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. 25, No. 10 November 2013

This Month's Meeting…

Thursday, November 14th, 2013 at 8:00 PM
Phillips Auditorium
Harvard-Smithsonian Center for Astrophysics
Parking at the CfA is allowed for the duration of the meeting

1.2-meter Millimeter-Wave Telescope. Courtesy Harvard-Smithsonian CfA

Big Science with "Mini" Telescopes: Mapping the Galaxy from NYC, Cambridge, and Chile

This month's speaker will be Dr. Thomas Dame from the Harvard-Smithsonian Center for Astrophysics. Dr. Dame will speak to us about the research performed with the 1.2 meter Millimeter-Wave Telescope that sits on the roof top above Phillips Auditorium where we have our meetings. If you've ever wondered what that instrument is up there and what research is done with it then this meeting is for you. Dr. Dame will talk about the history of the instrument and its twin down in Chile, and about the observations made with it in relation to mapping the molecular clouds in our galaxy and others nearby.

Please join us for a pre-meeting dinner discussion at Changsho, 1712 Mass Ave, Cambridge, MA at 6:00pm before the meeting.

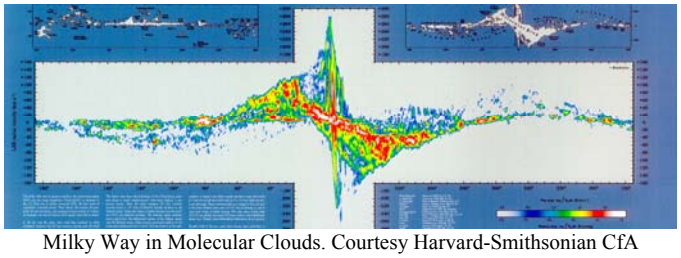
President's Message…

This month we will be witness to a new comet – Comet ISON (C/2012 S1) and it has been billed as potentially the "comet of the century". Haven't we heard that before? For some us this is Déjà Vu (remember Comet Kohoutek?) That was my first comet after getting into the hobby as a young boy. It was so exciting and was sooooo hyped up!! Well as we all know it didn't live up to the hype and the media had to have been just a little embarrassed by that one but we all move on.

Just three years later we had Comet West and this turned out to be so much of a better show and curiously – no media hype whatsoever. I remember Comet West fondly because the best views were in the early morning which was my favorite time for viewing. I loved the quiet and serenity and peacefulness of that time of day. The ghostly image of the comet hanging over the trees to the East as the day began to brighten was so surreal. I managed to get my first picture of a comet with that one too. I was pretty new at astrophotography which back then meant taking a picture with Kodak Kodachrome or Ektachrome or maybe even black and white. And it meant taking pictures with bracketed exposures to get the right mix of comet and brightening background sky. And it meant sending out your film and "waiting" for it get developed. That sure is a thing of the past . . . Well after a few days wait I got my pictures back and - Yes!!! - I got the comet! It was one of my favorite pictures even though by most standards it was pretty low quality. But it was my image and I was proud of it.

This comet coming up, assuming the comet lives up to the hype, should give you all a chance to get a great set of comet pictures of your own. Whether it is through a telescope, DSLR, point and shoot camera, or your iPhone you will surely feel the same sense of pride to get out there and get a picture. This is another pre-dawn event so set your clocks early and let's hopes for a good show. Be forewarned however, that there is a possibility that this comet could in fact break apart on its closest approach to the sun on November 28th. The early hype as the "comet of the century" has been understandably replaced with the reality that no one really knows what could happen. It could be a fantastic sight or no sight at all. But getting up early and trying to see it has its rewards either way – so give it a try and see if you too can get a memorable image of a ghostly comet as it passes on through our solar system.

~ Michael Hill – President ~



Milky Way in Molecular Clouds. Courtesy Harvard-Smithsonian CfA

October Meeting Minutes . . .

Glenn Chaple.*

Meeting held in Phillips Auditorium, Harvard-Smithsonian Center for Astrophysics.

Mike Hill, President: called the meeting to order at 8:00 PM.

- The Secretary's Report of the September 2013 meeting was given by Sidney Johnston.
- Mike Hill gave the Treasurer's report, as prepared by Nanette Benoit.
- Tom McDonagh gave the Membership Committee Report. Tom mentioned that any member not receiving the ATMoB Newsletter by e-mail should contact Tom to have the e-mail list fixed. Membership is now about 260 members.
- Glenn Chaple gave the Observing Committee Report. Glenn mentioned several events that observers could catch this month. Glenn also mentioned the certificates which observers can earn by observing double stars. Members are encouraged to go out and observe double stars to obtain the certificates, including the Master Observer Certificate.
- Mike Hill gave a report on the ATMoB Research and Imaging Observatory (ARIO) for Bruce Berger.
- Steve Clougherty gave the Clubhouse Committee Report. Steve mentioned that the Work Party last month was very successful. Next week another work party will continue the effort to clean the Clubhouse. The Clubhouse is being extensively used, including that it was open with activities 17 days during September. On September 28 every concrete pad was in use by observers and their telescopes.
- Mike Hill mentioned several announcements, including:
  Oct 11, a Chelmsford Star Party;
  Oct. 18, a Pollard School Star Party;
  Oct. 19, a Hanscom Air Force Base Star Party;
  Nov. 5, there is an ATMoB Executive Board Meeting at the Clubhouse; and
  Nov. 5, a North Reading Science Night.
- Old Business: none
- New Business: none

President Mike Hill introduced ATMoB longtime club member Glenn Chaple as the invited speaker. Glenn's talk was entitled "Double Stars for Backyard Astronomers or Double Stars are Twice the Fun"

Glenn has been an ATMoB member since April 1, 1980. Glenn is a published author of books and many magazine columns about astronomy. Glenn's monthly columns published in "*Astronomy Magazine*" dating from August 2004 are located at: http://www.astronomy.com/authors?name=Glenn+Chaple and his books include: *The Edmund mag 6 star atlas*; *Outer Planets* (Greenwood Guides to the Universe, Vol. 4); and *Exploring With a Telescope*, which are available online at booksellers such as Amazon, Barnes and Noble, and bookfinder.com. Also Glenn has written numerous chapters in other astronomy books.

Glenn's talk began with the definition of a double star: "double star, a noun meaning two stars, appearing close together when viewed through a telescope; either physically associated (binary star) or not associated (optical double star)". Two stars "physically associated" are gravitationally bound stars which orbit around a common center of mass, either as two or more stars and/or planets gravitationally bound as a single system. "Optical double" stars are stars which are too far apart to be gravitationally bound, but are aligned, by chance, with the Earth so that to an Earth bound observer the stars look near to each other.

The history of observations of double stars begins at least with Ptolemy in the 2nd century AD who classified two stars in Sagittarius as "double", although they are now known to be 14 arc minutes apart, an early "optical double" for the unaided eye. Further discovery of double stars occurred rapidly after the invention of the telescope. Benedetto Castelli, a Benedictine mathematician and student of Galileo's, observed Mizar as a double pair. Christian Mayer in the 1770s had a 2.5-inch telescope mounted on a quadrant, and published a catalog of 72 double stars, and Johann Elert Bode added 8 stars and published Mayer's catalog with 80 double stars in an astronomical journal, see http://www.jdso.org/volume3/number4/Schlimmer.pdf . Herschel subsequently discovered about 600 double stars. Burnham then discovered hundreds of double stars. Sorting out which reported double stars were binary stars (or otherwise gravitationally bound) or optical doubles occupied astronomers for some time.

When a gravitationally bound star passes in front of a companion, the light intensity of the two will decrease as the one star is blocked from an observer on Earth, and this observation provides one method of deciding that a double star is in a gravitationally bound system with at least one companion.

Also, a gravitationally bound system will have light Doppler shifted to the blue as a star approaches Earth and red as the star

recedes from Earth. This Doppler shift can be observed with a spectroscope and so distinguish a gravitationally bound system from an optical double. Some systems have been identified as gravitationally bound systems having at least 6 stars orbiting together. A binary identified as a binary by spectroscopic methods such as observing the Doppler shift is referred to as a "spectroscopic binary".

A further method of distinguishing a gravitationally bound system, when one of the stars is much dimmer than its companion, is observing small motions of the bright star as it orbits around a common center of mass with its dim companion.

Sirius A and Sirius B are a double star with Sirius A being the brightest star in the sky, and Sirius B being a white dwarf which is roughly 1/ 10,000 times dimmer than its bright companion. Careful astrophotography can reveal the bright star and its dim companion.

According to the Wikipedia page (http://en.wikipedia.org/wiki/Sirius); "In 1844 the German astronomer Friedrich Bessel deduced from changes in the proper motion of Sirius that it had an unseen companion. Nearly two decades later, on January 31, 1862, American telescope-maker and astronomer Alvan Graham Clark first observed the faint companion, which is now called Sirius B, or affectionately "the Pup" [since Sirius is the Dog Star]. This happened during testing of an 18.5-inch (470 mm) aperture great refractor telescope for Dearborn Observatory, which was the largest refracting telescope lens in existence at the time, and the largest telescope in America. Sirius B sighting was confirmed with smaller telescopes."

Representative Double Star Data includes the following elements.
Representative double star data for, Gamma Virginis:
Proper Name: gamma Virginis
Catalog Designation: STF 1670
Coordinates: RA 12h41.7m Dec -01o27'
Magnitudes: 3.5+3.5
Separation: 2.0" (2.0 arc seconds)
Position Angle: 11 degrees
Epoch: 2013
Comments: binary (Period=169y)

Various catalogs of double stars have been compiled. Catalog designations are used to identify a star appearing in the catalog, and include:

The Washington Double Star Catalog (WDS) (http://www.usno.navy.mil/USNO/astrometry/optical-IR-prod/wds/WDS)
William Herschel (H I, II, etc., H 1, 2, etc.);
John Herschel (h HJ);
James South (S);
J. South/J. Herschel (Sh, SHJ);
James Dunlop(Δ, DUN);
F.G.W. Struve (Σ, STF);
Otto Struve (OΣ, STT);
Pulkova Appendix Catalogue (OΣΣ, STTA);
S.W. Burnham (β, BU).

The angular separation of a binary pair of stars and the resolving limit of the observer's telescope determine if the pair can be resolved. A handy comparison for angular measurements is that one arc second is about the angle subtended by a penny at a distance of 4 kilometers from the observer.

The resolving power of a telescope depends upon the diameter of the aperture, and is related to diffraction rings produced by passage of light through the aperture of the telescope. The resolving limit is referred to as the Dawes' limit which includes a formula to express the maximum resolving power of a telescope. It is named for its discoverer, W. R. Dawes, although it is also credited to Lord Rayleigh.

The formula takes different forms depending on the units:
R = 11.6/D in centimeters, R in arcseconds;
R = 4.56/D in inches; where, D is the diameter of the main lens (aperture); R is the resolving power of the instrument.

The formula gives the following resolving powers R for apertures D in inches:
DAWES LIMIT BY APERTURE

APERTURE (inches)	DAWES LIMIT (arcsecond)
2.4	1.90
3.0	1.52
4.0	1.14
6.0	0.76
8.0	0.57
10.0	0.46
12.0	0.38

Some double stars which are just resolved by a 3 inch telescope, and which have roughly equal magnitudes include, with magnitude and angular separation, arcseconds:

zeta Aqr	mag 4.4+4.6	1.8"
mu Dra	mag 5.8+5.8	2.0"
STF 2245 Her	mag 7.0+7.0	2.4"
STF 2917 Lac	mag 8.0+8.0	4.9"
STF 675 Ori	mag 9.2+9.2	9.4"
A.G. 44 Tri	mag 9.9+10.0	10.0"

The position angle gives the orientation of the double star pair as seen by the observer. The position angle is measured relative to North-South and East-West as observed. Corrections for telescope optics (inversion, reflections, etc.) are made to refer the position angle to the observer's North-South and East-West. A line through the pair is measured counter-clockwise from the observer's North, and the line through the pair extends from the brighter star of the double.

The Epoch is the year in which the observation is made.

An "observing tip" is to use averted vision. When observing a close pair that is hard to see, the use of averted vision is very helpful. Averted vision is particularly helpful when one of the companions is dim and near the limit of visibility.

Club members are encouraged to observe double stars and to earn the "Master Observer" Certificate. An observation includes recording the above double star elements as observed data, and the date observed, etc.

Book Resources include:

- *Double Stars*, Sissy Hass, Sky Publishing
- *Double and Multiple Stars*, James Mullaney, Published by Springer
- *The Cambridge Double Star Atlas*, James Mullaney and Wil Tirion
- *A Visual Atlas of Double Stars*, Mike Roppelewski, Published by The Webb Society
- *A Field Guide to Double Star Observing*, Joe Del Santo, Email jdalsanto@waubonsee.edu for details.
- *Finder Charts of Select Double Stars*, Brent Watson,
- *Webb Society Deep-Sky Observer's Handbook Vol. I, Double Stars*
- *Deep Sky Observing with Small Telescopes*, David J. Eicher and the Editors of Deep Sky
- *Sky Watcher's Handbook* , Ed. James Mulrden

Resource Web Sites include:

- *Star Splitters* (bestdoubles.wordpress.com)
- Jeremy Perez Double Star sketches (www.perezmedia.net/beltofvenus/archives/sg-double_star.html)
- Double Star Searchable Database (www.virtualcolony.com/sac/star-search-form.html)
- Astronomical League Double Star Program (www.astroleague.org/al/obsclubs/dblstar/dblstar1.html)
- Eagle Creek Observatory Double Star Page (www.eaglecreekobservatory.org/eco/doubles)
- Double Star Observer (doublestarobserver.com/doublestar.html)
- Orbits of 150 Visual Binaries (www.dibonsmith.com/elements.htm)\

The meeting was adjourned at 9:37 PM

~ Sidney Johnston, Secretary ~

Clubhouse Report . . .

October 2013

Dumpster at the Clubhouse. Image by Al Takeda

We had a very productive work party at the ATMoB Clubhouse on Saturday, Oct. 19. A total of 17 members and friends arrived in the morning to help with a couple of physically demanding projects. Our first priority was a thorough clean out of the clubhouse attic and barn. Numerous items which had accumulated over the years were thrown out, such items included: 3 spare air conditioners, two mattresses (during a long ago visit to the Clubhouse John Dobson slept on one of them), several antiquated projectors (the lenses were salvaged), several broken chairs, an old water bubbler and other various items well past their prime. We filled a 15 yard dumpster before sundown.

(L-R) Tom Wolf and Steve Clougherty attaching reflectors. Image by Al Takeda

Project number two involved attaching red reflectors to our snow fence stakes and pounding them into the ground with our newly acquired sledge hammers. The orange fence webbing is no longer needed and the observing field should be safer to navigate at night as a result. Many thanks to Dave Prowten for refurbishing the telescope shed doors. We are once again indebted to John Blomquist for hauling his tractor to the clubhouse and mowing the entire property.

Thanks go out to our cooking and clean up crew who once again provided a wonderful meal for the hungry crew.

The next work party at the Clubhouse will be less physically challenging, we promise!

We would like to thank the following members and friends for taking part in this herculean effort: Glen Chaple, Mike Hill, Sai Vallabha, Jim and Charlie Gettys, Eileen Myers, Tom Wolf, Nina Craven, Dave Wilbur, Art Swedlow, Al Takeda, Bruce Berger, Cheryl Rayner, Paul Cicchetti, Steve Clougherty and Eric Johannson.

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

Clubhouse Saturday Schedule

November 16	Bill Robinson + N. & S. Sonowane **WORKPARTY # 11**	
November 23	Art Swedlow	Sai Vallabha
November 30	George Paquin	Dave Prowten
December 7	Paul Cicchetti	Tom McDonagh
December 14	Steve Clougherty + Al Takeda **WORKPARTY # 12**	
December 21	Eric Johansson	John Reed
December 28	Clubhouse Closed	
December 31	New Year's Eve Party	

Membership Report . . .

Membership count as of October 27, 2013 is at 248 individuals. This is two more members than at the same time last year.

19 members have renewed their membership this month. If you have renewed, thank you!

The membership renewal period begins in June and ends September 1st. Please contact me ASAP to renew you membership.

If you are a new or returning member in the 2013 calendar year, renewal payment is not required. If you have questions regarding your membership status, please contact me.

A new class of membership is available this year. Consider a Family membership for yourself and direct family members.

The renewal process can be completed on-line using PayPal. No PayPal account is required. Follow the link below, login using your email address on record with the club. Direct PayPal payments can be sent to membership@atmob.org. If you cannot gain access to the website, please contact me before renewing online.

http://www.atmob.org/members/person.php?frid=renewals

Renewal checks may also be mailed:
ATMoB
c/o Tom McDonagh
48 Mohawk Drive
Acton, MA 01720

The renewal form can be downloaded from the following link:

http://www.atmob.org/about/join.php

Contact me if you require a renewal form and do not have access to a computer / printer by phone (617-966-5221) or mail. If for any reason you are not receiving the *Star Fields* newsletter, please do not hesitate to contact me.

Don't delay, renew today!

Please take the time to seek out and welcome our new and returning club members:

Brian Gregor
Josh Simons
Ed Bernard
Joseph Sicree
Rick Eliot

The Amateur Telescope Makers of Boston, Inc. is a 501(c)3 organization. Donations are gladly accepted and are tax deductible to the fullest extent allowed by law. Consider making a tax-deductible contribution to the club during your estate and tax planning this year. Many companies make matching contributions at an employee's request. This is a simple way to make your donation go twice as far.

~ Tom McDonagh – Membership Secretary ~

2014 RASC Observer's Handbook . . .

Copies of the 2014 RASC Observer's Handbook will be sold at the November monthly meeting of ATMoB on Thursday, November 14th. Unsold copies will be available at the December meeting. Handbooks will again be $20 each. Payment in cash would be appreciated. The books were charged to my credit card, so any payment by check should be made payable to me.

The guide is published annually by The Royal Astronomical Society of Canada (RASC). It is a great annual reference for celestial data and for upcoming events in the sky. See http://www.rasc.ca/observers-handbook for more details.

~ Eileen Myers - Member at Large ~

2014 Astronomy Calendars . . .

I will once again be selling the Astronomy Calendars for $8.00 a copy (retail price is $12.95). Exact change will be greatly appreciated. I will only have 50 copies, so first come, first served. The club treasury will get about $1.50 for each copy sold; great deal for you and the club!

~ Submitted by Bernie Volz ~

Sky Object of the Month . . .

November 2013

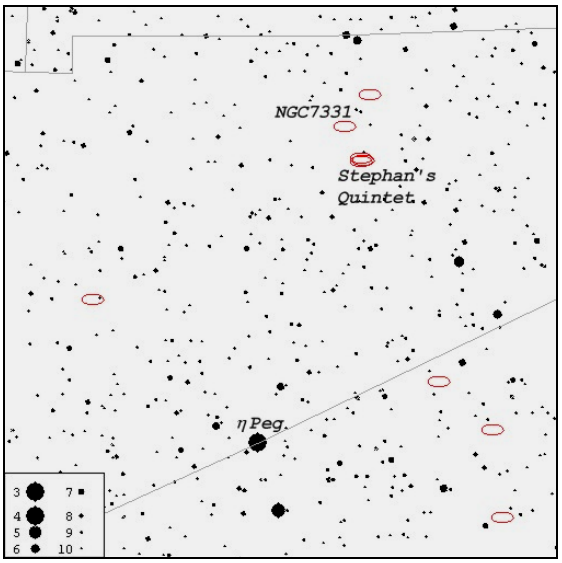
NGC 7331– Spiral Galaxy in Pegasus

NGC 7331. Photo by Mario Motta M.D.

What would the Andromeda Galaxy look like were it 20 times more distant? To find the answer, we need look no further than the spiral galaxy NGC 7331 in Pegasus. In size (a 130,000 LY diameter) and mass (300 billion suns), NGC 7331 is essentially a twin of the Andromeda Galaxy. Place the Andromeda Galaxy beside NGC 7331 and it, too, would be a magnitude 9.5 "faint fuzzy" with 10.5 by 3.5 arcminute dimensions.

I first viewed NGC 7331 in the fall of 1977, using a 3-inch reflector and a magnifying power of 60X. To me it appeared as "a faint small object that seemed slightly elliptical." A recent observation with a 4.5-inch reflector yielded a similar result. In both instances, I was seeing the galaxy's nucleus. Would a larger scope reveal the spiral arms? A 10-inch reflector did, but barely. In my logbook, I wrote, "Some hint of extensions – like a small, faint M31."

The accompanying finder chart shows the location of NGC 7331 – a 4 ½ degree star-hop north and slightly west of eta (η) Pegasi. Just ½ degree SSW of NGC 7331 is Stephan's Quintet. This clump of galaxies, ranging in magnitudes from 12.7 to 13.1) is a favorite target of owners of large-aperture telescopes.



www.astrosurf.com 7°45' x 7°45'. North is up

~ Glenn Chaple – Member at Large ~

M31, Andromeda Galaxy, Image by John Blomquist

Pollard School Star Party recap . . .

The Oct 18th Pollard School Star Party was a success again this year thanks to the participation of stalwarts from ATMoB and NSAC. Special thanks to Marion Hochuli, Brewster laMacchia, Tony Costanzo, Bruce Tinkler, Joe Henry, Tom McDonagh and Kurt Sidor. I apologize for anyone I missed from NSAC!

We had a record 350 – 400 attendees this year viewing the lunar eclipse, Venus and a host of celestial objects. The hayrides, bonfire, presentation and string quartet music (including the Star Wars theme) were big hits.

Bruce's information table was a smash hit with more visitors than ever, though frankly going into Uno's with him later in a NASA flight suit was a little odd. Having the event at a farm instead of the usual lit parking lot adds a lot to a star party!

~Submitted by Peter Bealo ~

Comets before Dawn . . .

For the next month we are fortunate to have 4 comets gracing our morning sky. All are visible in binoculars and there are a few reports of naked eye glimpses at dark sky locations.

The first is periodic Comet 2P/Encke. It is currently in the constellation of Virgo and rises just before astronomical twilight.

Comet C/2012 K5 (LINEAR) had an outburst similar to Comet 17P/Holmes. The predicted magnitude was to be around 12 but amateurs reported that it had brightened to magnitude 8.5 in October. It is currently in the constellation of Bootes and will pass the star Arcturus on November 17th.

Comet C/2012 S1 (ISON) has been a real disappointment so far. This future sun grazer is a magnitude dimmer than predicted. It is currently a binocular object and many people have reported seeing the coma and a dim tail. The comet is presently in Virgo and will reach perihelion on November 28th.

C/2012 S1, Comet ISON, 05:17 EST, 9Nov.2013.*

The real surprise is Comet C/2013 R1, Lovejoy. Currently near the Leo/Cancer border it is the brightest at magnitude 8. This comet is easy to view with a pair of 50mm binoculars and it will soon reach naked eye visibility in the latter part of November.

C/2013 R1, Comet Lovejoy. 9Nov2013.*

Penumbral Lunar Eclipse . . .

On Friday, October 18th a penumbral total lunar eclipse was seen over the ATMoB Clubhouse. The Earth's penumbral shadow covered about 76 percent of the Moon's surface and this allowed observers to see a slight darkening along the southern half.

While setting up for the first image, a plane transited across the face of the Moon and I snapped a single image as it passed over the eclipsed region.

Penumbral Lunar Eclipse and aircraft transit. *

~Submitted by Al Takeda – Star Fields Editor ~

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

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December *Star Fields* DEADLINE
Sunday, Nov. 24th

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 November 11, 2013

Amateur Telescope Makers of Boston, Inc.
c/o Tom McDonagh, Membership Secretary
48 Mohawk Drive
Acton, MA 01720
FIRST CLASS

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NEWSLETTER	Al Takeda	newsletter@atmob.org

PUBLIC OUTREACH
STAR PARTY COORDINATOR:
Virginia Renehan starparty@atmob.org

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 listen to WBZ (1030 AM)

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 (EST) from Universal Time (UT) subtract 5 from UT.

Nov 17 Leonid Meteor Shower peaks
Nov 17 Full Moon.
Nov 25 Last Quarter Moon (Moonrise at midnight)
Nov 28 Comet C/2012 S1 (ISON) at perihelion
Dec 2 New Moon
Dec 9 First Quarter Moon (Moonset at midnight)
Dec 14 Geminid Meteor Shower peaks
Dec 17 Full Moon
Dec 21 Winter Solstice