

The Newsletter of Westchester Amateur Astronomers

January 2021



The Heart Nebula by Leandro Bento

The Heart Nebula, catalogued as IC 1805 and Sharpless 2-190, is an emission nebula in Cassiopeia, 7500 light-years from Earth. Leo's image shows a 2½-degree field. The hydrogen gas in IC 1805 fluoresces from radiation emitted by large hot stars in open cluster Collinder 26/Melotte 15 in the middle of the nebula. Open cluster NGC 1027 sits at the right edge but it's a foreground object. William Optics RedCat 51 mm f/4.9 Petzval refractor, ASI ZWO533MC Pro, Optolong L-eNhance filter, iOpton SkyGuider mount. 68 x 180 sec subs with darks, flats and bias frames.

WAA January 2021 Meeting

Friday, January 15 at 7:30 pm

On-line via Zoom

Microquasars

Diana Hannikainen, Ph.D. Observing Editor *Sky & Telescope*

Microquasars are stellar-mass black holes in our galaxy that pull mass from a companion star. They emit X-rays and generate jets of subatomic particles along their axis of rotation, just like galactic quasars but on a much smaller scale.

Diana Hannikainen got her undergraduate degree at the University of Edinburgh. She earned an MSc and a PhD in high energy astrophysics at the University of Helsinki. She's been with S&T since 2018.

Pre-lecture socializing with fellow WAA members and guests begins at 7:00 pm!

The Zoom link will be emailed to members in advance each meeting and will also be posted on the opening page of the WAA web site.

WAA Members: Contribute to the Newsletter!

Send articles, photos, or observations to waa-newsletter@westchesterastronomers.org

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Also In This Issue of SkyWAAtch

- 3 Almanac (Bob Kelly)
- 4 The Great Conjunction
- 6 Member Profile: Robin Stuart
- 10 DSO of the Month: Messier 78
- 11 A Relic of the Early Space Age
- 12 Last Call for Mars?
- 13 On the Fate of Telescopes (Larry Faltz)
- 20 Images by WAA Members
- 26 Research Finding of the Month
- 27 Member/WAA Equipment Classified

WAA February 2021 Meeting

Friday, February 12 at 7:30 pm

On-line via Zoom

Update on Mars Research

Br. Robert Novak, Ph.D. Iona College & Goddard Spaceflight Flight Center

Our regular Mars update with Br. Novak. There's a lot happening at Mars!

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

Starway to Heaven

Ward Pound Ridge Reservation, Cross River, NY

Our star parties will resume in March, weather permitting and subject to public health measures in effect at that time.



New Members

Jeff Edrich	Putnam Valley
Laura Guinan	Port Chester
Robert Peake	Pleasantville
Erika Soldano	White Plains
James Sweeney	Larchmont
Albert Ysaguirre	White Plains

Renewing Members

Daniel Cummings Michael DiLorenzo Matthew Dugan Carlton Gebauer Mark Hefter Robin Stuart Melissa Toole Charles Wiecha Lori Wood Croton-On-Hudson Yonkers White Plains Granite Springs Dobbs Ferry Valhalla Bedford Hastings on Hudson Yonkers

ALMANAC For January 2021 Bob Kelly, WAA VP for Field Events

The cavalcade of bright planets comes to a close as we start calendar year 2021. **Jupiter** spurns **Saturn** as the solar glare overtakes them. **Venus** tends lower in the morning. **Mercury** tracks low through the evening twilight, while **Mars** holds the planetary standard high in the evening sky.

Mercury will slide into the evening sky, passing Jupiter and Saturn from the 9th through the 11th. **Jupiter** and **Saturn** are fresh off their historic close approach in December. At only 14 degrees from the Sun in the evening sky, they'll be even harder to catch, unless skies are very clear. Before the month ends, they'll be in conjunction with the **Sun**. Saturn will pass the Sun on the 23rd and Jupiter on the 28th. We needed the Solar and Heliospheric Observatory to see Mercury in conjunction with the Sun in December, so SOHO will be useful for spotting Jupiter and Saturn later in the month. Mercury will reach greatest eastern elongation on the 23rd, at only 19 degrees from the Sun, setting just before the end of evening twilight.

Venus gets lower, rising after morning twilight begins. Still at magnitude -3.9, its brightness helps us have any chance of seeing the morning star. Observers of the southeastern sky may be surprised when the thin **Moon** passes Venus on the 11th, drawing attention to the contrast between the slim lunar crescent and gibbous Venus, if you can get a scope on them.

Mars is the remaining easy-to-see planet this month. It's up until 1 a.m., shining at magnitude 0.0. The reddish disk is only 10 arc-seconds wide at New Year's at 7 arc-seconds by the end of the month, making surface features hard to pick out in modest telescopes. But Mars is easy to point out and fun to follow as it moves from Pisces to Aries. Mars will pass 1.7 degrees north of **Uranus** on the evening of the 21st, close enough to be a help for finding the magnitude 5.8 ice giant, 3.5 arc-seconds in diameter. The Moon will be nearby, having passed closer to them just 18 hours before, making Uranus a bit harder to find in the glare of its waxing gibbous phase. The pair of planets will be in the same field for wide-angle binoculars for a week, so try earlier than their closest



approach when the Moon is thinner or afterwards when the Moon is further away.



Neptune, at magnitude +7.9, is camped out amidst the stars of Aquarius, setting by 9 p.m. at the end of January.

The **Quadrantid meteor shower** has a sharp peak on the morning of the 3rd, in the daytime, with an 80percent full Moon in the pre-dawn hours, making it a hard-to-see shower this year. You could take the opportunity that morning to see the area of the Moon near Mare Orientale tipped towards Earth. Another favorable tilt toward us by Orientale occurs on the 28th and 29th.

The latest sunrise this northern hemisphere winter is on the 4th. Earth's annual perihelion is on the 2nd.

The **International Space Station** will make visible passes in the morning sky through the 10th and in the evening sky starting on the 16th. Consult a good app for exact times and positions.

Manhattan's cross streets align with sunrise on the 11th and 12th. Commonly called *Manhattanhenge*, a term coined by Neil deGrasse Tyson, the alignment takes place about three weeks before and after the winter solstice for sunrise and the summer solstice for sunset. Photographers will be jostling for positions in the city's streets looking southeastward. Manhattan's cross streets are aligned 119° (SE) - 299° (NW). ■

The Great Conjunction

It was typically frustrating Westchester weather for the Great Conjunction of Jupiter and Saturn on December 21st. A crystal clear afternoon gave way to clouds about an hour before sunset, although there were a few tiny sucker holes that allowed fleeting visual or imaging views for some WAA members.

In the lead-up to the event, two members made wider-angle shots. Here's **Alex Mold**'s image with the Moon on December 17th.



Alex Mold's image on December 18th

Rick Bria made a Christmas card out of the event on December 18th, which turned out to be the last clear night before closest approach. He made his image on the campus of Sacred Heart School in Greenwich.



Rick Bria's image on December 18th

Out in Long Island, **Steve Bellavia** sent a close-up image of the conjunction made on December 18th, when the planets were $19\frac{1}{2}$ arc-minutes apart.



Steve Bellavia's image with 6" SCT and CMOS camera

On the 21st, **Brian Blaufeux** managed to get a quick view through his 6" SCT in Larchmont. He held his cell phone up to the eyepiece to memorialize the event as the clouds came in. It's always hard to align the scope and cell phone camera without one of those adapter gizmos, so the resulting off-axis image looks to me like a mammogram with two flecks of calcium. But it's an intrepid record of this rare cosmic event.



Brian Blaufeux's cell phone image through 6" SCT

Steve got a brief clear window on the 21st and nailed the two planets when they were 6' 11" apart, just two hours after the time of their exact closest approach of 6' 07" (next page).

Since we were clouded out, Elyse and I watched a Zoom broadcast from the Westminster Astronomical Society (Carroll County, Maryland). They managed a few minutes of visibility, imaging through an 8" SCT while enthusiastically chatting about the event. It was a friendly group and there were about 40 on-line attendees. At 7:00 p.m. we logged onto the YouTube presentation by Lowell Observatory, which had over 40,000 participants. Lowell had perfectly clear skies at 5 p.m. MST, showing excellent images from a 14" PlaneWave on the Giovale Open Deck Observatory and later from a 5" refractor set up near their 4.3meter Discovery Telescope outside of Flagstaff.



Screen shot from the Lowell program. Image with 5" refractor.

The 2½-hour program featured a number of very informative talks by Lowell astronomers shown in a smaller window next to the image of the conjunction. The quality of the live image was good, but to show Saturn, Jupiter had to be overexposed and to see moons both planets had to be vastly overexposed.

SkyWAAtch

Lowell also showed an image taken on December 18th with the 4.3-meter telescope. Detail on the planets wasn't all that much better than Steve Bellavia's image below, and of course the separation was wider.

Jupiter and Saturn are in the same area of the sky every 19.8 years, but won't be this close until March 14, 2080. In one of the Lowell talks it was reported that there was an occultation of Saturn by Jupiter in 6857 BC and that it will happen again in 7541 AD. Using Stellarium I found that the closest the two planets will get that year is on June 21, 7541 when they will be just 40 arc-seconds apart, but not actually occulting, but that's assuming no change in orbital parameters in the intervening 5700 years. (LF) ■



Steve Bellavia's closest approach image at 5:03 p.m. on December 21st

Member Profile: Robin Stuart

Home town: Dunedin, New Zealand.

Family: A daughter and a son.

How did you get interested in astronomy? I was caught up in wave of excitement around the Apollo 11 Moon landing and tried to learn everything I could about the US and Soviet space programs. At some point I realized I knew next to nothing about astronomy and decided to do something about it. My father gave me an Air Force star identification booklet from the war years. I stepped outside and almost immediately spotted the Sickle of Leo. It was a bit of a revelation that the stars formed recognizable non-random patterns.

I was overjoyed when I was given a high-quality 2.4inch refractor as a birthday present. I spent many frustrating hours trying to find targets until I realized that you need to first sight along the tube and then go to the finder. Once I discovered that the wonders of the southern sky were at my fingertips. At our home we enjoyed <u>very</u> dark skies and for many years I could not understand the point of finder crosshairs as they were completely invisible.

I joined the local Dunedin Astronomical Society, ground a 6" mirror and built a Newtonian that finally allowed me to resolve Omega Centauri and other globulars. Later I ground and polished an 8" Pyrex mirror. Graduate studies in Physics took me abroad to Oxford, England, so the telescope was never finished.



Do you recall the first time you looked through a telescope? What did you see? Not really a telescope, but I remember being stunned by the view when I

turned my grandfather's 8×30-mm binoculars on the Moon.

What's your favorite object(s) to view? The area around the Southern Cross and Eta Carina, in my opinion, is the most beautiful in the whole sky. There you find Omega Centauri, the Jewel box cluster, Eta Carina itself and numerous dense open clusters all set in a particularly rich region of the Milky Way.

What kind of equipment do you have? Over the years I have accumulated a fair variety of equipment but tried to avoid redundancy. I have a pair of 20×80 mm binoculars that I bought in Geneva, Switzerland to observe Halley's Comet. I carried them whenever I travelled in case they were needed. On one occasion I was passing through customs in Atlanta. A young customs officer who reminded me a bit of Gary Coleman inspected them and exclaimed, "Oh boy, you must have gotten a really bad seat at the ball game!"

I have had a 70-mm Televue Pronto since about 2000 and recently purchased a Televue NP 127.

For a long time I have owned an 18" NGT-18a made by Jim's Mobile Industries. By nature it's a deep sky light bucket and the skies in Westchester are not really suitable. It has effectively been in storage for a quite a while but I am in the process of bringing it back to life.

What kind of equipment would you like to get that you don't have? A cooled CCD camera

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

Tenerife for Halley's Comet

Growing up under pristine skies in New Zealand I had eagerly anticipated the 1986 apparition of Halley's Comet, which favored the southern hemisphere. When the year finally rolled around I was working at CERN, the European particle physics laboratory, and living under the s**t skies of the Geneva region. I was determined not to miss out, however. I purchased my 20×80-mm binoculars and a tripod from a camera store in Geneva and made plans to fly to Tenerife in the Canary Islands. This was before the Schengen Agreement and European nations had a patchwork of odd visa requirements. For some reason the only country that in Western Europe for which a New Zealand passport holder required a visa was Spain and its territories and to get one required a face-toface interview with the Spanish Consul As I explained my reasons for wanting to visit a renowned tourist destination, it was clear that both he and I fully appreciated the absurdity of the situation and the visa was quickly issued.

To fly direct to Tenerife from Geneva was rather expensive. Flying from Spain was very much cheaper. My then- girlfriend and later wife set off in the early afternoon to drive our little Peugeot 104 from Geneva to Barcelona. After a stopping for a seafood dinner near Montpellier, we arrived in Barcelona around 3 in the morning. The next day was reserved for sightseeing. Our guidebook cheerfully informed us that Barcelona was the most dangerous city in Europe and that where we were reading this, in Las Ramblas down by the port, was the worst area of all.

We were fortunate to find a safe space right beside the cashier's booth in the long-term parking at Barcelona airport and boarded the flight to Tenerife. We toured during the day and nightly I drove up the mountain road, sometimes alone and sometimes accompanied, to near where the large telescopes are located. The sky and view of the comet were magnificent. On the first night out, as we ascended the mountain my companion pointed out that we weren't going to see anything as there were clouds above us. It was the Milky Way!

San Blas, Mexico for the July 11, 1991 Total Solar Eclipse

On July, 11 1991 the longest total solar eclipse of the 20th century occurred, lasting a full 6 minutes 53 seconds. My wife and I made plans to witness it in San Blas on the west coast of Mexico. We flew to Guadalajara planning to drive to San Blas and back the day of the eclipse. We left our hotel sometime after midnight. Although the road was shown as a major highway on the map, it was actually more like a goat track, full of deep bone crunching potholes which caused the loss of 3 hubcaps during the trip.

To observe the partial phases of the eclipse I had my trusty 20×80 -mm binoculars outfitted with Mylar filters. From San Blas the Sun would be at an altitude of 89° at totality and we also carried pair of camp

stretchers that would allow us to watch the event lying on our backs.

The small seaside village of San Blas was full of visitors from all over the world and excitement grew as the time of totality approached. I could see thunderheads beginning to form towers over some of coastal mountains but with luck they wouldn't obscure the Sun. Eventually it became clear that that is exactly what one of them was going to do and I felt a sense of desperation set in. There was no road running parallel to the coast so we couldn't jump in the car and change our vantage point. I began to look around for a fishing boat that we might hire to take us to a better position but it became resigned that it was now too late. The eclipse was still a memorable event with the impression of the Moon's shadow dropping out of the sky and the 360° dawn sky. The hazy disk of the Sun and crimson glow of prominences could be seen through the cloud but the corona was lacking. I had to wait until 2017 to witness my first total solar eclipse in its full glory (see WAA Newsletter October 2017 and March 2020).

Are there areas of current astronomical research that particularly interest you? The identities of Dark Matter and Dark Energy.

Do you have any favorite personal astronomical experiences you'd like to relate? The Leonid meteor storm on the morning November 19, 2002 was surely an unforgettable event. In the early morning hours I stepped outside in Valhalla Village to see whether the sky was clear and if the meteor storm had materialized. It had and that meant that it was time to rouse the kids. Together we watched in awe as the sky was filled with shooting stars. They whooped and hollered each time one streaked across sky. I was a bit concerned about disturbing the neighbors but decided that might be a good thing as then they wouldn't miss out on the spectacle. Eventually the early morning exertion proved too much. The kids crawled inside and curled back up in bed. I stayed out longer and lying on the garden picnic table saw a few headon meteors coming right down the barrel!

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

I am retired but consider myself a Physicist at the core. I worked in theoretical particle physics for nearly two decades before moving to risk management in the financial industry. At some point I did consider becoming a professional astronomer but decided that pursuing astronomy as a career would ruin it as an aesthetic pursuit.

What WAA activities do you participate in? Since retiring I regularly attend the Friday night lectures. I write for the newsletter and occasionally come to star parties.

Besides your interest in astronomy, what other avocations do you have? My interest in astronomy led me to attend a conference on traditional celestial navigation in Mystic Seaport, Connecticut in 2008. That pursuit consumed me for some time until I thought, "Well navigation is all very well but I should go and learn to sail." I completed most of the American Sailing Association courses and made my kids take some as well. Armed with those skills we have bareboat chartered in the British Virgin Islands and frequently sailed in Boston Harbor. I have completed a couple of offshore passages, Grenada – USVI and New York – Bermuda, where I could put celestial navigation with a sextant to the test in ocean swells.

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

The Munich Refractor

For most of my time as a post-doctoral fellow I had no access to a good telescope. That changed in the mid 1980's when I spent two years at the Max Planck Institute in Munich. This was the institute that Werner Heisenberg had directed after World War II. For some unknown reason it had an old but very fine and beautifully engineered 6-inch refractor in a dome on the roof. Perhaps a wealthy donor had decided that the Max-Planck-Institut für Physik und Astrophysik, Werner-Heisenberg-Institut für Physik needed such a thing but I never found out. It gave very nice views of the planets and star clusters but on the outskirts of Munich deep sky was out of the question. It was from there in 1986 that I made one of my many unsuccessful attempts to view a transit of Mercury (see the January 2020 SkyWAAtch).

To use the scope you just had to go to the front desk, request the key to the *Sternwarte* and sign the book. The only other user was a very straight laced German lad who lived in one of the condominiums nearby. In his view, when returning the key and signing out you also needed to record the objects you had viewed. That book became full of outraged complaints that Herr Stuart had not done that.

Comet Hyakutake

Comet Hyakutake graced our skies in 1996. Weather and other matters had prevented me from seeing it. At the time I was an Assistant Professor of Physics at the University of Michigan, Ann Arbor. One Friday night I was in my office working late and noticed in a weather satellite image that there appeared to be a clear area opening up to the west. Sometime after 10 p.m. I headed out along I-94. When I judged I had gone far enough I exited onto a side road and soon came to a broad flat area by the side of the road. After a brief pause for dramatic effect, my Ford Escort wagon lurched and its right hand side sank up to the chassis into snow. What I had taken in the dark for solid ground was actually a ditch filled to road level with snow. There was no escape but I was able to take my time enjoying the sight of Hyakutake's long gossamer tail stretching out overhead.

Now what to do? There was a farm house not too far away but there were no lights on and it was not clear to me how welcoming they would be to a bearded stranger arriving around midnight. I decided the best thing might be to try to walk to a service station that I thought I had seen a couple of miles back. I judged that I could probably reach it before hypothermia set in. I had not gone far when a pickup truck approached me from behind. The driver asked if that was my car he had seen and offered to give me a ride. A few minutes into the trip he declared "Wait! This truck is four wheel drive. I can get you out." We headed back and after clearing enough snow from under the front of the car to attach a chain, a few hefty tugs got me out. I was soon gratefully on my way back to Ann Arbor.

Return of the 18-inch Newtonian

In the late 1990s a complicated series of events meant that my 18-inch Newtonian telescope was in Cuernavaca, Mexico and it needed to come back to the US. In May I drove my old Ford Taurus from Ann Arbor to Mexico with the intention bringing it with me when I returned in August. It was five days' drive each way. I had 2 new front tires and 2 older rear tires on the car. I had some concerns about the latter's condition, so I stopped a garage in Kentucky on the way down. Although I was willing to buy new ones, the mechanic assured me that they looked fine to him.

Three months later I had disassembled the 18" and carefully stowed it in the trunk and back seat of the Taurus. The second day on the trip back was a Sunday. I was travelling on the final stretch of a new, long, straight toll road before reaching the US border at Nuevo Laredo. The toll was rather high so few locals made use of it but with your receipt you were insured against all mishaps and that included free towing if needed.

It was very hot! I think I was within about 60 miles of the border when, in the rearview mirror, I saw a fountain of rubber erupting from the back of the car. It was already clear what had happened as I pulled over. Muttering a steady stream of curses I unpacked the parts of the telescope from the trunk, put on the spare tire, repacked and went on my way. I wondered to myself what the odds might be of losing two tires in the in the space of just 60 miles. It was apparent that under the prevailing conditions the odds were pretty good, since almost instantly another fountain of rubber erupted from the rear of the vehicle.

Fortunately I had come to rest not too far from a call box. I walked to it and called and called and called but got no answer. No cars were passing and the only thing to do was wait. After a long while I watched as a vehicle slowly materialized through the shimmering heat over the brow of the hill. It was the Angeles Verdes or Green Angels highway service. When I told them that I had two flat tires they seemed confident that they could easily sort things out until I reemphasized that I had two flat tires. No problem! With your toll receipt you are entitled to free towing to the border. We'll give Pablo a call. After trying to raise him on the radio and again from the call box it was apparent that Pablo had better things to be doing on a Sunday than working at his job. They assured me that I didn't need to worry as they were not permitted to depart until the situation was resolved. By radio they were able to raise their base at the border who contacted a tow truck operator who was willing to come at a modest cost to me. At this the Green Angels topped up my water bottles and went on their way.

An hour passed, then two. As the Sun sank toward the horizon I began to accept that I was probably going to spend the night there. Soon after that however a tow truck with three men in it appeared on the other side of the highway. I waved and without a second thought they cut across the grassy divider pulling up in front of my car. The first thing I noticed was that their front tire was flat. Presumably they had picked up a nail crossing the divider. They had no spare. So there we were four guys, two vehicles, three flat tires on the side of the road with night falling.

The tow truck driver was a tall, slim young man sporting cowboy boots and a ten gallon hat. He apologized for taking so long but said he had had to find a translator. It was clear, though, that we did not actually need one as my Spanish was judged to be fine. Confronting our predicament for a moment he became pensive. I watched as he hoisted my car onto the truck but left the flatbed in a position so that enough was hanging over the back to slightly lift and take the weight off the front wheels. There were only 3 seats in the truck cab and I made it clear that, since I was paying, one of them was mine. The superfluous translator seemed happy enough to occupy the Taurus.

We headed off gingerly down the highway. Every now and then we'd hit a bump and the truck's front wheels would lift off entirely. We'd all hold our breaths until they touched down again. Eventually we exited in what seemed like the middle of nowhere and came to a tin shed with a large hand painted sign above it saying *Vulcanizadora* (Tire Service). A group of guys were sitting outside around a fire drinking beer. The tow truck was quickly jacked up and the tire repaired.

I was eventually deposited with my car at a lovely gardened motel complex in Nuevo Laredo. The tow truck driver offered to come back in the morning with his pickup and some blocks so we could go to buy new tires. I gladly and gratefully accepted his kind offer. When I asked for directions to the location where I needed to go to file the paperwork to export my car from Mexico he accompanied me and knew exactly what to do and which queues to jump so the whole thing was finished in a matter of minutes. Soon afterwards my trusty 18" Newtonian and I were crossing the bridge into Laredo, Texas. ■ Deep Sky Object of the Month: Messier 78

Messier 78				
Constellation	Orion			
Object type	Reflection nebula			
Right Ascension J2000	05h46m 48.0s			
Declination J2000	+00° 05' 00"			
Magnitude	8.0 (est)			
Size	8 x 6 arc-min			
Distance	1,630 LY			
NGC designation	2068			

While you're looking at glorious M42 in Orion, give M78 a try. It's much fainter and so needs darker skies or larger aperture. As a reflection nebula, it's not helped by narrowband filters. One observer noted that it resembles "fog around two headlights," those being two 10.5-magnitude stars within it. Stephen James O'Meara describes it as very comet-like, which is all the more reason that Messier included it in his catalog.

Messier 78: Visibility for January 2021				
9:00 p.m. EST	1/1/21	1/15/21	1/31/21	
Altitude	41°22′50.7″	46°42′31.6″	48°50'05.5"	
Azimuth	140°10'14"	158°04'53"	181°25'14"	



A Relic from the Early Space Age

Long-time WAA member Bill Newell was rummaging around in the far reaches of a kitchen drawer and came up with an early space-age artefact from his youth.

Bill writes:

This little guy is a Nabisco spoon spaceman from 1959—a cereal box promotion for Shredded Wheat Juniors. He is "Munchy." There were also "Crunchy" and "Spoon-size." The antenna and oval space helmet opening is the Nabisco logo, displayed in the corner of all their cereal boxes. All my childhood toys are long gone, but this one survived way in the back of a kitchen drawer. As I recall they also had a short comic strip with them and they were all flying around on rocket-propelled spoons in their comic stories. The spoon is a correct 1950s-period utensil as well.



These figures are called "spoon sitters" for obvious reasons. Kellogg invented the "cereal box prize" before World War I. Initially they were "cartoon flipbooks" that you would thumb through to see a moving image. When James Watson Hendry invented the screw injection molding machine in 1946, the mass production of thermoplastic toys took off. It was inevitable that marketers would exploit the iconology of space travel, especially after Sputnik in 1957.

A quick Internet search disclosed that there are quite a few of these offered for sale. Apparently the Nabisco logo "antenna" snapped off fairly easily. Most of the ones advertised on eBay have been shorn of the antenna and are listed for around \$20, but the complete ones, like Bill's, are being offered at \$80-100. We doubt they sell at that price.

Your editor finds the idea of a "rocket-propelled spoon" very interesting. If Mikey doesn't want to eat his cereal, well, just imagine how a rocket propelled spoon could solve that problem.

Last Call for Mars?

As the Earth pulls ahead of Mars in its orbit, the red planet is shrinking in apparent diameter and becoming fainter. At its closest approach on October 6th it was 22.6" and magnitude -2.6. On January 1st it will be shining at magnitude -0.2, with the 89% illuminated disk just 10.3" across. By the 31st, it will just be magnitude +0.4, 7.9" across, 88.6% illuminated. It won't reach conjunction with the Sun until October 2021.

Here are the relative sizes of Mars' disk as seen on the first of the month from September 2020 to April 2021.



On November 26th, with the disk still 15.3" across, **John Paladini** made these two images. The left color image is with an 8-inch SCT and a Sirius PC1 ("planetary contrast") filter, while the right image is through a 9.25" SCT using a monochrome camera. South is down.



Mars' distance from Earth (and therefore its disc size and relative brightness) is shown in this chart from <u>TheSkyLive.com</u>. The next near approach is on November 28, 2022, when the disk will be 17.2." This year's extravaganza won't be repeated until 2035.



On the Fate of Telescopes

Most old telescopes don't die, they just fade away. Or so it seems. One clear night, no one goes out to use the scope. Then another night, and another. Their capabilities diminished by time, wear, progress, maybe war, politics or light pollution, once-important or beloved instruments are consigned to the history books, or to museums, or into the scrap heap. A lucky few achieve productive second or even third lives, miraculously reborn elsewhere. A small number meet with a violent fate. Many just seem to disappear. Astronomy moves on.



The remaining section of William Herschel's "40-foot" reflector, at the Royal Observatory Greenwich (LF, 2009)

William Herschel's famous "40-foot" reflector at Observatory House in Slough was never as productive as his "20-foot" instrument, but by virtue of its immense size and royal patronage it attracted visitors from all over England, especially those members of the privileged class who were on their way to visit the royal family at nearby Windsor Castle, which is less than two miles south of where the telescope stood. Herschel built the 40-foot (with King George III's money) between 1785 and 1789 and used it occasionally until 1815. It lay dormant for a quarter century until it became clear that it was a hazard, the unmaintained wooden frame rotting in the damp English air and the 48-inch speculum-metal mirror tarnished beyond usefulness. William's son John, who became a famous astronomer and scientist in his own right, never used the telescope, so he decided to dismantle it before anyone could be hurt. On New Year's Day 1840 John gathered the Herschel family, including 90-year-old Carolyn (she lived until 1848, her brother William died in 1822) to officially decommission the instrument. They sang this hymn:

In the old Telescope's tube we sit, And the shades of the past around us flit; His requiem sung we with shout and din, While the old year goes out and the new comes in. Merrily, merrily, let us all sing, And make the old telescope rattle and ring.

Then the tube was filled with William's telescope making apparatus and sealed, and the structure dismantled. For thirty years the tube lay there, until a falling tree destroyed all but a quarter of it, which is preserved at the Royal Observatory Greenwich. The mirror rests in the collection of the Science Museum in London. Observatory House was left empty for decades and was demolished shortly after Sir Patrick Moore visited the abandoned and deteriorated structure in 1960 for one of his earliest "The Sky at Night" broadcasts. A rather non-descript office building named "Observatory House," looking nothing like an observatory of course, now occupies the site (25 Windsor Road, corner of Herschel Street, Slough). The only thing there to commemorate Herschel or the telescope is a small monument by Czech sculptor Franta Belsky, erected in 1969. Herschel is buried at St. Laurence's Church in Slough, where there is a beautiful stained glass window showing him at his telescope.



 (L) Herschel monument in Slough (Google Earth Street View image);
(R) Stained glass window at St Laurence's Church, Slough. Herschel peering into the 40-foot is at lower right

Herschel's "20-foot" scope was disassembled by John Herschel and taken to South Africa, where it was used between 1834 and 1838 to identify thousands of double stars and nebulas in the southern skies. When John returned to England, the telescope was permanently disassembled. One of its three 18.7-inch mirrors is at the Royal Observatory at the Cape of Good Hope and the other two are at the National Maritime Museum in Greenwich, down the hill from the Royal Observatory Greenwich. A piece of the original tube is held by the National Air and Space Museum.

The famous "Leviathan of Parsonstown," the Earl of Rosse's 72-inch diameter speculum-metal mirror telescope in Ireland that saw first light in 1845, was less completely demolished. It was in use longer than the 40-foot, was more solidly built with a stone support housing, and was more productive. After its discovery of the spiral arms of Messier 51 (see the June 2016 SkyWAAtch), it was used by J.L.E. Dreyer while he was compiling the New General Catalog. It remained in use until 1890. It was partly dismantled in 1908 but the stone superstructure remains to this day, with the tube still *in situ* although sealed. Its mirror is also in the London Science Museum.



The Leviathan of Parsonstown today

Among the wonderful chapters in *The Astronomical Scrapbook* by Joseph Ashbrook, editor of *Sky* & *Telescope* from 1964 to 1980, are several tales of now defunct telescopes and observatories, some constructed by dedicated and often obsessed amateurs. Some of these instruments went the way of Slough and Parsonstown: slow disuse and eventual dismantlement. Others suffered strange, sometimes violent fates. Some were reborn. The 16-inch Clark refractor at Warner Observatory in Rochester, NY was installed in 1882 and used by noted comet hunter Lewis Swift, who was also a character in the peculiar quest for the planet Vulcan during the 1878 total solar eclipse.¹ When the Panic of 1893 bankrupted the observatory's benefactor, patentmedicine entrepreneur Hulbert Harrington Warner, Swift moved the telescope to California. The Rochester building became a sanatorium and was eventually razed in 1930. The telescope had a second life at Echo Mountain. not far from Mount Wilson in the San Gabriels above Pasadena. It was used in 1904 by Harvard's William Pickering. A year later, one of the frequent fires in the area (still a constant concern for Mt. Wilson) nearly consumed the observatory. The telescope's objective was removed and stored in a tank of water as a preventive measure. The observatory survived the fire, but was freakishly destroyed in a wind storm in 1928. The scope survived and was sold to the University of Santa Clara, to be put in an observatory that was originally built to house a 60inch reflector that was never built. The scope was dormant by the 1980s and the building was converted to a media center. Resisting calls to dispose of the telescope, the university was eventually able to restore it and it is still used for outreach. I suppose that if it was a CAT and not a refractor, it would have six lives to go!

SkyWAAtch



William Lassell's 48-inch equatorial reflector

¹ See the <u>December 2019 SkyWAAtch</u>.

SkyWAAtch

Amateur astronomer William Lassell made a 24-inch speculum metal mirror reflector in 1844 after visiting Lord Rosse. With it he discovered Neptune's satellite Triton in 1846. He moved the telescope to Malta in 1852, but then got aperture fever and in 1859 constructed a 48-inch instrument near Liverpool. The telescope had a driving mechanism to keep it equatorially aligned; it might have been the first large reflector to do so. Lassell moved this telescope to Malta as well, in 1861, but in 1865 he dismantled it. It was never re-erected and was sold for scrap metal in 1880. Lassell wrote, "When witnessing the breaking up of the specula, I was not without a pang or two on hearing the heavy blows of sledge-hammers necessary to overcome the firmness of the alloy."

In the 1850's an Australian amateur, John Tebbutt, began to observe comets from his home in Windsor along the Hawkesbury River in then-rural New South Wales. He is credited with discovering the Great Comet of 1861. After using small aperture refractors, in 1886 he acquired an 8-inch Grubb refractor. In the last 20 years of the 19th century, he logged over 700 comet positions, while the combined professional observatories of Sydney, Melbourne and Adelaide produced only 289. Tebbutts was prolific, contributing 371 scientific papers although he worked in isolation. He never left Australia but he taught himself to read French and German, corresponded with international colleagues and assembled a large astronomical library. When the British Association for the Advancement of Science met in Sydney in 1914 the astronomers visited him at his home. Ashcroft, writing in 1972, says that there were only "remains" of an observatory, but in fact it was restored in the 1980's by Tibbutt's great-grandson.² The Grubb had been sold to someone in New Zealand after Tibbutt's death in 1916, but it was tracked down, repurchased and flown back to Windsor courtesy of the Royal Australian Air Force.

Ashcroft also relates the story of one Dr. William Kitchiner, a wealthy Londoner who obtained his first telescope in 1796 and eventually collected 51 instruments from two inches to 9.3 inches in aperture. Two of the reflectors, a 7-inch f/12 reflector and a 6.3-inch f/13.3 Herschelian were made by Herschel himself. Kitchiner had an interest in telescope design, and the British Optical Association Museum holds two of his letters on optics to Joseph Banks, President of the Royal Society. Kitchener, like Ernst Wilhelm Tempel after him,³ did not believe in the value of large instruments, writing "Immense telescopes are only about as useful as the Enormous Spectacles which are suspended over the doors of opticians." In addition to his interest in telescopes, Kitchiner was the author of a best-selling cookbook (he may even have invented the "crisp," the British name for the potato chip). He authored other books on a wide but peculiar range of subjects, among them one entitled *The Pleasure of Making a Will*. He was also an amateur musician and composed a hymn for telescope makers. The fate of the telescopes in his collection is unknown.



A Clark telescope as decoration at Princeton

In <u>last month's SkyWAAtch</u>, John Higbee reported on his observations with the 7.75" Clark refractor at the United States Naval Academy. A similar telescope once used at Princeton University now hangs as a decoration in a conference center on the campus, pointed skyward but blind. Princeton had a 23-inch and later a 30-inch reflector at FitzRandolph Observatory on the university campus, but they were removed years ago, their fate unknown. The building fell into disrepair and this year Princeton announced it would be demolished in favor of a parking lot for the nearby soccer stadium. A Princeton telescope was mentioned in Orson Welles's famous 1938 *War of the Worlds* broadcast. Princeton is three miles from Grovers Mill, the Martians' landing site.

Speaking of Alvan Clark & Sons telescopes, there is a fine 6-inch Clark refractor that's currently stored safely on the floor at the Hastings Historical Society in

² If you want to see it, go to 33°36′24.11″S, 150°49′50.12″E

³ See the <u>January 2018 SkyWAAtch. p. 5</u> for more information about Tempel.

Draper Park. This telescope was purchased and used there by Antonia Maury, Henry Draper's niece and a student of Vassar's Maria Mitchell. Maury went on to be one of the most honored of the Harvard "computers," as told in Dava Sobel's fascinating book *The Glass Universe*. Maury lived at the Draper house from 1935 until her death in 1952 at the age of 85. WAA's Bill Newell relates:

In 1988 Jon Elvert and I picked the scope up at Lehman College, who had somehow gotten a hold of it. It was standing on the end of the tube in a corner behind a bunch of junk. Bob Davison got the mount off the top of one of the Lehman buildings. The scope was a mess. Someone had disassembled it and then put the optics in all wrong. You couldn't see through it. A number of us took it apart, gave it a good cleaning and got the optics back together correctly. The brass tube was covered in some green stuff that Bob removed later. It looked a lot better after that. I de-gunked the mount and got it working again. It was on extended loan to us: We were the "Westchester Astronomy Club" back then, meeting at the Hudson River Museum. The guy running the planetarium at the HRM he said it was "a piece of junk" and put it in the well below the Zeiss projector, which was just a store room. Before he left for Oregon, Elvert gave me the paperwork from Lehman indicating that the scope was on loan to the club, not the museum, and he was afraid of what HRM would do if they thought it was theirs. When a new planetarium director came in, we got the scope out again and it was used at some of our star parties and at Stellafane - people can tell you of Bob Davidson setting it up in front of his Arabian Nights tent along with the Saturn (WAA's 1948 6-inch f/15 Saturn refractor, currently being restored by John Higbee) - it drew people from all over Stellafane because he set them up like two giant crossed swords over the tent's entrance. At some point we were contacted by Lehman who said they wanted to consider a more permanent display for the Clark and arranged with the Draper Museum, just being built, to house it there. It was then transferred to them.



Antonia Maury's 6-inch Alvan Clark & Sons refractor (LF)



Antonia Maury at the 6-inch Clark at Draper House (now Hastings Historical Society), 1930

The glass mirror from Draper's 15½-inch reflector, which he ground himself in 1861,⁴ is in a box in the basement of the Historical Society. The box is labeled "Warning. Very heavy. Do not move from this shelf."

As mentioned in the text accompanying Gary Miller's image of planetary nebula Jones-Emberson 1 in the <u>October 2020 SkyWAAtch</u>, p. 23, the Smithsonian Astrophysical Observatory's Oak Ridge Observatory, in the town of Harvard, MA just a mile or so from I-495, housed the 61-inch Wyeth reflector, the largest telescope east of the Mississippi. Expectations for this instrument can be gleaned from the fact that the observatory's cornerstone was laid in 1932 by Britain's Astronomer Royal Frank Dyson and Harvard's Harlow Shapley. Increasing light pollution and commitments to other facilities led to its closure in 2005. The Wyeth is described on the CfA's web site as being "retired." It was last used in an "optical SETI" project,

⁴ We know this from a remarkable 58-page biographical memoir of William Draper written by George Barker in 1888, six years after Draper's death, on line at <u>na-sonline.org/publications/biographical-memoirs/memoir-pdfs/draper-henry.pdf</u>.

SkyWAAtch

looking for repeating nanosecond optical laser pulses from nearby Sun-like stars. These could be evidence of intelligent extraterrestrial civilizations. None were found before the telescope went off-line.⁵ I spoke via Zoom with David Latham, Senior Astronomer at the SAO and Lecturer in the Department of Astronomy at Harvard. He told me he lives just across the street from the Wyeth and had used it for "at least a thousand nights." He confirmed it's still on its mount, sadly covered in cobwebs and pigeon droppings, an honor it shares with another famous instrument, the Holmdel Horn, at least before the horn was cleaned up to allow Penzias and Wilson to discover the cosmic microwave background.⁶ (I'm sure pigeons also honored Herschel's 40-foot and the Leviathan of Parsonstown.) There are no current plans to dismantle the Wyeth, at least for now, but the likelihood of it ever seeing the stars again seems nil.



The meridian telescope at the Quito (Ecuador) Observatory (LF)

A visitor to any historical observatory will usually encounter a beautiful meridian circle (also called a transit circle), a telescope designed for recording the exact time stars culminate (transit the local meridian), as an aid to establishing their exact celestial coordinates. Apparently none of these telescopes are in use today. All brass, large gears and elegant machining, these small-aperture, long focal-length refractors are now honored centerpieces at 19th century national observatories. I've seen examples in the last few years in London, Berlin, Santiago and Quito. Telescopes sometimes get in the way of invading armies. The Pulkovo Observatory outside of Saint Petersburg was founded in 1839 by Wilhelm von Struve. Previously head of Dorpat Observatory in Estonia, he commissioned the famous 9.6-inch Great Refractor from Joseph von Frauenhofer. This was the world's first modern telescope, installed in 1824 and now a treasured museum piece, having escaped unscathed from the two world wars. In 1885, Wilhelm's son Otto installed a 30 inch refractor, the largest in Europe, at Pulkovo. The observatory was bombed during the siege of Leningrad (as Saint Petersburg was known to the Soviets). The buildings were destroyed, but the optics of the telescopes had been removed and safely stored. After the war Pulkovo Observatory was reconstructed, some old instruments were rebuilt and new ones were added. The 30-inch lens could not be put back into service because the tube and mount were gone, but it's on display. To replace the scope, the Soviets commandeered a 26-inch Zeiss refractor that Hitler offered in 1938 as a gift to Mussolini, who apparently was an avid amateur astronomer. Zeiss was never paid for the telescope, so it was at the factory in Jena when the Soviets arrived, Jena being in East Germany. As part of war reparations, the Soviets also removed a 48-inch reflector from the Babelsberg Observatory near Potsdam, just outside of Berlin, relocating it to the Crimean Astrophysical Observatory, where it is still in use. The Potsdam Great Refractor, a double telescope (80 cm and 50 cm) made by Repsold in 1899, was damaged during the war but remained in Germany and was repaired.

A number of other observatories suffered during World War Two, either directly or indirectly. Instruments at the Qingdao Observatory in China, founded by the German Navy in 1898, were destroyed by Japanese military police during the Sino-Japanese War around 1937. The Manila Observatory was completely destroyed by Japanese bombers in December 1941. The Altona Observatory near Hamburg was only partially destroyed but it succumbed permanently when the post-war government was financially unable to support its rebuilding.

Few observatory telescopes seem to have been destroyed by accident. Of course, more than a few amateur instruments have met their end being dropped, knocked over in the dark or perhaps drowned in a

⁵ We certainly would have heard about it if they had! 6 The Horn, now a National Historic Landmark, has its open end covered with wire mesh to keep the pigeons out. See the <u>September 2013 SkyWAAtch</u>.

basement flood. We now have two examples of radio telescopes that met their fate without human intervention.



The 300-foot radio telescope before and after its collapse.

In 1988, the 300-foot parabolic radio dish at the National Radio Astronomy Observatory at Green Bank, West Virginia, suddenly collapsed. The problem was traced to a gusset plate that failed after 26 years of operation. Other telescopes at Green Bank continued to function. Construction for a new telescope began three years later and the 100-meter Robert Byrd Telescope saw first light in 2001. Financing undoubtedly was helped by the fact that Senator Byrd had already been in office for 29 years⁷ when the scope collapsed. He was the senior Democrat on the Senate Appropriations Committee, serving as its chair when Democrats held a majority in the Senate.

And so we come to the sad fate of the 300 meter 1,000-foot) Arecibo radio telescope in Puerto Rico.

Arecibo is an avatar of modern astronomical research. Opened in 1963, it made many important discoveries, participated in SETI research and was a backdrop for a number of very successful movies. Who doesn't recall rooting for James Bond (Pierce Brosnan) as he battled the traitor Alan Trevelyan (Sean Bean) to the death on the telescope's superstructure in Golden Eye? [The less said about Contact, the better, in my opinion.] It's been continually productive since it was commissioned. Besides receiving radio signals, Arecibo can also transmit and receive radar. Because its fixed position limits the field of view to a 40-degree cone from the zenith (from celestial declination -1 to +38 degrees), it can only track objects for 2.6 hours, but that has hardly been a problem. It can track solar system objects as far out as Saturn. Its radar system was used to discover Mercury's spin and make images of the surface of both Mercury and Venus. It made three-dimensional images of asteroids and tracked potentially hazardous bodies close to Earth.



Arecibo Observatory

Arecibo's radio observations revealed the Crab nebula pulsar, the first exoplanets (they surrounded a pulsar), the first repeating fast radio bursts and the first binary pulsar. It detected prebiotic organic chemicals in the distant galaxy cluster Arp 220, among many other findings. It was used to send the first (on purpose) message from humanity to the stars in 1974, transmitting the clever Frank Drake-Carl Sagan 1,679bit (73 rows by 23 columns) file at 2380 kHz with a power of 450 kW and a rate of 10 bits per second, towards the globular cluster Messier 13.

The observatory survived Hurricane Maria in 2017 with only very minor damage from a radar line feed cable that snapped, affecting 30 of the dish's 38,778 3-foot by 7-foot perforated aluminum panels. There

⁷ Byrd represented West Virginia from 1959 to 2010, the longest tenure of any senator in U.S. history.

was little impact on the telescope's performance. Two recent earthquakes seemed to cause no obvious damage, but perhaps they subtly took their toll. Eighteen cables running from the three support towers suspend the receiver 492 feet above the center of the dish. On August 10, 2020, just after Hurricane Isaias passed through the island, one of the auxiliary cables holding the 820-ton science platform slipped out of its socket, tearing a 100-foot gash in the dish. Initially, it didn't appear that the overall structural integrity of the telescope was threatened.



Damage after the August 10th cable failure

The National Science Foundation planned to replace the cable, but before any work could be done, on November 7th a main support cable failed, physically snapping due to excess strain. It had been connected to the same tower as the previously failed cable, and there was more damage to the reflecting surface. Now all the cables were suspect, with a real potential for catastrophic collapse of the entire telescope. On November 12th one of the three engineering firms retained to examine options optimistically suggested stabilizing the telescope by reinforcing the existing cables and support towers so that repairs could be accomplished, but they only projected a 10% safety margin. The other two firms concluded that repair was unacceptably risky under any scenario and recommended dismantling the structure in a controlled manner, probably requiring explosives. The Army Corp of Engineers concurred. This would be an end familiar to pet owners: severe injury followed by euthanasia. The NSF chose euthanasia on November 19th. Before anything could be done, nature took its course. At 7:53:51 a.m. on December 1st a cable supporting the receiver assembly let go, snapping the support towers and sending the 900-ton receiver crashing into the reflecting surface. The event must have looked a lot like the climax of GoldenEye. Once

again, life follows art. Fortunately, no one was there to be injured or killed.



Arecibo on December 1st

The loss of Arecibo is sad not just because of the impact on astronomy research, but because it truly was an icon. It's instantly recognizable to many nonastronomers. It had a certain wonderful improbability, sitting immobile in its sinkhole and yet able to reach the most distant cosmic objects. As a grand scientific instrument, it symbolized the future, but now it must be consigned to the past.

Arecibo had a reputation for generously accommodating researchers and graduate students and accepting seemingly outlandish research proposals, many of which bore fruit. It was particularly beloved by the SETI community because of its willingness to participate in so many search programs.

When an observatory ceases to exist, or a space mission is no longer operational, the team of people that staff it and use it also breaks up. "We're discussing the decommissioning of a structure made of steel and cables, but it truly is the people that have the ideas," said Ashley Zauderer, the NSF program director for Arecibo Observatory, at the November 19th news conference. "It's the idea of discovery that led to the construction to start with, it's the passion of the people that work at the observatory ... to continue to explore, to learn. It's not the telescope that's the heart and soul, it's the people."

The Chinese FAST radio telescope, 500 meters in diameter, lacks radar. We may not see an instrument with Arecibo's capabilities for many years, if ever.

Images by Members



The Hidden Northeast Edge of the Moon by Robin Stuart

The Moon's librations can reach 6.8° in latitude and 7.9° in longitude. On the evening of October 21st from Valhalla the sub-Earth point on the lunar surface was 6.4° N, 6.7° E presenting a good opportunity to observe features on the northeast quadrant of the Moon's limb that are not generally visible. This image was made during a fortuitous clear interval that night. It is comprised of 256 frames stacked using Autostakkaert!3, acquired with a Meade LPI-G monochrome camera through a Televue NP127 refractor. A light degree of wavelet sharpening was applied with RegiStax.

Around the limb clockwise from the top are Mare Humboldtianum, Mare Marginis, Mare Smythii and the shores of Mare Australe. Prussian explorer and polymath Alexander von Humboldt and British astronomer William Henry Smyth are the only two individuals to have lunar maria named after them. Bordering the prominent circular Mare Crisium on its top right are the sinuous coils of Mare Anguis, the Serpent Sea. To the lower right of Mare Crisium are Mare Undarum (Sea of Waves) and Mare Spumans (Sea of Foam). The bright area on the limb above Mare Marginis is part of a system of rays centered on the crater Giordano Bruno that lies just out of sight on the Moon's far side. One of those rays can be traced as far as the edge of Mare Crisium.



Supernova Remnant CTB 1/Abell 85 by Steve Bellavia

Supernova Remnant CTB 1 in the constellation Cassiopeia, also catalogued as SN G116.9+00.2, is 10,000 light years distant. It was identified as a radio source by astronomers from Caltech in 1960.⁸ It was assumed to be a planetary nebula because of its shape, cataloged as Abell 85 in 1966. Sidney van den Bergh determined in 1973 that it was actually a supernova remnant.⁹ It has an apparent diameter of a half a degree, the size of the full Moon. It is extremely faint and no source we could find reports a visual magnitude for this object. It looks to Steve like a popped balloon with air leaking out of the northwest side (north is up in the image).

Orient Point NY, October 17-18, 2020. Borg 90mm f/4 refractor, SkyWatcher EQ6-R Pro, ZWO ASI533MM Pro, cooled to -5° C, ZWO Duo-Band (Ha and OIII) filter: 62 x 300 sec (5.2 hours total), Gain 100 (1.00 e/ADU). Software: APT, PlaneWave PS2, PHD2, Stark Labs Nebulosity, PixInsight; GIMP 2.9

⁸ https://iopscience.iop.org/article/10.1086/127538/pdf

⁹ http://articles.adsabs.harvard.edu/pdf/1973ApJS...26...19V (see Plate 24)



Messier 106 in Canes Venatici by Steve Bellavia. Mag 8.4, size 17.4'x6.6', distance 6.6 Mpc. M106 is a Type II Seyfert galaxy. The small galaxy at 11 o'clock is NGC 4248, mag 12.5, size 2.9'x1.2', distance 7.6 Mpc.



Messier 33 in Triangulum by Leandro Bento. Magnitude 5.7 (but low surface brightness, making it hard to see visually from our area), size 68.7'x41.6', distance 840 Kpc. M33 is probably a satellite of M31 and is the smallest spiral galaxy in the Local Group.



NGC 7023 (Caldwell 4) by Scott Nammacher

This reflection nebula in Cepheus, often called the Iris Nebula, was discovered by William Herschel in 1794. He catalogued it as "IV 74." He observed a 7th magnitude star that was "very much affected with nebulosity," a quaint way to put it. The star is the brightest member of the open cluster Collinder 429, a sparse collection of fainter stars. The original NGC¹⁰ description of the object is "*7 in eF, eL neby" meaning "7th magnitude star in an extremely faint, extremely large nebulosity." It looks as if neither Herschel nor Dreyer perceived the other stars. The NGC 2000 says "C+N." NGC 7023 is 10 x 8 arc-minutes in size and 1,300 light-years distant. In dark skies it can be seen with binoculars.

The nebula shines from the photons emitted by the magnitude 7.3 Herbig Be star HD 200775 (also known as SAO 19158). It is composed of dust grains that survived the gravitational contraction that formed the star. Stephen James O'Meara's entry in *Deep Sky Companions: The Caldwell Objects* (2002), states that the star is very young (as are all "pre-main-sequence" Herbig Ae/Be stars), perhaps only 6,400 years old. A more recent study¹¹ of its magnetic field and other properties reports that it is a spectroscopic binary; the primary's surface temperature is 19,000 K, but "significant uncertainties exist related to the luminosity, and therefore the mass, radius and age of the magnetic primary star."

Scott used a PlaneWave 12.5" CDK telescope and SBIG 10XME camera, using MaximDL to capture, ACP software to control the photography runs and Photoshop to finish. He used RGB and luminance filters, making both 240-second exposures and 60-second exposures in each and merging a some of the 60-second shots into the longer ones to correct for blooming with camera on the central star.

¹⁰ <u>https://ia800501.us.archive.org/14/items/newgeneralcatalo00dreyrich/newgeneralcatalo00dreyrich.pdf</u>

¹¹ Alecian, E, et. al., Characterization of the magnetic field of the Herbig Be star HD 200775, *Mon. Not. R. Astron. Soc.* 2008; 385: 391–403

SkyWAAtch

The Sun is Back!



Solar cycle 25 finally started in earnest in the fall after a long period hardly any sunspots. Although solar activity during cycle 25 was predicted not to be too intense, several heliologists recent suggested that we'll see a lot of activity, so get your Halpha and properly filtered white-light scopes ready in case they're right!

Monitor the Sun at NASA's Solar Dynamics Observatory <u>https://sdo.gsfc.nasa.gov/</u> and NOAA's Space Weather Prediction Center <u>https://www.swpc.noaa.gov/</u>..

Three images from November 29th by Larry Faltz

Тор:

Active Region 2785 in white light. Orion 127 Mak, Baader mylar filter.

Center:

Active regions 2786 (right) and 2785 (center) in the hydrogen alpha band. Lunt 60 mm f/10 single-stack (0.7Å bandpass).

Bottom:

There was also a spectacular fimbriated prominence. It wasn't bright enough to be captured on an image properly exposed for the solar surface, so Larry made two different H-alpha images and used GIMP to layer and align them. Larry says "It's clearly artificial, but it makes the point."

A Celestron Skyris 445 monochrome planetary camera was used to capture these three images. Software: FireCapture, AS!3, and Registax.

SkyWAAtch



Robin Stuart also imaged the prominence with a monochrome camera, but colorized the resulting composite image.

Here's the Solar Dynamics Observatory Atmospheric Imaging Assembly UV (330 nm) image of this prominence:





Mauri Rosenthal uses a Baader energyrejection filter and DayStar Quark on a 3½inch Questar to produce high-contrast hydrogen-alpha images. This image of AR 2785 was made with a QHY5III174M monochrome camera. Software used includes FireCapture, AS!3, ImPPG, GIMP, and ACDSee.



Mauri's November 7th close-up image of Active Region 2781 was made with the same equipment plus a Televue 2.5X Powermate.

Research Highlight of the Month

Stone, SW, et. al., Hydrogen escape from Mars is driven by seasonal and dust storm transport of water, *Science* 2020; 370: 824-831

Mars, once wet, is now a dry planet, and getting drier. Its atmosphere has about 0.03% water vapor, less than a tenth of the average content in Earth's atmosphere (0.4% globally, 1% at sea level). A cold "hygropause" layer at around 40-50 km is thought to confine water vapor below it, because H_2O would condense at the hygropause and fall back to the planet. But the Sun's ultraviolet radiation dissociates H_2O into hydrogen and oxygen, which can rise above the hygropause and escape into space. A number of ionic intermediates, such as H_2O^+ and H_3O^+ are involved in these reactions. There is a seasonal variation in the rate of water loss: the warmer atmosphere of the Martian summer has a higher water content (just as the warmer summer atmosphere on Earth can hold more water), and so the amount of dissociation and thus water loss increases.

Warmer conditions in the Martian summer also create dust storms, such as the one that knocked out the Opportunity rover in 2018. Using the Neutral Gas and Ion Mass Spectrometer (NGIMS) on board the Mars Atmosphere and Volatile Evolution (MAVEN) spacecraft, a group from the Universities of Arizona and Maryland and the Goddard Spaceflight Center measured the various chemical species in the Martian atmosphere during three "Mars years." MAVEN's closest approach (periapsis) is 150 Im above the Martian surface. Its measurement of the various chemical species is very accurate.

The group detected the seasonal increase in atmospheric water in the Martian summer but also found significantly enhanced concentrations of water and reactive species during dust storms, suggesting that the dust storms play a major role in water loss by transporting water molecules off the surface and raising them higher in the atmosphere. They also developed models that suggest that carbon dioxide, which makes up 95% of the Martian atmosphere, also plays a role. CO_2 is ionized by particles in the solar wind and these ions, mainly CO_2^+ , vigorously split the water molecules. It's not clear whether these mechanisms can account for the disappearance of Mars' early ocean or whether some other process led to the bulk loss of liquid water from the surface. Failure of a global magnetic field might have been the major impetus for that event.





Fig 2C showing the increase in upper atmosphere water during a dust storm that occurred in June 2018. This was the dust storm that silenced Mars Exploration Rover Opportunity.

Fig 4 showing seasonal variation in upper atmosphere H_2O , Rectangular boxes show the periods of dust storms.

Member & Club Equipment for Sale

Item	Description	Asking price	Name/Email	
NEW LISTING Losmandy G11G mount	Pristine condition observatory-quality yet portable German equatorial mount. 2018 model. 60 lb. weight capacity. Heavy-duty tripod. Includes brand- new Gemini II go-to system new in box (never mounted). See <u>http://losmandy.com/g-11.html</u> .	\$2800	Dante Torrese torresedds@optonline.net	
NEW LISTING Explore Scientific 40 mm eyepiece	68° field of view. argon-purged, waterproof, 2" eye- piece. New in original packaging, only used once. Lists for \$389.	\$340	Greg Borrelly gregborrelly@gmail.com	
Meade 395 90 mm achromatic refractor	Long-tube refractor, f/11 (focal length 1000 mm). Straight-through finder. Rings but no dovetail. 1.25" rack-and-pinion focuser. No eyepiece. Excellent condition. A "planet killer." Donated to WAA.	\$100	WAA ads@westchesterastronomers.or g	
Atco 60-mm f/15.1 refractor	A classic Japanese refractor from the early 1970s. Obtained from the original owner about five years ago. It had been used only a few times, then stored for 40+ years. Current owner used it maybe seven times. Very good condition. Comes with three eye- pieces and a 1.25" eyepiece adaptor star diagonal. Straight-through finder. Equatorial mount with slow-motion adjustment knobs (screws). Wooden tripod, metal tube. Everything is original.	\$150	Robert Lewis lewis@bway.net	
Want to list something for sale in the next issue of the WAA newsletter? Send the description and asking price to <u>ads@westchesterastronomers.org</u> . 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 and selling items is at your own risk. WAA is not responsible for the satisfaction of the buyer or seller. Com- mercial 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 de- scriptions 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. <i>Caveat emptor!</i>				



April Moonrise by Larry Faltz

The full Moon rises over Mamaroneck Harbor, the Earth's shadow and the Belt of Venus. April 6, 2020, 7:26 p.m. EDT. Canon T3i, EF-S 18-135 mm lens at 27 mm (35 mm equivalent 43.2 mm). f/8, 1/320 sec, ISO 800.

More on the Belt of Venus in the <u>November</u> 2016 SkyWAAtch, p. 13.