

CACHE VALLEY CLEAR SKIES



Volume 12 No. 5

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<https://cvas-uutahskies.org>

PRESIDENT'S CORNER **Dale Hooper**

During March 2025 there are a couple astronomical events that I hope everyone is aware of. We discussed both of these briefly at our February club meeting.

Total Lunar Eclipse Mar 13-14

The first event is a total lunar eclipse the night of March 13th to 14th, with totality occurring on Pi Day – March 14th! Remember that by the 13th Daylight Saving Time will be in effect so eclipse events will occur an hour later than you may have anticipated. Here is the list of significant times of things during this eclipse

Start of Penumbral Eclipse, which is when the Moon enters the Earth's outer shadow or penumbra will occur at **9:57pm MDT**.

Start of Umbral Eclipse, where the Moon first touches the umbral or direct shadow will occur at **11:09pm MDT**. This is when lunar eclipses usually start to get interesting because at this point you can really begin to see the darker shadow taking a bite out of the moon. Totality will begin on International Pi Day (3/14) at **12:26am MDT**.

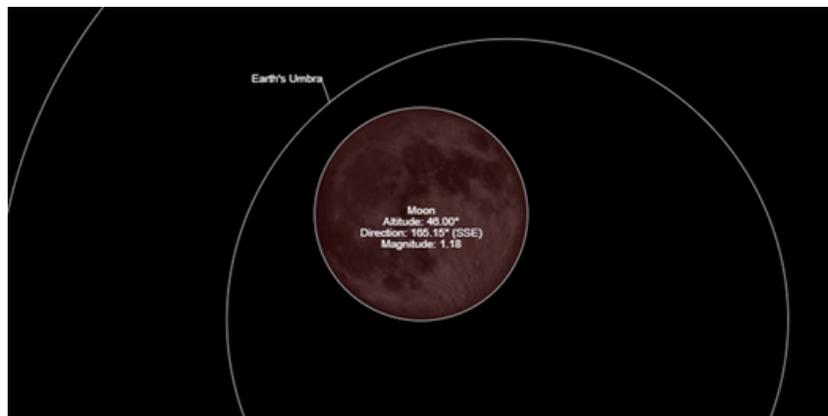
Max-eclipse will occur at **12:58am MDT**. You can see from the figure below (produced by timeanddate.com) that this will not be an especially deep eclipse. It is fairly likely that the western limb of the Moon will still be fairly light. Totality will end at **1:31am MDT**. The partial umbral eclipse will end at **2:47am MDT** and the penumbral eclipse will end at **4:00am MDT**.

Unless it is completely overcast it certainly worth trying to observe the eclipse from time to time, even if there are some clouds. The likelihood of completely clear skies is less than 35%. But hopefully we will at least get some views of partial phases and totality.



Executive Committee

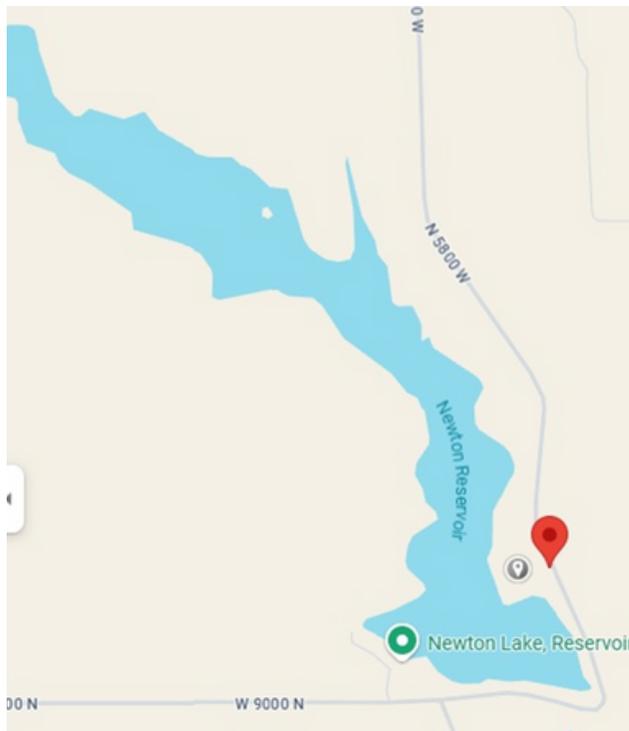
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2. Cont'd from pg 1.

Annual Messier Marathon

The second event is our annual Messier Marathon on the night of March 28th. This, like nearly everything we do, is weather dependent. We plan to again meet in the south part of the parking lot on the East side of Newton Dam. The smaller (gray) pin in the image on the East side of the reservoir below shows where we will be meeting.



The GPS coordinates for this location are Lat: 41.898568, Long: -111.973790. There is a picnic table as well as a vault bathroom where we meet. We had a really great time last year, so if the weather cooperates, I hope you will come on out.

My favorite website for Messier Marathon information is <http://www.messier.seds.org/>, it has a lot of helpful links. A few of my favorite links on this page are:

- <http://www.messier.seds.org/xtra/marathon/marathon.html>
- General description of a Messier Marathon with a lot of additional helpful links
- <http://www.messier.seds.org/xtra/marathon/marath1.txt>
- A printable text list of the Messier objects with the Don Machholz (traditional) list of object order
- <http://www.messier.seds.org/xtra/marathon/marath.html>
- The Messier Marathon search sequence with more information about each object

Global Meteor Network – Raspberry Pi Meteor Station

I also wanted to share a bit of information about another project that I have started working on, because it might be of interest to other members of the club. While reading the article, “The Stories Meteors Tell Us”, in the December issue of Sky and Telescope magazine (pages 12 – 17), I saw a reference to the Global Meteor Network (GMN) globalmeteornetwork.org. The GMN has developed a low-cost open-source system based on Raspberry Pi single-board computers and simple CMOS camera systems readily available from AliExpress.

The Raspberry Pi Meteor Station (RMS) consists of a Raspberry Pi 4 or 5 configured with the Global Meteor Network RMS software and a CMOS low-light security camera system. The RMS software provides the system with the capability of autonomously observing the sky every night and sends the reduced data to a server so that astronomers can further analyze it.

Cont'd on pg 3**STAR PARTIES**

March 4th – Lauralin Drive, Logan

March 28th – Messier Marathon, Newton Dam East parking lot.

We would love more volunteers at this!

STEM Nights

Cedar Ridge Elementary – March 13th
• Blaine Dickey/Clark Salisbury

Sunrise Elementary – March 18th
• Dean Louviere/Dell Vance

Greenville Elementary – March 24th
• Bruce Horrocks/Clark Salisbury

The science goals of the GMN from (<https://globalmeteornetwork.org/scientific-mission/>) are:

- Providing the meteor community with real-time awareness of the near-Earth meteoroid environment by publishing orbits of all observed meteors from all around the globe every morning.
- Observing meteor showers, computing their flux, mass indices and orbits to constrain meteor shower prediction models.
- Observing meteorite-producing fireballs to increase the number of meteorites with known orbits (only ~50 circa 2021, more info: <http://www.meteoriteorbits.info/>) and help constrain meteorite source regions.

I have a Raspberry Pi 5 that I was originally going to use for seestar_alp, but just about everything in that project is being incorporated by ZWO into the actual SeeStar app. So, I decided to re-purpose this RPi 5 for use with the GMN. The GMN has a lot of helpful pages for acquiring everything needed for the RMS (https://globalmeteornetwork.org/wiki/index.php?title=Shopping_list_and_tools_needed), and how to build, test and install it (https://globalmeteornetwork.org/wiki/index.php?title=Build_%26_Install_%26_Setup_your_camera_-_The_complete_how-to). There is also a groups.io list for support: globalmeteornetwork.groups.io.

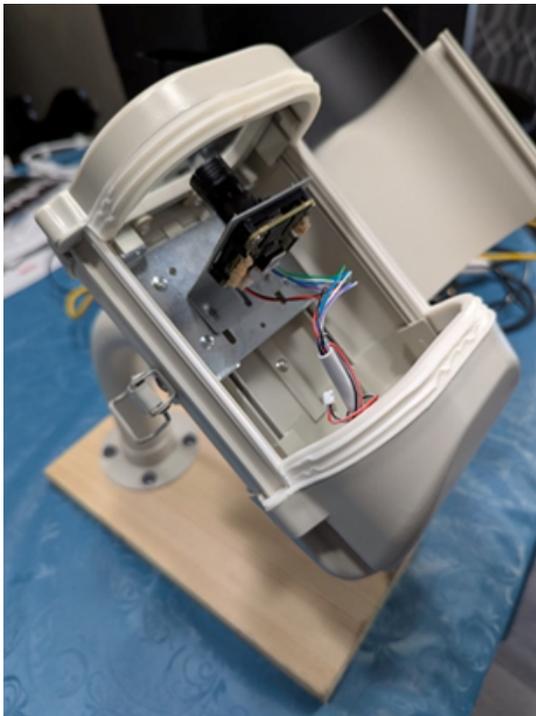
I'm currently in the testing phase with mine, I've acquired the station code (US005T) and emailed my public key, so I can begin uplinking data as soon as I am ready for calibration help. In the images below, you can see the Raspberry Pi 5 (in this image the real-time clock and case top are missing), the housing with the IMX291 and lens and a screen with a test image. Note that the test image is reporting LOTS of meteors, because I don't have it in the final location, so it is seeing lots of stray light sources, etc. The final configuration will be on my observatory control room roof facing East.

Club Meetings

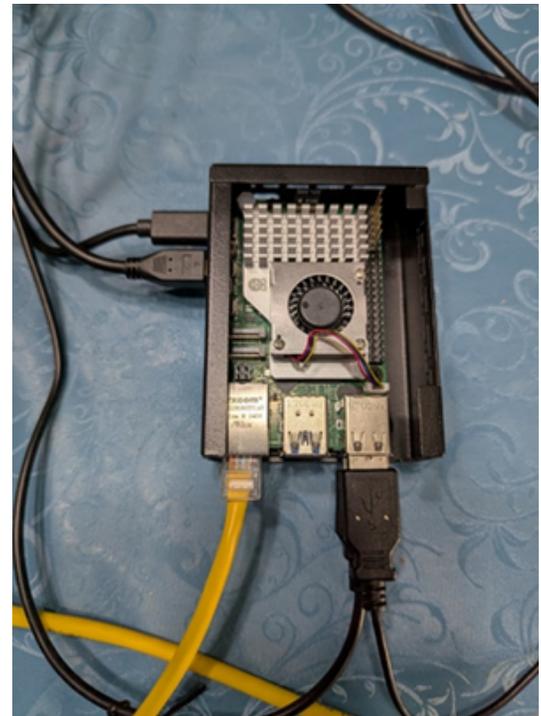
March 21

Room 107 of the Engineering Lab Building on the USU Campus

- 3rd Friday of the month
- Boyd Edwards will teach us about a new telescope he has been using.



Housing, IMX291 and 4mm f/0.95 Lens



8 GB Raspberry Pi 5 (without real-time clock and case top)



RMS Test Screen for Station US005T - Hyde Park

I hope to have my station installed and sending data by the end of February. Thus far, it appears that most of the work involved in the meteor stations is assembling and testing them. The reduced data is sent to the server autonomously. It will be my duty make sure that the station continues to run and properly updates when changes are made available. The data produced by your station remains yours and there is additional analysis you can do with it if you are interested.

There are a couple reasons that I really wanted to share this with you. First of all, a number of the parts from AliExpress come in units of ten or twenty. So, if you build one of these, I would be happy to give you these parts (tall header pins, real-time clock, bolts) so that you can save a bit. Secondly, the meteor detection analysis is much better if multiple cameras are able to observe the same meteors. This would certainly be a great project for students.

An 8 GB Raspberry Pi 4 is \$75 and an 8GB Raspberry Pi 5 is \$80. The rest of the parts are about \$100. So, for not a huge investment you can take an active part in astronomical research and discovery. You will be listed as a co-author for any papers where the professional astronomers use your data.

Clear skies!

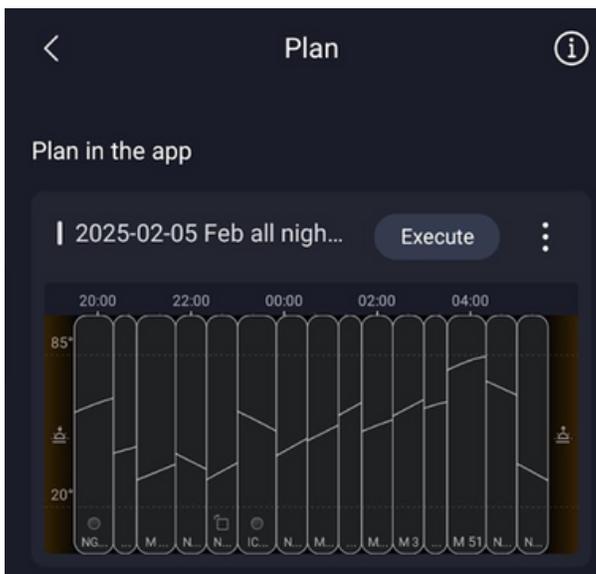
4.

Plan Function in SeeStar by Blaine Dickey

ZWO SeeStar S-50 recently added a “PLAN” function to their smart scope making it possible to automatically image all night long without any human intervention. This is a very welcome improvement.

Think of it! You can set your scope out, execute your plan, and go to bed. When you get up in the morning all your images are saved to your phone for you to examine and you haven't lost any sleep.

Recently I gave the SeeStar “PLAN” function a test run to see how well it performed. The night was clear and cold around 20° F. Before taking my SeeStar outside and setting it on the backyard I made sure that my plan would include objects that were visible at the time I instructed the program to image them. This turned out to be a little more challenging than I thought it would be, but was greatly aided by the program itself. Essentially you search for an object and using a special graph in the program determine its altitude in the sky to make sure it's up high enough to image at the time it's scheduled. Once you know that then you have a button that adds it to the plan. You continue this procedure starting at astronomical Dusk and continue until astronomical Dawn. Below is an example of my first all night imaging program.



You will notice an Execute button just above on the right side of the graph. When you're ready you just hit that button you're program starts. A green light will come on indicating it is imaging. A green bar will then slowly move across the top of the graph showing which object it is imaging. When it is done it will light up the

next object and move across the top of that. You can also check the image as it builds up on the screen. The program continues on until the last image finishes at which time the SeeStar arm will close so that it won't inadvertently point at the rising sun.

The images below were all taken automatically on my first trial run. Only one problem occurred when the object NGC 891 was being imaged and it started to go behind a tree. There was enough of it showing that I got a fair image anyway.

There is much more I could mention but this gives a basic idea of what happened. I was very pleased with the results shown below. I successfully imaged 22 objects using the “PLAN” function. In addition I included an image taken of Messier 42 taken on the same night as a test image. Altogether there were a total of 23 deep sky objects imaged that night.

Because a SeeStar does not have enough battery power to image all night long, I decided to add an external power supply rated at 10K milliamps. To prevent it from cord wrapping I purchased a plastic battery holder and plugged the battery into the SeeStar as shown. By morning I still had 65% of the SeeStar battery unused.





Row 1: Messier 53/ Messier 109/ IC 443

Row 2: Messier 65, Messier 66, and NGC 3628/ NGC 4088 and 4085/ NGC 3373, NGC 3371, and Messier 105



Row 3: IC 2574/ NGC 891/ Messier 90

Row 4: NGC 2175/ Messier 51/ Messier 3



Row 5: Messier 42/ NGC4631 and NGC 4627/ NGC 4565 and 4565A

So, what's in a number?

By Bruce Horrocks

I know that I am kind of weird, and my wife will confirm this fact to me several times each day. Things that I find interesting like physics and science, she finds boring, and tedious. For example, I am fascinated with certain numbers and mathematical expressions. While she says she doesn't need math in her life, we all find ourselves immersed in numbers every day like, what time is it, how old are you, what is the temperature, or that dreaded number of, how much do I weigh? All of these questions can be best answered with a simple number. I know I personally prefer a numeric response when I ask someone what the temperature is outside and not the reply of, "freaking cold" or "hot as an oven." When I traveled a lot a years ago, I would take a couple of good math problems to work on during the flight or find some interesting math articles to read.

As astronomers, we mostly find ourselves looking at objects that are so far away from us we use the term "Light Year" to describe these insanely large distances. Other than objects in our solar system, we think something is close if it is only like 4 light years away like the star system Alpha Centauri, or the Helix Nebula, only a mere 700 light years away. I remember a few years ago Tom Westre gave us the challenge to find some galaxies that are way out there in the billions of light years. Really these are numbers that are outrageously beyond our capacity to grasp. (This explains why our national debt is now up over 36 trillion dollars. Don't get me going on this but check out USdebtclock.org.) While I know what these large numbers represent on paper, what is difficult is to comprehend what these number physically represent. I get the difference in driving 100 miles versus 10 miles, but one light year, is still incomprehensible for me. Let's just look at a few examples of these so you might get a grasp of some of these numbers. (Note: Remember that one light year is approximately 6 trillion miles (6×10^{12} or 6,000,000,000,000.)

Proxima Centauri - Closest star to Earth at around 4.3 light years away and it is only about 14% the size of our Sun or about 1.5 times the diameter of Jupiter. With a brightness magnitude of 11 or so, not very much to look at.

Andromeda Galaxy – Our closest galaxy at only 2.5 (2.5×10^6) million light years away and about 152,000 light years in diameter. It contains about one trillion stars or around 4 times as many stars as are in our Milky Way Galaxy. If you can hang around for 4 billion (4×10^9) years or so we will merge and be one happy family.

Age of the Universe – Current estimates put the age of our universe at 13.7 billion (13.7×10^9) years, but who's counting? A million seconds was about $11 \frac{1}{2}$ days ago, a billion seconds was 31 years and 8 months ago, and a trillion seconds puts us back to 31,000 BC when the earth was in the last ice age.

Galaxies in our Universe – Two trillion (2×10^{12}) is the current estimate. This number seems to have grown rapidly with the advancement of technology like the James Webb Telescope. There might be more, but we will stay with this number for now. This also put the estimated number of stars in our universe to around 10^{24} . Now we are finally getting into bigger numbers where we have to use exponential notation to write them out. This is much simpler to write out rather than writing a lot of zeros.

Atoms on Earth – The estimated number of atoms that make up our planet is 10^{50} . This is a very large number and if you only add about 30 more zeros to that to make it 10^{80} you have a number very close to the total number of atoms in the observable universe. Your body has about 7×10^{27} atoms just in case you were wondering.

Googol – Now I know this is not a deep space object, but this is the name of the number that is 10^{100} . The term came about as a 9 year boy was talking to his smart math uncle who asked him for a very large number. Smart kid! Many years later the founders of Google chose this name to represent the search engine for which infinite bits of information on the internet would be searched by us astronomers.

Googolplex – Here I finally get lost. This number is so big if you typed out all the zeros on paper, that paper would fill the universe. This number is 10^{Googol} . If you had a Googolplex amount of seconds in time, that would last you for 3.16×10^{99} years. This number is just really, really big. Let's just call it good at that.

Factorial – I think these are cool! If, you are not familiar with this term, it is where you multiply all the number before it by each other, and this is designated with a "!" mark. This math function shows you the number of possible combinations for arranging that number of objects. For example, if we have 5 different coins the number of possible different sequences would be, $5! = 1 \times 2 \times 3 \times 4 \times 5 = 120$ possibilities. Let's try this using a deck of cards as a number for now so we have $52!$ which equals approximately 8×10^{67} . To give an approximation of what this number means, let's presume that we have a multiverse situation. We will say that there 100 trillion (100×10^{12}) universes, and each universe has 10^{24} stars (just like our universe), and each star has one planet with 8 billion (8×10^9) people on it just like earth. You give each person on each earth a deck of cards and they make a new arrangement every second. This would have to go on for 320 billion (320×10^9) years before they finish every possible combination. That is 23 times longer than the universe has existed. Inconceivable!!!

Infinity – Now here is a term that just seems to go on forever. Wait, it does go on forever! In fact, there is not one number we have discussed that even comes close to this number or concept. The irony with this number is that things can be infinity large or infinity small. If you take a rope and keep cutting it in half and repeat this, theoretically it can go on forever as each piece would get infinity smaller but never reaching zero. There are several interesting illustrations about infinity. My favorite is the hotel with infinite rooms and each room is occupied and then someone else needs to check in to the hotel. Always room for one more. My kids liked the Toy Story movies and I was always a bit intrigued about Buzz Lightyear going to infinity "and beyond."

I find that when I am looking out into space and see what seems like an infinite universe, it gives me an opportunity to stop and ponder how wonderful this life is. I am amazed to see the beauty of some objects larger than our solar system and then some things on earth as elegant as a single snowflake. We are given a few short years to spend with a few good friends and family, and there are some days that you wish could last forever. Enjoy it at the moment and live long and prosper.

SHOW TIME

Below is information about the items that our club members brought and explained for our annual show & tell meeting:

NoiseXTerminator is a fast and easy-to-use AI-powered noise reduction tool specifically for astrophotography. While AI-based noise reduction solutions exist for general photography, they were not trained on astronomical images, and most were trained in a “generative” fashion. As a result, they often mangle stars and invent detail that simply isn’t there. NoiseXTerminator was trained using purely discriminative (non-generative) methods, so it produces the best result possible without fabricating features that don’t exist.

Dean Louviere – He showed how he is getting the most bang for the buck with each of his astronomy purchases. A recent purchase is the Gemini Focuser Pro from AliExpress available from this link: https://a.aliexpress.com/_mNdSHYP. This is a great autofocuser, has an ASCOM driver and costs less than half as much as a ZWO EAF.

Bruce Horrocks – Demonstrated the following tools (text provided by Bruce):

BlurXTerminator is an AI-powered deconvolution tool designed specifically for astronomical images. It is available as a plug-in process module for PixInsight only. Because deconvolution inherently requires linear image data, The design intent of BlurXTerminator is to recover as much detail as possible based on low-contrast information actually present in an image, without fabricating detail that does not in fact exist just for the sake of an image that appears sharper. Great care has been taken in the architecture and training of the neural network to ensure that its output is as faithful as possible to reality if it is properly used.

StarXTerminator is an AI-powered tool to remove stars from astronomical photographs. This allows separate processing of stars and background objects, or simply leaving out the star salt together. Small stars, big stars, huge stars, and even diffraction spikes are recognized and removed, with minimal impact to non-stellar features. StarXTerminator is very easy to use, with no sliders to tweak or parameters to adjust

Dell Vance – Showed us some translucent plexiglass he is using to help him get the right exposures for his flats with his new astro camera. It is SimbaLux Acrylic Sheet White 32% Translucent Cast Plexiglass 12 inch x 12 inch square panels. They are available from Amazon at the following link: <https://a.co/d/bYfIIo>

Blaine Dickey – He told us how he is planning to use planetary mode with his SeeStar S50 for the lunar eclipse. Blaine will take one image every 60 seconds and it will be converted to a video.

Reviewed for us the following books and explained that they have a wealth of information about different objects to observe (from the Imm Astrophotography Series) which are available from Amazon:

The 750 Best Deep Sky Objects – by Gary Imm

Galaxies and Their Amazing Features – by Gary Imm

The Complete vdB Catalog – by Gary Imm

The Hickson Catalog – by Gary Imm

Note that there are three other books in the Imm

Astrophotography Series. Blaine said he may purchase some of these later:

The Complete Arp Catalog

The Top 250 Planetary Nebulae: A Guide for Astrophotographers

The Complete Messier Catalog: Plus Caldwell Catalog Highlights

Dave Rady – He shared his new carbon fiber tripod, which will work great with the SeeStar. We hope to have more details to share at a later time. Dave also showed us his manual filter wheel from Astromania. He is using this to hold various filters for planetary observations. You can find out more about this filter wheel at:

<https://astromaniaoptics.com/products/astromania-2quot-superior-quality-multiple-5-position-filter-wheel-for-telescope-allowing-you-to-image-without-any-reflections-or-stray-light?srsltid=AfmBOop4JUVFUSNxm-dm-1sTMIU4lxQVhy6YQcnMD9rUrgzm-xio6b2C7y&VariantsId=10332>

Dr Boyd Edwards – Shared with us his new William Optics Cat 91 WIFD, 5-Element Advanced Petzval Refractor. The William Optics writeup states, “The Petzval design inherently flattens the field, eliminating the need for an external field flattener.” More information can be found about this beautiful telescope at:

<https://williamoptics.com/products/cat-91-wifd?variant=46123394302169&gQT=2>

Dale Hooper -

Demonstrated the relativistic effects capabilities of StarStrider from

<https://www.fmjsoft.com/starstrider.html#main>. You

can download the shareware version (30 day trial) for free or purchase the full version for \$20 (which allows you to use a database with more stars and a higher resolution texture package).

StarStrider is a software planetarium, virtual spaceship, a 3D star chart and solar system simulator.

Dr Mario Harper – Shared his new ZWO ASI2600MC Air Wireless Smart Camera. This camera has an APS-C format (23.5mm x 15.7mm) and incorporates a cooled deep sky camera, guide camera and ZWO ASIAir all in one camera. More information about this all-in-one color camera can be found at:

<https://www.zwoastro.com/product/zwo-asi2600mc-air/>

Photo Gallery



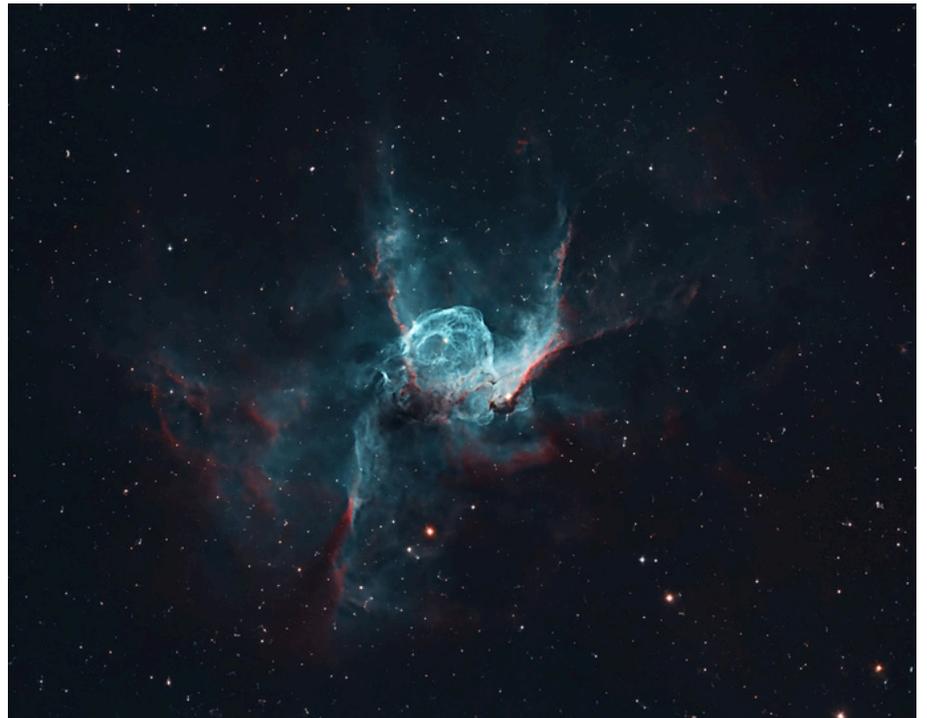
The Dolphin Nebula was HOO combination using a 150mm telescope and the ZWO 2600MM with Ha and Oiii filters.

It required 6 x 600 second exposure with each filter to capture this object.

-Bruce Horrocks

Thors Helmet Nebula was also a HOO combination using a 150mm telescope and the ZWO 2600MM with Ha and Oiii filters. This was made using 12 x 300 second exposures with each filter.

-Bruce Horrocks



CACHE VALLEY ASTRONOMICAL SOCIETY MEMBERSHIP APPLICATION FORM

Member # _____

NAME: _____
 First Middle Initial Last

Address: _____
 Street City State Zip Code

Home Phone: _____ **Cell Phone:** _____

Work Phone : _____ **Occupation :** _____

Email Address: _____

How did you learn about CVAS?

_____ Website _____ Star Party _____ CVAS Member _____ Other _____

Membership: \$20 lifetime membership

Tell us about yourself: Do you have a special interest in astronomy? Do you have special skills? Are you willing to volunteer on CVAS projects or attend public outreach star parties? Astro equipment owned.

By signing this application, I acknowledge I have access to the CVAS website, cvas-utahskies.org , and the CVAS constitution. I agree to abide by the constitution.

Signature: _____ **Date:** _____

Bring this form to the meeting or contact **Dell Vance, Membership Coordinator** at avteam.dell@gmail.com.