STAR FIELDS

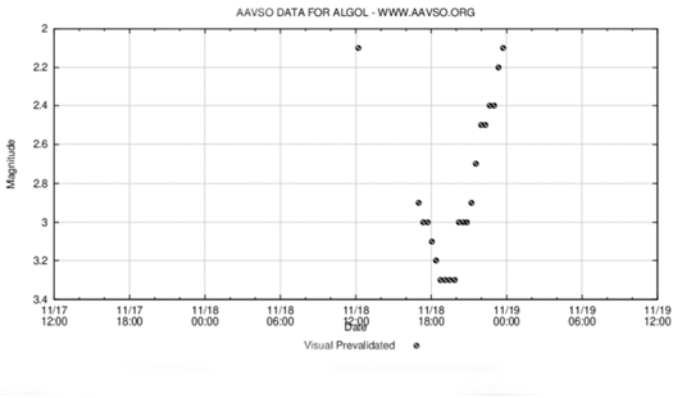
Newsletter of the
Amateur Telescope Makers of Boston
Including the Bond Astronomical Club
Established in 1934
In the Interest of Telescope Making & Using

Vol. 30, No. 11 December 2018

This Month's Meeting . . .

Thursday, December 13th, 2018 at 8:00 PM
Phillips Auditorium
Harvard-Smithsonian Center for Astrophysics
Parking at the CfA is allowed for the duration of the meeting

Variable Stars and their Stories



Algol light curve. Courtesy AAVSO

Variable stars have always been the most intriguing (and fun) targets for observers, professional and amateur alike. Stellar variability, both intrinsic and extrinsic, provides unique insights in critical stages of stellar evolution, help determine distances to nearby galaxies and add to our understanding of explosion physics and chemical enrichment of the Milky Way.

Our guest speaker for the evening will be Dr. Stella Kafka, Director of the AAVSO (American Association of Variable Star Observers). She will introduce some of the most common aspects of stellar variability and their significance in astrophysics. She will discuss their common light curves identifiers, and present work by AAVSO observers that has led to cutting-edge scientific discoveries throughout the years. Finally, she will discuss how you can participate in variable star observations from your back yard, contributing to the AAVSO International Database and to cutting-edge science.

Dr. Stella Kafka, is the Director of the AAVSO (American Association of Variable Star Observers). Before her tenure at the AAVSO, Dr Kafka held positions at CTIO, Spitzer Science center/Caltech, Carnegie Institution of Washington/DTM and AIP Publishing. The AAVSO is an international non-profit organization of variable star observers whose mission is to enable anyone, anywhere, to participate in scientific discovery through variable star astronomy.

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 . . .

With the holiday season in full swing, it is time for me to reflect on how grateful I am for all of the club members who do so much to ensure that our organization runs smoothly and efficiently. My thanks go out to members of the Clubhouse Committee, the Observing Committee, as well as to the multitude of volunteers who maintain our facilities for all to use. Behind the scene efforts by our dedicated Outreach Committee members allow us to meet our all-important outreach goals. I am also thankful to all of the Club Officers who give of their time and talents to cover often mundane aspects of running such a vibrant club. Without their efforts it would be hard to enjoy our talented speakers and fellow club members. It is important that we show appreciation to all of the speakers, past and future, who have given so much of their time and efforts to provide our club members with insightful and informative presentations at our monthly meetings in Cambridge. Please take the time to recognize all of our members and guest speakers who do so much to make our club a world class organization!

On the Clubhouse front we have exciting news. Real progress has been made! The new Paramount German equatorial mount arrived and is installed. The finishing touches for polar alignment and testing are ongoing, so I am happy to say we will have a top notch facility in ARIO shortly. Please keep an ear to the ground with regard to training sessions.

Steve Clougherty, John Reed, Barry Jensen, Phil Rounseville, Rich Nugent, Ed Los and Marian Hochuli met at the Clubhouse a few weeks ago to assess the mirror making facilities and suggested improvements. They considered the follow topics:

- The building of a Mirror-o-Matic to assist with the grinding and polishing of mirrors. Barry Jensen, George Roberts and I met last Saturday to discuss the design and to start analyzing what can be salvaged from existing equipment at the Clubhouse. We should have a build plan report by the January meeting.

- Cleaning the grinding room and sectioning off a small area for polishing and could be completed this winter.

- Buying or building an auto-collimator for the test tunnel to augment our existing Foucault tester. Barry Jensen and George Roberts are spearheading this effort.

Our next monthly club meeting will be held on the 13th of December at Phillips Auditorium in Cambridge. I am looking forward to Stella Kafka's presentation covering variable star astronomy. It should be a fascinating and enjoyable talk! Happy Holidays to all!

Clear Skies!

~ Tom McDonagh – President ~

November Meeting Minutes . . .

Rich Sanderson *

Minutes of the 914th ATMoB meeting held on November 8th, 2018 at the Harvard-Smithsonian Center for Astrophysics in the Phillips Auditorium. Club President Tom McDonagh presided and called the meeting to order at 8:02 pm.

President Tom McDonagh welcomed club members and opened the meeting by briefly describing Richard Sanderson's upcoming presentation. He also announced that he had received promotional T-shirts and other material promoting the movie, *First Man.* The movie is about astronaut Neil Armstrong, who was the first human to step onto the lunar surface. The materials will be available following the conclusion of the meeting.

- Secretary John Harrington read the minutes of the Club's October meeting.

- Treasurer Eileen Myers presented the Treasurer's Report. She described the delivery of heating oil to the Clubhouse.

- Chris Elledge then announced that, since the Club now has a security certificate for its website, visitors will no longer be redirected to the Club Express website. Chris then presented the Membership Report, showing 274 memberships covering a total of 374 members.

- Former Club President Glenn Chaple presented our current President with two new gavels, each the size and mass of a large mallet, for the firm maintenance of order.

- Glenn then presented the Observing Committee report focusing on the famous variable star Algol, which will drop by one full magnitude in brightness on December 5th. He also described the upcoming close conjunction of Mars and Neptune, which will occur on December 6th and 7th. Finally, he announced the monthly Observers' Challenge objects, dwarf galaxies NGC 147 and 185 in Cassiopeia, posted by Roger Ivester.

- President McDonagh thanked all Club members, especially Bruce Berger and Jim Gettys, who had participated in selecting a new equatorial mount for the ATMoB Research and Imaging Observatory (ARIO). The model that was selected is a Software Bisque Paramount MX +.

- Steve Clougherty gave the Clubhouse Report noting that the latest work party had to be postponed from late October until November 3rd and 4th. He thanked the 20 Club members that had participated. John Reed led the group that finished scraping and staining the barn, the roll-off roof observatory and the 17-inch Dobsonian shelter (dedicated to Sai Vallabha). He also mentioned that that the snow fence has been erected.

- Vice President Rich Nugent gave the Outreach Committee report. He briefly described the October 16th star party for the Cub Scouts and the October 20th star party training session at the Clubhouse, as well as the October 27th star party provided by the Club for the MIT Haystack Observatory staff. Rich called on Club members to participate in upcoming star parties, including:

  November 13th at Center School in Stow, MA
  November 30th at Vining School in Billerica, MA

- Old Business: None.

- New Business:

  Paul Valleli asked if any Club members had an old computer with a line printer parallel port that they could donate so he could continue using his ray tracing program. He is also looking for a 5.5" outer diameter brass slug that he could machine into a lens cell for his century-old 5-inch John Mellish refractor.

  President Tom McDonagh spoke briefly about the demise of the long-lived Kepler Space Telescope.

  Tom also announced that Treasurer Eileen Myers is selling *Astronomy* magazine calendars. Eileen mentioned that the Club's receipt of the *Royal Astronomical Society of Canada Observer's Handbooks for 2019* has been delayed due to the ongoing strike by Canada Post. *(Editor: The handbooks have arrived and will be on sale at the December meeting.)*

President McDonagh then thanked Al Takeda and all other Club members who have helped make recent events at the Clubhouse a success. This drew a round of applause from the audience.

President Tom McDonagh thanked Rich Nugent for bringing refreshments for the meeting.

President McDonagh then introduced Rich Sanderson, former Curator of Physical Science at the Springfield Science Museum in Massachusetts. Mr. Sanderson gave an engaging presentation on the "Top 10 Astronomical Spectacles" that he had witnessed in his 50-year observing career. Among those spectacles were the 1973 eclipse (of 7 minutes' duration) that he saw at age 18; the brilliant fireball that soared above the Stellafane Convention in 1973; the unique "chromosphere rainbow" that he saw from Aguazul, Colombia in 1977; the great annual eclipse of 1994 seen from Stellafane; Comet Hyakutake in 1996; Comet Hale-Bopp in 1996-1997 (visible for 18 months); the Leonid meteor storm of November 2001; the "Red Sox Lunar Eclipse" of 2004; the 2012 Transit of Venus; and finally the 2017 Great American Solar Eclipse.

President McDonagh adjourned the meeting at 10 PM.

~ John Harrington, Secretary ~

Meeting Recordings . . .

The recording of ATMoB meeting #914 is available on YouTube: https://youtu.be/8idi3_vWe8c

I would like to thank Rich Sanderson 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 Richard Sanderson, Timothy and Bryan Tait, and Scott and Ethan Drown.

As of November 30th, 2018 we have 283 memberships covering 360 members. This is broken down as follows:

- 133 Regular Members
- 98 Senior Members
- 5 Student Members
- 45 Family Memberships covering 122 Members

76 memberships have expired.

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

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

~ Chris Elledge – Membership Secretary ~

Meeting Refreshment Assignment . . .

2018 - 2019

Dec. – Mike Hill
Jan. – John Harrington
Feb. – Eileen Myers
Mar. – Glenn Chaple
Apr. – Chris Elledge
May – Al Takeda
Jun. – Bruce Berger
July – TBD

Clubhouse Report . . .

(L-R) Paul Cicchetti and Chris Elledge installing the "snow fence" *

The Clubhouse monthly work party for November was held on Saturday, the 24th with a total of twenty members and friends in attendance. Mild temperatures allowed for some outdoor work. Dave Prowten measured and cut several lengths of clapboard to replace missing and rotted sections of the barn and Clubhouse. Barry Jansen assisted with staining while Dave was able to install the new pieces before dark. The barn and Clubhouse have been nearly completely stained on the first floor level this year. Next Spring we will continue with staining the second floor level.

Bruce Berger and John Stodieck machined an adapter plate for the ATMoB Research and Imaging Observatory (ARIO) pier to accept the new Paramount MX + equatorial head. We are very pleased to report that during the first week of December the new Paramount was delivered, and Bruce Berger, Jim Getty's and Alan Sliski successfully mounted it on the pier. Polar alignment was completed and a few test images have been taken and will be shown at the monthly meeting on Thursday, Dec 13.

Paul Cicchetti, Chris Elledge and Al Takeda installed the snow fence.

John Reed and Paul spent several hours hammering out the Saturday coverage schedule for the upcoming year.

Many thanks to Mike Hill for cleaning and organizing the barn loft during the work party.

Several members of the mirror making committee reviewed the layout for a new mirror grinding and polishing machine to be completed over the winter months. Barry Jansen will take the lead on this project. Workshop members also plan to dedicate a "clean room" facility at the Clubhouse for future mirror making activities. In the past, considerable pedestrian traffic at the Clubhouse has impeded quality mirror fabrication and we would like to spend the next few months building and organizing a dedicated space for these activities. Barry and George Roberts also plan to build an autocollimator for the new mirror workshop this coming year.

Al Takeda continued to document the Matt BenDaniel donations.

Lunch was served to volunteers and we would like to thank John Reed, Art Swedlow and the other volunteers who helped with clean up.

Many thanks to the following members and friends of the ATMoB who helped during the month of November: Paul Cicchetti, Steve Clougherty, Karl Dean, Scott Drown, Ethan Drown, Chris Elledge, Marion Hochuli, Barry Jansen, Dick Koolish, Ed Los, Rich Nugent, Dave Prowten, Phil Rounseville, Alan Sliski, John Stodieck, Art Swedlow, Timothy Tait, Al Takeda, Brian Tait and Bill Toomey.

Important Notice: Please check your email on the ATMoB-ANNOUNCE list for mirror making sessions. A revised schedule will be released soon.

Clubhouse Saturday Schedule		
December 15	Phil Rounseville	Joe Wolfe
December 22	**WORK PARTY # 13 **** NO DUTY	
December 29	**New Year's Eve Party Preparation**	
January 5	Steve Clougherty	Joe Henry
January 12	Paul Cicchetti	John Reed
January 19	**WORK PARTY # 1 **** NO DUTY	

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

Clubhouse Evening Schedule	
Friday Night Educational Videos	7:00 pm - 10:30 pm #
Saturday Afternoon Mirror Making	**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.	

(L-R) Dave Prowten and Steve Clougherty repairing the Chase Hutch. *

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

RASC and Astronomy Calendars . . .

The 2019 Royal Astronomical Society of Canada (RASC) Handbooks finally arrived.

Handbooks and Calendars will be available for purchase at the upcoming December 13th monthly meeting at the CfA in Cambridge.

1. The Royal Astronomical Society of Canada (RASC) *Observer's Handbook 2019* U.S. Edition will be available at $22 each (which includes a $1.32 donation to ATMoB).

To read about the handbook see https://www.rasc.ca/handbook

2. The *2019 Astronomy Magazine Deep Space Mysteries* calendar will be available at $8 each (which includes a $1.50 donation to ATMoB).

To view the calendar, see it at the *Astronomy* Magazine/Kalmbach Publishing Co website https://myscienceshop.com/product/calendar/68189

Please pay with exact cash. Should you need to pay by check, please make the check payable to Eileen Myers.

For more information, contact Eileen at starleen@charter.net.

~ Eileen Myers, Treasurer ~

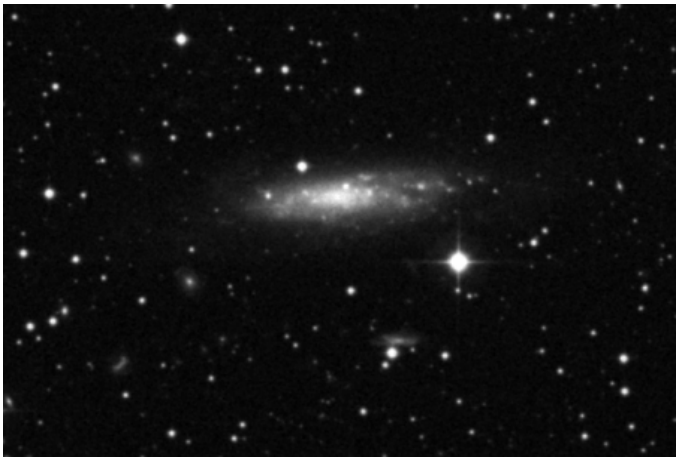
Sky Object of the Month . . .

December 2018

Courtesy LVAS Observer's Challenge***

NGC 1003– Spiral Galaxy in Perseus

Magnitude: 11.5 Size: 5.5' X 2.0'



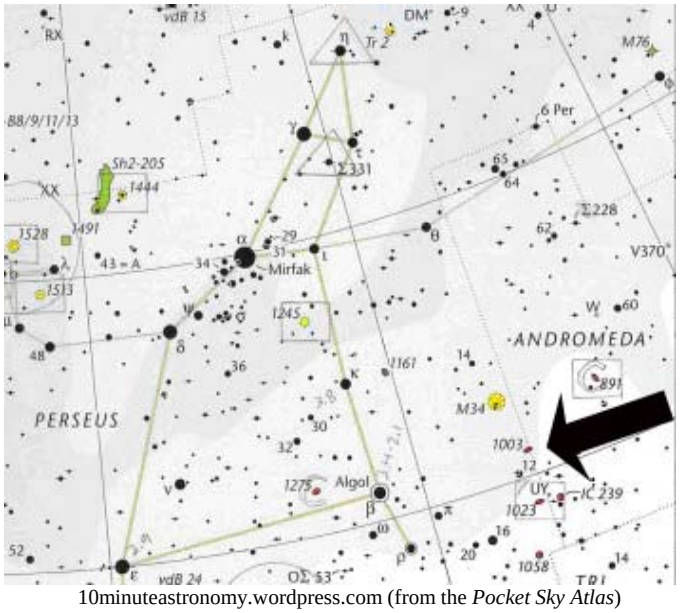
NGC 10003. inthesky.org (North is up)

When William Herschel conducted his systematic sky surveys during the latter part of the 18th century, he placed his deep sky finds into 8 categories, or classes. Class I through III included nebulosities of varying degrees of visibility, Class I being the brightest. Although the Herschel Catalog designations have been replaced by the New General Catalog (NGC) numbers, they still serve as guides to selecting "faint fuzzies" appropriate for a specific aperture telescope. Consider the spiral galaxy NGC 1003 in Perseus. When Herschel came upon it in the autumn of 1784, he catalogued it twice – as number 238 in Class II (Faint Nebulae) and as number 198 in Class III (Very Faint Nebulae). In either case, this is not a target you'd select for a small backyard scope.

George Kepple and Glen Sanner's *Night Sky Observing Guide* provide descriptions of deep-sky objects by aperture ranges of 4-6, 8-10, 12-14, 16-18 and (occasionally) 20-22 inches. The smallest aperture for which a visual description of NGC 1003 is given is for the 12-14-inch range. In the *Observing Handbook* and *Catalogue of Deep-Sky Objects*, authors Christian Luginbuhl and Brian Skiff describe it as "easily visible in 15 cm (8 inches). Can this galaxy be glimpsed with smaller apertures? To capture NGC 1003 with a 4 – 6-inch scope will require extremely dark sky conditions and a well-trained, dark-adapted eye.

Telescopically, NGC 1003 appears as a faint east-west smudge, concentrated towards the center. Measurements hint at a distance of 33 light years, which translates to a true diameter of 54,000 light years.

NGC 1003 is located about a degree northwest of the 5th magnitude star 12 Persei. It's interesting to note that when constellation boundaries were formally defined by the International Astronomical Union in 1930, the borderline between Perseus and Andromeda cut through the western part of NGC 1003 – the galaxy literally resides in two constellations!



10minuteastronomy.wordpress.com (from the *Pocket Sky Atlas*)

***The purpose of the LVAS Observer's Challenge is to encourage the pursuit of visual observing. It is open to everyone who is interested, and if you are able to contribute notes, drawings, or photographs, the LVAS will be happy to include them in their monthly summary. If you would like to contribute material, submit your observing notes, sketches, and/or images to either Roger Ivester (rogerivester@me.com) or Fred Rayworth (fred@fredrayworth.com). To find out more, click on the following links: LVAS Observer's Challenge past reports and/or visit the Las Vegas Astronomical Society website.

~ Glenn Chaple for the LVASS ~

October Outreach Report . . .

ATMoB members and Parker Middle School staff at the Acton Star Party. *

November brought many cloudy nights, forcing cancellation/postponements of most of our scheduled star parties! However, one event, the Acton-Boxborough evening of astronomy, had a large, well-organized indoor component so it was held despite the clouds that evening.

Quite a few members and friends of ATMoB were on hand to share their passion for astronomy with the 150 students (and their parents and siblings) in attendance.

Kelly Beatty gave presentations, as did Galileo (Mike Francis).

Corey Mooney displayed some of the fascinating technology he is working with to image the sky and present the views to his audience in real-time.

Eileen Myers had students grind glass as she explained the process of and reasons for making your own telescope mirror.

Al Takeda displayed his imaging rig and astrophotos. I showed views if the Moon (Moon Globe HD on my iPad) through my ETX-125 scope.

Bob Phinney, Bruce Tinkler, and John Hinz set up a STEM project center where students were able to build their own red LED flashlights.

Kelly Beatty, Steven Feinstein, Bernie Kosicki, John Reed, and George Roberts were also on hand to talk up the club and astronomy, in general.

The organizers have always treated us to a delicious meal afterwards...I'm sure they'd be willing to share their recipes for the several chilies on hand! This event has been held for the better part of a decade and the organizers are very appreciative of our contributions. While we didn't get to observe this time, I'm sure we will be back in the future! Thanks to all who participated!

Kelly Beatty has suggested that we may want to consider approaching the Boston news outlets for January's total lunar eclipse. The timing of the eclipse makes it a little difficult to run public outreach but TV coverage with a live feed for the 11 p.m. news would certainly give the ATMoB some nice press. Thanks for the suggestion, Kelly! More on this to come.

As we get into the Winter months we tend to do fewer star parties. However, requests for the Spring have already started to come in. Please consider volunteering for outreach events. For more info contact me or anyone on the outreach committee at starparty@atmob.org.

~ Rich Nugent - Outreach Committee Chair ~

ATMoB New Year's Eve Party . . .

Musical duo (L-R) Ed Los and Claude Galinski. 12/31/16. *

Come and see comets this New Year's Eve!

The eating and festivities will start at 6:30 PM Monday 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.

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. Comets 46P/Wirtanen and 38P/Stephan-Oterma will both be in Lynx on Dec. 31st. Moonrise will be at 2:49 EST the morning of January 1st, so 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 decorations will take place at the Saturday, December 29th 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 ~

Comet 46P / Wirtanen . . .

Periodic Comet 46P / Wirtanen has brightened to naked eye visibility. The diameter of the coma has also increased to 30 minutes, the size of the full Moon. It is currently in the constellation of Cetus (the whale). On December 11th the comet will rise at 15:25 EST (20:25 UT), transit at 21:48 EST (02: 48 UT) and set at 04:03 EST (09:03 UT).

Wirtanen will make a close pass to the Earth at just 7.2 million miles (11.6 million km.) on December 16, 2018 when it will pass close to the Pleiades open cluster.

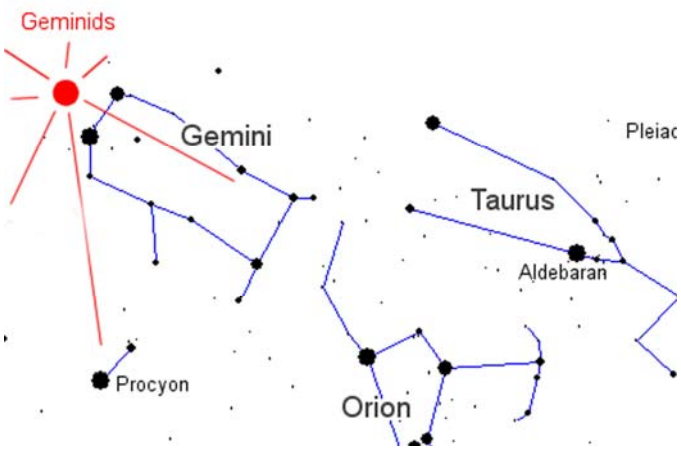
Comet 46P / Wirtanen. From Stellarium

Many ATMoB members observed the comet through Phil Levin's parallelogram mounted binoculars at the Clubhouse on Friday evening, December 7th. They reported that it was a large circular "fuzzball" without a tail.


Comet 46P / Wirtanden. 10 images, 90 second lights, Takahashi Epsilon-180 + Canon T1i DSLR (unmodified), ATMoB Clubhouse, 8 Dec. 2018. Al Takeda.

Go outside and observe this comet before moonlight starts to interfere!

Geminid Meteor Shower . . .



The rocky debris of Asteroid 3200 Phaethon will shower upon us as the annual peak of the Geminid meteors occur on Friday, December 14th. The First Quarter Moon, which happens on the following day, will set around midnight, giving us more than 6 hours of moonless skies to watch the show.

This shower has a Zenithal Hourly Rate (ZHR) around 120 meteors per hour, under very dark skies. The radiant lies near 2nd magnitude star Castor. Castor rises about 45 minutes after sunset and will be 30 degrees above the horizon by 9:00 pm. Culmination occurs around 2 am.

Try a "buddy system" to count meteors. One person keeps track of time and records the data while the other observers verbally count out the meteors seen. If you would like to perform a scientific meteor count, use the standardized method spelled out at the American Meteor society website. Print out the Instructions and the Standard or Advanced Visual Observing Form to record your observations.

Winters in New England can be brutally cold, so dress warmly. Use a comfortable lounger or chair and use a blanket or sleeping bag.

~ Al Takeda - Member at Large and Newsletter Editor ~

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

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December *Star Fields* DEADLINE
Sunday, December 23th

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 11, 2018

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

EXECUTIVE BOARD 2018-2019

PRESIDENT:	Tom McDonagh	(617) 966-5221
VICE PRES:	Rich Nugent	
SECRETARY:	John Harrington	
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TREASURER:	Eileen Myers	(978) 456-3937
MEMBERS AT LARGE:	Maria Batista	(617) 347-3730
	Alan Sliski	
	Al Takeda	(508) 494-7877
PAST PRESIDENTS:		
2015 - 18	Glenn Chaple	(978) 597-8465
2012 - 14	Mike Hill	(508) 485-0230

COMMITTEES

CLUBHOUSE:	John Reed	(781) 861-8031
	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 Standard Time (EDT) from Universal Time (UT) subtract 5 from UT.

Dec 7 New Moon
Dec 14 Geminid meteors peak (13:00 UT, 8:00 ESt)
Dec 15 First Quarter Moon (Moonset at midnight)
Dec 21 Winter Solstice
Dec 22 Full Moon
Dec 29 Last Quarter Moon (Moonrise at midnight)
Jan 4 Quadrantid meteors peak
Jan 6 New Moon
Jan 14 First Quarter Moon (Moonset at midnight)