SkyWAAtch

The Newsletter-Journal of Westchester Amateur Astronomers

October 2021

The Veil Nebula by Olivier Prache

This is a single image of the Veil obtained with just 49 minutes of exposure using Olivier's new Celestron RASA-8 astrograph and a ZWO ASI071MC color camera. There were no filters or focal reducers in the optical train. Olivier made the image at the Medomak Astronomy Retreat and Symposium in central Maine in August.

The field of view is 3.38 x 2.25 degrees.

For a review of this unique imaging scope, see Olivier's article on page 13.

WAA October Meeting

Friday, October 8 at 7:30 pm

On-line via Zoom

New Horizons and the Solar System's 3rd Zone

Will Grundy, PhD
Planetary Scientist, Lowell Observatory
Co-Investigator, New Horizons mission

Dr. Grundy does spectroscopic, thermal, and imaging observations of outer Solar System bodies using numerous large ground- and space-based telescopes including Hubble, Keck, Gemini, DCT, IRTF, and MMT. He headed the surface composition science theme team on New Horizons. Dr. Grundy will discuss the astonishing scientific results from this mission, and how our view of the solar system has changed as a result.

Also In This Issue

3	Club News
4	Almanac (Bob Kelly)
5	WAA Picnic October 16th
6	Member Profile: John Paladini
9	From the Editor: First Telescopes
12	DSO of the Month
13	Celestron RASA-8 (Olivier Prache)
18	Another Movie Telescope
19	A Star in the Leg of Ophiuchus (Robin Stuart)
22	Images by Members
27	Research Finding of the Month: Mars
28	Member Equipment Classifieds

WAA Members: Contribute to the Newsletter!
Send articles, photos, or observations to
waa-newsletter@westchesterastronomers.org

SkyWAAtch © Westchester Amateur Astronomers, Inc.

Editor: Larry Faltz Assistant Editor: Scott Levine
Almanac Editor: Bob Kelly Editor Emeritus: Tom Boustead

Call: 1-877-456-5778 (toll free) for announcements, weather cancellations, or questions. Also, don't forget to visit the WAA website.

WAA November Meeting

Friday, November 12 at 7:30 pm

On-line via Zoom

Magnetic Anomalies on the Moon

Dany Waller
Graduate Student, Johns Hopkins University Applied Physics Laboratory

Starway to Heaven Star Party

Ward Pound Ridge Reservation, Cross River, NY

Saturday, October 2 (rain/cloud date October 9). Pandemic requirements still in effect.

New Members

Andrzej Cichon	Port Chester
Barton Fried	Forest Hills
Karen Heffner	Norwalk
Ruth Irving	Yonkers
Erich Morisse	Pleasantville
Ciaran O'Sullivan	Montrose

Renewing Members

Liv Andersen	Westport
Thomas Boustead	White Plains
Kevin Bynum	Irvington
Jim Carroll	Peekskill
Bill Caspe	Scarsdale
Laura Doty	Ossining
Eileen Fanfarillo	Irvington
Parikshit Gogte	Chappaqua
Thomas Haeberle	Glendale
Daniel Intrilligator	Peekskill
Manish Jadhav	Ossining
Glen & Patricia Lalli	White Plains
Scott Levine	Croton On Hudson
George & Susan Lewis	Mamaroneck
James Nagy	Waccabuc
Scott Nammacher	Athens
Alfred J. Padilla	Armonk
William Rothman	Bronxville
Peter Rothstein	Hastings on Hudson
Steve Tinsley	Scarsdale
Roman Tytla	North Salem
Harry Vanderslice	Mamaroneck

Sky*WAA*tch Honored

2021 APEX® AWARDS FOR PUBLICATION EXCELLENCE

At the suggestion of Ann Cefola, we entered Sky*WAA*tch in the 2021 Apex Awards, an annual competition for "professional communicators," which of course we are not: we're amateur communicators simply trying to inform and educate. The company that runs the competition, Communications Concepts, Inc., notes that

> APEX Awards are based on excellence in graphic design, editorial content, and the ability to achieve overall communications excellence. *APEX Grand Awards* honor the outstanding works in each main category, while *APEX Awards of Excellence* recognize exceptional entries in each of the individual sub-categories.

We entered issues from 2020 in the "Newsletters: Electronic and Email" category, and received an Award of Excellence.

There were few, if any, other amateur organizations that received this recognition. Most submissions were by corporations, professional societies, government agencies, publishers and media companies. The only astronomy-related prize besides ours was a Grand Award for a publication from the NASA Armstrong Flight Research Center.

The prize is that we're allowed to use the Apex logo, so you'll see it (smaller, of course) in future issues, if it doesn't crowd out important astronomy and club information. What's more important to us than recognition by Apex is that club members and others in the astronomy community who receive Sky*WAA*tch find it readable and informative.

Club Leadership: Thanks, Paul!

The destructive deluge from Hurricane Ida on September 1 affected a number of WAA members, but none more than WAA President Paul Alimena, whose Rye home was damaged and his dental practice completely obliterated. Paul had no choice but to resign as President to focus on coping with all the loss.

WAA flourished under Paul's leadership in the past three years. He ensured the continuity of club activities during the pandemic by implementing Zoom meetings and organizing our star parties to meet tough New York State requirements for screening and record-keeping. He found a new source for our liability insurance, saving us thousands of dollars when our former insurer wanted to inflate our premium six-fold. He moved our bank accounts when our previous banker insisted on too much process for what should have been simple transactions. He implemented a QuickBooks accounting system and set up a server so that the accounting software and our membership database could be accessed remotely. Membership continued to climb during his tenure.

The WAA Bylaws elevate Senior Vice President Charlie Gibson to the presidency until the next election, which will take place at the 2021 Annual Meeting, prior to the December 12th lecture. Members not currently involved in leadership are encouraged to offer a small amount of their time and effort to the club's operations, following Paul's example of dedication, service and excellence.

ALMANAC For October 2021

Bob Kelly, WAA VP for Field Events


New
10/6


1Q
10/12

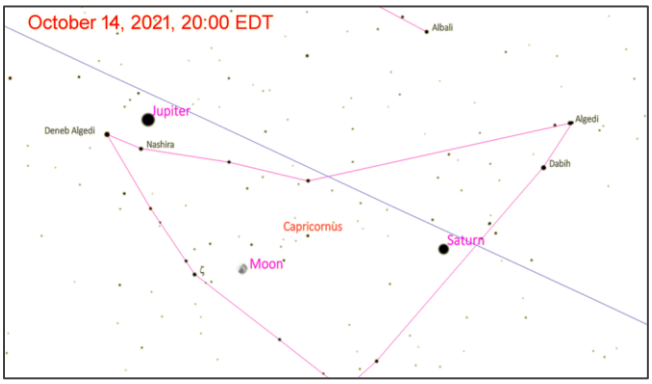

Full
10/20


3Q
10/28

Evening Giants

Jupiter and Saturn are still big and bright after sunset. They are highest in the sky to the south around 8 to 9 p. m. Daylight Savings Time this month, well placed for telescopic viewing. Saturn's rings are still wide open, tipped 19 degrees toward Earth, nearly the largest amount this year. Check out those moons! Saturn has Iapetus at magnitude +11.6 and Titan at magnitude +8.8. They are lined up to the northwest of Saturn though the 4th. Which of Saturn's other moons can you spot? It's a good time to get an app for Saturn's and Jupiter's moons to follow their dancing around their planets.

The Moon joins the giants in our sky on the 14th. They meet near Capricorn. Some maps connect its stars as a triangle with the top side dented. See if you can visualize this solar system triangle in front of the sea goat's triangle.



Venus, Brilliant but Shy

Venus gets to its greatest elongation, 47 degrees from the Sun in the evening sky. It's dazzlingly bright at magnitude -4.4, but no higher than 22 degrees above the horizon even at sunset. Its phase reduces to half-lit by the end of the month, even as Venus' disk gets slightly larger. Look early to see the phase in telescope or binoculars.

Mercury's Entrance into the Morning Sky

Mercury gets only 18 degrees from the Sun at greatest elongation on the 25th, but unlike the evening planets Mercury stands highest in our morning sky for 2021, rising as early as the beginning of twilight.

Hiding in the Solar Glare

The favorite game of the planets is getting lost in the bright sky near the Sun. Fortunately, the Solar & Heliospheric Observatory spacecraft[1] gives us great views of planets and stars near the Sun . Since Mercury is swinging between us and the Sun on this trip through the glare, it will be closer to us, with its unlit side facing us. Mercury will appear to fade as its phase decreases as it approaches solar conjunction on the 9th. Keep an eye on it (via SOHO) and also see Mars as it approaches conjunction with the Sun on the 8th. Mercury and Mars will be closest together on the 9th; Mars to the north of the Sun, Mercury to the south of the Sun and further away.

Be the Planetary Police

The "Celestial Police" was a fantastic foursome of astronomers in the early 1800s who thought, based on the empirical Titus-Bode "law", there should be a planet between Mars and Jupiter. Uranus had been found in 1781 and was near the distance projected by the rule. So they divided up the sky to find more planets. The found more, and less, then they bargained for as they racked up discoveries of several disappointingly small objects in the "gap." This started the first of the "what is a planet?" controversies. Don't let their work go to waste! Several of these crumbs of a planet that didn't get its act together are visible in October. 1 Ceres (the first found) brightens though magnitude +8 this month in Taurus. 2 Pallas is dimming though +9 in Pisces as is 6 Hebe in Sagittarius. 40 Harmonia, which I had never heard of, is in Cetus at +9. Then there's 89 Julia, heading toward +10 in Aquarius. In-the-Sky.org has lists of bright asteroids and comets and links to sky maps.

Uranus and Neptune Color Controversy

Neptune is near Jupiter and Saturn, next door in Aquarius. October is a great time to see this furthest out planet (according the latest list of planets) at magnitude +7.8. It's just past its brightest for the year, Uranus follows later in the evening in Aries at

[1] https://sohowww.nascom.nasa.gov/data/realtime-images.html

magnitude +5.7. Can you spot it and a bunch of sixth magnitude stars nearby? It's a good test of the effects of light pollution. A small telescope will allow you to add your observation of these two far-out places to the debate about how blue (or not) they are.

Moon!

It's all about the Moon. We love the amount of detail available to us with any optical aid. We avoid it when we want to see the faint objects of the deep sky. New Moon dates are creeping earlier in the month – as they should since the time between new Moons (the lunar month) averages 29 days, 12 hours, 44 minutes, and 2 seconds, less than the typical calendar month. Our star parties are scheduled around a new Moon to keep the sky dark so we can show our guests the fainter objects, and when it's up, the Milky Way. Our star parties used to occur after our monthly meeting, but the "November" star party is set for October 30th, with a back-up date of November 6th in case of a cloudy 30th. Next year, the "month-jumping" star party schedule will be more frequent.

Mare Orientale Peek-a Boo

One of my favorite times is when ridges from the "bulls-eye" on the Moon, Mare Orientale, peek over the southwestern limb. The Moon appears to wobble in our sky due to the many solar system bodies that tugging at its orbit around the Earth and Sun. Thanks to this we get to see about 59 percent of the Moon's surface over the course of a year. That's more than half of the Moon, due to this "libration" effect. The largest tilt of the Mare Orientale for quite some time in our direction is during the thin crescent moon phase on the mornings of the 2nd and 3rd and again on November 1st. Here's a good article about it: http://is.gd/lunlib

Meteors

Just for the record, the Orionid meteors will peak on the morning of the 21st, but a full Moon will make all but the brightest hard to see, despite its source, Comet Halley, typically zipping a dozen meteors per hour through our atmosphere.

Going Deeper

Got binoculars? Take some side trips off the Milky Way using the Northern Cross (Cygnus the Swan) as a marker. Check out the Dolphin (Delphinus), a cute five-star formation. Sagitta really looks like a tiny arrow. Nearby is the Coathanger, too big to fit in most telescopes, but a lovely surprise in binoculars. This asterism, named Brocchi's Cluster and catalogued as Collinder 399, is a bunch of stars that by coincidence line up to form a familiar object.

A telescope will show the Ring Nebula (M57) among the four fainter stars in Lyra near Vega.

Going Wider

Nearsighted? Look at some bright star asterisms like the Big Dipper without glasses. I was on a plane fight and glanced out my window without my glasses and saw six bright fuzzy stars the size of marbles in the shape of a dipper skimming the northern horizon. The low altitude in the sky and being framed by the small aircraft window made the pattern shimmer and seem larger than life.

The **International Space Station** is visible in our evening skies through the 9th and in the morning from the 19th onward.

WAA Picnic October 16th

The annual WAA Member Picnic will be Saturday, October 16 from 12:00-4:00 p.m. Sadly, this will be the last time we will be at the Danish Home in Croton since the property will soon be sold. This is a rain-or-shine event. Food and soft drinks will be served; attendees should bring their own beer and maybe a side dish if they are enthusiastic.

In order to hold a group event, we are required to observe Covid-19 precautions. Attendance is limited to 60 participants. You must **register** for the picnic by Monday, Oct. 11. To register please send an email to Eva Andersen at andefam55@gmail.com with full name, date of birth, address, contact number and scanned or electronic copy of the Covid vaccination card for all those attending. Also let Eva know if you have any food allergies or dietary preferences. Upon receipt of your email or letter she will confirm your registration for the picnic. Because they will not be vaccinated in time for the picnic, children under the age of 16 cannot be accommodated.

There are more details in the emails sent to members on Sept 16th and 23rd.

In spite of the restrictions, this will be a fun event. Please come!

Member Profile: John Paladini

Home town: Putnam County NY

Family: Wife, son, daughter 2 grand kids, 2 cats

John at Stellafane with home-made high-resolution optical solar spectroscope

How did you get interested in astronomy?

When I was 7 years old my brother took me to his friend's house. This friend ground his own mirrors. One night he took out one of his creations (a Newtonian - I believe it was an 8 inch). He pointed it to Saturn. I took a peek and I was hooked. I actually could not believe it was real. I looked inside scope to see if there was a picture pasted inside.

Do you recall the first time you looked through a telescope? What did you see?

I still remember the color of Saturn being more vivid than when I look now, probably cause of the yellowing of the lens in my eyes.

What's your favorite object(s) to view?

Sun, planets, wide field views of deep sky objects

What kind of equipment do you have?

I have pretty much all of the scopes an amateur could have or desire, including a few antiques. Plus I have night vision eyepieces and video camera and equipment.

I also ground a few lenses and mirrors, some which I sold overseas on request in online forums. One of my long focal length lenses is now in Bompas, France. I can't help thinking it's enjoying some good conversation with fine French wine and food.

What kind of equipment would you like to get that you don't have?

I'm currently looking for an updated deep sky camera, probably a ZWO. I wouldn't mind picking up an Alvin Clark refractor (good luck to me finding one that I could afford!)

John's one-inch Dollond antique telescope

Have you taken any trips or vacations dedicated to astronomy? Tell us about them.

In 2019 I went to the Adler Planetarium in Chicago. What a wonderful place, with a host of antique scopes. IMHO it makes the NYC planetarium look dull. (See the October 2018 SkyWAAtch for more on this special facility, America's first planetarium).

In 2017 I went to see a solar observatory near Bari, Italy. It was near completion and in its testing phase at that time. The people there let me in once I got to tell them of my interest. It was a 10-inch dedicated solar refractor with hydrogen-alpha filters. They showed me the control station and some images. It was late in day so I did not get to see through it.

In 2015 I went to *the Istituto e Museo di Storia della Scienza* (now the Museo Galileo) in Florence, Italy. I got to see Galileo's "Jupiter lens" (yes, the cracked one you see in books), plus a host of many other old scopes. I wanted to put a cot and just sleep there for a few days (not allowed)!

Are there areas of current astronomical research that particularly interest you?

Solar astronomy. I built my own spectroheliograph. Ken Harrison, the author of a number of solar and physics books, told me that as far as he knew , I was the only one in NYC area operating one. I think there is one on Long Island now.

Do you have any favorite personal astronomical experiences you'd like to relate?

In 1986 Halley's Comet passed by. I was at Playland at night with some other people. The comet was not an optimal view for northern observers at the time. One of the other observers was having a hard time trying to find it. So I helped him, and a few moments later I got the comet in his scope. He was so excited that he got down and kissed my feet (well, my shoes actually). My brother was there and could not believe it. That is still a strange one to me.

Fellow member Mike Virsinger introduced me to solar astronomy which I did not do much of before meeting him - now it's my main "thing." I like to kid him that he cost me a lot of money!

After making a CaK conversion eyepiece and writing an article about it in the WAA newsletter, I entered it in a Stellafane contest in 2017 and won a first prize.

I got an email from Larry Faltz a few years go saying that Fred Vieo, a well-known amateur solar astronomer, wanted to contact me about my spectroheliograph. I was very flattered. I had a great conversation with him.

I got chance to consult with fellow member Doug Baum and with Russ Lederman of Denkmeier to develop the BiPH night-vision eyepiece.

What do you do (or did you do, if retired) in "real life"?

I have a math degree and an MS in computer science. I retired in 2017 after working for 33 years as a software engineer at BAE Systems, dealing with military electronic systems and related items. For seven years before that I jumped around at various software jobs for analytical finance, including an 18 month stint in the late 1970s with James H Simons, helping him and his crew on foreign currency market exchange analysis.

Have you read any books about astronomy that you'd like to recommend?

The Sun by C A Young (1896). Schellen's *Spectrum Analysis* from the 1870s, still relevant and wonderful. *Mars, the Photographic Story* by EC Slipher (1962). It gives you the feel about the state of affairs just before the Mariner 4 flyby in 1964. *Solar Astronomy*, edited by Christian Viladrich (2021), my most recent purchase

How did you get involved in WAA?

A cousin gave me a copy of a printed WAA newsletter in the 1990s. I went to a meeting at the planetarium in Yonkers and have been a member ever since.

Digges-Bourne Telescope (see the June 2021 SkyWAAtch)

What WAA activities do you participate in?

Scopes at Ward Pound Ridge - at times helping fellow members with purchase and equipment use. I've written some articles for the newsletter.

Besides your interest in astronomy, what other avocations do you have?

I like bike riding, gardening and growing some of my own food.

Home-made 90-mm hydrogen-alpha telescope (see the September 2014 SkyWAAtch)

Provide any other information you think would be interesting to your fellow club members, and don't be bashful!

I like to dig up astronomical information from past and see if it's relevant to current times.

I'm often referred to as the "junkyard astronomer." I got this name early on from other club members when I showed several home-made telescopes and accessories. Some of these were constructed using copper or PVC piping and steel hose clamps. They have a real home-made look, not that slick professional appearance that graces the scopes entered into the ATM competition at Stellafane.

The impetus for my junkyard construction methods is to save money. For example, I made my own Night Vision eyepiece. Commercial versions can cost up to four thousand dollars. The night vision tube itself cannot be made at home. But you can buy a used tube for about $800-$2,000 depending on specifications. The real savings is in the tube housing. Commercial bodies can cost $500-$700. I can build a monocular for $40-$50. So there is quite a savings.

My second cost saving project was construction of the spectroheliograph. To buy a commercial one would cost well over $2,000. I built one for about $600.

I also have made recreations of antique telescopes, such as 17th century long focal length instruments with objectives of f/40 or more. There is no commercial source for these items so you need to make them for yourself.

But to make everything fit together and not require a lot of fancy machining that costs a fortune, I use a lot of PVC pipe and hose clamps.

CaK-to-Visible eyepiece (1st prize at Stellafane). The eyepiece converts the CaK line at 393.4 nm in the deep violet, almost impossible to see with the human eye, to a green image to which the eye is very sensitive. This allows viewing of the CaK line without a camera. The conversion principle and construction details are in the October 2014 SkyWAAtch.

■

From the Editor: First Telescopes — Larry Faltz

The Covid pandemic has brought many terrible things to the world, but among the few positives seems to be growing engagement with astronomy (along with massive adoption of rescue animals and people doing more reading of actual printed books). Getting outside at night for a look at the stars is attractive as a pandemic-safe activity, and should be enticing and educational for children whose academic progress has been stunted by school closures and the limitations of on-line learning. As a result, astronomy equipment has been flying off of vendors' shelves. Coupled with some supply-chain problems, good telescopes and accessories have been hard to get.

WAA often gets requests for assistance in purchasing a new telescope.[1] The two most common reasons given are a life-long but casual interest in astronomy that can now be indulged because of retirement, or a parent seeking to stimulate a child's interest in science and learning. (There are two ways to interest young children in science: astronomy and dinosaurs. In the old days some kids were enticed with chemistry sets, but liability concerns have all but destroyed that route.) We pass these requests around to members of the Board. I've answered quite a few.

When someone asks me for help in purchasing a new telescope, I've found that it's important to engage them in a discussion and not just throw out a recommendation. How did their interest start? What do they know? What are their goals? What do they want to see? Expect to see? What do they want to spend? Where will they observe? Who's in the family? The answers allow me to gauge expectations and offer advice not just on buying a telescope but on how and where to use it, and to ensure realistic expectations about what they'll see, spend and carry. I always invite them to a WAA star party at Ward Pound Ridge Reservation. Of course, I have to remind them about the effects of weather on observing.

It's important to personalize: I sometimes relate my own progress and choices. There's nothing like teaching from experience, because it's what you know best. It's also important, I think, to make a personal connection on behalf of the club. The more we are real people to the public and don't conform to the caricature of arcane science geeks speaking an incomprehensible language, the more effective we will be in achieving the mission articulated in our Bylaws: "To promote knowledge and understanding of astronomy and related sciences." You can't do that by being impersonal, disembodied, using elevated scientific jargon, or just throwing out the names of your personal favorite instruments. It's always worth the time to know that the people you are teaching are really learning.

Telescopes today, like other devices that were once simple (now we have digital toasters, web-enabled light bulbs, cars with more chips than a large bag of Doritos, etc.), can appear fearsomely complicated at the outset. Features like go-to, automatic alignment and wi-fi control solved time-consuming problems for us. They made our observing lives more efficient once we learned to use them, but we forget our struggle to climb the learning curve. Many of us migrated from simple instruments where the only power required was a red flashlight to look at our printed star charts, and we understood the problems these enhancements solved. But newbies wanting a "good" scope with modern features will be confronted with the technology before they've learned anything about night sky, the Earth's rotation and the organization of celestial objects in constellations and catalogs, things we knew but wanted an easier way to manage.

At the end of June, WAA President Paul Alimena asked me to assist someone who was going to Montana to spend a week with another friend who had just purchased a Celestron NexStar Evolution 8 with StarSense automatic alignment. Both he and the scope's owner were completely unfamiliar with either the telescope or the night sky. How to advise them? We solved this problem with a three-way Zoom call. I went over such basics as how to carry the scope and set it up, the importance of leveling the tripod, how to power it, how to clean (and not clean) the corrector plate, what the StarSense does and how it works, and how to select objects. But then I realized that no one who was going to use it knew the difference between a Messier object and a first magnitude star. So I did some teaching about that: what were the best objects to look at (the usual summer wonders: double star, open and globular clusters, a

[1] Usually via info@westcheseterastronomers.org

few nebulas and galaxies, Jupiter and Saturn, the Moon) and what they were. Of course, this torrent of information is hard to retain, so I recommended some books and of course the usual admonition to "RTFM." (If you don't know what this means, email me.) I think they learned a lot and I enjoyed spending time with them.

Around the same time we got an email from a woman in one of the river towns who wanted to get a telescope for her five year-old child, who was beginning to show some intellectual gifts. Many five-year-olds can't use a telescope. They can't quite figure out what they're supposed to look at when told to sight down the eyepiece. But in two years they'll be seven and won't have a problem.[2] Mom wanted to spend $300. I researched some of the options in that price range, as did she, and as we exchanged emails (some of mine fairly lengthy) she began to appreciate the advantages and limitations of certain kinds of telescopes and mounts and the importance of having an instrument that would be neither too limiting nor too complicated. Either of those qualities would end up frustrating her and the child's interest. After looking at push-to Orion StarBlasts, and a variety of low-end go-to scopes, we settled on the Celestron StarSense Explorer series, in particular the 102-mm refractor, which got a good review in *Sky & Telescope*. Although a little above her initial price point, and needing about $100 in upgrades (diagonal and eyepieces), the scope would be fairly easy to use and the iPhone-based push-to system should be easily mastered. She recognized the value of the additional investment. At my encouragement she went to the August star party (I was at an astronomy event in Maine and couldn't be there to meet her). She sent me this note: "My husband and I went to the star gazing party yesterday and it was awesome fun. The association members are so happy to help newbies like us. Jordan [Webber] was there with his dobsonian and he showed us Saturn with its rings, Jupiter with four moons, the Ring Nebula, and the Moon. It was our first time seeing these sights and we are totally mesmerized. I have got more confidence about buying that telescope now." This is a perfect outcome for these newcomers and for the club. With Jordan, she was in perfect hands: a knowledgeable enthusiast who is always willing to spread the joy of astronomy.

Sadly, many people don't reach out when considering buying a telescope. They don't have good sources of information or can't find good on-line articles that could help them, they get confused by the jargon, or they simply buy on impulse. When asked, I always recommend the series of articles on buying a new telescope on the *Sky & Telescope* web site.[3] Yet there is still a lot of misinformation that gets to the public.

Three telescope mounts I hate: the dreaded EQ-1, a camera tripod with a pan-tilt head, and a simple U-shaped mount. The latter two can't reach the zenith most of the time.

An example is an article on the NBC News web site that appeared on August 4, "Top-rated telescopes and binoculars for stargazing in 2021."[4] Exactly how these telescopes were rated, or by whom, isn't made clear, and reading the article it was evident to me that the writer didn't know much about telescopes. All the telescopes that were listed would be considered "hobby-killers" by *Sky & Telescope* criteria. The apertures ranged from 50 to 80 millimeters. Four of the eight scopes had substandard 0.965" Huygenian eyepieces that were out of date fifty years ago. Two 70 mm f/5.7 refractors with 1.25" eyepieces only supplied Kellners, also an out-of-date design. All the tripods were spindly, and the only two mounts that could reach the zenith were those awful EQ-1 slow-motion stalk-controlled atrocities that no one can align properly or figure out how to use their crude setting circles. The best scope was a "Coleman AstroWatch" 80 mm f/5, the classic "short tube 80" offered for years by Orion. I am sure this scope comes from the same Chinese factory and is just rebranded as a marketing opportunity for the company that makes camping equipment. The short-tube 80 is a decent scope for its size and it's nicely portable (I took one out west this summer) but it has serious

[2] This is something I've learned from our outreach events, when parents bring all their children, even toddlers. The little ones don't want to be left out, so we give them a try.

[3] https://skyandtelescope.org/astronomy-equipment/choosing-astronomy-equipment/telescopes/

[4] https://www.nbcnews.com/shopping/tech-gadgets/best-telescopes-binoculars-n1274719

color fringing on bright objects, which is only natural for an f/5 crown-flint doublet. The descriptions of each scope offered enticements about capturing images with a cell phone that were unrealistic.

An article like this is a disservice to consumers and to the hobby of amateur astronomy. I wondered why NBC News, an organization that should be (and mostly is) dedicated to advancing truth, would carry it until I noticed this disclaimer: "Our editors independently selected these items because we think you will enjoy them and might like them at these prices. If you purchase something through our links, we may earn a commission." It's true that these were cheap (most of them well below $100), but junk ought to be cheap. The article also notes that "Retailers like Walmart, REI and The Home Depot sell a selection of telescopes and binoculars, some of which can also help you capture photos of planets and constellations." One wonders why a news organization would not refer prospective telescope buyers to vendors that specialize in…telescopes! More money changing hands?

At times I have been offered compensation for my telescope advice, sometimes with the initial request for assistance. I've always refused payment from the people I advise, even if I pay them a visit. It might be different if you're engaged to build or manage an observatory, which is an actual job, but not just for giving one's opinion or teaching a new colleague. I don't get paid for being a Professor of Medicine either: as the Hippocratic oath says, "I will revere my master who taught me the art…[I] will consider his sons as brothers. I will teach them my art and I will impart all my acquirement, instructions, and whatever I know, to my master's children, as to my own; and likewise to all my pupils, without fee or indenture." It's the same honor to teach the skills needed to become an observer. Enthusiasm can't be priced and payment would take the fun out of it. I ask them to join or give a tax-deductible contribution to WAA.

When recommending scopes, I stress the importance of a stable tripod or a good dobsonian base. Many otherwise decent low-end scopes come with shaky marginal tripods. Tripods need solid leg-spreaders; the trays on inexpensive aluminum tripods are usually inadequate on their own but hanging some weight under the spreader can help. An upgrade to a steel tripod is usually a good investment, but wait to get familiar with the instrument, tolerating the tripod's limitations for a little while, before spending another $200-300. The mount must allow the scope to reach the zenith: there's some good stuff up there most nights! If someone wants to start with a large scope, 8" or more, I always ask how good their back is. And if someone wants to start off doing imaging even before he/she has done some visual observing and learned the sky, my firm advice is: DON'T.

A few years ago at NEAF, a fellow who looked to me to be in his late sixties asked me to accompany him to the Celestron booth. He was buying his first telescope and "getting into" the hobby. He said he wanted to "do imaging" but didn't know anything about it. We first looked at some of Celestron's fine 6- and 8-inch SCTs on go-to alt-az mounts, and I proposed that he "get into" astronomy by becoming a visual observer first. But then he saw an 11-inch SCT on a heavy duty equatorial mount. It was a beautiful leviathan. I suggested it would be too much for him, too heavy, bulky and complex. Better to get a 6 or 8, enjoy stargazing, and then, if he's really into it and learns enough, either get a wedge or sell the scope and get an imaging-capable set-up, which would probably not be an 11-inch SCT, but a fast 4-5-inch refractor on a GEM. He insisted on the 11-inch and bought it. A few weeks later, he came to a WAA star party with the scope and a scowling wife who had objected to the whole project from the start. He had great difficulty getting the OTA seated on the equatorial mount, staggered under its weight and succeeded only in dropping it onto the asphalt. Fortunately, and rather amazingly, the corrector plate didn't crack. He just dented the front edge of the tube. He never did get the thing to work, and I don't think we ever saw him again. Proof of the old adage "less is more." Aperture rules, but consider and even test out size and weight. It won't do to have a scope you can't lift or fit in your car. The best telescope is not just the one you use, it's the one you <u>can</u> use.

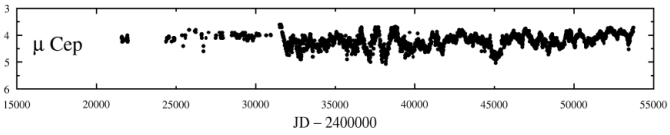
I don't think spending less than $300 for a telescope/mount/tripod (and often another $100 in accessories) can provide real value. Cheap products will be frustrating to use, little will be seen and the prospective enthusiast will be completely turned off to the hobby. To spend less but still have a good experience, first get a decent 7x50 or 10x50 binocular and scan the skies in a lounge chair.■

Deep Sky Object of the Month: Herschel's Garnet Star (Mu Cephei)

Mu Cephei	
Constellation	Cepheus
Object type	Red supergiant star
Right Ascension J2000	21h 43m 30.4609s
Declination J2000	+58° 46' 48.166"
Magnitude	+4.08 (variable 3.7-5.0)
Size	N/A
Distance	940 parsecs
Other designations	Erakis, HD 206936, BD+58°2316, SAO 33693

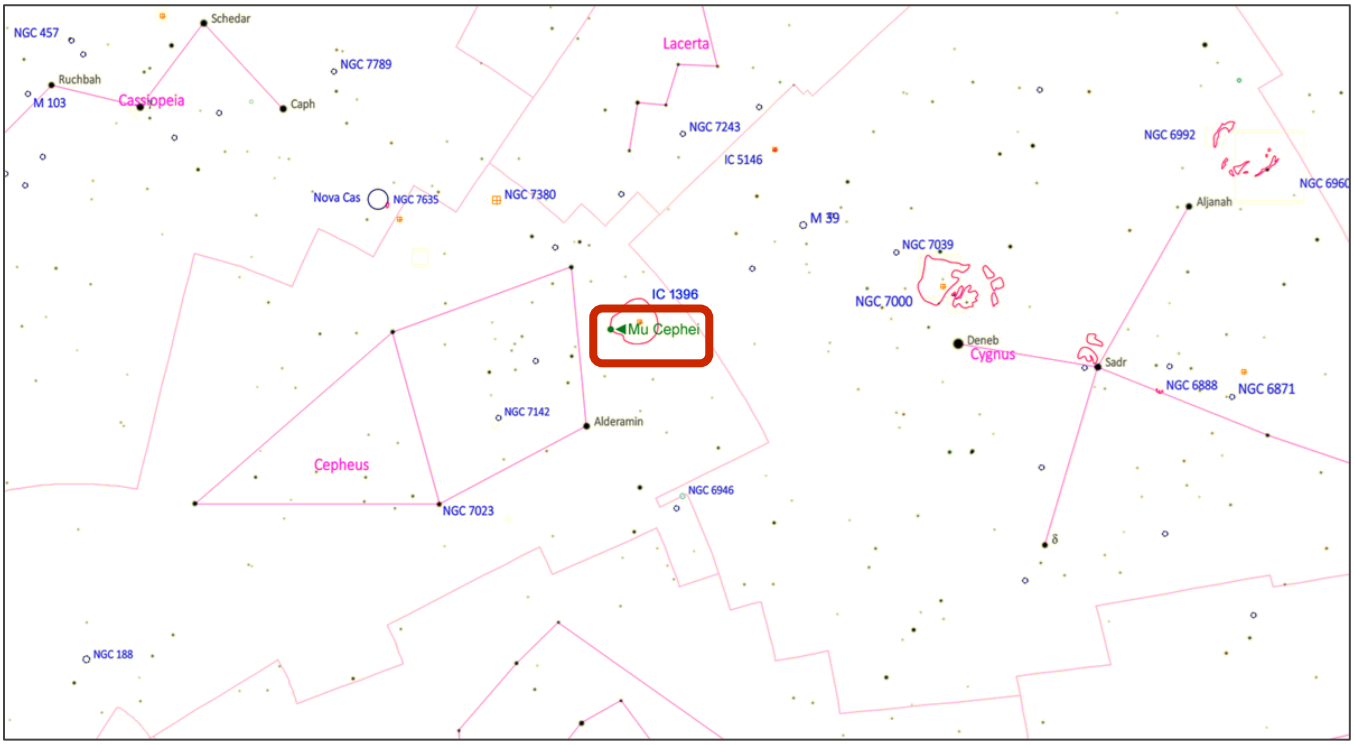
First identified as a 5th magnitude star by Hipparchus (as listed in Ptolemy's *Almagest*), it was named μ by Bayer in the *Uranometria* (1603). In 1783 William Herschel called its color "garnet" in a report to the Royal Society. Burnham notes that "this famous and interesting object is perhaps the reddest star visible to the naked eye in the north half of the sky." It also may be the largest naked eye star, with a diameter of 2.4 billion miles, larger than the orbit of Saturn. It is more luminous than Betelgeuse. Typical of red giants, it is irregularly variable. Perhaps it will go supernova in the not too distant future.

Visibility of Mu Cephei			
10:00 pm EDT	10/1/21	10/15/21	10/31/21
Altitude	72° 21'	69° 58'	63° 52'
Azimuth	357° 39'	336° 44'	322° 53'



Light curve for Mu Cephei, from Kiss, LL, Szabo, GM, Bedding, TR, Variability in red supergiant stars: pulsations, long secondary periods and convection noise, *Mon.Not.Roy.Astron.Soc*.372:1721-1734,2006

The color actually seems to vary a little, changing from garnet to deep orange, perhaps related to its magnitude, the optics used or just the eye of the beholder. It is just behind the edge of the Elephant Trunk Nebula.



The 8” Celestron Rowe-Ackermann Schmidt Astrograph (RASA-8)

Olivier Prache

Introduction

The Celestron RASA is somewhat unique in the world of astrophotography in that it is unambiguously dedicated to imaging. Indeed, it does not qualify as a telescope, since there is no means of using one’s eyes to view anything. As such, it is not as versatile as a conventional telescope, but with respect to imaging, it does provide significant benefits.

This is more like a lens that you attach to your camera, or, more correctly, a lens to which you attach a camera. The diagram below (courtesy of Celestron) shows the basic optical path

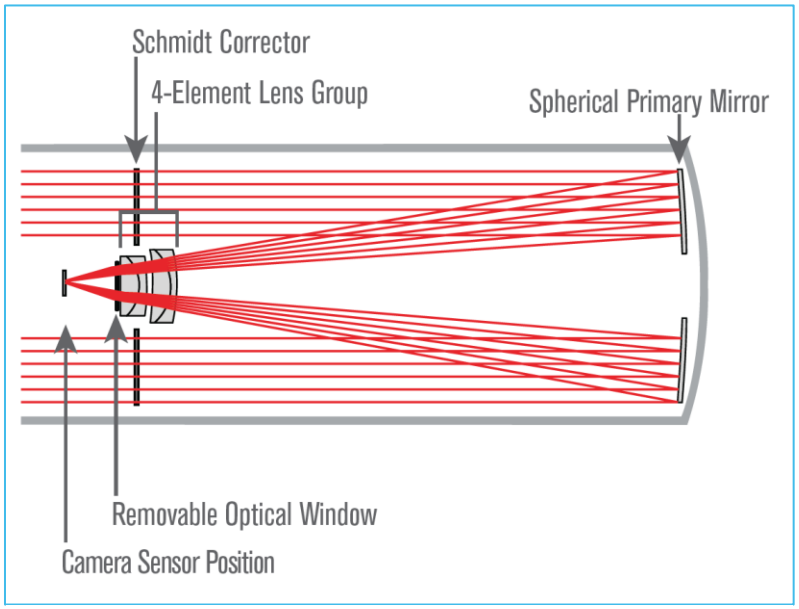


Figure 1: RASA Optical Path

The concept is not new. It is based on the venerable Schmidt camera design that goes back to the 1930s. What is new, however, is the modification to push the focal plane past the front corrector plate so that a camera can be mounted outside the optical tube assembly (OTA).[1] Celestron wanted to make this instrument reasonably affordable and that led to keeping the same corrector plate design as their Edge HD series, but with a longer focal length primary (still spherical and thus relatively easy to polish and figure) and a front lens element group to get a flat image at the focal plane (the sensor position).

Why would anyone want to use this?

In one word: speed. The RASA design is a speed demon, boasting an f/2 aperture ratio. To put things into perspective, it would take an f/6 telescope 9 (nine!) times as long as an f/2 to gather the same number of photons, everything else being the same. One minute exposure with an f/2 system is equivalent to 9 minutes with an f/6 system. A direct consequence is that guiding can be optional, provided that polar alignment is well done. Indeed, the images shown in this review were all acquired without guiding.

The 8” version of the RASA has a 400 mm focal length, resulting in a 24.7-inch OTA length, longer than a typical 8” f/10 Schmidt-Cassegrain, but certainly manageable by a single person. The tube weighs 17 pounds.

When combined with an APS-C sensor (around 23mm x 15mm), the field of view (FOV) reaches 2.46 degrees. That is enough to get the full Veil Nebula (both arcs) in one frame, or both the Lagoon Nebula and the Trifid Nebula, or the North American and Pelican Nebula, in the same frame. All with very short exposure times compared to slower systems.

This opens the door to large mosaic imaging within the same night!

[1] In a Schmidt camera, the image plane is inside the corrector plate. In traditional Schmidt camera, a piece of film had to be mounted inside the tube, through a flap on the side of the telescope.

Review

That is the promise, but how well does this work in real life?

I bought the RASA-8 because I was going to Maine in August for a week of astro-imaging (and astro-viewing using other attendees' large aperture monsters) at the Medomak Astronomy Retreat and Symposium (MARS). I was not looking to get a new mount since the one I have that is portable is the Celestron AVX. It's not what one might call a high end or even mid-range mount, but Celestron was showing photos of the RASA-8 on the AVX and a few YouTube reviews provided me with enough confidence that this combination could work.

Figure 2: RASA-8 on AVX

Because it is very (very) bad form to try out a new photon gathering machine upon arrival to a star party (remembering the dreaded "new scope curse"), I did the initial setup and trial run in my Pleasantville driveway. I have a permanent installation in my backyard observatory, but it's not capable of supporting the RASA-8 in a piggy-back configuration. This is just as well since I wanted to use the AVX mount and work out possible kinks.

To make a long story short, the AVX-RASA-8 combination works well. However, there are a few things to note:

1. It is absolutely necessary to have a dew shield with this OTA: the corrector plate is so close to the front that dew is guaranteed to show up. I made one with some insulation material, painted black inside and secured with Velcro.
2. It is also absolutely necessary to keep the cooling fan on throughout the night. I had zero dew with just the fan and dew shield. No dew heater was needed, which is just as well since mine broke when I tried it.
3. While the manual focuser works well, for imaging, given the speed of the optical system, the critical focus zone is very small and using a focus motor and an autofocus program simplifies the process greatly. Celestron offers a focus motor (as does ZWO) and I chose the Celestron unit because it plugs directly into the AVX mount, saving myself from having to manage another cable.

Figure 2 shows the set-up ready for night-time, only minus my laptop, which only needs one USB cable to connect to everything. There is a small ZWO guide scope under the OTA with a ZWO guide camera. It works, but I did not use it yet. The AVX is a bit finicky with guiding because the stiffness of the axes makes good balance harder to reach.

For this initial run, I did not polar align the mount. Polaris is not visible from my driveway because of trees, a common problem for many Westchester astronomers wanting to observe or image from their homes. I simply used my iPhone compass to get to north, eyeballed the elevation based on my latitude and the mount's marking, and finished with a 3-star alignment using the hand controller. As a result I limited my exposure times to 30 seconds, and that proved to be just fine.

On to some results

Figure 3 is a shot of the North American (NGC 7000) and Pelican (IC 5070 and IC 5067) nebulas: Fifty minutes total exposure with 30-second sub exposures. I used an Optolong L-Enhance filter, which works so well locally.

Figure 3: North America & Pelican Nebulas (Pleasantville, NY)

From a wide field of view standpoint, this checks the box: both nebulas comfortably fit within the ZWO ASI071MC camera sensor frame. The sensor is 16.2 megapixels; each pixel is 4.8 microns square, and the resolution is 2.46 arcseconds per pixel, with a total field of 3.38 x 2.25 degrees.

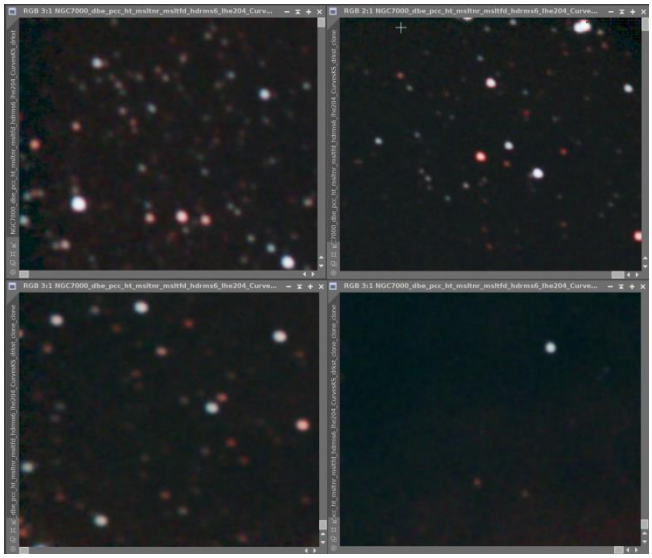


Figure 4: Extreme corners of North American/Pelican image

How flat is the field of view? Figure 4 shows close-ups of the four corners of the image. Note how the slight visible elongation is in the same orientation and looking worse more on the left side than the right side.

This could be due to tilt. The three frames of Figure 5 were taken along the center axis of the image, top, middle and bottom. The stars all look pretty round, which leads me to think tilt may be the reason for slight elongations at the corners. Even at modest magnification, this elongation does not really affect the quality of the image (of course, this is a personal observation and I am obviously biased).

A take away from this image is that it is possible to get good results in Westchester County in a relatively short time and with an ordinary mount, one that is not particularly renowned for its imaging prowess.

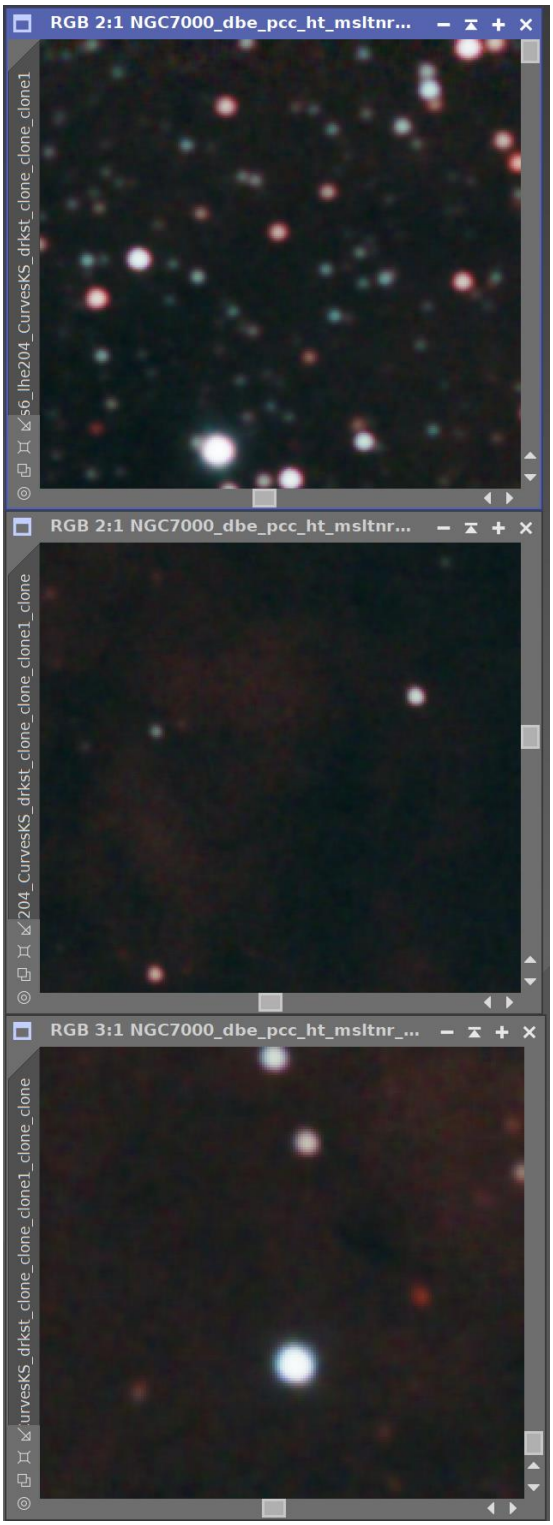


Figure 5

When the seeing was better, as it was in Maine on a moonless night the second week of August, the same exposure time led to impressive results, as shown in the two images reproduced at the end of this review: a galaxy (M101) and two nebulas (M8 and M20). Both images are 42-minute exposures (60-second subs). Not easy to see in the M101 picture as reproduced are many faint galaxies, so while it looks like an empty expanse, it is quite rich. I spotted several PGC objects at magnitude 15 to 18 (according the TheSkyX star map), a testimonial to how deep the skies were in Maine.

I was also able to get a good polar alignment using Polemaster, which I found to be a powerful antidote to alignment-related nervous breakdowns! It's a definite must-have for any imaging endeavor.

Even without spending a lot of time with this equipment, I am impressed by the image quality of the RASA optical design. With additional time spent getting the guider to work correctly, it should be possible to capture 5-minutes exposures with the AVX mount and reach even deeper into the night.

The other side of the coin

Nothing is perfect and I'd be remiss to not mention the possible drawbacks of this instrument.

Specific to the RASA-8 is a limit on the camera body size: it has to fit within a 90-100 mm circle, which disqualifies a DSLR or a full frame mirrorless camera. If you only have a DSLR, either go for the RASA-11 (much bigger, heavier, needs the right mount, etc.), or buy a dedicated imaging camera, like a ZWO or QHY.

This system is really designed for One Shot Color cameras (OSC) as it is not practical to consider a color filter-wheel arrangement. Having said that, it is perfectly possible to use a monochrome camera with color or narrowband filters, but changing the filters becomes a manual operation. I have done this in the field at night, and it is not that difficult, just point the OTA to the zenith and take your time. Celestron made it relatively effortless to change filters. Even better, for those cameras with a short distance between flange and sensor, like the ZWO ASI294, there is an adapter with a filter drawer that does not require any adapter unthreading-threading. My camera, unfortunately, has a longer sensor-flange distance and the adapter is too short to accommodate a filter drawer.

The field of view is huge. One may say, so what, isn't this great? Yes, it is, but if you want to blow up your images, you will quickly find a limitation because the image scale is rather large, even with 4.78 micron pixels. There can be quite a level of detail in the RASA images, but any time one zooms in to check out the faint fuzzies, one quickly sees pixels instead. Not to worry too much: there are now color cameras with very small pixels, and one could just use a monochrome camera with smaller pixels and narrowband (or RGB) filters to get more details.

Good focus takes time. I have not yet explored this much but a simple out-of-the-box V-curve autofocus is not going to get the best results. The focuser step size needs to be figured out to leverage the best results. The critical focus zone is very small and the images shown could use some optimization on that front. I have not evaluated the impact of temperature, given that I refocus every 30 minutes, but with the fan active at all times, I would not be surprised if that time could be increased.

The Celestron brochures show the RASA without a finder and I did not use one either. But when doing the initial alignment of the mount, even with a large FOV, it is possible to miss the target star: everything looks so bright! All it takes to overcome this problem is to do the alignment early enough in the evening, but it is best to know what one is looking at!

Conclusion

Would I recommend this scope? And if so, to whom?

Unconditionally yes if one wants to do imaging. The learning curve is short compared to starting out with a 70 to 90 mm APO. The short exposure time is a very addictive drug, and reduces the constraints on the mount (I would still prefer to use an EQ6-R-Pro or CGEM-II to the AVX to be perfectly honest, but there's no need for a Mach-1 or MyT class mount). To drive the point home further, after this short experience I am no longer looking for a Takahashi telescope.

Is this a beginner's scope? Not really, Using the RASA assumes some imaging experience. It looks easy but the biggest obstacle for a beginner, I believe, is that you cannot look through it to make sure you are pointing correctly (think of the finder alignment). ■

Figure 6: RASA-8 M101 (Washington, ME)

Figure 7: RASA-8 M8 & M20 (Washington, ME)

Another Movie Telescope

A refractor in the back-ground.

Can you name the movie and the person on the right? You've seen this movie.

Answer on page 28.

A Star in the Leg of Ophiuchus

Robin Stuart

On May 24, 1869 ten men in four small wooden boats set off from Green River Station in Wyoming Territory to explore and map regions of the American Southwest that had rarely been visited even by Indians. The 900-mile journey would take them down the Green River to its junction with the Grand (now Colorado) River, through the Grand Canyon to finally reach the Virgin River in present day Lake Mead on August 30.

The expedition was led by Major John Wesley Powell, in honor of whom Lake Powell was named following the construction of the Glen Canyon Dam. On June 8 one of the boats, the *No-Name*, was wrecked, with the loss of a third of the party's provisions. On July 6 one man abandoned the expedition. Within days of journey's end, three others attempted to walk out and are believed to have been killed by Indians.

A serious blow was dealt to the expedition's objectives when on July 11 Powell's boat, the *Emma Dean*, was swamped running rapids in Desolation Canyon, which in the words of expedition member John Sumner "ruined $800 of watches" (Ghiglieri 2015, p. 162). This meant that the 4 chronometers that they carried were rendered useless. There was now no straightforward way to find Greenwich Mean Time (GMT) and hence longitude. Powell did make efforts to salvage the situation using an Elgin watch that he also had in his possession. He attempted to time the first and last contacts of the solar eclipse of August 7, 1869 but was clouded out. He also undertook an extensive series of lunar distance sights but this was likely something that he had not practiced. All of the rounds of sights show inconsistencies that make them unusable. The discovery of the longitude of key features along the route had to await subsequent expeditions. Latitude measurements were not affected.

Naturally this famous expedition has received a lot of scrutiny from historians. Powell's original journals are in the collection of the Smithsonian Institution (Powell 1869). Their contents and those of other expedition members have been transcribed and published by Ghiglieri (2015) along with a great deal of other background information. That work also contains a transcription of Powell's astronomical observations by Richard Quarteroli who advocated for their interpretation (Quateroli 2002). For a long time, the meaning of these screeds of figures remained mysterious. Although investigations by an anonymous expert in celestial navigation provided some insights, no systematic and conclusive study had been made. In 2019 I took up the challenge along with my collaborator, Lars Bergman. We were able to make sense of all the figures and published our conclusions in the *Journal of Navigation* (Bergman and Stuart 2021).

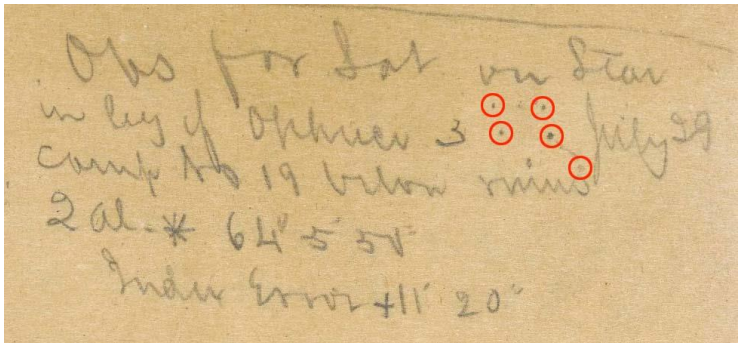
The campsites from which Powell made his most extensive rounds of sights were described in sufficient detail that they can be accurately located on modern maps. When compared with the latitude extracted from Powell's records, his measurements revealed him to be a skilled observer, with average errors of less than ½ arc minute or ½ nautical mile (0.6 mile).

Major Powell fought on the side of the Union in the American Civil War and had his right arm amputated below the elbow following the Battle of Shiloh in 1862. This would have presented some challenges when using a sextant.

Observations were made with an artificial horizon which consisted of a shallow dish of liquid mercury. A sextant is then used to measure the angle between an object and its reflected image. This is twice the altitude of the object above the horizontal and, because a sextant can only measure angles up to about 120°, the altitude of the body being observed must be below 60°. This meant that the classic *noon sight* (see WAA Newsletter, February, 2019, p. 11) was not an option, as the Sun was transiting at too high an altitude. Instead, Powell made meridian altitude sights of Saturn, Altair and on one occasion β Ceti (Diphda).

The altitude of the celestial pole in the sky is equal to the observer's latitude. By measuring the altitude of Polaris and applying some corrections one's latitude can be determined. In 1869 Polaris lay 1.4° from the pole, which is about twice what it is today. Without applying corrections, the observer's position could be off by ±84 nautical miles (97 miles). Although dependent on the time of the observation, Polaris only moves slowly and very accurate time is not required. Powell carried out 4 rounds of Polaris sights, obtaining a similar level of accuracy as for the meridian transits. Powell's meridian altitude of July 29, shown

below, presents something of an enigma. He records the observation of a "Star in leg of Ophiuchus". He includes a sketch of five stars, with two of them connected by a line. Just what does this mean?



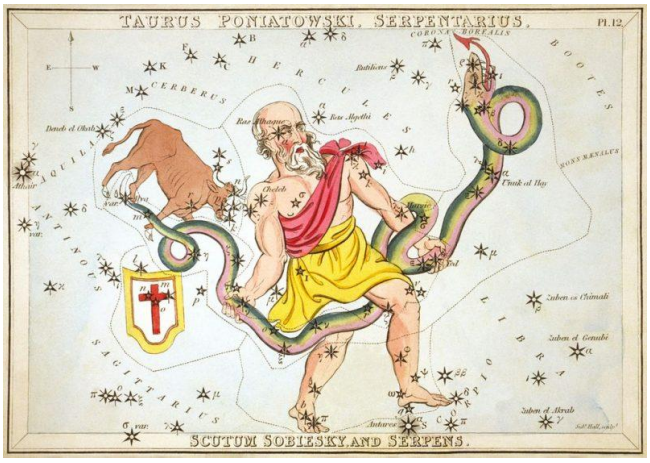
Obs[ervation] for Lat[itude] on Star
in leg of Ophiuchus July 29
Camp No 19 below ruins
2 Al. * 64°-5′ 50″
Index Error +11′ 20″

Major Powell's meridian transit observation of July 29th, 1869. "2 Al." indicates that recorded value is double the altitude as it was measured using an artificial horizon. The *Index Error* is the zeroing error in the sextant that must be added to correct the recorded value. Included in the text is a sketch showing five stars, circled in red. (Smithsonian Institution, NAA MS 1975a-v2-145b).

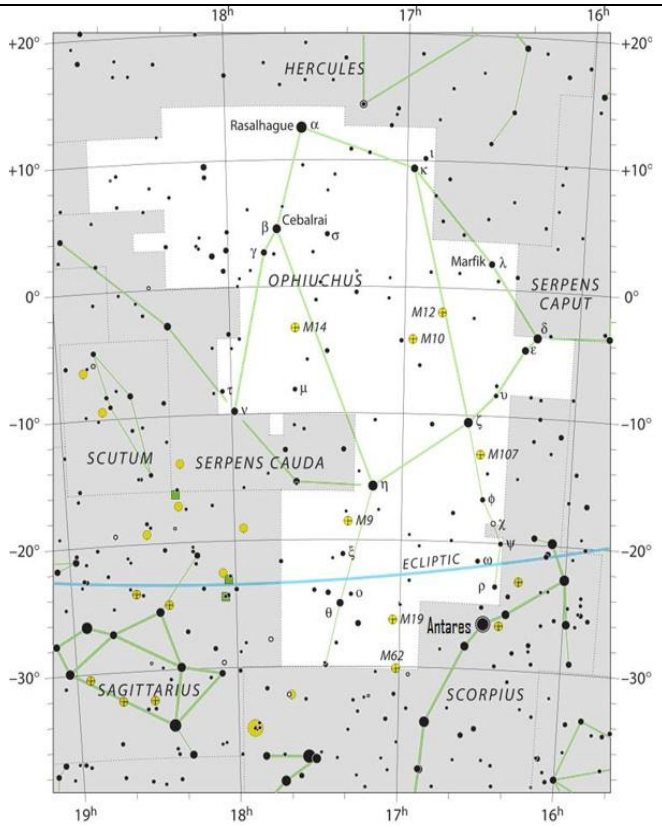
Nowadays using Stellarium or similar software it is a simple matter to simulate the view that the expedition would have had from their camp on the banks of the Colorado River. Lo and behold, the arrangement of stars that Powell sketched appears in the sky to the south. The diamond shape is formed by Sabik (η Ophiuchi) together with ξ, ο and ν Serpentis in the constellation of Serpens Cauda, the serpent's tail. The "Star in leg of Ophiuchus" is apparently Saturn. With this interpretation the deduced latitude is 37°23.4′ N, which correctly places the expedition's location on the river between their campsites on 20 July at the confluence of the Green and Colorado rivers and that of 31 July at the mouth of the San Juan River.

Saturn on the meridian with the stars of Ophiuchus and Serpens Cauda as would have been seen on July 29th, 1869 from latitude 37°23.4′N. Simulated view using Stellarium.

Pictorial representations of Ophiuchus often place Sabik near his knee. More modern versions show Sabik at the hip. In either interpretation, Saturn in July 1869 would have formed part of a leg.



Ophiuchus holding the serpent, Serpens, as depicted in Urania's Mirror, a set of constellation cards published in London in 1824. Sabik (η Ophiuchi) is shown near his right knee. Also shown is the now defunct constellation Taurus Poniatovii and Scutum Sobiescianum, modern Scutum, both added to honor Polish kings.



Modern representation of Ophiuchus with Sabik (η Ophiuchi) at the Serpent Bearer's hip. (IAU and *Sky & Telescope* magazine)

Powell had taken three meridian transit sights of Saturn prior to this one, and another afterwards. In all of these, Saturn was recorded as "Saturn". Why did Powell choose to refer to the planet in this cryptic manner, as a "Star in leg of Ophiuchus"? Confusion or misidentification cannot be the issue. Was it a puzzle or a jest? That we will probably never know.

References

Bergman, L. and Stuart, R. G. (2021) *Astronomical Observations of the 1869 Powell Expedition Through the Grand Canyon*. Journal of Navigation, **74**, 212-233.

https://www.cambridge.org/core/journals/journal-of-navigation/article/astronomical-observations-of-the-1869-powell-expedition-through-the-grand-canyon/D5627421BA12E49147E637BAE25F497F/share/d3684665dccf0a25c69599b9f08bc483f2be78a2

Ghiglieri, M.P. (2015). *First Through Grand Canyon*, 3rd edition, Puma Press, Flagstaff.

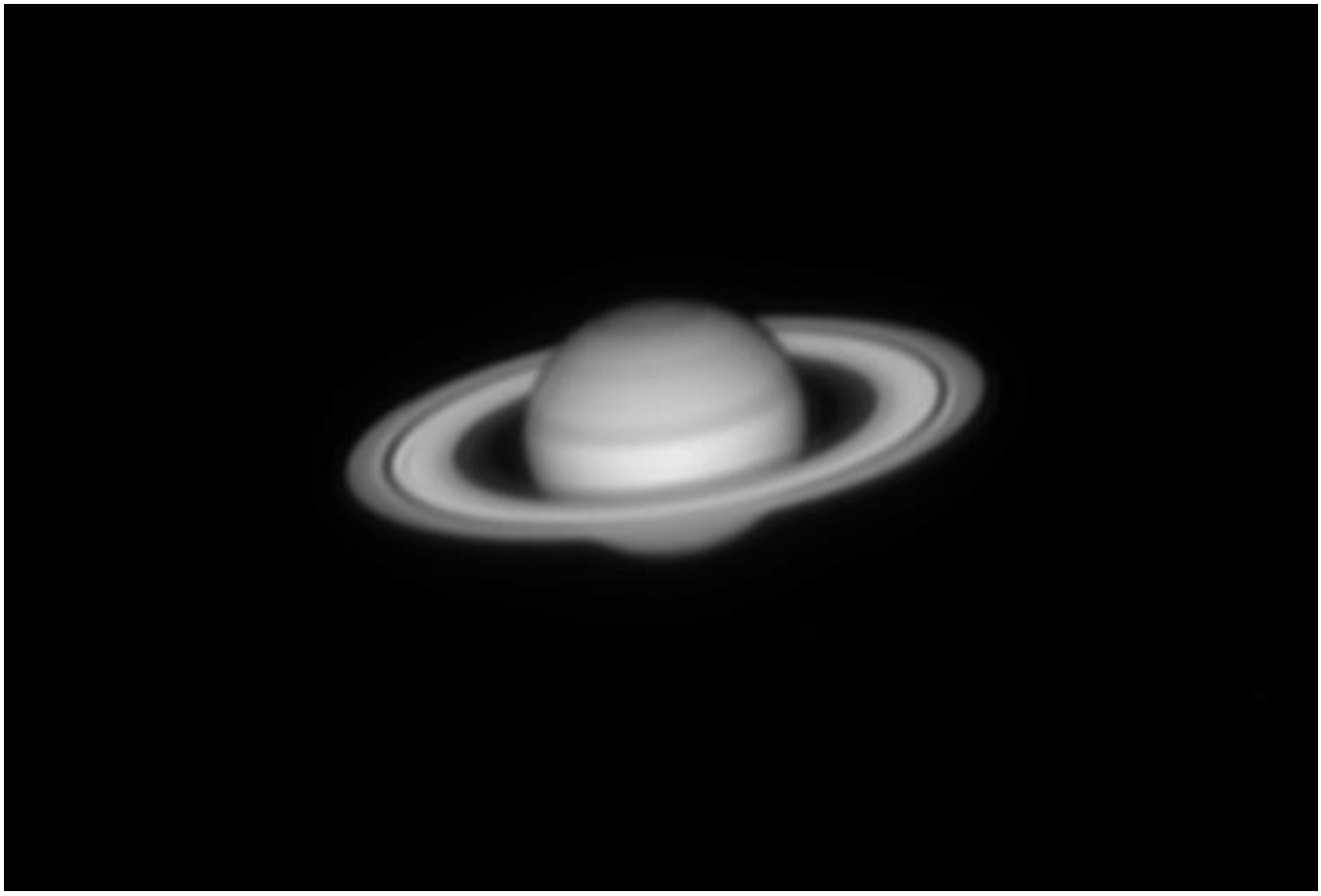
Powell J. W. (1869) *Geological Notes and sections, and Astronomical Record of 1869* Smithsonian Institution, National Anthropological Archives MS 1795a, Volume 2, Journals 1869–1872. https://sova.si.edu/record/NAA.MS1795AB

Quartaroli, R.D. (2002) *GPS in 1869: The Geographical Powell Survey,* Proceedings of the Inaugural Grand Canyon History Symposium, ed. M. F. Anderson, Grand Canyon Association, 129–136. http://www.riverguides.org/History/GrandCanyonHistoriansSymposium2005.pdf

John Wesley Powell around 1869 ■

Images by Members

Saturn in optimal seeing by Larry Faltz



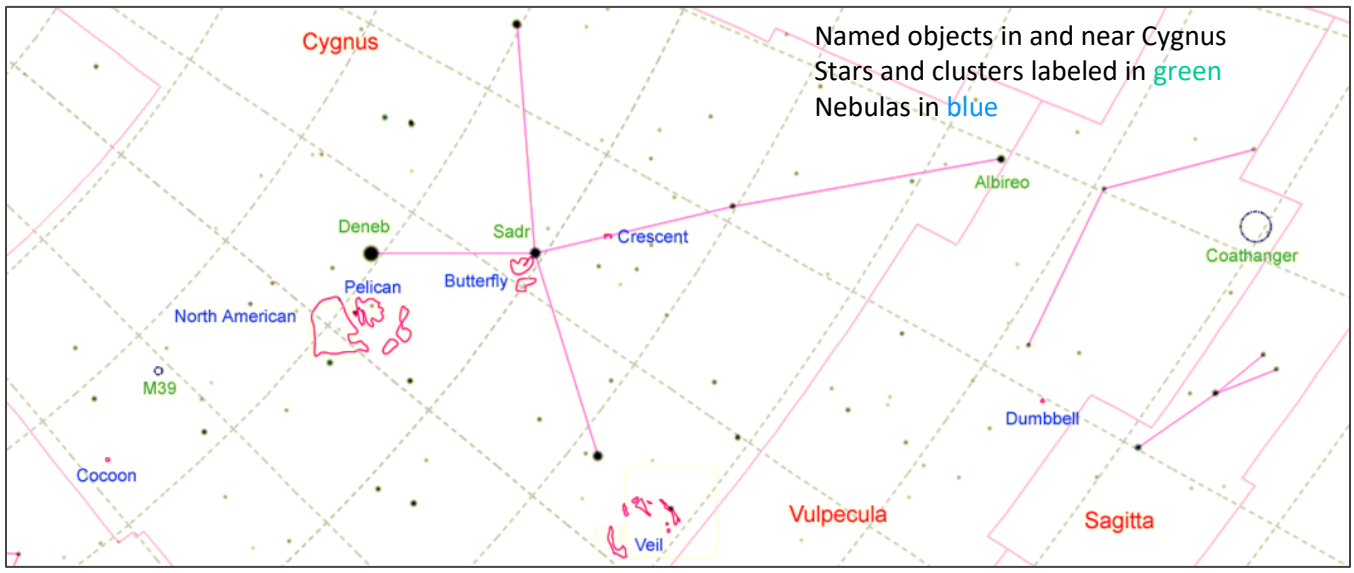
Planetary observing and imaging are always better when the seeing is excellent. Turbulence results from heat cells in the atmosphere (or inside an insufficiently equilibrated scope) that scramble the wavefront. To minimize this problem you have to go where sources of heat (people, buildings, cars, streets, factories and power plants) aren't, and make sure your scope comes to ambient temperature. This image was made at the Medomak Astronomy Retreat and Symposium in rural Maine, with forests and farms for miles in every direction. I had been viewing for five hours before putting the camera on the telescope.

The planet was only at 25° 42' elevation at 12:51 a.m. on August 14, azimuth 195° south. In that direction there are no heat sources: essentially nothing but landscape for thirty miles to the Maine coast, then just ocean until Cuba. At one point I used a 5-mm Televue Nagler T-6 eyepiece to give 400X with my well-collimated CPC800 (8" SCT). In Westchester 400X would only show a gyrating fuzzy blob, but that night the view through the eyepiece was exceptional. The Cassini division was sharp, steady and black and the C ring was visible as well. Jupiter was also stunning, with detail and color in many bands. The Red Spot was sharply defined and colored. The view was even better in Eric Baumgartner's marvelous 7-inch TMB refractor, especially through his rare three-element "monocentric" planetary eyepieces.

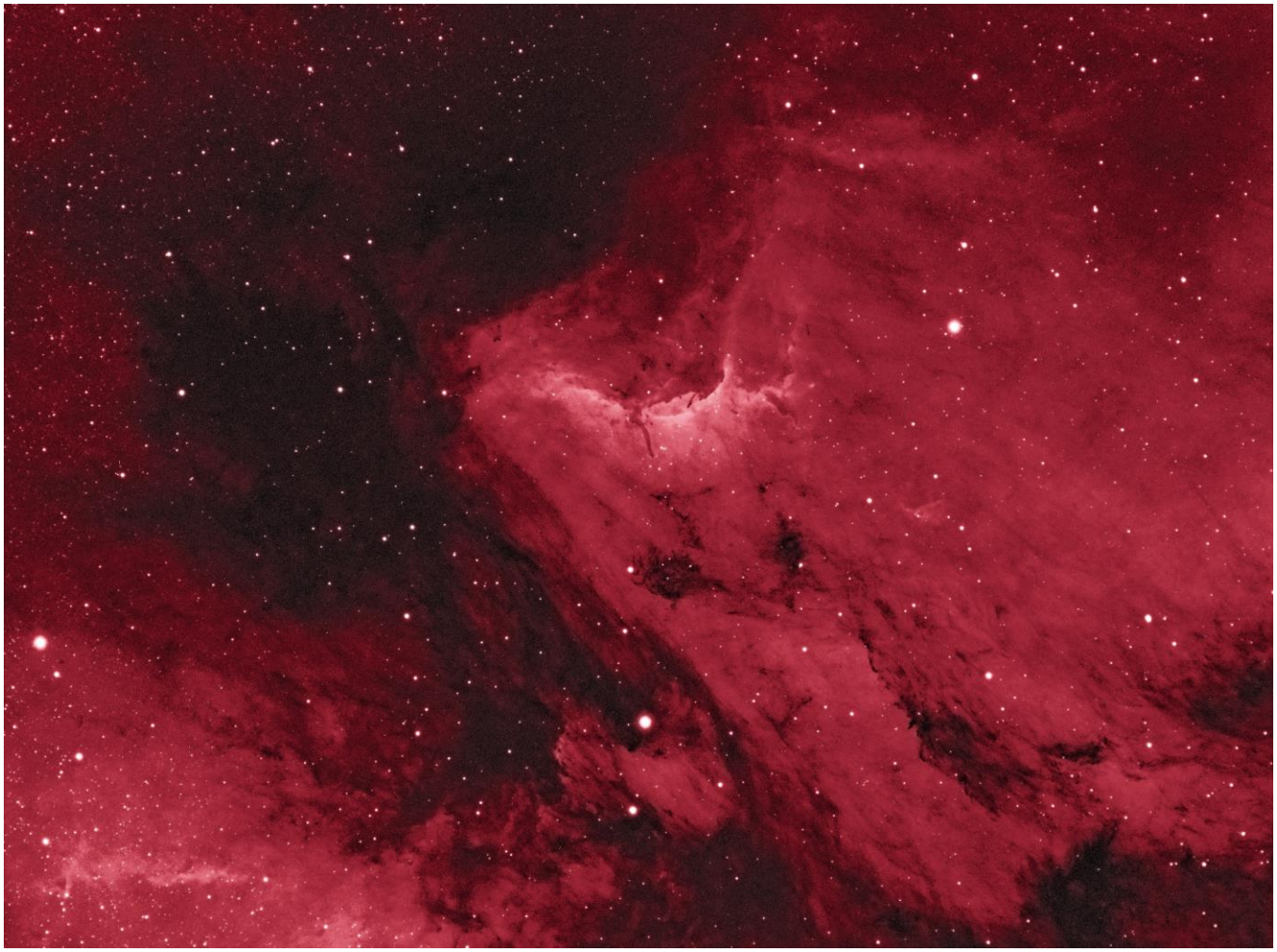
The image was made with a Celestron CPC800, 2X Barlow, ASI290MM (monochrome) camera and a red filter. I managed to get the focus right. The region of interest was reduced to 1280x720 from the sensor's native 1936x1096. Images of 45.7 milliseconds each were acquired at 21 FPS, for a total of 4472 frames over 3½ minutes. Autostakkert!3 selected and stacked the best 50% of the frames. I applied wavelets in Registax 6.1.

IC 5146, The Cocoon Nebula, Caldwell 19, SH2-125 by Steve Bellavia

Steve's beautiful image was obtained over two nights in early September at Orient Point on Long Island. The Cocoon Nebula looks as if it is leaving a wake as it plows through the summer Milky Way in Cygnus. The wake is actually molecular dust, catalogued as Barnard 168. The Cocoon itself is ionized hydrogen (HII) illuminated by a hot, young (100,000 years old) star that is so energetic its energy and winds have cleared the gas and dust in the most central part of the nebula. Technical information is at https://www.astrobin.com/vafzfp/.



Pelican Nebula by Jordan Webber



It seems to the Editor, that Jordan has achieved a three-dimensional effect in the brightest region of the Pelican Nebula, IC 5070 & IC 5076. The nebula is named for its resemblance to the aquatic bird, but one can see other things if you can free your mind from the standard appellation. For example, you might see an eagle with his wings spread and his talons about to grasp a bit of the North American Nebula on the left. It's a bit like looking at clouds or Rorschach tests.

The Pelican and the somewhat brighter North American nebula are really part of the same HII complex. They appear to be separate because of an obscuring molecular dust cloud. The complex is about 1,800 light years distant. The nebula is illuminated by a hot star, but exactly which one isn't clear. Originally, Deneb, two degrees away, was thought to be responsible, but as more observations were obtained HD 199579, which is located in the North American nebula, was claimed to be providing the energy for the whole complex. In 1980 a reddened star behind the dust lane was suggested, and since then a substantial number of other candidates have been found. It is very likely that more than one young star contributes energy to the fluorescence of the hydrogen.

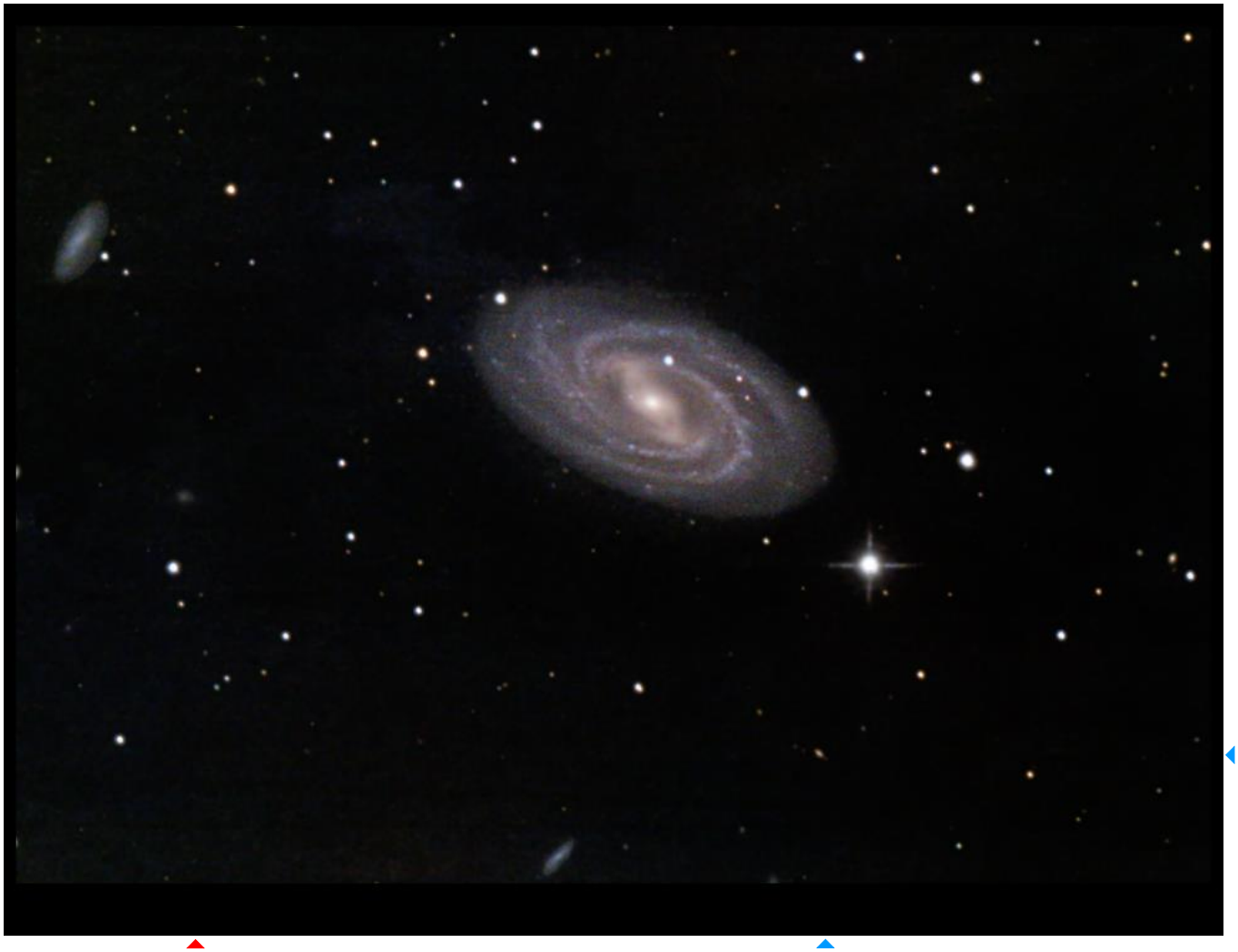
The North American and Pelican nebulas are frequently imaged, as seen in Olivier Prache's "first light" RASA-8 image on page 15 in this issue and in Tony Bonaviso's cover image in the March 2021 SkyWAAtch. Although not visible with naked eye or binoculars from Westchester, these two complex and beautiful celestial objects can be seen with an image intensifier and a hydrogen-alpha filter.

Soul Nebula by Leandro Bento

Also known as IC 1848 Westerhout 5, Sharpless 2-199 and LBN 667, this object in Cassiopeia is an area of hydrogen emission excited by stars from several open clusters of young stars within it. It's called the "Soul" primarily because it's located close to IC 1805, the "Heart Nebula." IC 1805 certainly looks more like a heart than IC 1848 looks like a soul, however. The 1938 song "Heart and Soul" by Hoagy Charmichael and Frank Loesser was a beginners' duet for many piano students in the 1940s, 50s and 60s. IC 1848 is actually more properly the main open cluster within the Soul Nebula, with clusters CR 34, CR 632 and CR 634 also nearby.

Leandro made this image of September 3 at Ward Pound Ridge Reservation. WO Redcat 51 telescope, ZWO ASI533MC Pro camera, Optolong L-Enhance filter, Ioptron Skyguider tracker, 78 frames at 180 seconds each, gain 360, -10°temp. Darks, flats and bias frames taken.

Messier 109 by Rick Bria



The small but lovely barred spiral galaxy Messier 109 was not given a number in Messier's original catalogue, but is found in his description of M97: "Near this nebula he [Pierre Mechain] has seen another one, [the position of] which has not yet been determined [M108], and also a third which is near Gamma of the Great Bear [M109 near Gamma Ursae Majoris]." M108 and M109 were formally added by Owen Gingerich in 1953.

The galaxy shines at a visual magnitude of 9.8. It is 7.24 arc-minutes in diameter and is 18.10 Mpc distant. In Rick's image, made with the 14-inch PlaneWave at Maria Aloysius Hardey Observatory in Greenwich, three accompanying galaxies can be seen. On the upper left, the distinct smudge is UGC 6969, g-band magnitude 14.947, distance 19.07 Mpc. Towards the lower edge, another spiral, UGC 6940, shines at *g* magnitude 15.983. It is 19.11 Mpc distant. Just above the V-band magnitude 11.55 star Gaia DR2 792345123070625664 (catalogued in the now out-of-date Tycho catalog as Tyc 3833-778-1), is the faint g-band magnitude 16.478 galaxy 2MASX J11585539+5321100, 231.31 Mpc distant. You can find it by triangulating the red index marks at the edges of the image. Galaxy 2MASX J11571521+5315577 is indicated by the blue index marks. Its g-magnitude is 17.679, distance 220.87 Mpc.

Magnitude measurement in spectral bands is explained in the article "Measuring Starlight: Magnitudes, Film and Filters" in the September 2021 SkyWAAtch. The g band is reasonably close to the older and more familiar V band that amateurs usually encounter when we see magnitudes in our software or references. Distance and magnitude data are taken from the NASA/IPAC Extragalactic Database, http://ned.ipac.caltech.edu/.

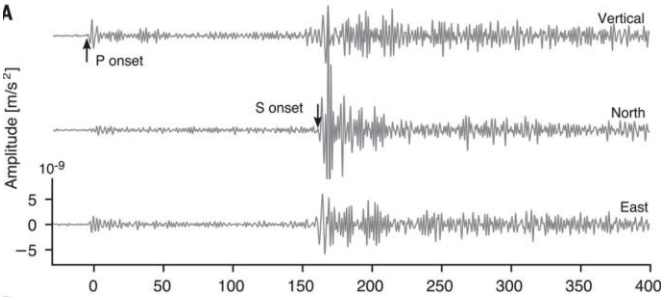
Research Highlight of the Month

Khan, A. et. al, Upper mantle structure of Mars from InSight seismic data, *Science* 2021; 373: 434-438

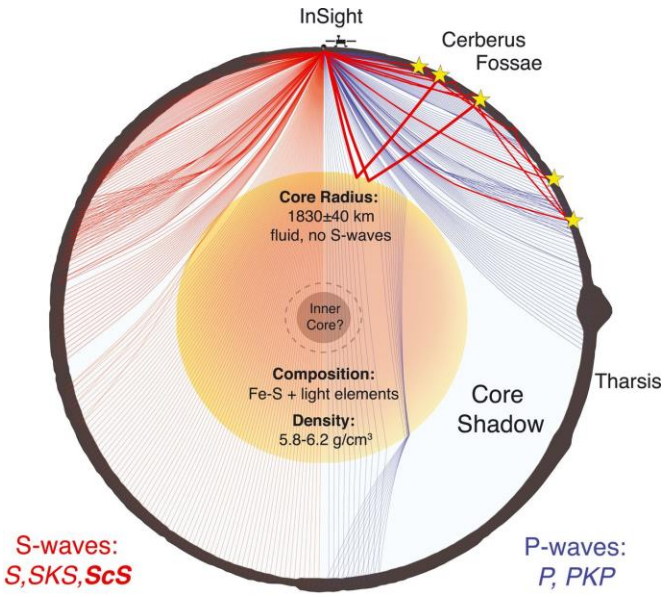
Knapmeyer-Endrun, B, et. al., Thickness and structure of the martian crust from InSight seismic data, *Science* 2021;373: 438-443

Stähler, S, et. al, Seismic detection of the martian core, *Science* 2021; 373: 443-448

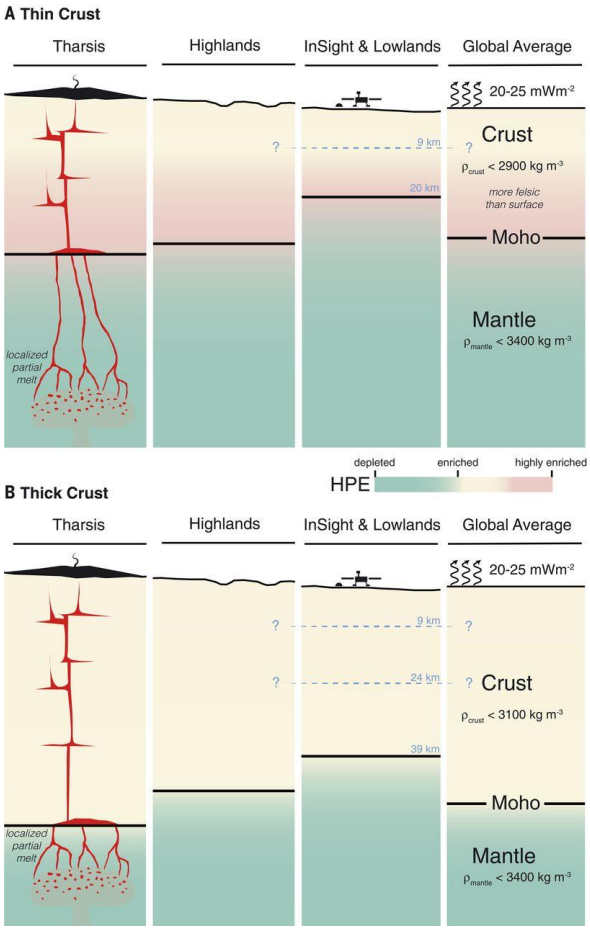
These three papers present the findings of the first two years of data acquisition by the InSight lander, which arrived on the martian surface in November 2108 and started recording seismic activity 3 months later. Mars has a larger, less dense core than expected, meaning its iron and nickel must be enriched in lighter elements like sulfur. The core starts about halfway to the center of the planet. The mantle is thin, lacking the mineral bridgmanite, $(Mg,Fe)SiO_3$, which is only stable under high pressure and is the most abundant mineral in the Earth, which has a thick mantle. This means that the early core would have cooled more rapidly, creating a "geodynamo" that would have created a magnetic field. That field no longer exists. The early martian geodynamo would have been as strong as Earth's is now. The crust is enriched in radioactive heat-producing elements, but its exact depth can't yet be determined yet. These and other details inform possible histories of planet formation and evolution. They neither confirm nor rule out the possibility of a giant impact being responsible for the peculiar divergence of Martian topology, the low-lying flat northern hemisphere contrasted with the cratered highlands in the south. InSight will continue to gather data at least until the end of 2022.



A Marsquake as detected by InSight (Khan, et. al.)



Model of Mars' core (Stähler, et. al.)



Two models of the martian crust (Knapmeyer-Endrun, et. al)

Member & Club Equipment for Sale

Item	Description	Asking price	Name/Email
Celestron CPC 800	8-inch f/10 SCT, complete with tripod, Telrad finder, dew shield and power supply. Like new. Updated to latest firmware. Just point it at two stars and you're good to go.	$750	David Parmet david@parmet.net
Nexus DSC Digital Setting Circles	Connects to encoders on your mount (you provide) for accurate push-to object finding. Contains many astronomical catalogues. See https://www.astrodevices.com/Products/NexusDSC/index.html.	$100	Peter Rothstein peterrothstein01@gmail.com
Bausch & Lomb 5-inch f/8 objective lens	Large-format/aerial camera lens in cell. Cleaned and reconditioned by John Paladini. Diaphragm removed. Weight 10 lbs. Mounted on a wooden board, can be removed. See images at https://is.gd/WAABL. Use in a telescope or camera project. Donated to WAA.	$25	WAA ads@westchesterastronomers.org
ExploreScientific 127-mm refractor	Air-spaced ED APO f/7.5 triplet OTA with tube rings, 2" diagonal, Orion focus extender. Like new condition; rarely used. See https://is.gd/es127gb for more information.	$1000	Greg Borrelly gregborrelly@gmail.com
ExploreScientific 40-mm eyepiece	68° field of view. Argon-purged, waterproof, 2" eyepiece. New in original packaging, only used once. Lists for $389.	$340	Greg Borrelly gregborrelly@gmail.com
ADM R100 Tube Rings	Pair of 100 mm adjustable rings with large Delrin-tipped thumb screws. Fits tubes 70-90 mm. You supply the dovetail. Like new condition, no scratches. See them on the ADS site at https://tinyurl.com/ADM-R100. List $80.	$50	Larry Faltz lfaltzmd@gmail.com
75-mm Tube Rings	Pair of 75-mm inside diameter rings with 3-point nylon centering screws. Can accommodate tubes between 40 and 75 mm. On fine slotted 200 mm dovetail bar. Great for finder, guide scope, small camera lens. Photo https://is.gd/75mmrings.	$50	Larry Faltz lfaltzmd@gmail.com
Want to list something for sale in the next issue of the WAA newsletter? Send the description and asking price to ads@westchesterastronomers.org. Member submissions only. Please offer only serious and useful astronomy equipment. WAA reserves the right not to list items we think are not of value to members.			
Buying or selling items is at your own risk. WAA is not responsible for the satisfaction of the buyer or seller. Commercial listings are not accepted. Items must be the property of the member or WAA. WAA takes no responsibility for the condition or value of the item, or for the accuracy of any description. We expect, but cannot guarantee, that descriptions are accurate. Items are subject to prior sale. WAA is not a party to any sale unless the equipment belongs to WAA (and will be so identified). Sales of WAA equipment are final. *Caveat emptor!*			

Answer to *Another Movie Telescope* on page 18: *Raiders of the Lost Ark*, Harrison Ford as Indiana Jones.