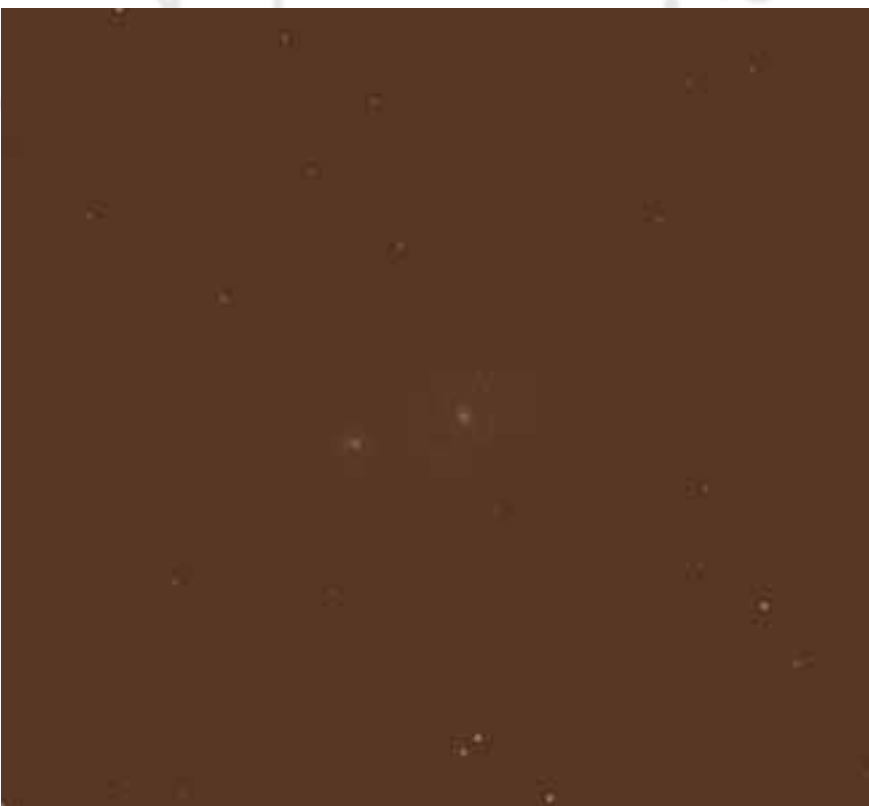


The telescope used was a basic 8" Celestron f/10 SCT equipped with a 0.63 focal reducer and mounted on a Celestron AVX mount. A Canon EOS 70D DSLR was used together with Backyard EOS running under Windows for data acquisition. Photos of this rig can be seen in an article on Dana's observatory elsewhere in this issue of the FOCUS.

Out of the original 60 images, only 18 were free enough of motion blur and tracking errors to use since the images were obtained without guiding and the AVX mount is not stiff enough to prevent blurring under windy conditions prevalent at the time. Those 18 individual 50 second exposures were calibrated using Flats, Darks, and Bias frames, then aligned and integrated to produce a single intermediate image.

The intermediate image was further processed in PixInsight using the PixInsight process "DynamicBackgroundExtraction" to remove a mild background gradient, "TGVDenoise" to remove chromatic noise in the background, "MultiscaleLinearTransform" for general luminance noise reduction at the linear stage, "HistogramTransformation" for an initial basic stretch, then "CurvesTransformation" using an S-curve and an inverted luminance mask to further accentuate the features of the galaxies and clean up the background. "CurvesTransformation" was also used to adjust color balance in the bright areas of the image.

The sharpest single image of the set appears immediately at left to show what an unprocessed 50 second snapshot looks like. The only processing applied to this single image was a simple histogram expansion and cropping so the field of view matches the photo above.



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A Photo-Review of Dana Wright's Self-Built Roll-Off Roof Observatory *by Bill Hanagan*

I first saw Dana's observatory on a windy night in February when we worked through some questions he had on imaging, and I thought his observatory would make an interesting subject for the FOCUS. Dana's observatory was built over "6-7 weekends in August and September" (of 2016). Dana's recollection of the materials cost was that it fell in the range of \$2,000- \$2,500.

An opportunity to take some daytime photos of Dana's observatory eventually presented itself when I met up with him again to help him process some images of M52 using PixInsight, the end result of which appears elsewhere in this issue of The FOCUS.

The photo below shows the observatory structure with the roof closed. Dana and his wife Barbara's home is visible in the background, which stands directly southeast from the observatory.



Dana says he built the observatory primarily so his wife Barbara could do some visual observing, but he also has an interest in doing astrophotography himself.

The picture at the left above illustrates the view to the southeast and the next view (to the northwest) show that the horizon for this location is relatively open in several directions.



The next photo to the right shows a view into the observatory through the door with the roof still closed. Dana made the red telescope pier himself by welding steel plate to a length of Schedule 40 Pipe. The pipe is secured to a 3' deep 18" diameter concrete footer (underground). The pier is physically isolated from the observatory floor. 12 Volt power is provided to the observatory by a portable 12V battery which Dana carries back to the house for recharging. A rope and pulley is attached to the roof that allows it to be opened and closed from inside the observatory.

The floor has interior dimensions of 6' x 7'. That makes the observatory tighter than the Sawin, but it's still large enough for 2-3 people to enter easily and there is room in the corners for small tables to hold the prerequisite PC for image acquisition. Dana uses Backyard EOS for image acquisition as well as the ASCOM platform and the Celestron Unified ASCOM driver to control his AVX mount, all of which runs under Windows (only).

This view to the Southwest, below left, shows the telescope with the roof open with low trees in the background. Like all good roll-off observatories, this one gives an unobstructed view of the sky from the Zenith down to just a few degrees above the horizon in most directions, with no need to adjust the roof position during the night.



Here's a view, below, over the wall into the open observatory showing the telescope, computer desk, and the full-sized entry door. The two low walls are 6'6" high, while the peak over the door and the peak of the rolling roof are about 8'6" above the floor.



(Continued on Next Page)



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

| | |
|-------------------|------------------------------------|
| April 7: | 6:30 – 8:00 |
| May 5 | 7:00- 8:00 |
| 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 |

Dana Wright's Self-Built Observatory (Continued from Preceding Page)

The next photo, below left, shows Dana seated beside the wall-mounted computer table and shelf installed in his observatory.



The photo below shows the structure of the roof. The rolling roof uses garage door track both to support the roof and to hold it down against any lift created by the wind. The roof rolls off into a position that blocks the only light trespass nearby, which comes from neighbors to the immediate south.



The last photo, below, shows the pier-plates that Dana made for leveling his mount.



While Dana doesn't consider his observatory to be a permanent structure, he has plans to keep it around for a long time.



03/21/17 DAS Board Meeting Agenda

1. *Review of Minutes from Last Meeting—Bill McKibben*
2. *Treasurer's Report—Diana Metzger*
3. *Progress reports from current projects*
4. *DAS Dinner Meeting Update –Jeff Lawrence*
5. *June Meeting and Solar Eclipse—Jeff Lawrence*
6. *DAS Board Roles and Responsibilities Documents –Rob Lancaster*
7. *ToolChest For the Sawin—Jack Goodwi*
8. *New Loaner Scopes for Beginners.*



February 26th's Annular Solar Eclipse

Die-hard eclipse chasers have journeyed to the Southern Hemisphere to catch a short and dramatically thin "ring" eclipse of the Sun.

Whenever the Moon passes directly in front of the Sun, termed a central solar eclipse, we Earthlings usually conjure up visions of the awe and spectacle of totality.

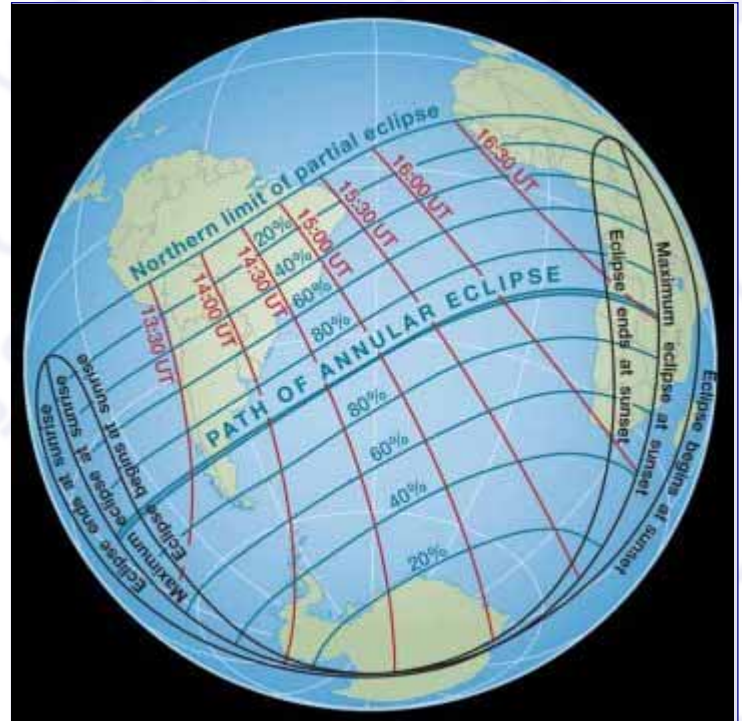
But that's not always the case. The orbital geometry of the Earth-Moon system is subtle. At this time of year, Earth is relatively close to the Sun in its not-quite-circular orbit, so the solar disk appears larger than average. And this coming weekend's new Moon is about midway between its perigee on February 18th and its apogee on March 3rd — so its disk won't be particularly large.

The upshot is that when the Moon and Sun meet in the sky on Sunday, February 26th, the result will be an annular or ring eclipse of the Sun. Astronomers calculate that the magnitude of this eclipse — the ratio of the Moon's apparent diameter to the Sun's — is 0.9922. So this event will be very nearly total and only barely annular. It'll be a dramatic sight along the centerline, as the ring at mid-eclipse will be no more than about 15 arcseconds wide!

This geometry also means that the path of annularity — called the antumbra — is very narrow, 31 km (19 miles) wide at the point of greatest eclipse though flaring to as much as 96 km (60 miles) at the endpoints. The culminating ring in this 3¼-hour-long event will last for at most 44 seconds.



Many eclipse-chasers are traveling to southern Argentina, where the prospects for clear skies on eclipse day are most favorable. *Xavier Jubier*



This month's annular solar eclipse is a far-southern event. Red lines show the moment of mid-eclipse in Universal Time; blue lines show the maximum fraction of the Sun's diameter covered by the Moon. Sky & Telescope diagram; source: Fred Espenak

The eclipse will be confined almost entirely to the Southern Hemisphere. The path of annularity crosses parts of southern Chile and Argentina, the South Atlantic Ocean (where mid-eclipse occurs at 14:53 Universal Time), Angola, and (at sunset) the Zambia-Congo border.

Partial phases sweep over most of South America, Africa, and Antarctica, as the globe above shows. North Americans are left out entirely.

According to meteorologist Jay Anderson, the weather prospects in Africa are relatively poor. But they're much better in South America and especially over the flat Patagonian plains of southern Argentina, where the likelihood of a cloud-free morning is 60% or better. Not surprisingly, that's where most eclipse-chasers are headed.

So wish them all clear skies — and let's hope they take plenty of dramatic images of this celestial treat.

Check out Fred Espenak's website at <http://eclipsewise.com/oh/ec2017.html#SE2017Feb26A> for more details.



Science *NASA Seeks Payload Ideas for Mystery Satellite*

WASHINGTON — NASA is soliciting concepts for payloads that could fly on a mysterious satellite it is in discussions to inherit from another government agency.

NASA issued a request for information (RFI) Feb. 15 for a proposed spacecraft called the NASA Science/Technology Platform Satellite, or NSTP-Sat. The RFI was the first time NASA had publicly discussed such a mission.

The RFI, issued by NASA's science mission directorate, solicits ideas for payloads, including remote sensing instruments and technology demonstrations, which could fly on the spacecraft. The RFI offered few details about the proposed mission, noting NSTP-Sat could fly "to low Earth orbit, geostationary equatorial orbit, medium Earth orbit, Earth-Moon L1, or lunar orbit in the 2021 timeframe.

The RFI, which remains open until March 17, seeks ideas for how this spacecraft could be used to meet NASA's science and technology development goals. The RFI states that NASA will use the responses to determine "whether there are science opportunities for new uses of this spacecraft" and "whether a solicitation for proposals is warranted to enable such opportunities." [Satellite Quiz: What's Up There?]

The RFI offered few details about the spacecraft itself. "The NSTP-Sat is a spacecraft platform that has become available to NASA as excess Government property through an interagency agreement," it stated. It added the spacecraft was a "Boeing GEO spinner bus" that could launch on an EELV-class rocket or as a secondary payload on a Space Launch System mission.

NASA and other organizations involved with NSTP-Sat have been reticent to provide additional details about how NASA gained access to the satellite bus. Alan Zide, a program executive in NASA's heliophysics division and the point of contact listed in the RFI, did not respond to email messages with questions about the satellite.

"NASA spokesman Dwayne Brown said March 1 that NASA is in discussions with the U.S. Air Force to obtain the bus. "NASA and the U.S. Air Force (USAF) are in discussions concerning the transfer of a satellite bus that the USAF has determined does not meet current or projected Air Force mission requirements," he said.

U.S. Air Force spokeswoman Capt. AnnMarie Annicelli said March 2 she was not familiar with the satellite and was looking into it, but has not provided any additional information. When asked who the original customer was for this Boeing-built satellite, Addrian Brooks, a spokesman for Boeing Network and Space Systems, said March 2 that the company was "unable to disclose this information."

Jonathan McDowell, an astronomer at the Harvard-Smithsonian Center for Astrophysics who specializes in space history, notes the dimensions for the satellite provided in the RFI are consistent with two versions of satellites built by Hughes Space and Communications. One, the HS-389, was used for the Intelsat 6 series of satellites, while the HS-393 was sold to other commercial customers. Those satellites were built and launched in the late 1980s and early 1990s. Boeing acquired Hughes Space and Communications in 2000.

The National Reconnaissance Office (NRO), he noted, is thought to have used the same bus for a series of data relay satellites operating under the code name QUASAR, also known as the Satellite Data System (SDS). Four such satellites launched from 1989 through 1996.

Spin-stabilized satellites have fallen out of favor, having been replaced by three-axis stabilized satellites. The last Boeing-built commercial spin-stabilized satellite, a Boeing 376 spacecraft called e-BIRD, launched in 2003.

McDowell said a later generation of QUASAR satellites, launched from 1998 to as recently as 2014, were also assumed to be three-axis stabilized. However, he noted there's little known about this series of satellites, leaving open the possibility it also used the same bus as the earlier spacecraft.

"It's possible that some other NRO program also used this bus, but QUASAR/SDS is definitely the most likely," he said in a March 3 email.

If the satellite in question is indeed from the NRO, it would not be the first time NASA inherited spare hardware from that intelligence agency. In 2012, NASA announced it was taking possession of two 2.4-meter mirror assemblies from the NRO. The mirrors were reportedly built for NRO's Future Imagery Architecture program, and became surplus when the NRO cancelled the optical portion of that program in the mid-2000s.

NASA, after taking possession of the mirrors, solicited ideas from the scientific community on how to use what it called Astrophysics Focused Telescope Assets. NASA decided to use one of the mirrors for the Wide Field Infrared Survey Telescope (WFIRST), which originally planned to build a much smaller mirror. WFIRST is planned for launch in the mid-2020s.

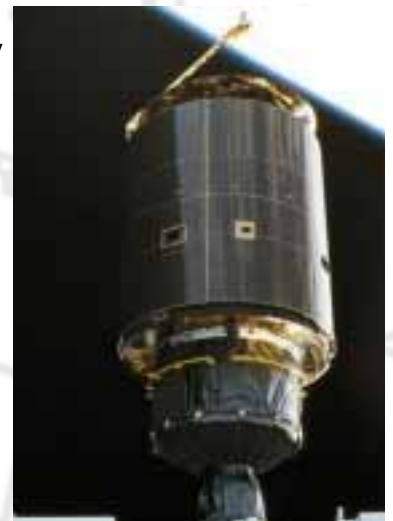
Phillip Swarts contributed to this story. This story was provided by SpaceNews, dedicated to covering all aspects of the space industry.

EDITOR'S RECOMMENDATIONS:

Read SpaceNews for the Latest Space Industry News -- <http://spacenews.com/>

Blastoff! US Spy Satellite Launches Atop Atlas V Rocket | Video -- <http://www.space.com/35878-blastoff-us-spy-satellite-launches-atop-atlas-v-rocket-video.html>

Launch Photos: NROL-79 Spy Satellite Launches Atop Atlas V Rocket -- <http://www.space.com/35877-atlas-v-rocket-spy-satellite-nrol-79-launch-photos.html>



The Intelsat 603 satellite during a 1992 shuttle repair mission.

Photo by DAS Member Willis Greiner, Jr.
The Orion and adjacent Running Man Nebulae -



Image obtained February 24-25, 2017 through RVO's Explore Scientific's 127mm ES127ED APO refractor with Explore Scientific's .7 reducer/flattener lens resulting in an f/5.25 optical system -- using a Baader-modified Canon XSi DSLR and BackyardEOS image-acquisition software -- 21 of 24 carefully selected and stacked 180-second RGB frames combined with multiple dark, flat and bias calibration frames shot at ISO 800 and totaling more than 210 minutes (63 minutes effective luminance) were used to create this image; optics driven by the Losmandy G-11 mount equipped with Ovision's precision RA worm gear, guided with a ZWO ASI 120MM Monochrome CCD camera through a 60mm guidescope using PhD2 guiding software and post-processed with DeepSkyStacker, CCDStack2 (DDP and deconvolution) and Photoshop CS3 s/w

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DAS 2017 Dinner Meeting



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

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





Recap of Two More Mount Cuba/DAS Workdays

Feb 19th, 2017 and Feb 26th, 2017— *Rob Lancaster, DAS President*

If you are not already aware, Mount Cuba and the DAS have embarked on a joint project. Mt. Cuba purchased and the DAS is assisting in the assembly of two new telescope domes to expand and enhance both visual and photographic astronomy at the observatory. The new domes will be used by DAS club members, astronomy students from the University of Delaware, and by Mount Cuba Associates for education, research, and outreach, as well as for general enjoyment. In last month's Focus, I explained how the domes arrived and how we performed the initial construction of the first dome in late January. Please see last month's focus for more details on that.

Due to some unseasonably warm weather, we scheduled a workday for Feb 19th 2017 to continue working on the domes. It was literally 70 degrees outside, so we figured that would be an excellent time to work on it. In fact, some people considered it to actually be too warm, but most were comfortable. We had an excellent turnout on this second day including Greg Lee, Bill McKibben, Jack Goodwin, Dave Groski, Bill Hanagan, Jim Chang, Jeff Lawrence, Ted Trevorow, Terry Lisansky, Tom Harding, Amy Hornberger, and Rob Lancaster. Our goal for this second day was to assemble the second dome, since some parts of that dome that were missing the first time had arrived earlier that week, and also to start working on the weather sealing task. The first part of the work went very smoothly, and we very rapidly put the second dome together, having gained plenty of experience on the first dome last month. We also put the metal track on the bottom of the first dome, which we had not done the first time.

Then we reviewed the video on weather sealing the domes and began trying to follow its instructions. Unfortunately this part did not go as well as the first part of the day because the weather stripping material called for in the instructions was not included. The material that was included was very thick and it looked like there was not enough of it to do the job. We tried to get it in there the way instructions said, and had a bit of a challenge doing it as you can see in the photo with Dave standing on the dome to try and help us get the pieces together. To alleviate some of our frustration, we spent some time with the club's new solar scope, admiring numerous prominences along the edge of the sun. At the end of the day, we got the weather stripping into one dome and we had two assembled, but not fully waterproofed domes.



(Continued on Following Page)



Since we did not understand why the weather stripping was not provided, and why that thick material was there in its place, Terry Lisansky and Jeff Lawrence both contacted SkyShed Pod to find out. Also Jeff watched the video yet again and discovered that the thicker material we had used in the first dome was actually intended for another part of the process. When SkyShed Pod got back to us, we found out that in fact they have changed the instructions so that the weather stripping mentioned in the video is no longer used, instead, the domes are to be sealed with Lexel sealant. So, that was why the weather stripping was not provided with our dome. We just never received the updated instructions.

Now that we knew how to proceed, we could actually try to continue work on the domes. On Feb. 26th, we had yet another nice day, though it wasn't quite as warm as our previous workday. We also had an excellent turnout on this third dome workday including Greg Lee, Bill McKibben, Jack Goodwin, Dave Groski, Bill Hanagan, Jim Chang, Jeff Lawrence, Terry Lisansky, Amy Hornberger, Tom Harding, Mark Phillips with his children, and Rob Lancaster. We now had the Lexel sealant thanks to Jim and Jack, and were able to reuse some of the previously improperly used foam rubber for its intended purpose. We separated and took the domes off the top of each SkyShed Pod, cleaned up their joints and sealed them with the Lexel sealant thanks to Terry's sealing skills and Mark's finger. After the sealant set, we put the domes back on, added the L-shaped gasket material that goes between the dome hemispheres, and finally used the foam rubber in its intended spot. Then, we moved the 12" telescope into one of the two domes to test it out and we observed Venus through the telescope. In the next couple of months, DAS members are encouraged to try out the telescope in the dome, so that we can experiment with it, work out any issues, and be ready to proceed when we are ready to finish installing the domes with piers in their more permanent locations. (Continued on Following Page)



Two More Mount Cuba/DAS Workdays (Continued from Preceding Page)



Think of the many benefits of being a member of the Delaware Astronomical Society!

We have telescopes including eyepieces and collimating equipment for your use. All you need to do is ask an officer or other board member to arrange for you to become certified on the telescope you want to use. If you have a suitable camera, you can start taking your own photos of lovely celestial objects. If you know nothing about astrophotography, no problem, we have people eager to teach you how to do it. There is a special interest group in astrophotography that meets monthly.

If you want to build a telescope of your own, we have members who are expert and who are willing to show you how to do it. We have books in our library that explain the concepts.

If you are a beginner, you will have help in Greg Lee's "What's Up in the Sky, so that you will know where to look for interesting objects that month. We have beginner topics each month offered early in the program, so that school age and morning people can get some good information and still be home for their preferred bedtime. We have a Great Courses astronomy course with 96 30-minute lectures in our library that will get you up to speed in basic concepts. We have a Great Courses series on observing. There is a library with many topics on astronomy.

If you want help with finding objects in the sky, come to our star parties, formal and informal, to get some help with using your telescope, collimating and aligning with your finder scope.

If you have a problem with your equipment, come out on Tuesday nights to find members who can help you problem solve. Let us know in advance what you would like to work on or which problems need solved, or what interesting things you would like to try.

If you like to party, come out on those Tuesday nights; sometimes we have informal cookouts and observing. We also have picnics coupled with solar observing at other times.

If you love to work, come to our work days. In future we will be doing concrete work around the Sawin observatory, making an attractive area around the sundial, and painting the Sawin. Work will be done to upgrade the electrical system in the Sawin.

If you want to be more involved, let one of the Board Members know! We need people with diverse interests!

There is something for everyone in the DAS, so be sure to send in \$30 for dues soon to help improve the amenities of the club even more.

Checks to:

Diana Metzger
604 Baldwin Lane
Wilmington, DE 19803 or **Cash at the meeting to Diana**

Or you can pay with PayPal using the link below; you don't have to have an account with PayPal, just a credit card.

https://www.paypal.com/cgi-bin/webscr?cmd=_s-xclick&hosted_button_id=NDGKG4CWCX8GU

***WELCOME a New Member
to the DAS!***

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

*Please welcome
new member
George Ozer
to the Club.*

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 Next AP-SIG Meeting is Scheduled for March 24 / 25 by Bill Hanagan

For those interested in an alternative to PixInsight for Deep-Sky image processing,

The special topic planned for the March 24 / 25 AP-SIG meeting is a review by AP-SIG member Mark Mitchell of one of the most popular alternatives to PixInsight, the use of "DeepSky Stacker" for image calibration, alignment, and stacking, coupled with Photoshop for subsequent image enhancement.

As is often the case, 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.

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.

AP-SIG members are 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.

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

On How to Get Started in Astro-Photography Bill Hanagan

You can get started in astrophotography with your current camera mounted on a tripod by taking wide field photographs of meteor showers, conjunctions, constellations, and star trails. Mounting your camera "piggyback" on a motorized telescope that tracks the movement of the stars allows you to photograph a few more subjects, mostly large and bright nebulae and comets. At this level, some smaller subjects may benefit from the use of a telephoto lens. As you move to progressively fainter and smaller subjects, the demands on your equipment will grow considerably. However, as you improve your equipment, the number of subjects that you can photograph will also increase exponentially.

Joining the AP SIG is a great way to learn what equipment you'll need to photograph the subjects that interest you and to find out what specific equipment works well (or doesn't work) before you spend your money.

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.



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

Photos need NOT be current.

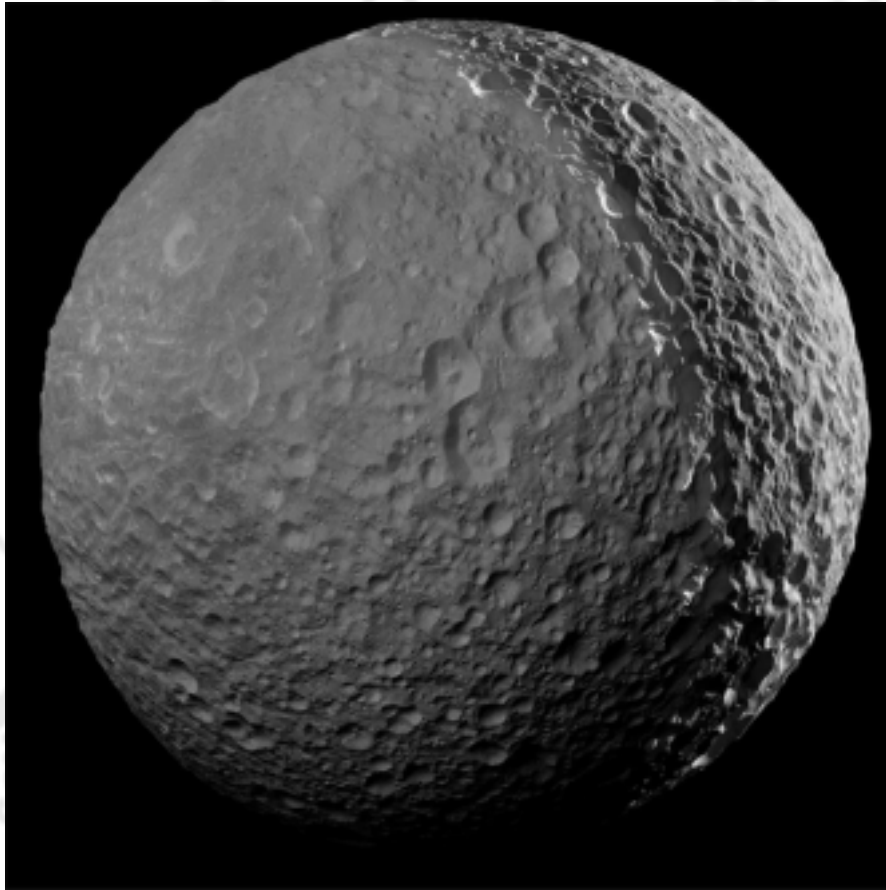
**So how about you?? HAVE ANY
OLD or NEW ASTROPHOTOS??**

PLEASE email to FOCUS editor

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

Mimas in Saturnlight -- The Astronomy Picture of the Day

Image Credit: Cassini Imaging Team, SSI, JPL, ESA, NASA



Explanation: Peering from the shadows, the Saturn-facing hemisphere of Mimas lies in near darkness alongside a dramatic sunlit crescent. The mosaic was captured near the Cassini spacecraft's final close approach on January 30, 2017. Cassini's camera was pointed in a nearly sunward direction only 45,000 kilometers from Mimas. The result is one of the highest resolution views of the icy, crater-pocked, 400 kilometer diameter moon. Other Cassini images of Mimas include the small moon's large and ominous Herschel Crater.



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!

Upcoming Monthly Meetings

March 21, 2017-- 7:00 pm - 9:30 **DAS Monthly Meeting** Topic: Mike Turco -- "The Effects of the Sun on Earth's Climate"

April 18, 2017 7:00 pm - 9:30 pm

DAS Monthly Meeting Topic: Prof. Dave Goldberg ; Board meeting at 7PM, all are welcome; General Meeting at 8PM.

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.

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.

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.



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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
 - 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.

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

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

Board Members

Officers:

President: Rob Lancaster -- RLancaste@gmail.com -- also Webmaster

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

Secretary: Bill McKibben -- BillMcK21921@comcast.net

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

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Terry Lisansky -- Terry@terry.cx

Glenn Bentley -- (610) 869-0706 -- GBentley@chesco.org

Bill Hanagan -- (302) 239-0949 -- 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 -- (410) 398-7394 -- also *FOCUS* Newsletter, articles & Photo Contributions & Submissions

Observatory: Jack Goodwin -- (610) 457-2945 -- Jack_Goodwin@yahoo.com

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

Library: Maria Lavalley and Sue Bebon Astronomical League Coordinator--K Lynn King -- klynking@verizon.net

Observing Chair: Greg Lee

Elections Chair: Currently Vacant --also Awards Chair and By-Laws



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!

The Last
Word. . .



FOCUS Editor
Joe Neuberger

***SALUTE to the Volunteer Members
Who have been extremely active around Mt Cuba of late.***

***Firstly, they instilled the new steel steps leading
from the lower parking lot to the front entrance to the Mt. Cuba Observatory.***

***And lately they've been busy as bees putting together the
two new POD Observatories that are presently located adjacent to
the Sawin Observatory, with more work to be done in that area.***

THANK YOU to ALL who have contributed their efforts! THANK YOU!