FOCUS

DELAWARE ASTRONOMICAL SOCIETY

**Next Meeting – Tuesday, November 20th, 2018 at 8pm
at the Mt. Cuba Astronomical Observatory**

MEETING TOPIC:
My Eclipses: The Good, The Bad, & The Ugly

Guest Speaker: Bob Summerfield

Photo by Nico Carver

In the November Issue

From the President
Rob Lancaster

We have had much better luck with the weather over the last couple of weeks and have made some great progress. We had a successful cleanup of the DAS corner of the store room on the first Tuesday after our October meeting, then we had another good cleanup of the Sawin observatory on the second Tuesday after the meeting. You can now move around much more safely and freely in both locations. We have also been working diligently on Tuesday nights with different groups working on various projects including building Arduino controlled automated focusers, working on Astrophotography software, upgrading the drive in the Sawin mount, and planning outreach events. We had excellent weather for the AP-SIG meeting, where we had excellent attendance, we had 3 telescopes imaging away, we had multiple beginners connecting to the club equipment for the first time, and we had a group doing visual observing. Also, I think we have had a number of clear nights in the past month or so that is greater than the number in the last 3 months combined (or at least it feels that way). I hope everyone is getting out and enjoying the fall weather.

This month we have a number of exciting events coming up. We have an Astrophotography Special Interest Group meeting, a Book Club Meeting, and a full DAS meeting. For this monthly meeting we welcome back the energetic and enthusiastic Bob Summerfield for a talk on Eclipses. Remember also that each Tuesday that is not a Monthly meeting, we will have the more informal Astronomy Workshops where you can pursue your interests in Astronomy. Please consider volunteering at or participating in some of these events. They really are a lot of fun and we really appreciate all you do for the club!

Thank you,

Rob Lancaster
DAS President

Report on the Chesapeake Star Party
Fred De Lucia

It's thrilling to observe objects within our 7 billion mile wide solar system or the 100-200 thousand light years of our own galaxy, but delving into the 10 million light year expanse of the Local Group of Galaxies raises the excitement quotient substantially. Going beyond that and lingering on galaxies, like the Whirlpool at 36 million light years away, or reaching to see clusters of galaxies even more distant brings indescribable wonders. That's the allure of truly dark skies and why the Chesapeake Star Party was worth a 4 hour drive.

GREG LEE SETTING UP HIS 16" F/4.5

One night of clouds, another of sucker holes followed by two nights of cloudless, eyebrow raising Milky Way is the short version of this report. Hopefully, this event was the first of many more to come of Chesapeake Star Parties at the Chesapeake's Virginia Eastern Shore hosted

SUNDAY BREAKFAST AT THE EXMORE DINER, ME, GREG LEE AND ROB LANCASTER

by Bay Star Telescopes. Bay Star Telescopes is the registered name of the fledgling telescope company of former DASer Shawn where the star party was held.

Mostly cloudy skies greeted me upon my Thursday arrival and the clouds seemed like they would prevail into Friday so I took a pass on observing either night. But on Friday Bob Jorgensen took the bait and later reported that the sky was full of evasive sucker holes. He no sooner would aim his 20" f/5 scope to an open area of sky when the "hole" of stars would fade to utter blackness. At other times, like invisible gates swinging open, a dense Milky Way would gradually flourish into view to last only a few minutes before the stars were snuffed out again. That's what happens at sites that are genuinely dark. You can't see clouds because there's no reflected light to illuminate them. If it's cloudy, the sky is just black and void of stars. When stars start appearing, the clouds are parting. So weird! But when it was clear the skies, measured by my SQM-L sky meter, were 6.38 Naked Eye Limiting Magnitude (NELM) with an intense Milky Way that stretched from horizon to horizon.

Participants during the star party proper were Bob and Erin Jorgensen, John and Karen Hornberger, Rob Lancaster, Greg Lee, Rick and Nancy Spencer, Rob Cordivari, Bill Hanagan, Shawn (our host) and me. Several neighbors and friends of Shawn's showed up on Saturday and Sunday. Beginning with Mars and Saturn for views relatively close to our home world and then moving beyond the Solar System to The Swan Nebula (M17), The Whirlpool Galaxy (M51) and the Keystone Cluster (M13) the neighbor guests got an overwhelming eyeful of mind-numbing astronomical wonders they never expected.

The telescope line up comprised 10 telescopes and a pair of binoculars. Although 6 large Newtonian Dobs dominated the field, most with GoTo tracking, there was no shortage of rich field views with smaller optics.

- Greg Lee had an Explore Scientific 16" f/4.5 and his mounted 20x80 binoculars,
- Rick Spencer brought an 18" f/4.2 Teeter,
- Bob Jorgensen set up his 20" f/5.0 Obsession,
- Rob Cordivari's 20" f/3.0 JP AstroCraft was accompanied by a camera mounted on an iOptron Skytracker,
- Shawn used his Kubota RTV to tow his DIY 22" f/3.2 onto the field,
- Rob Lancaster was busy with an OPT TPO 6" f/4.0 Newtonian for imaging on a Losmandy G11 mount and a 120mm f/5.0 Orion refractor for visual,
- John Hornberger cruised the sky with a Celestron Regal M2 100mm f/5.4 spotting scope,
- I had my 18" f/4.0 StarStructure and my 80mm Stellarvue f/6 apo refractor.

I'm sure Bill Hanagan and Rob Lancaster will report on their imaging hardware elsewhere in this issue.

Saturday night had plenty of open sky available. From 7:30PM and throughout the night not one cloud was present enabling me to remain on the field until 5AM. It was magnificent. Humidity was high but the seeing was spectacular. One of my favorite views was the Blue Snowball, NGC 7662, at 1137x. Sharing that view with Bob had him exclaiming with much surprise about the detail that high power brought to this familiar object. The outer shell and inner structure of the nebula was splendid.

Another jaw dropper view was NGC 246, the Skull Nebula, through Rob Cordivari's 20" f/3.0 scope. Both Greg Lee and I spent quite a while with Rob observing it. This ghostly nebula was much brighter and better detailed than at my local dark sites.

SHAWN AND HIS DIY 22" F/3.2

Rob Cordivari texted me afterward about how impressive "the wide open panoramic very dark sky" was and how he was "drooling over Canis Major rising to a jet black background without even a whiff of a light dome."

The ever elusive Horsehead (B33) wasn't the standout performer I saw during November two years ago at this same site when Orion, B33's home constellation, was higher. Now it took some patience and a judicious amount of averted vision. To maximize the light to my eye in my 18" I used an eyepiece yielding a 5mm exit pupil and a H-Beta filter. The dark nebula gave itself up as a very subtle shade against the faint nebula (IC 434) that was illuminated behind it. Sunday night Bill Hanagan was amazed with the star-filled field of view around M57, the Ring Nebula, and how inky black the spaces between the stars were while adding that it was the best view he ever saw of it. My observations uncovered its central neutron star holding steady and easily with slight averted vision.

The Sculptor Galaxy, NGC 253, at low altitude was such a delight due to the absence of any sky glow that it inspired Rob Lancaster to start an imaging run on it.

Dew had its varying degrees of issues for everyone. Some scopes had to shut down due to fogged primary or secondary mirrors. Others with dew controllers and eyepiece heaters were able to last out the session. Cameras also had dew issues unless precautions were taken. My only problem was with my filters fogging in my filter slide despite the slide having a heater, so I went

ME AND MY 18" F/4.0

old school and removed the convenient slide and resorted to changing filters by screwing them on and off my eyepiece barrels, an awkward exercise in the dark (I since modified my dew controller so the filter slide has its own dedicated heater channel, which should alleviate fogging issues).

Regretfully, I didn't spend nearly as much time catching views through others' scopes as I would have liked but I certainly shared many views through mine. However, there were hours when I selfishly pecked away at my observing lists digging deeper and deeper into that oh so black sky that sprawled in stellar brilliancy not seen in too long a time.
Two experiences alone made the trip worthwhile and will remain within my astronomy memory of views to recall when pressed for what I like to see. Under a sky as inviting as we had on that Saturday night NGC 383 and NGC 1275 were humbling to behold. NGC 383, aka the Pisces Cloud, is a string of about 8 or more galaxies in the 13th to 15th+ magnitude range that spread handsomely across an eyepiece's field of view. In an extra wide field 8mm eyepiece that gives an angular field of view of about 23 arc minutes in my 18" f/4.0 this collection of galaxies were strikingly contrasted against a deep, deep black background. Knowing that they were 230 million light years away brought more value to this part of the session.

But more impressive at 240 million light years distant was NGC 1275, the Perseus Galaxy Cluster. These splendorous wisps of light began traveling to us in the early years of the Mesozoic era, the age of reptiles and dinosaurs. I never pass up an opportunity to observe this array of galaxies when under very dark skies at this time of year. The galaxies of NGC 1275 are dispersed throughout the field of view against a rich region of dim background stars for which any number of eyepieces can bring gratifying rewards. For me I kept changing between my extra wide field 13mm and an 8mm. But using my 6mm and slowly scanning around the field brought wonders difficult to describe. The star cities that share the field with these galaxy clusters permeate with endless possibilities that humankind are likely never to understand fully.

Although void of details or clear definition, most of these very remote galaxies are rather elusive to see, yet, with patience, dedication, good optics, a wonderful dark sky and sufficient desire, one can gain a sense of the extreme, the potential infinite stretch of a universe hardly scratched by mortals. Humbling is a woefully inadequate word for these views through an eyepiece but it does provide an unassailable basis to seek out truly dark skies and for making the trek to the Chesapeake Star Party.

SHAWN'S 22", MY 18" & 80MM AND ROB CORDIVARI'S 20" F/3.0

BOB JORGENSON'S AND FRED'S SET UP AREA

ROB LANCASTER'S JEEP AND 6" IMAGING RIG

MONDAY BREAKFAST AT THE EXMORE DINER: ME, SHAWN AND GREG.

A Composite Image of the Core of the Milky Way, from the October 3 Chesapeake Star Party

Bill Hanagan

Below is a composite image showing the core of the Milky Way at October's Chesapeake Star Party. Fred DeLucia describes the Chesapeake Star Party in detail elsewhere in this issue of the FOCUS.

To capture the twenty sub-exposures that I used to create this image, I employed an old CG-5 German equatorial mount (GEM) and my Canon EOS 6D with a 50mm f/1.8 lens set at f/2.5.

I chose to image at ISO 3200 and to take 20 second images for alignment and stacking rather than taking a single 6 minute and 40 second exposure at a lower ISO. I did this primarily because it allowed aircraft with blinking lights to be easily removed from the final image via "pixel rejection" in PixInsight, the image processing software that I use.

The outline of the trees from the last exposure in the set was used to create the tree-profile section of this composite image. This gives up some part of the sky seen in the earlier sub-exposures but prevents the trees in the foreground from becoming a long blur in the final image.

For exposure control, I used the Canon TC80N/3 timer / remote trigger, though beginners should note that less expensive 3rd party versions of this have been available for some time.

I also used a camera gear-head for mounting the camera on the Vixen style dovetail that attaches to my old CG-5 mount in order to gain the necessary freedom of motion to frame the shot properly. For dew control, I used a "Thousand Oaks" dew controller powered by a Powerwerx 12V power supply, which itself was protected from dew in a plastic "SockitBox".

The SockitBox is not as feature-rich as a good NEMA4 enclosure, but it costs a little less and is readily available from Amazon on short notice. It can even protect electronics within from heavy rain and is commonly used for making 110V electrical connections that remain outdoors permanently.

The dew at the Chesapeake Star Party was heavy enough that I needed to add a second dew heater strip to the lens on my DSLR, but I needed the extra dew heater in part because my lens had an insulating rubber grip.

# A Fantastic Astrophotography Evening at Shawn Colyer's

Rob Lancaster

As Fred DeLucia explained eloquently elsewhere in this issue of the Focus, a number of us really had a great time in Exmore, VA last month after months and months of rain. It was a spectacularly clear night and my primary imaging setup worked perfectly all night long. I did not plug in any cables backwards destroying my camera, I did not forget my counterweights, I did not forget any cables, and I managed to get there several hours before sunset so that I could get everything all set up, test it, and make sure it was all working ahead of time. Those of you who have been on other trips we have made, know the issues I am referring to . . . but not this time!! That much cannot be said for my other setup. I brought along a camera with a sky tracker as a second imaging setup. The lens on the camera fogged up with dew right away. I had dew control with me for my primary setup, but not for the camera. So I said "Oh Well" and I focused on using my primary setup for imaging and while it was running I spent a lot of time gazing at the Milky Way, the North American Nebula, and other normally elusive objects in my refractor.

I started my primary imaging rig up as soon as it was dark enough to start imaging because I wanted to get photos of the objects in Sagittarius, which I often do not get to see because at my normal location here in Northern Delaware, my view of the south is both blocked by trees and obscured by the light pollution of Wilmington. So I did some quick calculations so that I would get enough Red, Green, and Blue images as well as some Ha and OIII images to enhance them. The images were not enough to get truly spectacular images of the Lagoon and the Trifid (I spent about 40 minutes on each), but long enough that I could get some of the best images I have taken of them for years. Then I proceeded on to the Helix Nebula. I wanted to get a really good image of this nebula because it was a very dark location and I did have a lot more time to image this one before it hit the trees. So I took about 3 hours of red, green, blue and Ha images of this nebula to try to bring out some details that are usually obscured by light pollution. Then after seeing a truly awesome view of the Sculptor galaxy in Fred's big scope, I decided to switch from the Helix to the Sculptor galaxy and I was not disappointed. I spent about 18 minutes imaging that and it was worth it. I was next thinking about moving on to some other objects, but it was then that I realized that my primary mirror was fogging up with dew and I don't have any dew control on that. That has never happened to me before. It did last from sunset (8 pm ish) until about 3 am, which is pretty good, but I might look into that.

The Helix Nebula: It is 9 Red, 9 Green, and 9 Blue Images combined with 9 Ha images. They were all 5 minutes apiece.
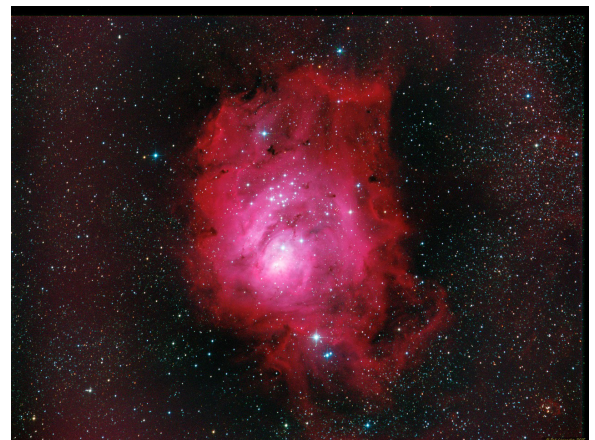
The Lagoon Nebula: It is 3 Red, 3, Blue, 3 Green, and 4 Ha images. All 3 minutes apiece.

The Sculptor Galaxy: It is just 3 Red, 3 Green, and 3 Blue Images of 3 minutes apiece.

My Current Main Imaging Setup:

ON THE SCOPE

- Losmandy G11 Mount with Gemini 1 Level IV
- TPO 6 inch f/4 Telescope from OPT
- Televue Paracorr to correct for coma
- Moonlite Focuser with Hi-Res Stepper Motor
- ZWO ASI 120 MM Guide Camera
- Orion 50 mm mini-guide scope
- SBIG STF8300-M camera (upgraded this summer)
- SBIG 8 position Filter Wheel
- Astrodon L, R, G, B filters
- Baader Ha and OIII filters
- Raspberry Pi 3 running INDIServer and PHD2
- Dewbuster Dew controller providing dew control and powering devices
- 100 Ah battery in homemade battery box

AT MY TABLE

- Homemade laptop enclosure
- Blanket to cover the box and opening (and sometimes for warmth)
- Mac Laptop
- KStars and Ekos Astrophotography Software as INDI client
- Red Laptop cover screen
- Either battery or AC power for the laptop

The Trifid Nebula: It is 3 Red, 3 Green, 3 Blue, 3 Ha, and 3 OIII images. They were all 3 minutes apiece.
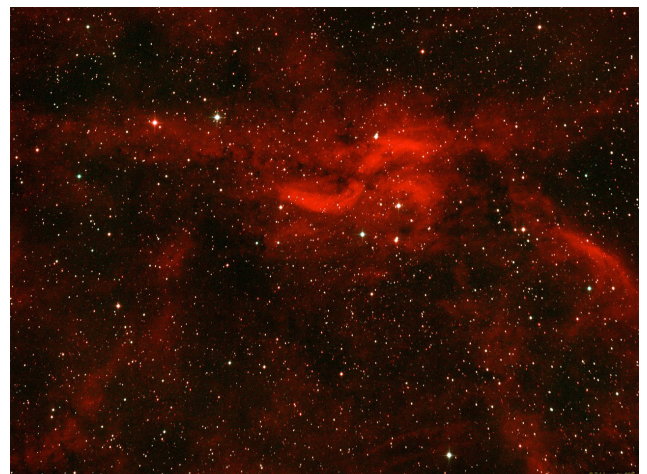
The Propeller Nebula taken from my driveway. It is 20 Ha images and 10 OIII images. (This was my practice shot before going down.)

November AP-SIG Meeting Report and Upcoming December Meeting

Bill Hanagan

Comet 21P and Stars
Photo by Mark Mitchell

November 2018 AP-SIG Meeting

The Astro-Photography Special Interest Group (AP-SIG) met on Saturday, November 3 at Mt. Cuba and the Sawin Observatory. The meeting started at 5 PM and ran to about 2 AM, though most of the group left around midnight. I provided the refreshments this time around (Pecan Brownies and Pecan Lemon Cake).

We began our meeting in daylight at the Sawin observatory to give several new members an introduction to the club's GO-TO mounts in the Sawin (HDX-110) and in the Skyshed POD (EQ6-R).

We stopped briefly for the group photo above, which is centered on the club's HDX-110 GO-TO mount and GSO 12" f/4 Imaging Newtonian, which several of us used later in the evening. From left to right (front) are Ryan Gilbert, Bill Hanagan, Eric Stricko, John Basaha, Sidney Ocampo, and Bob Jensen. Behind the wall, from left to right, are Rob Lancaster, Ron Worden, Bob Trebilcock, and Nico Carver. Nico did the honors setting up this shot using my DSLR.

Moving indoors while we awaited darkness, I gave the special topic presentation on "Getting Started in Astrophotography", using my own photos to show what can be done at several different hardware levels. Here's a progressive list of four hardware levels that many beginners work their way through as they develop their skills in astro-photography.

> **1)** A camera braced against a tree, rock, post, or other pre-existing support taking photos through the camera's "normal" lens;
> **2)** A camera mounted on a tripod taking photos through the camera's "normal" lens;
> **3)** A camera mounted on a low cost equatorial mount, a barn-door tracker, or a "Sky Tracker" taking photos through normal as well as telephoto camera lenses.
> **4)** A camera at the "prime focus" of a telescope mounted on a solid German equatorial mount taking photos unguided.

I didn't go into guiding, which is an advanced topic which we'll review at a future AP-SIG meeting. One of my example photos from hardware level 3, an image of the Milky Way, appears elsewhere in this issue of the FOCUS.

Nico Carver and Rob Lancaster also contributed to the discussion by reviewing their own portable tripod-mounted trackers, showing some of the photos they obtained using their DSLRs.

I also gave a second special topic presentation intended for beginners on how to Control "EQ" Style Telescope Mounts using Windows computers running ASCOM and Cartes du Ciel, in addition to controlling the Motorized Feathertouch Focuser using ASCOM.

After the indoor part of the meeting, we went out to the Sawin where I assisted several new members in connecting to and controlling the HDX-110 mount from their respective Windows computers. After some troubleshooting, Sidney Ocampo and Bob Jensen both successfully demonstrated control of the HDX-110 mount from their own computers and executed GO-TOs using Cartes du Ciel. Since the EQ6-R relies on EQMOD running under Windows just like the HDX-110, anyone who learns to use the HDX-110 will have an easy time learning to control the new EQ6-R with the same Windows software once the SkyShed POD is fully operational.

It was a beautiful night and both Nico Carver and Rob Lancaster brought out their portable imaging rigs to capture images after the meeting, with the added side benefit that AP-SIG members could see both rigs in action. Nico uses EQMOD with Sequence Generator Pro running under Windows on a laptop computer to acquire images with his EQ6 mount and Stellarvue SVQ85. Rob Lancaster uses a Linux based imaging program called Ekos to operate his Losmandy G11 and 6" f/4 Newtonian from his Mac, using a Raspberry Pi as an intermediary.

December 2018 AP-SIG Meeting

The December AP-SIG meeting is tentatively scheduled for the weekend of November 30 / December 1 at Dana and Barbara Wright's home. Dana will talk primarily about adding a stepper motor for driving the focuser on his 8" SCT. His talk will cover:

- Planning the system to achieve the step resolution necessary.
- Choosing and mounting the motor and the gear reduction hardware.
- Building an Arduino based stepper motor controller with USB interface.
- Installing and configuring the Windows ASCOM driver that controls the stepper motor through the Arduino.
- Operating the system from Windows based imaging software including Sequence Generator Pro.

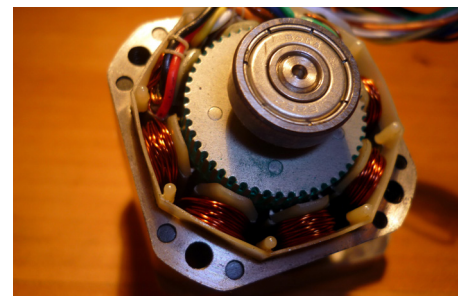Stepper motor by Dolly1010 (Vlastní fotografie), CC BY 3.0.

If you decide to try this, be careful to download only the software provided on the SourceForge web site (below) as related code from other sources has been found to contain malware.
https://sourceforge.net/projects/arduinoascomfocuserpro2diy/

As usual, we'll 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 with you to promote the discussion of image acquisition and processing techniques.

The exact time, location, and other details of the AP-SIG meeting will be announced a couple of days ahead of the meeting via the DAS Yahoo Group email list and 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. 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.

11/20/18 DAS Board Meeting Agenda

1. **Review of Minutes from Last Meeting—Bill McKibben**
2. **Treasurer's Report—Bob Trebilcock**
3. **Groups.io transition—Rob Lancaster**
4. **Report on storeroom & Sawin cleanups—Rob Lancaster**
5. **Plans for newly donated telescopes—Jeff Lawrence**
6. **Mount Cuba Work Days and Pods Project—Dave Groski**
7. **Making our scopes more beginner friendly (instructions, parts, procedures, etc)—Rob Lancaster**

November 1 is past--time to renew DAS Dues!

Delaware Astronomical Society 2019 annual membership dues were due November 1.

Dues remain $30 for the 2019 calendar year.

If you haven't already paid your 2019 dues there are several payment options:

1) You can bring cash, check or money order for $30 made out to DAS to the Tuesday meeting November 20. I will be available at the meeting to collect any payments.

2) You can use your PayPal account to send payment to DASmtcuba@gmail.com

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

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

4) You can mail payment to:

   Robert Trebilcock
   DAS Treasurer
   3823 Rotherfield Lane
   Chadds Ford, PA 19317

Photo by AP-SIG Member Ron Worden

Technical Information:

Target : NGC2024(Sharpless 277)
Constellation: Orion
Right Ascension: 05h 41m 54s
Declination: -01* 51' 0.0"
Distance: ~1350 ly
Apparent magnitude: 10.0
Apparent size: 30'x30'   Radius 30 ly
Date: 11/10/2018
Location: Snobie Observatory/Lincoln Control Center.
Bear, Delaware W75* 40' 43.04" N39* 34' 39.7"
Telescope: Meade 10" SCT + Meade 6.3 Focal Reducer 1575mm FL
Mount: Losmandy G11 Guided w Dithering
Cameras: SBIG ST4000XCM + ZWO174 autoguider(+-1arcsec)
Temperature: 35*F cooled to 0*C
Filters: OneShotColor
Exposure: 11LFs-300sec subs(55min)
Software: PixInsight
Frame: 33 x 33 arcmin
Calibration with: 50 Bias & 13 dark frames
Observer: Ron Worden

MCAO Volunteers Needed

Hello. I would like to introduce myself. My name is Kim Green and I am the secretary at the Mount Cuba Astronomical Observatory. This year we have increased our field trip activity, we have added many additional Public and Family Nights and we added children's programs to our calendar. The community has requested these programs and we are doing our best to accommodate. With that being said, we are looking for volunteers to help out. We are desperately in need of people who are available to help during our day time led trips. But we would also love to have some evening help as well. So keep an eye out for future emails from me. If you are interesting in helping out please contact me at 302-654-6407 or email me at KimGreenMCAO@gmail.com.

An Update on my Progress with KStars, INDI, and a Raspberry Pi

Rob Lancaster

It has been awhile since I described the current state of my work with KStars and INDI, so I think it might be worthwhile for me to do so now. Many of you know that back in the summer of 2016, I stumbled upon INDI from an email PixInsight had sent out about adding INDI support in PixInsight. After I learned a little more, I realized I had found a treasure and I plunged headfirst into converting my imaging system to one that used KStars, INDI, and a Raspberry Pi for Astrophotography.   As a refresher, INDI is a protocol similar to ASCOM, which connects to your devices using drivers and then makes them available to other programs. Unlike ASCOM, INDI not only works on the same computer, but also works over networks, so you can host your devices on a different computer like a Raspberry Pi and then control them from another computer such as a Mac or Windows Laptop. This is quite convenient in the observing field or observatory. On Linux and Mac computers, an INDI server runs INDI drivers, but on Windows, an INDI server typically runs ASCOM drivers. There are currently more than 20 INDI clients including the very popular programs: PixInsight, Cartes Du Ciel, CCDCiel, HNSky, Stellarium, PHD2, and KStars. KStars is a free full-featured planetarium program that acts as an INDI client. It has a sophisticated built-in Astrophotography suite called Ekos that controls the equipment. At the time I started using it, KStars only existed on Linux computers. For the first few months, I ran all of my equipment on my Raspberry Pi and controlled my setup over a VNC connection wirelessly or via Ethernet cable from my laptop. I wrote two articles about this for the Focus back in the Summer and fall of 2016.

6/2016 Focus: http://www.delastro.org/files/focus/2016-06-focus.pdf

9/2016 Focus: http://www.delastro.org/files/focus/2016-09-focus.pdf

I really liked how the program KStars worked on my Raspberry Pi and wanted to use it natively on my Mac laptop, which is of course faster than the Pi. I worked really hard and found some folks from around the world to help me port KStars so that it would work well on Mac computers as well as on Linux. I headed up the porting project and did most of the work, but they definitely provided tons of support such as testing what I edited, providing feedback, helping me solve issues, and writing a script to automate the build. I learned quite a bit in the process about C++, networking, astrophotography, and large software projects. About a month later, I was running KStars natively on my Mac and communicating wirelessly over Wi-Fi to the INDI Server on my Raspberry Pi. Thus,

KSTARS RUNNING ON MY MAC SHOWING **CYGNUS**

I was a happy camper, though there was still a lot of work to be done. By February of 2017, we had gotten far enough along so that we could release a disk image so that anyone with a Mac could use it. Around the same time that I was developing the Mac version, the Windows version of KStars was released as well (a different group was working on that), so now it is available for free on all 3 platforms. Please see https://edu.kde.org/kstars/ for details and download information for any computer. Also, the Windows version is now available on the Microsoft Store as of September of 2018.

KSTARS IMAGING THE **LOBSTER CLAW NEBULA** AT MY HOUSE
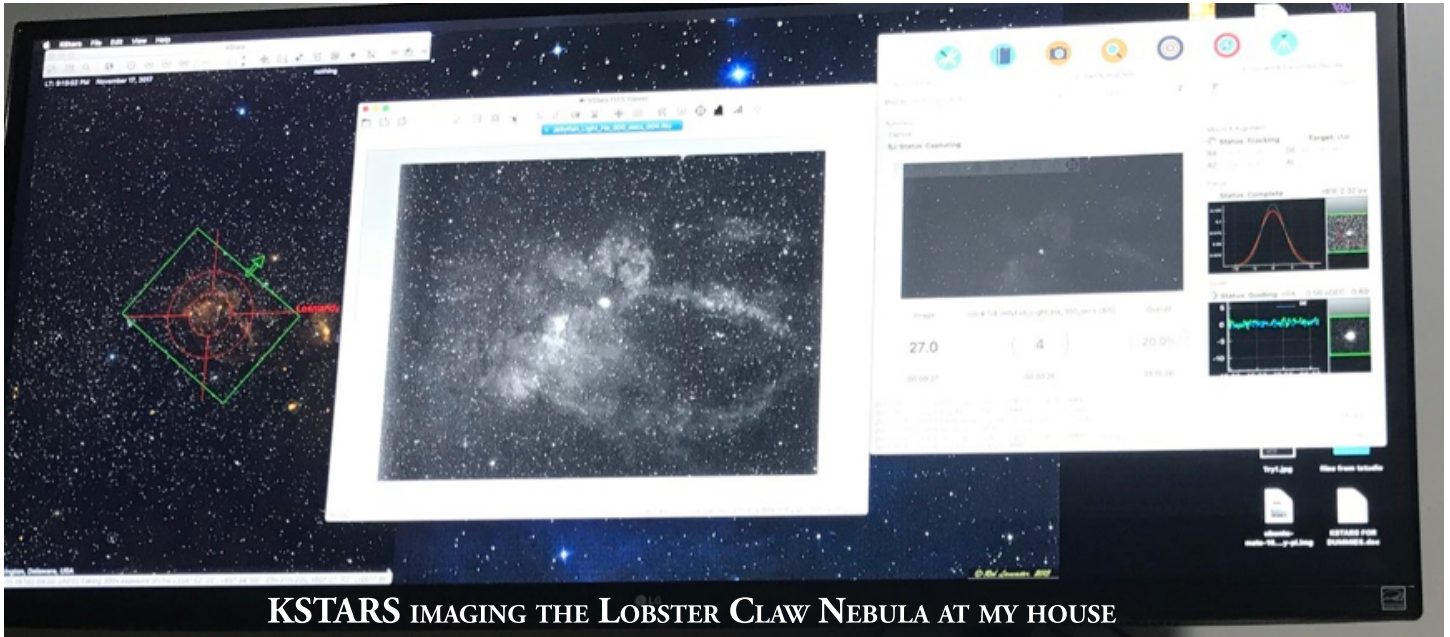
KStars and INDI are both constantly evolving. As community projects, they are continuing to improve as the community provides additions to the programs. They are not without bugs just like any software program, but the development team (which includes me) is incredibly responsive and most major issues that are reported are typically fixed within one or two days and then released in a new version, which is pretty amazing for a team of volunteers (in my opinion). As of now, KStars is a fully capable planetarium program with astrophotography control using its built-in astrophotography suite called Ekos. It is currently capable of image sequences, plate solving (locally and remotely) with Astrometry.net, internal or external (PHD2) guiding, fully robotic telescope control, and much more. INDI is currently capable of controlling dozens of telescope mounts, cameras, automatic focusers, filter wheels, domes, weather monitors, and other auxiliary equipment. The list of Devices supported on INDI


RON WARDEN IMAGING WITH **KSTARS** AT HOME

today may actually be longer than the devices supported by ASCOM, though which devices are supported by your system will depend on the operating system you are using on the computer to which they are connected. More devices are added every day. A list of compatible hardware is available here: https://www.indilib.org/devices.html and it is also compatible with most DSLR cameras, with the full list here: http://gphoto.org/proj/libgphoto2/support.php.   The best thing about INDI is that the devices do not have to be on the same computer because INDI works over the network. This easily accommodates wireless control. It also helps with compatibility. For example, if you have a camera that is not supported by Astrophotography software on your Windows computer (such as a Fishcamp Starfish or Pentax DSLR), a Raspberry Pi could support it and allow an astrophotography INDI client to access it wirelessly.

Recently the projects have gotten a lot of attention. Jasem Mutlaq, who heads up both projects, has gone on the Astro Imaging YouTube Channel a couple of times, in September of 2016 to talk about Ekos and in August of 2018 to talk about Raspberry Pis. I participated in the 2018 talk. Jasem's Stellarmate product which is based INDI and KStars was featured in Astronomy Technology Today in June of 2018. Recently, ZWO started selling a product they are calling the ASI Air, which is also based on INDI and a Raspberry Pi. In January 2018, I gave a presentation and interactive lesson on the use of KStars and INDI at the University of Delaware as a part of an Astronomy Visualization Workshop. There are now numerous projects and YouTube channels working on projects related to INDI and the Raspberry Pi.

Since I have gotten involved with INDI and KStars, in addition to porting KStars to Mac computers, I have added a number of my own improvements to both KStars and INDI. I really do enjoy programming, astronomy, and making things. This combines all of my interests in a way that I can give back to the world. It is also really exciting to work with people from around the world at the forefront of astronomy and astronomical imaging. I regularly interact with people from Kuwait, Germany, France, Great Britain, Slovakia, Italy, and other areas of the United States in these projects. And hopefully with all of this work we have been doing, we can provide anybody in the world who is interested in astrophotography from beginners to experienced astrophotographers with free software that is powerful and capable enough to support their hobby. Below are a few of the highlights of my own additions with a brief summary of each if you are interested.

Summary Tab (Summer 2016)

My very first contribution to KStars was to make a suggestion to Jasem that Ekos really needed a summary screen so that a user could see everything that is going on with their imaging session as it is happening at one glance. I did not write the code, but I like to think of it as my first contribution since I did suggest it to him.
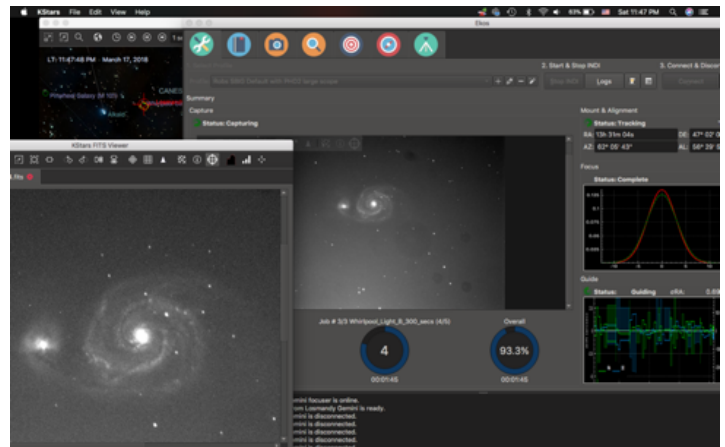
FITSViewer Window (October 2016)

One of the first things that I did myself besides porting KStars was to make updates to the FITSViewer window. I improved the ways in which the user interacts with the image to make zooming and panning more natural. I added a couple of overlays, added a feature that automatically identifies objects in your images, and a feature that will let you re-center your telescope by just clicking on your image where you want the new center to be
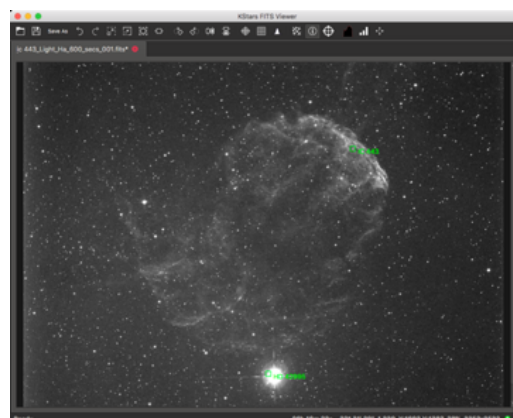
Astrometry.net Configuration and Index File Downloader (Feb 2017)

Astrometry.net is a fantastic program, but it can be incredibly confusing to set up and configure properly. It allows you to take images anywhere in the sky and then automatically update your telescope about where it is pointing by "plate solving" the image. For months I struggled to get the settings exactly right so that I could plate solve images within a few seconds. KStars was already capable of communicating with astrometry.net, but the user had to enter the options they wanted to use and the user had to manually install astrometry and index files. After I learned quite a bit about it, I decided it would be really helpful for users if I overhauled the way KStars interacts with astrometry.net based on what I learned. I made the options into checkboxes that were somewhat automated. I also made an index file downloader, where all the user has to do is to click the index files they want and the files will download and install automatically. I also programmed it to recommend certain files based on the field of view of the camera.
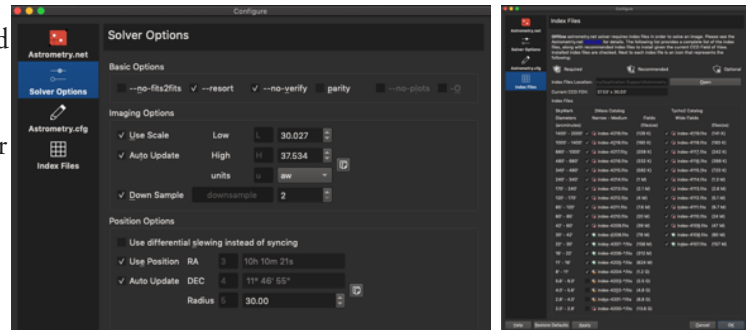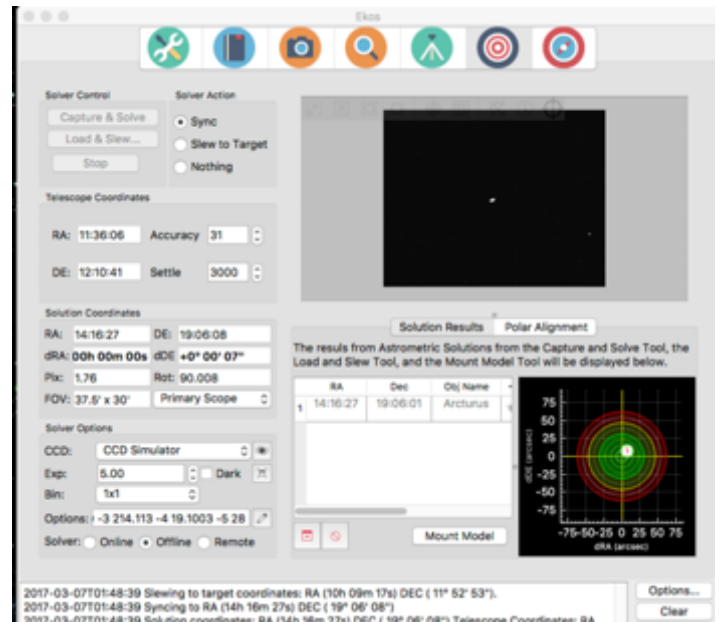
Plate Solving Error Graph (March 2017)

Jasem had said numerous times that he had wanted to implement this feature and just never had time. When an image is plate solved, there is a difference between the location where the mount thinks it is pointing and the actual location the mount is pointing at based on the plate solve. This information can be very useful for the user to determine how reliable the current pointing model actually is, to determine whether they need to do more plate solves to get accurate slews, and to analyze the performance of the mount. So, I worked to display that information in a tabular and graphical format with both the RA and DEC error displayed on the plot for the last several plate solves.

Mount Modeling Tool (March 2017)

I added this feature to KStars as an extension of my work on the plate solving graph because my mount (Losmandy G11) is capable of getting greater accuracy the more alignment points it has, but you really want those points to be nicely distributed around the sky to get a good pointing model. So it is basically a tool that lets you select objects or locations in the sky to plate solve and helps you visualize where those points will be on the sky map. Then it can automatically go through your list to perfect your pointing model. This feature is not for everyone, because not all telescopes can benefit from more alignment points. But two common examples that can benefit from using it would be the Losmandy G11 and EQMod, both of which are very common in our club.
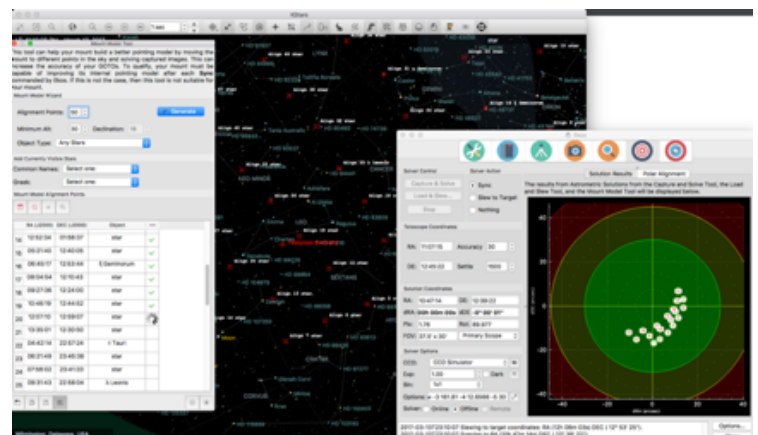
## What's Interesting Tool (May 2017)

This tool already existed in KStars but its potential was not being met. I have always wanted software that could let me truly explore catalogs like Sharpless and NGC. There are so many great objects out there and having a nice, visually interesting platform to explore them is great. So I overhauled the feature. It used to show a little bit of information that the author of the feature wrote about a few objects he thought to be interesting. Instead, I programmed it to show information about all the objects in the sky, filtered and sorted by the user so that its not overwhelming. I used the list of interesting objects as a starting point, but expanded it quite a bit. I changed the feature so that it could get data, information, and images from Wikipedia and other sources. And finally I made it so that you could explore the catalogs, which was what I wanted in the first place.

## Raspberry Pi Setup Script—AstroPi3 (September 2017)

It can be really challenging to set up any computer system, let alone one you are not familiar with. It took me a couple of months of work with configurations, settings, and programs to get my Raspberry Pi 3 just the way I wanted it. Luckily at the same time I was making it, I took notes on what I did and shared them with others. When other people started using the Raspberry Pi as well around the world, they used my instructions and made modifications to my instructions. By September of 2017 there were a number of images online that people could download as well as some preconfigured Raspberry Pis that you could buy. But I still liked the configuration that I had made. When I was setting up a Raspberry Pi for Ron Worden, I realized that it would really help to automate this setup in a script. So I did that and I posted it online. Using this script, anybody can set up a Raspberry Pi for Astrophotography and they can also customize the process if they want it to be set up differently. I also made a variation on the script that could be used to set up other single board computers that I tested on the Odroid C2 and the Rock 64. But the Raspberry Pi 3 is still the best system in my opinion. Today this script gets more than 20 downloads per week. You can find out more here: https://github.com/rlancaste/AstroPi3

Improved Guiding Graphs (December 2017-January 2018)

KStars already had an internal guider that was written by Jasem as well as support for external guiding using PHD2, but the information that was presented in the Guide window was not as thorough as that provided by PHD2. KStars already had a "Drift Graph" that showed the error in RA and
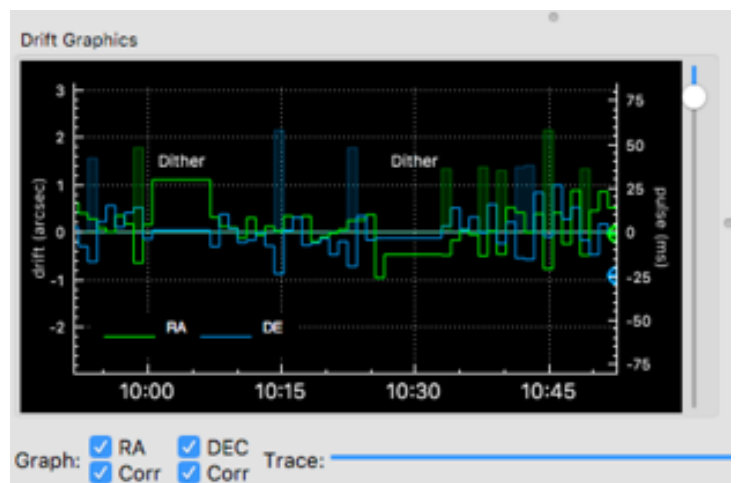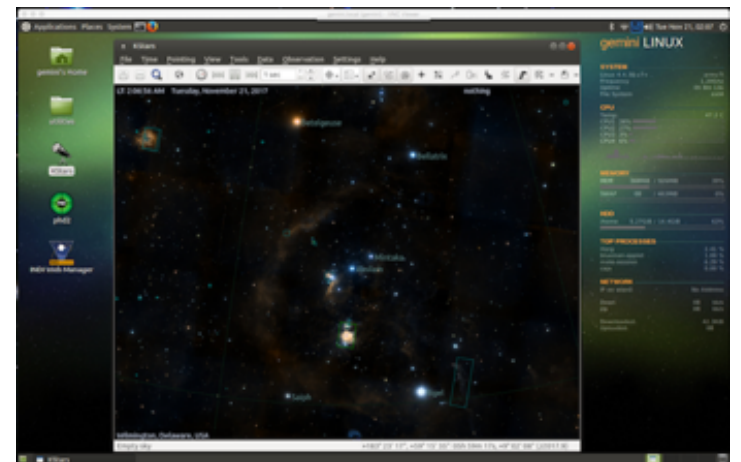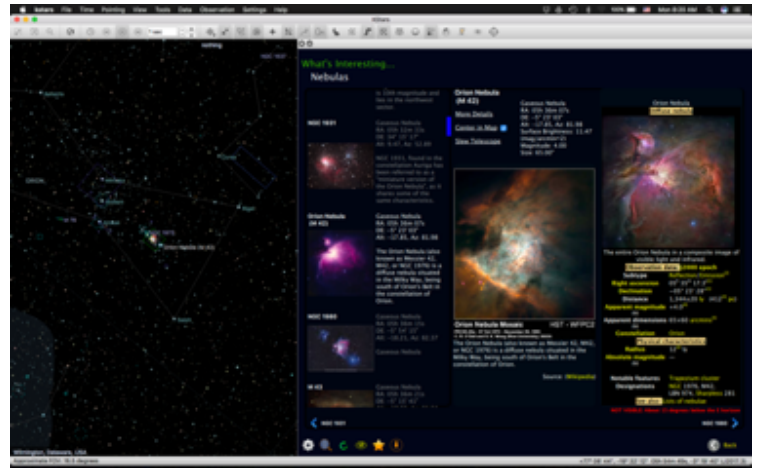
Dec as time went on, I added another plot that I called the "Drift Plot" which gave an X-Y representation of the error. I also enhanced the time-based graph to allow it to display the mount corrections in addition to the error, to be zoomable, to include a time slider to show the history, and to have several other options that were not there before.
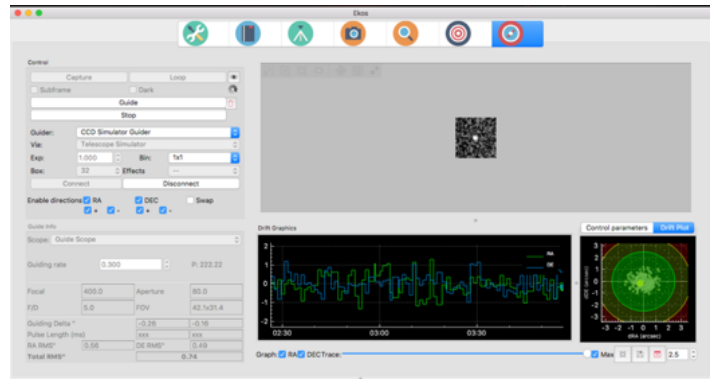

Improved PHD2 support (December 2017 -January 2018)

As I mentioned, PHD2 support was already included, but it did not send back all of the information to KStars that was possible and sometimes it had some communication issues. So I overhauled the way that the PHD2 interactions worked. I restructured the way the commands were sent and received. I also added more commands and used more of the data that was sent back to achieve better PHD2 integration in KStars. Now it seems to work much better and you get most of the same information that you get from the actual PHD2 screen without having to see the screen of PHD2. This is great for me because I am now running PHD2 on the Pi and getting the information back to see it in KStars. That way, I don't have to see the screen of the Pi to know what PHD2 is doing.

EKOS REPORTING PHD2 INFO

PHD2 GUIDING
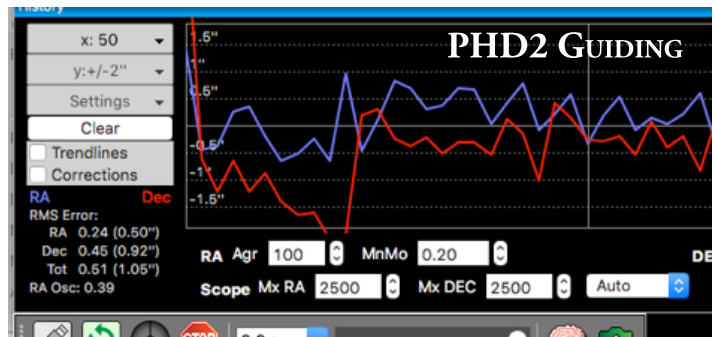
Star Profile Viewer (January 2018)

I added this feature more for fun than anything else. Years ago I had a piece of software that displayed some really nice 3D plots of the profiles of stars so the user could make judgments about the quality of the focus or guide stars. I found that QT (which KStars is built on) now had 3D graphs for Data Visualization so I decided to write a feature that would integrate those features and allow the user to visually inspect the data from their images in a 3D graph to get more information about the data. This feature is not just useful for those wanting to get a picture of how good their guide/focus stars are, it also could prove to be extremely valuable to researchers who want 3D or cross section graphs of the objects they are studying. I remember similar features in the software I used in college for research.

3D STAR PROFILE IN EKOS


CROSS SECTION STAR PROFILE IN EKOS
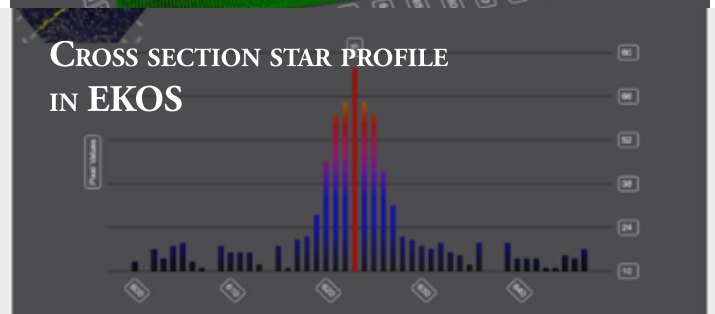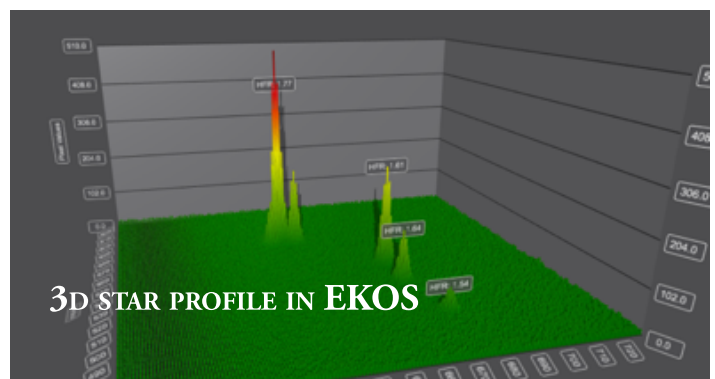
Finishing the Mac INDI drivers (May - June 2018)

When I first started using INDI on my Raspberry Pi in 2016, it already did exist on Macs as well, but the number of drivers that worked on Mac computers was less than the number that worked on Linux. Most of the mount drivers worked fine, but there were some noticeable gaps with CCDs in particular. When we ported KStars to work on Macs in 2016-2017, I just compiled what already existed in INDI for macs and put it into the KStars app bundle. As time went on, more and more CCD drivers got added and ported for Macs. Some of them I participated in, such as the DSI driver, and some were done by others such as the Apogee driver. By Spring of 2018, there were only a few that were not working on Macs. So, I made it my goal to solve this problem. I fixed any easy problems that I found, contacted vendors about adapting their Linux drivers to work on Macs as well, and got permission to include drivers that others had made but were not yet being included. After I completed my mission, the drivers SBIG, MGEN, ATIK, INDIDuino, SSAG, Morovian, Fishcamp, and Radio Detectors were all included with KStars for Mac OS.

Creating the INDI Webcam Driver (July 2018)

After I completed my Mac INDI driver project, I found that there was still one big thing missing on Mac computers compared to Linux. On Linux computers, webcams are supported using the V4L2 INDI driver which is built on the Video4Linux project. It supports literally hundreds of webcams on Linux computers. On Macs, there are a number of cameras that are natively supported by AV Foundation and related technologies, but there was no way to get V4L2 to work on Mac computers and there was no way to use these cameras in astrophotography software. After experimenting for a bit, I found that FFMPEG would provide me with the tools I would need to create a driver that could not only support webcams for Mac using AV Foundation, but also V4L2 on Linux, and Firewire IIDC cameras. It took me a couple of weeks of hard work to get that working. Then I realized that I could make a couple of minor changes to the code so that it could also support IP cameras and it could even support your cell phone camera wirelessly!!! And then I also realized that since the cell phone can take 30 frames per second, we could use that to automatically stack the frames and get better immediate results with the webcams. So, with this driver, you can now use your cell phone as a wireless guide camera on your astrophotography rig if you like. Or you can use your cell phone as your primary imager (assuming you can attach it to the telescope).
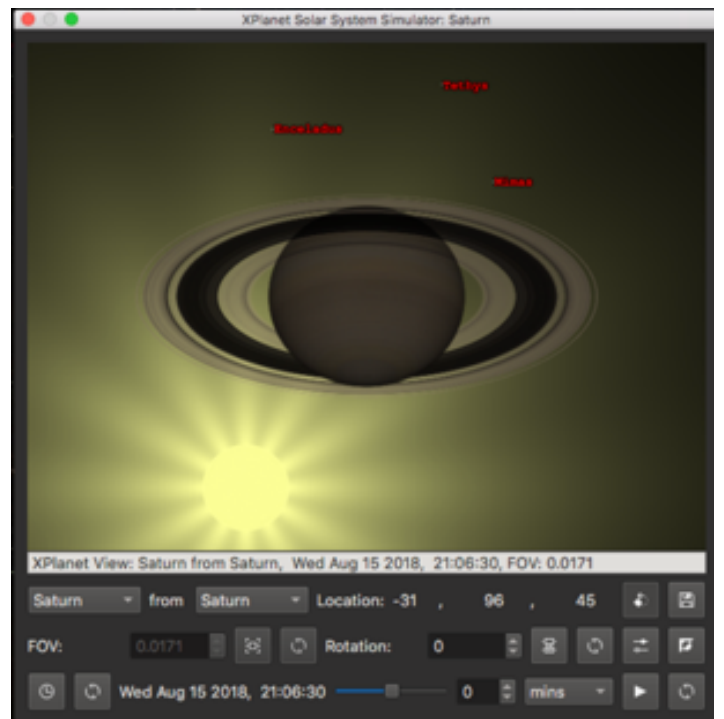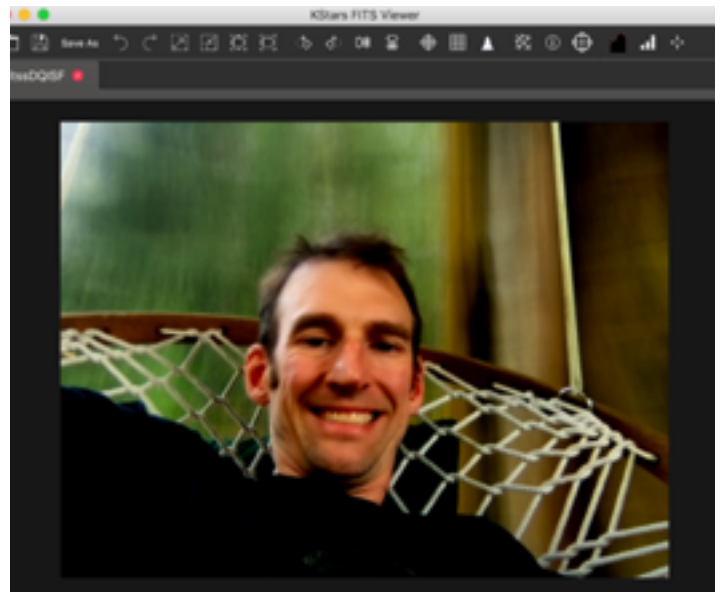
XPlanet Viewer (August 2018)

Several years ago, a user made a suggestion to Jasem that he should add XPlanet support to KStars. XPlanet is a solar system rendering software package that works on Windows, Macs, and Linux. He did add it, and KStars could then generate images of the planets and their moons based on the date and time. But I thought that this feature had a lot more potential. So, I decided to create a KStars tool that could make use of XPlanet to essentially make a solar system simulator. The user could watch animations, zoom to different planets, change the date and time, as well as view different astronomical events. I made the tool interactive so the user could pan around and zoom with the mouse. The tool requires the user to download planet

image maps and the accuracy of the planet markings will depend on the accuracy of those maps. But if they are accurate, you can see what the markings of Mars will look like at any given time, when one of the moons of Jupiter will transit, and identify the moons of Saturn.

Craft Recipes for KStars and Dependencies (Current project)

When we first started porting KStars to Macs, we followed a list of instructions. Then the instructions were turned into a script that could be run (Thanks to Jamie Smith in North Carolina!). But KStars for Windows currently makes use of the KDE Craft tool to build all of the dependencies and to build KStars. This has a number of advantages. Craft is maintained by multiple people on different projects, as opposed to our script that is just handled by us. This means it will be updated more often. Also it means that the builds can be done by craft on their servers. Currently, I have to build every KStars Mac version that is released on my home computer. It will be nice to have a nightly build that is not my responsibility. Also, if we can get Craft to build KStars for Mac on the KDE servers, then some of the recipes that we use to build the Mac version might be portable to the Windows version as well, which would enhance the capability of the Windows version of KStars.

Future Development

Both KStars and INDI are constantly getting improved and are global in scope. KStars has 119 contributors with 10,500 commits over the last 20 years. INDI has 83 contributors with 6,200 commits. The contributors include volunteers, researchers, companies who make astronomy products, and people with a passion for coding. Every summer there are Google "Summer of Code" students working on the projects to gain experience in coding a real-world project. Both KStars and INDI are used by hundreds of universities, individuals, and companies for device control on Linux, Mac, and Windows all around the world. More than 20 programs rely on INDI drivers for their device communications. Compared to most open source software projects, these are extremely active with multiple updates per day on average. The feature improvements that I explained above were my own personal contributions, but there are dozens like me who are contributing as well. I am planning to continue to make improvements like this where I see the need. One of the next things that I am planning to implement is Live CCD stacking in the FITSViewer. Another feature Jasem is currently working on is Web-based control of Ekos from a remote computer. Features like this get added all the time. Since Jasem has been in charge, KStars has been transformed from a typical simple planetarium program into a free astrophotography control center with observatory grade functions. There should be many other improvements like this for years to come with Jasem at the helm. And I am proud to support the production of free astrophotography software for users of all ability levels whether they use Windows, Macs, or Linux computers.

Please let me know if you have any questions. I would be glad to help.

For more information about INDI: https://indilib.org
For the INDI Source Code: https://github.com/indilib/indi
For help with INDI: https://www.indilib.org/forum.html
For more information about KStars: https://edu.kde.org/kstars/
For the KStars Source Code: https://github.com/KDE/kstars
For updates on the latest KStars Developments: http://knro.blogspot.com
For Video Tutorials made by Jasem: https://www.youtube.com/channel/UCIxLPA537RuQxHWvv5gw_zg
https://www.youtube.com/channel/UC1x4aSvnUVtBNafANsD_Izg

DAS Loaner Equipment

The DAS has several telescopes that are designated for loan to members. Our advice to new members is to take any of these telescope out on loan so you can learn the advantages and disadvantages of the various designs.

- 80mm Celestron Refractor with a NexStar GOTO mount. (On loan from Bill McKibben)

- Meade ETX 90mm Special Edition

- Bushnell Voyager 4" tabletop scope (AstroScan clone)

- Three Dobsonian scopes: two with 6" aperture, one with 8" aperture. This style scope is very easy for beginners.

- Meade 8" LX-10 Telescope: This 8" Meade LX-10 Schmidt Cassegrain Telescope (SCT) is a good loaner if you have any thoughts about buying an SCT telescope on a GoTo fork mount.

Procedure for DAS Members to Sign Out Loaner Equipment
Jack Goodwin

1. **Inform**: Please inform DAS Observatory Chair via e-mail -- this is currently how all loaner equipment is being logged/tracked. (email below)

2. **Borrower email to include:**
    a. Your name and contact information (cell #, email, home number, etc.)
    b. Date equipment borrowed
    c. Description of all equipment being borrowed
    d. Estimated return date for each component borrowed
    e. List any damaged/missing components (if applicable)

3. **Damage:** If the equipment is damaged while you are borrowing the equipment, please notify the DAS Observatory Chair in a timely manner.

4. **A sign out log** will be posted in the near term to compliment the email notification.

NOTE: Currently DAS Loaner equipment is **only available for loan to current DAS members**. (Which is a great excuse to join DAS)

Thank you,
Jack Goodwin,
DAS Observatory Chair
Jack_Goodwin@yahoo.com
610-457-2945 (cell)

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. We get together 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 have made several Newtonian telescope mirrors from scratch and completed some mirrors that members brought in as works in progress, including one that was started in the mid-1960's! We've also made new telescope tubes, made secondary mirror holders, tested numerous telescope objectives, made wire spiders for Newtonian secondaries, and made many solar filters for telescopes and binoculars. We also completed the refiguring of the DAS 17.5" Newtonian mirror used in the Big Dob currently housed in the Sawin Observatory.

If you're interested in telescope making, feel free to email me and let me know what you're interested in doing at hanaganw@verizon.net and include your name, address, and phone number. I'm always glad to provide some guidance and information to other telescope makers.

How to Join the DAS Yahoo Group
DAS FORUM / E-MAIL SITE ON YAHOO

This is an e-mail service for use by DAS members and our astronomy enthusiast friends. To use this site, go to http://groups.yahoo.com. To join, you must have a Yahoo ID and password; if you don't, you can register on the DAS Yahoo Group site by following Yahoo's instructions. You can then begin the short process 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 for approval of your application to join the DAS Yahoo Group, so other members will know to whom they are communicating (Note: you can elect to have your name and email address hidden from anyone other than members of the DAS Yahoo Group).

Finally, specify your desired email address for delivery of messages.

New Members Form

Please make checks payable to DAS, print out the following form and mail to:

Robert Trebilcock, DAS Treasurer, 3823 Rotherfield Lane, Chadds Ford, PA 19317

DAS Membership costs $30 per year, which renews November 1st. We pro-rate membership based on when you join, as follows:

Month Joined	Cost	Renewal Due
Jan-Feb	$30	This November
March-May	$20	This November
June-Aug	$10	This November
Sept-Dec.	$30	Next November

NEW MEMBERSHIP FORM

Item	Cost	Sub-total
Membership	$30/20/10	
Astronomy Magazine	$34	
	TOTAL:	

Name_____

Email Address_____

Street Address_____

Phone Number_____

City_____State_____

Zip_____

How did you hear about DAS?_____
_____

For questions or concerns, contact Robert Trebilcock, DAS Treasurer at (610) 558-1637 (leave message) or by email to Trebilcock@aol.com

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Vice-President: Jeff Lawrence, (302) 668-8277, Jeff@DelAstro.org
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Board Members at Large:
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Amy Hornberger, aehornberger@gmail.com
Dave Groski, groski@udel.edu

Standing Committee Chairs:
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Education: Ted Trevorrow, (302) 593-7949, edt750@verizon.net
Library: Maria Lavalle and Sue Bebon
Observing: Greg Lee, (302)252-7806, greglee288@gmail.com
Publications: Nico Carver, (302)353-2448, nicocarver@gmail.com

Other Positions:
Amateur Telescope Making Special Interest Group: Bill Hanagan, hanaganw@verizon.net
Astronomical League Coordinator: K Lynn King, klynnking@verizon.net
Astro-Photography Special Interest Group (AP-SIG): Bill Hanagan, hanaganw@verizon.net
Awards Chair: Amy Hornberger, aehornberger@gmail.com
DAS Book Club Leader: Amy Hornberger, aehornberger@gmail.com
Elections Chair: Nico Carver, nicocarver@gmail.com
Programs Chair: Jeff Lawrence, Jeff@DelAstro.org
Webmaster: Rob Lancaster, RLancaste@gmail.com

New Members

Please see the How to Join page on our website for methods to become a dues-paying member. If you have any questions call any of the member representatives listed.

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!