

# REFLECTIONS / REFRACTIONS

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University Lowbrow Astronomers Monthly Newsletter

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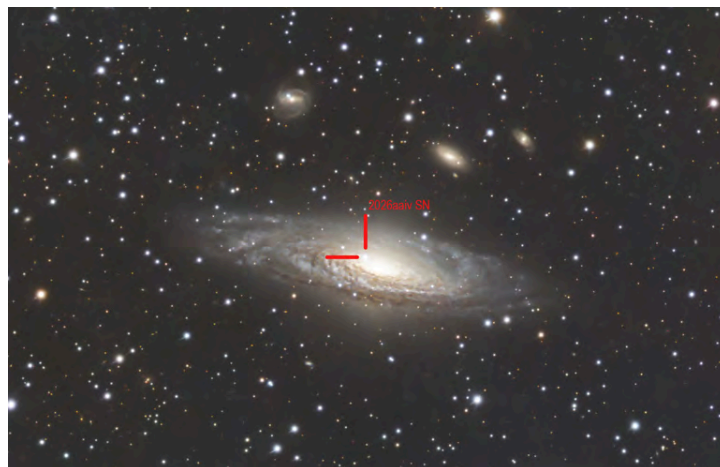
**Club Information** .....



## STEPHAN'S QUINTET & NGC7331 Supernova

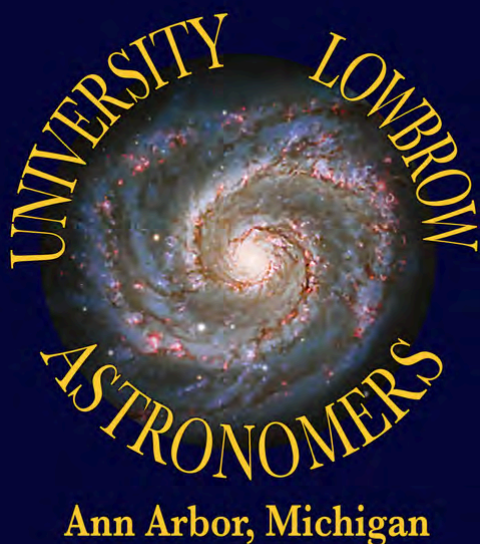
BY AWNI HAFEDH

This was one of the targets at BFSP (Bottom Feeder Star Party) in Gladwin this year. We had some great time with wonderful skies and epic company. The exciting thing about those targets was the Supernova



within NGC7331. It is marked in the image above. The other thing about this FoV is the beautiful cluster of Stephan's Quintet and the collection of many galaxies, starting from top-right (NGC7340, NGC7338, NGC7337, NGC7336, NGC7335, NGC7333, NGC7331, NGC7320, NGC7319, NGC7318, NGC7317) and there are a lot more tiny ones as well.

**SUPERNOVA** continues on page 6.



# BIG BLUE DOB: GPS UPGRADE

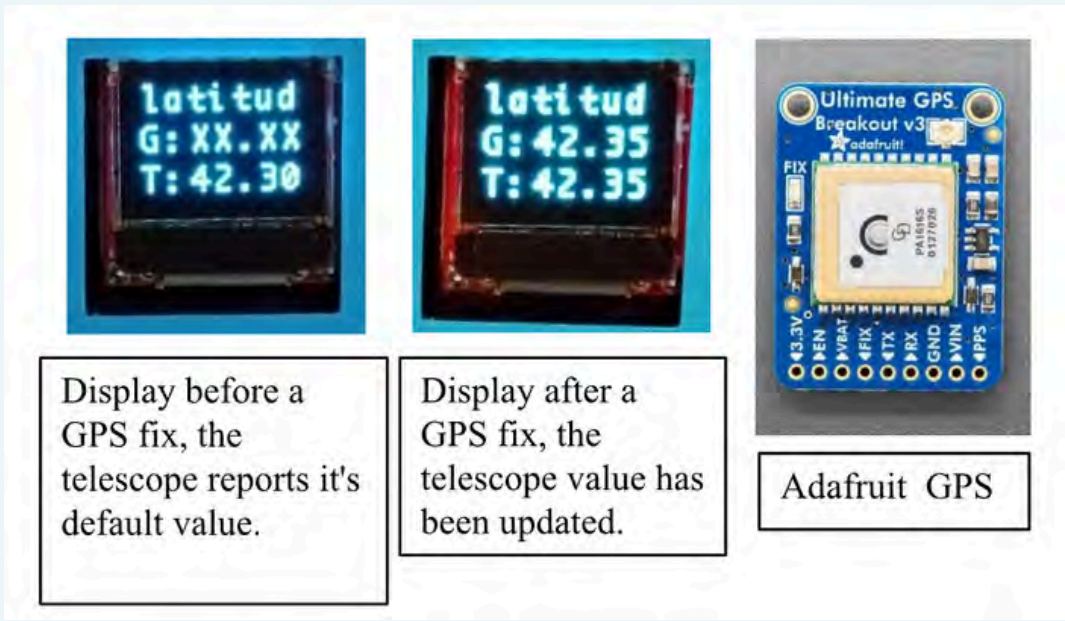
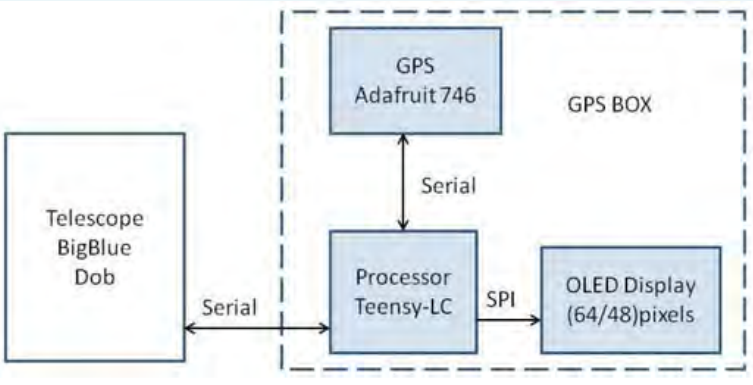
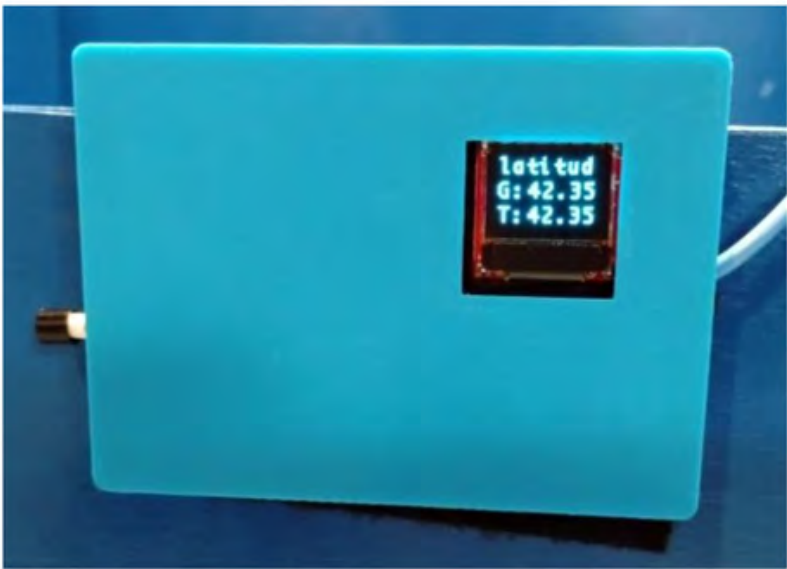
BY DON FOHEY

I designed and built my Big Blue Dob 14-1/4 inch f4.1 Newtonian several years ago. I added digital encoders, Bluetooth communication to Sky Safari, a stepper motor drive system and ALT-AZ tracking. The tracking equations require Azimuth, Altitude and Latitude. Syncing on Polaris establishes Azimuth and Altitude. The default Latitude is my home at 42.30 degrees. I have a method to manually change Latitude with a Bluetooth terminal emulator.

Traveling to another location required me to manually enter the Latitude. Sometimes I forget and it is just one more task in an already long list of things to do when setting up a truss dob. With GPS readily available, I designed and built a box to automatically set Latitude.

The Processor reads data from the GPS. The GPS sends a wealth of data and once the GPS has a location fix the Processor parses it out to extract only the Latitude. A GPS fix can take a couple of minutes. The Processor then sends the Latitude to the telescope and to the display. It appears as G: 42.35 for example.

The telescope sends Latitude to the Processor at power on and whenever the latitude is changed. The Processor then sends the telescope Latitude to the display. This insures a correct display of the current telescope Latitude value even if the GPS is unable to obtain a location fix. The button on the side of the box toggles the display on and off so that night vision isn't compromised.



**The system works nicely and Latitude is now one less thing to configure at setup.**



**YOU'RE INVITED TO ...  
ASTRONOMER DEAN REGAS'  
ONLINE CLASS**

**MONSTERS IN THE SKY**  
Tuesday October 6,  
7pm EDT

Astronomer Dean Regas guides you around monstrous stars and terrifying constellations of the season as well as special astronomical events coming up. To join October 6 use:

[https://us06web.zoom.us/j/86853076388?  
pwd=63FhlzKmpngprNaASHhYFrBfKVg3ox.1](https://us06web.zoom.us/j/86853076388?pwd=63FhlzKmpngprNaASHhYFrBfKVg3ox.1)

**Passcode:223660**

Dean Regas, Your Astronomer  
Host of the Looking Up podcast  
<https://www.astrodean.com>

**UPCOMING SPEAKER  
SCHEDULE**

**October 16:**

**Jim Shedlowski**

**Topic:** Peenemunde: The  
Birthplace of Space Travel

**November 20:**

**Sebastian Garcia**

**Topic:** Telescopius Software  
Update

**December 18:**

**Jim Shedlowski**

**Topic:** From Peenemunde  
to the Moon

**January 15:**

**Cayanne Matt**

**Topic:** Evolution of scaling  
relations between galaxy  
properties and  
supermassive black hole  
mass

**February 19: TBA**

**March 19: TBA**

## PARTIAL LUNAR ECLIPSE

BY DOUG  
SCOBEL



Partial Lunar Eclipse (almost total!) of August 27-28, 2026. The skies started out clear, but just after maximum eclipse clouds started rolling in. So I didn't get any good shots of the waning partial phases (I prefer to show the entire eclipse from start to finish). So I had to cut them off here.

The three shots, left to right, were taken at 22:34, 23:13, and 00:23 EDT, respectively. Corresponding approximately to the start of the partial phase, the middle of the partial phase, and maximum eclipse. The moon was obscured over 96% by the dark part of the earth's shadow (AKA umbra).

## IC5146 COCOON NEBULA & ENVIRONS

BY GLENN KAATZ

This is my most recent project, a wide field view of the Cocoon Nebula and the dark dust nebula extending from it (Barnard 168). IC 5146 is about 4,000 light years away in Cygnus. Imaging particulars:

Explore Scientific 102 mm triplet refractor  
ZWO AM5N mount  
ASI294 MC Pro camera  
Optolong 1.25 inch LPro filter  
ZWO electronic filter wheel  
ZWO automatic focuser  
10.4 hours of integration time, 3 minute subframes  
Processing with Pixinsight and Photoshop



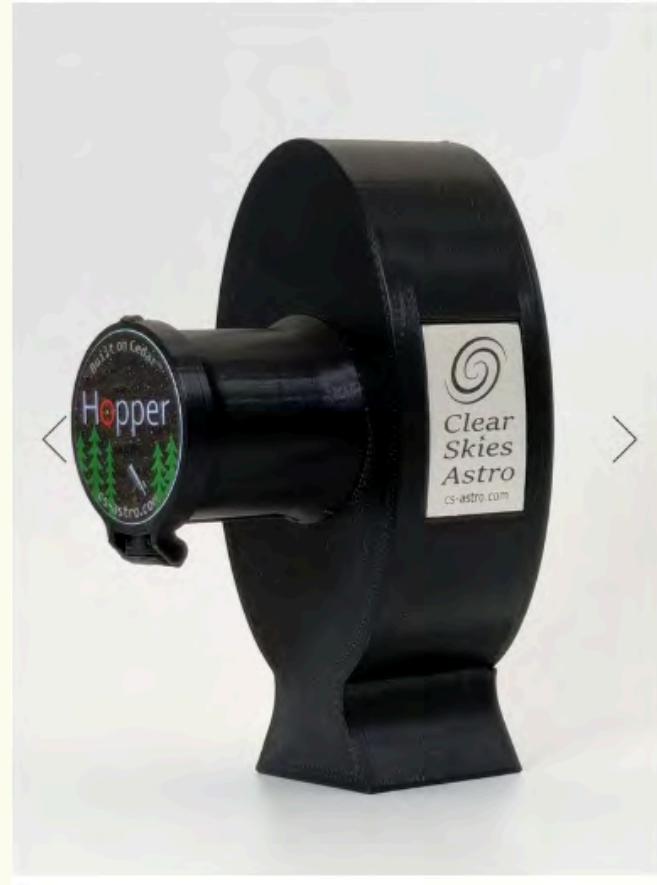
# REVIEW: CLEAR SKIES ASTRO "HOPPER" PLATE SOLVING FINDER

BY DON FOHEY

**The "Hopper" is a plate solving finder. It works so well that I will not use my digital encoder system again.**

I have used digital setting circles for years. My system communicates encoder data to Sky Safari via Bluetooth. Sky Safari places a cursor on the sky map at the location the telescope is pointing. A one- or two-star alignment is conducted. Some evenings the system works near perfect with objects appearing dead center in a high power eyepiece all across the sky. Other times it is accurate near the alignment star and there is an offset error as the telescope is moved across the sky. This can require me to repeat alignment on a nearby star. I have wrestled with this issue for years. I have worked on scope leveling, encoder axis orthogonality and everything I can think of. The "Hopper" works so well, I will never use my digital encoder to Sky Safari system again. I still need the encoder for my tracking system, which works well.

As an aside, I want to point out that the second star alignment feature on Sky Safari 7 Pro does not work with settings "Bluetooth", "Basic Encoder", "Alt AZ Push To". Aligning on the 2nd star does nothing. It works well on Sky Safari 6 Pro and Sky Safari 8 Pro. I have communicated with Simulation Curriculum, the parent company of Sky Safari. Their reply was, since it works with Sky Safari 8 Pro, we are not going to implement changes to Sky Safari 7. However Sky Safari 8 Pro does not work on my older tablet. This problem was partly the reason I was willing to try another solution.



It had been weeks waiting for clear skies. Finally, Thursday night, Sept 24 was clear. Neptune was at opposition. The Moon was one day from full. I set up my 14" telescope in my light polluted driveway. I could barely see a star or two. The "Hopper" saw stars, and I easily went to Neptune which was then centered in the eyepiece. Wow! With fair skies the Hopper display and/or Sky Safari cursor moves smoothly across the sky with telescope movement. With the washed out skies near the full moon there was some step movements as the Hopper located the very few visible stars. Performance was certainly good enough to easily move to a magnitude +7.8 Neptune 20 degrees from the nearly Full Moon.

The user interface to the Hopper is the "Cedar Aim App" available for Android or iOS. Your device connects to the WIFI network broadcasted by the Hopper. There appears to be a Bluetooth connection which I have not tried. You can use the Hopper as a standalone device or integrated with either Sky Safari or Stellarium. The Hopper easily mounts on a

REVIEW: CLEAR SKIES ASTRO "HOPPER" continues, p. 6

## REVIEW: CLEAR SKIES ASTRO "HOPPER" continues,...

standard finder dove tail (Synta/Vixen 32mm dovetail). it is very light, about 2.8 oz. The unit is powered like most USB devices with a USB-C connector. It requires 5Volts and consumes 2 watts.

To use the Hopper with Sky Safari do the following. Configured a Sky Safari telescope "Preset" for the Hopper. Connect tablet or phone to the Hopper's WIFI network. Start the Cedar Aim app. At setup the display shows stars in the field of view. Point the telescope to one of the stars and tap the star to align the Hopper with the telescope. The Cedar Aim app is no longer needed. Start Sky Safari and select "Telescope", "Connect". Sky Safari places a cursor on the sky map at the location the telescope is pointing. All done, what could be simpler, now move the telescope and the cursor moves. Move the telescope so that an object is centered in the cursor and the object will be centered in the eyepiece. Wow!

As a standalone device, after setup, the display shows stars and objects in the display field of view. There is a built-in catalog of

100,000 objects. After selecting an object the display continually shows you the direction and amount to move the telescope. When you get close the object appears on the display and then it is simple to center the object. I have only once used this feature. It does seem simple and easy to use.

Google AI reports:

☒ **Camera FOV:** ~20–25 degrees, optimized via its built-in pre-focused lens and sensor to capture robust star patterns while avoiding local obstructions like dew shields or the moon. [1, 2]

☒ **Pointing Accuracy:** Better than 1 arcminute (sub-20 arcsecond performance is common), allowing it to center targets precisely even at high eyepiece magnifications. [1, 2]

☒ **App Display:** The companion Cedar Aim app displays an interactive framing overlay showing a localized region around 10 degrees across surrounding your target. [1, 2]

Unfortunately, at this writing the Clear Skies Astro web site ( <https://www.cs-astro.com/> ) reports that the "Hopper is sold out" list price \$350.

## SUPERNOVA continued from page 1:

What really amazes me is that if you think about it, this galaxy is around 45 million light-years from us, which means that the supernova blast happened 45 million years ago. Simply mind blowing.

I captured 30x3min subs which makes it 1.5 hours of integration time.

Equipment used

Celestron 9.25" with 0.7x reducer

ZWO ASI2600MC Camera

Astronomik L filter

iOptron CEM60 mount

# A REVIEW OF WHAT THE SEESTAR S50PRO CAN DO

BY BRIAN D. OTTUM, Ph.D.

ZWO sent me a new Seestar S50Pro, gently asking me to publish my impressions. I'm not much of a social media influencer but do show 20,000 followers to my Instagram "astropicsdaily."

**UNBOXING** No, I did not shoot an unboxing video. Those are ridiculous. But it is shocking how small a box this thing ships in. 8"x14"x14"! Inside is a nice thin cardboard protector box that has fancy graphics and a handle (no enduring value). Then there is the all-foam case. This is very carefully designed packaging. Inside the foam case is just the device and its little carbon fiber tripod. That's it.

**SETTING UP** There is only one button, one USB-C charging port, and one hole (3/8" thread). It looks like it was designed by Apple Computer. The first thing I did was use one of my many USB charging cords to charge it. The LED indicator showed it was already 4 dots out of 5. So it charged fully in less than an hour.

Lowbrow Jeff Kopmanis, who has tons of experience with Seestars, let me borrow an equatorial tilt head. I attached it to one of my cheap Chinese carbon fiber tripods (a Surai, recommended by Lowbrow Adrian Bradley). Given my decades of astrophotography experience, my goal is to push this thing to the limit – so there's no need to operate in Alt-Az mode where exposures are limited by field rotation.

I downloaded the Seestar app to both my android Pixel phone and Pixel tablet. Soon I realized the larger screen is kinda required for all the complex details. Leveling the tripod took just a few minutes. The Seestar demands to have the button pointing UP in equatorial mode.

The app is shockingly powerful. Ten years ago, I'd need 10 different PC programs to do what this one phone app does. Alas, the app was obviously not designed by Apple Computer. More like Microsoft: complex screens, unintuitive navigation, important buttons hidden away. But once you spend a couple hours playing with the app, you get the hang of it. (I still needed to use Google Gemini to get help on some features.)



**HOW TO TAKE PICTURES** This device can automatically use or not use the light pollution filter, based on its knowledge of your location (light pollution) and the object you are shooting (nebulae for sure). The filter is a conventional dual band H-alpha and OIII, like the L-enhance or NBZ. Otherwise, there are automatic solar filters as well as base UV/IR cut filters.

The device knows what time it is, and its precise location by using GPS. The app has many suggestions of things that you can shoot the moment it starts up. Fantastic for the beginner. Once you select an object, it quickly slews to it and takes a short test shot. This is the amazing part: It compares the starfield to a local database of the entire sky to know EXACTLY where it is pointing ("plate-solving"). It then precisely centers the object in less than a minute. Shocking.

I set the software to the maximum exposure duration (60seconds). (I hope later software updates will allow the 5 minute exposures that can give even deeper images.) Once the S50Pro starts taking images of an object, it delays for a minute (presumably taking a dark frame). Then everything is on autopilot. It is taking images, aligning them, stacking them, averaging them, and showing you the updated summary. There is nothing you need to do, except watch the picture develop.

As I understand, the device uses dithering to eke out the highest possible resolution shots. That is where the centering adjusts by a tiny, tiny amount to the left/right/up/down to average out noise. Again, this is magic for a simple little device. When finished, you simply save the image, and it transfers to your phone/tablet. It's that simple.

**POST-PROCESSING** Those who've endured one of my presentations know that I always say that post-processing is more important than anything else when it comes to finished image quality. The Seestar app has AI-assisted tools that do a shockingly good job. You can crop, brighten, increase contrast, increase color. These are standard. It does two more things that are almost magic: reducing noise and reducing the stars. These are the most AI-assisted tools. They work great. I hunger for future updates on sophisticated stretching & sharpening and region-specific processing. At that point, Pixinsight/Siril/Photoshop will be superfluous. That day cannot come soon enough for me, even though I've invested a thousand hours (& \$) in Photoshop.

REVIEW: What the Seestars50 Pro can do continues, p. 8

## CAN A \$1000 TELESCOPE BEAT ONE COSTING \$7000?

Over the past 4 years, I have assembled a nice small astrophotography rig. The goal was quick imaging and portability – for both electronically-assisted astronomy (EAA, putting on shows for the public), and long exposure pretty pictures. The rig started out simple and relatively quick to set up, but adding autoguiding, autofocus, and dew control made it a chore. Here's the current \$7000 rig:

- ZWO AM-5 mount
- Sharpstar 6" f/2.8 reflector
- ZWO ASI2600MCpro cooled camera
- ZWO ASIAIR+ computer controller
- Small autoguiding scope and ZWO camera
- ZWO automatic focuser
- Dew heaters for scope and guidescope
- Waterproof 12VDC 10A power supply
- Many feet of USB and 12VDC cables

As many of you read in my earlier newsletter article, I installed this rig in my backyard observatory (where the dome used to be).



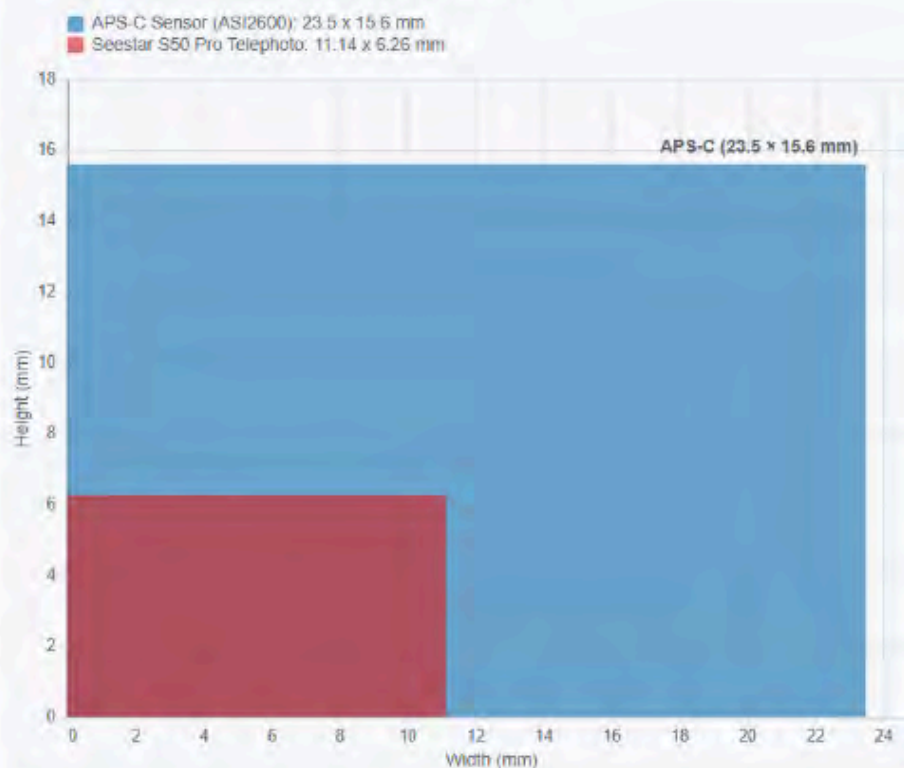
So the challenge was to put the new Seestar S50Pro up against this rig, in my light-polluted Saline backyard, side-by-side, shooting the same objects, for the same amount of time (about an hour), doing only minimal processing within the apps. Who will win?

## HEAD-TO-HEAD RESULTS

On September 7-8, I shot five objects with both rigs:

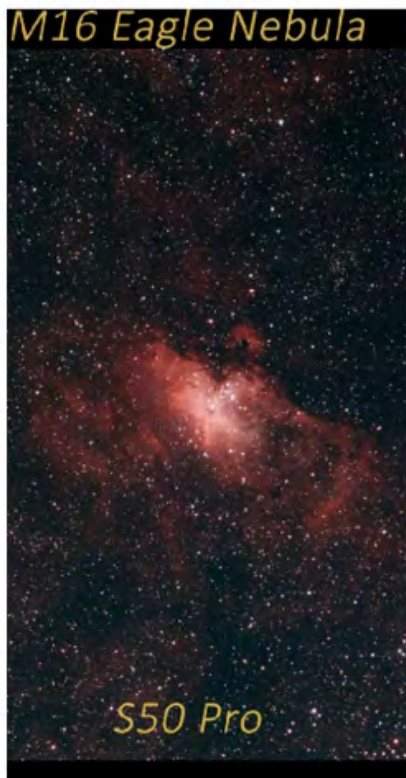
- M16 Eagle Nebula – stellar nursery with lots of hydrogen alpha gas
- Eastern Veil Nebula – supernova remnant with both hydrogen and oxygen
- North America Nebula – another big hydrogen cloud
- M27 Dumbbell Nebula – dying star with hydrogen and oxygen
- M31 Andromeda Galaxy – broadband object so no filters

Sensor Physical Size Comparison (mm)



**The next several pages show the results side by side.**

M16 Eagle Nebula



\$7000 Rig

NGC6992 Eastern Veil



\$7000 Rig

*NGC7000 North America Nebula*



*M31 Andromeda Galaxy*



## M27 Dumbbell Nebula



**H2H CONCLUSIONS** Physics says that the small 4K 3849x2160 pixel sensor in the Seestar cannot compete with my rig's medium-sized 6248x4176 pixel COOLED sensor. Physics says that the little 50mm aperture cannot compete with 150mm aperture. Physics says that the f/5.2 Seestar will gather photons way slower than my f/2.8 Sharpstar. Physics says that the Seestar's 2.3 arc-seconds per pixel resolution falls a bit short of the 1.8 in the expensive rig.

On the other hand, the Seestar offers a totally superior user experience. Instant gratification. It just works. Setup time is 5 minutes vs. an hour. Takedown time is 5 minutes vs. an hour. The Seestar can be carried onto a plane (my big rig cannot even fit into a large suitcase). The Seestar app does everything for you, freeing you up to stargaze, use binoculars, nap. The ASIAIR app that runs my \$7000 rig is very similar, but much more powerful and therefore more engaging. It requires/allows much more intervention and control. That's both good and bad.

If you closely inspect the Seestar images vs. those from my \$7000 rig, you will see that they are of slightly lower resolution, slightly lower depth, slightly lower detail. BUT, when you factor in the ridiculous ease and dramatically lower price you can reach the conclusion that the Seestar is MUCH more bang for the buck.

But I have to say that for people with a backyard where they can keep a scope set up, who enjoy the endless tweaking of post-processing, who want to shoot small objects, the S50P falls short. (Today.)

### PUSHING THE SEESTAR S50 PRO TO THE MAX

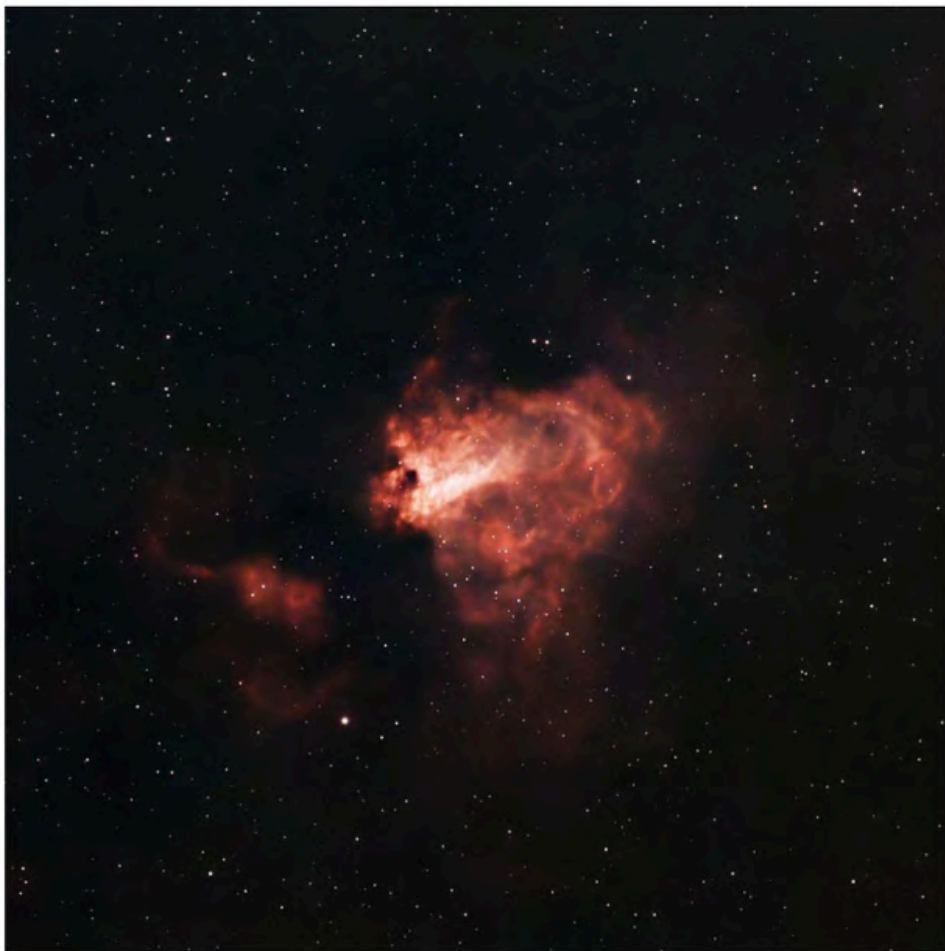
Just a couple days later, Sept. 9, 10, 11, I took the S50P to the Great Lakes Stargaze. The GLSG has relocated from Gladwin in the center of the state to Millersburg way up north. The new site is super dark. It is the Ocqueoc Outdoor Center, a historic Civilian Conservation Corps camp that is nearly 100 years old. The site has bunkhouses, showers, classroom, cafeteria and a commercial kitchen. There were many great talks on IRMA, Pixinsight, and Lowbrow Norbert Vance enlightening us on "hidden gems" in the sky. Fellow Lowbrows Tim Miller and Ken Ruble were also there.

My goal up north was to push the S50Pro and see what it could do: long integration times, mosaics, post-processing completely within the app. However, I did not use Plan Mode, which allows you to just select the objects you want and it will image all night long by itself!

It took me 5 minutes to take the device from my car, set it on the tripod, and level. Another 3 minutes to polar align once twilight came. Then I was ready to image.

**Twilight was still strong when I took just 15 minutes of exposure on M17, the Swan Nebula. Darn good result, despite a low altitude and twilight.**

**Also taken (below) in strong twilight, I shot M11 (Wild Duck Cluster), for just 10 minutes. I like the dark nebulae.**





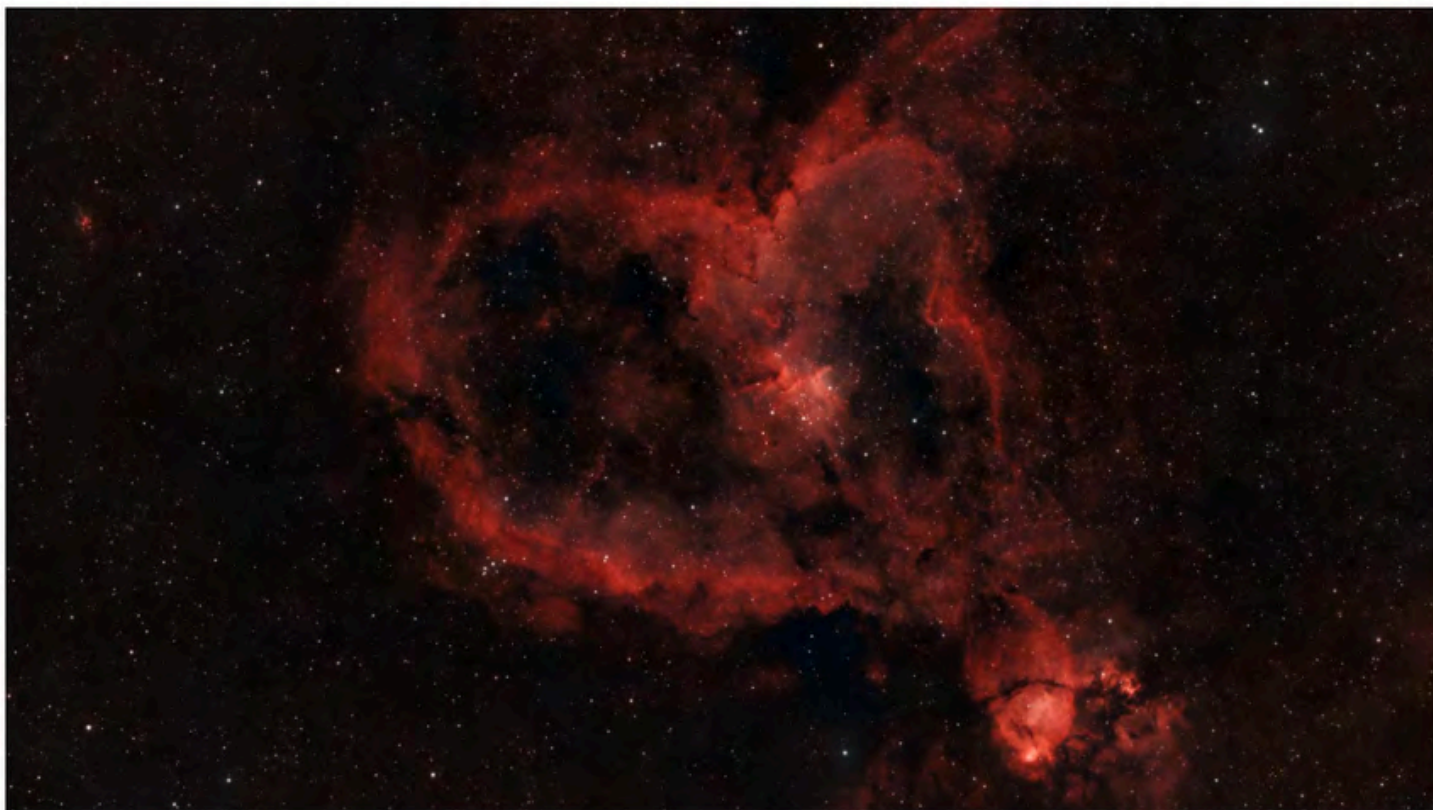
**The Helix Nebula does not get very high in the sky when you are located near the Mackinac Bridge. But one hour's worth of 60 second exposures does allow us to see the "eyebrow" of the Eye of God.**

**On the last night, I realized that I had not caught the M13 Hercules globular cluster. But I had so many other things to do, so I only took 2 exposures (each 60 seconds). Holy cow. You can see that NGC galaxy and even the closer IC galaxy.**

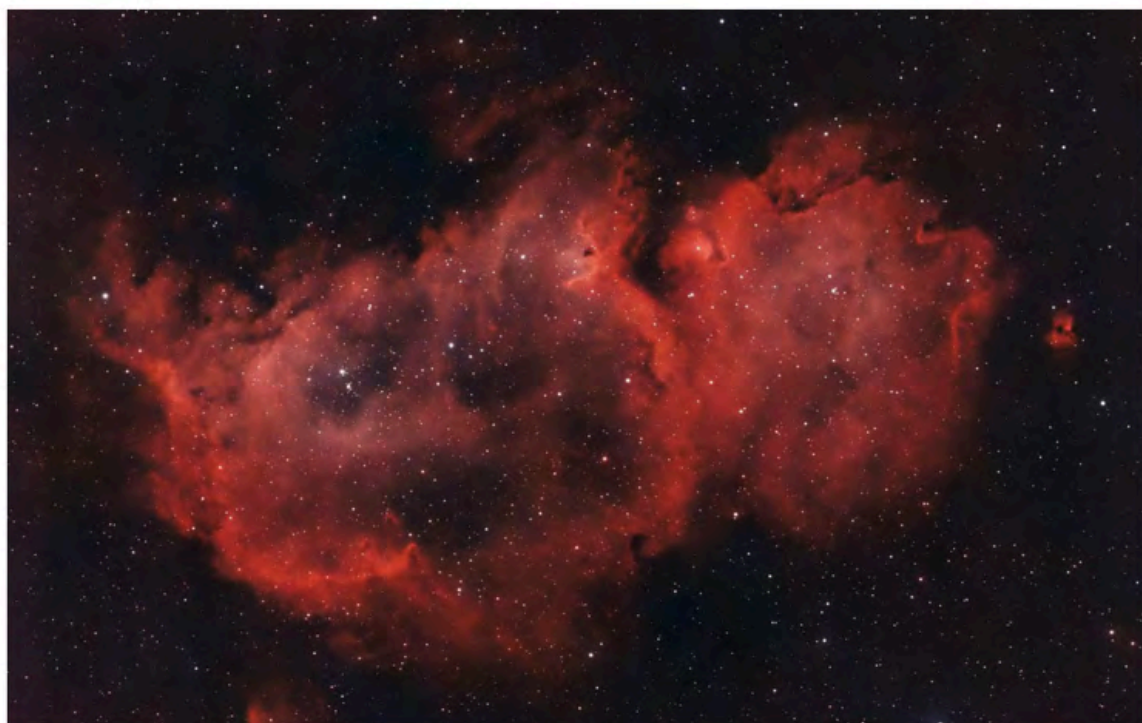


REVIEW: What the Seestars50 Pro can do continues, p. 14

**The Heart Nebula is so huge it required a 4X mosaic. You simply draw the square around the object, and S50P does the rest. A total of 1.5hrs exposure is good, but this object could benefit from a lot more.**

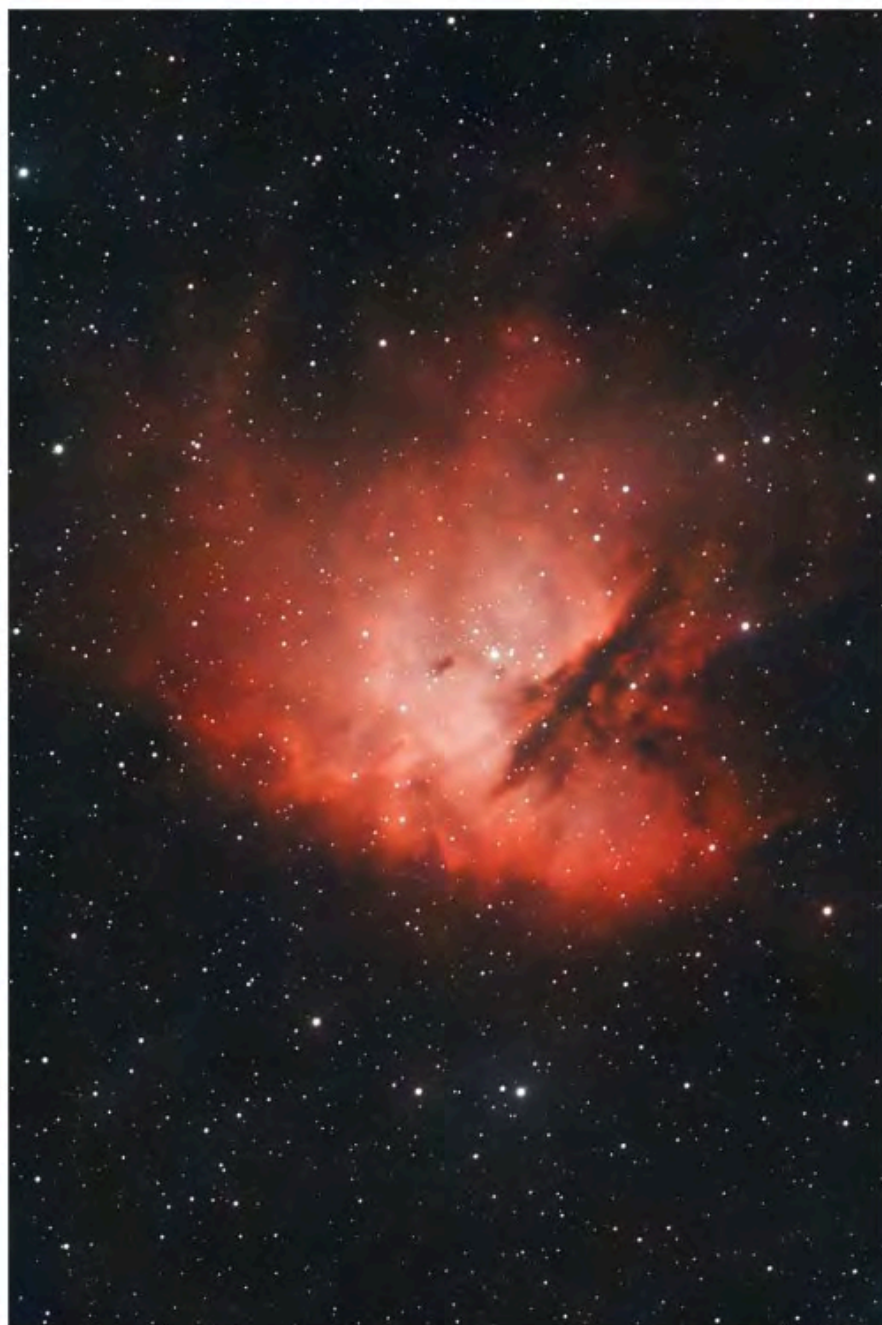


**The nearby Soul Nebula is a 3X mosaic with 1hr exposure. A little brighter than the Heart, with 25pct less area to cover.**





**As the Pleiades rose in the east at 3am, I took this shot for 40 minutes. Good, but the stars were quite bloated. The star reduction slider in the app did well to take away some but not all the bloating. Doubling this exposure would yield more dust.**



**The Pac Man Nebula is often overlooked. Here is an hour of exposures. Woka woka.**

**REVIEW: What the Seestars50 Pro can do continues from p. 15**

**There are so many good things to shoot. I only got 23 minutes on the Bubble Nebula and M52. Cool to see all the nebulosity.**



**The Butterfly Nebula is also called the Sadr Nebula, at the center of Cygnus. Just 21 minutes of exposure.**

**REVIEW: What the Seestars50 Pro can do continues, p. 17**

**REVIEW: What the Seestars50 Pro can do continues from p. 16**

**I'm very happy with this shot of M33, just an hour and twelve minutes of exposure. Single frame.**



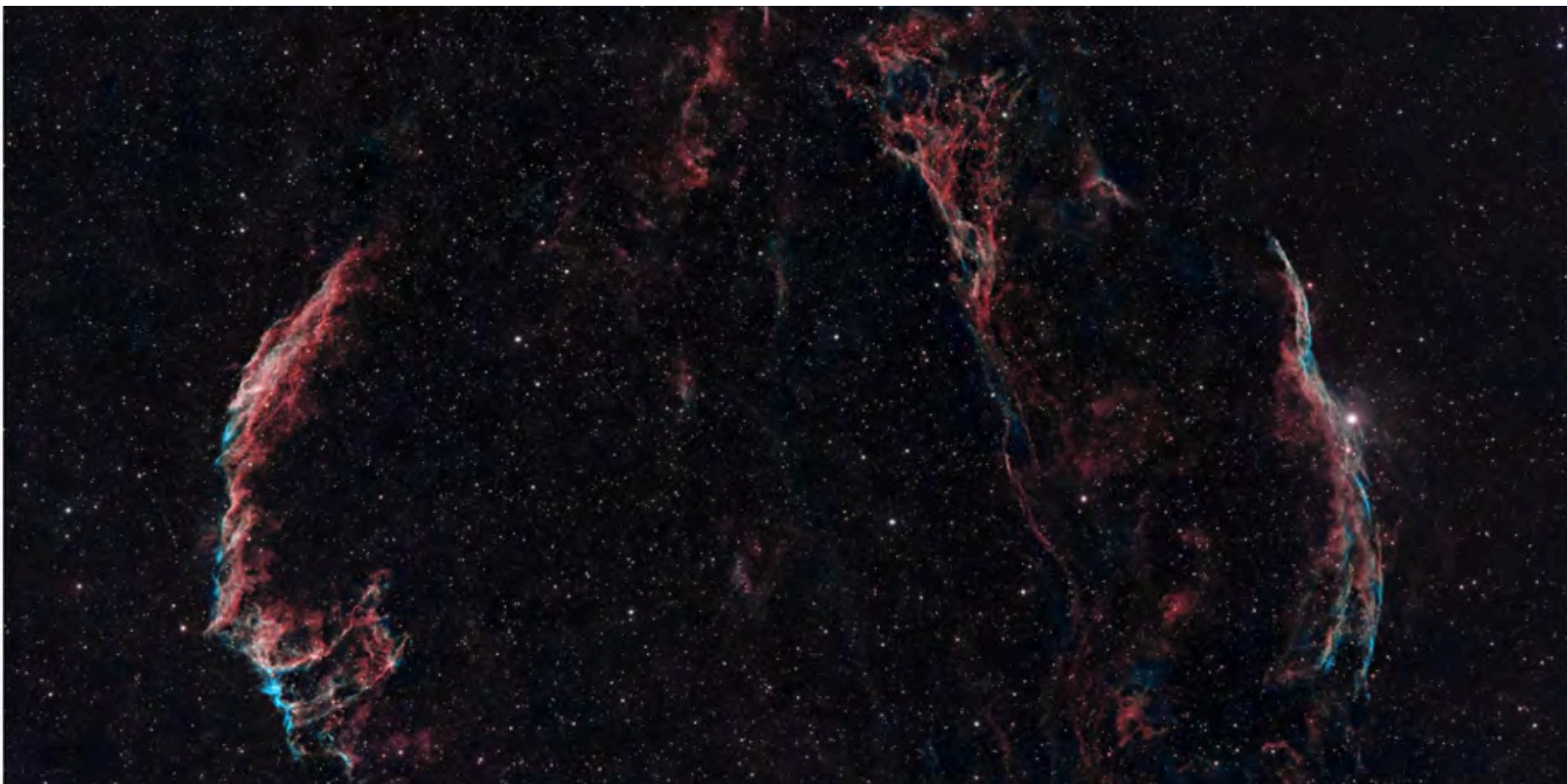
**The Elephant Trunk Nebula is in the center of IC1396 in Cepheus, near the Garnet Star. Just 19 minutes.**

**REVIEW: What the Seestars50 Pro can do continues, p. 18**

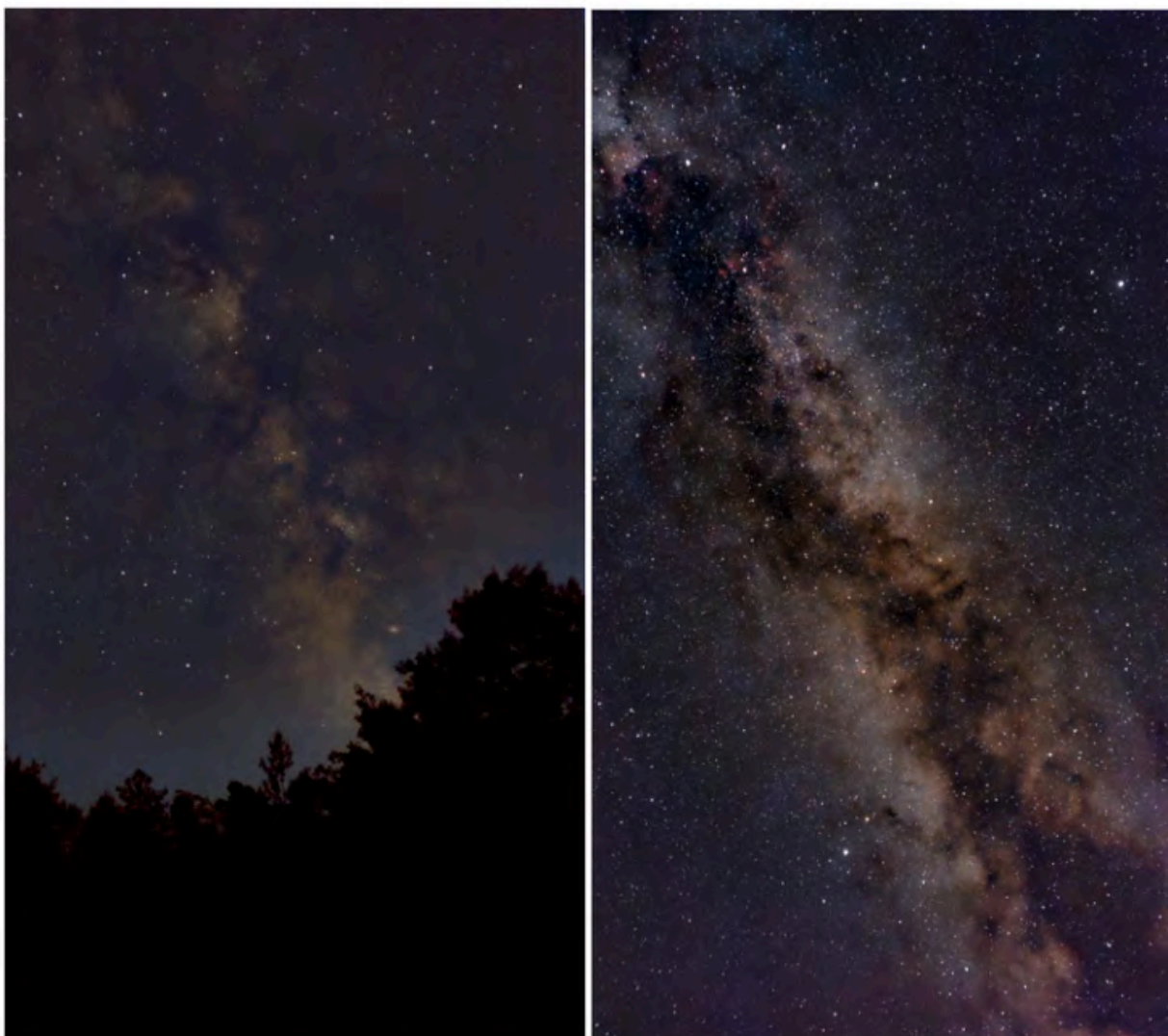
**Andromed  
a Galaxy  
just barely  
fits into  
the frame.  
This is  
2hrs. Not  
much  
different  
from what  
I took with  
my remote  
observator  
y.**



**The entire Veil supernova remnant requires a 3X mosaic. I cannot believe this much detail with only 48 minutes exposure! However, the S50P was pointed straight overhead during excellent transparency in a dark sky.**



**The S50P also contains a wide angle lens. Here are 10 and 20 minute stacks. Nothing better than my smartphone can take.**



### **SEESTAR IS A DISRUPTIVE INNOVATION**

Netflix, digital cameras and smartphones started out with low performance and were viewed as “crappy” substitutes. But they continually improved and eventually killed established competitors (Blockbuster, Kodak, RAZR). Seestar, as well as Dwarflabs are seen as nonthreatening “toys” by people who’ve spent thousands of dollars in their rigs. This is human nature – you have to mentally protect your investment.

Astrophotography hardware has been disrupted by ZWO and Dwarflabs. I predict that the next disruption will be in software. Pixinsight is the dominant power, but it requires DAYS of learning time. I’m cheering for ZWO to continue adding AI-assisted post-processing tools to the Seestar (and ASIAir) apps. So I don’t have to learn Pixinsight. So I can stop paying Adobe a ransom for Photoshop.

### **DRACO?**

Dwarflabs has teased us with the Draco, with a larger aperture (90mm vs. 50mm), faster light collection (f/3.8 vs f/5.2), bigger sensor (50megapixels vs 8!), longer exposures (300sec vs 60), cooled sensor, narrowband option. \$1400.

It seems too good to be true. They have not begun shipping. I asked them if they’d like me to do a head-to-head vs. the S50P. They asked me how many subscribers I have, how many commercial sponsors I have, and other questions. I pointed out that their competitor sent me a scope to test, unsolicited. And that my YouTube reviews got 30,000+ views in less than a month. Stay tuned.

## NO MINUTES THIS MONTH!

Enjoy one final Seestar image, this time from the Seestar S30



### NGC 7023 (IRIS NEBULA)

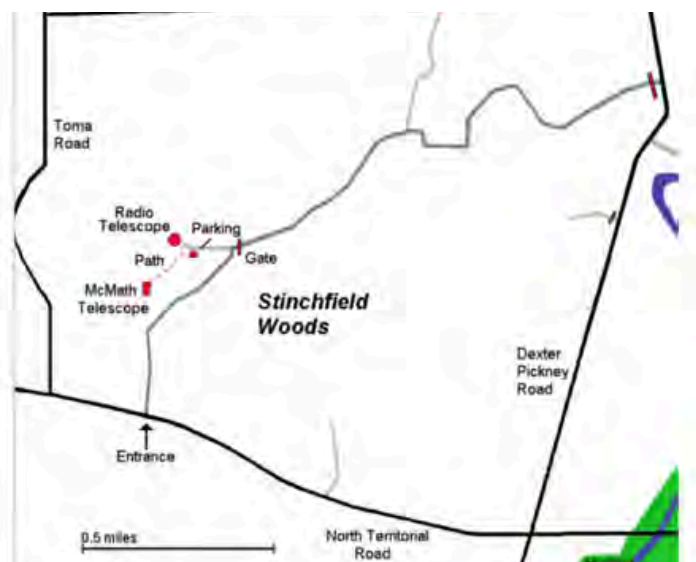
BY JEFF KOPMANIS

I added another 61 minutes to the other 4 sessions I'd taken of the Iris Nebula, for a total of 326 minutes of 30s and 60s images. The details were really starting to pop, and the SyQon and VeraLux tools were able to coax the dimmer stars at the center out for all to see.

## PLACES & TIMES

Monthly meetings of the University Lowbrow Astronomers are held on the third Friday of each month at 7:30 p.m. The location is usually the Judy & Stanley Frankel Detroit Observatory. The Observatory is located at 1398 E. Ann St., Ann Arbor. The Ann Street Parking Structure (M86), the Catherine Street Structure (M5), the Glen Street Structure (M61), and the School of Public Health II Lot are usually open after 6:00 p.m. Mon-Fri. The M86 structure is closest to the Detroit Observatory.

Peach Mountain Observatory is the home of the University of Michigan's 25-meter radio telescope and McMath 24" telescope, which is maintained and operated by the Lowbrows. The entrance is addressed at 10280 North Territorial Road, Dexter MI, which is 1.1 miles west of Dexter-Pinckney Rd. A maize and blue sign marks the gate. Follow the gravel road to the top of the hill to a parking area south of the radiotelescope, then walk about 100 yards along the path west of the fence to reach the McMath Observatory.



## PUBLIC OPEN HOUSE / STAR PARTIES

Public Open Houses / Star Parties are generally held on the Saturdays before and after the New Moon at the Peach Mt. Observatory but are usually canceled if the forecast is for clouds or temperatures below 10 degrees F. For the most up-to-date info on the Open House / Star Party status call: (734) 975-3248 after 4 pm. Many members bring their telescope to share with the public and visitors are welcome to do the same. Mosquitoes can be numerous, so be prepared with bug repellent. Evenings can be cold so dress accordingly.

Lowbrow's Home Page  
<http://www.umich.edu/~lowbrows/>

## MEMBERSHIP

Annual dues are \$30 for individuals and families, or \$20 for full time students and seniors age 55+. If you live outside of Michigan's Lower Peninsula then dues are just \$5.00. Membership lets you access our monthly newsletter online and use the 24" McMath telescope (after some training). Dues can be paid by PayPal or by mailing a check. For details about joining the Lowbrows, contact the club treasurer at: [lowbrowdoug@gmail.com](mailto:lowbrowdoug@gmail.com)

### Newsletter Contributions:

Members and non-members are encouraged to write about any astronomy-related topic. Contact the Newsletter Editor: Amy Cantu [cantu.amy@gmail.com](mailto:cantu.amy@gmail.com) to discuss format. Announcements, article, and images are due by the 1st day of the month as publication is the 7th.

### Telephone Numbers:

|                       |                                                    |
|-----------------------|----------------------------------------------------|
| President:            | Charlie Nielsen (734) 747-6585                     |
| Vice President:       | Don Fohey<br>Brian Ottum<br>Ken Cook<br>Tim Miller |
| Treasurer:            | Doug Scobel                                        |
| Observatory Director: | Jack Brisbin                                       |
| Newsletter Editor:    | Amy Cantu                                          |
| Key-holders:          | Jim Forrester<br>Jack Brisbin<br>Charlie Nielsen   |
| Webmaster:            | Barry Chapman                                      |
| Online Coordinator    | Jeff Kopmanis                                      |

**A NOTE ON KEYS:** The Club currently has three keys to the Observatory and the North Territorial Road gate to Peach Mountain. University policy limits possession of keys to those whom they are issued. If you desire access to the property at an unscheduled time, contact one of the key-holders. Lowbrow policy is to provide as much member access as possible.

Email to all members  
[Lowbrow-members@umich.edu](mailto:Lowbrow-members@umich.edu)