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. 31, No. 11 December 2019

This Month's Meeting . . .

Thursday, December 12th, 2019 at 8:00 PM
Phillips Auditorium
Harvard-Smithsonian Center for Astrophysics
Parking at the CfA is allowed for the duration of the meeting

A Thousand Nights Under Stars

Image by Babak Tafreshi

Our speaker this month, Babak Tafreshi, has spent the past two decades photographing surreal scenes of the night sky all over the world. He will talk about his adventurous journey to photograph the wonders of this Earth under the stars. Babak will also speak about his work to document the last remaining dark starry skies on this planet to increase public awareness on the values of the natural night environment for all species.

Babak Tafreshi is a *National Geographic* photographer, the founder and director of The World at Night (TWAN) international program, a science journalist, and contributing photographer at *Sky & Telescope* magazine. He was born in Tehran, Iran and now lives in Boston. His Earth and sky images merge art, culture, and science. You can visit his website at babaktafreshi.com.

His new book, *The World at Night*, will be available at the meeting with a book signing between 7:30 - 8:00 pm.

Please join us for a pre-meeting dinner discussion at House of Chang, 282 Concord Ave., Cambridge, MA. at 6:00 pm before the meeting.

President's Message . . .

On November 19th, I had the pleasure of attending an astronomy themed event hosted by swissnex boston. This group is a global network that creates opportunities for researchers, entrepreneurs, artists and "future-makers" to reach past current capacity and make meaningful collaborative connections with top innovators between Switzerland and North America.

For the November event the organizers hosted Nobel prize winner, Dr. Didier Queloz, recognized for his efforts in discovering the first exoplanet orbiting a sun-like star (51 Pegasi B). The evening highlighted the resounding impact of this discovery on space science, culture and the imagination of the general public.

Dr. Queloz, a Professor of Physics at the University of Geneva, highlighted the scientific and personal aspects of the discovery process while acknowledging all the "players" involved. Under the tutelage of Dr. Michael Mayor, Queloz worked to improve the accuracy of detection of the radial velocity of stellar objects using Doppler spectroscopy. With technology allowing for measurements with an accuracy of 15 m/s, Queloz and Mayor surveyed suspect star systems. Previous Doppler spectrometers had a resolution of 1 km/s. In July of 1995, the pair discovered 51 Pegasi B, later classified as a Hot Jupiter orbiting a sun-like star 50 light years away. Dr. Queloz went on to describe the reluctance of the scientific community in recognizing his findings as true exoplanet discoveries. With time and additional discoveries, came the understanding and the recognition that exoplanets do indeed exist.

Dr. Queloz was followed with an engaging presentation by Dr. Willy Benz, a Professor of Physics at the University of Bern. Dr. Benz highlighted the more personal aspects of his attempts to discover exoplanets and the good-natured admission of being scooped by Queloz and Mayor. Dr. Benz spoke of his efforts in championing the upcoming ESA CHEOPS satellite with a mission of characterizing exoplanets using the transit method. Combined with ground based Doppler measurements, the team hopes to understand the physical and chemical nature of these extra-solar worlds.

Following the keynote speakers, a roundtable discussion wrapped up the evening featuring prominent local scientists in the field including Drs. George Ricker and Kim Arcand, moderated by Katie Greene. Prathima Muniyappa, a Designer, Conservator and a Research Assistant for the Space Enabled research group at the MIT Media Lab, rounded out the panel, engaging the members and attendees with her interpretation how such discoveries impact our cultures.

In the end, light refreshments were served, and attendees had the opportunity to meet with the keynote speakers and panelists. It was a great opportunity to rub elbows with Nobel prize winners and key thought leaders in exoplanet discovery and characterization. Queloz and Benz were especially accommodating and interactive.

I truly enjoyed the evening and encourage you all to seek out opportunities such as these to hear from and meet with individuals such as the exoplanet science community. It was time well spent.

Another similar opportunity will occur at the Astronomy on Tap event held on Monday, December 16th at the Asgard, 350 Massachusetts Avenue, Cambridge beginning at 6 pm. Tickets can be obtained at the following link:
https://www.google.com/maps/reserve/v/event/m/08MiFDX0zEs/s/_gMr5-oYrZQ/ld/20191216T230000?source=es&gei=EnableBuyOnGoogleSubtext

We are lucky to live in a central hub for astronomy-based events. I hope you take the opportunity to experience events such as these.

Keep looking up with your feet firmly on the ground!

~ Tom McDonagh – President ~

Meeting Refreshment Assignment . . .

2019 - 2020
Dec. - Maria Batista
Jan. - Bruce Berger

November Meeting Minutes . . .

Dr. J.J. Hermes *

Minutes of the 925th ATMoB meeting held November 14, 2019, at the Harvard-Smithsonian Center for Astrophysics in the Phillips Auditorium. Club President Tom McDonagh called the meeting to order at 8:04 pm.

- Secretary John Harrington read the minutes of the Club's October meeting.
- Treasurer Eileen Myers gave the Treasurer's report and announced that the Club was still collecting money to send to Attila Danko to help fund the Clear Dark Sky Chart. She also announced that the Club has funded eight new Library Project telescopes, though the cost will gradually be reimbursed as telescopes are purchased by area libraries.
- Membership Secretary Chris Elledge presented the Membership Report, showing 298 total memberships covering 398 Club members, but there are still 84 members who have not yet renewed. The annual renewal period ended in September, so all Club members are encouraged to renew their memberships promptly.
- Glenn Chaple gave the Observers Report, noting several upcoming conjunctions. The Observers Challenge object for the month is NGC 246, a planetary nebula in Cetus also known as the Skull nebula. Vice President Rich Nugent then discussed the need for a narrow passband filter to see this object. Glenn then spoke on the famous variable star Mira, currently increasing in brightness.
- Steve Clougherty gave the Clubhouse Report, noting that two recent work parties on October 19th and November 9th had finished work on the side porch. Al Takeda cleaned up the 1st floor telescope room. Thanks to the efforts of Barry Jensen, the Mirror-o-Matic machine is now up and running. All Club telescopes are now operational and the ATMoB Research and Imaging Observatory dome shutter is being renovated.
- Rich Nugent gave the Outreach Report and noted two recent star parties for the Westford Cub Scouts and the Acton-Boxborough Regional High School. Upcoming star parties included the Center School on December 2nd and Timberlane Regional Middle School in Plaistow, N.H. on December 3rd.
- Old Business:
  ATMoB pins are still available

  Purchases made through the smile.amazon.com website will result in a small donation to the Club

  RASC Handbooks are still available at $24 each and Astronomy magazine calendars for $8 each.
  Editor: Handbooks and calendars are sold out.
- New Business:

  Bill Toomey spoke about the Club's ATMoB Research and Imaging Observatory (ARIO), which has now been used for its first science observations. Four research projects are planned using ARIO:

  ° Variable Stars
  ° Cataclysmic Variables
  ° Exoplanet Transit Photometry
  ° Asteroid Orbital Determinations

Bill noted that nine Club members have signed up to undertake science research with ARIO.

Kelly Beatty spoke briefly about the library telescope program, noting that there will be a modification party for the telescopes at New England SciTech on Saturday, November 23rd.

President McDonagh then introduced Dr. J.J. Hermes of Boston University, who spoke on the subject of "When the Referee Lets You Name the Stars," or "Slung-Shot Survivors of Supernovae." In keeping with the title of his presentation, Dr. Hermes noted that it has become very difficult to have an object named for you. The reality is that the entire sky is now well-mapped to the 20th magnitude. The best hope for becoming famous is to discover a new class of stars.

In times past, it was easier to have an object or class of objects named for you. One example was the Giclas catalog of likely white dwarf stars, named for professional astronomer Henry Giclas. Giclas' catalog contained over 1,700 potential white dwarf stars, though data from the European Space Agency's (ESA) Gaia mission have shown that only about 1/3rd are truly white dwarfs.

Dr. Hermes studies white dwarf stars, the end-point for all main-sequence stars of solar mass. White dwarfs are very compact and dense, packing 60% of the mass of the Sun into an object only the size of Earth. Gaia's data has revealed a small but new class of stars that fall between white dwarfs and main sequence stars on the Hertzsprung-Russell diagram. One peculiar member of that new class is the star GD 492, which has been so strongly accelerated that it is referred to as a hypervelocity star and will eventually leave the Milky Way. Much of Dr. Hermes' research focuses on what accelerates such stars, and he believes that GD 492's former binary partner must have exploded as a supernova to accelerate GD 492.

Dr. Hermes and his team are looking for more members of this class of hypervelocity stars, which the data indicate will have low mass but be very metal-rich and have a rapid motion through space of 800 km/s or more. They have recently discovered a candidate star, using the 4-meter SOAR telescope in Chile. Their research indicates this hypervelocity star was accelerated when its former binary partner underwent a rare sub-luminous supernova event (SNe Type 1ax). Such supernovae occur when a white dwarf star explodes but is only partially destroyed, contaminating any binary partner's atmosphere with metals. It remains an open question, however, as to whether such hypervelocity stars are actually the ejected partners from former binaries, or are instead the scorched remains of the original white dwarf that underwent the sub-luminous supernova. Either way, they are the rare survivor of a supernova event.

President McDonagh thanked Dr. Hermes for his presentation and thanked Vice President Nugent for providing the refreshments. The meeting was adjourned at 9:48 pm.

~ John Harrington, Club Secretary ~

Meeting Recordings . . .

The recording of ATMoB meeting #925 is available on YouTube: https://youtu.be/K7OuS5yYMHA

I would like to thank Dr. JJ Hermes 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 ~

Membership Report . . .

I am pleased to welcome our newest members: Abbiramy Arumugam, Suhail Chamieh, Keith Davies, Sandra Lobo, Michael Kaiser, and George Silvis.

As of November 30th, 2019 we have 303 memberships covering 393 members. This is broken down as follows:

- 135 Regular Members
- 108 Senior Members
- 5 Student Members
- 50 Family Memberships covering 140 Members
- 3 Guest Member
- 2 Honorary Members

79 Memberships are expired.

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.

Donations are encouraged during membership renewal to help keep our club running smoothly, our clubhouse maintained, and our telescopes in good condition. Donations are tax deductible to the extent allowed by law. If you choose to pay by credit card please consider making at least a small donation since credit card companies take a few percent of your payment to the club.

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

~ Chris Elledge – Membership Secretary ~

Image by Babak Tafreshi (TWAN)

Clubhouse Report . . .

Pierre Fleurant (on the ladder) and Bruce Berger working on the dome *

November 2019 Clubhouse Report

It was a crisp 32 degrees with clear skies as Chris Elledge opened the Clubhouse for the November 9, 2019 work session. 33 members would help us provide this effort. Thanks go out to Judson Belmont, John Blomquist, Paul Cicchetti, Alva Couch, Steve Clougherty, Chris Elledge, Pierre Fleurant, Gregory Fontaine, Jim Gettys, Barry Jensen, Eric Johansson, Alan Kaplan, Phil Levine, Ed Los, Jon Lynd, Tom McDonagh, Vladislav Mlch, Corey Mooney, Keira Mooney, Eileen Myers, Rich Nugent, Venu Venugopal, Dave Prowten, John Reed, Phil Rounseville, Steve Scampini, HaJ Schaefer, Alan Sliski, John Stodieck, Art Swedlow, Al Takeda, Bill Toomey and Stefan Vasile.

Paul C. got a couple of volunteers together to install our snow fence. Several of the red reflectors had come off but most of them were replaced with the few remaining ones we had in stock. We will order more for the next snow season. Paul C. and John S. tuned up our snow blower and reported that it is working well.

Dave P. repaired one of the porch support columns that had rotted.

Alan Sliski spent several hours installing our new digital read out on the Bridgeport milling machine. One axis remains to be completed and we will attempt to finish this project during the December work party. Eric Johansson reports that the spin grinding machine is now operational

Corey Mooney demonstrated the new 3D printer and we plan to have it permanently located in the first floor ATM project room (former grinding room). Thanks to Keira Mooney for painting the 3D printer table, as well as door frames throughout the first floor.

Now that our grinding and polishing rooms are finished, the first floor of the Clubhouse looks just great! We ask that all members who use our facilities for their own projects to clean up after each session and put supplies and equipment back in their proper place.

Bruce Berger is VERY happy to report that the dome slit for ATMoB Research and Imaging Observatory (ARIO) is working flawlessly! He and Bill Toomey have begun taking readings for a few variable stars during the last couple of weeks. The ARIO team is eagerly looking for members who would like to learn how to use the equipment and work on their own projects with this research grade instrument. Contact Bruce Berger, Bill Toomey or Jim Gettys if you are interested.

Many thanks go to Eileen Myers who coordinated and cooked lunch for the crew. We appreciate her tireless efforts and also appreciate those members who help her with lunch prep and clean up!

And thanks to Paul C. for donating three equipment cases for our use.

Later, while several were clearing space for the lawn mowers in the far barn, we were greeted by Elaine and Stephen Kolaczkowski who stopped by to pick up ATMoB pins from Treasurer Eileen M. It was a pleasant surprise for we last bade them farewell when departing from the city of Cairns, after the 2012 ATMoB Australian Total Solar Eclipse expedition led by Mario Motta and Bernie Volz.

If you're free and nearby for the next work party, stop by and see what's happening at your Clubhouse. Our next work party will be held at 10 am on Saturday, Dec 14th.

IMPORTANT NOTICE: The Clubhouse phone was accidentally disconnected by Verizon. Please have a cell phone available for emergencies. More information later.

Clubhouse Saturday Schedule		
Dec 7	Paul Cicchetti	John Reed
Dec 14	**WORK PARTY # 12 **** Closed	
Dec 21	Phil Rounseville	Joe Wolfe
Dec 28	**WORK PARTY # 13 **** New Year's Eve Party Prep	
Jan 4	Steve Clougherty	Joe Henry
Jan 11	**WORK PARTY # 1 **** Closed	

**** Closing time for the Clubhouse is determined by the work crew**

Clubhouse Evening Schedule	
Friday Night Educational Videos	**ATMoB-Announce**
Saturday Night Observing	7:00 pm - ##
# Closing time is determined by the organizers ## Closing time is determined by the "A" members on duty.	

~ Clubhouse Committee Chairs ~
~ Steve Clougherty, John Reed and Dave Prowten ~

Outreach Report . . .

We had two successful events during November. On Saturday, November 2nd we had the pleasure of providing telescopes for the Westford Cub Scouts at the Westford Sportsman's Club. About 40 scouts, parents, and siblings attended. We were able to provide views of Jupiter, Saturn, Neptune, the Moon, a number of colorful double stars, and even some deep sky objects. The attendees were genuinely excited by the opportunity to use the telescopes. Thanks to Paul Cicchetti, Corey Mooney, Rich Nugent, and Bob Toop for volunteering!

On Monday, November 4th, several ATMoB members were at the DiscoverSTEM 2019 event at the Acton-Boxborough High School. Clouds prevented outside observing but Bernie Kosicki set up a display showcasing climate change while Corey Mooney ran a computer-simulator letting students attempt to launch, pilot, and land a rocket ship. Rich Nugent set up a telescope offering virtual views of the Moon using MoonGlobe HD, set for the exact date and time of the event. We expected a larger crowd but it was a fun event, none-the-less!

We attempted to hold a star party at the Center School in Stow, MA on Monday, December 2nd. An early winter storm caused the school to have a snow day so the event was postponed to the next night. Unfortunately, the likelihood of a second snow day and the overall condition of the school's campus caused the school to cancel the event. We'll try to reschedule in the spring.

As always, outreach is only successful when our members volunteer to help out. If you've never attended one of these events you should consider giving one a try. Any telescope will do and you don't have to be an expert observer! Let me or any of the star party coordinators (John Harrington, Bernie Kosicki, and Laura Sailor) know if you're interested and we'll fill you in on the details!

~ Rich Nugent - Vice President and Outreach Chair ~

ATMoB Research and Imaging Observatory Science . . .

In the last Starfields and at our November meeting I reported on the ATMoB Research and Imaging Observatory (ARIO) being commissioned to do science. At last count we have fourteen members who have signed up for the ARIO Science Working Group and we are always looking for more. We are currently exploring four areas of research we have identified. I am heading up the variable star project, Art Swedlow is heading up the exoplanet verification project, Jim Gettys is heading up the asteroid orbital elements project, and Bruce Berger is heading up the asteroid occultation project.

Of these four projects, the asteroid occultation project has proved least familiar to the members I have talked to, so I thought I would take a little time to explain its importance.

An occultation is one of the most profoundly amazing sights that the amateur astronomer can ever witness. Occultations are like eclipses in that they involve the passage of one celestial object in front of another. This process creates an opportunity to study the nature of one or both objects and offers professional and amateur astronomers exciting opportunities for continuing research.

To give a little background, any celestial body bound gravitationally to the Sun moves around the Sun in an ellipse and that an ellipse can be described by a set of six constants called the orbital elements. This also includes the Earth. We think of the Earth's ellipse as never changing, but this isn't true. Due to the pull of the other planets, the shape of the Earth's ellipse is continually changing. This is also true of the ellipse of every other object in the Solar System.

For the major bodies in the Solar System these changes are well understood. The Jet Propulsion Laboratory (JPL) has modeled these changes with a set of polynomials for which they have released several datasets (https://ssd.jpl.nasa.gov/?ephemerides or https://en.wikipedia.org/wiki/Jet_Propulsion_Laboratory_Development_Ephemeris). For example, the DE102 almanac covered between 1141 BCE and 3001 CE. But this is not true of the minor Solar System bodies like asteroids and Kuiper Belt Objects.

There are two major reasons the orbits of the minor bodies may not be well known. The first is that the orbits were not well established to begin with and second that these smaller bodies are more subject to having their orbits changed by perturbations from the other Solar System bodies. It's important to define and catalogue these orbits for several reasons, not the least of which is to provide and early warning system for the inevitable collision of one of these bodies with our celestial home.

Since the positions of stars are well known and an asteroid passing between the observer and the star casts a shadow on Earth equal in size to the asteroid, we can time the "blinking" off and on of the star and use this data to refine the orbit of the asteroid, understand its approximate size, determine if any secondary bodies accompany it or the occulted star, and even if it has an atmosphere. Indeed, a line of observers arranged across the eclipse path with precise timing equipment can capture several chords of the passing body, and if one can combine enough observations of the same orbit, a two-dimensional shape emerges. If the star blinks out twice, then we can learn that the asteroid is not a single object, but two objects orbiting each other, or even a binary star. A surprising number of asteroids turn out to be binary.

I hope this gives some reasons for our doing these scientific observations. Bruce Berger has given talks about asteroid occultations in the past and plans to write an article for Starfields on the mechanics of recording occultations, followed by some hands-on demonstrations and observations.

~ Submitted by Bill Toomey and Bruce Berger~

New Year's Eve Party . . .

To ATMoB Members and their Families,

Come and celebrate having survived the ominous Year Y2K - 20 years later.

The eating and festivities will start at 6:30 PM Tuesday evening, and will continue past midnight. Arrive at any time, since there will be 8 opportunities in all to shout "Happy New Year".

Noisemakers and cheers will ring out each time the New Year crosses a time zone, starting with Greenwich Mean Time (7 PM local time), and continuing hour after hour through Eastern Standard Time (midnight local time), with a couple of half hour celebrations in between.

Stop by with your family and friends. No RSVP is needed.
Please bring something tasty to share. Entrée type dishes are always very welcome. Folks arrive and leave all evening and the party seems to start again with each new group. There will be plenty of non-alcoholic beverages. All sorts of funny hats, shiny beads and noise makers will be available to wear and use at the party.

The Clubhouse will be warm and the party is on regardless of the weather. Don't forget your warm observing clothes and boots, and bring a telescope and camera if you like. The club's observatories will be open for observing too. The 5-day old Moon will set at 9:49 PM, so Lunar, Venus, Uranus, Neptune, and Deep Sky observing will be lots of fun at the club's observatories.

We will have line dancing led by Julie Kaufmann, and we are hoping to have live music again this year.

Clubhouse vacuuming, setting up tables, and putting up New Year's decorations will take place at the Saturday, December 28th Work Party. Help is needed. No experience necessary.

Any party suggestions or questions are welcome, so please email them to Eileen at starleen@charter.net or call at 978-501-6342 (day) or 978-456-3937 (evening).

For one set of directions to the ATMoB Clubhouse in Westford, see the last page of the ATMoB newsletter, or go to www.atmob.org and look for directions to the Clubhouse under About ATMoB. There are, of course, many other routes that may be shorter for you.

Please come and have fun and thank the members of the New Year's Eve Committee: Eileen Myers, Al Takeda, Julie Kaufmann, John Reed, and ...

~ Submitted by Eileen Myers ~

Library Telescope Program Modification Party . . .

Library Telescope Program Modification Group. Image courtesy of Rich Nugent.

On Saturday, November 23 we held our first Library Telescope Program Modification Party! Organized and led by Kelly Beatty, the event was held at New England Sci-Tech (NEST) in Natick, MA. Thanks go out to NEST/ATMoB members Bob Phinney, Bruce Tinkler, Rusty Moore, and George Roberts for providing the space to store the telescopes and for hosting the mod party!

The ATMoB recently purchased ten 4.5-inch StarBlast telescopes from Orion Telescopes and the modification kits from Cornerstones of Science. Before these telescopes are released to libraries they are made tamper-proof. This done by making the following changes/upgrades:

- The finder scope batteries are converted from an internal button battery to external AA batteries
- The telescope/finder caps have tethers attached to them
- The focuser is fortified and the eyepiece screws are changed out
- The primary mirror collimation knobs are changed out
- Stickers are applied to the telescope tube
- A fanny pack loaded with accessories is attached
- The telescope is collimator and the finder is aligned
- A Celestron 8-24mm zoom eyepiece is attached
- The telescope is cleaned and returned to its original packaging

We spent about 3 hours converting the scopes but this process will certainly become more efficient as we become more experienced with the process. Special thanks go out to Peter Smith from the New Hampshire Astronomical Society. The NHAS founded this entire program and Peter was on hand to

offer his expertise! He must have answered hundreds of questions but through his patient guidance all of the telescopes survived and will find their way to libraries!

There were 19 of us working on the scopes. In addition to the folks mentioned above, thanks go out to Bruce Berger, Michael Brown, Keith Davies, Chris Elledge, John Harrington, Theo Hill, Sandra Lobo, John Lyna, Tom McDonagh, Corey and Keira Mooney, Rich Nugent, and Jim Ritscher.

This first-time ever ATMoB Library Telescope Program mod party was a great success! Everyone had a fun time, met some new friends, and learned some new skills! We'll be looking for more volunteers to help at future modification parties and to be responsible for the occasional upkeep of the scopes so please consider helping out.

~ Rich Nugent - Vice President and Outreach Chair ~

Observer's Challenge . . .

November 2019

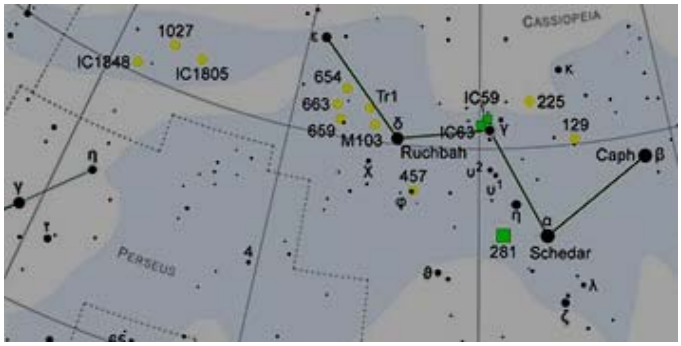
IC 1805 – Emission Nebula in Cassiopeia
Magnitude: 6.5; Size: 1.5° X 1.5°

Canon 80D, 400mm f2.8 lens. Image by Doug Paul, ***

Last month's Observer's Challenge, the planetary nebula NGC 246 in Cetus, tested our observing skills because its light is spread over a relatively large area. We continue that scenario with IC 1805, the "Heart Nebula" in Cassiopeia. Notes in Sanner and Kepple's *Night Sky Observer's Guide* describe this 1.5 by 1.5 degree nebula as "not visible" in 8-10-inch scopes and "very faint through a UHC filter" with 12-14-inch instruments. Despite this discouraging assessment, it might be an interesting challenge for large binoculars in a dark sky area or a rich-field telescope like an Edmund Astroscan fitted with a low power eyepiece and a UHC filter.

6-inch refractor, Oxygen III filter and Sulfur II filters. Image by Mario Motta

At the heart of the "Heart" is the source of its illumination – the open cluster Melotte 15. A young stellar group (its age is estimated to be 1.5 million years), Melotte 15 is dominated by O-type stars, some as much as 50 times the mass of the sun. According to Sanner and Kepple, the cluster is visible in scopes a small as 2-3 inches. Nebula and cluster lie some 7500 light years away.



Freestarcharts.com

The purpose of the Observer's Challenge is to encourage the pursuit of visual observing and is open to everyone who is interested. Contributed notes, drawings, or photographs will be published in a monthly summary. Submit them to Roger Ivester (rogerivester@me.com). To access past reports, log on to https://rogerivester.com/category/observers-challenge-reports-complete/

~ Submitted by Glenn Chaple ~

*Editor: * Photos by Al Takeda unless otherwise noted.*

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January *Star Fields* DEADLINE
Sunday, December 22nd

Email articles to Al Takeda at
newsletter@atmob.org

Articles from members are always welcome.
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POSTMASTER NOTE: First Class Postage Mailed December 9, 2019

Amateur Telescope Makers of Boston, Inc.
c/o Chris Elledge, Membership Secretary
99 College Ave
Arlington, MA 02474
FIRST CLASS

EXECUTIVE BOARD 2019-2020

PRESIDENT:	Tom McDonagh	(617) 966-5221
VICE PRES:	Rich Nugent	(508) 935-8158
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	Steve Clougherty	(781) 784-3024
	David Prowten	(978) 369-1596
OBSERVING:	Bruce Berger	(978) 387-4189
NEWSLETTER	Al Takeda	newsletter@atmob.org

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: Held the second Thursday of each month (September to July) at 8:00PM in the Phillips Auditorium, Harvard-Smithsonian Center for Astrophysics, 60 Garden St., Cambridge MA. For INCLEMENT WEATHER CANCELLATION see 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 open every Saturday from 7 p.m. to late evening. 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 Saving Time (EST) from Universal Time (UT) subtract 5 from UT.

Dec 4 First Quarter Moon (Moonset at midnight)
Dec 12 Full Moon
Dec 14 Geminid meteor shower peaks. 19 UT (14 EST)
Dec 18 Last Quarter Moon (Moonrise at midnight)
Dec 21 Winter Solstice
Dec 26 New Moon
Dec 27 Saturn 1.2 deg. north of Moon
Jan 3 First Quarter Moon (Moonset at midnight)
Jan 4 Quadrantid meteor shower peaks. 09 UT (04 EST)