



STAR FIELDS

Newsletter of the
Amateur Telescope Makers of Boston
Including the Bond Astronomical Club
Established in 1934
In the Interest of Telescope Making & Using

Vol. 33, No. 2 February 2021

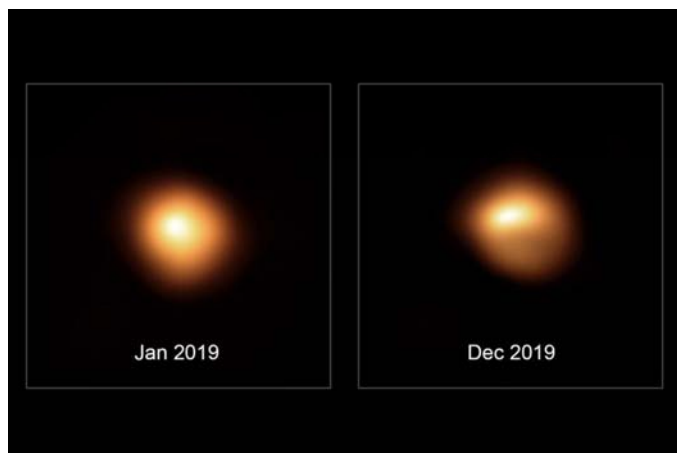
This Month's Meeting . . .

Thursday, February 11th, 2021 at 8:00 PM
[Zoom On-line Meeting](#)

All ATMoB meetings scheduled for the Harvard-Smithsonian Center for Astrophysics in Cambridge, MA have been **canceled indefinitely** due to concerns over the [coronavirus](#) outbreak.

We are holding virtual on-line meetings using the Zoom application. Please refer to the [ATMoB website](#) for future meetings. Members should check their email on the ATMOB-ANNOUNCE list for additional information. Please [select this Zoom link to attend the 938th Meeting of the Amateur Telescope Makers of Boston](#).

A Romp with Betelgeuse



Betelgeuse taken by the ESO's Very Large Telescope in January and December 2019. ESO/M. Montargès et al

Last year, Betelgeuse entertained us with its unprecedented fading. There was some speculation that the star might be on the verge of becoming a supernova. The last such event in the Milky Way blazed in our skies over 400 years ago, so interest was high, and astronomers around the globe were on alert. But what really happened? This month's speaker is ATMoB member, Tom

Calderwood, and his presentation is titled "A Romp with Betelgeuse". He acknowledges there is no universally accepted explanation for this star's behavior. His talk will review scientific results to date with a special emphasis on work by the American Association of Variable Star Observers (AAVSO).

Tom Calderwood is an ATMoB member since 1984 and the leader of the Photoelectric Photometry section of the AAVSO. He is the author of *The Great Dimming of Betelgeuse*, the cover article of *Sky & Telescope* magazine's March 2021 issue. He is a retired software engineer, holds a degree in mathematics from MIT, and is a member of the "Months of Betelgeuse" professional research collective. I hope you can join us for his presentation!

~ Rich Nugent – President ~

President's Message . . .

It's been a year since COVID began to sweep across the globe and only now, with the administration of vaccines, is there hope of our lives returning to something that might resemble normal. Recently Governor Baker has eased some of the COVID restrictions and has ended the stay-at-home mandate. However, at the same time, the daily numbers of new COVID cases and deaths related to the disease are still significant, and now highly contagious variants of the virus are showing up across the United States. The vaccine rollout is slow going, and with supply issues and difficulties in obtaining appointments I suspect our situation will remain the same for some time to come. The Center for Astrophysics (CfA) Phillips Auditorium remains closed to us and so we will continue to hold virtual monthly meetings via Zoom. I'm seeing about 65 members attending our meetings, but we have room for more! If you're still having problems setting up Zoom, let me know. As for the reopening of the observing site, by the time you read this the observing field and observatories will be covered with at least a foot of new snow. While we are allowed access to the site and have a system in place for reserving pads and observatories, it looks like it will be a while longer before we invite folks to return. If you do have a need to visit the site, I need to let the folks at MIT know in advance, so kindly let me know and I'll pass the info along.

In a recent email I let folks know that I'm already assembling a Nominating Committee for the club elections in June. So far, three members have volunteered to be on the Committee, but I need six. Ultimately, the membership will vote in April, selecting three. The Committee is announced at the May meeting and a slate of officers is presented to the membership and voted upon in June. The job should be relatively easy as only two positions will need candidates: The Vice President and one Member-At-Large. I expect that COVID-19 restrictions will force us to run these elections electronically. If you are interested in helping out with the Nominating Committee or are considering serving as a Board member, please get in touch with me or one of the club's officers.

I just stepped outside to check on the sky and it's really cold. Weather forecasters are predicting tonight's temperatures will dip into the single digits with a wind chill temperature near 0° F. Winter observing. What's the plan? Well, we could just sit inside

but observing is more fun, so bundle up! My favorite piece of cold-weather gear is a battery powered sweatshirt I purchased at one of the big-name hardware stores. Made by Milwaukee Tools, it has three warmth settings, and with a 3 amp hour battery lasts all night. For outerwear, I have a pair of ski pants I wear over my jeans and a regular winter jacket over the heated sweatshirt. For really cold weather I have a jacket and bib-overalls from Refrigiwear. Don't forget a warm hat and comfortable, insulated footwear. Walmart sells hand and foot warmers (from Hot Hands) that last ALL night.

Now that you're ready for these cold nights, there will be plenty to look at because I plan to continue emailing my monthly lists of 19+ objects throughout the winter. Beginning this month, I'll include the Messier objects of the month. Instead of one (very) long night of a Messier marathon in March, take your time and spend a year getting through the catalog. Whether you're new to astronomy or a seasoned pro, many of these 110 deep sky objects are the showpieces of the sky and some will surely become your favorites. While you're observing Messier objects, don't forget to take a high-magnification look at M42's Trapezium. If the air is steady, see if you can glimpse the 5th and 6th stars.

I was looking at Mars the other night. Its small ruddy disk still shows a few surface markings but when Mars was particularly close this past fall, I spent most of my telescope time observing it. I tried to spot the regions where spacecraft have touched down and my thoughts turned to *this* month. The rover population on Mars is about to increase by one! NASA is planning that its long-awaited Mars Rover 2020 mission will reach the Red Planet on February 18th. If all goes well and after another "seven minutes of terror," the rover, *Perseverance*, will touchdown on the Martian surface. During the final moments of the descent, a sky-crane maneuver — successful with the *Curiosity* rover in 2012 — will lower *Perseverance* down to the surface. The process must be autonomous since Mars will be some 11.4 light-minutes from Earth. I guess that means it'll be 11.4 minutes of terror, then!

The rover will be investigating the rocks and regolith for evidence of long-ago climate conditions that may have supported microbial life and will analyze samples for the biosignatures of ancient lifeforms. Experiments on board will also test the feasibility of converting the Martian atmosphere (96% CO₂) into breathing oxygen for future manned missions. *Perseverance* will also be collecting samples and storing them on the surface for a future return mission, projected to be completed in 2031.

Tucked under *Perseverance* is *Ingenuity*. This is a test of concept experiment and is a solar-powered helicopter! If this drone can fly in the thin Martian air, it will be able to scout out areas of interest for the rover to visit. I wonder what the helicopter will sound like when it flies away. Well, there's good news, *Perseverance* will have two microphones designed to bring us the sounds of Mars! Between the armada of orbiters and surface craft operating today, we are witnessing the prelude to human exploration of Mars! Exciting times, these are!

Well, I hope you won't let winter get in the way of enjoying the sky. No matter where your interests lie, there's always something to observe. So, be brave, bundle up and shovel a path to your

favorite observing spot. And, if it's too cold for you, just hang on. During the early evening hours the constellations of spring are rising in the east and it won't be long until we're swatting mosquitoes and worrying about ticks, again! In the meantime, stay safe and be well, my friends!

~ Rich Nugent – President ~

January Meeting Minutes . . .



David Eicher on Zoom *

ATMoB 937th Meeting Minutes January 14, 2021

Rich Nugent presented the President's welcome. The Harvard-Smithsonian Center for Astrophysics and our Clubhouse remain closed. If you need to visit the Clubhouse or grounds, please tell Rich so that he can notify Mary Young, Interim Assistant Director for Administration at MIT Haystack Observatory, in advance of your visit.

- Alva Couch presented the Secretary's report, including the events of the 936th meeting and the quarterly board meeting on January 7, 2021, in which the Board decided to keep the Clubhouse closed for the foreseeable future.
- Eileen Myers presented the Treasurer's report. There was a small net inflow, including inflow of funds from membership dues and donations, as well as expenses for the Clubhouse furnace maintenance and website maintenance fees.
- Chris Elledge presented the membership report. Please see an updated membership report elsewhere in this newsletter.
- Glenn Chaple presented the observers' report, including the conjunction of Uranus and Mars on Thursday, Jan 21, 2021, when Uranus will be 1.7 degrees south of Mars. On Saturday, Jan 23, Mercury will be at greatest eastern elongation, very low in SW after sunset. The January Observer's Challenge is the open cluster/nebula IC 348 in Perseus. During this otherwise uneventful month, Rich Nugent suggests trying to spot the International Space Station (ISS) with your telescope. He suggests putting a moon filter on, because it will be bright.

- Steve Clougherty presented the Clubhouse report. Steve received a report that a window was broken. Investigating, he found that there was one window cracked in the second floor, but no signs of vandalism. He patched the window to keep the building sealed. Separately, a circuit breaker was tripped and the dew heaters on the telescopes in the Ed Knight Observatory lost power. We will need to visit and check the circuit breakers and dew heaters when work parties resume. For the time being the Clubhouse remains closed.
- Bruce Berger presented the Mittelman ATMoB Observatory (MAO) report. The camera, some filters, and the filter holder arrived and were mechanically integrated into a functioning imaging system by Alan Sliski. The first light images of the observatory are amazing, including two images composited from 23 five-minute unguided exposures of IC410 and the tadpoles. The first narrowband image used a standard Red/Green/Blue (RGB) color map and the second image mapped the color channels to the "Hubble Palette". Images were composited from 8 exposures of H-alpha, 7 exposures of OIII, and 8 exposures of SII. Many thanks to Al Takeda, who processed and composited these images. Next steps include forming a research projects list, installing new fiber cables to all three observatories, and planning the move to the grounds in the first quarter of 2021.
- Old business: Haystack interim administrator Mary Young reported that despite delays due to the pandemic, Haystack and MIT staff are onboard with a lease renewal for the Clubhouse, which will give us a lease until April 2027.
- New business: It is time to form a Nominating Committee for the 2021 election. Rich Nugent explained the nominating process for Board members. We have three members for the Nominating Committee, and would like three more. Please feel free to volunteer. If you want to get more involved, consider running for one of the two open positions: Vice President or Member at Large.

Our speaker for the evening, David Eicher, described the almost hundred-year evolution of our understanding of galaxies, starting with the Hubble discovery of the nature of M31 (the Andromeda Galaxy) on October 6, 1923. Hubble's initial catalog of galaxies led to an age of classification, where galaxies were first classified by shape and later by more subtle differences, including whether or not there is evidence of a black hole at the core. David illustrated the classifications of galaxies by giving us a picture tour of many favorite galaxies.

Although we normally see galaxies as relatively static features of the night sky, David described their dynamic and sometimes violent natures. Although not perceivable in a human concept of time, galaxies commonly collide to form larger galaxies, and to evolve from a spiral shape to other shapes through those collisions. With respect to the vast timescales in which galaxies change, we are very lucky to be living in the spiral arm of the Milky Way; living near the core of a galaxy is a violent experience in which colliding stars are common! In the future on the timescale of galaxies, when humanity may be a distant memory, the Milky Way and the Andromeda galaxy will collide

and create a new combined galaxy. The study of galaxies is very active today. A recent discovery 12 years ago showed that the shape of our Milky Way galaxy is not a pure spiral, but is instead "a barred spiral" whose shape provides evidence of past events and interactions.

Our next Zoom meeting will be held on Feb 11, 2021 at 8 pm. The next meeting of the ATMoB Board will be held on Thursday, Mar 25, 2021.

The meeting was adjourned at 10:00 pm.

~ *Alva Couch - Secretary* ~

Membership Report . . .

I am pleased to welcome our newest members: Jennifer DeLorey, Orlando Lima, and Susan Edwards.

As of February 1st, 2021 we have 322 memberships covering 413 members. This is broken down as follows:

- 132 Regular Members
- 128 Senior Members
- 4 Student Members
- 53 Family Memberships covering 144 Members
- 3 Guest Members
- 2 Honorary Members

You can check if you need to renew and start your renewal process on the website at <https://www.atmob.org/renew>

You can also download the membership application from the website at <https://www.atmob.org/signup> by clicking on the "Download an application" link.

Please contact me if you need any help with renewing or logging into the website.

~ *Chris Elledge - Membership Secretary* ~

Meeting Recordings . . .

The recording of ATMoB meeting #937 is available on YouTube: <https://youtu.be/rrvSpVU4OXs>

I would like to thank Dave Eicher for giving his presentation and allowing us to record it.

This link is to the publicly available cut of the meeting recording. To view the original version of the meetings, please see the Announce Forum on the ATMoB Website <https://www.atmob.org>

~ *Chris Elledge - Membership Secretary* ~

Clubhouse Observing Suspension

With Governor Baker's mandate for a 10:00 p.m. curfew beginning on 6 November, we are suspending our observing sessions at the Clubhouse, for the time being.

~ *Rich Nugent – President* ~

Clubhouse Report . . .



Snowbound Clubhouse. February 23, 2008 *

February 2021 Clubhouse Report

Not much to report this month. I inspected the property 3 weeks ago and all is well!

I plan to get there over the next week to check once again. Tom McDonagh keeps me apprised of the Clubhouse's inside temperature with a sensor that is communicating with his phone app.

~ *Clubhouse Committee Chairs* ~

~ *Steve Clougherty, John Reed and Dave Prowten* ~

Educational DVD Videos Will Soon Move to Monday Evenings . . .

Announcement: The DVD lectures will be switching to Monday evenings starting on February 22, 2021.

Member-at-Large Maria Batista is hosting Wednesday evening DVD lectures. These weekly Zoom meetings start at 7 PM. Members can sign up at www.atmob.org.

Mittelman ATMoB Observatory Update . . .

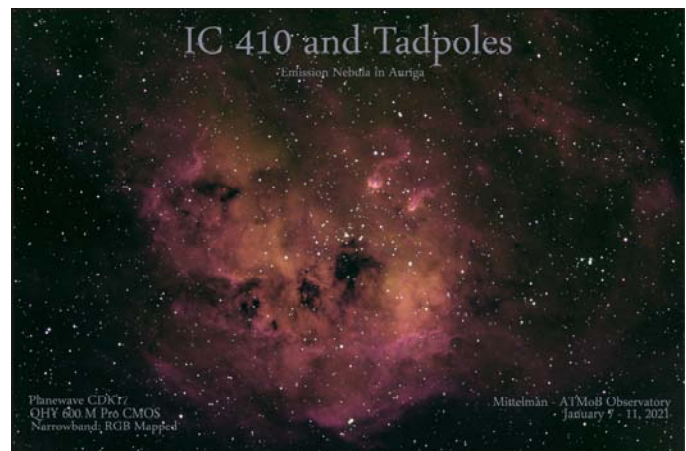
With the acquisition of the QHY600 CMOS camera, a 9-position QHY filter wheel, along with Luminance, Hydrogen-alpha, Oxygen III, and Sulfur II filters, integration testing by the Mittelman ATMoB Observatory (MAO) group is now in full swing. The science filters (BVRI: Blue, Visible, Red, Infrared) are backordered and we are regularly contacting the vendor for shipping dates.

All of the mechanical components have been installed into the optical train of the PlaneWave CDK17. Alan Sliski's fabricated adapter spacer, installed between the PlaneWave's field flattener and the QHY filter wheel, allows us to get the correct back focus distance for this optical setup.

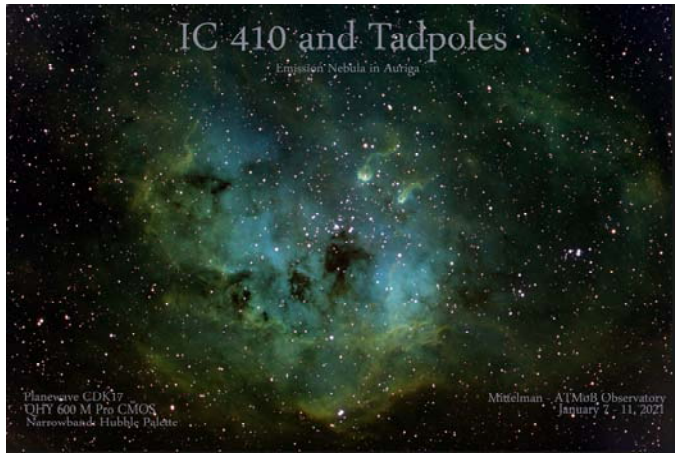
Software integration is moving forward. Arne Henden of the AAVSO, who has taken over one hundred thousand CCD images, is mentoring us as we learn how to configure the ACP Observatory Control Software to perform observatory automation that will meet our requirements.

Even without automation, Bruce Berger and Alan Sliski were able to take the first light images using Maxim DL to manually control the camera and filter wheel. The target was the Observer's Challenge object for February 2021, the emission nebula IC 410. The final usable light frames were 8 x Hydrogen-alpha, 7 x Oxygen III and 8 x Sulfur II, each with an unguided exposure of 300 seconds (5 minutes). A full set of calibration frames, darks, flats and bias, were made on the same night.

I calibrated and processed the raw files to create an RGB and a "Hubble Pallet" color mapped image. Each image size is huge! On average, each file is approximately 30 Megabytes. For this "small" test run the total files acquired amounted to 2.25 Gigabytes. This observatory will output an enormous amount of data during each clear night when in full operation.



IC 410 and Tadpoles. H-a, OIII and SII mapped in RGB colors. January 7 - 11, 2021. Mittelman ATMoB Observatory. Processing by Al Takeda.



IC 410 and Tadpoles. H- α , OIII and SII mapped in the Hubble palette. January 7 - 11, 2021. Mittelman ATMoB Observatory. Processing by Al Takeda.

On Tuesday, January 26th, AAVSO and ATMoB member, Gary Walker, gave the club a presentation on CMOS cameras. Gary started off by saying that manufacturers have stopped producing CCD chips and have transitioned to CMOS chips. Most CMOS chips today are used in more than a billion cell phones and machine vision systems. Couple this with the fact that they can be made on the same fabrication lines as integrated circuit chips and you can see the economics of phasing out CCDs for the astronomy consumer market.

Gary showed that CMOS cameras are quite different from CCD cameras. The most prominent advantage is that the read noise is much lower, around 1 - 5 electrons. Standard errors are a factor of 2 better than CCDs.

In order to get the best science results, Gary gave us a list of rules (some are optional).

- Manage your darks (do not scale).
- Have a defined time interval for darks. Gary uses 5, 15, 40, 60, 90, 120, 240 seconds.
- Darks must be the same exposure as your science.
- Darks should be taken as close in time as your science. No dark libraries.
- Take high quality flats.
- Exposures should be between half a full well and full well. Do not saturate your image.
- "Stack on the fly" to reduce noise, if your camera supports this feature.
- Mitigate Residual Bulk Images (RBI), "ghost" images, by using the opaque "black" filter to block starlight before moving the telescope to a new target.

Gary recommends using a CMOS camera to do science. "You cannot beat a CMOS camera for photometry... the CMOS

camera [won] in almost every case that I have ever tried. I have no cases where the CCD data was better."

~ Al Takeda - MAO Operations and Imaging ~

Observer's Challenge . . .

February, 2021

NGC 1893 – Open Cluster in Auriga (Magnitude: 7.5, Size: 12.0')

IC 410 – Emission Nebula in Auriga (Size: 40' X 30')



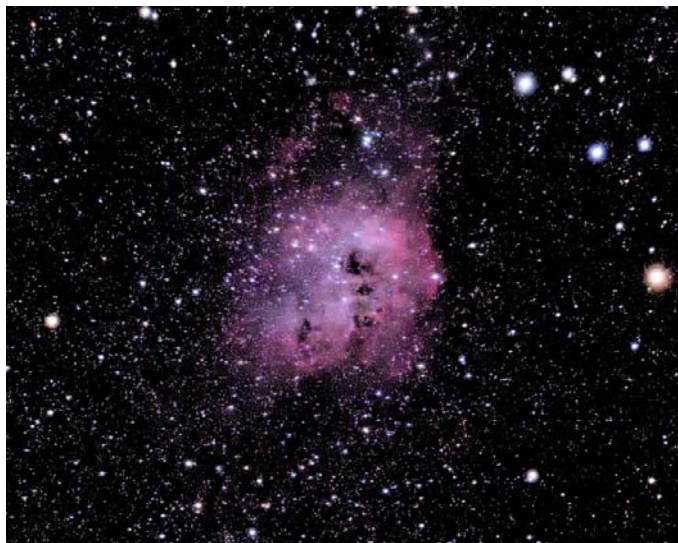
NGC 1893/IC 410 close-up image. North up. 32-inch relay scope, ZWO ASI6200 CMOS camera. 2.5 hrs. H- α , 1 hr. OIII, 1 hr. SII. Image by Mario Motta

This month's Observer's Challenge takes us to the emission nebula IC 410 and its embedded open cluster NGC 1893. The cluster is comprised of several dozen members, some twenty of which are magnitude 9 to 12. Most are massive O and B-type stars. They appear relatively faint because the entire system is 12,000 light years away.

It's the surrounding nebulosity that provides the real challenge. A haze surrounding NGC 1893 might be glimpsed with 6-inch or 8-inch scopes from remote dark-sky locations but observers working from typical suburban environments will need as much as twice that aperture and possibly an assist from an O-III filter.

A distinctive feature of IC 410 is a pair of gaseous streamers northeast of NGC 1893 that point away from the cluster. Their similarity in appearance to larval frogs gives IC 410 the nickname the "Tadpoles Nebula". They appear in the accompanying close-up image of IC 410 taken by ATMoB member Mario Motta. For an ultimate Observer's Challenge, see if you can spot them visually.

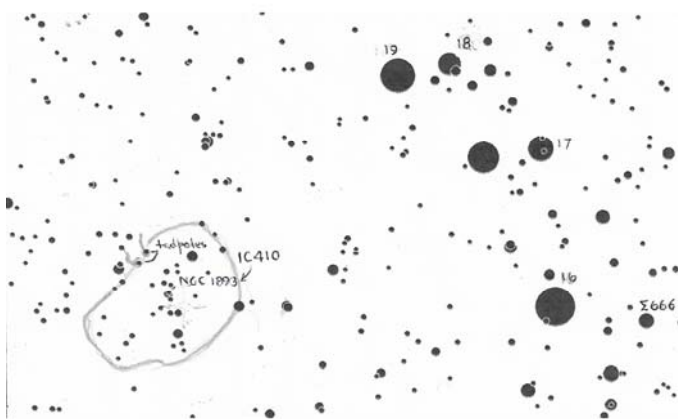
Located at RA 5h 22.7m and Dec +33°24', this cluster/nebula complex is a quick star-hop from Melotte 31, a stellar group that includes the 5th magnitude star 16 Aurigae. About 20 arc-minutes west of 16 is the near-twin double star Struve 666 (magnitudes 7.85 and 7.89, separation 3.2"). Before moving on to NGC 1893/IC 410, give this little gem a look-see!



NGC 1893/IC 410 wide-field view. Canon Ra, 400mm f/2.8 lens, ISO 1600, 110 minute total. North is up. Image by Doug Paul



astronomy.com



Finder chart using the AAVSO's Variable Star Plotter. Field is 1.5° by 1°, with North up. Annotated by Glenn Chaple

The purpose of the Observer's Challenge is to encourage the pursuit of visual observing. It is open to everyone who is interested. If you'd like to contribute notes, drawings, or photographs, we'll be happy to include them in our monthly summary. Submit your observing notes, sketches, and/or images to Roger Ivester (rogerivester@me.com). To find out more about the Observer's Challenge or access past reports, log on to <https://rogerivester.com/category/observers-challenge-reports-complete/>.

~ Submitted by Glenn Chaple ~

Mars and Uranus Conjunction . . .



Canon EF 400mm, f/5.6L with 1.4X Extender (Imaged @ 560mm f/8), Canon EOS Ra, Tripod Image, 1 x 1 second subframe, ISO 25600. Image by Al Takeda

The temperature was a bone chilling 16 degree F. with a wind chill of about 1 degree F. by 30 - 40 mph gusting winds.

I used my Canon Ra and attached my Canon 400mm, f/5.6L telephoto lens with a 1.4X extender. This setup was mounted on a heavy duty tripod in an attempt to minimize wind vibrations. Focusing was performed by utilizing the "Live View" camera display (at 30X) and a Bahtinov mask. I could see the image shaking from the wind gusts as I attempted to focus.

I used a wired shutter release and took about 30 images using various shutter speeds from 2.5-seconds to 0.6-seconds. I also experimented with different ISO settings. I also took dark frames with the same exposure settings,

After 45 minutes my thumb and index finger became numb and I retreated to my apartment. The above image is the only one that was acceptable. Select this [link for a high resolution image](#).

~ Submitted by Al Takeda ~

Skyward . . .

By David H. Levi

February 2021

Orion in Winter



Orion and vicinity with a bright Geminid meteor. Image by David Levy

As twilight deepens these evenings, Orion is just clearing the eastern horizon. Robert Frost wrote eloquently in his famous poem *The Star Splitter*

"You know Orion always comes up sideways,
Throwing a leg up over our fence of mountains."

Whenever I see Orion rising, which is almost every night from fall to midwinter, I am reminded of how poets like Robert Frost saw the mighty hunter as it entered the sky to take command of winter. Even if you have difficulty finding some constellations, the three stars in a row that form Orion's belt are a giveaway. And if you have a telescope, as Frost did, the view is even better. Just below the belt lies a fainter set of three stars. Surrounding the middle one is a gigantic cloud of hydrogen gas which is the Great Nebula in Orion. It is one of the richest star forming regions in our whole galaxy.

During that first winter I enjoyed watching lots of the fainter stars within the nebula change their brightness over time scales of days, hours, or in one case, minutes. According to Janet Mattei, the late director of the American Association of Variable Star Observers, these variable stars can "flicker" as they go through their carefree cycles of stellar youth.

Near the top of Orion, marking his left shoulder is a much older, grandfather star. Named Betelgeuse, this star is at the other end of the stellar life cycle. An old, very large and massive sun, Betelgeuse varies lazily from being almost as bright as Rigel, the star marking Orion's lower right knee, to not much brighter than Bellatrix, the star marking Orion's right shoulder.

Last winter Betelgeuse faded more than usual, and throughout 2020 it was setting off alarms that it was about to explode as a

supernova. Probably not now, though it will likely happen within the next hundred thousand years or so. In the spring Betelgeuse began to brighten again, but when I saw it rising above the eastern horizon in late August, it had faded once more. Around that same time, the Hubble Space Telescope, observing in ultraviolet light, provided data that suggested that the unusual dimming was caused by an ejection of some very high temperature gas from within the star into space.

When Betelgeuse is finally done being the star we love, its core will collapse almost instantaneously, within a few seconds. Betelgeuse will increase exponentially in brightness. It will shine as brightly as the first quarter Moon and will be easily visible in daylight for three months or more. It will be brighter than Tycho's great exploding star of 1572, and brighter even than the brilliant supernova of 1006. As large as it is, Betelgeuse is probably not massive enough that its core will shrink to a black hole. Instead, it will probably form a new neutron star, small, dark, very dense, and cold.

Stars are people too. They age just as we do. They enjoy the carefree times of youth, go through a long middle age like our Sun, and then get strange again as they grow old. Please go out and enjoy Orion rising over the eastern horizon these evenings. It is time to settle back and enjoy this magnificent king of the winter sky. As you look, imagine how young stars like those in the nebula, and old ones like Betelgeuse, tell their beautiful story of the life cycle of distant suns.

~ Submitted by Mario Motta at the request of David Levy ~

Editor: * Photos by Al Takeda unless otherwise noted.

March Star Fields DEADLINE

Sunday, February 21st

**Email articles to Al Takeda at
newsletter@atmob.org**

Articles from members are always welcome.

POSTMASTER NOTE: Not mailed due to the coronavirus pandemic

Amateur Telescope Makers of Boston, Inc.
c/o Chris Elledge, Membership Secretary
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FIRST CLASS

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	Steve Clougherty	(781) 784-3024
	David Prowten	(978) 369-1596

OBSERVING:	Bruce Berger	(978) 387-4189
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NEWSLETTER	Al Takeda	newsletter@atmob.org
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PUBLIC OUTREACH

COMMITTEE CHAIR:	Rich Nugent	starparty@atmob.org
STAR PARTIES:	Bernie Kosicki	
	Laura Sailor	
	John Harrington	

How to Find Us...

Web Page www.atmob.org

MEETINGS: Zoom On-Line Meetings until further notice. Meetings held the second Thursday of each month (September to July) at 8:00 PM. For meeting details go to www.atmob.org and check your email on the ATMOB-ANNOUNCE list.

CLUBHOUSE: Latitude 42° 36.5' N Longitude 71° 29.8' W

The Tom Britton Clubhouse is CLOSED. It is the white farmhouse on the grounds of MIT's Haystack Observatory in Westford, MA. Take Rt. 3 North from Rt. 128 or Rt. 495 to Exit 33 and proceed West on Rt. 40 for five miles. Turn right at the MIT Lincoln Lab, Haystack Observatory at the Groton town line. Proceed to the farmhouse on left side of the road. Clubhouse attendance varies with the weather. It is wise to call in advance: (978) 692-8708.

Heads Up For the Month . . .

To calculate Eastern Standard Time (EST) from Universal Time (UT) subtract 5 from UT.

Feb 4 Last Quarter Moon (Moonrise at midnight)

Feb 11 New Moon

Feb 19 First Quarter Moon (Moonset at midnight)

Feb 22 Moon is 0.4 degrees North of M35, 08:00 UT (03:00 EST)

Feb 27 Full Moon

Mar 6 Last Quarter Moon (Moonrise at midnight)

Mar 6 Mercury at greatest western (morning) elongation (27 degrees)

Mar 13 New Moon

Mar 14 Daylight Saving Time begins